Urinary incontinence in women: the management of urinary incontinence in women

National Collaborating Centre for Women’s and Children’s Health

Commissioned by the National Institute for Health and Clinical Excellence

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1 Guideline summary

1.1 Guideline development group membership, NCC-WCH staff and acknowledgements (Original 2006 guideline)

GDG members

- Elisabeth Adams: Subspecialist in Urogynaecology
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1.2 Guideline development group membership, NCC-WCH staff and acknowledgements (2013 partial update)

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- Catherine Linney: Lay member
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1.2 Foreword (or executive summary)

This guidance is a partial update of National institute for Health and Clinical excellence (NICE) clinical guideline 40 (published October 2006) and will replace it. For further information refer to Appendix A and D.

New and updated recommendations have been included based on evidence of the clinical and cost-effectiveness of:

- Antimuscarinic drugs:
  - darifenacin
  - darifenacin – extended release
  - fesoterodine – modified release
  - oxybutinin
  - oxybutynin – modified release
  - oxybutynin – transdermal
  - oxybutynin – topical gel
  - propiverine
  - propiverine – extended release
  - solifenacin
  - tolterodine
  - tolterodine – extended release
  - trospium
  - trospium – extended release

- Sacral nerve stimulation compared with either no active treatment or placebo
Percutaneous posterior tibial nerve stimulation (PTNS) compared with either no active treatment or placebo

Transcutaneous posterior tibial nerve stimulation compared with no either no active treatment or placebo

Transcutaneous electrical nerve stimulation (TENS) compared with no either no active treatment or placebo

A comparison of TENS, transcutaneous posterior tibial nerve stimulation, sacral nerve stimulation and PTNS (if these treatments are found to be effective compared with no treatment or placebo)

Botulinum toxin A compared with placebo in women with OAB caused by detrusor overactivity

Pharmacological treatment compared with neuromodulation in all women with overactive bladder

Pharmacological treatment compared with neuromodulation and botulinum toxin A in women with OAB caused by detrusor overactivity only

Surgical approaches for mid-urethral procedures in women undergoing their primary surgical tape procedure:
- retropubic bottom up
- retropubic top down
- transobturator inside out
- transobturator outside in
- single-incision.

Interventions for women for whom the primary tape procedure has failed:
- conservative management, looking only at:
  - lifestyle interventions, specifically weight loss, fluid management and smoking cessation
  - physical therapy, specifically pelvic floor muscle training
- repeat tape procedure
- fascial sling
- colposuspension.

Recommendations are marked to indicate the year and type of review:

- [2006] if the evidence has not been reviewed since the original guideline.
- [2006, amended 2013] if the evidence has not been reviewed, but an essential change has been made that affects the meaning of the recommendation.
- [2013] if the evidence has been reviewed but no change has been made to the recommendation.
- [new2013] if the evidence has been reviewed and the recommendation has been updated or added.

Appendix L contains recommendations from the 2006 guideline that the GDG have removed or amended for clarification in the 2013 update. This is because the evidence has been reviewed and the recommendation has been updated or because NICE has updated other relevant guidance and has replaced the original recommendations. Where recommendations have been replaced, details are provided. Where there is no replacement recommendation, an explanation for the proposed deletion is given.
A grey bar down the side of the page indicates those sections of the guideline which are new or have been updated. Material from the original guideline which has been deleted can be found in Appendix 3.
1.3 Care pathway/Algorithm

A - Initial advice and conservation treatments

- History taking and physical examination
  - At the initial clinical assessment, the woman's urinary incontinence (UI) should be categorised as stress UI (SUI), mixed UI, or urgency UI (OAB). Initial treatment should be started on this basis. In mixed UI, treatment should be directed towards the predominant symptom.
  - If stress incontinence is the predominant symptom in mixed UI, discuss with the woman the benefit of conservative management including antimuscarinic drugs before offering surgery.
  - The clinical assessment should seek to identify relevant predisposing and precipitating factors and other diagnoses that may require referral for additional investigation and treatment.

- Bladder diaries
  - Bladder diaries should be used in the initial assessment of women with UI or OAB. Women should be encouraged to complete a minimum of 3 days of the diary covering variations in their usual activities, such as both working and leisure days.

- Symptom scoring and quality of life assessment
  - The following incontinence-specific quality of life scales are recommended when therapies are being evaluated: ICIQ, BFLUTS, I-QOL, SUIQ, UISS, SAAPI-QM, ISI, and KHQ.

- For women with only OAB symptoms offer:
  - Lifestyle advice [A16]
  - Bladder training [A18]

- For women with mixed UI symptoms offer:
  - Lifestyle advice [A16]
  - Bladder training [A18]
  - Pelvic floor muscle training [A17]

- Do not offer transcutaneous posterior tibial nerve stimulation for OAB.

- Do not offer transcutaneous electrical nerve stimulation.

- Electrical stimulation should not routinely be used in combination with pelvic floor muscle training.

- Perineometry or pelvic floor electromyography as biofeedback should not be used as a routine part of pelvic floor muscle training.

- Do not offer transcutaneous posterior tibial nerve stimulation (TENS) to treat OAB in women.

- Explain that there is insufficient evidence to recommend the use of transcutaneous posterior tibial nerve stimulation to treat OAB.

- Do not offer transcutaneous posterior tibial nerve stimulation for OAB.

- Anti-muscarinic (see pathway B)

- MDT (see pathway C)

- Do not offer assessments:
  - Cystoscopy in the initial assessment
  - Pad tests
  - Q-tip, Bonney, Marshall and Fluid-Bridge tests
  - Magnetic resonance imaging, computed tomography, X-ray is not recommended for the routine assessment of women with UI. Ultrasound is not recommended other than for the assessment of residual urine volume.

- Lifestyle advice
  - Consider advising modification of high or low fluid intake for the treatment of women with UI or OAB.
  - Women with UI or OAB who have a body mass index greater than 30 should be advised to lose weight.
  - A trial of caffeine reduction is recommended for the treatment of women with OAB.

- Pelvic floor muscle training
  - Routine digital assessment to confirm pelvic floor muscle contraction should be undertaken before the use of supervised pelvic floor muscle training for the treatment of UI.
  - A trial of supervised pelvic floor muscle training of at least 3 months’ duration should be offered as first-line treatment to women with stress or mixed UI.
  - Pelvic floor muscle training programmes should comprise at least eight contractions performed three times per day.
  - If pelvic floor muscle training is beneficial, an exercise programme should be maintained.
  - Electrical stimulation and/or biofeedback should be considered in women who cannot actively contract pelvic floor muscles in order to aid motivation and adherence to therapy.

- Bladder training
  - Bladder training lasting for a minimum of 6 weeks should be offered as first-line treatment to women with urgency or mixed UI.
  - If women do not achieve satisfactory benefit from bladder training programmes, the combination of an antimuscarinic agent with bladder training should be considered if frequency is a troublesome symptom.

- Do not offer interventions:
  - Electrical stimulation should not routinely be used in the treatment of women with OAB.
  - Electrical stimulation should not routinely be used in combination with pelvic floor muscle training.

- Referral to a specialist (see pathway F)

- Assessment of residual urine
  - The measurement of post-void residual volume by bladder scan or catheterisation should be performed in women with symptoms suggestive of voiding dysfunction or recurrent UTI.
  - A bladder scan should be used in preference to catheterisation on the grounds of acceptability and lower incidence of adverse events.
  - Women who are found to have a palpable bladder on bimanual or abdominal examination after voiding should be referred to a specialist.

- No UTI symptoms should not be offered antibiotics without the results of midstream urine culture.

- No UTI symptoms should be offered a midstream urine specimen sent for culture and analysis of antibiotic sensitivities.

- An appropriate course of antibiotic treatment should be prescribed pending culture results.

- Specialist referral (see pathway F)
B – Drug treatment for OAB and mixed UI

Initial assessment and conservative treatment (see pathway A)

[B1] Considerations before treatment
Before antimuscarinic drug treatment starts, discuss with women:
- the likelihood of success and associated common adverse effects, and
- that some adverse effects such as dry mouth and constipation may indicate that treatment is working, and
- that they may not see the full benefits until they have been taking the treatment for 4 weeks.

If a woman’s antimuscarinic drug treatment is effective and well tolerated, do not change the dose or drug.

[B2] Do not offer
Do not offer oxybutynin (immediate release) to frail older women.
Do not offer the following to treat OAB or mixed UI:
- solifenacin, or
- propiverine (extended release), or
- fesoterodine, or
- trospium (extended release), or
- tolerodine (extended release).

Flavoxate, propantheline and imipramine should not be used for the treatment of UI or OAB in women.

[B3] Offering antimuscarinic drugs
Offer the following choices first to women with OAB or mixed UI:
- oxybutynin (immediate release), or
- tolerodine (immediate release), or
- propiverine (immediate release).

When offering antimuscarinic drugs to treat OAB always take account of:
- the woman’s coexisting conditions (for example, poor bladder emptying)
- use of other existing medication affecting the total anticholinergic load
- risk of adverse effects.

Prescribe the lowest recommended dose when starting a new antimuscarinic drug treatment.
If the first-line antimuscarinic drug treatment for OAB or mixed UI is not well tolerated, offer a choice of one of the following as a second-line antimuscarinic drug treatment:
- trospium (immediate release), or
- oxybutynin (extended release), or
- darifenacin, or
- or an alternative first-line immediate release drug.

Offer a topical antimuscarinic only to women unable to tolerate oral medication.

[B4] Medication review
Offer a face-to-face or telephone review 4 weeks after the start of each new antimuscarinic drug treatment. Ask the woman if she is satisfied with the therapy and:
- if improvement is optimal, continue treatment, or
- if there is no or suboptimal improvement or intolerable adverse effects, change the dose, or try an alternative antimuscarinic drug, and review again 4 weeks later.

Offer review before 4 weeks if the adverse events are intolerable. Consider referral if the woman does not want to try another antimuscarinic drug, but would like to have specialist treatment.

[B5] Further medication review
Consider a further face-to-face or telephone review if a woman’s condition stops responding optimally to treatment after an initial successful 4 week review.

[B6] Women who choose not to have further treatment at this time
If antimuscarinic drug treatment is not successful, discuss the options for further management (non-therapeutic interventions and invasive therapy) with the woman:
- if she would like to think about invasive therapy, arrange urodynamic investigation to determine whether detrusor overactivity is present
- if she does not wish to explore invasive therapy see recommendation 50.

[B7] Annual medication review
Review women who remain on long-term drug treatment for UI or OAB annually in primary care (or every 6 months for women over 75).

MDT referral (see Pathway C)
Unsuccessful antimuscarinic treatment (pathway B)

Unsuccessful SUI conservative treatment (pathway A)

[C1] The multidisciplinary team (MDT)
- The multidisciplinary team (MDT) for urinary incontinence should be drawn from community and secondary or tertiary care and include as a minimum:
  - a specialist surgeon
  - a specialist nurse
  - a specialist physiotherapist.

[C2] MDT process
- Any woman wishing to consider surgical treatment for UI should be informed about the benefits and risks of surgical and non-surgical options. Counselling should include consideration of the woman’s child-bearing wishes.
- Offer invasive therapy for OAB and SUI symptoms only after a clinical review by the MDT.
- Discuss the recommendations made by the MDT at the clinical review with the woman.

[C3] Women who choose not to have further treatment at this time
- If a woman chooses not to have further treatment for urinary incontinence:
  - offer her advice about managing urinary symptoms, and
  - explain that if she changes her mind at a later date she can book a review appointment to discuss past tests and interventions and reconsider her treatment options.

[C4] Urodynamic testing
- Do not perform multi-channel cystometry, ambulatory urodynamics or videourodynamics before starting conservative treatment.
- After undertaking a detailed clinical history and examination, perform multi-channel filling and voiding cystometry before surgery in women who have:
  - symptoms of OAB leading to a clinical suspicion of detrusor overactivity, or
  - symptoms suggestive of voiding dysfunction or anterior compartment prolapse, or
  - had previous surgery for stress incontinence.
- Do not perform multi-channel filling and voiding cystometry in the small group of women where pure SUI is diagnosed based on a detailed clinical history and examination.
- Consider ambulatory urodynamics or videourodynamics if the diagnosis is unclear after conventional urodynamics.

Invasive OAB treatment (see pathway E)

Invasive SUI treatment (see pathway D)
D – Surgical approaches for SUI

[D1] Choice of SUI treatment
- When offering a surgical procedure discuss with the woman the risks and benefits of the different treatment options for SUI using the information in table 8.12.
- Refer women to an alternative surgeon if their chosen procedure is not available from the consulting surgeon.
- If conservative treatment for SUI has failed, offer:
  - synthetic mid-urethral tape (see D2) or
  - open colposuspension (see D3), or
  - autologous rectus fascial sling (see D4)

[D2] Synthetic mid-urethral tape
- When offering a mid-urethral tape procedure, surgeons should:
  - use one of the following procedures and devices for which there is current high quality evidence of efficacy and safety
  - TVT or Advantage for a 'bottom-up' retropubic approach
  - TVT-O for an 'inside-out' transobturator approach
  - Obtape, Monarc or Obtroyx Halo for an 'outside-in' transobturator approach
  - only use a device that they have been trained to use
  - use type 1 macroporous polypropylene tape
  - consider using a tape coloured for high visibility, for ease of insertion and revision.
- If women are offered a procedure involving the transobturator approach, make them aware of the lack of long-term outcome data.

[D3] Open colposuspension

[D4] Autologous rectus fascial sling

[D5] Follow-up
- Offer a follow-up appointment, (including vaginal examination) to all women who have had continence surgery within 6 months.

[D6] Secondary SUI procedures
- The MDT should review all patients whose invasive SUI procedure has failed.
- Women whose primary surgical procedure for SUI has failed and who wish to consider further treatment should:
  - be referred to tertiary care for assessment by a specialised multidisciplinary team, and
  - have repeat urodynamic testing including additional tests such as imaging and urethral function studies.

[D7] Women who choose not to have further treatment at this time
- If a woman chooses not to have further treatment for urinary incontinence:
  - offer her advice about managing urinary symptoms, and
  - explain that if she changes her mind at a later date she can book a review appointment to discuss past tests and interventions and reconsider her treatment options.

[D8] Alternative treatment: Intramural bulking agents
- Consider intramural bulking agents (silicone, carbon-coated zirconium beads or hyaluronic acid/dextran copolymer) for the management of stress UI if conservative management has failed. Women should be made aware that:
  - repeat injections may be required to achieve efficacy
  - efficacy diminishes with time
  - efficacy is inferior to that of retropubic suspension or sling.

[D9] Alternative treatment: Artificial urinary sphincter
- In view of the associated morbidity, the use of an artificial urinary sphincter should be considered for the management of stress UI in women only if previous surgery has failed. Life-long follow-up is recommended.

[D10] Do not offer
- Laparoscopic colposuspension is not recommended as a routine procedure for the treatment of stress UI in women. The procedure should be performed only by an experienced laparoscopic surgeon working in a multidisciplinary team with expertise in the assessment and treatment of UI.
- Anterior colporrhaphy, needle suspensions, paravaginal defect repair and the Marshall–Marchetti–Krantz procedure are not recommended for the treatment of stress UI.
- Autologous fat and polytetrafluoroethylene used as intramural bulking agents are not recommended for the treatment of stress UI.
- Use 'top-down' retropubic tape procedures only as part of a clinical trial. Refer to single-incision sub-urethral short tape insertion for stress urinary incontinence (NICE interventional procedure guidance 262) for guidance on single incision procedures.
E – Invasive approaches to OAB

[E1] Information before treatment
- Start treatment with BoNT-A only if women: have been trained in clean intermittent catheterisation and have performed the technique successfully, and are able and willing to perform clean intermittent catheterisation on a regular basis for as long as required.
- Discuss the risks and benefits of treatment with BoNT-A with women before seeking informed consent, covering: the likelihood of being symptom free or have a large reduction in symptoms, the risk of clean intermittent catheterisation and the potential for it to be required for variable lengths of time after the effect of the injections have worn off, the absence of evidence on long-term risks, duration of effect, and the number of injections required for optimum treatment, the risk of adverse effects including an increased risk of urinary tract infection.

[E2] Offering BoNT-A
- After MDT review, offer bladder wall injection with BoNT-A to women with proven detrusor overactivity that has not responded to conservative management (including antimuscarinic drug therapy).

[E3] Failure of BoNT-A
- Consider SNS after MDT review if a woman’s OAB has not responded to conservative management (including antimuscarinic drugs) and BoNT-A.

[E4] Unable to Catheterise
- Offer sacral nerve stimulation (SNS) to women after MDT review if: their OAB has not responded to conservative management including antimuscarinic drugs, and they are unable to perform clean intermittent catheterisation.

[E5] Repeat treatment
- Offer specialist follow-up at 4 to 6 months to women having treatment for OAB with BoNT-A or sooner if symptoms return.
- Tell women how to self-refer for prompt specialist review if symptoms return following a BoNT-A procedure. Offer repeat treatment as necessary.

[E7] Do not offer BoNT-B
- Do not offer botulinum toxin B to women with proven detrusor overactivity.

[E6] Offering SNS
- Discuss the long-term implications of SNS with women including: the need for peripheral nerve evaluation test stimulation and probability of the test’s success, the risk of failure, the long-term commitment, the need for surgical revision, the adverse effects.
- Tell women how to self-refer for prompt specialist review if symptoms return following an SNS procedure. Offer repeat treatment as necessary.

[E8] Urinary diversion
- Urinary diversion should be considered for a woman with OAB only when conservative treatments have failed, and if BoNT-A, sacral nerve stimulation and augmentation cystoplasty are not appropriate or are unacceptable to her. Provide life-long follow-up.

- Augmentation cystoplasty for the management of idiopathic detrusor overactivity should be restricted to women who have not responded to conservative treatments and who are willing and able to self-catheterise. Preoperative counselling for the woman or her carer should include common and serious complications: bowel disturbance, metabolic acidosis, mucus production and/or retention in the bladder, UTI and urinary retention. The small risk of malignancy occurring in the augmented bladder should also be discussed. Provide life-long follow-up.

[D10] Women who choose not to have further treatment at this time
- If a woman chooses not to have further treatment for urinary incontinence: offer her advice about managing urinary symptoms, and explain that if she changes her mind at a later date she can book a review appointment to discuss past tests and interventions and reconsider her treatment options.
F – Referral for specialist intervention and surgeon standards

[F1] Urgent referral
- Women with UI who have any of the following should receive an urgent referral:
  - microscopic haematuria in women aged 50 years and older
  - visible haematuria
  - recurrent or persisting UTI associated with haematuria in women aged 40 years and older
  - suspected malignant mass arising from the urinary tract.
- In women with UI, further indications for consideration for referral to a specialist service include:
  - persisting bladder or urethral pain,
  - clinically benign pelvic masses
  - associated faecal incontinence
  - suspected neurological disease
  - symptoms of voiding difficulty
  - suspected urogenital fistulae
  - previous continence surgery
  - previous pelvic cancer surgery
  - previous pelvic radiation therapy.

[F2] Maintaining and measuring expertise and standards for practice
- Surgery for UI should be undertaken only by surgeons who have received appropriate training in the management of UI and associated disorders or who work within a multidisciplinary team with this training, and who regularly carry out surgery for UI in women.
- Training should be sufficient to develop the knowledge and generic skills documented below. Knowledge should include the:
  - specific indications for surgery
  - required preparation for surgery including preoperative investigations
  - outcomes and complications of proposed procedure
  - anatomy relevant to procedure
  - steps involved in procedure
  - alternative management options
  - likely postoperative progress.
- Generic skills should include:
  - the ability to explain procedures and possible outcomes to patients and family and to obtain informed consent
  - the necessary hand–eye dexterity to complete the procedure safely and efficiently, with appropriate use of assistance
  - the ability to communicate with and manage the operative team effectively
  - the ability to prioritise interventions
  - the ability to recognise when to ask for advice from others
  - a commitment to multidisciplinary team working.
- Training should include competence in cystourethroscopy.
- Operative competence of surgeons undertaking surgical procedures to treat UI or OAB in women should be formally assessed by trainers through a structured process.
- Surgeons who are already carrying out procedures for UI should be able to demonstrate that their training, experience and current practice equates to the standards laid out for newly trained surgeons.
- Surgery for UI or OAB in women should be undertaken only by surgeons who carry out a sufficient case load to maintain their skills. An annual workload of at least 20 cases of each primary procedure for stress UI is recommended. Surgeons undertaking fewer than five cases of any procedure annually should do so only with the support of their clinical governance committee; otherwise referral pathways should be in place within clinical networks.
- There should be a nominated clinical lead within each surgical unit with responsibility for continence and prolapse surgery. The clinical lead should work within the context of an integrated continence service.
- A national audit of continence surgery should be undertaken.
- Surgeons undertaking continence surgery should maintain careful audit data and submit their outcomes to national registries such as those held by the British Society of Urogynaecology (BSUG) and British Association of Urological Surgeons Section of Female and Reconstructive Urology (BAUS-SFRU).
G – Non-therapeutic interventions and alternative treatments

**[G1] Catheters**
- Bladder catheterisation (intermittent or indwelling urethral or suprapubic) should be considered for women in whom persistent urinary retention is causing incontinence, symptomatic infections or renal dysfunction, and in whom this cannot otherwise be corrected. Healthcare professionals should be aware, and explain to women, that the use of indwelling catheters in urge UI may not result in continence.

**[G2] Intermittent urethral catheters**
- Intermittent urethral catheterisation should be used for women with urinary retention who can be taught to self-catheterise or who have a carer who can perform the technique.

**[G3] Indwelling urethral catheters**
- Careful consideration should be given to the impact of long-term indwelling urethral catheterisation. The practicalities, benefits and risks should be discussed with the patient or, if appropriate, her carer. Indications for the use of long-term indwelling urethral catheters for women with UI include:
  - chronic urinary retention in women who are unable to manage intermittent self-catheterisation
  - skin wounds, pressure ulcers or irritations that are being contaminated by urine
  - distress or disruption caused by bed and clothing changes
  - where a woman expresses a preference for this form of management.

**[G4] Indwelling suprapubic catheters**
- Indwelling suprapubic catheters should be considered as an alternative to long-term urethral catheters. Healthcare professionals should be aware, and explain to women, that they may be associated with lower rates of symptomatic UTI, 'bypassing', and urethral complications than indwelling urethral catheters.

**[G5] Absorbent products, urinals and toileting aids**
- Absorbent products, hand-held urinals and toileting aids should not be considered as a treatment for UI. They should be used only as:
  - a coping strategy pending definitive treatment
  - an adjunct to on-going therapy
  - long-term management of UI only after treatment options have been explored.
- Intravaginal and intraurethral devices are not recommended for the routine management of UI in women. Women should not be advised to consider such devices other than for occasional use when necessary to prevent leakage, for example during physical exercise.

**[G6] Do not use**
- Complementary therapies are not recommended for the treatment of UI or OAB.

**[G7] Desmopressin**
- The use of desmopressin may be considered specifically to reduce nocturia in women with UI or OAB who find it a troublesome symptom. The use of desmopressin may be considered specifically to reduce nocturia in women with UI or OAB who find it a troublesome symptom. Use particular caution in people with cystic fibrosis and avoid in those over 65 years of age or with cardiovascular disease or hypertension.

**[G8] Oestrogens**
- Intravaginal oestrogens are recommended for the treatment of OAB symptoms in postmenopausal women with vaginal atrophy.

**[G9] Duloxetine**
- Duloxetine is not recommended as a first-line treatment for women with predominant stress UI. Duloxetine should not routinely be used as a second-line treatment for women with stress UI, although it may be offered as second-line therapy if women prefer pharmacological to surgical treatment or are not suitable for surgical treatment. If duloxetine is prescribed, women should be counselled about its adverse effects.
This guideline recommends some drugs for indications for which they do not have a United Kingdom (UK) marketing authorisation at the date of publication, if there is good evidence to support that use. Many drugs do not have a license for use specifically in pregnant women, reflecting the fact that this group is often excluded from studies. Unlicensed drugs are indicated with a footnote.

### 1.4 Key priorities for implementation

<table>
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<th>Recommendation</th>
<th>See section</th>
</tr>
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<tbody>
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<td>1</td>
<td>At the initial clinical assessment, the woman’s urinary incontinence (UI) should be categorised as stress UI (SUI), mixed UI, or urgency UI/overactive bladder (OAB). Initial treatment should be started on this basis. In mixed UI, treatment should be directed towards the predominant symptom. [2006]</td>
<td>4.2</td>
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<tr>
<td>4</td>
<td>Routine digital assessment to confirm pelvic floor muscle contraction should be undertaken before the use of supervised pelvic floor muscle training for the treatment of UI. [2006, amended 2013]</td>
<td>4.3</td>
</tr>
<tr>
<td>17</td>
<td>Bladder diaries should be used in the initial assessment of women with UI or OAB. Women should be encouraged to complete a minimum of 3 days of the diary covering variations in their usual activities, such as both working and leisure days. [2006]</td>
<td>4.9</td>
</tr>
<tr>
<td>41</td>
<td>Do not routinely offer percutaneous posterior tibial nerve stimulation (PTNS) for OAB. Only consider PTNS if antimuscarinic drug treatment has not worked adequately and the woman does not want botulinum toxin A (BoNT-A) or sacral nerve stimulation (SNS). [new 2013]</td>
<td>5.5</td>
</tr>
</tbody>
</table>
| 42     | Absorbent products, hand held urinals and toileting aids should not be considered as a treatment for UI. They should be used only as:  
• a coping strategy pending definitive treatment  
• an adjunct to ongoing therapy  
• long-term management of UI only after treatment options have been explored. [2006] | 5.6 |
| 52     | Before antimuscarinic drug treatment starts, discuss with women:  
• the likelihood of success and associated common adverse effects, and  
• the frequency and route of administration, and  
• that some adverse effects such as dry mouth and constipation may indicate that treatment is working, and  
• that they may not see the full benefits until they have been taking the treatment for 4 weeks. [new 2013] | 6.1 |
| 58     | Offer the following choices first to women with OAB or mixed UI:  
• oxybutynin (immediate release), or  
• tolterodine (immediate release), or  
• propiverine (immediate release). [new 2013] | 6.1 |
| 59     | If the first-line treatment for OAB or mixed UI is not well tolerated, offer one of the following as a second-line antimuscarinic drug treatment:  
• trospium (immediate release), or  
• oxybutynin (extended release), or | 6.1 |
<table>
<thead>
<tr>
<th>Number</th>
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<tbody>
<tr>
<td></td>
<td>darifenacin, or</td>
<td></td>
</tr>
<tr>
<td></td>
<td>an alternative immediate release drug (from recommendation 58).</td>
<td>[new 2013]</td>
</tr>
<tr>
<td>72</td>
<td>Offer invasive therapy for OAB and SUI symptoms only after a clinical review by the MDT.</td>
<td>7.2</td>
</tr>
<tr>
<td>88</td>
<td>When offering a surgical procedure discuss with the woman the risks and benefits of the different treatment options for SUI using the information in table 8.12.</td>
<td>5.5</td>
</tr>
</tbody>
</table>

## 1.5 Recommendations

### Assessment and investigation

#### History-taking and physical examination

1. At the initial clinical assessment, the woman’s urinary incontinence (UI) should be categorised as stress UI (SUI), mixed UI, or urgency UI/overactive bladder (OAB). Initial treatment should be started on this basis. In mixed UI, treatment should be directed towards the predominant symptom. [2006]

2. If stress incontinence is the predominant symptom in mixed UI, discuss with the woman the benefit of conservative management including antimuscarinic drugs before offering surgery. [new 2013]

3. The clinical assessment should seek to identify relevant predisposing and precipitating factors and other diagnoses that may require referral for additional investigation and treatment. [2006]

#### Assessment of pelvic floor muscles

4. Routine digital assessment to confirm pelvic floor muscle contraction should be undertaken before the use of supervised pelvic floor muscle training for the treatment of UI. [2006, amended 2013]

#### Assessment of prolapse

5. Women with UI who have symptomatic prolapse that is visible at or below the vaginal introitus should be referred to a specialist. [2006]

#### Urine testing

6. A urine dipstick test should be undertaken in all women presenting with UI to detect the presence of blood, glucose, protein, leucocytes and nitrates in the urine. [2006]

7. Women with symptoms of urinary tract infection (UTI) whose urine tests positive for both leucocytes and nitrates should have a midstream urine specimen sent for culture and analysis of antibiotic sensitivities. An appropriate course of antibiotic treatment should be
### Number  Recommendation  

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<th>Recommendation</th>
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<tbody>
<tr>
<td>8</td>
<td>Women with symptoms of UTI whose urine tests negative for either leucocytes or nitrites should have a midstream urine specimen sent for culture and analysis of antibiotic sensitivities. The healthcare professional should consider the prescription of antibiotics pending culture results. [2006]</td>
<td>4.5</td>
</tr>
<tr>
<td>9</td>
<td>Women who do not have symptoms of UTI, but whose urine tests positive for both leucocytes and nitrites, should not be offered antibiotics without the results of midstream urine culture. [2006]</td>
<td>4.5</td>
</tr>
<tr>
<td>10</td>
<td>Women who do not have symptoms of UTI and whose urine tests negative for either leucocytes or nitrites are unlikely to have UTI and should not have a urine sample sent for culture. [2006]</td>
<td>4.5</td>
</tr>
</tbody>
</table>

### Assessment of residual urine

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</thead>
<tbody>
<tr>
<td>11</td>
<td>The measurement of post-void residual volume by bladder scan or catheterisation should be performed in women with symptoms suggestive of voiding dysfunction or recurrent UTI. [2006]</td>
<td>4.6</td>
</tr>
<tr>
<td>12</td>
<td>A bladder scan should be used in preference to catheterisation on the grounds of acceptability and lower incidence of adverse events. [2006]</td>
<td>4.6</td>
</tr>
<tr>
<td>13</td>
<td>Women who are found to have a palpable bladder on bimanual or abdominal examination after voiding should be referred to a specialist. [2006]</td>
<td>4.6</td>
</tr>
</tbody>
</table>

### Referral

<table>
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<tr>
<th>Number</th>
<th>Recommendation</th>
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</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>Women with UI who have any of the following should receive an urgent referral¹:</td>
<td>4.7</td>
</tr>
</tbody>
</table>
|        |  - microscopic haematuria in women aged 50 years and older  
|        |  - visible haematuria  
|        |  - recurrent or persisting UTI associated with haematuria in women aged 40 years and older  
|        |  - suspected malignant mass arising from the urinary tract. [2006]                                                                                                                                 |             |
| 15     | In women with UI, further indications for consideration for referral to a specialist service include:                                                                                                | 4.7         |
|        |  - persisting bladder or urethral pain  
|        |  - clinically benign pelvic masses  
|        |  - associated faecal incontinence  
|        |  - suspected neurological disease  
|        |  - symptoms of voiding difficulty  
|        |  - suspected urogenital fistulae  
|        |  - previous continence surgery  
|        |  - previous pelvic cancer surgery  
|        |  - previous pelvic radiation therapy². [2006]                                                                                                                                                               |             |

¹ NICE’s ‘Referral guidelines for suspected cancer’ ([http://guidance.nice.org.uk/CG27](http://guidance.nice.org.uk/CG27)) define urgent referral as the patient being seen within the national target for urgent referrals (currently 2 weeks).

² For further indications for consideration for referral, see recommendations 5 and 13.
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<tr>
<th>Number</th>
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<tbody>
<tr>
<td>16</td>
<td>The following incontinence-specific quality-of-life scales are recommended when therapies are being evaluated: ICIQ, BFLUTS, I-QOL, SUIQQ, UISS, SEAPI-QMM, ISI and KHQ. [2006]</td>
<td>4.8</td>
</tr>
<tr>
<td>17</td>
<td>Bladder diaries should be used in the initial assessment of women with UI or OAB. Women should be encouraged to complete a minimum of 3 days of the diary covering variations in their usual activities, such as both working and leisure days. [2006]</td>
<td>4.9</td>
</tr>
<tr>
<td>18</td>
<td>Pad tests are not recommended in the routine assessment of women with UI. [2006]</td>
<td>4.10</td>
</tr>
<tr>
<td>19</td>
<td><strong>Do not perform</strong> multi-channel cystometry, ambulatory urodynamics or videourodynamic before starting conservative treatment. [2006, amended 2013]</td>
<td>4.11</td>
</tr>
</tbody>
</table>
| 20     | **After undertaking a detailed clinical history and examination, perform** multi-channel filling and voiding cystometry before surgery in women who have:  
- symptoms of OAB leading to a clinical suspicion of detrusor overactivity, or  
- symptoms suggestive of voiding dysfunction or anterior compartment prolapse, or  
- had previous surgery for stress incontinence. [2006, amended 2013] | 4.11 |
<p>| 21     | <strong>Do not perform</strong> multi-channel filling and voiding cystometry in the small group of women where pure SUI is diagnosed based on a detailed clinical history and examination. [2006, amended 2013] | 4.11 |
| 22     | Consider ambulatory urodynamics or videourodynamic if the diagnosis is unclear after conventional urodynamics. [2006, amended 2013] | 4.11 |
| 23     | The Q-tip, Bonney, Marshall and Fluid-Bridge tests are not recommended in the assessment of women with UI. [2006] | 4.12 |
| 24     | Cystoscopy is not recommended in the initial assessment of women with UI alone. [2006] | 4.13 |
| 25     | Imaging (magnetic resonance imaging, computed tomography, X-ray) is not recommended for the routine assessment of women with UI. Ultrasound is not recommended other than for the assessment of residual urine volume. [2006] | 4.14 |
|        | <strong>Lifestyle interventions</strong> |
|        | Caffeine |</p>
<table>
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<tr>
<th>Number</th>
<th>Recommendation</th>
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<tbody>
<tr>
<td>26</td>
<td>A trial of caffeine reduction is recommended for the treatment of women with OAB. [2006]</td>
<td>5.2</td>
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<tr>
<td></td>
<td><strong>Fluid intake</strong></td>
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<tr>
<td>27</td>
<td>Consider advising modification of high or low fluid intake in women with UI or OAB. [2006]</td>
<td>5.2</td>
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<tr>
<td></td>
<td><strong>Weight</strong></td>
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<tr>
<td>28</td>
<td>Women with UI or OAB who have a body mass index greater than 30 should be advised to lose weight. [2006]</td>
<td>5.2</td>
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<tr>
<td></td>
<td><strong>Physical therapies</strong></td>
<td></td>
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<tr>
<td></td>
<td><strong>Pelvic floor muscle training</strong></td>
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<tr>
<td>29</td>
<td>A trial of supervised pelvic floor muscle training of at least 3 months’ duration should be offered as first-line treatment to women with stress or mixed UI. [2006]</td>
<td>5.3</td>
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<tr>
<td>30</td>
<td>Pelvic floor muscle training programmes should comprise at least eight contractions performed three times per day. [2006]</td>
<td>5.3</td>
</tr>
<tr>
<td>31</td>
<td>Perineometry or pelvic floor electromyography as biofeedback should not be used as a routine part of pelvic floor muscle training. [2006]</td>
<td>5.3</td>
</tr>
<tr>
<td>32</td>
<td>If pelvic floor muscle training is beneficial, an exercise programme should be continued. [2006]</td>
<td>5.3</td>
</tr>
<tr>
<td></td>
<td><strong>Therapeutic stimulation</strong></td>
<td></td>
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<tr>
<td>33</td>
<td>Electrical stimulation should not routinely be used in the treatment of women with OAB. [2006]</td>
<td>5.3</td>
</tr>
<tr>
<td>34</td>
<td>Electrical stimulation should not routinely be used in combination with pelvic floor muscle training. [2006]</td>
<td>5.3</td>
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<tr>
<td>35</td>
<td>Electrical stimulation and/or biofeedback should be considered in women who cannot actively contract pelvic floor muscles in order to aid motivation and adherence to therapy. [2006]</td>
<td>5.3</td>
</tr>
<tr>
<td></td>
<td><strong>Behavioural therapies</strong></td>
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<tr>
<td></td>
<td><strong>Bladder training</strong></td>
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<tr>
<td>36</td>
<td>Bladder training lasting for a minimum of 6 weeks should be offered as first-line treatment to women with urgency or mixed UI. [2006]</td>
<td>5.4</td>
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<tr>
<td></td>
<td><strong>Multicomponent behavioural therapy</strong></td>
<td></td>
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<tr>
<td>37</td>
<td>If women do not achieve satisfactory benefit from bladder training programmes, the combination of an antimuscarinic agent with bladder training should be considered if frequency is a troublesome symptom. [2006]</td>
<td>5.4</td>
</tr>
<tr>
<td></td>
<td><strong>Neuromodulation in primary care</strong></td>
<td></td>
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<td></td>
<td><strong>Transcutaneous electrical nerve stimulation</strong></td>
<td></td>
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<tr>
<td>38</td>
<td>Do not offer transcutaneous electrical nerve stimulation (TENS) to treat OAB in women. [new 2013]</td>
<td>5.5</td>
</tr>
<tr>
<td></td>
<td>Transcutaneous posterior tibial nerve stimulation</td>
<td></td>
</tr>
<tr>
<td>Number</td>
<td>Recommendation</td>
<td>See section</td>
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<tr>
<td>39</td>
<td>Explain that there is insufficient evidence to recommend the use of transcutaneous posterior tibial nerve stimulation to treat OAB. [new 2013]</td>
<td>5.5</td>
</tr>
<tr>
<td>40</td>
<td>Do not offer transcutaneous posterior tibial nerve stimulation for OAB. [new 2013]</td>
<td>5.5</td>
</tr>
</tbody>
</table>

**Percutaneous posterior tibial nerve stimulation**

41 Do not routinely offer percutaneous posterior tibial nerve stimulation (PTNS) for OAB. Only consider PTNS if antimuscarinic drug treatment has not worked adequately and the woman does not want botulinum toxin A (BoNT-A) or sacral nerve stimulation (SNS). [new 2013]

**Non-therapeutic interventions**

Absorbent products, urinals and toileting aids

42 Absorbent products, hand held urinals and toileting aids should not be considered as a treatment for UI. They should be used only as:

- a coping strategy pending definitive treatment
- an adjunct to ongoing therapy
- long-term management of UI only after treatment options have been explored. [2006]

**Catheters**

43 Bladder catheterisation (intermittent or indwelling urethral or suprapubic) should be considered for women in whom persistent urinary retention is causing incontinence, symptomatic infections, or renal dysfunction, and in whom this cannot otherwise be corrected. Healthcare professionals should be aware, and explain to women, that the use of indwelling catheters in urgency UI may not result in continence. [2006]

**Intermittent urethral catheters**

44 Intermittent urethral catheterisation should be used for women with urinary retention who can be taught to self-catheterise or who have a carer who can perform the technique. [2006]

**Indwelling urethral catheters**

45 Careful consideration should be given to the impact of long-term indwelling urethral catheterisation. The practicalities, benefits and risks should be discussed with the patient or, if appropriate, her carer. Indications for the use of long-term indwelling urethral catheters for women with UI include:

- chronic urinary retention in women who are unable to manage intermittent self-catheterisation
- skin wounds, pressure ulcers or irritations that are being contaminated by urine
- distress or disruption caused by bed and clothing changes
- where a woman expresses a preference for this form of management. [2006]

**Indwelling suprapubic catheters**
<table>
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<tr>
<th>Number</th>
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<tbody>
<tr>
<td>46</td>
<td>Indwelling suprapubic catheters should be considered as an alternative to long-term urethral catheters. Healthcare professionals should be aware, and explain to women, that they may be associated with lower rates of symptomatic UTI, ‘bypassing’, and urethral complications than indwelling urethral catheters. [2006]</td>
<td>5.6</td>
</tr>
<tr>
<td>47</td>
<td>Intravaginal and intraurethral devices are not recommended for the routine management of UI in women. Women should not be advised to consider such devices other than for occasional use when necessary to prevent leakage, for example during physical exercise. [2006]</td>
<td>5.6</td>
</tr>
<tr>
<td>48</td>
<td>Complementary therapies are not recommended for the treatment of UI or OAB. [2006]</td>
<td></td>
</tr>
<tr>
<td>49</td>
<td>Pelvic floor muscle training should be offered to women in their first pregnancy as a preventive strategy for UI. [2006]</td>
<td>5.8</td>
</tr>
<tr>
<td>50</td>
<td>If a woman chooses not to have further treatment for urinary incontinence:</td>
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<tr>
<td></td>
<td>• offer her advice about managing urinary symptoms, and</td>
<td></td>
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<tr>
<td></td>
<td>• explain that if she changes her mind at a later date she can book a review appointment to discuss past tests and interventions and reconsider her treatment options. [new 2013]</td>
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<tr>
<td>51</td>
<td>When offering antimuscarinic drugs to treat OAB always take account of:</td>
<td>6.1</td>
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<tr>
<td></td>
<td>• the woman’s coexisting conditions (for example, poor bladder emptying)</td>
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<td></td>
<td>• use of other existing medication affecting the total anticholinergic load</td>
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<tr>
<td></td>
<td>• risk of adverse effects. [new 2013]</td>
<td></td>
</tr>
<tr>
<td>52</td>
<td>Before antimuscarinic drug treatment starts, discuss with women:</td>
<td>6.1</td>
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<tr>
<td></td>
<td>• the likelihood of success and associated common adverse effects, and</td>
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<td></td>
<td>• the frequency and route of administration, and</td>
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<td></td>
<td>• that some adverse effects such as dry mouth and constipation may indicate that treatment is working, and</td>
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<tr>
<td></td>
<td>• that they may not see the full benefits until they have been taking the treatment for 4 weeks. [new 2013]</td>
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<tr>
<td>53</td>
<td>Prescribe the lowest recommended dose when starting a new antimuscarinic drug treatment. [new 2013]</td>
<td>6.1</td>
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<tr>
<td>54</td>
<td>If a woman’s antimuscarinic drug treatment is effective and well tolerated, do not change the dose or drug. [new 2013]</td>
<td>6.1</td>
</tr>
<tr>
<td><strong>Choosing antimuscarinic drugs</strong></td>
<td><strong>Flavoxate, propantheline and imipramine should not be used for the treatment of UI or OAB in women.</strong> [2006]</td>
<td><strong>6.1</strong></td>
</tr>
<tr>
<td>55</td>
<td>Do not offer oxybutynin (immediate release) to frail older women³. [new 2013]</td>
<td><strong>6.1</strong></td>
</tr>
<tr>
<td>56</td>
<td>Do not offer the following to treat OAB or mixed UI:</td>
<td><strong>6.1</strong></td>
</tr>
<tr>
<td>- solifenacin, or</td>
<td>- propiverine (extended release), or</td>
<td></td>
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<tr>
<td>- fesoterodine, or</td>
<td>- trospium (extended release), or</td>
<td></td>
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<tr>
<td>- tolterodine (extended release) [new 2013]</td>
<td></td>
<td><strong>6.1</strong></td>
</tr>
<tr>
<td>57</td>
<td>Offer the following choices first to women with OAB or mixed UI:</td>
<td><strong>6.1</strong></td>
</tr>
<tr>
<td>- oxybutynin (immediate release), or</td>
<td>- tolterodine (immediate release), or</td>
<td></td>
</tr>
<tr>
<td>- propiverine (immediate release). [new 2013]</td>
<td></td>
<td><strong>6.1</strong></td>
</tr>
<tr>
<td>58</td>
<td>If the first-line treatment for OAB or mixed UI is not well tolerated, offer one of the following as a second-line antimuscarinic drug treatment:</td>
<td><strong>6.1</strong></td>
</tr>
<tr>
<td>- trospium (immediate release), or</td>
<td>- oxybutynin (extended release), or</td>
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<tr>
<td>- darifenacin, or</td>
<td>- an alternative Immediate release drug (from recommendation 58). [new 2013]</td>
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<tr>
<td>59</td>
<td>Offer a transdermal antimuscarinic only to women unable to tolerate oral medication. [new 2013]</td>
<td><strong>6.1</strong></td>
</tr>
<tr>
<td><strong>Reviewing antimuscarinic drug treatment</strong></td>
<td>Offer a face-to-face or telephone review 4 weeks after the start of each new antimuscarinic drug treatment. Ask the woman if she is satisfied with the therapy and:</td>
<td><strong>6.1</strong></td>
</tr>
<tr>
<td>- if improvement is optimal, continue treatment, or</td>
<td>- if there is no or suboptimal improvement or intolerable adverse effects change the dose, or try an alternative antimuscarinic drug, and review again 4 weeks later. [new 2013]</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>Offer review before 4 weeks if the adverse events are intolerable. [new 2013]</td>
<td><strong>6.1</strong></td>
</tr>
<tr>
<td>61</td>
<td>Consider referral if the woman does not want to try another antimuscarinic drug, but would like to have specialist treatment. [new 2013]</td>
<td><strong>6.1</strong></td>
</tr>
<tr>
<td>62</td>
<td>Consider a further face-to-face or telephone review if a woman’s</td>
<td><strong>6.1</strong></td>
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³ The GDG defined ‘frail older women’ as those with multiple comorbidities, functional impairments such as walking or dressing difficulties and any degree of cognitive impairment.
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<th>Number</th>
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<tbody>
<tr>
<td>65</td>
<td>Review women who remain on long-term drug treatment for UI or OAB annually in primary care (or every 6 months for women over 75).</td>
<td>6.1</td>
</tr>
</tbody>
</table>
| 66     | If antimuscarinic drug treatment is not successful, discuss the options for further management (non-therapeutic interventions and invasive therapy) with the woman:  
  - If she would like to think about invasive therapy, arrange urodynamic investigation to determine whether detrusor overactivity is present.  
  - If she does not wish to explore invasive therapy see recommendation 50. | 6.1 |
| 67     | The use of desmopressin may be considered specifically to reduce nocturia in women with UI or OAB who find it a troublesome symptom. Use particular caution in people with cystic fibrosis and avoid in those over 65 years of age or with cardiovascular disease or hypertension. | 6.2 |
| 68     | Duloxetine is not recommended as a first-line treatment for women with predominant stress UI. Duloxetine should not routinely be used as a second-line treatment for women with stress UI, although it may be offered as second-line therapy if women prefer pharmacological to surgical treatment or are not suitable for surgical treatment. If duloxetine is prescribed, women should be counselled about its adverse effects. | 6.4 |
| 69     | Systemic hormone replacement therapy is not recommended for the treatment of UI. | 6.5 |
| 70     | Intravaginal oestrogens are recommended for the treatment of OAB symptoms in postmenopausal women with vaginal atrophy. | 6.5 |
| 71     | The multidisciplinary team (MDT) for urinary incontinence should be drawn from community and secondary or tertiary care and include as a minimum:  
  - a specialist surgeon  
  - a specialist nurse  
  - a specialist physiotherapist. | 7.2/8.2 |
| 72     | Offer invasive therapy for OAB and SUI symptoms only after a clinical review by the MDT. | 7.2/8.2 |
| 73     | Discuss the recommendations made by the MDT at the clinical review with the woman. | 7.2/8.2 |
| 74     | Any woman wishing to consider surgical treatment for UI should be informed about the benefits and risks of surgical and non-surgical options. Counselling should include consideration of the woman's | 7.2/8/2 |
Invasive procedures for OAB

Botulinum toxin A

75. After MDT review, offer bladder wall injection with BoNT-A\(^4\) to women with proven detrusor overactivity that has not responded to conservative management (including antimuscarinic drug therapy). [new 2013]

76. Use 200 units when offering BoNT-A. [new 2013]

77. Discuss the risks and benefits of treatment with BoNT-A with women before seeking informed consent, covering:
- the likelihood of being symptom free or having a large reduction in symptoms
- the risk of clean intermittent catheterisation and the potential for it to be required for variable lengths of time after the effect of the injections have worn off
- the absence of evidence on long-term risks, duration of effect, and the number of injections required for optimum treatment
- the risk of adverse effects including an increased risk of urinary tract infection. [new 2013]

78. Start treatment with BoNT-A only if women:
- have been trained in clean intermittent catheterisation and have performed the technique successfully, and
- are able and willing to perform clean intermittent catheterisation on a regular basis for as long as required. [new 2013]

79. Offer specialist follow-up at 4 to 6 months to women having treatment for OAB with BoNT-A or sooner if symptoms return. [new 2013]

80. Tell women how to self-refer for prompt specialist review if symptoms return following a BoNT-A procedure. Offer repeat treatment as necessary. [new 2013]

81. Do not offer botulinum toxin B to women with proven detrusor overactivity. [2013]

Sacral nerve stimulation

82. Offer sacral nerve stimulation (SNS) to women after MDT review if:
- their OAB has not responded to conservative management including antimuscarinic drugs, and
- they are unable to perform clean intermittent catheterisation. [new 2013]

83. Consider SNS after MDT review if a woman’s OAB has not responded to conservative management (including antimuscarinic

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\(^4\) At the time of consultation (February 2013), botulinum toxin type A did not have a UK marketing authorisation for this indication. The prescriber should follow relevant professional guidance, taking full responsibility for the decision. Informed consent should be obtained and documented. The patient should provide informed consent, which should be documented. See the General Medical Council’s Good practice in prescribing medicines – guidance for doctors for further information.
<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendation</th>
<th>See section</th>
</tr>
</thead>
<tbody>
<tr>
<td>84</td>
<td>Discuss the long-term implications of SNS with women including:</td>
<td>7.4</td>
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<td></td>
<td>- the need for peripheral nerve evaluation test stimulation and probability of the test’s success</td>
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<td></td>
<td>- the risk of failure</td>
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<td>- the long-term commitment</td>
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<td></td>
<td>- the need for surgical revision</td>
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<td></td>
<td>- the adverse effects. [new 2013]</td>
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</tr>
<tr>
<td>85</td>
<td>Tell women how to self-refer for prompt specialist review if symptoms return following an SNS procedure. Offer repeat treatment as necessary. [new 2013]</td>
<td>7.4</td>
</tr>
</tbody>
</table>

**Augmentation cystoplasty**

86 Augmentation cystoplasty for the management of idiopathic detrusor overactivity should be restricted to women who have not responded to conservative treatments and who are willing and able to self-catheterise. Preoperative counselling **for the woman or her carer** should include common and serious complications: bowel disturbance, metabolic acidosis, mucus production and/or retention in the bladder, UTI and urinary retention. The small risk of malignancy occurring in the augmented bladder should also be discussed. **Provide life-long follow-up. [2006, amended 2013]**

**Urinary diversion**

87 Urinary diversion should be considered for a woman with OAB only when conservative treatments have failed, and if BoNT-A, sacral nerve stimulation and augmentation cystoplasty are not appropriate or are unacceptable to her. **Provide life-long follow-up. [2006, amended 2013]**

**Surgical approaches for SUI**

88 When offering a surgical procedure discuss with the woman the risks and benefits of the different treatment options for SUI using the information in table 8.12. [new 2013]

89 If conservative treatment for SUI has failed, offer: 8.3

- synthetic mid-urethral tape (see recommendations 90–94) or
- open colposuspension (see recommendation 95), or
- autologous rectus fascial sling (see recommendation 96). [new 2013]

**Synthetic tapes**

90 When offering a mid-urethral tape procedure, surgeons should: 8.3

- use one of the following procedures and devices for which there is current high quality evidence of efficacy and safety5:
  - TVT or Advantage for a ‘bottom-up’ retropubic

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5 The guideline only recommends the use of tapes with proven efficacy based on robust randomised controlled trial evidence. However technological advances are frequent, therefore the choice of tape should include devices that are shown in future clinical trials to have equal or improved efficacy at equal or lower cost.
If women are offered a procedure involving the transobturator approach, make them aware of the lack of long-term outcome data. [new 2013]

Refer women to an alternative surgeon if their chosen procedure is not available from the consulting surgeon. [new 2013]

Use 'top-down' retropubic tape procedures only as part of a clinical trial. Refer to single-incision sub-urethral short tape insertion for stress urinary incontinence (NICE interventional procedure guidance 262) for guidance on single incision procedures. [new 2013]

Offer a follow-up appointment, (including vaginal examination) to all women who have had continence surgery within 6 months. [new 2013]

Colposuspension

Laparoscopic colposuspension is not recommended as a routine procedure for the treatment of stress UI in women. The procedure should be performed only by an experienced laparoscopic surgeon working in a multidisciplinary team with expertise in the assessment and treatment of UI. [2006]

Biological slings

Anterior colporrhaphy, needle suspensions, paravaginal defect repair and the Marshall–Marchetti–Krantz procedure are not recommended for the treatment of stress UI. [2006]

Intramural bulking agents

Consider intramural bulking agents (silicone, carbon-coated zirconium beads or hyaluronic acid/dextran copolymer) for the management of stress UI if conservative management has failed. Women should be made aware that:

- repeat injections may be required to achieve efficacy
- efficacy diminishes with time
- efficacy is inferior to that of retropubic suspension or sling. [2006, amended 2013]

Autologous fat and polytetrafluoroethylene used as intramural bulking agents are not recommended for the treatment of stress UI. [2006]

Artificial urinary sphincter

In view of the associated morbidity, the use of an artificial urinary sphincter should be considered for the management of stress UI in...
<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendation</th>
<th>See section</th>
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</thead>
<tbody>
<tr>
<td>women only if previous surgery has failed. Life-long follow-up is recommended. [2006]</td>
<td>Considerations following unsuccessful invasive SUI procedures</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>The MDT should review all patients whose invasive SUI procedure has failed. [new 2013]</td>
<td>8.6</td>
</tr>
<tr>
<td>101</td>
<td>Women whose primary surgical procedure for SUI has failed and who wish to consider further treatment should:</td>
<td>8.6</td>
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<tr>
<td></td>
<td>● be referred to tertiary care for assessment by a specialised multidisciplinary team, and</td>
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<td></td>
<td>● have repeat urodynamic testing including additional tests such as imaging and urethral function studies. [new 2013]</td>
<td></td>
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<tr>
<td>102</td>
<td>If a woman does not want continued invasive SUI procedures, offer advice as described in recommendation 50. [new 2013]</td>
<td></td>
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<tr>
<td>Maintaining and measuring expertise and standards for practice</td>
<td></td>
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<tr>
<td>103</td>
<td>Surgery for UI should be undertaken only by surgeons who have received appropriate training in the management of UI and associated disorders or who work within a multidisciplinary team with this training, and who regularly carry out surgery for UI in women (see recommendation 90). [2006]</td>
<td>9.3</td>
</tr>
<tr>
<td>104</td>
<td>Training should be sufficient to develop the knowledge and generic skills documented below. Knowledge should include the:</td>
<td>9.3</td>
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<tr>
<td></td>
<td>● specific indications for surgery</td>
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<td></td>
<td>● required preparation for surgery including preoperative investigations</td>
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<td></td>
<td>● outcomes and complications of proposed procedure</td>
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<td>● anatomy relevant to procedure</td>
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<td></td>
<td>● steps involved in procedure</td>
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<td></td>
<td>● alternative management options</td>
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<td></td>
<td>● likely postoperative progress.</td>
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<td></td>
<td>Generic skills should include:</td>
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<td></td>
<td>● the ability to explain procedures and possible outcomes to patients and family and to obtain informed consent</td>
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<td></td>
<td>● the necessary hand–eye dexterity to complete the procedure safely and efficiently, with appropriate use of assistance</td>
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<td>● the ability to communicate with and manage the operative team effectively</td>
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<td>● the ability to prioritise interventions</td>
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<td></td>
<td>● the ability to recognise when to ask for advice from others</td>
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<td></td>
<td>● a commitment to multidisciplinary team working. [2006]</td>
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<tr>
<td>105</td>
<td>Training should include competence in cystourethroscopy. [2006]</td>
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<tr>
<td>106</td>
<td>Operative competence of surgeons undertaking surgical procedures to treat UI or OAB in women should be formally assessed by trainers through a structured process. [2006]</td>
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<tr>
<td>Number</td>
<td>Recommendation</td>
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<tr>
<td>107</td>
<td>Surgeons who are already carrying out procedures for UI should be able to demonstrate that their training, experience and current practice equates to the standards laid out for newly trained surgeons. [2006]</td>
<td>9.3</td>
</tr>
<tr>
<td>108</td>
<td>Surgery for UI or OAB in women should be undertaken only by surgeons who carry out a sufficient case load to maintain their skills. An annual workload of at least 20 cases of each primary procedure for stress UI is recommended. Surgeons undertaking fewer than five cases of any procedure annually should do so only with the support of their clinical governance committee; otherwise referral pathways should be in place within clinical networks. [2006]</td>
<td>9.3</td>
</tr>
<tr>
<td>109</td>
<td>There should be a nominated clinical lead within each surgical unit with responsibility for continence and prolapse surgery. The clinical lead should work within the context of an integrated continence service. [2006]</td>
<td>9.3</td>
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<tr>
<td>110</td>
<td>A national audit of continence surgery should be undertaken. [2006]</td>
<td>9.3</td>
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<tr>
<td>111</td>
<td>Surgeons undertaking continence surgery should maintain careful audit data and submit their outcomes to national registries such as those held by the British Society of Urogynaecology (BSUG) and British Association of Urological Surgeons Section of Female and Reconstructive Urology (BAUS-SFRU). [2006]</td>
<td>9.3</td>
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</tbody>
</table>

### 1.6 Key research recommendations

<table>
<thead>
<tr>
<th>Number</th>
<th>Research recommendation</th>
<th>See section</th>
</tr>
</thead>
<tbody>
<tr>
<td>RR7</td>
<td>What is the effectiveness of different pelvic floor muscle training regimens in the management of women with overactive bladder (OAB) symptoms and to whom should it be offered?</td>
<td>4.3</td>
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</tbody>
</table>

**Why this is important**

For many women with urinary incontinence symptoms, management of their condition will take place predominantly in primary and community care. Pelvic floor muscle training may be their only experience of therapeutic intervention. It is not currently known whether different pelvic floor muscle training regimens have an impact on treatment outcomes. It is also not known whether other factors also have an impact on its effectiveness. These factors include the way that the training is offered, the technique that is taught, the intensity and frequency of training, and the length of time that pelvic floor muscle training is continued. Since pelvic floor muscle training is widely used in clinical practice, robust evaluation is required to identify whether these or other factors have an important impact on patient centred outcomes.
<table>
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<tr>
<th>Number</th>
<th>Research recommendation</th>
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<tbody>
<tr>
<td>RR9</td>
<td>What is the comparative effectiveness and cost-effectiveness of transcutaneous electrical nerve stimulation (TENS) of the sacral nerve roots, and transcutaneous and percutaneous posterior tibial nerve stimulation for the treatment of OAB?</td>
<td>5.5</td>
</tr>
</tbody>
</table>

**Why this is important**

TENS can be applied either over the sacrum or over the posterior tibial nerve to modulate the sacral nerve supply to the bladder. The treatment uses surface electrodes which the patient can carry out in their own home. Percutaneous posterior tibial nerve stimulation involves the introduction of a needle in the region of the posterior tibial nerve near the ankle, and at present is carried out in clinics in secondary care. Currently it is offered widely as a conservative treatment for OAB without adequate evidence that it is effective. Although this is a relatively low cost treatment, both the equipment and staff time have a cost implication, and because it has been widely used in conservative management this has large resource consequences for the NHS. Robust evidence is required to establish whether it is a cost-effective option relative to other conservative therapies for all women or for a selected group of patients who are unsuitable for or have unsuccessful botulinum toxin A or antimuscarinic drug treatment.

| RR11   | What is the long-term effectiveness, optimal dose and optimal frequency of repeat therapy of botulinum toxin A (BoNT-A) in women with OAB based on detrusor overactivity including risk of adverse events such as urinary infection? | 7.3 |

**Why this is important**

There are currently no trials looking at long-term outcomes, optimal dose, optimal frequency and long-term adverse effects of BoNT-A for women with OAB. Further research into these outcomes would have an impact on future updates of key recommendations within the guideline and would impact on how resources are used within urinary incontinence services. Effective treatment with BoNT-A may require repeated injections to remain effective but the frequency of these is not reported in the current data. BoNT-A has the potential to cause incomplete bladder emptying resulting in the need for women to perform catheterisation indefinitely. This not only has financial implications but catheterisation and the morbidity associated with it will not always be acceptable to women. Additionally there are currently no data on whether repeated BoNT-A injections alter bladder function.

| RR13   | What is the effectiveness and what is the optimum sequence of treatment with BoNT-A and sacral nerve stimulation (SNS) for the treatment of OAB after failed conservative (including drug) treatment? | 7.4 |

**Why this is important**

It is not currently known which treatment option, either BoNT-A or...
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<tr>
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<tr>
<td>SNS, is the most effective in the medium and long-term for women with OAB in whom initial treatment, including antimuscarinic drugs, has failed. The initial outlay for SNS is high but when successful it appears to be effective. BoNT-A also has a high failure rate but a lower outlay and it is not yet understood the cost threshold (in terms of treatment cycles or length of follow-up) at which BoNT-A is likely to be the less cost-effective option compared with SNS. Currently, funding for SNS is on an individual basis due to its high cost, leading to geographical inequalities in access. A head-to-head longitudinal study of these 2 treatments would determine both which should be offered first and at what point in the treatment pathway. Such studies have not been done. This evidence could reduce inequalities in access to treatment. In subsequent NICE guidance evidence would be available to inform recommendations on the treatment pathway and at which point in the treatment pathway for OAB each of these options should be offered. It would also provide more robust information to patients about the risk of adverse events and support women’s choice about whether to proceed with treatment.</td>
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<tr>
<td>RR16</td>
<td>What are the effects of the following predictors on tape failure? 8.3</td>
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<tr>
<td>Age per decade (outcome defined as recurrent stress urinary incontinence)</td>
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<td>Lower maximum urethral closure pressure (MUCP) (reference not stated)</td>
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<td>Secondary surgery versus primary surgery (patient reported outcome)</td>
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<td>Higher maximal flow rate</td>
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<td>Concurrent pelvic organ prolapse surgery</td>
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<td>Nocturia versus no nocturia (patient reported outcome)</td>
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<td>Urgency versus no urgency (patient reported outcome)</td>
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<td>Pad weight (per 10 g)</td>
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<td>Previous UI surgery versus no surgery</td>
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<td>Q-tip maximum straining less than 30 degrees, yes versus no</td>
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<td>Urge score (per 10 points)</td>
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<td>Urgency symptoms versus no urgency symptoms</td>
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<td>More than 20 procedures for each surgeon versus first 10 procedures for each surgeon (outcome 1)</td>
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<tr>
<td>More than 20 procedures for each surgeon versus first 10 procedures for each surgeon (outcome 2)</td>
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<td>General anaesthesia versus local anaesthesia</td>
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<td>Body mass index over 35 versus 30 or less (patient reported outcome)</td>
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<tr>
<td>MUCP 31 or more versus 30 or less (objective outcome)</td>
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<tr>
<td>Primary surgery versus secondary surgery (objective outcome)</td>
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<tr>
<td>Preoperative anticholinergic medication use versus no use</td>
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Why this is important
The factors identified for this research question are thought anecdotally by surgeons to have an impact on the outcome of tape surgery but there is little robust evidence in the literature. Certain patient factors such as younger age and increased weight are thought to produce a higher chance of recurrent symptoms. Similarly, the effect of previous incontinence surgery, concomitant prolapse surgery and the ‘learning curve’ of the surgeon are all thought to have adverse effects on outcome (including an increased chance of urgency incontinence). In addition there is little robust evidence regarding the effect of previous urgency incontinence, higher maximum flow rates, nocturia or pre-operative use of anticholinergics on the occurrence of post-operative urgency and bladder overactivity (DO). It would be useful to be able to individualise treatment by understanding these risks in more detail.

1.7 Research recommendations

<table>
<thead>
<tr>
<th>Number</th>
<th>Research recommendation</th>
<th>See section</th>
</tr>
</thead>
<tbody>
<tr>
<td>RR1</td>
<td>The role of clinical pelvic floor muscle assessment prior to PFMT should be investigated to determine whether it enhances the therapeutic effect of the intervention.</td>
<td>4.3</td>
</tr>
<tr>
<td>RR2</td>
<td>Further research is needed to answer the question of whether the use of urodynamics, prior to initial or subsequent treatments, affects the outcomes and cost effectiveness of interventions in women with UI or OAB.</td>
<td>4.11</td>
</tr>
<tr>
<td>RR3</td>
<td>Further studies are required to clarify the role of ultrasound for the assessment of OAB.</td>
<td>4.14</td>
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<tr>
<td>RR4</td>
<td>There is a need for prospective interventional studies in all areas of lifestyle interventions to evaluate the effects of modifying these factors on UI and OAB.</td>
<td>5.2</td>
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<tr>
<td>RR5</td>
<td>Studies investigating different pelvic floor muscle training regimens are required to establish the optimum method of delivering and undertaking this intervention.</td>
<td>5.3</td>
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<tr>
<td>RR6</td>
<td>Research into the optimal electrical stimulation of the pelvic floor parameters is required, to inform future clinical practice. Studies investigating the role of electrical stimulation in women who cannot contract the pelvic floor muscle are required.</td>
<td>5.3</td>
</tr>
<tr>
<td>RR7</td>
<td>What is the effectiveness of different pelvic floor muscle training regimens in the management of women with overactive bladder (OAB) symptoms and to whom should it be offered?</td>
<td>5.3</td>
</tr>
<tr>
<td>RR8</td>
<td>A direct comparison of single-component and multicomponent behavioural therapy is required.</td>
<td>5.4</td>
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<tr>
<td>RR9</td>
<td>What is the comparative effectiveness and cost-effectiveness of transcutaneous electrical nerve stimulation (TENS) of the sacral...</td>
<td>5.5</td>
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</table>
nerve roots, and transcutaneous and percutaneous posterior tibial nerve stimulation for the treatment of OAB?

R10 Further studies need to be undertaken to evaluate the role and effectiveness of physical and behavioural therapies and lifestyle modifications in the prevention of UI in women. Long-term outcomes in particular should be evaluated.

RR11 What is the long-term effectiveness, optimal dose and optimal frequency of repeat therapy of botulinum toxin A (BoNT-A) in women with OAB based on detrusor overactivity including risk of adverse events such as urinary infection?

RR12 Further RCT evidence is required for drugs, BoNT-A and SNS in women with OAB due to idiopathic detrusor overactivity.

RR13 What is the effectiveness and what is the optimum sequence of treatment with BoNT-A and sacral nerve stimulation (SNS) for the treatment of OAB after failed conservative (including drug) treatment?

RR14 Newer mid-urethral procedures should be further investigated and compared with pelvic floor muscle training and accepted surgical interventions in the treatment of stress urinary incontinence.

RR15 What are long-term outcomes for ‘top down’ retropubic, transobturator and single incision procedures?

RR16 What are the effects of the following predictors on tape failure?

- Age per decade (outcome defined as recurrent stress urinary incontinence)
- Lower maximum urethral closure pressure (MUCP) (reference not stated)
- Secondary surgery versus primary surgery (patient reported outcome)
- Higher maximal flow rate
- Concurrent pelvic organ prolapse surgery
- Nocturia versus no nocturia (patient reported outcome)
- Urgency versus no urgency (patient reported outcome)
- Pad weight (per 10 g)
- Previous UI surgery versus no surgery
- Q-tip maximum straining less than 30 degrees, yes versus no
- Urge score (per 10 points)
- Urgency symptoms versus no urgency symptoms
- More than 20 procedures for each surgeon versus first 10 procedures for each surgeon (outcome 1)
- More than 20 procedures for each surgeon versus first 10 procedures for each surgeon (outcome 2)
- General anaesthesia versus local anaesthesia
- Body mass index over 35 versus 30 or less (patient reported outcome)
- MUCP 31 or more versus 30 or less (objective outcome)
- Primary surgery versus secondary surgery (objective outcome)
- Preoperative anticholinergic medication use versus no use
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<th>Research recommendation</th>
<th>See section</th>
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</thead>
<tbody>
<tr>
<td>RR17</td>
<td>What is the effectiveness of a repeat procedure following primary tape failure?</td>
<td>8.6</td>
</tr>
<tr>
<td>RR18</td>
<td>What is the effectiveness of re-suturing following vaginal tape erosion?</td>
<td>8.6</td>
</tr>
<tr>
<td>RR19</td>
<td>Which is the comparative effectiveness of a different procedure following failure of a primary tape, colposuspension and/or bulking agents intervention?</td>
<td>8.6</td>
</tr>
<tr>
<td>RR20</td>
<td>What is the efficacy of conservative treatments (including physiotherapy) following primary surgical procedure failure?</td>
<td>8.6</td>
</tr>
</tbody>
</table>

### 1.8 Other versions of the guideline

To be completed following consultation.

### 1.9 Schedule for updating the guideline

Clinical guidelines commissioned by NICE are published with a review date three years from the date of publication. Reviewing may begin before 3 years have elapsed if significant evidence that affects guideline recommendations is identified sooner.
2 Introduction

2.1 Urinary incontinence

Urinary incontinence (UI) is a common symptom that can affect women of all ages, with a wide range of severity and nature. While rarely life-threatening, incontinence may seriously influence the physical, psychological and social wellbeing of affected individuals. The impact on the families and carers of women with UI may be profound, and the resource implications for the health service considerable.

The International Continence Society (ICS) has standardised terminology in lower urinary tract function: UI is defined as ‘the complaint of any involuntary urinary leakage’.\(^1\) This may occur as a result of a number of abnormalities of function of the lower urinary tract, or as a result of other illnesses, and these tend to cause leakage in different situations. Definitions for stress, mixed and urge UI and overactive bladder (OAB) are given in the glossary. Other types of UI may be described by the situations that provoke urine loss, for example during sexual intercourse, or on laughing or giggling. Some patients may simply report being ‘wet all the time’. This may be a reflection of the severity of their condition, although may on occasions be due to other pathologies, for example fistula.

There are currently approximately 80 cases of fistula between the urinary tract and genital tract treated each year in England and Wales and this condition is not considered further in this guideline. It is recognised that UI may be of a transient nature on occasion, reflecting acute health or environmental factors.

Prevalence and incidence

Urinary incontinence is an embarrassing problem to many women and thus its presence may be significantly underreported. In a UK community study, the prevalence of UI known to the health and social service agencies was 0.2% in women aged 15–64 years and 2.5% in those aged 65 and over.\(^2\) A concurrent postal survey showed a prevalence of 8.5% in women aged 15–64 and 11.6% in those aged 65 and over. Incontinence was described as ‘moderate’ or ‘severe’ in one-fifth of those who reported it and, even among these, fewer than one-third were receiving health or social services for the condition.\(^2\) The Leicestershire MRC Incontinence Study, of individuals over 40 years of age, found that 33.6% of the population reported significant urinary symptoms but only 6.2% found these bothersome, and only 2.4% both bothersome and socially disabling. Of the population surveyed, 3.8% (one in nine of those with clinically significant symptoms) felt the need for help with their symptoms.\(^3\) Some women may not see their UI as a major problem. For others, who do perceive a problem with which they would like help, there are often barriers to presentation. Women may take up to 10 years before seeking help.\(^5\) They may be too embarrassed to seek advice, may not wish to bother their general practitioner (GP), may believe UI to be a normal consequence of the ageing process or may not appreciate that treatments are available.\(^6\)

Differences in study populations, the definition and measurement of UI, and the survey method used result in a wide range of prevalence estimates.\(^7\) Where the most inclusive definitions have been used (‘ever’, ‘any’, ‘at least once in the last 12 months’), prevalence estimates in the general population range from 5% to 69% in women 15 years and older, with most studies in the range 25–45%.\(^7\) There appears to be less variation in the prevalence of more severe UI and estimates in the general population range between 4% and 7% in women under 65 years, and between 4% and 17% in those over 65 for daily UI.\(^7\) The Leicestershire MRC Incontinence Study found that, while 34.2% of women reported UI at times, only 3.5% experienced the symptom on a daily basis, 11.8% weekly, 7.3% monthly and 11.6% yearly.
Several studies have shown that the prevalence of any UI tends to increase up to middle age, then plateaus or falls between 50 and 70 years, with a steady increase with more advanced age. The EPINCONT survey, of women aged over 20 years from Norway, illustrates this point (Figure 1.1). These data also show that slight to moderate UI is more common in younger women, while moderate and severe UI affects the elderly more often. Stress UI appears to be the most common UI type and overall 50% of incontinent women in the EPINCONT survey reported this as their only symptom; 11% described only urge UI and 36% reported mixed UI. This and other studies indicate that the trends in prevalence of UI at different ages reflect a reduction in the complaints of stress UI in those aged 50 years and over, with an increase in urge UI and mixed UI in women aged 60 years and above (Figure 1.2). This study also found that the severity of incontinence varied between the different types: the proportion of incontinence that was regarded as being severe was 17%, 28% and 38% in the stress, urge and mixed UI groups, respectively.

There are relatively little epidemiological data on the prevalence of OAB syndrome. A telephone survey from the USA found an overall prevalence of OAB wet of 9.6% in women over 18 years of age, rising from 5% in those aged 18–44 to 19% in those over 65. Survey data from Europe found prevalence of the same order. The Leicestershire MRC Incontinence Study found an overall prevalence of OAB in women aged 40 and over of 21.4%. It has been estimated that, while not all may need or want help, 20.4% of people aged 40 years and over, representing around 5 million people in the UK, have a healthcare requirement. In women aged 40 and over this figure increases from 20.5% aged 40–49 up to 35.6% at age 80 and over.

**Risk factors**

In addition to the effect of age, cross-sectional studies suggest other associations and possible risk factors for UI. These include pregnancy, parity, obstetric factors, menopause, hysterectomy, obesity, lower urinary tract symptoms, functional impairment, cognitive impairment, smoking,
family history, diet and genetics. Urinary incontinence may be a presenting symptom of neurological disease.

**Costs and implications for health services**

**Costs to patients and carers**

Urinary incontinence is distressing and socially disruptive. It may be the cause of personal health and hygiene problems. It may restrict employment and educational or leisure opportunities, and lead to embarrassment and exclusion. Furthermore, for some, it may result in abuse of adults in the workplace and older people in residential care or nursing homes. In adult women with UI, 60% avoid going away from home, 50% feel odd or different from others, 45% avoid public transport and 50% report avoiding sexual activity through fear of incontinence. Serious psychiatric morbidity has been reported in one-quarter of women attending hospital for investigation of UI. For carers, UI is often a major reason for the breakdown of the caring relationship which can lead to admission to residential or nursing home care; incontinence is second only to dementia as an initiating factor for such moves. Financial costs to patients and carers, including the cost of absorbent products, laundry, etc., may also be considerable.

**Costs to the health services**

There is limited information on the cost of managing UI in the UK although the estimated total cost in the USA in 1995 was $12.4bn (£7bn), with the vast majority of this relating to community or nursing home care ($8.6bn and $3.8bn [£5bn and £2.2bn], respectively). These costs are of a similar order to those associated with gynaecological cancers, osteoporosis, pneumonia and influenza, and arthritis, and in the USA and Sweden are equivalent to approximately 2% of the total healthcare budget. With current UK health spending of £90bn, this would approximate to £1.8bn annually in England and Wales, or perhaps £600 per incontinent individual. Data from the Leicestershire MRC Incontinence Study estimates the annual cost to the NHS of treating clinically significant UI at £536m (£233m for women). The total annual service costs (including costs borne by individuals) were estimated at £743m.

A study of the costs of care for women seeking treatment for UI across Europe (the PURE study), determined that the mean UI-related costs per year ranged from €359 (£248) in the UK/Ireland (where
patients were predominantly treated by their GPs) to €515 (£355) in Germany and €655 (£452) in Spain (where the initial referral may sometimes be to specialists and sometimes to GPs).\(^5\)

Health-related costs of managing OAB in the USA have been estimated at around $9bn (£5bn), the cost patterns raising the possibility that treating OAB at an early stage may both improve patient care and minimise overall use of healthcare resources.\(^2\)

### 2.2 Aim of the guideline

This clinical guideline concerns the management of UI in adult women. It includes:

- stress UI
- OAB (with or without urge UI)
- mixed UI.

It has been developed with the aim of providing guidance on:

- initial and ongoing assessments and investigations
- appropriate use of conservative and surgical treatment options
- the competence required by surgeons performing the primary and subsequent operative procedures.

### 2.3 Areas outside the remit of the guideline

This guideline does not address:

- the management and treatment of co-morbidities, such as pelvic organ prolapse (POP), except where they relate to the treatment of UI and/or OAB syndrome
- incontinence caused by neurological disease
- incontinence in men
- incontinence in children
- anal incontinence.

### 2.4 For whom is the guideline intended?

This guideline is of relevance to those who work in or use the NHS in England and Wales, in particular:

- all healthcare professionals who are involved in the care of women who have UI or OAB syndrome (including GPs, nurses, physiotherapists, gynaecologists, urologists and occupational therapists). The healthcare professionals providing care for women with UI or OAB may vary depending on geographical service provision.
- those responsible for commissioning and planning healthcare services, including primary care trust commissioners, Health Commission Wales commissioners, and public health, trust and care home managers
- women with UI and/or OAB syndrome, their families and other carers.

### 2.5 Who has developed the guideline?

The guideline was developed by a multi-professional and lay working group (the Guideline Development Group or GDG) convened by the National Collaborating Centre for Women’s and Children’s Health (NCC-WCH). The membership is listed above. Staff from the NCC-WCH provided support for the guideline development process by undertaking systematic searches, retrieval and
appraisal of the evidence and health economic modelling, and wrote successive drafts of the
guideline.
All GDG members’ potential and actual conflicts of interest were recorded on a declaration form
provided by NICE and are shown in Appendix C. The form covered consultancies, fee-paid work,
shareholdings, fellowships, and support from the healthcare industry. The GDG leader and NCC-
WCH executive director consider that the declarations made did not influence the recommendations
developed.

2.6 Other relevant documents
This guideline is intended to complement other existing and proposed works of relevance, including
related NICE guidance:

- Guidelines:
  - Infection Control: Prevention of Healthcare-Associated Infection in Primary and
    Community Care
  - Referral Guidelines for Suspected Cancer
  - Routine Postnatal Care of Women and Their Babies
  - Faecal Incontinence (in development – expected date of issue June 2007).

- Cancer service guidance:

- Interventional procedures:
  - Sacral Nerve Stimulation for Urge Incontinence and Urgency-Frequency
  - Intramural Urethral Bulking Procedures for Stress Urinary Incontinence in
    Women
  - Insertion of Extraurethral (Non-Circumferential) Retropubic Adjustable
    Compression
  - Devices for Stress Urinary Incontinence in Women
  - Insertion of Biological Slings for Stress Urinary Incontinence in Women
  - Bone-Anchored Cystourethropexy.

- Other than NICE guidance, relevant works are:
  - the third International Consultation on Incontinence (ICI) (2005)
  - the Royal College of Physicians report on incontinence (1995)
  - the Department of Health’s Good Practice in Continence Services (2000)
  - the National Service Framework for Older People (2001).

2.7 Related NICE guidance

  Available from http://publications.nice.org.uk/urinary-incontinence-in-neurological-
disease-cg148

- Lower urinary tract symptoms. NICE clinical guideline 97 (May 2010). Available from

- Patient experience in adult NHS services. NICE clinical guideline 138 (February 2012).
  Available from www.guidance.nice.org.uk/CG138
3 Guideline development methodology

3.1 2006 Guideline method

This guideline was commissioned by NICE and developed in accordance with the guideline development process outlined in the NICE technical manual.36

Literature search strategy

Initial scoping searches were executed to identify relevant guidelines (local, national and international) produced by other development groups. The reference lists in these guidelines were checked against subsequent searches to identify missing evidence.

Relevant published evidence to inform the guideline development process and answer the clinical questions was identified by systematic search strategies. The questions are shown in Appendix B. Additionally, stakeholder organisations were invited to submit evidence for consideration by the GDG provided it was relevant to the clinical questions and of equivalent or better quality than evidence identified by the search strategies.

Systematic searches to answer the clinical questions formulated and agreed by the GDG were executed using the following databases via the ‘Ovid’ platform: Medline (1966 onwards), Embase (1980 onwards), Cumulative Index to Nursing and Allied Health Literature (1982 onwards), British Nursing Index (1985 onwards) and PsycINFO (1967 onwards). The most recent search conducted for the three Cochrane databases (Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews, and the Database of Abstracts of Reviews of Effects) was Quarter 1, 2006. The Allied and Complementary Medicine Database (AMED) was also used for alternative therapies (1985 onwards via the Datastar platform). Searches to identify economic studies were undertaken using the above databases and the NHS Economic Evaluations Database (NHS EED).

Search strategies combined relevant controlled vocabulary and natural language in an effort to balance sensitivity and specificity. Unless advised by the GDG, searches were not date specific. Language restrictions were not applied to searches. Both generic and specially developed methodological search filters were used appropriately.

There was no systematic attempt to search grey literature (conferences, abstracts, theses and unpublished trials). Hand searching of journals not indexed on the databases was not undertaken.

Towards the end of the guideline development process, searches were updated and re-executed, thereby including evidence published and included in the databases up to 17 March 2006. Any evidence published after this date was not included. This date should be considered the starting point for searching for new evidence for future updates to this guideline.

Further details of the search strategies, including the methodological filters employed, are available on the accompanying CD-ROM.

Synthesis of clinical effectiveness evidence

Evidence relating to clinical effectiveness was reviewed using established guides37,43 and classified using the established hierarchical system shown in Table 3.1.36 This system reflects the susceptibility to bias that is inherent in particular study designs.

The type of clinical question dictates the highest level of evidence that may be sought. In assessing the quality of the evidence, each study receives a quality rating coded as ‘++’, ‘+’ or ‘−’. For issues of therapy or treatment, the highest possible evidence level (EL) is a well-conducted systematic review or meta-analysis of randomised controlled trials (RCTs; EL = 1++) or an individual RCT (EL = 1+).
Studies of poor quality are rated as ‘−’. Usually, studies rated as ‘−’ should not be used as a basis for making a recommendation, but they can be used to inform recommendations. For issues of prognosis, the highest possible level of evidence is a cohort study (EL = 2). A level of evidence was assigned to each study, and to the body of evidence for each question.

For each clinical question, the highest available level of evidence was selected. Where appropriate, for example if a systematic review, meta-analysis or RCT existed in relation to a question, studies of a weaker design were not included. Where systematic reviews, meta-analyses and RCTs did not exist, other appropriate experimental or observational studies were sought. For diagnostic tests, test evaluation studies examining the performance of the test were used if the efficacy of the test was required, but where an evaluation of the effectiveness of the test in the clinical management of patients and the outcome of disease was required, evidence from RCTs or cohort studies was optimal.

The system described above covers studies of treatment effectiveness. However, it is less appropriate for studies reporting diagnostic tests of accuracy. In the absence of a validated ranking system for this type of test, NICE has developed a hierarchy for evidence of accuracy of diagnostic tests that takes into account the various factors likely to affect the validity of these studies (Table 3.2).

For economic evaluations, no standard system of grading the quality of evidence exists. Economic evaluations that are included in the review have been assessed using a quality assessment checklist based on good practice in decision-analytic modelling.

Table 3.1 ‘Levels of evidence for intervention studies’

<table>
<thead>
<tr>
<th>Level</th>
<th>Source of evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1++</td>
<td>High-quality meta-analyses, systematic reviews of randomised controlled trials (RCTs) or RCTs with a very low risk of bias</td>
</tr>
<tr>
<td>1+</td>
<td>Well-conducted meta-analyses, systematic reviews of RCTs or RCTs with a low risk of bias</td>
</tr>
<tr>
<td>1−</td>
<td>Meta-analyses, systematic reviews of RCTs or RCTs with a high risk of bias</td>
</tr>
<tr>
<td>2++</td>
<td>High-quality systematic reviews of case–control or cohort studies; high-quality case–control or cohort studies with a very low risk of confounding, bias or chance and a high probability that the relationship is causal</td>
</tr>
<tr>
<td>2+</td>
<td>Well-conducted case–control or cohort studies with a low risk of confounding, bias or chance and a moderate probability that the relationship is causal</td>
</tr>
<tr>
<td>2−</td>
<td>Case–control or cohort studies with a high risk of confounding, bias or chance and a significant risk that the relationship is not causal</td>
</tr>
<tr>
<td>3</td>
<td>Non-analytical studies (for example case reports, case series)</td>
</tr>
<tr>
<td>4</td>
<td>Expert opinion, formal consensus</td>
</tr>
</tbody>
</table>

Table 3.2 ‘Levels of evidence for studies of the accuracy of diagnostic tests’

<table>
<thead>
<tr>
<th>Level</th>
<th>Type of evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ia</td>
<td>Systematic review (with homogeneity) of level-1 studies</td>
</tr>
<tr>
<td>Ib</td>
<td>Level-1 studies</td>
</tr>
<tr>
<td>II</td>
<td>Level-2 studies; systematic reviews of level-2 studies</td>
</tr>
<tr>
<td>III</td>
<td>Level-3 studies; systematic reviews of level-3 studies</td>
</tr>
<tr>
<td>IV</td>
<td>Consensus, expert committee reports or opinions and/or clinical experience</td>
</tr>
</tbody>
</table>
without explicit critical appraisal; or based on physiology, bench research or ‘first principles’

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Homogeneity means there are minor or no variations in the directions and degrees of results between individual studies that are included in the systematic review.

Level-1 studies are studies that use a blind comparison of the test with a validated reference standard (‘gold’ standard) in a sample of patients that reflects the population to whom the test would apply.

Level-2 studies are studies that have only one of the following:
- narrow population (the sample does not reflect the population to whom the test would apply) use a poor reference standard (defined as that where the ‘test’ is included in the ‘reference’, or where the ‘testing’ affects the ‘reference’)
- the comparison between the test and reference standard is not blind
- case–control studies.

Level-3 studies are studies that have at least two or three of the features listed above.

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Table 3.3  MHRA classification of adverse effect frequency

<table>
<thead>
<tr>
<th>Classification</th>
<th>Frequency of occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very common</td>
<td>more than 1 in 10 (&gt;10%)</td>
</tr>
<tr>
<td>Common</td>
<td>between 1 in 10 and 1 in 100 (≥1% and ≤10%)</td>
</tr>
<tr>
<td>Uncommon</td>
<td>between 1 in 100 and 1 in 1000 (≥0.1% and &lt;1%)</td>
</tr>
<tr>
<td>Rare</td>
<td>between 1 in 1000 and 1 in 10 000</td>
</tr>
<tr>
<td>Very rare</td>
<td>fewer than 1 in 10 000</td>
</tr>
</tbody>
</table>

Evidence was synthesised qualitatively by summarising the content of identified papers in evidence tables and agreeing brief statements that accurately reflected the evidence. Quantitative synthesis (meta-analysis) was performed where appropriate. Where confidence intervals were calculated, this was done in accordance with accepted methods. Summary results and data are presented in the guideline text. More detailed results and data are presented in the evidence tables on the accompanying CD-ROM, where a list of excluded studies is also provided.

Specific considerations for this guideline

It was anticipated that some evidence relevant to this guideline would not be specific to women with UI and thus studies with mixed populations (men and women, and/or with UI of different aetiology) were considered if the majority of the population was women with idiopathic UI or OAB.

Published guidance from the NICE Interventional Procedures (IP) Programme was considered, alongside all relevant evidence in women with UI or OAB when an interventional procedure was approved for use. Where the IP guidance states that an interventional procedure is not for routine use, the procedure was not considered within this guideline.

The NICE health technology appraisal on tension-free vaginal tape (2003) was updated within this guideline by addressing a question on the intervention. The associated NICE guidance will be withdrawn on publication of this guideline.

The classification of adverse effect frequency used by the Medicines and Healthcare products Regulatory Agency (MHRA) was adopted within the guideline, as shown in Table 3.3.

Health economics

The aims of the economic input into the guideline were to inform the GDG of potential economic issues relating to UI in women and to ensure that recommendations represent a cost effective use of healthcare resources.

The health economist helped the GDG by identifying topics within the guideline that might benefit from economic analysis, reviewing the available economic evidence and, where necessary, conducting economic analysis. Reviews of published health economic evidence are presented alongside the
reviews of clinical evidence, and modelling is presented in the appendices, with cross references from the relevant chapters.

**Outcome measures used in the guideline**

For this guideline, treatment has been assessed against a number of outcome domains, as follows:

- the woman’s observations, including changes in symptoms and satisfaction
- generic and incontinence-specific aspects of quality of life (QOL)
- the clinician’s observations including urodynamic investigation and quantification of incontinence
- harm (adverse effects, surgical complications)
- health economic outcomes, for example quality-adjusted life years (QALYs).

**Table 3.4 Classification (grading) of recommendations for intervention studies**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>At least one meta-analysis, systematic review or randomised controlled trial (RCT) that is rated as 1++, and is directly applicable to the target population, or a systematic review of RCTs or a body of evidence that consists principally of studies rated as 1+, is directly applicable to the target population and demonstrates overall consistency of results, or evidence drawn from a NICE technology appraisal.</td>
</tr>
<tr>
<td>B</td>
<td>A body of evidence that includes studies rated as 2++, is directly applicable to the target population and demonstrates overall consistency of results, or extrapolated evidence from studies rated as 1++ or 1+.</td>
</tr>
<tr>
<td>C</td>
<td>A body of evidence that includes studies rated as 2+, is directly applicable to the target population and demonstrates overall consistency of results, or extrapolated evidence from studies rated as 2++.</td>
</tr>
<tr>
<td>D</td>
<td>Evidence level 3 or 4, or extrapolated evidence from studies rated as 2+, or formal consensus.</td>
</tr>
<tr>
<td>D (GPP)</td>
<td>A good practice point (GPP) is a recommendation for best practice based on the experience of the Guideline Development Group.</td>
</tr>
</tbody>
</table>

**Forming and grading recommendations**

For each guideline question, recommendations were derived using, and explicitly linked to, the evidence that supported them. In the first instance, informal consensus methods were used by the GDG to agree evidence statements and recommendations. Additionally, in areas where no substantial evidence existed, the GDG considered other guidelines or consensus statements to identify current best practice. Shortly before the consultation period, formal consensus methods were used to agree guideline recommendations (modified Delphi technique) and to select five to ten key priorities for implementation (nominal group technique).

Each recommendation was graded according to the level of evidence upon which it was based, using the established systems shown in Tables 3.4 and 3.5. For issues of therapy or treatment, the best possible level of evidence (a systematic review or meta-analysis or an individual RCT) equates to a grade A recommendation. For issues of prognosis, the best possible level of evidence (a cohort study) equates to a grade B recommendation. However, this should not be interpreted as an inferior grade of recommendation because it represents the highest level of relevant evidence.

In addition, the GDG made research recommendations in areas where evidence is lacking.
**External review**

This guideline has been developed in accordance with the NICE guideline development process. This has included giving registered stakeholder organisations the opportunity to comment on the scope of the guideline at the initial stage of development and on the evidence and recommendations at the concluding stage. In addition, the guideline was peer reviewed by nominated individuals. The developers have carefully considered all of the comments during the consultation periods by registered stakeholders with validation by NICE.

### Table 3.5 Classification (grading) of recommendations for intervention studies

<table>
<thead>
<tr>
<th>Grade</th>
<th>Level of evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (DS)</td>
<td>Studies with level of evidence Ia or Ib</td>
</tr>
<tr>
<td>B (DS)</td>
<td>Studies with level of evidence of II</td>
</tr>
<tr>
<td>C (DS)</td>
<td>Studies with level of evidence of III</td>
</tr>
<tr>
<td>D (DS)</td>
<td>Studies with level of evidence of IV</td>
</tr>
</tbody>
</table>

**3.2 Schedule for updating the guideline**

Clinical guidelines commissioned by NICE are published with a review date 4 years from the date of publication. Reviewing may begin earlier than 4 years if significant evidence that affects guideline recommendations is identified sooner. The updated guideline will be available within 2 years of the start of the review process.

**3.3 Methodology for 2013 Update**

This guidance was commissioned by NICE and developed in accordance with the guideline development process outlined in the 2009 edition of The Guidelines Manual (www.nice.org.uk/guidelinesmanual)

In accordance with NICE’s Equality Scheme, ethnic and cultural considerations and factors relating to disabilities have been considered by the GDG throughout the development process and specifically addressed in individual recommendations where relevant. Further information is available from: www.nice.org.uk/aboutnice/howwework/NICEEqualityScheme.jsp.

**Developing review questions and protocols and identifying evidence**

The GDG formulated review questions based on the topics agreed with the stakeholders and included in the scope (see Appendix A) and prepared a protocol for each review question (see Appendix D). These formed the starting point for systematic reviews of relevant evidence. Published evidence was identified by applying systematic search strategies (see Appendix E) to the following databases: Medline (1950 onwards), Embase (1980 onwards), Cumulative Index to Nursing and Allied Health Literature (CINAHL; 1982 onwards), and three Cochrane databases (Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews, and the Database of Abstracts of Reviews of Effects). Searches to identify economic studies were undertaken using the above databases, the NHS Economic Evaluation Database (NHS EED), and the Health Technology Assessment (HTA) database. None of the searches were limited by date. Searches in Embase were limited to English language, and searches in Medline were limited to English language and studies in humans. None of the other searches were limited by language of publication (although publications in languages other than English were not reviewed). Validated search filters were used to identify particular study designs, such as randomised controlled trials (RCTs). There was no systematic attempt to search grey literature (conference abstracts, theses or unpublished trials), nor was hand searching undertaken of journals not indexed on the databases.
Towards the end of the guideline development process, the searches were updated and re-executed to include evidence published and indexed in the databases by 30th November 2012.

**Reviewing and synthesising evidence**

Evidence relating to clinical effectiveness was reviewed and synthesised according to the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach (see http://www.gradeworkinggroup.org/index.htm). In the GRADE approach, the quality of the evidence identified for each outcome in the review protocol is assessed according to the factors listed below, and an overall quality rating (high, moderate, low, or very low) is assigned by combining the ratings for the individual factors.

- Risk of bias (in study design using either NICE or CASP methodological checklists (See http://www.nice.org.uk/guidelinesmanual and http://www.casp-uk.net/). This also includes limitations in the design or execution of the study (including concealment of allocation, blinding, loss to follow up; these can reduce the quality rating)
- Inconsistency of effects across studies: occurs when there is variability in the treatment effect demonstrated across studies (heterogeneity) (this can reduce the quality rating)
- Indirectness: the extent to which the available evidence fails to address the specific review question (this can reduce the quality rating)
- Imprecision: present when there is uncertainty around the estimate of effect, for example when the confidence intervals are wide and cross the ‘imaginary’ lines of clinically significant effect (See below in ‘Outcome measures). This reflects the confidence in the estimate of effect. (this can reduce the quality rating)
- Other considerations (including large magnitude of effect, evidence of a dose-response relationship, or confounding variables likely to have reduced the magnitude of an effect; these can increase the quality rating in observational studies, provided no downgrading for other features has occurred)

The type of review question determines the highest level of evidence that may be sought. For issues of therapy or treatment, the highest possible evidence level is a well-conducted systematic review or meta-analysis of RCTs, or an individual RCT. In the GRADE approach, a body of evidence based on RCTs has an initial quality rating of high, but this may be downgraded to moderate, low, or very low if the factors listed above are not addressed adequately. For issues of prognosis, the highest possible level of evidence is a controlled observational study (a cohort study or case–control study), and a body of evidence based on such studies would have an initial quality rating of low, which might be downgraded to very low or upgraded to moderate or high, depending on the factors listed above.

For each review question the highest available level of evidence was sought. Where appropriate, for example, if a systematic review, meta-analysis or RCT was identified to answer a question directly, studies of a weaker design were not considered. Where systematic reviews, meta-analyses and RCTs were not identified other appropriate experimental or observational studies were sought.

For the review in this update we used the following study types and methodology checklists

<table>
<thead>
<tr>
<th>Question</th>
<th>Study type</th>
<th>Checklist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Botulinum toxin A</td>
<td>Randomised trials</td>
<td>NICE checklist for Randomised controlled trials</td>
</tr>
<tr>
<td>Neuromodulation</td>
<td>Randomised trials</td>
<td>NICE checklist for Randomised controlled trials</td>
</tr>
<tr>
<td>Antimuscarinics</td>
<td>Systematic review</td>
<td>NICE checklist for Systematic reviews and meta-analyses</td>
</tr>
<tr>
<td>Surgical interventions</td>
<td>Randomised controlled trials</td>
<td>NICE checklist for Randomised controlled trials</td>
</tr>
</tbody>
</table>
We used the CASP checklist for observational studies as none of the NICE checklists were appropriate for non-comparative studies.

The quality items for each study are reported in the study’s evidence table and are summarised in the footnotes of each GRADE profile. For this guideline, we inserted footnotes to explain the choice we made while assessing the quality of evidence for each outcome. These footnotes indicated if we upgraded the evidence level, downgraded the evidence level or left the evidence level unchanged and gave the rationale for doing this.

Some studies were excluded from the guideline reviews after obtaining copies of the publications because they did not meet inclusion criteria specified by the guideline development group (see Appendix G). These studies are listed in alphabetical order for each question and the reason for exclusion provided for each one.

Basic characteristics of each included study were summarised in evidence tables for each review question (see Appendix H) along with the quality assessment. Where outcomes data were presented results were entered in text-boxes exactly as reported in the full-text report of the study. The data grids in the ‘Results’ column contain data we exported to Revman 5.1 (see http://ims.cochrane.org/revman) for meta-analysis. Where the standard deviation of the mean change from baseline was not reported, we imputed this using either the baseline SD from the control group or the standard deviation from a similar group.

Where possible, dichotomous outcomes were presented as relative risks (RRs) with 95% confidence intervals (CIs), and continuous outcomes were presented as mean differences with 95% CIs or standard deviations (SDs).

The body of evidence identified for each therapy or treatment review question (or part of a review question) was presented in the form of a GRADE evidence profile summarising the quality of the evidence and the findings (pooled relative and absolute effect sizes and associated CIs). Where possible, the body of evidence corresponding to each outcome specified in the review protocol was subjected to quantitative meta-analysis. In such cases, pooled effect sizes were presented as pooled risk ratios (RRs), pooled odds ratios (ORs), or mean differences. By default, meta-analyses were conducted using a random effects models as this is regarded as a more conservative method.

Where quantitative meta-analysis could not be undertaken the range of effect sizes reported in the included studies was presented in a GRADE profile.

Outcome measures

For this guideline update, the effectiveness of interventions to treat urinary incontinence has been assessed against a variety of outcomes. The justification for using these outcomes is based on their relevance to women with the condition, to stakeholders involved in the consultation for this guideline and the expert consensus opinion of members of the multidisciplinary guideline development group.

Outcomes included those that were felt to be desirable states (for example, improvement in incontinence status) and the unwanted side-effects of treatment (for example, need for self-catheterisation). When assessing the effectiveness of a particular treatment, information about the effect of that treatment on one or more primary outcomes was sought.

Primary outcomes agreed in stakeholder consultation were:

- Continence status (zero episodes per day).
- Self-reported rate of absolute symptom reduction, for example number of episodes of incontinence per day.
- Adverse effects: for example, tolerability of drugs, development of new OAB symptoms after surgery for stress urinary incontinences, need for self-catheterisation after botulinum toxin A.
Incontinence-specific quality of life: for example, Incontinence – Quality of Life, Bristol Female Lower Urinary Tract Symptoms questionnaire (BFLUTS) or the King’s Health Questionnaire.

Psychological outcomes, such as anxiety and depression.

Clinical measures, such as cystometric capacity, post-void residual volume

Once the GDG was convened, each member was surveyed to reach agreement on how to measure outcomes in a clinically meaningful way. The GDG members were asked individually to consider the time-point at which a specific outcome should be measured, the important adverse effects, and to prioritise the outcomes. (The questionnaire and feedback is available in Appendix W)

Throughout the review we used the confidence intervals to decide imprecision, using a ‘zone’ rule.

The default three zones, for example for the risk ratio, are less than 0.75, 0.75 to 1.25, and greater than 1.25. If the confidence interval:

- was in a single zone, we rated the findings as precise and did not upgrade or downgrade.
- Crossed into two zones, we downgraded to ‘serious imprecision’.
- Crossed into three zones, we downgraded to ‘very serious imprecision’.

Where the GDG select a minimal important difference (MID) for an outcome, this MID defined the three zones.

The GDG consensus was that patient satisfaction with treatment was the most important outcome as the best overall indicator of treatment success since it includes those women who, while not on optimal treatment, may nevertheless have improved quality of life compared with before treatment.

**Network meta-analysis**

A network meta-analysis (NMA) can be undertaken where there is a comparison of multiple treatments. The approach is an extension of meta-analysis that includes multiple different pairwise comparisons across a range of interventions to treat one condition.

For this guideline, a hierarchical Bayesian NMA was undertaken to evaluate the effectiveness of antimuscarinic drugs for the treatment of overactive bladder. Trial populations were sufficiently homogenous to allow indirect comparisons of treatments that had not been directly evaluated as trials were identified that compared treatments with a common comparator. The analysis was strengthened by incorporating direct evidence from head-to-head trials as well as indirect comparisons from placebo-controlled trials. The output of the NMA was odds ratios and median probabilities of effectiveness with 95% credible interval ratios (comparable with confidence intervals). The probabilities of effectiveness were used to parameterise a new health economic model developed for this guideline update.

The NMA was undertaken in WinBugs® with additional expert support provided by the Technical Support Unit at NICE.

**Incorporating health economics**

The aims of the health economic input to the guideline were to inform the GDG of potential economic issues relating to urinary incontinence, and to ensure that recommendations represented a cost effective use of healthcare resources. Health economic evaluations aim to integrate data on benefits (ideally in terms of quality adjusted life years (QALYs)), harms and costs of different care options.

The GDG prioritised a number of review questions where it was thought that economic considerations would be particularly important in formulating recommendations. Systematic searches for published economic evidence were undertaken for these questions. For economic evaluations, no standard system of grading the quality of evidence exists and included papers were assessed using a quality assessment checklist based on good practice in economic evaluation. Reviews of the relevant published health economic literature are presented alongside the clinical effectiveness reviews.
Health economic considerations were aided by original economic analysis undertaken as part of the development process. For this guideline the areas prioritised for economic analysis were as follows:

- The cost-effectiveness of antimuscarinic drugs for overactive bladder after conservative management has been unsuccessful (incorporating a network meta-analysis of evidence of effectiveness)
- The cost-effectiveness of Botulinum Toxin A versus sacral nerve stimulation in the treatment of overactive bladder once pharmacological treatment has been unsuccessful

A third analysis comparing surgical approaches for mid-urethral procedures in women undergoing their primary surgical tape procedure was considered. However, there was insufficient evidence of difference in effectiveness or cost between each type of procedure to undertake a health economic analysis.

Evidence to recommendations

For each review question recommendations for clinical care were derived using, and linked explicitly to, the evidence that supported them. In the first instance, informal consensus methods were used by the GDG to agree short clinical and, where appropriate, cost effectiveness evidence statements which were presented alongside the evidence profiles.

Statements summarising the GDG’s interpretation of the evidence and any extrapolation from the evidence used to form recommendations were also prepared to ensure transparency in the decision-making process. The criteria used in moving from evidence to recommendations are summarised in Table 3.4.

In areas where no substantial clinical research evidence was identified, the GDG considered other evidence-based guidelines and consensus statements or used their collective experience to identify good practice. The health economics justification in areas of the guideline where the use of NHS resources (interventions) was considered was based on GDG consensus in relation to the likely cost effectiveness implications of the recommendations. The GDG also identified areas where evidence to answer their review questions was lacking and used this information to formulate recommendations for future research.

Towards the end of the guideline development process formal consensus methods were used to consider all the clinical care recommendations and research recommendations that had been drafted previously. The GDG identified 10 ‘key priorities for implementation’ (key recommendations) and 5 high-priority research recommendations. The key priorities for implementation were those recommendations thought likely to have the biggest impact on clinical care and outcomes in the NHS as a whole. The priority research recommendations were selected in a similar way.

Table 3.4 Criteria considered in moving from evidence to recommendations

<table>
<thead>
<tr>
<th>Criterion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative value placed on the outcomes considered</td>
</tr>
<tr>
<td>Consideration of clinical benefits and harms</td>
</tr>
<tr>
<td>Consideration of net health benefits and resource use</td>
</tr>
<tr>
<td>Quality of the evidence</td>
</tr>
<tr>
<td>Other considerations (including equalities issues)</td>
</tr>
</tbody>
</table>

Stakeholder involvement

This paragraph will be completed following the stakeholder consultation
Specific considerations for this guideline

Formal consensus voting

A formal consensus approach was used where it was agreed that a recommendation was required, but the GDG were unable to reach a conclusion using discussion alone.

Methods

The formal consensus approach involved a series of action statements relating to management or treatment under review being drafted by the NCC-WCH technical team. These were collated into a consensus questionnaire. The GDG are asked to independently complete the questionnaire stating their level of agreement (“Strongly agree to strongly disagree”) with each statement and provide comments on where statements should be amended. The results of the voting were collated by the technical team. If 70% or more of the GDG agreed or disagreed with a statement then consensus was reached. If there was no consensus the statement could be adapted based on comments and presented for a second round of voting, applying the same majority threshold. Statements where consensus was reached were then used to draft recommendations. These were discussed and ratified at a subsequent GDG meeting.

The GDG made a priori decisions regarding outcomes. For each outcome they defined thresholds for clinically important differences (also known as ‘minimal important difference’ or MID) for all outcome measures which are summarised here:

- For the outcome ‘Patient satisfaction with treatment’ the GDG agreed that where possible outcomes should be dichotomised into ‘improved’ and ‘not improved’ by combining categories, for example ‘very improved’ and ‘improved’. The outcome statistic (Risk ratio or RR) default definitions of MID were 0.75 and 1.25.

- For the outcome ‘Self reported rate of absolute symptom reduction’ they agreed that a 50% reduction in symptoms constituted a clinically significant difference for both episodes of incontinence and episodes of urgency.

- For the outcome ‘Continence status (zero episodes per day)’ the GDG accepted that this was a valid definition in itself. Again we used the default definitions of MID for RR as above.

- For the outcome ‘Incontinence-specific quality of life (QOL)’ the GDG agreed that only incontinence-specific quality of life should be used. The developers of these scales have published MIDs which can be used as the thresholds for clinically significant difference.

- For the outcome ‘Adverse effects’ the GDG agreed that this should vary from question to question. For example, for BoNT-A, the need for self catheterisation was specified as the single most important adverse effect. Default definitions of MID for relative risk were adopted as above.

- For the outcome ‘Psychological outcomes’ the GDG agreed that Depression and Anxiety were important outcomes. As with the I-QOL an MID from the published literature would be used.

- For the outcome ‘Clinical measures’ the GDG agreed that post-void residual volume was the single most important of the different clinical measures used. In the absence of data a default MID of 25% change in post-void residual volume was used. This meant that if the intervention or control lead to an improvement or worsening of 25% of the baseline values then this was considered clinically meaningful for both patient and clinician.
4 Assessment and investigation

4.1 Introduction

Initial assessment when a woman comes into first contact with a health professional is important. It forms the basis for counselling, ongoing management and treatment. Categorisation of UI by symptom profile may direct the patient to the most appropriate and effective resources. Further evaluation of severity of the condition, and ultimately the impact of treatment on that severity, will enable the healthcare professional to deliver the optimum care. Co-existing conditions (e.g. prolapse, diabetes, heart failure) or treatments (e.g. drug therapy) must be recognised and clinicians must be aware of their interaction with UI. Investigation should be used appropriately, taking into account the nature of the condition.

Studies considered for the assessment and investigation section

For history taking and physical examination, where primary research data were not available, published consensus statements and narrative reviews that discussed these issues were used as a basis for the GDG’s statements and recommendations. For each investigation used in the assessment of UI in women, up to five questions were asked (refer to the assessment matrix in Appendix Q):

- Does the investigation direct the woman to an alternative pathway?
- What is the diagnostic accuracy of the investigation?
- What is the test–retest reliability of the investigation?
- Does the use of the investigation affect outcomes?
- Does the use of the investigation predict outcomes of treatment?

For questions of diagnostic accuracy, the ideal study is one that makes blind comparison of the test with a validated reference standard in a sample of women reflective of the population to whom the test would apply. Within the clinical area of UI, there is no agreement as to what the reference standard is for the diagnosis of UI and thus studies that consider accuracy are limited by the standard against which they are compared.

4.2 History taking and physical examination

History taking of women with UI or OAB guides the investigation and management by evaluating symptoms, their progression and the impact of symptoms on lifestyle. Taking a history also allows the assessment of risk factors associated with the possible diagnoses. The relevant elements of history follow.

Urinary symptoms

In order to reach a clinical diagnosis, a urinary history is taken to determine storage and voiding patterns and symptoms. The major symptoms to consider include:

- Storage symptoms:
  - frequency (daytime), nocturia, urgency, urge UI
  - stress UI
Accompanying symptoms that may indicate the possibility of a more serious diagnosis and which require referral, such as haematuria, persisting bladder or urethral pain, or recurrent urinary tract infection (UTI), can also be identified when taking a urinary history.

How do urinary symptoms compare with urodynamic findings?

We found no studies in which clinical outcomes in women with UI diagnosed by clinical history alone were compared with those in women with UI diagnosed using urodynamics. However, several studies have evaluated the accuracy of the symptom of stress or urge UI relative to findings on urodynamic (UD) investigations in women undergoing assessment of their urinary symptoms. Most of these studies have been considered in two reviews and a health technology assessment of diagnostic methods for UI.46-48 Two of the publications included studies of women with symptoms of stress, mixed or urge UI and one included only studies evaluating women with stress UI.47 The reviews that included women with stress, mixed or urge UI calculated and combined sensitivity and specificity data for the symptom of stress (be it with or without mixed symptoms) and for the symptom of urge UI (be it with or without mixed symptoms). The GDG considered that the mixed ‘symptom’ should be considered separately (because in practice women are categorised into those with stress, mixed or urge UI) and that the important question in relation to the comparison of urinary history with urodynamic findings is whether urodynamics gives additional information to that obtained from the history alone. In considering this question, the GDG took the approach that a clinical history would be taken for every woman, and that a positive history for a particular type of UI would always be followed by treatment appropriate to that type of UI.

Overall, 25 relevant studies that compared the diagnosis based on history with urodynamic findings were considered by the GDG. These studies used cystometry as the reference standard for diagnosis of UI and therefore assumed that history taking had a lower diagnostic value in comparison. Fourteen studies included women with stress, mixed or urge UI, and 11 presented raw data in a way that allowed sensitivity, specificity, positive predictive value (PPV) and negative predictive values (NPV) to be calculated.49-66 Two of these studies only reported accuracy data for stress and mixed UI.61,62 Five studies only investigated how a history of urge UI or OAB compared with urodynamic findings of detrusor overactivity (DO).63-67 Six studies only investigated how a history of stress UI compared with the finding of urodynamic stress incontinence,68-73 four of which provided some but not all accuracy data.

Multichannel cystometry (with or without uroflowmetry, urethral pressure profilometry, or cystourethrogram) was the urodynamic method used in 24 studies. The remaining study used single-channel cystometry for women with urge UI (and suspected DO) and multichannel cystometry for women with stress UI.50 All except four studies62, 64,70 stated that terminology used for urodynamic findings conformed to ICS standards.

With the exception of one study49 which involved primary and secondary care, all studies were conducted in secondary or tertiary care.

The GDG focused on the 11 studies that provided diagnostic accuracy data for stress, mixed and urge UI. Confidence intervals were calculated for each value, as this was considered to be more appropriate than pooling data from individual studies. Pooling the available data (by meta-analysis) or generating receiver operating characteristic curves was not considered to be appropriate because the population in each study varied in terms of the relative proportions of stress, mixed or urge UI, the methods used to obtain a history varied, and the studies were considered to be of poor quality in terms of defining diagnostic accuracy because of unblended urodynamic testing.

The diagnostic accuracy data for the studies is summarised in Table 4.1. For further details refer to Appendix R.

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Table 4.1 Summary of diagnostic accuracy data

<table>
<thead>
<tr>
<th>UI symptom</th>
<th>Sensitivity median (range)</th>
<th>Specificity median (range)</th>
<th>Positive predictive values median (range)</th>
<th>Negative median predictive values (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stress UI</td>
<td>66% (17–83%)</td>
<td>83% (49–92%)</td>
<td>70% (41–95%)</td>
<td>69% (49–85%)</td>
</tr>
<tr>
<td>Mixed UI</td>
<td>68% (42–85%)</td>
<td>77% (34–89%)</td>
<td>35% (18–70%)</td>
<td>90% (80–97%)</td>
</tr>
<tr>
<td>Urge UI</td>
<td>45% (14–86%)</td>
<td>96% (81–98%)</td>
<td>73% (25–81%)</td>
<td>91% (79–98%)</td>
</tr>
</tbody>
</table>

The overall conclusions are that the available studies comparing history of stress, mixed or urge UI with findings of stress UI and/or DO on multichannel cystometry have poor internal and external validity. We consider that the NPV is of particular interest in terms of assessing whether urodynamic testing provides additional information compared with clinical history, because this quantity summarises the extent to which a negative history is associated with a negative finding on urodynamics (i.e. whether diagnosis based on urodynamics would alter the findings for women with no history of a particular type of UI). In addressing the question of whether urodynamics gives additional information to that obtained from history alone, with the limitations of the studies in mind, the following conclusions can be drawn:

- If a woman does not report mixed UI (i.e. if she reports pure stress UI or pure urge UI), the probability of finding urodynamic stress incontinence (USI) plus DO on cystometry is small (around 10%), therefore urodynamic testing might be said to offer little additional diagnostic value. It is acknowledged that urodynamic investigation is not simply used to distinguish USI and DO, and that further information may be obtained about other elements of lower urinary tract function, such as the voiding pattern.

- If a woman does not report pure urge UI, the probability of finding DO on cystometry is small (again around 10%), therefore urodynamic testing offers little added diagnostic value.

The situation for pure stress UI is less clear-cut. Here 15–51% (median 31%) of women who do not report pure stress UI may nevertheless be found to have USI on cystometry. However, the lack of consistency between the NPVs in the available studies together with the lack of detailed information about the method of obtaining a history and the poor quality of the studies limit the extent to which the evidence would support urodynamic testing for women who do not report stress UI. However, a limitation of dealing with stress, mixed and urge UI as three separate entities is that the analysis ignores the interdependence between the different diagnoses.

History taking is regarded as the cornerstone of assessment of UI. Current practice is that women with UI are categorised according to their symptoms into those with stress, mixed or urge UI; women with mixed UI are treated according to the symptom they report to be the most troublesome. In the absence of evidence that urodynamic testing improves the outcome of women treated conservatively (see Section 4.11), and without robust evidence that urodynamic testing provides additional valuable information to the history alone in the initial assessment of women with UI, the GDG concluded that urodynamic testing is not required before initiating conservative treatment.

Bowel symptoms

Constipation or problems with defecation may predispose to UI and adversely affect the outcome of any continence surgery. Straining can contribute to loss of bladder control by weakening pelvic floor muscles (refer to lifestyle interventions, Section 5.1). Faecal incontinence in association with UI or OAB may suggest the presence of cognitive impairment, neurological and/or anatomical damage. Women with faecal incontinence may require referral for management of that condition (a NICE guideline on faecal incontinence is in development, with an expected date of issue of June 2007).

Medical history

Conditions that may exacerbate or co-exist with UI or OAB can be identified by taking a general history and are important contributory factors to exclude. These include mental health, cognitive impairment and disorders of the:

- neurological system (e.g. multiple sclerosis, spinal cord injury, Parkinson’s disease,
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1. cerebrovascular accident, cauda equina syndrome, pelvic plexus injury
2. metabolic system (e.g. diabetes)
3. cardiorespiratory system
4. renal system.

**Surgical history**

Previous surgery for UI or for POP may complicate treatment and make diagnosis more difficult because of its interference with the normal support mechanisms of the vagina and urethra. Any surgery that might have interfered with normal nerve supply to the bladder or urethra may also be relevant; this could include low spinal surgery, radical hysterectomy, low rectal surgery, sympathectomy or complex pelvic surgery.

**Obstetric and gynaecological history**

The number and type of deliveries and their outcome would normally be documented. The woman's desire for further childbearing should also be established as this may have implications for the most appropriate treatment options. The menstrual history and menopausal status should be determined, and enquiry made into symptoms of uterovaginal prolapse. The woman's sexual function and her expectations from this point of view should also be considered.

**Drug history**

Some medications may be associated with UI and their use may need to be reviewed. These include drugs that affect:

- the central nervous system, for example sedatives, hypnotics, anxiolytics and smooth muscle relaxants
- the autonomic nervous system, for example drugs with antimuscarinic action, sympathomimetics and sympatholytics
- fluid balance, for example diuretics and alcohol.

A drug history should consider previous medication for UI symptoms, and any known allergies, which may affect future treatment choices.

**Does history taking affect outcome?**

No evidence was identified that addressed this question. Nevertheless, the fundamental importance of history taking within all aspects of clinical practice cannot be overemphasised.

**Test–retest reliability of history taking**

No evidence was identified that addressed this question.

**General assessment**

Assessment of the social and functional impact of UI, desire for treatment, expectations and motivation are important as these help to establish the woman's goals, and may influence the type and degree of intervention offered.

Social circumstances to consider include home environment, personal relationships, occupational history and lifestyle factors such as smoking and body mass index (BMI). Adjustment of these lifestyle factors may form part of the management of the condition in some women (refer to Section 5.1).

Functional assessment, which may include consideration of access and ease of use of toileting aids, mobility and dexterity, is important. Assessment of the home environment may be undertaken, for example by an occupational therapist.

**Physical examination**

Physical examination is carried out to guide the diagnosis and management of incontinence and the identification of any underlying, modifying or serious conditions that require treatment outside the scope of this guideline.

The assessment of cognitive impairment allows the effect of disease to be taken into account and allows modification of treatment. The Abbreviated Mental Test Score (AMTS) and the Mini Mental
State Examination (MMSE) should be undertaken for women aged over 75 years with complex comorbidities. These scales should also be considered for younger women if clinically appropriate.

Abdominal examination can detect a significantly enlarged bladder or palpable pelvic mass. A palpable bladder may indicate the presence of chronic urinary retention. Palpation may detect a volume of 300 ml or more. Urinary incontinence may occur in association with urinary retention (often called overflow incontinence).

Pelvic assessment is important and should include vaginal examination, and possibly also rectal examination if clinically indicated. Vaginal examination can assess POP and identify atrophic changes, infection and excoriation. Uterine and ovarian enlargement may be determined by bimanual examination. When rectal examination is undertaken, it is used to further evaluate posterior vaginal wall prolapse and, where indicated by a history of constipation, prolapse or faecal incontinence. Assessment of pelvic floor, prolapse and residual urine are considered in more detail in Sections 4.3, 4.4 and 4.6.

Neurophysiology

Neurophysiological tests include assessments of nerve conduction and electromyography (EMG). The former include sacral reflex latencies, pudendal terminal motor latencies and evoked potentials, which test the integrity of nerve pathways relating to voiding and continence. Abnormal results might indicate underlying neurological dysfunction. Electromyography tests the end organ function of somatic muscles of the pelvic floor, or sphincter complexes, but cannot be used to record activity from smooth muscle. No evidence was identified that addressed diagnostic accuracy of neurophysiological testing in relation to idiopathic UI. Where history suggests evidence of neurological disease, examination of lower limbs together with sacral sensation and sacral reflexes is required.

Evidence statements for history taking and physical examination

The reporting of stress, urge or mixed UI is commonly used to direct treatment decisions. [EL = 4]

The diagnostic value of history taking has been compared with urodynamic testing in women with UI or OAB. In general, there is a low level of agreement between a history of urinary symptoms and urodynamic findings. [EL = DS III]

However, women who do not report mixed or urge UI are unlikely to have findings of mixed UI or DO on urodynamics. [EL = DS III]

<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>At the initial clinical assessment, the woman’s urinary incontinence (UI) should be categorised as stress UI (SUI), mixed UI, or urgency UI/overactive bladder (OAB). Initial treatment should be started on this basis. In mixed UI, treatment should be directed towards the predominant symptom. [2006]</td>
</tr>
<tr>
<td>2</td>
<td>If stress incontinence is the predominant symptom in mixed UI, discuss with the woman the benefit of conservative management including antimuscarinic drugs before offering surgery. [new 2013]</td>
</tr>
<tr>
<td>3</td>
<td>The clinical assessment should seek to identify relevant predisposing and precipitating factors and other diagnoses that may require referral for additional investigation and treatment. [2006]</td>
</tr>
</tbody>
</table>

4.3 Pelvic floor muscle assessment

Methods used to assess pelvic floor muscle contraction include digital palpation, EMG and perineometry. For digital palpation, grading scales have been used to quantify the strength of contraction, for example the Oxford grading system.31

Does pelvic floor muscle assessment affect outcome?

In RCTs that evaluated pelvic floor muscle training (PFMT) for the treatment of UI, both those studies that did and those that did not assess pelvic floor muscle contraction prior to treatment showed
efficacy of active treatment compared with control (refer to physical therapies, Section 5.2). [EL = 3]

No further evidence was identified in relation to the effects of undertaking pelvic floor assessment on outcomes of women with UI.

**Test–retest reliability**

Two case series evaluated the test–retest reliability of grading systems for digital assessment.\(^{75,76}\) One assessed the test–retest and inter-rater reliability of a four-item pelvic floor muscle rating scale (covering pressure, duration of contraction and displacement; \(n = 37\), about two-thirds of whom had urinary symptoms). Retest was done after 1–4 weeks. Significant inter- and intrarater correlations were reported for the rating scale, and for EMG, which was also performed.\(^{75}\) [EL = 3] The second case series evaluated test–retest reliability of digital assessments of pelvic floor muscle power and endurance in women with UI, with power being assessed on a modified Oxford grading system. Retest was undertaken after 2–5 weeks. Significant correlations between test and retest results were reported for both parameters, with agreement seen in nine cases (\(n = 20\)).\(^{76}\) [EL = 3]

**Evidence statements for pelvic floor muscle assessment**

There is a lack of evidence as to whether digital assessment of pelvic floor muscle contraction affects the outcome of PFMT in women with UI. [EL = 3] Inter- and intra-observer reliability of grading systems for digital assessment of pelvic floor muscle contraction is poor. [EL = 3]

**From evidence to recommendations**

The GDG recognises that there is a lack of evidence for clinical utility of digital pelvic floor muscle assessment. However, expert opinion is that the determination of whether a woman can contract pelvic floor muscles will direct treatment decisions. [EL = 4]

### Number | Recommendation
--- | ---
4 | Routine digital assessment to confirm pelvic floor muscle contraction should be undertaken before the use of supervised pelvic floor muscle training for the treatment of UI. [2006, amended 2013]

### Number | Research recommendation
--- | ---
RR1 | The role of clinical pelvic floor muscle assessment prior to PFMT should be investigated to determine whether it enhances the therapeutic effect of the intervention.

#### 4.4 Assessment of prolapse

Several grading systems for POP have been described, including the Baden and Walker halfway method and the Pelvic organ prolapse quantification (POP-Q) system. The POP-Q system was designed to measure the type and severity of prolapse. In practice, the extent to which symptoms are bothersome is also an important factor to consider.

Women who present with symptoms of prolapse and UI should have an abdominal examination to exclude other pathology. Inspection of the genitalia may reveal the degree of uterine descent. On vaginal examination, the position of the cervix is determined and, at this point, the clinician can make an assessment of the strength of the pelvic floor. Bimanual examination will reveal any pelvic masses.
The woman can be asked to cough and bear down, which may demonstrate stress UI or the presence of cystocele or rectocele.

### Diagnostic accuracy

In considering the question of diagnostic accuracy in relation to POP assessment, the GDG considered that the important issue is how symptoms correlate with the prolapse grading systems available. Three cross-sectional studies considered the correlation of POP symptoms with the degree of pelvic organ support.\(^9\)\(^{81}\) POP-related symptoms and/or their bother factor were not significantly associated with the stage of prolapse, as defined by the POP-Q classification system in one study. However, women reported a mean of more than one symptom when the prolapsed extended beyond the hiatus, compared with a mean of less than one symptom when the leading edge of the prolapse did not reach the hiatus (\(n = 477\)).\(^79\) [EL = 3] In a survey of women attending a gynaecological examination, the prevalence of POP was 31%, with 2% having prolapse that reached the introitus. Although no significant differences in the prevalence of certain symptoms (sense of heaviness in the abdomen, difficulty voiding or emptying bowel) were found in women with or without POP, cystocele or rectocele, respectively, the symptom prevalence was higher in women with prolapse (\(n = 487\)).\(^80\) The third study found that seeing or feeling a bulge was reported by all women who had prolapse beyond the hiatus. However 21% of women who had this level of prolapse did not report this symptom.\(^81\) [EL = 3]

### Does assessment of prolapse affect outcome?

No evidence was identified that addressed this question.

#### Evidence statement for assessment of prolapse

<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Women with UI who have symptomatic prolapse that is visible at or below the vaginal introitus should be referred to a specialist. [2006]</td>
</tr>
</tbody>
</table>

### 4.5 Urine testing

Urinalysis is used to detect infection, protein, blood and glucose in the urine. Protein may indicate infection and/or renal impairment, blood may indicate infection or malignancy, and glucose may indicate diabetes mellitus. Some findings on urine testing indicate referral (see Section 4.7).

#### Diagnostic accuracy of urine testing for urinary tract infection

One study evaluated the accuracy of urine reagent strips for the diagnosis of UTI in women with UI. Identification of leucocytes and/or nitrites on a reagent strip was indicative of a positive test for infection. Using urine culture as the reference standard, the reagent strips had sensitivity of 29%, specificity of 99%, and positive and negative predictive values of 82% and 92%, respectively (\(n = 265\)).\(^82\) [EL = DS II]

#### Does urine testing affect outcome?

No evidence was identified that addressed this question. The GDG also considered whether treating a UTI affects UI symptoms. While no evidence was found in relation to treating an infection, one study in nursing home residents considered the impact of treating bacteriuria on UI. Half the patients had bacteriuria at baseline, which was removed in 81% of patients by antibiotic treatment. Eradication of bacteriuria appeared to have no effect on incontinence (\(n = 191\); 71% women).\(^83\) [EL = 2+]

#### Evidence statements for urine testing

Urine dipstick testing for leucocytes and nitrites has low sensitivity and high specificity for the diagnosis of UTI in women with UI. A negative urine dipstick test therefore excludes a UTI with a high degree of certainty. Only one-third of positive tests are associated with bacteriologically proven UTIs. [EL = DS II]
From evidence to recommendations

Although urine testing for leucocytes and nitrites has a high specificity, false negatives can arise when infection occurs with organisms that do not convert nitrates to nitrites. Hence, in symptomatic patients with a negative test, the clinician may wish to consider prescribing antibiotics once a urine sample has been collected but before results of midstream urine culture are available.

In patients with symptoms of UTI and a positive urine test for leucocytes and nitrites, infection is highly likely and immediate prescription of antibiotics is therefore justified. In single uncomplicated UTI it might be argued that this should be done without sending urine for laboratory analysis, depending on local knowledge of antibiotic resistance. In recurrent or complicated cases, however, this would not be appropriate. We therefore recommend that a midstream urine specimen be sent for culture and antibiotic sensitivities before prescribing in all cases.

<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>A urine dipstick test should be undertaken in all women presenting with UI to detect the presence of blood, glucose, protein, leucocytes and nitrites in the urine. [2006]</td>
</tr>
<tr>
<td>7</td>
<td>Women with symptoms of urinary tract infection (UTI) whose urine tests positive for both leucocytes and nitrites should have a midstream urine specimen sent for culture and analysis of antibiotic sensitivities. An appropriate course of antibiotic treatment should be prescribed pending culture results. [2006]</td>
</tr>
<tr>
<td>8</td>
<td>Women with symptoms of UTI whose urine tests negative for either leucocytes or nitrites should have a midstream urine specimen sent for culture and analysis of antibiotic sensitivities. The healthcare professional should consider the prescription of antibiotics pending culture results. [2006]</td>
</tr>
<tr>
<td>9</td>
<td>Women who do not have symptoms of UTI, but whose urine tests positive for both leucocytes and nitrites, should not be offered antibiotics without the results of midstream urine culture. [2006]</td>
</tr>
<tr>
<td>10</td>
<td>Women who do not have symptoms of UTI and whose urine tests negative for either leucocytes or nitrites are unlikely to have UTI and should not have a urine sample sent for culture. [2006]</td>
</tr>
</tbody>
</table>

4.6 Assessment of residual urine

Some findings on physical examination or from history taking in relation to emptying may indicate referral because of suspected voiding dysfunction. Abdominal examination can detect a significantly enlarged bladder, which may indicate the presence of chronic urinary retention. Palpation may detect a volume of 300 ml or more. Large post-void residual urine may indicate the presence of underlying bladder outlet obstruction, neurological disease or detrusor failure. These would be a reason for referral to a specialist rather than progression through a path of conservative treatments. Large residual urine – in effect chronic retention of urine – may also present with renal failure although this is much less likely in women than in men. However, there is no accepted definition for what constitutes a high or large residual volume in women with UI. Residual urine volumes may vary and thus repeat measurements may be required.

Methods used to measure post-void residual urine are abdominal palpation, ultrasound scanning and catheterisation.

Diagnostic accuracy

The diagnostic accuracy of bladder ultrasound for the measurement of post-void residual urine was evaluated in three studies, using a bladder scanner (portable bladder ultrasound). The accuracy of bimanual examination was evaluated in one study. Catheterisation was used as the reference standard in each. The residual urine volume indicative of a positive test result ranged from 50 to 200 ml across the studies.
Portable ultrasound (bladder scanner) versus catheterisation

Two studies enrolled men and women.\textsuperscript{84,86} The first study, in nursing home residents, reported sensitivities of 90–95% with a portable bladder ultrasound device at residual volume cut-off of less than 50 or 100 ml, and 59–69% for residual volumes of more than 100, 150, or 200 ml. Specificity values were 63–71% and 95–99%, respectively. It was not possible to calculate positive and negative predictive values from the data given (\(n = 201; 74\% \text{ women}\)).\textsuperscript{86} [EL = DS Ib] The second study reported sensitivities of 90% for a post-void residual of 100 ml or more, and 92% for 200 ml or more. Specificities were 88% and 83%, PPV 91% and 76%, and NPV 86% and 95%, respectively (\(n = 46; 74\% \text{ women}\)).\textsuperscript{84} [EL = DS Ib] One study evaluated only women with UI. Based on a residual urine volume of 100 ml being a positive result, ultrasound had a sensitivity of 67% and specificity of 97%. It was not possible to calculate PPV or NPV from the data given (\(n = 95\)).\textsuperscript{85} [EL = DS II]

Bimanual examination versus catheterisation

The diagnostic accuracy of bimanual examination relative to catheterisation in women was assessed in one study. Based on a residual urine volume of 50 ml being a positive result, bimanual examination had a sensitivity of 14%, specificity of 67%, PPV 7% and NPV 82% (\(n = 47\)).\textsuperscript{87} [EL = DS Ib]

\textbf{Does assessment of residual urine affect outcome?}

No evidence was identified that addressed this question.

Test–retest reliability

One study reported test–retest reliability of portable ultrasound scanner measurements, with good correlation reported for both observers (\(r = 98\) for one [187 pairs measured] and \(r = 97\) for the second [143 pairs]).\textsuperscript{86} [EL = DS Ib]

\textbf{Evidence statements for assessment of residual urine}

The sensitivity and specificity of ultrasound (using a bladder scanner) in the detection of post-void residual urine volume, in comparison with catheterisation, is within clinically acceptable limits. [EL = DS II] The former is less invasive with fewer adverse effects. [EL = 4] The sensitivity of bimanual examination to detect small post-void residual volumes is poor. [EL = DS Ib]

From evidence to recommendations

The GDG considers that the lack of evidence for what constitutes a clinically significant residual volume in women with UI precludes making a recommendation other than in women who have signs or symptoms suggestive of voiding dysfunction.

<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>The measurement of post-void residual volume by bladder scan or catheterisation should be performed in women with symptoms suggestive of voiding dysfunction or recurrent UTI. \cite[2006]{2006}</td>
</tr>
<tr>
<td>12</td>
<td>A bladder scan should be used in preference to catheterisation on the grounds of acceptability and lower incidence of adverse events. \cite[2006]{2006}</td>
</tr>
<tr>
<td>13</td>
<td>Women who are found to have a palpable bladder on bimanual or abdominal examination after voiding should be referred to a specialist. \cite[2006]{2006}</td>
</tr>
</tbody>
</table>

\textbf{4.7 Referral}

\textbf{Evidence statement}

Certain signs or symptoms on assessment indicate referral for further investigation by an appropriate specialist. The NICE guideline on referral for suspected cancer covers some indications for referral that are relevant to this guideline.\textsuperscript{23} [EL = 4]
From evidence to recommendations

There are other women for whom referral for further advice or specialist intervention may be considered, because of either co-existent conditions or a history of prior interventions. The GDG recognises that not all such women may wish to be referred. However, referral should be considered in these cases. Owing to variations in service configuration, it is not possible to state to which service or healthcare professional women should be referred. Similarly, timescales are not specified for referral priorities because NICE recommends that trusts should work to local definitions of maximum waiting times. [EL = 4]

<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendation</th>
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</thead>
<tbody>
<tr>
<td>14</td>
<td>Women with UI who have any of the following should receive an urgent referral:</td>
</tr>
<tr>
<td></td>
<td>• microscopic haematuria in women aged 50 years and older</td>
</tr>
<tr>
<td></td>
<td>• visible haematuria</td>
</tr>
<tr>
<td></td>
<td>• recurrent or persisting UTI associated with haematuria in women aged 40 years and older</td>
</tr>
<tr>
<td></td>
<td>• suspected malignant mass arising from the urinary tract. [2006]</td>
</tr>
<tr>
<td>15</td>
<td>In women with UI, further indications for consideration for referral to a specialist service include:</td>
</tr>
<tr>
<td></td>
<td>• persisting bladder or urethral pain</td>
</tr>
<tr>
<td></td>
<td>• clinically benign pelvic masses</td>
</tr>
<tr>
<td></td>
<td>• associated faecal incontinence</td>
</tr>
<tr>
<td></td>
<td>• suspected neurological disease</td>
</tr>
<tr>
<td></td>
<td>• symptoms of voiding difficulty</td>
</tr>
<tr>
<td></td>
<td>• suspected urogenital fistulae</td>
</tr>
<tr>
<td></td>
<td>• previous continence surgery</td>
</tr>
<tr>
<td></td>
<td>• previous pelvic cancer surgery</td>
</tr>
<tr>
<td></td>
<td>• previous pelvic radiation therapy. [2006]</td>
</tr>
</tbody>
</table>

4.8 Symptom scoring and quality of life assessment

Symptom and quality of life scoring is used to give some quantification of the impact of urinary symptoms and provides a measure that can be used to assess outcomes of treatment at a later stage. The International Consultation on Incontinence (ICI) uses three grades of recommendation for symptom scoring and QOL scales, based on the evidence available to support their use, as listed below:6

- highly recommended – validity, reliability and responsiveness established with rigour in several data sets (‘Grade A’), or in one dataset with UI (‘Grade A’) |
- recommended (‘Grade B’) – validity, reliability and responsiveness indicated but not with rigour; validity and reliability established with rigour in several data sets |
- with potential (‘Grade C’) – questionnaires in early development.

The test–retest reliability of ICI ‘Grade A’ or ‘Grade A’ condition-specific scales for use in women are considered within this guideline because these are the questionnaires validated to the highest level. These are:7

- ICIQ, BFLUTS and SUIQQ (for combined evaluation of symptoms and QOL impact of UI)

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6 NICE’s ‘Referral guidelines for suspected cancer’ (http://guidance.nice.org.uk/CG27) define urgent referral as the patient being seen within the national target for urgent referrals (currently 2 weeks).

7 For further indications for consideration for referral, see recommendations 5 and 13.
- I-QOL, SEAPI-QMM, KHQ, IIQ, IIQ-7, UISS and CONTILIFE (for evaluation of QOL impact of UI)
- OAB-q, UDI, UDI-6, ISI and BFLUTS (for combined evaluation of symptoms and QOL impact of OAB).

**Test–retest reliability of symptom scoring and quality of life scales**

Test–retest reliability was generally reported within validation studies for these questionnaires, although in the case of CONTILIFE\(^{56}\) and the short forms of UDI and IIQ (UDI-6, IIQ-7),\(^{88}\) no test–retest reliability data were presented. The available studies generally quoted correlation of test and retest findings, with some publications reporting actual scores or differences in test–retest scores. [EL = 3]

The results are shown in Table 4.2. For ICIQ, BFLUTS, I-QOL, SUIQQ, UISS, SEAPI-QMM, ISI and KHQ, either significant agreement or significant correlation between test and retest scores was reported (correlation was assessed using Spearman’s, Pearson’s, Cronbach’s alpha, or the intraclass correlation coefficients). Few studies reported the actual test and retest scores. The available evidence for UI, IQ and OAB-q showed either a significant difference between test and retest scores and/or poor correlation between test and retest scores. [EL = 3]

**Evidence statement for symptom scoring and quality of life**

The test–retest reliability of ICIQ, BFLUTS, I-QOL, SUIQQ, UISS, SEAPI-QMM, ISI and KHQ is good. For other scores, the evidence is weak or absent. [EL = 3]

**Number Recommendation**

| 16 | The following incontinence-specific quality-of-life scales are recommended when therapies are being evaluated: ICIQ, BFLUTS, I-QOL, SUIQQ, UISS, SEAPI-QMM, ISI and KHQ. [2006] |

**4.9 Bladder diaries**

Bladder diaries are used to document each cycle of filling and voiding over a number of days and can provide information about urinary frequency, urgency, diurnal and nocturnal cycles.

<table>
<thead>
<tr>
<th>Table 4.2 Test–retest reliability of quality of life and symptom scoring scales</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Questionnaire</strong></td>
</tr>
<tr>
<td>International Consultation on Incontinence Questionnaire (ICIQ)(^{90})</td>
</tr>
<tr>
<td>Bristol Female Lower Urinary Tract Symptoms (BFLUTS)(^{91})</td>
</tr>
<tr>
<td>Stress and Urge Incontinence and Quality of Life Questionnaire (SUIQQ)(^{92})</td>
</tr>
<tr>
<td>Incontinence Quality of Life (I-QOL)(^{93-95})</td>
</tr>
<tr>
<td>62 patients (68% Mean 18</td>
</tr>
<tr>
<td>Test</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>SEAPI-QMM</td>
</tr>
<tr>
<td>King’s Health Questionnaire (KHQ)</td>
</tr>
<tr>
<td>Urogenital Distress Inventory (UDI) and Incontinence Impact Questionnaire (IIQ)</td>
</tr>
<tr>
<td>IIQ</td>
</tr>
<tr>
<td>Urinary Incontinence Severity Score (UISS)</td>
</tr>
<tr>
<td>Overactive Bladder Questionnaire (OAB-q)</td>
</tr>
<tr>
<td>Incontinence Severity Index (ISI)</td>
</tr>
</tbody>
</table>

$r =$ correlation coefficient

functional bladder capacity and total urine output. They also record leakage episodes, fluid intake and pad changes and give an indication of the severity of wetness. They may also be used for monitoring the effects of treatment.

**Test–retest reliability of bladder diaries**

Five studies evaluated the test–retest reliability of bladder diaries or frequency–volume charts. One study evaluated a 1 day diary, one a 3 day diary, and three studies evaluated a 7 day diary.

Data captured in the charts were: frequency and voided volume; frequency, leakage and urgency episodes, and voided volume; frequency and leakage episodes; and leakage episodes only.

**1 day diary**

A case–control study reported some reproducibility data for the 1 day charts in women with stress UI. The 95% limits of agreement between the first and second days of measurement lay between 0.5 and 2.1 for frequency, and for total, mean and largest single voided volume measures ($n = 80$). [EL = 3]

**3 day diary**

In a case series of men and women with stress, mixed or urge UI, or OAB, the retest reliability of a 72 hour bladder diary and pad test was evaluated after an interval of 1 week ($n = 106$; 84% women). The authors’ predefined minimum correlation coefficient for test–retest reliability of 0.7 was met for overall...
frequency, day frequency, leakage episodes, urgency episodes and mean voided volume (correlation coefficient 0.70–0.87), but not for night frequency (0.605). Correlation, but not actual results, was also reported for 24 and 48 hour results; the correlation appeared to improve at 72 hours compared with 24 hours for urgency episodes. Compliance with recording voided volume data fell with time.\textsuperscript{104} [EL = 3]

Diaries of 7 days or longer
A case series evaluated the reproducibility of leakage episode and frequency data from a 7 day diary repeated after 4 weeks in women with urodynamic stress UI (n = 138). Minimal differences in test–retest results were seen for leakage episodes (mean 1.7/week, r = 0.906) and frequency (mean 0.03/(24 hours), r = 0.831). Correlation coefficients for the first 3 and last 4 days of the diary were also reported, which were 0.887 for leakage episodes and 0.908 for frequency.\textsuperscript{105} [EL = 3]

A second case series reported test–retest variability and correlations of leakage episodes, and diurnal and nocturnal frequency, based on a 7 day diary in women aged 55 years or over (n = 50; 68% USI, 32% DO with or without stress UI). The test–retest reliability was reported to be significant for the three parameters, with correlation coefficients of 0.86–0.91. No significant differences were seen between any test and retest results.\textsuperscript{106} [EL = 3]

The third case series investigated the reliability of a 14 day diary for the measurement of leakage episodes in women. Significant correlation was reported between the diary findings of weeks one and two, with 5 days’ recording being necessary for internal consistency, for women with predominant urge UI and 7 days for women with predominant stress UI (n = 214).\textsuperscript{107} [EL = 3]

Does the use of bladder diaries affect outcome?
A considerable placebo effect has been reported in many placebo-controlled trials evaluating the effectiveness of conservative interventions for the treatment of UI or OAB, with this placebo effect being reflected in self-reported changes in voiding pattern, using bladder diaries. This placebo effect usually decreases over time. Several investigators suggest that completion of these diaries, together with the close monitoring, placebo medication, and therapeutic attention via interaction between them and their patients, induces a bladder training/retraining effect. However, none of the trials were designed to examine whether bladder diaries affect outcomes of women with UI or OAB, and therefore the conclusion that the diaries are the cause of a placebo effect is not proven. In addition, sufficient duration will be needed to allow the initial ‘beneficial’ placebo response to run its course so that true effects of interventions can be observed.

Evidence statements for bladder diaries
Bladder diaries are a reliable method of quantifying urinary frequency and incontinence episodes. [EL = 3] They are useful as a measure of outcome of treatments. The optimum duration of bladder diaries is unclear. [EL = 4]

<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>Bladder diaries should be used in the initial assessment of women with UI or OAB. Women should be encouraged to complete a minimum of 3 days of the diary covering variations in their usual activities, such as both working and leisure days. [2006]</td>
</tr>
</tbody>
</table>

4.10 Pad testing
Pad tests are used to detect and quantify urine loss. Pad tests of varying duration have been evaluated: 1 hour or less, 24 hours, and 48 hours or longer.

Does pad testing affect outcome?
No studies were identified that addressed this question.
**Test–retest reliability**

**Short pad tests**

Fourteen studies considered the test–retest reliability of pad testing: eight studies considered short pad tests (1 hour or less), and six considered tests of longer duration (24–72 hours). The data reported generally were correlations of test and retest findings, with some publications reporting actual scores or differences in test–retest scores. Correlation was assessed using Spearman’s, Pearson’s or Lin’s concordance correlation coefficients in five studies; the remaining nine studies did not state which test was used.

The results for the short pad tests are shown in Table 4.3. One study considered the reliability of a test of 12–15 minutes’ duration. The standardised 1 hour pad test was used in four studies. Another three studies used a modified version where the test differed in the method of filling the bladder, or in the quantity of fluid instilled or consumed. Across these studies, significant correlation or agreement was reported between test and retest urine loss, although the differences between test and retest results across studies varied widely (means of 2–23 g).

**24, 48 and 72 hour pad tests**

Six case series reported test–retest reliability for pad tests of 24–72 hours. The results are shown in Table 4.4. These studies also reported significant correlation between test and retest results. One study noted that the number of pad-test days required for optimal reliability was 3 days (data only shown in graph in publication). Another found that correlation appeared to improve at 72 hours compared with 24 hours, but compliance fell.

**Evidence statements for pad testing**

The evidence supporting the use of pad testing is contradictory and of poor quality. However, there appears to be good group correlation with test–retesting even though the amounts leaked may differ in individuals. It is possible that pad tests of longer duration (24 hours or longer) are more sensitive for measuring incontinence than a short standardised 1 hour test. There is a lack of evidence in relation to whether pad testing in the assessment of women with UI affects outcomes. [EL = 3]

While there is no evidence of diagnostic value or clinical utility for pad testing, the GDG’s view is that pad tests may be useful for evaluating therapies for incontinence. [EL = 4]

<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>Pad tests are not recommended in the routine assessment of women with UI. [2006]</td>
</tr>
</tbody>
</table>

**Table 4.3 Test–retest reliability of short pad tests**

<table>
<thead>
<tr>
<th>Pad test duration</th>
<th>Population and any relevant test conditions</th>
<th>Test–retest interval</th>
<th>Level of agreement between test and retest</th>
</tr>
</thead>
<tbody>
<tr>
<td>12–15 minutes</td>
<td>33 women with stress UI; testing undertaken as part of cystometry, with the bladder filled to 75% of cystometric capacity</td>
<td>Same day</td>
<td>Significant correlation ($r = 0.74$) reported between test and retest; no numerical data reported</td>
</tr>
<tr>
<td>Standardised 1 hour test</td>
<td>56 women with an unspecified type of UI; study aimed to ensure bladder volume at retest was similar to that at the first test, although median volumes were significantly different</td>
<td>3–10 days</td>
<td>Significant difference of 9.7 g between test and retest</td>
</tr>
<tr>
<td>Standardised 1 hour test</td>
<td>18 women with stress or mixed UI</td>
<td>1–15 days</td>
<td>Mean test–retest difference of 23 g (median 4 g); significant correlation reported ($r = 0.68$)</td>
</tr>
</tbody>
</table>

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Standardised hour test\textsuperscript{113}  1  20 women with stress, mixed or urge UI  1 week  Difference in median pad weight gain of 3 g between tests; significant correlation $r = 0.77$

Standardised hour test\textsuperscript{112}  1  19 men and women with stress, mixed or urge UI  1–36 days  Correlation of 0.96 reported for difference in urine loss; differences in test–retest results not reported

Modified Standardised hour test\textsuperscript{114}  1  67 women with stress and mixed UI; bladder filled to capacity with normal saline  Immediate  Significant test–retest difference in urine loss of 9 g and 12 g; correlations $r = 0.97$ and $r = 0.84$, respectively

Modified standardised hour test\textsuperscript{115}  1  16 women referred for PFMT; 1 litre rather than 500 ml fluid consumed  1–7 days  Mean difference in urine loss of 2 g on pad test; significant correlation $r = 0.73$

Modified standardised hour test\textsuperscript{116}  1  25 women with stress or mixed UI; bladder instillation of fluid to 50% of maximum cystometric capacity  1–85 days  Mean test–retest differences of up to 24 g; significant correlation $r = 0.97$

### 4.11 Urodynamic testing

The term ‘urodynamics’ encompasses a number of varied physiological tests, of bladder and urethral function, which aim to demonstrate an underlying abnormality of storage or voiding. The term is often used loosely to mean multichannel cystometry.

Cystometry is the measurement of intravesical pressure, which can be carried out through a single recording channel (simple cystometry) or, more commonly, by multichannel cystometry, which involves the synchronous measurement of both bladder and intra-abdominal pressures by means of catheters inserted into the bladder and the rectum or vagina. The aim is to replicate the woman’s symptoms by filling the bladder and observing pressures changes or leakage caused by provocation tests.

Uroflowmetry entails a free-flow void into a recording device, which provides the practitioner with information about the volume of urine passed and the rate of urine flow.

<table>
<thead>
<tr>
<th>Pad test duration</th>
<th>Population and any relevant test conditions</th>
<th>Test–retest interval</th>
<th>Level of agreement between test and retest</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 hours\textsuperscript{117}</td>
<td>13 women with stress or mixed UI</td>
<td>Consecutive days</td>
<td>Non-significant mean difference of 5 g between test and retest; retest results differed approximately three-fold from the first test</td>
</tr>
<tr>
<td>24 hours\textsuperscript{118}</td>
<td>31 women with stress or urge UI</td>
<td>Consecutive days</td>
<td>Significant correlation ($r = 0.82$)</td>
</tr>
<tr>
<td>24 hours\textsuperscript{119}</td>
<td>104 women with UI; urodynamic finding: 65% stress UI, 29% mixed UI, 6% DO and ‘others’</td>
<td>Consecutive days</td>
<td>Significant correlation between the first 24 hours and 7 days of data; authors also claimed that 3 pad-test days optimal for reliability (data only shown in graph)</td>
</tr>
<tr>
<td>24 and 48 hours\textsuperscript{120}</td>
<td>48 women with unspecified type of UI</td>
<td>6–28 days</td>
<td>Significant correlation for both tests: 24 hour ($r = 0.66$), 48 hour ($r = 0.9$)</td>
</tr>
</tbody>
</table>
There are also numerous tests of urethral function, including urethral pressure profilometry and leak point pressure measurement. These are used to derive values that reflect the ability of the urethra to resist urine flow, expressed most commonly as maximum urethral closure pressure (MUCP), or as abdominal, cough or Valsalva leak point pressures (ALPP, CLPP, VLPP).

Videourodynamics involves synchronous radiographic screening of the bladder with multichannel cystometry and is so called because originally the information was recorded to videotape. Ambulatory urodynamics involves multichannel cystometry carried out with physiological bladder filling rates and using portable recording devices, which enable the woman to remain ambulant during the test.

**Diagnostic accuracy**

The agreement between urinary history and urodynamic findings is considered in Section 4.2.

**Does urodynamic testing affect outcome?**

A systematic review considering this question has been published but it only included one fully published RCT. The RCT was considered alongside other relevant, fully published data.

The RCT compared conservative treatment tailored to urodynamic findings (PFMT or bladder retraining) with a multicomponent conservative treatment regimen (PFMT and bladder retraining), without prior urodynamic investigation in women with symptoms of UI or OAB (n = 60; 48 analysed). After 3 months of treatment, no significant differences were seen between groups in any outcome (leakage episodes, frequency, nocturia, subjective assessment, short pad test). Since the uninvestigated trial arm received both treatments, the outcomes from treatment may be uninformative about the value of urodynamics.

Two observational studies reported outcomes of continence surgery for stress UI in women who had preoperative urodynamic investigations (61% or 71%), compared with those who did not. Neither found significant differences between groups in cure/success rates or symptom severity scores at mean follow-up of 25 months (n = 109) or at 1 year (n = 279).

**Do preoperative urodynamic findings predict post-surgical outcomes?**

In a few case series of surgical interventions for stress UI in women, authors retrospectively explored whether certain preoperative findings on urodynamic testing (urethral pressure profilometry or uroflowmetry) predicted surgical success or complications. These studies cover a range of surgical procedures (suspension procedures, slings, intramural bulking agents), with some studies evaluating more than one procedure. Data were presented in various ways, with some studies comparing the mean urethral pressures in successful or failed groups and others considering the success or failure rates above certain urethral pressure thresholds. Generally, small numbers of women were involved in the individual studies (n range 45–375, with most studies including fewer than 100 women). Cure rates were reported at varying durations of follow-up, ranging from 3 to 26 months (most under 1 year). The impact of possible confounding factors was not generally considered within the study reports. The studies were neither designed nor powered to show differences in the outcomes evaluated.
Success

Five of eight case series reported that the urethral closure pressure was statistically significantly lower in women who failed surgery (colposuspension, tension-free vaginal tape [TVT], vaginal wall sling), or that the failure rate was higher in women with maximum urethral closure pressure (MUCP) of 20 cmH₂O or less.¹²⁷,¹³¹–¹³³,¹³⁸ Two case series found no significant association between preoperative MUCP and surgical success or failure.¹²⁸,¹²⁹ One case series reported varying results according to the procedure undertaken, with meanMUCPsignificantly lower in women who failed colporrhaphy, with no differences found for MUCP in women who had successful or unsuccessful needle suspension or colposuspension procedures.¹³⁴

A further two studies considered different pressure measurements. One reported that preoperative opening detrusor pressure and urethral pressure at closure were significantly lower in women who had objective failure of colposuspension.¹³⁵ Another reported that the preoperative ‘index of urethral relaxation at stress’ (ratio of highest intraurethral pressure between coughs in the stress urethral pressure profilometry to the MUCP at rest) in women undergoing a suspension procedure was significantly lower in cases of objective failure.¹²⁸

Four studies considered success according to abdominal or Valsalva leak point pressures (VLPP). Three reported no difference in success rates after surgery (vaginal wall sling, polypropylene sling, polytetrafluoroethylene bulking) according to baseline leak point pressures.¹³⁰,¹³¹,¹³⁵,¹³⁶ One of these studies reported that the failure rate was significantly higher in women with both VLPP less than 50 cmH₂O and MUCP less than 30 cmH₂O, compared with both values above these thresholds.¹³１ The fourth case series reported a significantly lower cure rate with TVT in women with low VLPP (less than 60 cmH₂O).¹³⁸

Complications

The preoperative maximum urine flow rate was significantly lower in women who had delayed voiding in three of four studies that considered this.¹⁴⁰,¹⁴²,¹⁴⁴ One reported that a maximum flow rate of less than 20 ml/second was associated with delayed voiding.¹⁴⁰ The third study found no significant association between preoperative peak urine flow rate or residual volume and delayed voiding.¹⁴¹ The procedures undertaken were a fascia lata sling, TVT and colposuspension.

No association was found between preoperative MUCP or VLPP values and voiding dysfunction in the studies that considered this.¹⁴⁰,¹⁴²,¹⁴³

Two studies considered factors associated with the development of de novo DO, following colposuspension. Preoperative opening detrusor pressure, urethral pressure at closure and acceleration of flow rate were significantly higher in women with de novo DO in one study, while preoperative MUCP was not found to be associated with de novo DO (n = 209).¹²⁹ The second study did not report an association between uroflowmetry and de novo DO (n = 77).¹¹⁴ [EL = 3]

Different methods of urodynamic investigation

Single-channel versus multichannel cystometry

The findings of single-channel (‘simple’) and multichannel cystometry were compared in four studies (n range 70–179).¹⁴⁵–¹⁴⁸ Two studies included elderly men and women, with data reported separately for women.¹⁴⁵,¹⁴⁶ The tests were conducted on the same day in three studies¹⁴⁶,¹⁴⁸ (in random order in one¹⁴⁷) and after an interval of 1–4 weeks in the fourth study.¹⁴⁵ Assessments or interpretation of the traces were performed blind in two of the studies¹⁴⁶,¹⁴⁷ [EL = DS II] but not in the other two.¹⁴⁵,¹⁴⁸ [EL = DS III] The diagnostic accuracy results, for simple compared with multichannel cystometry, for a diagnosis of DO (or detrusor hyperreflexia¹⁴⁵) in the four studies were: sensitivity range 59–100%, specificity 68–89%, PPV 17–84%, NPV 79–100%.

A fifth study reported accuracy of single-channel cystometry with cough stress test, relative to multichannel cystometry, for a diagnosis of stress UI. The sensitivity, specificity, PPV and NPVs found were 84%, 84%, 87% and 81%, respectively (n = 145).¹⁴⁹ [EL = DS III]

Stress test versus multichannel urodynamics

Three studies evaluated the accuracy of a simple stress test for a diagnosis of stress UI.¹⁵⁰–¹⁵² In the first, the stress test was conducted with a fixed bladder volume (which requires catheterisation). Compared with videocystometry and leak point pressure findings, the stress test had sensitivity of
94%, specificity 90%, PPV 97% and NPV 82%.\textsuperscript{150} [EL = DS II] In the second study, the stress test was conducted with an empty bladder and found sensitivity of 49%, specificity 95%, PPV 98% and NPV 29% compared with multichannel cystometry. These values changed to 65%, 76%, 66% and 76%, respectively, when the stress test was compared with MUCP of 20 cmH\textsubscript{2}O or less.\textsuperscript{151} [EL = DS III]

The third study compared the accuracy of urethral closure pressure profilometry during multichannel cystometry for a diagnosis of stress UI, relative to a diagnosis based on a clinical stress test. Urethral closure pressure profilometry had sensitivity of 93%, specificity of 83%, PPV 92% and NPV 86% (n = 981).\textsuperscript{152} [EL = DS III]

Ambulatory versus conventional multichannel urodynamics

Six case series compared ambulatory urodynamics with conventional multichannel cystometry or videocystometry (n range 20–22),\textsuperscript{153–158} In three studies, the populations evaluated were those in whom a diagnosis had not been reached on conventional cystometry or whose symptoms did not match the cystometric findings.\textsuperscript{153,156,158} Three of the studies included men and women, the majority being women.\textsuperscript{153,156,157}

The studies differed in the duration of ambulatory monitoring (3–24 hours) and in the interval between tests (from 1 week to a mean of 37 weeks in those that reported this). The studies considered agreement between the two methods with none reporting data in a way that allows calculation of sensitivity, specificity, PPV or NPV. Two studies reported the agreement for any type of UI,\textsuperscript{153,154} and four for urge UI or DO.\textsuperscript{155–158}

The studies reported the following:

- 63% had additional findings on ambulatory urodynamics\textsuperscript{153}
- significant difference in the proportions with DO or with normal findings on ambulatory versus conventional urodynamic testing\textsuperscript{154}
- more patients were found to have DO on ambulatory than conventional urodynamic testing\textsuperscript{155–158} [EL = 3]

Videocystourethrography versus other methods

Videocystourethrography (VCU) was compared with multichannel cystometry in one study (n = 159). VCU had sensitivity of 61%, specificity 70%, PPV 56% and NPV 74% for a diagnosis of stress UI, and 14%, 97%, 87% and 45%, respectively, for urge UI.\textsuperscript{159} [EL = DS III] Compared with clinical assessment (n = 37), the accuracy of VCU was: \textsuperscript{160}

- sensitivity of 74%, specificity 78%, PPV 78% and NPV 74% for stress UI
- 0, 91%, 0 and 91%, respectively, for mixed UI (zero sensitivity and PPV because no women had both a clinical and urodynamic finding of mixed UI)
- 50%, 89%, 20% and 97%, respectively, for urge UI.\textsuperscript{160} [EL = DS III]

No studies were identified that compared the accuracy of leak point pressures with MUCP for the diagnosis of intrinsic sphincter deficiency.

Test–retest reliability of urodynamic testing

One case series evaluated the intra- and inter-observer reliability of voiding measurements (pressure flow parameters) in women. Repeat cystometry was done after 1 week. Differences in intra- and inter-rater findings for the parameters measured (opening and closing detrusor pressure, maximum flow rate, detrusor pressure at maximum flow rate) were reported to be small although no statistical analysis was reported (n = 554).\textsuperscript{161} [EL = 3]

No studies were identified in relation to the test–retest reliability of the filling phase of cystometry.

In a series of men and women with OAB, cystometry was performed at baseline and repeated after 2–4 weeks' placebo treatment within an RCT. All parameters (volume at first desire to void, volume at first involuntary contraction, and maximum pressure of involuntary contraction) increased significantly at the second measurement, and therefore it seems this study evaluated the effects of placebo on cystometric parameters rather than reproducibility (n = 30; 40% women).\textsuperscript{162} [EL = 3]
Health economics of urodynamic testing

Resource scarcity provides the rationale for undertaking any health economic analysis. Finite resources mean that expenditure on preoperative urodynamic testing, or anything else for that matter, carries an opportunity cost – that is, other possible uses of those resources and benefits from them are foregone. The efficiency issue is then whether that expenditure represents the best use of those scarce resources: could greater patient benefit be obtained if the resources used for preoperative urodynamic testing were employed elsewhere? The health economics of preoperative urodynamic testing is especially important to consider because its impact on outcomes has been questioned and yet it currently represents routine clinical practice, using actual NHS resources. Therefore, an economic analysis of preoperative urodynamic testing in women who failed conservative treatment has been undertaken for this guideline and the details are given in Appendix S.

Evidence statements for urodynamic testing

There is often inconsistency between the clinical history and the urodynamic findings. [EL=DS III] Multichannel cystometry, when it reproduces the woman’s symptoms, may reveal the underlying pathophysiological explanation of incontinence. Single-channel cystometry is less reliable, although a simple clinical stress test may be as accurate as multichannel cystometry in the diagnosis of stress UI. [EL = 3] Although videocystourethrography has the benefit of simultaneous structural and functional assessment, it is not clear whether this adds any relevant diagnostic accuracy, compared with multichannel cystometry. Ambulatory monitoring demonstrates functional abnormalities more often than multichannel cystometry, but the significance of this is unclear. [EL = 3] There is no evidence that pretreatment multichannel cystometry will improve the outcomes of treatments for incontinence. [EL = 2–] Although some urodynamic parameters have been found to correlate with adverse outcomes of surgery such as voiding difficulty and OAB, no test has been shown to reliably predict beneficial or adverse outcomes of surgery. [EL = 3] Nevertheless, it is recognised that preoperative urodynamic testing is firmly established in clinical practice and widely believed to contribute to improved patient counselling with regard to the likely outcomes of surgery. [EL = 4]

Economic modelling shows the cost effectiveness of preoperative urodynamic testing to be highly sensitive to the proportion of women with pure stress incontinence who failed conservative treatment, but this is not clearly established.

From evidence to recommendations

The GDG considers that urodynamic testing does not assist in the assessment of a woman prior to conservative treatment. The GDG also maintains the view that urodynamics investigation is not essential in every woman prior to primary surgery for stress UI, and therefore is not routinely recommended.

While the evidence suggests that preoperative urodynamics are not necessary for women with pure stress incontinence, the GDG accepts that these tests may help where the clinical diagnosis is not clear or in those women where initial surgical therapy has failed. Complex reconstructive urological procedures such as augmentation cystoplasty have been developed for use in specific urodynamic abnormalities; they should only be undertaken where these abnormalities are shown to be present.

Evidence to recommendations (2013)

Although urodynamic testing was not reviewed within the 2013 guideline update, to improve the implementation of the recommendation the GDG has modified the recommendations for clarification on the indications of its use.

Explanatory text was added to the recommendation on multichannel filling and voiding cystometry particularly because establishing a diagnosis of pure SUI requires a detailed clinical history and examination. This has been added to the recommendation to avoid women being offered surgical treatment for SUI without the identification of any symptoms of OAB, which are present in most women who have stress incontinence. The recommendations have been reordered to avoid misinterpretation of the recommendation since the majority of women (following unsuccessful conservative management) are likely to require urodynamic testing because they have some symptoms of OAB. Finally, the recommendations for ambulatory urodynamics have additional text to clarify that this procedure should take place following unclear outcomes from an initial urodynamic assessment.
Number | Recommendation
---|---
19 | Do not perform multi-channel cystometry, ambulatory urodynamics or videourodynamic before starting conservative treatment. \[2006, amended 2013\]
20 | After undertaking a detailed clinical history and examination, perform multi-channel filling and voiding cystometry before surgery in women who have:
- symptoms of OAB leading to a clinical suspicion of detrusor overactivity, or
- symptoms suggestive of voiding dysfunction or anterior compartment prolapse, or
- had previous surgery for stress incontinence. \[2006, amended 2013\]
21 | Do not perform multi-channel filling and voiding cystometry in the small group of women where pure SUI is diagnosed based on a detailed clinical history and examination. \[2006, amended 2013\]
22 | Consider ambulatory urodynamics or videourodynamic if the diagnosis is unclear after conventional urodynamics. \[2006, amended 2013\]

Number | Research recommendation
---|---
RR2 | Further research is needed to answer the question of whether the use of urodynamics, prior to initial or subsequent treatments, affects the outcomes and cost effectiveness of interventions in women with UI or OAB.

**4.12 Other tests of urethral competence**

Other than urodynamic studies, the Q-tip, POP-Q, Bonney, Marshall and Fluid-Bridge tests can assess urethral competence (hypermobility of the urethrovaginal junction). The Q-tip test involves placing a sterile Q-tip in the urethra and the woman is asked to bear down. If the Q-tip moves more than 30°, the test is considered positive. The Bonney and Marshall tests involve pressing either the index and middle finger of the examiner’s hand (Bonney test) or the jaws of a forceps (Marshall test) against the anterior vaginal wall, without pressing on the urethra. The stress provocation test is repeated and if no leakage occurs the Bonney or Marshall test is said to be positive. The Fluid-Bridge test is designed to test bladder neck competence by testing for the presence of fluid within the urethra, by demonstrating continuity between two channels of a pressure-recording catheter (one in the bladder and the other in the urethra).

**Diagnostic accuracy**

**Q-tip test**

One study compared the accuracy of the Q-tip test for evaluating urethrovaginal junction mobility against ultrasound, as the reference standard in women with prolapse or UI (93% UI). It reported that the Q-tip test (change of 30° or more between rest and straining angles from the horizontal) had sensitivity of 25%, specificity 78%, PPV 67% and NPV 37%, relative to a positive test on ultrasound (more than 10 mm movement, \(n = 114\)).\[163\][EL = DS III] Three studies compared visual assessment of the urethrovaginal junction (POP-Q) with the Q-tip test.\[164--166\] One of these studies reported the accuracy of the POP-Q system for diagnosing urethral hypermobility, using the Q-tip test as the reference standard, in women with symptoms of prolapsed (70%) and/or UI (30%). Results were presented for different cut-off points of Aa descent. As the Aa point became more distal, specificity and PPV of visual assessment increased (from 36% to 100% and 80% to 100%, respectively), and sensitivity and NPV fell (from 94% to 2% and 67% to 26%, respectively) (\(n = 111\)).\[164\][EL = DS III] The other studies evaluated the correlation between Q-tip and POP-Q measurements in women who had urethral hypermobility (maximum straining angle of 30° or
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Urethral pressure profilometry had sensitivity 50%, specificity 88%, PPV 69% and NPV 78% relative to the Marshall test.\textsuperscript{173} [EL = DS III]

**Do tests of urethral competence predict outcome?**

Only one study reported any data relevant to this question. In a case series of women undergoing colposuspension or needle suspension, the failure rate was significantly higher in women with a negative Q-tip test, who formed 4% of the study population ($n = 406$).\textsuperscript{174} [EL = 3]

**Evidence statements for tests of urethral competence**

The Q-tip, Bonney, Marshall and Fluid-Bridge tests have been developed to evaluate the mobility or competence of the urethrovaginal junction. [EL = DS III] However, there is no evidence to support their role in the clinical assessment of UI. [EL = 4]

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<tbody>
<tr>
<td>23</td>
<td>The Q-tip, Bonney, Marshall and Fluid-Bridge tests are not recommended in the assessment of women with UI. [2006]</td>
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</table>

### 4.13 Cystoscopy

Cystoscopy is the direct visualisation of the bladder and urethral lumen using either a rigid or flexible cystoscope. Examination is used to identify areas of inflammation, tumour, stones and diverticula, all of which are findings that will require management within a different clinical pathway.

**Alternative pathway**

One study aimed to determine whether multichannel cystometry, in combination with urethrocystoscopy, improved the ‘diagnostic accuracy’ of cystometry alone in women, 93% of whom presented with UI, the remainder with prolapse (6%) or retention (1%). The women’s history as reported did not indicate that cystoscopy was necessary. Urethrocystoscopy indicated a new diagnosis, of different pathology, in six women ($n = 84$).\textsuperscript{175} [EL = 3]

**Diagnostic accuracy**

Two studies evaluated the accuracy of dynamic urethroscopy (urethroscopy with simultaneous supine cystometry) relative to multichannel cystometry with or without urethral pressure profilometry, for the diagnosis of stress UI (one study)\textsuperscript{176} or DO (one study).\textsuperscript{148} For a diagnosis of stress UI, urethroscopy had sensitivity of 60%, specificity 79%, PPV 75% and NPV 66% ($n = 99$).\textsuperscript{176} [EL = DS III] For a diagnosis of DO, urethrocystoscopy had sensitivity of 25%, specificity 94%, PPV 65% and NPV 74% ($n = 218$).\textsuperscript{148} [EL = DS III]

**Evidence statement for cystoscopy**

The available evidence does not support the role of cystoscopy in the assessment of women with UI. [EL = 3]

From evidence to recommendation

The GDG felt that cystoscopy may be of value in women with pain or recurrent UTI following previous pelvic surgery, or where fistula is suspected; its place in recurrent stress UI without these additional features is less clear.

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<tr>
<td>24</td>
<td>Cystoscopy is not recommended in the initial assessment of women with UI alone. [2006]</td>
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4.14 Imaging

Imaging techniques that can be used in the assessment of the urinary tract include ultrasonography, X-ray, computed tomography (CT) and magnetic resonance imaging (MRI). Confirmation of alternative pelvic pathology, by means of cross-sectional imaging or ultrasound, would be an indication for referral to a specialist. In addition, imaging may be used to characterise the extent and anatomical contents of a POP, especially in the standing position with MRI.

Diagnostic accuracy

The use of ultrasound for the diagnosis of post-void residual urine is considered in Section 4.6.

Diagnosis of UI

No evidence was identified that considered the use of MRI or CT scanning in the assessment of women with UI. Studies considering the use of ultrasound and X-ray imaging are described below.

The sensitivity and specificity of ultrasound and the Q-tip test, relative to a urodynamic finding of stress UI in women, was reported in one case series. Ultrasound (a positive test defined as a 1 cm or greater drop in urethrovesical junction) had a sensitivity and specificity of 86% and 91%, respectively. The values were 90% and 55%, respectively, for a positive Q-tip test (change in angle of 35° or more) (n = 67). [EL = DS II]

Other studies have investigated whether certain parameters that could be measured by imaging might be used in the assessment of women with UI. These parameters include bladder wall thickness, bladder neck positioning, specific urethral measurements and the posterior urethrovesical angle.

Bladder wall thickness for DO diagnosis

Two studies focused on bladder wall thickness measured by transvaginal ultrasound for the diagnosis of DO. One reported significantly greater bladder wall thickness in women with DO than with any other diagnosis, and that bladder wall thickness of more than 5 mm had sensitivity of 84%, specificity 89% and PPV 94% for diagnosing DO, using videocystourethrography with or without ambulatory urodynamics as the reference standard (n = 180). [EL = 3] The second study investigated bladder wall thickness in women in whom urodynamic findings and clinical diagnoses were equivocal. Compared with women with stress UI, and compared with women without UI on urodynamic testing, the bladder wall thickness in women with DO appeared to be significantly greater (n = 128). [EL = 3]

Studies investigating correlation of anatomical shape or movement with stress UI

Another four studies considered whether anatomical shape or movement correlates with reporting of UI, or with urodynamic findings, but the clinical significance of the findings reported in these studies is not clear. The studies considered the following (see evidence tables for findings).

- A case series investigated whether urethral measurements, taken by intraurethral ultrasonography, could distinguish women with intrinsic sphincter deficiency (ISD) from those with urodynamic stress UI (n = 39).

- Two studies considered whether the posterior urethrovesical angle measured using bead chain urethrocystography could be used to diagnose stress UI. One of the studies aimed to determine how bladder neck descent and posterior urethrovesical angle correlated with urodynamic findings (n = 84). [EL = 3] The other study considered the prevalence of several parameters, including posterior urethrovesical angle of 115° or more, in continent and incontinent groups (n = 59).

- One study evaluated two parameters measured on bead chain cystography (the urethra at the most dependent position in the bladder, and descent of the urethrovesical junction below the posterior edge of the symphysis pubis) compared with a 1 cm or greater drop in urethrovesical junction, measured on ultrasound in women with stress UI (n = 85).

Does imaging affect women’s outcomes?

No evidence was identified that addressed this question.
Evidence statement for imaging

There is a lack of evidence regarding the use of MRI or CT scanning in the assessment of women with UI. The available data do not support the use of ultrasound or X-ray imaging in the assessment of UI. The correlation between anatomy and function is unclear. [EL = 3]

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<td>25</td>
<td>Imaging (magnetic resonance imaging, computed tomography, X-ray) is not recommended for the routine assessment of women with UI. Ultrasound is not recommended other than for the assessment of residual urine volume. [2006]</td>
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<tr>
<th>Number</th>
<th>Research recommendation</th>
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<tbody>
<tr>
<td>RR3</td>
<td>Further studies are required to clarify the role of ultrasound for the assessment of OAB.</td>
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4.15 Information provision

No evidence was identified in relation to whether providing information to a woman has an impact in terms of her satisfaction with the outcomes of treatment for UI or OAB.

While there is a lack of evidence in relation to the information given to women with UI, women need the right information, at the right time, with the support they need to use it. It is well recognised in the healthcare community that clear communication, the involvement of service users and the provision of timely evidence-based information are key elements in moving towards a genuinely patient-centred service. Improving information for patients was a commitment in the NHS Plan and part of the recommendations in the Kennedy Report. There are NHS guidelines on the importance of patient information and a toolkit to help develop these can be downloaded from www.nhsidentity.nhs.uk/patientinformationtoolkit/index.htm.

Patients’ desire for information may be underestimated in the majority of cases, although it is also recognised that individual patients’ desire for information varies. Information ‘seekers’ may cope better with more information, and information ‘avoiders’ cope better with less.

Women presenting with symptoms of UI need information that helps them to understand the various types of UI, their symptoms, investigations and the treatments recommended. They need to feel confident that the information provided is based on valid, systematic research into which clinical procedures, drug therapies and medical devices are most effective. However, patients and their families need information that is both scientifically valid and understandable. Since patients make important medical decisions with their clinicians (not separately from them), information provided must be designed for use by patients with their clinicians.

Women with UI should also be given information on where else to go for help and support, for example patient organisations such as Incontact (www.incontact.org) and the Continence Foundation (www.continence-foundation.org.uk).
5 Conservative management

5.1 Introduction

This chapter refers to those therapies used for UI that do not involve surgery. These include lifestyle interventions, physical, behavioural, drug and complementary therapies, and nontherapeutic interventions (products that collect or contain leakage). The preventive use of physical and behavioural therapies and of lifestyle interventions is also considered.

The International Continence Society define ‘conservative treatment’ as therapies that are usually low cost, and managed principally by the person with urinary incontinence (UI) with instruction/supervision from a health professional. They differ from other forms of incontinence management, in that they have a low risk of adverse effects and do not prejudice other subsequent treatments.

Antimuscarinic treatment is also considered to be a conservative management approach and is discussed in more detail in subchapter 6.2.

5.2 Lifestyle interventions

Studies considered for the lifestyle interventions question

Evidence described in this section is derived from studies that investigated the effects of modifying the specified lifestyle factors on UI- or OAB-related outcomes. Where no such interventional studies were identified, other study designs investigating how these lifestyle factors may affect the prevalence, or incidence, of UI or OAB were considered. Several observational studies have considered the possible association between lifestyle factors and UI, many of which include both men and women.

5.2.1 Bowel habit

No studies were identified that addressed the effects of modifying bowel habit on UI in women. Three observational studies in women considered whether bowel habit is a risk factor for UI. One observational study compared the history of bowel function in women with uterovaginal prolapse (n = 23, ten of whom had ‘minor’ stress UI symptoms), women with stress UI (n = 23) and a control group (n = 27). Straining at stool as a young adult was reported by significantly more women with prolapse or stress UI than the control group (61% versus 30% versus 4%), as was bowel frequency of less than twice a week as young adults in women with prolapse compared with control (48% versus 8%).[EL = 2+]

Another cohort study reported that bowel urgency was associated with risk of OAB at 1 year (n = 12570).[EL = 2+]

A cross-sectional study considered the effects of constipation and straining at stool on lower urinary tract symptoms. Stress UI, urgency and hesitancy were associated with both constipation and straining at stool. Sensation of incomplete emptying, post-void dribble and straining were associated with straining at stool (n = 487).[EL = 3]

A further cross-sectional survey reported that constipation was associated with a risk of stress and urge UI, although constipation was not defined (n = 6006).[EL = 3]
5.2.2 Dietary factors

No studies were identified that addressed the effects of modifying dietary factors, including alcohol consumption. A cohort study investigated the association between the intake of certain foods, energy, minerals and vitamins and the 1 year incidence of stress UI or OAB in women aged 40 years or above. The data indicate that certain quantities of some foods may be associated with reduced risk of new-onset OAB (chicken, vegetables, bread, protein, vitamin D and potassium) or new-onset stress UI (bread), and some quantities may be associated with an increased risk of new-onset OAB or stress UI (carbonated drinks) or stress UI (high fat, cholesterol, vitamin B12 and zinc intake) n = 6424.190–192 [EL = 2+]

A cross-sectional study did not find an association between alcohol use and urgency (n = 1059; 50% women).193 [EL = 3]

5.2.3 Caffeine

One RCT evaluated the effects of reducing caffeine intake to a maximum of 100 mg/day in addition to bladder training compared with bladder training alone in men and women with OAB with or without UI (n = 74). At 1 month, significantly greater reductions in urgency episodes and frequency were seen in the caffeine reduction group, with no significant differences between groups in reductions in urge UI episodes.194 [EL = 1+]

Four observational studies investigated the relationship between caffeine consumption and UI or OAB.195–198 Two of these studies evaluated the effects of caffeine on urodynamic parameters in women, as follows:

- A case–control study reported that the risk of DO was significantly higher with high versus minimal caffeine intake (OR 2.4, 95% CI 1.1 to 6.5). The risk with moderate versus minimal caffeine intake was not statistically significant (OR 1.5 , 95% CI 0.1 to 7.2; n = 259).195 [EL = 2+]

- A significant increase in detrusor pressure rise on bladder filling was seen after 200 mg caffeine intake in women with DO. No significant changes were identified in other urodynamic parameters in either group (women with DO or asymptomatic women, n=30).196 [EL = 3]

The other two studies reported the effects of modifying caffeine intake on subjective or objective outcomes.197,198

- During the initial 2–4 week self-monitoring phase of a behaviour management programme in women,199 daily intake of caffeine, urine loss, daytime leakage episodes, and frequency fell and daily fluid intake increased. None of the changes in outcomes was significantly associated with reduced caffeine intake (n = 34).197 [EL = 3]

- In a series of older people with psychiatric conditions who underwent a 13 week programme of alternating caffeine intake or abstinence, day and night leakage episodes were higher during periods of caffeine intake (n = 14; eight women).198 [EL = 3]

Four cross-sectional studies investigated the association between caffeine intake and UI or OAB.193,200–202 The findings in the individual studies were as follows:

- no association between coffee intake and urgency (n = 1059; 50% women)193

- increased risk of UI with tea intake (n = 6876)200

- nocturia was more common in women who drank tea in the evening (no numerical data presented; n = 3669)201

- the risks for difficulty in emptying the bladder and having a weak urinary stream were higher in women who drank coffee (n = 297).202 [EL = 3]
5.2.4 Fluid intake

In one RCT in women with UI (type unspecified), no significant changes in leakage episodes were reported after modifying daily fluid intake for 5 weeks. Adherence to fluid intake protocols was reported to be poor (n = 32).203[EL = 1−]

A further crossover RCT considered the effects of fluid manipulation over a 3 week period in women with stress UI or idiopathic DO. Fluid manipulation consisted of caffeine restriction for 1 week followed by increased or decreased fluid intake in association with continued caffeine restriction for 2 weeks. Caffeine restriction alone did not lead to statistically significant reductions in any outcome (leakage or urgency episodes, frequency, 24 hour pad test). Increasing fluid intake led to a significant increase in urgency episodes in women with DO, with no significant effects on other outcomes. After reducing fluid intake, significant reductions in leakage and urgency episodes, and in frequency, were seen (n = 84; 69 analysed).204[EL = 1−]

Based on women with stress UI or DO enrolled in a study of behaviour management,205 weak correlation between fluid intake and diurnal and nocturnal frequency and leakage episodes was reported over a 1 week period (n = 126).206[EL = 3]

Number  Recommendation

26 A trial of caffeine reduction is recommended for the treatment of women with OAB. [2006]

5.2.5 Smoking

No studies were identified that addressed the effects of smoking cessation on UI in women. One cohort study found significantly increased incidence of stress UI or OAB in current smokers compared with never smokers at 1 year (n = 6424).196[EL = 2+] A case–control study reported significantly higher prevalence of smoking among women with UI than women who were continent (OR 4.2, 95% CI 2.2 to 8.2). In women with UI, the prevalence of urge UI was significantly higher among smokers than non-smokers (n = 160).207[EL = 2−]

Six cross-sectional surveys considered the relationship between smoking and UI in women. Three surveys reported no association (n = 297, n = 486, n = 6037; 56% women).202,208,209 The others reported a positive association between current smoking and UI (one study, n = 6876)200 or nocturia (one study, n = 3669),201 and between former smoking and UI (two studies, n = 6876; 1059 [50% women]).193,200[EL = 3]

5.2.6 Weight

One RCT evaluated the effects of a 3 month weight reduction programme in overweight women with UI. Reductions in weight and leakage episodes and improvements in QOL were significantly greater in the group assigned weight reduction compared with no intervention. Beyond the randomisation phase, women were offered continued intervention for 6 months, after which symptoms were still improved compared with baseline (n = 48; 40 analysed).210[EL = 1−]

Three case series reported the effects of surgically induced weight loss on UI in morbidly obese women:

- In 12 women with stress, urge or mixed UI who had mean weight loss of 33% following gastric bypass surgery, nine were subjectively cured of UI with no significant change in frequency at mean follow-up of 14 months.211[EL = 3]
In women who had lost 50% or more of their excess weight following bariatric surgery, the prevalence of stress UI fell from 61% to 12% after stabilisation of weight loss (2–5 years) (n = 138). Two cohort studies [EL = 3] and five cross-sectional studies [EL = 2+] investigated the relationship between BMI and UI or OAB. One cohort study found significantly increased 1 year incidence of stress UI or OAB in women with BMI more than 30, compared with a BMI of 20–25 (n = 6424). The second cohort study, which investigated the prevalence of stress or urge UI in participants of high- or low-impact exercise, reported that BMI was associated with risk for regular stress and urge UI but gave no specific detail (n = 104). Two cohort studies and five cross-sectional studies investigated the prevalence of UI or OAB was higher with increased BMI, specifically:

- increased risk of UI with BMI greater than 25 (n = 6876)
- women with regular UI had the highest mean BMI (n = 486)
- significantly higher prevalence of UI in women with BMI greater than 29 (n = 6037; 56% women)
- increased risk of two or more nocturia episodes versus one episode for women with BMI of 30 or more versus less than 20 (n = 3669)
- increased risk of UI or urgency with increasing BMI, although BMI thresholds were not defined (n = 487)
- increased risk of urge UI and a trend towards increased risk of urgency in women within the highest versus lowest BMI quartiles (n = 297)
- increased risk of both stress and urge UI in women within the highest BMI quartile (n = 6006).

Number	Recommendation
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28	Women with UI or OAB who have a body mass index greater than 30 should be advised to lose weight. [2006]

5.2.7 Physical exercise

No controlled studies were identified that addressed the effects of physical exercise on UI in women. A cohort study investigated the prevalence of stress or urge UI in past US Olympians who had participated in long-term high-impact exercise (gymnastics or track and field) in the past compared with low-impact exercise (swimming). No significant difference in the prevalence of stress or urge UI was identified between high- or low-impact exercise groups (n = 104). Another cohort study evaluated the effects of physical activity before, during and after first childbirth; the analysis suggested that pre-pregnancy high-impact activity may be associated with risk of UI (n = 665). [EL = 2+]

Three cross-sectional studies investigated the prevalence of UI in women who exercise compared with those who do not. The three studies found that the overall prevalence of UI was not significantly different between groups (total n = 1677). A further cross-sectional study reported that urgency was less likely in women who exercise at least weekly (n = 6006).
Evidence statements for lifestyle interventions

There is a lack of high-quality prospective controlled trials evaluating the effects of modifying lifestyle factors in women with UI or OAB. [EL = 4]

Observational studies suggest that an increased caffeine intake may be associated with OAB and UI. [EL = 3] There is some evidence that caffeine reduction leads to less urgency and frequency when used in addition to bladder training. [EL = 1+]

Only RCTs of poor quality exist for modifying fluid intake, which were inconclusive. [EL = 1−] There is evidence of an association between obesity and UI or OAB, and in obese women weight reduction of at least 5% is associated with relief of UI symptoms. [EL = 3]

Constipation (bowel frequency of less than twice a week), and increased straining at stool in early adult life, may be associated with an increased tendency to prolapse and UI but no evidence on the effect of modifying bowel habit on continence was identified. [EL = 2+] Some dietary factors may increase the risk of developing UI or OAB although there is no evidence in relation to the effects of modifying these factors. [EL = 2+] Most observational studies suggest that smoking is associated with an increased risk of UI and OAB although there is no evidence relating to smoking cessation in the management of these symptoms. [EL = 3] There are conflicting data in relation to the association between physical exercise and UI prevalence. [EL = 3]

From evidence to recommendations

Where there is consistent evidence that a lifestyle factor appears to increase the risk of UI or OAB, or where there is consistent evidence of benefit from modifying a lifestyle factor, the GDG has recommended interventions in relation to these (caffeine, weight). Both excessive and inadequate fluid intake may lead to lower urinary tract symptoms; this should be considered on an individual basis. The overall lack of consistency in findings indicates a need for further research in this area.

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<th>Number</th>
<th>Research recommendation</th>
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<tr>
<td>RR4</td>
<td>There is a need for prospective interventional studies in all areas of lifestyle interventions to evaluate the effects of modifying these factors on UI and OAB.</td>
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5.3 Physical therapies

A variety of physical therapies are used in the management of UI in women. Pelvic floor muscle training (PFMT) involves recruiting pelvic floor muscles for muscle strengthening and skill training. Contraction of pelvic floor muscles causes inward lift of the muscles, with resultant increase in urethral closure pressure, stabilisation and resistance to downward movement.\textsuperscript{220} Biofeedback can promote awareness of the physiological action of pelvic floor muscles by visual, tactile or auditory means, for example, by manometry or electromyography (EMG).\textsuperscript{221,222} Weighted vaginal cones are cone-shaped appliances of various weights that can be used to facilitate strengthening of pelvic floor muscles. Passive and active contraction of the pelvic floor muscles aims to prevent the cones from slipping out of the vagina\textsuperscript{222}. Therapeutic electrical stimulation involves the application of electrical current, usually via vaginal/rectal surface electrodes, to stimulate the pelvic floor muscles via their nerve supply, or to alter reflex activity or inhibit detrusor contractions by a neuromodulatory effect on the nerve pathways.

Studies considered for the physical therapies question

Evidence described in this section is derived from RCTs. Two systematic reviews published on the Cochrane library (PFMT, and weighted vaginal cones) in women with UI collate much of the RCT data identified in the systematic searches.\textsuperscript{224,225} Owing to overlap of studies within Cochrane reviews, and because they include abstracts that have not subsequently been published, the studies were considered individually alongside all other relevant primary data.

Overall, the studies of physical therapies are heterogeneous in terms of the treatment programmes used, duration of treatment and/or follow-up, the populations and number of individuals enrolled and the outcomes measured. Several studies considered more than one intervention.
5.3.1 Pelvic floor muscle training

A wide range of different PFMT programmes was used across the RCTs, varying in duration, in number and type of contractions and repetitions. Daily PFMT was used in most. Further detail of the PFMT programmes used is provided in the relevant subsections.

**PFMT versus no treatment or sham PFMT**

Six RCTs compared PFMT with no treatment in a total of 422 women (211 having either treatment). Four enrolled women with stress UI,\(^{226–229}\) and one included women with stress or mixed UI (8.9%).\(^{230}\) The remaining study included women with stress, mixed or urge UI (urge UI in 16%), in which those with urge UI were treated with bladder training and those with mixed UI with bladder training plus PFMT: this study is considered in the behavioural therapies section (5.3). Some results for the 60% of women from this study who had stress UI were reported separately and are considered here.\(^{232}\) Other than one quasi-RCT,\(^{231,232}\) the studies were considered to be of good quality. [EL = 1+]

Women were advised to undertake daily PFMT in five studies. The number of contractions instructed varied, other than one study that only evaluated the ‘knack’ over a 1 week period.\(^{227}\) The lowest number of contractions across the other studies was 8–12 contractions three times a day (plus an exercise class every week) and the highest was 20 contractions four times a day, increasing to 200 per day.\(^{226,228,230,231}\) In a comparison with duloxetine, PFMT involved a target of 200 contractions per week (over 4 days), and the ‘knack’. Half the studies provided other support, including an audiotape plus group training once a week\(^{226}\) or a leaflet in addition to initial instruction.\(^{230,231}\) The woman’s ability to contract the pelvic floor muscle (PFM) was checked by vaginal palpation in five studies,\(^{226–229,231,232}\) one of which excluded women unable to contract the PFM.\(^{227}\)

Duration of treatment was 3 months in most studies, although this varied from 1 week to 6 months. Most studies considered cure rates and changes in leakage episodes at the end of treatment, which showed significantly greater improvements with PFMT compared with no treatment, in the five studies that recommended daily PFMT. The results for PFMT groups versus no treatment were:

- subjective cure rates of 16% and 56% versus 3% (two studies)\(^{226,230}\)
- success (combined subjective cure and improvement) in 85% versus 0% (one study)\(^{232}\)
- objective cure rates (1 hour pad test or negative stress test) of 44% and 65% versus 0% and 7% (two studies)\(^{226,232}\)
- reductions in leakage episodes of 54% or 72% versus 6% and an increase of 10% (three studies; no numerical data in one).\(^{226,230,232}\)

Three studies also considered short pad test results, each of which showed significantly less leakage in women undergoing PFMT.\(^{226–228}\) One RCT used a 24 hour pad test where no difference was identified.\(^{226}\) Both those studies that did\(^{226–228,231,232}\) and those that did not\(^{230}\) assess PFM contraction prior to treatment showed efficacy of active treatment groups over control. [EL = 3]

Five year follow-up has been reported of women from a 3 month study during which the control group was offered PFMT.\(^{233}\) At 5 years in women with stress, mixed or urge UI (those with stress or mixed undergoing PFMT), 69% reported improvement or dryness compared with pretreatment. However, a non-significant increase in leakage episodes was seen in women with stress UI \((n = 110)\).\(^{233}\) [EL = 3]

In a comparison of PFMT with sham PFMT (and with duloxetine 80 mg with or without PFMT), sham PFMT involved contracting hip abductor muscles. No significant differences were reported between PFMT and sham PFMT groups in any outcome (leakage episodes, global improvement, QOL) after 12 weeks’ treatment. It is unique to this trial that PFMT apparently gave no significant benefit over sham treatment.\(^{229}\) [EL = 1+]

**Adverse effects**

The majority of studies comparing PFMT with no treatment did not consider adverse effects. One RCT reported isolated adverse effects (pain, and an ‘uncomfortable feeling’ during exercise).\(^{231}\) Another RCT reported that no adverse effects occurred.\(^{229}\) Adverse effects occurring in the duloxetine study were pooled, and therefore a distinction between these interventions is not possible.\(^{229}\)
Different pelvic floor muscle training regimens
Several RCTs compared different PFMT regimens, or different methods of delivering PFMT.

Intensive versus standard regimens
Four RCTs compared ‘intensive’ with ‘standard’ PFMT. The PFMT programmes and the populations evaluated were as follows:

- an exercise class every week in addition to standard PFMT (individual instruction, clinic biofeedback, 8–12 contractions three times a day, contraction checked by palpation) versus standard PFMT alone; 6 months’ treatment, women with stress UI (n = 52)\(^{234,235}\) [EL = 1+]

- a program of PFMT with bladder training for women with frequency and urgency (PFMT consisting of individualised instruction, target 80–100 contractions/day) versus standard postnatal care (which could include information on pelvic floor exercises); in women with stress, urge (15%) or mixed UI (31%) 3 months postpartum, assessed after 1 year’s treatment,\(^{236}\) and at 6 years (n = 747)\(^{237}\) [EL = 1++]

- PFMT with or without vaginal cones versus standard PFMT (antenatal and postnatal instruction) in women with UI 3 months postpartum, assessed after 1 year’s treatment and at 24–44 months postpartum; awareness of contraction checked by perineometry (n = 145)\(^{238}\) [EL = 1–]

- one-to-one instruction while in hospital postnatally, with an option to attend two postnatal pelvic floor exercise classes, versus standard care (verbal promotion of exercises, plus explanatory leaflet); effects assessed at 6 months postpartum (n = 190)\(^{239}\) [EL = 1+]

The rate of subjective cure or improvement was significantly higher in the intensive group in the study that considered this outcome (96% versus 66%; cure rates alone9% versus 0%),\(^{234,235}\) Two of three studies in postpartum women found significantly lower UI prevalence in the intensive groups (60% versus 69% and 50% versus 76%),\(^{236,238}\) while the third reported no significant difference (60% versus 46%).\(^{239}\) The findings of pad tests were inconsistent (two studies).\(^{234,235,238}\)

Longer term follow-up is available from two studies. At 6 years, no significant differences were found between ‘intensive’ and ‘standard’ groups in UI prevalence, severity or leakage episodes in the 69% of women followed up.\(^{236,237}\) [EL = 1++] Five year follow-up of the intensive PFMT arm (23 women) of one RCT\(^{234,235}\) has also been published,\(^{240}\) and a 15 year follow-up of both treatment arms.\(^{241}\) Data at 15 years show no differences in urinary outcomes or satisfaction between groups in the 91% of women followed up.\(^{241}\)

Group versus individual training
Two RCTs of 3 months’ duration compared groups with individual PFMT in women with stress, mixed or urge UI (n = 530, n = 44),\(^{242}\) [EL = 1+]\(^{243}\) Group sizes were eight to ten or four to twelve.\(^{243}\) In the smaller of the two RCTs (n = 44), women also underwent bladder training. Neither of the studies found significant differences between the two methods in the outcomes evaluated (leakage, UI severity, self-reported change in symptoms, pad test, QOL or frequency).

None of the RCTs comparing different PFMT methods considered adverse effects.

PFMT and drug treatment
One RCT compared PFMT with intravaginal oestrogen in women with stress UI (3 months’ treatment with follow-up at 12 months) but no between-group analyses were reported.\(^{228}\) [EL = 1+] Three RCTs evaluated combined PFMT and drug therapy (estril, tolterodine and duloxetine).\(^{229,244,245}\)

The PFMT regimen varied across these studies: five contractions per hour,\(^{228}\) 75 contractions per day,\(^{245}\) 15 minutes per day,\(^{244}\) and a target of 200 contractions per week over a 4 day period.\(^{225}\) Pelvic floor muscle contraction was checked by vaginal palpation in two studies.\(^{228,229}\)

Oral estriol 1 mg plus PFMT was compared with PFMT alone in postmenopausal women with stress UI (n = 73; 66 analysed). A higher cure rate was reported with estriol plus PFMT compared with PFMT alone, at 2 years (78% versus 68%); no other outcomes were reported.\(^{244}\) [EL = 1–]
The effects of adding PFMT to tolterodine 2 mg b.d. compared with tolterodine alone was considered in men and women with frequency, urgency and urge UI (n = 480; 75% women). After 6 months’ treatment, no significant differences were seen between tolterodine plus PFMT versus tolterodine alone in changes in any outcome. The reductions in symptoms with combined therapy versus tolterodine alone were: urge UI episodes 64% versus 70%, frequency 23% versus 27%, and urgency 79% versus 83%. Overall 82% versus 86% considered themselves improved. Adverse effects reported with tolterodine (with or without PFMT) were dry mouth, headache, constipation, nausea, dry eyes and dizziness.245 [EL = 1++]

Duloxetine 80 mg daily (with or without PFMT) was compared with PFMT and with no active treatment (sham PFMT and placebo drug) in women with stress UI (n = 201). Significantly greater reductions in leakage episodes were reported with duloxetine (with or without PFMT) compared with PFMT alone after 3 months’ treatment. Global improvement and I-QOL scores indicated greater improvement with duloxetine plus PFMT compared with no active treatment. Discontinuation and adverse effect rates (nausea, dizziness, dry mouth, constipation, insomnia, somnolence, asthenia) were significantly higher in duloxetine-treated groups compared with PFMT or no active treatment combined.229 [EL = 1++]

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<tr>
<td>29</td>
<td>A trial of supervised pelvic floor muscle training of at least 3 months’ duration should be offered as first-line treatment to women with stress or mixed UI. [2006]</td>
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<tr>
<td>30</td>
<td>Pelvic floor muscle training programmes should comprise at least eight contractions performed three times per day. [2006]</td>
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<tr>
<td>31</td>
<td>Perineometry or pelvic floor electromyography as biofeedback should not be used as a routine part of pelvic floor muscle training. [2006]</td>
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<tr>
<td>32</td>
<td>If pelvic floor muscle training is beneficial, an exercise programme should be continued. [2006]</td>
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### Research recommendation

**RR5**

Studies investigating different pelvic floor muscle training regimens are required to establish the optimum method of delivering and undertaking this intervention.

**RR7**

What is the effectiveness of different pelvic floor muscle training regimens in the management of women with overactive bladder (OAB) symptoms and to whom should it be offered?

**Why this is important**

For many women with urinary incontinence symptoms, management of their condition will take place predominantly in primary and community care. Pelvic floor muscle training may be their only experience of therapeutic intervention. It is not currently known whether different pelvic floor muscle training regimens have an impact on treatment outcomes. It is also not known whether other factors also have an impact on its effectiveness. These factors include the way that the training is offered, the technique that is taught, the intensity and frequency of training, and the length of time that pelvic floor muscle training is continued. Since pelvic floor muscle training is widely used in clinical practice, robust evaluation is required to identify whether these or other factors have an important impact on patient centred outcomes.

#### 5.3.2 Vaginal cones

Ten RCTs evaluated the use of weighted vaginal cones in women with UI compared with PFMT or electrical stimulation, or in combination with PFMT.226,238,246–253 Other than one study that enrolled...
women with stress, mixed or urge UI (postnatally). All studies included women with stress UI. Between 37 and 145 women were evaluated in each study.

The protocol for cone use differed across studies. Seven used a range of weights, increasing according to ability to retain the cone (20–70 g). Other studies used a fixed weight of 150 g, while two studies did not specify weights used. One study used a fixed weight of 150 g, while two studies did not specify weights used. In five studies, women were instructed to hold the cones in place twice or three times a day for 10–15 minutes. Once daily use for between 5 and 25 minutes was advised in another five studies.

In studies involving PFMT, daily PFMT was undertaken. The number of contractions ranged from 24 (eight contractions three times a day) to 100 where specified. PFMT was individually tailored in three studies and included the ‘knack’ in two. Seven studies stated that ability to contract PFMT was checked at baseline.

Cones versus no active treatment

Cones were compared with no treatment within one RCT (total n = 107). Significantly greater improvement in leakage and social activity indices were seen with cones after 6 months’ treatment. No significant differences were seen between groups in other outcomes (subjective or objective cure, leakage episodes).

Cones versus PFMT

Cones were compared with PFMT in four studies of 3–6 months’ duration. Two of these studies had other treatment arms (electrical stimulation and an untreated control). A further study, also described under the intensive versus standard PFMT section, compared ‘intensive’ PFMT (PFMT/cones/PFMT plus cones) with standard postnatal care but only analysed results for women who completed the study. Results were presented for the intensive group as a whole, except for the proportion cured, where there was no significant difference between cone and PFMT groups at 1 year postpartum.

Two studies of 3 months’ duration reported no significant differences between cones and PFMT in improvements in outcomes evaluated: leakage episodes, subjective improvement, subjective or objective cure rates (n = 60); or leakage episodes, PFM strength or QOL (KHQ) (n = 101).

The third study found significantly greater improvement with PFMT versus cones in the short pad test, leakage episodes, leakage index and PFM strength, and a significant difference in subjective and objective cure rates (56% versus 7% and 44% versus 15%). No significant differences were seen in 24 hour pad test results after 6 months’ treatment (n = 107). The fourth study, which only analysed results for those who completed 4 months’ treatment, found a significantly greater reduction in leakage on the stress pad test with cones versus PFMT. No significant differences were found in other outcomes (PFM strength and subjective assessment) (n = 37).

Cones versus electrical stimulation

Cones were compared with electrical stimulation in three studies, none of which reported significant differences between groups in any outcome, whether assessed at 1 or 6 months. Women in one study also undertook PFMT. Outcomes evaluated across two studies were: short and 24 hour pad tests, subjective cure, leakage episodes, leakage and social activity indexes, and pelvic floor muscle strength. The remaining study only considered urethral pressure and pad test results, and gave inadequate data and detail of methods for evaluation (n = 20).

Cones in combination with PFMT

Cones and PFMT in combination were compared with PFMT alone in a 3 month study. Limited results were given (urodynamics only available for 59%), with no between-group analysis for subjective assessments; however, a similar proportion of women in both groups reported cure or improvement (n = 46).

Cones and PFMT in combination were compared with electrical stimulation in two studies of 6 weeks’ duration. One reported no differences between groups in leakage episodes or frequency, while no between-group analyses were reported for other outcomes (n = 40). The other study found no significant differences between groups in any outcome (urethral or vaginal pressures, PFM contraction and subjective assessment) (n = 120).
Adverse effects

One study reported adverse effects, which were four reports in 27 cone users (one abdominal pain, one bleeding, two vaginitis) and two reports in the electrical stimulation group (tenderness and bleeding; discomfort). No adverse effects were reported in the PFMT or untreated control groups.

Motivation problems were very common in the cone and electrical stimulation groups in one study (52% and 32%).

The withdrawal rate from cone therapy was 47% in a study that noted this, compared with none with PFMT. Differences in withdrawal rates between groups were not apparent in other studies.

5.3.3 Biofeedback

Most data regarding biofeedback relate its use in conjunction with PFMT, rather than as an isolated intervention. A variety of biofeedback methods were used across these studies, differing in the probes used (vaginal probes with EMG electrodes, pressure-sensitive intravaginal devices), in the feedback provided (visual and/or auditory) and the setting in which biofeedback was undertaken (home or clinic). Additionally, a few studies used electrodes/rectal catheters to monitor muscle activity or abdominal pressure.

Only one study compared biofeedback alone with PFMT (and with cones, n = 101). No significant differences were found between the three groups in improvements in outcomes evaluated at 3 months: leakage episodes, PFM strength and QOL (KHQ).[EL = 1–]

Eleven RCTs compared biofeedback-assisted PFMT with PFMT alone, in women with stress UI (eight studies), stress or mixed UI (one study), stress or urge UI (one study) or OAB (one study). Treatment duration ranged from 4 weeks to 6 months, with the number of women per study ranging from 22 to 103; most included fewer than 50 women. Of the 11 studies, four were considered to be of poor quality [EL = 1–] and seven of good quality.[EL = 1+] The majority of the studies found no significant differences between biofeedback-assisted PFMT groups and PFMT alone in the outcomes measured (subjective or objective cure, QOL [BFLUTS] or social activity index scores).[EL = 1–] Cure rates in the seven studies that reported this outcome (though variably defined) ranged from 16% to 69% (median 30%) with PFMT and from 15% to 73% (median 50%) with biofeedback-assisted PFMT.[EL = 1–] Significant additional benefit, in terms of leakage episodes, was reported in one study that alternated biofeedback with electrical stimulation, and in PFM parameters in two studies.[EL = 1+] A further two RCTs evaluated different methods of biofeedback. One compared biofeedback by palpation with EMG in women with stress UI. There were no significant differences between the biofeedback methods in urinary outcomes after 8 weeks’ treatment (n = 50). The second study compared the use of a vaginal plus abdominal probe with a vaginal probe only, for 4 weeks. Greater improvement in QOL was seen using a vaginal probe only, with no differences reported in other outcomes (leakage, pelvic floor muscle strength or endurance) (n = 38).[EL = 1+] Two RCTs considered adverse effects. None were reported in one, and another noted that two women (13%) found the vaginal probe uncomfortable, and that 17% from PFMT or biofeedback-assisted groups reported pain while training.[EL = 1+] 

5.3.4 Magnetic therapy

Magnetic therapy aims to stimulate the pelvic floor muscles and/or sacral roots by placing them within an electromagnetic field.

Two RCTs compared magnetic stimulation therapy with sham stimulation delivered via a portable device for the treatment of UI for 8 weeks. In the first study, in women with stress, mixed or urge UI, significantly more women in the magnetic therapy group reported improvement in symptoms. No significant differences in improvements in other outcomes were seen (pad weight, PFM contraction, leakage episodes or nocturia). Two reports of a pulsating sensation in users of magnetic stimulation were noted.[EL = 1+] The second study, in women with urge-predominant mixed UI, reported a significantly higher ‘success’ rate with magnetic stimulation; between-group comparisons for other outcomes were not reported (frequency, nocturia). No women experienced adverse effects (n = 39).[EL = 1–]
Two case series considered the effects of 6 or 8 weeks of magnetic therapy using a special chair (two 20 minute sessions a week). Women in one had stress UI (a minority having urge-predominant mixed UI), and urge or mixed UI in the other. Results for 74 patients have been reported, which showed significant improvement in all outcomes considered (leakage episodes, pad test results, frequency and satisfaction). Adverse effects were not considered in one study, while none were reported in the other. \(^{257,258}\) [EL = 3]

### 5.3.5 Economic evidence for physical therapies

There is a lack of good-quality evidence about the clinical and cost effectiveness of conservative therapies for UI. In the absence of evidence of a difference in efficacy between treatment options, cost minimisation analysis may be used to determine the most cost effective. Cost minimisation was undertaken for the physical therapies PFMT, cones, biofeedback and electrical stimulation. Estimates of the costs of the conservative therapies and an explanation of how these estimates were derived are given in Appendix T.

Additionally, because the other conservative treatment option for stress UI is duloxetine (see Section 5.4.4), a decision tree model was developed to compare the cost effectiveness of PFMT and duloxetine, as a first-line treatment for women with moderate to severe stress UI (assumed to be 14 or more leakage episodes per week). Treatment effects and costs were based on a 52 week time frame. This is described in detail in Appendix T. Under baseline assumptions, PFMT 'dominates' duloxetine. This means that it is both more effective and less costly. The sensitivity analyses undertaken (and detailed in Appendix T) did not change this conclusion.

### Evidence statements for physical therapies

Daily PFMT is an effective treatment for stress or mixed UI compared with no treatment over the short term. Other than occasional cases of pain or discomfort, no other adverse effects were noted. [EL = 1+] Women's pelvic floor contraction was assessed at baseline in the majority of studies. Studies that did or did not assess pelvic floor muscle contraction prior to treatment both showed efficacy of active treatment compared with control. [EL = 3]

In studies of up to 1 year, higher intensity PFMT regimens confer greater subjective cure or Improvement than lower intensity regimens. Over the longer term, differences between these groups are not sustained. [EL = 1+] There is a lack of evidence for optimum training regimens for PFMT. [EL = 4]

There is no additional benefit from the use of PFMT in women undergoing treatment with tolterodine for OAB. [EL = 1++] In women with stress UI, vaginal cones are more effective than no treatment over the short term. There is no evidence of a difference in effectiveness between cones and PFMT. Compared with PFMT, cones are associated with more adherence problems. [EL = 1+] One study suggested that the training time for using vaginal cones is one-third of that for PFMT, which would make vaginal cones cheaper than PFMT. However, it is not clear what the appropriate training regimen should be for women using vaginal cones. Vaginal cones are not suitable for all women. Cones are inappropriate for use in some circumstances, such as when there is a moderate to severe prolapse, too narrow or too capacious a vagina causing difficulty with insertion or misplacement of the cone, untreated atrophic vaginitis, vaginal infection, or during menstruation or pregnancy. [EL = 4]

Evidence does not indicate additional benefit from biofeedback with PFMT in comparison with PFMT alone in treating UI. [EL = 1+] Biofeedback with PFMT is more costly than PFMT alone and therefore is not cost effective given a lack of additional benefit.

There is lack of consistency in the electrical stimulation protocols employed in available studies. There is limited evidence for the benefit of electrical stimulation versus sham electrical stimulation in the treatment of urge UI. [EL = 1+] There is no evidence of additional benefit of electrical stimulation in combination with PFMT compared with PFMT alone. [EL = 1−]

There are limited data on the use of magnetic therapy for UI, and its role in the treatment of women with UI is unclear. [EL = 3]

An economic model constructed for the purposes of this guideline suggested that PFMT is more cost effective than duloxetine alone, as first-line treatment for stress UI. This result was generally not affected by making plausible changes to model parameters in favour of duloxetine. While the model...
was based on the best available clinical evidence, there is a lack of long-term effectiveness data for either treatment.

From evidence to recommendations
While there is no evidence of effectiveness for either biofeedback or electrical stimulation, the GDG considered that the information and support generated by biofeedback may assist motivation for some women, and that electrical stimulation may be of value for those who are unable to initiate a pelvic floor muscle contraction. [EL = 4]

In recommending the use of PFMT, the GDG considered that guidance should be given on the number of pelvic floor contractions to be undertaken within such a programme. Without clear evidence on optimal training regimens, the minimum number of daily pelvic floor muscle exercises advised across the studies was adopted by the GDG as the minimum number of contractions that women should be aiming for, that is 24 (eight contractions three times a day). Most studies evaluate 3 months’ treatment and, in the view of the GDG, this is an appropriate period of time to recommend PFMT before assessing its effectiveness.

5.3.6 Therapeutic stimulation
A range of various electrical stimulation methods and protocols were used across the RCTs, though the protocol used was poorly reported in some studies. Various types of current were used (interferential therapy, faradic stimulation, alternating pulse currents), with various current intensities.
The setting (home or clinic), duration (15 to 30 minutes) and frequency (two to three times per week) of individual treatments also varied. Electrical stimulation parameters were generally tailored to the woman’s tolerance.

Electrical stimulation versus sham stimulation
Eight RCTs compared electrical stimulation with sham stimulation. Treatment duration ranged from 4 to 15 weeks, with the number of women recruited in each study ranging from 24 to 121.

Four studies included women with stress UI,248,268,276,277 two included women with stress, mixed or urge UI,272,273 and two included women or men and women (57% women) with urge or urge-predominant UI.269,274 One study was of poor quality,248 [EL = 1−] and the others were of good quality.268–273 [EL = 1+]

The outcomes reported across these studies were leakage episodes, UI prevalence, pad tests, subjective cure or improvement, PFM strength, urodynamic parameters and QOL (SF-36, IIEQ, UDI).
The findings across these studies were inconsistent, with significant benefit with electrical stimulation versus sham stimulation reported for some but not all outcomes, and not across all studies. Not all studies reported between-group comparisons.

A further RCT compared electrical stimulation with ‘lower urinary tract exercises’ (PFMT and bladder training), and with both interventions combined, in women with DO (n = 68). At 9–11 weeks, no significant differences were found between groups in any outcome (detrusor activity index, leakage episodes, PFM strength).275[EL = 1−]

PFMT versus electrical stimulation
Eight RCTs compared PFMT with electrical stimulation in women (six in women with stress UI,226,228,248,276–278 one in those with stress, mixed or urge UI,279 and one in those with OAB with urge UI).265

The RCTs involving women with stress UI recruited between 18 and 51 patients. Duration of treatment ranged from 6 weeks to 12 months. The PFMT group also used vaginal cones in one study.268 The quality of two studies was poor,248,278 [EL = 1−] while four were of good quality.226,228,276,277 [EL = 1+]

None of the studies reported significant differences between groups in subjective or objective cure rates. The subjective cure rates ranged from 10% to 56% with PFMT, and from 4% to 12% with electrical stimulation, and objective cure rates from 10% to 54% versus 4% to 40%. Several other outcomes were reported in one study, where improvements in PFM parameters, short pad test results, leakage and social activity indexes were significantly greater in the PFMT group compared with electrical stimulation.226 No significant differences were reported between groups in leakage episodes or leakage frequency (three studies),226,248,277 or in 48 hour pad test results (one
One of the studies also compared propantheline with electrical stimulation, which reported no significant differences between groups in subjective or objective cure or improvement.²²⁷ The RCT involving women with stress or mixed or urge UI (66% mixed) found no significant differences between PFMT and electrical stimulation groups in any outcome (subjective assessment, 48 hour pad test results, improvements in PFM strength or DO prevalence) after 8 weeks’ treatment (n = 35).²²⁸[EL = 1+] The RCT in women with OAB and urge UI reported significantly greater improvements in PFM parameters and QOL (KHQ) with PFMT compared with electrical stimulation, but no significant differences in self-reported cure or improvement after 12 weeks’ treatment (n = 103).²³⁵[EL = 1+] Electrical stimulation in combination with PFMT

Four RCTs evaluated electrical stimulation in combination with PFMT versus PFMT alone in women with stress UI (stress or urge in one RCT).²⁷⁸,²⁸⁰–²⁸² The duration of treatment ranged from 1 to six months, with the number of women enrolled ranging from 14 to 57. One RCT also compared the combination with electrical stimulation alone.²⁷⁸ Three studies were of poor quality,²⁷⁸,²⁸⁰,²⁸²[EL = 1–] and one of good quality.²⁸¹[EL = 1+] Across these RCTs, electrical stimulation did not confer additional benefit to PFMT alone in the outcomes measured (self-reported cure or improvement, pad test, PFM parameters). No significant differences in self-reported cure or improvement were seen with electrical stimulation plus PFMT compared with electrical stimulation alone.

Adverse effects

Of all studies that considered the effectiveness of electrical stimulation, five considered adverse effects. None were reported in one study.²²⁶ Across the others, adverse effects or complications noted were: vaginal irritation (12–22%), pain (6–9%), and cases of faecal incontinence, discomfort, and tenderness and bleeding.²²⁶,²²⁸,²⁶⁸,²⁶⁹,²⁷⁷ One study reported difficulty in maintaining motivation in 32% of the electrical stimulation group.²²⁶

<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>33</td>
<td>Electrical stimulation should not routinely be used in the treatment of women with OAB. [2006]</td>
</tr>
<tr>
<td>34</td>
<td>Electrical stimulation should not routinely be used in combination with pelvic floor muscle training. [2006]</td>
</tr>
<tr>
<td>35</td>
<td>Electrical stimulation and/or biofeedback should be considered in women who cannot actively contract pelvic floor muscles in order to aid motivation and adherence to therapy. [2006]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number</th>
<th>Research recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>RR6</td>
<td>Research into the optimal electrical stimulation of the pelvic floor parameters is required, to inform future clinical practice. Studies investigating the role of electrical stimulation in women who cannot contract the pelvic floor muscle are required.</td>
</tr>
</tbody>
</table>

### 5.4 Behavioural therapies

Behavioural therapy involves an individual learning new patterns of response or re-establishing previously learnt behaviour to fit in with what is considered usual. Women with OAB (wet or dry) usually void more frequently than usual due to urgency. Women with stress UI also often void more frequently in the belief that they will pre-empt an involuntary urine loss associated with any increase in intra-abdominal pressure.
Various toileting programmes have been used. Bladder training (also described as bladder retraining, bladder drill, bladder re-education or bladder discipline) actively involves the individual, in attempting to increase the interval between the desire to void and the actual void.\textsuperscript{309} This may occur by mandatory schedules in which the individual may not use the toilet between set times for voiding, or a self-scheduled regimen where the patient gradually increases their inter-voiding times, and may use the toilet between times if the urge becomes unbearable.\textsuperscript{300}

### Studies considered for the behavioural therapies question

Evidence described in this section is derived from RCTs. Four systematic reviews of various toileting regimens have been published on the Cochrane library.\textsuperscript{309,301–304} The RCTs within these systematic reviews were considered individually. Further RCTs identified are also included here. Several studies included both men and women, none of which reported data separately by gender.

#### 5.4.1 Bladder training

### Bladder training versus control

Two RCTs compared bladder training with control in women ($n = 60$, $n = 123$).\textsuperscript{205,305} In the first study, supervised bladder training as inpatients towards a target voiding interval of 4 hours was compared with unsupervised training at home, in women with frequency, urgency and urge UI (two-thirds of whom also had stress UI). At 6 months follow-up (duration of intervention unclear), more women in the supervised group were continent or symptom-free.\textsuperscript{307} [EL = 1+]

The second RCT in women with UI (type unspecified) compared bladder training (target voiding interval of 2.5–3 hours) with an untreated control group. Urine loss, leakage episodes and QOL (IIQ) were improved in the bladder training group after 6 weeks’ treatment.\textsuperscript{206} [EL = 1+] Neither study considered adverse effects.

### Bladder training versus drug treatment

Two RCTs compared bladder training with drug treatment in women with urge or mixed UI (one oxybutynin,\textsuperscript{306} one a combination of flavoxate and imipramine\textsuperscript{307}).

In women with urge UI, similar self-reported cure rates (about 73%) were seen with a 6 week bladder training programme (target voiding interval of 3–4 hours) and with oxybutynin ($n = 81$). Relapse occurred in 4% of the bladder training group, and in 44% of the oxybutynin group, at 6 months. About half of the oxybutynin group required dose reduction owing to adverse effects. No between-group comparisons were made for other outcomes.\textsuperscript{305} [EL = 1+] No details of the bladder training programme were provided for the comparison with flavoxate plus imipramine ($n = 50$). Significantly more women were subjectively or objectively cured after 4 weeks’ bladder training than with drug therapy.\textsuperscript{307} [EL = 1+]

### Bladder training in combination with drug treatment

Three double-blind (DB) RCTs evaluated the addition of antimuscarinic drug treatment to bladder training (one oxybutynin\textsuperscript{308}, one terodiline\textsuperscript{309} [no longer available in the UK], and one imipramine\textsuperscript{310}). Bladder training aimed to reduce frequency by delaying voiding for as long as possible in two studies,\textsuperscript{308,309} and aimed at a 4 hourly voiding target in one.\textsuperscript{310} A further RCT compared tolterodine plus bladder training with tolterodine alone.\textsuperscript{311} All studies included men and women; two included elderly people,\textsuperscript{308,309} and two included a broader age group.\textsuperscript{310,311}

In individuals with symptoms of urinary frequency, urgency and urge UI, a significant reduction in daytime frequency was seen with oxybutynin plus bladder training compared with placebo plus bladder training, after 6 weeks’ treatment ($n = 60$; 93% women). No significant differences were reported in other outcomes (daytime leakage episodes, nocturia, nocturnal enuresis, self-reported benefit, adverse effects).\textsuperscript{308} [EL = 1+]

No significant differences in frequency, leakage episodes or self-reported improvement were seen between terodiline or placebo in addition to bladder training in individuals with urinary frequency and urge UI, after 6 weeks’ treatment ($n = 37$; 88% women). Two adverse effects were noted with terodiline (one oesophagitis, one dry mouth).\textsuperscript{309} [EL = 1+]

In individuals with incontinence and ‘unstable bladders’, no significant differences were seen between imipramine plus bladder training and bladder training alone, in cure or urodynamic parameters with...
follow-up to 11 months. Dry mouth and constipation were reported with imipramine, with no adverse effects reported with bladder training (n = 33). 310 [EL = 1−]

Bladder training in addition to tolterodine was compared with tolterodine alone in men and women (n = 501; 75% women) with urinary frequency, urgency, with or without urge UI (61% with). The aim of bladder training was five to six voids per day while maintaining the same fluid intake. Combined treatment resulted in reduced frequency and increase in volume voided versus tolterodine alone, with no differences between groups in leakage or urgency episodes, patient’s perception of change or adverse effects after 6 months’ treatment. 311 [EL = 1++]

Bladder training versus PFMT

Two RCTs compared bladder training with biofeedback-assisted daily PFMT in women. 312,313 One did not report the type of UI or report between-group comparisons for bladder training, PFMT or no treatment (n = 50). 312 [EL = 1−]

The other RCT compared bladder training, biofeedback-assisted PFMT and the interventions in combination in women with stress, urge or mixed UI who had palpable pelvic floor contraction on vaginal examination. 312 After 3 months’ treatment, a significantly greater reduction in leakage episodes was seen with combination treatment compared with monotherapy; this was not sustained after a further 3 months follow-up. No other significant differences were reported between groups (n = 204). 312 [EL = 1+] 312

Number	Recommendation

36 Bladder training lasting for a minimum of 6 weeks should be offered as first-line treatment to women with urgency or mixed UI. [2006]

5.4.2 Multicomponent behavioural therapy

Eight RCTs evaluated the use of a multicomponent behavioural programme that included bladder training and PFMT. 199,231,314–324 The bladder training methods used were urge strategies in three studies, 314–316 bladder training in three studies (one also included fluid management), 199,231,320 education in one study, 321,322 and one study allocated PFMT or prompted voiding depending on the cognitive status of individuals. 323,324 In four of the RCTs, biofeedback-assisted PFMT was used 199,314,315,317–319; PFMT involved daily exercises in six studies, and the programme was not described in two. 320–322 Six studies checked the ability of individuals to contract the pelvic floor muscle at baseline. 231,314–320,323,324 Seven RCTs enrolled women only, while one enrolled men and women. 323,324

Compared with no active treatment or usual care

In four of the RCTs, the comparison group was no active treatment or usual care. Owing to the variety of behavioural methods used, each study is described individually. One RCT in women aged 55 years or above with stress, urge or mixed UI compared a 6 month sequential programme of behavioural management (self-monitoring including fluid management, bladder training, EMG-assisted PFMT) with no active treatment. The behavioural management group achieved significantly greater improvement in leakage episodes, 24 hour pad test, QOL (IIQ) and subjective severity assessment compared with control. Only 21% were followed up to 2 years, in whom improvements seemed to be maintained. No significant differences between groups were reported in voiding frequency or interval (n = 218). 199 [EL = 1++]

Another RCT compared 3 months of behavioural therapy with untreated control in women with any type of incontinence. The behavioural strategies used were PFMT for stress UI, bladder training for urge UI and bladder training followed by PFMT for mixed UI. Overall, the results showed significant reduction in leakage episodes with behavioural therapy, and a higher proportion reporting improvement versus control (n = 110). 231 [EL = 1+] Results for the 60% of women with stress UI were reported separately, which also showed significant reduction in leakage episodes.
The third RCT, in women with any type of UI, reported significant reductions in leakage episodes with 16 weeks’ behavioural therapy (bladder training and PFMT) compared with no active treatment. No significant differences were reported in frequency \( (n = 152) \). [EL = 1+]  

The fourth RCT compared a 10 week behavioural therapy programme (education, PFMT), with usual care in women with stress or urge UI. Significantly greater reductions in leakage episodes were reported with behavioural therapy, with no differences between groups in QOL \( (n = 145) \). [EL = 1+]  

**Compared with other active interventions**  
Two RCTs in women with urge or mixed UI compared a sequential 8 week programme of behavioural training (PFMT with anorectal biofeedback, urge strategies, repeat PFMT if needed, review and reinforcement) with oxybutynin, or self-help. \( ^{314-318} \) Significant reductions in leakage episodes and in nocturia were seen with behavioural training versus oxybutynin, and oxybutynin versus placebo tablets, and significantly more reported satisfaction and improvement with behavioural training versus oxybutynin. Dry mouth and inability to void were significantly more frequent with oxybutynin than control groups \( (n = 197) \). \( ^{314,315,317} \) [EL = 1+] In the study evaluating the same behavioural training programme with a group receiving biofeedback (vaginal palpation), and a self-help group receiving written instructions of the programme only, no significant differences were reported in satisfaction, improvement, QOL (IIQ, SF-36) or bladder capacity \( (n = 222) \). \( ^{315} \) [EL = 1++]  

After the initial 8 week period of one of these RCTs, \( ^{314} \) women initially treated with behavioural therapy or oxybutynin who were not cured or not completely satisfied were offered the other treatment option in addition to the initial therapy for a further 8 weeks. Significant additional improvement in leakage episodes was seen in those who took oxybutynin in addition to continued behavioural treatment \( (n = 28) \) and in those who continued with oxybutynin and, in addition, underwent behavioural treatment \( (n = 27) \). \( ^{325} \) [EL = 2+]  

A further RCT in women with predominant stress UI also compared an 8 week sequential programme of behavioural training (PFMT with anorectal biofeedback, the ‘knack’, managing urgency, repeat PFMT if needed, review and reinforcement), with or without the addition of electrical stimulation, with a self-help group who received written instructions of the programme \( (n = 200) \). Leakage episodes were significantly reduced in both behavioural training groups versus self-help, and significantly more of the behavioural training (electrical stimulation) group reported ‘much better’ improvement (versus anorectal feedback) or satisfaction with treatment (versus self-help). No differences were reported in QOL (IIQ, SF-36), or bladder capacity. Vaginal irritation was reported in 6% of the electrical stimulation group. \( ^{315} \) [EL = 1++]  

One RCT assigned homebound adults with UI (type unspecified) to different treatment strategies depending on cognitive status: biofeedback-assisted PFMT versus control for the cognitively intact \( (n = 93; 91\% \text{ women}) \), or prompted voiding versus control for the cognitively impaired \( (n = 19; 68\% \text{ women}) \). Although reported as one trial, this was effectively two separate 8 week trials. \( ^{323,324} \) PFMT was significantly more effective than control in reducing leakage episodes (the only outcome reported). \( ^{323} \) [EL = 1+]  

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**Number** | **Recommendation**  
--- | ---  
37 | If women do not achieve satisfactory benefit from bladder training programmes, the combination of an antimuscarinic agent with bladder training should be considered if frequency is a troublesome symptom. [2006]  

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**Number** | **Research recommendation**  
--- | ---  
RR8 | A direct comparison of single-component and multicomponent behavioural therapy is required.
5.3.3 Prompted voiding

Prompted voiding and timed voiding are toileting programmes used in people who are not capable of independent toileting, such as the cognitively impaired. Prompted voiding teaches people to initiate their own toileting through requests for help and positive reinforcement from carers. It has been used in institutionalised women with cognitive and mobility problems. They are asked regularly if they wish to void and only assisted to the toilet when there is a positive response.326

Five RCTs compared 1 hourly prompted voiding (three studies326-329) or 2 hourly prompted voiding (two studies330,331) with usual care, or ‘wet checks’ only. Four studies were conducted in cognitively impaired elderly nursing home residents326-330 and one in homebound adults.324 One study enrolled women only,327 while the remainder enrolled both genders although predominantly women.

The findings of the RCTs of prompted voiding were as follows:

- significant benefit with ‘functional incidental training’, which included daytime 2 hour prompted voiding, in terms of leakage and urine toileting ratio compared with usual care in a 32 week study (n = 190; 84% women)330[EL = 1+]
- significant reduction in wet episodes versus usual care after 13 weeks’ intervention, which appeared to be sustained after a further 22 weeks follow-up; no differences were reported between groups in improvement or self-initiated requests (n = 143; all women)337 [EL = 1+]
- reductions in leakage and an increase in requests for toileting assistance during the 3 week intervention period versus wet checks only (n = 21; 71% women)328[EL = 1+]
- reductions in leakage and an increase in toileting into a receptacle over an intervention period of 10–20 days versus usual care (n = 126; 75% women)328,329 [EL = 1+]
- No differences versus usual care in any outcome (leakage episodes, % wet, or self-initiated toileting) (n = 19; 68% women).324 [EL = 1+]

None of the studies evaluating prompted voiding considered adverse effects.

A placebo-controlled RCT evaluated the effects of oxybutynin in non-responders to prompted voiding (n = 75; 78% women).331 Significant improvement in leakage episodes was reported with oxybutynin after 20 days’ treatment (40% versus 18% had one or fewer episodes per day). No other outcomes were significantly different (change in leakage episodes, continent voids, volume voided).331 [EL = 1+]

5.3.4 Timed voiding

Timed voiding (scheduled, routine or regular toileting) is a passive toileting assistance programme that is initiated and maintained by a caregiver, for example for patients who cannot participate in independent toileting. Toileting is fixed by time or event, on a regular schedule or on a schedule to match the patient’s voiding pattern. The aim is to avoid incontinence episodes rather than restore bladder function.302

Three RCTs evaluated timed voiding in cognitively impaired elderly men and women (predominantly women) who were nursing home residents (two studies), or had caregiver support at home (one study).332,333 The comparator was no active treatment.

One 6 month RCT reported significant reduction in leakage episodes in the intervention group (scheduled toileting according to voiding pattern, mostly about 2 hours, and advice on fluid intake and environment; n = 118, 69% women).332 [EL = 1+] A cluster RCT of 36 weeks’ duration reported limited results indicating greater reductions in leakage episodes, with scheduled toileting (toileting within 30 minutes prior to an individual’s mean voiding time) but no differences between groups in volume voided (n = 113; 82% women).332 [EL = 1–]

The third RCT compared timed voiding (2 hourly) in combination with antimuscarinic drugs for urge UI, or PFMT for stress UI, with no active intervention for 8 weeks (n = 278; 83% women). Significant improvements in night-time leakage episodes were reported in the active intervention group, but not in daytime leakage or pad test findings.330 [EL = 1+]

None of the studies evaluating timed voiding considered adverse effects.
Evidence statements for behavioural therapies

Evidence statements for behavioural therapies

1. Bladder training is more effective than no treatment in women with urge or mixed UI, at 6 months follow-up. In women with urge UI, bladder training had a similar subjective cure rate to oxybutynin after a 6 week programme but adverse effects and relapse rates were lower with bladder training. The combination of oxybutynin or tolterodine and bladder training programmes results in greater reduction in frequency of micturition but has not been shown to lead to further improvements in incontinence. Combination treatment of bladder training together with PFMT may confer a greater short-term benefit to women with stress, urge or mixed UI, but in the long term combination and monotherapies are equally effective. [EL = 1+]

2. A wide range of behavioural therapies have been used within multicomponent treatment regimens in women with stress, mixed or urge UI. All appear to show improvements in leakage episodes over comparators (no active treatment, drug therapy, written instructions, usual care) within a 6 week to 6 month time frame. [EL = 1+] No direct comparisons of single-component behavioural therapy with multicomponent behavioural therapies were identified.

3. Prompted voiding and timed voiding strategies lead to reduced leakage episodes in cognitively impaired men and women. [EL = 1+]

From evidence to recommendations

- Bladder training is less costly than most antimuscarinic drug treatment and is not associated with adverse effects. [EL = 4]

5.5 Neuromodulation

5.5.1 Introduction

Neuromodulation is the alteration of neural pathways by the application of a stimulus (electrical or chemical) to a targeted site of the body. The exact mechanism of neuromodulation is unclear.

Neuromodulation of the sacral nerve roots may be achieved by direct conduction of electrical impulses from a lead implanted into the sacrum (sacral neuromodulation) (see subchapter 7.4) or by the retrograde stimulation of impulses through the posterior tibial nerve. Posterior tibial nerve stimulation may be delivered by surface electrodes (transcutaneous posterior nerve stimulation of posterior tibial nerve) or using a fine needle inserted close to the actual nerve (percutaneous posterior tibial nerve stimulation, or PTNS). Transcutaneous neuromodulation (TENS) can also be delivered by surface electrodes applied directly over the sacrum in the region of the sacral nerve roots.

Intravaginal or intra-anal electrical stimulation with surface electrodes is a method of stimulating activity of the pelvic floor muscles via their nerve supply. This form of electrical stimulation may also have a neuromodulatory effect on bladder function; the evidence for this intervention can be found in subchapter 3.5.6.

5.5.2 Transcutaneous electrical nerve stimulation (TENS)

Introduction

Transcutaneous electrical nerve stimulation (TENS) has historically been recognised as a form of electrical nerve neuromodulation in which skin surface electrodes are placed over the dermatomes of S2 to S4 for variable periods (estimated to be around 30 to 45 minutes) of time, daily. A variation of this has evolved where neuromodulation electrodes are placed over the posterior tibial nerve which for the purposes of clarity can be found in sub-chapter 5.5.3.

Review questions

In women with OAB (with or without detrusor overactivity) what is the effectiveness of transcutaneous electrical nerve stimulation (TENS) compared with no active treatment?
Description of included studies
No new evidence was identified on the efficacy of TENS for overactive bladder symptoms and overactive bladder caused by urodynamically proven detrusor overactivity. The description of included studies relates to evidence published in the 2006 guideline.

TENS of the posterior tibial nerve is carried out by placing surface electrodes over the posterior tibial nerve, normally at the ankle.

Transcutaneous electrical nerve stimulation
One 12 week crossover RCT compared TENS with oxybutynin in men and women (70% women) with idiopathic DO ($n = 43$). Significant improvements in functional capacity and frequency were reported with both treatments. No significant changes in SF-36 parameters were seen. Adverse effects reported were dry mouth, blurred vision and dry skin; these all had a lower incidence in the TENS group.\[EL=1+\]

Two case series reported findings of TENS over the short term (1–3 weeks) in men and women with OAB (total $n = 103$, with 84 analysed). These generally indicated improvements in frequency, nocturia and urgency,\[284,285\] and in urge UI.\[285\] [EL = 3]

Evidence to recommendations (2013)
The GDG found no new evidence since 2006 review of TENS for the treatment of OAB. However, the GDG moved to not recommend the use of TENS based on their clinical judgement and the conclusions of reviews for PTNS and TENS of the posterior tibial nerve.

The GDG considered that this form of transcutaneous electrical nerve stimulation had the least chance of being effective. The positioning of the surface electrodes over the sacral nerve roots is not considered to be as effective as when the posterior tibial nerve is stimulated. No evidence was found to support recommending this form of neuromodulation of the posterior tibial nerve.

Furthermore, the clinical opinion of the GDG was that this form of neuromodulation is unlikely to be effective in clinical practice. The GDG concluded that this form of electrical stimulation is likely to represent a misallocation of resources for the NHS and patients when other more effective treatments are available and should be utilised in its place.

Finally, the GDG concluded that to fully appreciate if there is a value of the use of TENS then there is a need for a more robust evaluation of TENS for the treatment of OAB.

Recommendations

<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendation</th>
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</thead>
<tbody>
<tr>
<td>38</td>
<td>Do not offer transcutaneous electrical nerve stimulation (TENS) to treat OAB in women. [new 2013]</td>
</tr>
</tbody>
</table>

5.5.3 Transcutaneous posterior tibial nerve stimulation

Introduction
Transcutaneous posterior tibial nerve stimulation is carried out by placing surface electrodes over the posterior tibial nerve, normally at the ankle. Although this is the stimulation of the posterior tibial nerve it should not be confused with the procedure using a needle, commonly known as PTNS, and reviewed in sub-chapter 5.5.4. No abbreviations are used in this section to distinguish it from PTNS.

Review question
In women with OAB symptoms (with or without detrusor overactivity) what is the effectiveness of transcutaneous electrical stimulation of the posterior tibial nerve compared with no active treatment?
Description of included studies

Two randomised controlled trials (RCTs) were included in this review. They compared transcutaneous posterior nerve stimulation sessions with sham transcutaneous posterior nerve stimulation sessions or no treatment. In one study (Svihra et al., 2002) 30 minutes of transcutaneous posterior tibial nerve stimulation was performed once a week for 5 weeks and was compared to oxybutynin 5mg/three times a day or no treatment. In the second study 8 30 mins twice-weekly sessions were compared to sham transcutaneous posterior tibial nerve stimulation (Bellette et al., 2009). All participants had overactive bladder symptoms. Detrusor overactivity was not reported in either study. Both studies included women only and neither study reported on previous management of OAB.

The mean (SD) age of participants ranged from 47.73 (SD 10.9) to 54 (SD not reported) years. Neither study reported on the mean number of incontinence episodes, mean number of urgency episodes or duration of OAB symptoms. Funding sources were not reported for (Bellette et al., 2009). (Svihra et al., 2002) was funded by a government ministry.

Evidence profile

The following GRADE profile shows the evidence for transcutaneous electrical stimulation of the posterior tibial nerve for overactive bladder symptoms compared to sham transcutaneous posterior tibial nerve stimulation (no active treatment) or no treatment. One of the studies reported data on absolute rate of symptom reduction per day, psychological outcomes or clinical measures (post-void residual volume).

Table 5.1 GRADE findings for comparison of transcutaneous posterior tibial nerve stimulation with No active treatment for overactive bladder

<table>
<thead>
<tr>
<th>Number of studies</th>
<th>Number of women</th>
<th>Effect</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>comparator</td>
<td>control</td>
<td>relative (95% CI)</td>
</tr>
<tr>
<td>Patient satisfaction</td>
<td>1 (Svihra et al., 2002)</td>
<td>5/9 (55.6%)</td>
<td>0/9 (0%)</td>
</tr>
<tr>
<td></td>
<td>Self reported rate of absolute symptom reduction: number of episodes of incontinence per day</td>
<td>No evidence reported</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Self reported rate of absolute symptom reduction: number of episodes of urgency per day</td>
<td>No evidence reported</td>
<td></td>
</tr>
<tr>
<td>Continence status</td>
<td>1 (Bellette et al., 2009)</td>
<td>12/21 (57.1%)</td>
<td>6/16 (37.5%)</td>
</tr>
<tr>
<td></td>
<td>Incontinence QOL (measured with: OAB-q total score; Better indicated by higher values)</td>
<td>1 (Bellette et al., 2009)</td>
<td>21</td>
</tr>
<tr>
<td>Adverse effects</td>
<td>2 (Bellette et al., 2009) ; (Svihra et al.,)</td>
<td>0/30 (0%)</td>
<td>0/25 (0%)</td>
</tr>
</tbody>
</table>
Evidence statements

Patient satisfaction with treatment
A single RCT showed a clinical benefit in favour of transcutaneous posterior tibial nerve stimulation. The evidence for this finding was of low quality.

Self reported rate of absolute symptom reduction: number of episodes of incontinence per day
No studies were identified for this outcome.

Self reported rate of absolute symptom reduction: number of episodes of urgency per day
No studies were identified for this outcome.

Continence status
A single study showed no clinical benefit between transcutaneous posterior tibial nerve stimulation and no active treatment. The evidence was of very low quality.

Incontinence-specific quality of life
A single RCT showed a clinical benefit in favour of transcutaneous posterior tibial nerve stimulation. The evidence was of high quality.

Adverse effects
A meta-analysis of two RCTs showed no adverse effects for transcutaneous posterior tibial nerve stimulation and no adverse effects for no active treatment. The evidence was of high quality.

Psychological outcomes
No studies were identified for this outcome.

Post-void residual volume
No studies were identified for this outcome.

Evidence to recommendations

Relative value placed on the outcomes considered
The GDG considered patient satisfaction to be the primary outcome. However, because of the low sample size in the single RCT available, continence status was considered equally important.

Consideration of clinical benefits and harms
The RCT evidence available for transcutaneous posterior tibial nerve stimulation was limited to two small RCT studies comparing transcutaneous posterior tibial nerve stimulation with no active treatment. The evidence identified a small benefit in patient satisfaction and incontinence-specific quality of life but no improvement in the other self-reported or clinical outcomes. The wide error margins and small sample sizes meant that the GDG was not confident that the evidence showed an improvement in outcome using transcutaneous posterior tibial nerve stimulation.

There were no reported adverse events reported in intervention or control groups of the two RCT studies. The GDG agreed this reflected current clinical practice.

Consideration of health benefits and resource uses
The evidence available, the GDG concluded, was low quality. Furthermore there is only limited evidence of a health benefit in offering transcutaneous posterior tibial nerve stimulation treatment to
women with overactive bladder symptoms. Therefore, there was no need to consider health economic evidence, despite the inexpensive cost of the treatment.

The GDG opted for transcutaneous posterior tibial nerve stimulation to be restricted for use only in a research setting due the lack of evidence of efficacy in the treatment of women with OAB. Research is warranted because it is an inexpensive treatment with no reported adverse advents that may provide some benefit.

Despite not being recommended in the previous guideline, the GDG noted that in some treatment centres home units delivering transcutaneous posterior tibial nerve stimulation continue to be offered on a short-term loan to patients. Since there are no adverse events associated with its use, the GDG view was that women should be informed that there is no evidence of the effectiveness of transcutaneous posterior tibial nerve stimulation but also that some women have found some relief from symptoms using this intervention.

**Quality of evidence**

The evidence considered by the GDG was varied from outcome to coutcome and ranged from very low quality to high quality. The GDG deemed the findings reported in the evidence to not be significant enough to overturn current practise, as dictated in the previous version of the guideline.

**Recommendations**

<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>39</td>
<td>Explain that there is insufficient evidence to recommend the use of transcutaneous posterior tibial nerve stimulation to treat OAB. [new 2013]</td>
</tr>
<tr>
<td>40</td>
<td>Do not offer transcutaneous posterior tibial nerve stimulation for OAB. [new 2013]</td>
</tr>
</tbody>
</table>

**5.5.4 Percutaneous posterior tibial nerve stimulation (PTNS)**

**Introduction**

Percutaneous posterior tibial nerve stimulation (PTNS) delivers neuromodulation to the S2-S4 junction of the sacral nerve plexus via the route of the posterior tibial nerve. A fine needle is inserted close to the posterior tibial nerve slightly above the ankle and connected to a device delivering an electrical current to stimulate the nerve. Conventionally, a typical treatment would consist of 12 weekly 30 minute sessions in a clinical setting. Symptoms may recur following withdrawal of treatment and top up treatments may be required at varying intervals.

**Review questions**

In women with OAB, what is the effectiveness of percutaneous posterior tibial nerve stimulation (PTNS) compared with no active treatment?

In women with OAB, What is the effectiveness of percutaneous posterior tibial nerve stimulation compared with pharmacotherapy

**Percutaneous posterior tibial nerve stimulation vs. Antimuscarinic treatment**

Percutaneous posterior tibial nerve stimulation was considered in one RCT. The RCT evaluated the effects of oxybutynin 5 mg daily in addition to PTNS compared with PTNS alone in men and women (n = 43; 88% women). Improvements in frequency, urgency and urge UI episodes were noted with both treatments, with no significant difference between groups in ‘response rates’. [EL = 3]

**Description of included studies (evidence from 2006 onwards)**

**PTNS versus sham PTNS**

Three randomised controlled trials (RCTs) were included in this review. They all compared PTNS sessions with sham PTNS sessions. In one study 30 minutes of PTNS or sham PTNS were performed once a week for 12 weeks (Peters et al., 2010). In two studies 30 minutes of PTNS or sham PTNS were performed 3 times a week for 4 weeks (Finazzi-Agro et al., 2009); (Finazzi-Agro et al., 2010). All participants had overactive bladder and had not responded to previous treatments,
including behavioural and rehabilitation therapy and/or antimuscarinic drugs although it was unclear how many women were refractory to each treatment. Detrusor overactivity was the cause of the overactive bladder symptoms in 100% of the population reported in one study (Finazzi-Agro et al., 2010). Detrusor overactivity was not reported in the remaining two studies (Finazzi-Agro et al., 2009); (Peters et al., 2010). Two studies included women only (Finazzi-Agro et al., 2009); (Finazzi-Agro et al., 2010). In the remaining study 79% of participants were women (Peters et al., 2010).

The mean age of participants ranged from 42 ± 7 to 62.5 (SD not reported) years. The mean number of incontinence episodes per day at baseline in one study was 3.1 ± 3.5 to 3.4 ± 3.5 (Peters et al., 2010) and the mean number of incontinence episodes/three days in one study was 4.1 ± 1.8 to 4.2 ± 2.1. The mean number of urgency episodes per day at baseline in one study was 8.2 ± 4.5 to 8.5 ± 4.2 (Peters et al., 2010). The mean duration of symptoms reported in two studies ranged from 1.7 (SD not reported) to 10.2 ± 11.5 years (Finazzi-Agro et al., 2009) (Peters et al., 2010).

All three studies (Finazzi-Agro et al., 2009) (Finazzi-Agro et al., 2010), (Peters et al., 2010) were funded or supported by Uroplasty Inc.

**PTNS versus drugs**

A single study (Peters et al., 2009) was included in this review. PTNS were performed once a week for 12 weeks and was compared with extended release tolterodine 4mg qd. 94% of participants were women but the number with detrusor overactivity was not reported.

The mean age of participants ranged from 57.9 ± 23.3 years and the mean duration of symptoms was 9.6 ± 12.1 years. The mean number of incontinence episodes per day and mean number of urgency episodes per day were not reported.

The study was supported by Uroplasty Inc.

**Evidence profiles**

The following GRADE profiles show the evidence for PTNS for overactive bladder compared to sham PTNS (Table 5.2) and compared with drugs (Table 5.3) by outcome in order of GDG ranked importance.

**Table 5.2 GRADE findings for comparison of PTNS with sham PTNS for overactive bladder**

<table>
<thead>
<tr>
<th>Number of studies</th>
<th>Number of women</th>
<th>Effect</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comparator</td>
<td>Control</td>
<td>Relative (95% CI)</td>
<td>Absolute (95% CI)</td>
</tr>
<tr>
<td>Patient satisfaction with treatment (follow-up 1 week; assessed with: Global Response Assessment (GRA))</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Peters et al., 2010)</td>
<td>60/110 (54.5%)</td>
<td>23/110 (20.9%)</td>
<td>RR 2.61 (1.75 to 3.9)</td>
</tr>
<tr>
<td>Incontinence episodes (follow-up 1 week; measured with: 3-day voiding diary; Better indicated by lower values)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Peters et al., 2010)</td>
<td>N =103 (from a mean of 3.4 episodes at baseline to 1.4 episodes at endpoint)</td>
<td>N = 105 (from a mean of 3.1 episodes at baseline to 1.9 episodes at endpoint)</td>
<td>-</td>
</tr>
<tr>
<td>Urgency episodes (follow-up 1 week; measured with: 3-day voiding diary; Better indicated by lower values)</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>
1 (Peters et al., 2010) | N = 103 (change from 8.5 mean episodes at baseline to 4.6 mean episodes at endpoint) | N = 105 (change from 8.2 mean episodes at baseline to 6.1 mean episodes at endpoint) | 1.5 (MD) fewer episodes per day (range 2.56 to 0.44 fewer episodes) | HIGH

### Continence status (follow-up unclear; assessed with: 3-day voiding diary)

2 (Finazzi-Agro et al., 2009) (Finazzi-Agro et al., 2010) | 22/34 (64.7%) | 0/25 (0%) | RR 16.15 (2.33 to 111.79) | 667 more women per 1000 (444 to 802 more women) | MODERATE

### Incontinence QOL (follow-up 1 week; measured with: Overactive Bladder Questionnaire (OAB-q); Better indicated by lower values)

1 (Peters et al., 2010) | N = 101 (change from baseline to endpoint = −36.7 points) | N = 102 (change from baseline to endpoint = −29.2 points) | 7.5 points (MD) improvement on OAB-q scale (range 13.21 to 1.79 lower) | MODERATE

### Adverse effects

2 (Finazzi-Agro et al., 2010): (Peters et al., 2010) | 6/128 (4.7%) | 0/127 (0%) | RR 13 (0.74 to 228) | 47 more women per 1000 (range 8 to 99 more women) | LOW

### Psychological outcomes

No evidence reported

### Post-void residual volume

No evidence reported

---

## Evidence statements – PTNS versus sham PTNS for OAB

1. **Patient satisfaction with treatment**
   - A single RCT showed a clinical benefit in favour of PTNS. The evidence for this finding was of high quality.

2. **Self reported rate of absolute symptom reduction: number of episodes of incontinence per day**
   - A single RCT showed no difference in clinical benefit between PTNS and sham PTNS. The evidence was of moderate quality.

3. **Self reported rate of absolute symptom reduction: number of episodes of urgency per day**
   - A single RCT showed no difference in clinical benefit between PTNS and sham PTNS. The evidence was of moderate quality.

4. **Continence status (defined as > 50% reduction in incontinence episodes)**
   - A meta-analysis of two RCTs showed a clinical benefit in favour of PTNS. The evidence was of moderate quality.

5. **Incontinence-specific quality of life**
   - A single RCT showed a clinical benefit in favour of PTNS. The evidence was of moderate quality.

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Adverse effects
A meta-analysis of two RCTs showed that fewer adverse effects were associated with sham PTNS. The evidence was of low quality.

Psychological outcomes
No studies were identified for this outcome.

Post-void residual volume
No studies were identified for this outcome.

Table 5.3 GRADE findings for comparison of PTNS with drugs for overactive bladder

<table>
<thead>
<tr>
<th>Number of studies</th>
<th>Number of women</th>
<th>Effect</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Comparator</td>
<td>Control</td>
<td>Relative (95% CI)</td>
</tr>
<tr>
<td>Patient satisfaction with treatment</td>
<td>No evidence reported</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self reported rate of absolute symptom reduction: number of episodes of incontinence per day</td>
<td>No evidence reported</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self reported rate of absolute symptom reduction: number of episodes of urgency per day</td>
<td>No evidence reported</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continence status (defined as cured)</td>
<td>1 (Peters et al., 2009)</td>
<td>2/50 (4%)</td>
<td>2/50 (4%)</td>
</tr>
<tr>
<td>Incontinence QOL (OAB-q scale used - Better indicated by higher values)</td>
<td>1 (Peters et al., 2009)</td>
<td>44</td>
<td>43</td>
</tr>
<tr>
<td>Adverse effects</td>
<td>1 (Peters et al., 2009)</td>
<td>8/49 (16.3%)</td>
<td>7/49 (14.3%)</td>
</tr>
<tr>
<td>Psychological outcomes</td>
<td>No evidence reported</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-void residual volume</td>
<td>No evidence reported</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Evidence statements – PTNS versus drugs for OAB
Patient satisfaction with treatment
No studies were identified for this outcome

Self reported rate of absolute symptom reduction: number of episodes of incontinence per day
No studies were identified for this outcome.
Self reported rate of absolute symptom reduction: number of episodes of urgency per day
No studies were identified for this outcome

Continence status (defined as cured)
A single study showed no clinical benefit for PTNS over extended release tolterodine. The evidence was of moderate quality.

Incontinence-specific quality of life
A single study showed no clinical benefit for PTNS over extended release tolterodine. The evidence was of high quality.

Adverse effects
A single study showed no clinical benefit for PTNS over extended release tolterodine. The evidence was of low quality.

Psychological outcomes
No studies were identified for this outcome.

Post-void residual volume
No studies were identified for this outcome.

Economic evidence
No studies were identified for this question. The GDG estimated that the cost of equipment is around £2,000 to £3,000 per unit, with an additional cost of £320 per patient for the percutaneous leads (12 per patient). The time for a health care professional to carry out the procedure was estimated by GDG members to be 15 to 30 minutes for each treatment with monthly follow-up.

Evidence to recommendations
Relative value placed on the outcomes considered
The GDG considered patient satisfaction to be the primary outcome of a successful PTNS treatment. The GDG also noted that patient satisfaction is dependent on an individual’s treatment goals which can also be raised or lowered by the opinions of health care professionals. For this outcome, it was especially relevant to consider the research context carefully to ensure that it adequately reflected UK practice. Secondary outcomes were continence status and adverse effects as these would impact upon clinical and patient decision making,

Continence status and adverse events were reported in all studies considered in the review, however, the definition of continence status used in studies (50% reduction of incontinence episodes) differed from that GDG defined outcome of continence status (0 episodes per day). Only one study reported other outcomes, these were incontinence, urgency episodes and quality of life.

Consideration of clinical benefits and harms
Three RCTs were identified which reported a benefit in patient satisfaction, continence status and quality of life for PTNS compared with sham treatment. There was no difference reported in episodes of incontinence or urgency.

The reported incidence of adverse effects was low compared with other interventions for OAB. The GDG considered that the low rate of adverse events was favourable, where the alternatives often have adverse effects that contribute to a noticeable dropout rate. Reported adverse events in Peters et al., 2010 were ankle bruising, discomfort at needle site and tingling in the leg. Zero adverse events were reported in either group in Finazzi-Agro et al., 2010. Finazzi-Agro et al., 2009 did not report adverse events.

The GDG concluded that although there is evidence of clinical benefit of PTNS versus sham treatment with a minimal adverse event profile, the GDG also noted there is a lack of long-term follow-up or evidence of duration of effect of PTNS versus sham treatment. Furthermore, the GDG noted that the continence status overestimated the benefit because it did not report total incontinence cessation. Therefore, the GDG determined that the evidence for PTNS did not demonstrate enough clinical effectiveness to be routinely recommended in the NHS because the impact on IQOL was not sufficiently strong.
Consideration of health benefits and resource uses

The effectiveness of PTNS compared with the alternative treatments (which could be antimuscarinic drugs, Botulinum toxin A or Sacral nerve stimulation) has not been evaluated. There was only one RCT identified that compared PTNS with another treatment and that was against Tolterodine ER only. The GDG considered that this was insufficient evidence to undertake a cost-effectiveness analysis. This study showed that PTNS was no better than Tolterodine ER. PTNS is likely to be a more expensive treatment option than drug therapy. The studies reported the PTNS regime should be used 12 times in total, over 4 weeks. The GDG considered that a single course of treatment would not always be the only one required and many women would require repeat course of treatment in the months or years following the first treatment.

In the absence of comparative evidence, the GDG view was that PTNS was unlikely to be a cost-effective alternative compared with the other treatment options available. However, in the event that a woman chooses not to proceed with invasive treatment following unsuccessful conservative treatment, the GDG considered that PTNS was likely to be cost effective when compared with no active treatment.

Quality of evidence

The intervention and population of the included studies met the criteria specified in the systematic review protocol, although timing of assessment in one study was unclear. The GDG noted that there was a lack of clarity in the studies regarding how many interventions women had failed before being offered PTNS. There were few drop-outs in the studies.

The continence status outcome was not measured in the manner the GDG had outlined (i.e. ‘Absolutely dry’), and therefore lowered the quality of evidence for this outcome. Furthermore, the values in these studies cannot be compared with other interventions, as the measurement of success differs. Finally, the data was pooled from two RCTs and there was a low level of heterogeneity in the outcome.

The GDG noted that in some circumstances the study populations differed from the women who would be normally be offered PTNS in the UK, depending on the commissioned care pathway. Therefore, the GDG concluded that evidence did not reflect the UK context.

The non-UK context, outcome measures, poor follow-up and potential bias meant that the GDG felt that the evidence was not sufficient to support a positive recommendation for the use of PTNS. The GDG agreed to recommend that PTNS should not be routinely used in the NHS. Since PTNS is a safe intervention with unproven efficacy it should only be offered in a research setting or in small population of women who are unable to have other interventions after unsuccessful antimuscarinic.

Other considerations

Equalities

The GDG noted that the mean age of the populations studied was below what would be expected to extrapolate the evidence for a frail older person. The studies considered would have not had a population with the amount or type of co-morbidities. The GDG also noted that woman with cognitive dysfunction or a neurological disability may be unable to feel pain or translate discomfort into an emotional response. For this reason, the GDG believed that the recommendation to offer PTNS in a research setting should not routinely include this group of women.

NICE Interventional procedure guidance 362

The GDG were aware of the guidance issued in the NICE interventional procedure 362 (IPG362). The GDG concurred with the decision that the procedure is safe. However, they chose not to recommend PTNS based on the GDG’s assessment of treatment efficacy and cost-effectiveness.

Role in the care pathway for the treatment of OAB

PTNS is sporadically used across the NHS as there is no current guidance governing its use. In this context, PTNS is mostly offered in secondary care following the failure of conservative treatments. The GDG did not recommend the routine use of PTNS in the NHS in any setting and therefore it should not form any part of the standard care pathway for the treatment of OAB as other interventions are deemed to have superior effectiveness. However, the GDG did note that PTNS had some limited evidence of effectiveness. This means it could be considered after unsuccessful antimuscarinic
treatment and if further invasive treatment (BoNT-A) is not acceptable to the woman with the understanding that limited benefit has been shown and there is low level of adverse effects. The GDG agreed that PTNS should be used in secondary care but not as an alternative to conservative or drugs treatments nor more invasive treatments (assuming the woman would consider most invasive treatments).

Recommendations

<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendation</th>
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</thead>
<tbody>
<tr>
<td>41</td>
<td>Do not routinely offer percutaneous posterior tibial nerve stimulation (PTNS) for OAB. Only consider PTNS if antimuscarinic drug treatment has not worked adequately and the woman does not want botulinum toxin A (BoNT-A) or sacral nerve stimulation (SNS). [new 2013]</td>
</tr>
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</table>

Number | Research recommendations |
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<tbody>
<tr>
<td>RR9</td>
<td>What is the comparative effectiveness and cost-effectiveness of transcutaneous electrical nerve stimulation (TENS) of the sacral nerve roots, and transcutaneous and percutaneous posterior tibial nerve stimulation for the treatment of OAB?</td>
</tr>
</tbody>
</table>

Why this is important

TENS can be applied either over the sacrum or over the posterior tibial nerve to modulate the sacral nerve supply to the bladder. The treatment uses surface electrodes which the patient can carry out in their own home. Percutaneous posterior tibial nerve stimulation involves the introduction of a needle in the region of the posterior tibial nerve near the ankle, and at present is carried out in clinics in secondary care. Currently it is offered widely as a conservative treatment for OAB without adequate evidence that it is effective. Although this is a relatively low cost treatment, both the equipment and staff time have a cost implication, and because it has been widely used in conservative management this has large resource consequences for the NHS. Robust evidence is required to establish whether it is a cost-effective option relative to other conservative therapies for all women or for a selected group of patients who are unsuitable for or have unsuccessful botulinum toxin A or antimuscarinic drug treatment.

5.6 Non-therapeutic interventions

This section covers the use of products that collect or contain leakage (e.g. absorbent products, urinals and toileting aids, catheters) and products used to prevent leakage (e.g. devices that support the bladder neck, intra- or extraurethral devices).

Studies considered for the non-therapeutic interventions section

Little primary research evidence was identified that addressed the guideline questions. No studies were identified that evaluated the effects of containment on maintenance of independent living, rates of institutionalism, or return to work, and only one study considered QOL (an evaluation of pessaries for UI, described below). Published consensus statements and narrative reviews that discussed issues relevant to the circumstances of use of containment products, or catheterisation, were used as a basis for the recommendations. [EL = 4]

5.6.1 Absorbent products, urinals and toileting aids

One RCT compared a conservative management strategy with the use of absorbent products (pads and pants) for 6 months (n = 90). Conservative management involved providing estriol (depending on oestrogen status), PFMT (six training sessions), bladder training (for urge or mixed UI), electrical stimulation, and pads and pants. Significantly greater reductions in UI severity and impact, and leakage episodes, were seen with conservative management compared with the control group. No
significant differences were seen between groups in frequency. The pads and pants arm showed no change in incontinence impact at 6 months.\textsuperscript{454} [EL = 1+]

Evidence statement for absorbent products, urinals and toileting aids
Pads and pants are ineffective in the treatment of UI. [EL = 1+] There is no evidence to support the use of hand-held urinals and toileting aids in the treatment of UI. There is a variety of such products available. There is a lack of evidence for their use in management. However, they are used by women in maintaining social continence. [EL = 4]

From evidence to recommendation
The GDG recognises that some women may not wish to pursue active interventions for UI and that absorbent products, urinals and toileting aids are an alternative management option in such circumstances. However, the GDG felt that women must be fully aware of all possible treatment options before adopting this course of action. In addition, the GDG agreed that the use of these products should be considered for women awaiting definitive treatment.

<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendation</th>
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</thead>
<tbody>
<tr>
<td>42</td>
<td>Absorbent products, hand held urinals and toileting aids should not be considered as a treatment for UI. They should be used only as:</td>
</tr>
<tr>
<td></td>
<td>• a coping strategy pending definitive treatment</td>
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<tr>
<td></td>
<td>• an adjunct to ongoing therapy</td>
</tr>
<tr>
<td></td>
<td>• long-term management of UI only after treatment options have been explored. [2006]</td>
</tr>
</tbody>
</table>

5.6.2 Catheters
The care of patients with long-term urinary catheters is covered within the NICE clinical guideline \textit{Infection Control: Prevention of Healthcare-Associated Infection in Primary and Community Care}.\textsuperscript{22} Within that guideline, the recommendation that intermittent catheterisation is preferred to indwelling catheterisation was informed by a systematic review of risk factors for UTI, in adults with spinal cord dysfunction. The GDG’s view is that the evidence relating to adults with spinal cord dysfunction is relevant to the use of catheters in women with idiopathic UI.\textsuperscript{455} The systematic review found eight cohort studies that considered risk of infection according to type of catheter used by men and/or women with spinal cord injuries. In seven of eight studies, patients using intermittent catheters, had fewer infections or lower prevalence of bacteriuria than those who used indwelling catheters (follow-up ranging from about 1 to 2.5 years). However, none of the primary studies adjusted for baseline differences between groups (total n = 1153). [EL = 2+]

Evidence statement for catheters
Intermittent catheterisation is associated with reduced risk of UTI compared with indwelling catheterisation. [EL = 2+]

From evidence to recommendations
In the absence of evidence on long-term catheterisation in women, but alongside the systematic review described, the GDG considered that suprapubic catheterisation is preferable to indwelling urethral catheterisation owing to reduced risk of urethral and other complications (symptomatic UTI, and ‘bypassing’). Suprapubic catheterisation is not without risk, particularly at initial insertion, although the benefits and risks of this approach have not been fully established. Long-term medical management of suprapubic catheterisation may be problematic if healthcare providers lack knowledge and expertise in this area, and if the homebound patient lacks rapid access to medical care if a problem arises.

The population for whom catheterisation is recommended was also determined by GDG consensus.

The GDG feels that the use of an indwelling catheter in a woman with OAB may be associated with an increase in detrusor activity and therefore an increased tendency to ‘bypassing’ (urine leakage around the catheter). Assuming they empty their bladder completely, as most patients with idiopathic DO will, a catheter is unlikely to achieve continence.
Number | Recommendation
---|---
43 | Bladder catheterisation (intermittent or indwelling urethral or suprapubic) should be considered for women in whom persistent urinary retention is causing incontinence, symptomatic infections, or renal dysfunction, and in whom this cannot otherwise be corrected. Healthcare professionals should be aware, and explain to women, that the use of indwelling catheters in urgency UI may not result in continence. [2006]

Intermittent urethral catheters

44 | Intermittent urethral catheterisation should be used for women with urinary retention who can be taught to self-catheterise or who have a carer who can perform the technique. [2006]

Indwelling urethral catheters

45 | Careful consideration should be given to the impact of long-term indwelling urethral catheterisation. The practicalities, benefits and risks should be discussed with the patient or, if appropriate, her carer. Indications for the use of long-term indwelling urethral catheters for women with UI include:

- chronic urinary retention in women who are unable to manage intermittent self-catheterisation
- skin wounds, pressure ulcers or irritations that are being contaminated by urine
- distress or disruption caused by bed and clothing changes
- where a woman expresses a preference for this form of management. [2006]

Indwelling suprapubic catheters

46 | Indwelling suprapubic catheters should be considered as an alternative to long-term urethral catheters. Healthcare professionals should be aware, and explain to women, that they may be associated with lower rates of symptomatic UTI, ‘bypassing’, and urethral complications than indwelling urethral catheters. [2006]

5.6.3 Products to prevent leakage

Studies reporting the use of the following products were identified:

- intravaginal devices: Continence Guard (also known as the ConveenContiguard), Contrelle®/continence tampon, Contiform®, bladder neck support prosthesis (Introl)
- meatal devices: FemAssist®, CapSure®/shield, Miniguard (also called ‘continence control pad’/Impress Softpatch)
- intraurethral devices: a urethral plug (the VIVa Plug, also called Alive), FemSoft® insert, Reliance ® (one of the studies was a controlled trial versus NEAT).

Two of these products are known to be available or could be obtained by women in the UK (Contrelle®/Activgard [formerly known as ConveenContiguard, or Continence Guard], and FemSoft®). Neither product can be provided on NHS prescription. The Rocket ®incontinence device is also available, but no studies were found regarding its use. Many of the other products listed are known to have been withdrawn from the UK market for commercial reasons (Contiform®, FemAssist®, CapSure®, Reliance ®).

While there is no evidence to support the use of menstrual tampons in the management of UI, GDG members are aware that menstrual tampons are used by many women to support the bladder neck and to prevent leakage. Manufactures of these products do not recommend this usage and state that they should be used only during menstruation.
Evidence relating to the use of the available products

A case series of women with stress or mixed UI who used FemSoft® (mean follow-up 15 months), reported that leakage episodes were fewer and more pad tests were negative with the device in place, compared with without the device. Symptomatic UTI was very common (47%), and the incidence of insertion trauma, haematuria, spotting, cystoscopic evidence of bladder or urethral irritation or trauma and device migration were common (n = 150). [EL = 3]

Four case series [456–459,461] (patient numbers ranging from 15 to 38) and one crossover RCT [462] (n = 94; 62 completed and analysed) found that the majority of users of the Contience Guard reported cure or improvement (57–89%) after 3–5 weeks’ treatment (up to 1 year in one study). Adverse effects reported were expulsion of the device (8–47%), voiding difficulties (11–14%), UTI (11%) [458] and vaginal irritation (23%). Three studies found no vaginal irritation or erosion on gynaecological examination. [456–458] No adverse effects were reported in two studies. [457,461]

Evidence statement for products to prevent leakage

There is limited evidence of efficacy for Contrelle®Activgard (formerly known as the Continence Guard or ConveenContiguard) and FemSoft® in the management of UI. Adverse effects, in particular UTI, are very common. [EL = 3]

From evidence to recommendation

In the GDG’s view, some women find these products beneficial for occasional use in certain circumstances as a preventive strategy.

<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendation</th>
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<tbody>
<tr>
<td>47</td>
<td>Intravaginal and intraurethral devices are not recommended for the routine management of UI in women. Women should not be advised to consider such devices other than for occasional use when necessary to prevent leakage, for example during physical exercise. [2006]</td>
</tr>
</tbody>
</table>

5.6.4 Pessaries

A small case series reported that QOL improved (IIQ) in women with stress or mixed UI and POP who used a ring pessary with diaphragm for 1 year (six of 38 women enrolled). [481][EL = 3]

Evidence statement for pessaries

The limited evidence available does not support the use of ring pessaries for the treatment of UI in women whether or not there is prolapse present. [EL = 3]

5.7 Complementary therapies

Women who do not find conventional treatments acceptable often explore the use of complementary therapies for UI, and as adjuncts to conventional treatments.

Studies considered for the complementary therapies section

Most of the articles identified reported the use of acupuncture or hypnotherapy for UI, or were narrative reviews regarding the use of complementary therapies for UI. Use of traditional Chinese medicines was also mentioned in a narrative review, but no further references to their use for UI were found. [482]

5.7.1 Acupuncture

Three RCTs [483–486] and three case series [487–490] evaluated the use of acupuncture for UI or OAB in women. Across these studies, the acupuncture points and duration of stimulation used varied. Duration of treatment ranged from 2 to 4 weeks. All were considered to be of poor quality because of lack of information or for only analysing results for women who completed treatment.

One RCT assessed the effects of daily acupuncture at acupoints Sp-6 and St-36 on nocturnal frequency in elderly people on long-stay hospital wards. The median reduction in frequency in the
acupuncture group after 2 weeks' treatment (20 minutes per day) was −2.0 (95% CI −1.0 to −3.0). No significant change was seen in the placebo group, who received mock TENS. Two publications of this RCT were identified; one stated that 15 of the 20 studied were women, another stated that 17 were women.\[483,484\] [EL = 1−]

The acupuncture treatment given in the second RCT, to women with stress UI, depended on what the deficiency was considered to be. A total of 30 sessions were given every other day. Significantly more women treated with acupuncture than placebo were improved (assessed clinically and urodynamically) after treatment.\[485\] [EL = 1−]

An RCT in women with OAB with urge UI reported significant improvements in frequency, urgency and QOL (UDI and IIQ) after 4 weeks' acupuncture treatment compared with placebo acupuncture (designed for relaxation). Changes in leakage episodes were not significantly different between groups. Adverse effects reported were bruising or bleeding from acupuncture sites (23%) and minor discomfort on needle placement (25%) (n = 85; 74 analysed).\[486\] [EL = 1−]

Three case series evaluated acupuncture for UI or OAB in a total of 87 patients (84 women).\[487–489,491\] The symptoms being treated were frequency, urgency and dysuria,\[487,489\] "lower urinary tract symptoms"\[489\] and urge or mixed UI.\[491\] Treatment consisted of a single session, or 6 or 12 weeks' regular treatment.

The acupuncture points used also varied across studies.

Symptomatic improvement was reported in 53–60% of patients (assessed at 3 or 8 months).\[487,489,491\] No adverse effects were reported. Longer term follow-up (about 5 years) of 21 patients show that symptoms recur, and that repeated treatment may be necessary.\[488\] [EL = 3]

5.7.2 Hypnosis

The studies identified in relation to hypnotherapy in women with UI consisted of case series and case reports.

In the largest case series of women with incontinence due to DO, they underwent 12 sessions of hypnotherapy over 1 month, which involved symptom removal by direct suggestion and ‘ego strengthening’. At the end of the 12 sessions, the majority of women were subjectively cured or improved, with the remainder unchanged (n = 50). Objective cure or improvement (on cystometry) was seen in the majority at 3 months (n = 44).\[492\] Limited follow-up data at 2 years for 30 of the women have been reported. Of the women who were subjectively or objectively cured at 3 months, fewer than half remained cured (n = 30).\[489\] [EL = 3]

In another publication, four cases (three women) of hypnotherapy for DO were reported. Hypnotherapy involved three 1 hour sessions, including anxiety control methods, ego strengthening, training in self-hypnosis, age progression, explanation of stable bladder function and ‘handon-abdomen technique’. Two of the three women reported remission of symptoms at 6 months.\[493\] [EL = 3] A report of two women with UI who were ‘successfully’ treated with hypnotic techniques and waking counselling was also identified.\[493\] [EL = 3]

5.7.3 Herbal medicines

One report described the use of a tablet preparation containing crataeva (Crataevanurvala, a herb used in traditional Hindu science of medicine) and equisetum (horsetail) to treat women with symptoms of urge and/or stress UI for 12 weeks (n = 8). Quality of life (UDI) showed significant positive change to perceptions of frequency, leakage related to urgency or activity and difficulty emptying the bladder. All parameters of the IIQ questionnaire except physical recreation and household chores improved significantly.\[494\] [EL = 3]

Evidence statements for complementary therapies

Poor-quality evidence shows that acupuncture may reduce nocturia and both stress and urge incontinence in the short term (up to 4 weeks) but it is unclear whether any particular acupuncture treatment is more effective than others. [EL = 3]
There is limited evidence that hypnotherapy for women with UI secondary to detrusor overactivity offers some benefit over the short term (up to 6 months). About half of women relapsed over a 2 year period. [EL = 3] There is a lack of evidence on herbal medicines for UI or OAB.

The GDG recognises that, despite the limited and poor-quality evidence available, some women may wish to explore complementary therapies for their incontinence [EL = 4].

### Number Recommendation

| 48 | Complementary therapies are not recommended for the treatment of UI or OAB. [2006] |

### 5.8 Preventive use of conservative therapies

#### Studies considered for this section

Evidence described in this section is derived from RCTs. Two systematic reviews of the use of physical therapies for prevention of UI were identified. The RCTs within these systematic reviews were considered individually if they addressed effectiveness. Any further RCTs identified are also included here.

No studies were identified that evaluated the use of lifestyle interventions for prevention of UI or OAB.

#### 5.8.1 Behavioural therapy

One RCT evaluated a multicomponent behavioural modification programme comprising initial education, PFMT and bladder training in older women who had no UI (39%) or minimal UI (defined as one to five wet days in the previous year) \(n = 480\) randomised; 359 analysed). At 1 year follow-up, significantly more women maintained or improved their continence status compared with an untreated control group. Significantly greater improvements in frequency and voiding interval were also seen in the behavioural modification group versus control. Adverse effects were not considered. \([EL = 1−]\)

#### 5.8.2 Physical therapies

##### Preventive use during pregnancy

Four RCTs compared more structured PFMT with usual care during pregnancy (from weeks 18 or 20) in women in their first pregnancy. One study enrolled women with increased bladder neck mobility, which has been shown to be predictive of postnatal stress UI. Women with UI were excluded from one study, whereas in two studies between 25% and 32% had UI at baseline. Between 72 and 1169 women were enrolled in these studies (total \(n = 1810\)); the proportion completing follow-up or responding to questionnaire follow-up was noted to be low in three studies \(64−86\%\).

The PFMT programmes involved daily exercises with between 42 and 72 contractions. The individual’s ability to contract the pelvic floor muscle was checked at baseline. The comparison group was ‘usual care’ in each study, which comprised: ‘usual’ information from midwife or GP; routine antenatal care (likely to have received verbal advice on pelvic floor exercises); and routine care, no systematic PFMT programme. Two of the studies reported that women in the control group also undertook PFMT regularly \(20\%\) and \(51\%\).

In the first study, significantly fewer women who had been randomised to a 12 week PFMT programme reported UI at the end of treatment, and at 3 months postpartum, compared with those receiving usual care. Greater benefit was seen with PFMT in the number of leakage episodes and in pelvic floor muscle strength. No adverse effects were reported. \([EL = 1++]\)

In a study of women with increased bladder neck mobility, significantly fewer reported stress UI or had a positive 1 hour pad test at 3 months postpartum, after a structured PFMT programme, compared with those receiving usual care. No significant differences were seen between groups in changes in bladder neck mobility, pelvic floor muscle strength or in QOL (KHQ). Women in the PFMT group had
significantly higher scores in the general health domain of SF-36 compared with the usual care group.\textsuperscript{501} [EL = 1+]

No numerical data were reported in the third RCT, although the authors noted that no significant differences were seen between groups in UI or pelvic floor muscle strength at 12 months postpartum (n = 46). Adverse effects were not considered.\textsuperscript{502} [EL = 1-]

The largest study considered risk of urinary outcomes during the antenatal period and up to 6 months postpartum. At antenatal week 36, there was a trend towards reduced risk of any type of UI and of fewer leakage episodes in the PFMT group, although no difference between groups was statistically significant. At 6 months postpartum, differences between groups were less, again with none being significant (n = 1169).\textsuperscript{503} [EL = 1+]

\section*{Preventive use after pregnancy}

Four controlled trials evaluated PFMT for the prevention of UI in postpartum women. UI was reported by 17–32\% of women across all studies at baseline.\textsuperscript{506-509} The intervention was started 24 or 48 hours after delivery in primi- or multiparous women in two RCTs.\textsuperscript{506,507} A more structured 4 or 8 week PFMT programme was compared with usual care in both studies. At 3 months postpartum, the following results were seen:

- significantly lower prevalence of UI in the PFMT group following the 8 week treatment programme (n = 676); this difference was not sustained at 1 year (n = 569)\textsuperscript{510} [EL = 1+]
- no significant differences in UI prevalence between groups following the 4 week treatment programme (n = 1609; 89\% of those randomised).\textsuperscript{507} [EL = 1-]

A further two studies (one RCT,\textsuperscript{509} one cohort\textsuperscript{508}) recruited women 8 weeks postpartum. The RCT compared a 6 week programme of PFMT with biofeedback and electrical stimulation, with usual care in primiparous women (n = 107). Stress UI prevalence was not significantly different between groups at 10 months postpartum. However, the prevalence of stress UI differed between groups at baseline (31\% PFMT versus 16\% control), which was not accounted for in the analysis at 10 months.\textsuperscript{509} [EL = 1-]

The cohort study reported a significantly lower stress UI prevalence in women (41\% of whom had UI at baseline) who had undergone a structured 8 week PFMT programme compared with usual care, both at the end of the intervention (n = 198)\textsuperscript{508} and at 1 year postpartum (n = 162).\textsuperscript{511} No significant differences were found between groups in leakage index or social activity index. [EL = 2+]

\section*{Evidence statement for preventive use of physical therapies}

There is evidence that PFMT used during a first pregnancy reduces the prevalence of UI at 3 months following delivery. [EL = 1+] The effects in the longer term are inconsistent and the impact of subsequent pregnancies unknown. [EL = 4]

<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>49</td>
<td>Pelvic floor muscle training should be offered to women in their first pregnancy as a preventive strategy for UI. [2006]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number</th>
<th>Research recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>R10</td>
<td>Further studies need to be undertaken to evaluate the role and effectiveness of physical and behavioural therapies and lifestyle modifications in the prevention of UI in women. L0ng-term outcomes in particular should be evaluated.</td>
</tr>
</tbody>
</table>
5.9 Optimal sequence and timescales for conservative therapies

The GDG’s view was that conservative management should be pursued prior to surgical procedures in the treatment of UI. The factors affecting the GDG’s decisions regarding first-line conservative therapies are summarised below.

For stress UI, the GDG considered the cost effectiveness of PFMT and duloxetine as first-line treatment. The conclusion was that PFMT dominated and it was therefore recommended as the first-line intervention for stress UI.

For OAB (with or without urge UI), cost minimisation was used to determine whether bladder training or antimuscarinic drug treatment should be offered as first-line treatment. Bladder training was recommended as the first-line intervention as it is less costly and not associated with adverse effects.

In the GDG’s view, the management of mixed UI depends upon which symptom predominates (i.e. stress or urge UI).

In the absence of evidence for optimal duration of treatment, the GDG considered that a 3 month trial period of PFMT is sufficient to determine whether treatment is effective and tolerated. A shorter trial period of 6 weeks would usually be appropriate for bladder training.

5.10 Progression of treatment

If a woman has had a period of unsuccessful conservative treatment then conventionally more invasive alternative interventions are considered. Over time if optimal symptom management is not achieved more aggressive procedures can be offered, some with a higher risk of adverse events, others requiring life-long care.

Throughout the guideline and specifically following antimuscarinic drug treatment (see subchapter 6.1), recommendations have addressed the needs of women who do not wish to continue treatment. The provisions are two-fold. First, the GDG recommended that if a woman did not wish to progress to more invasive treatment, the management of symptoms with conservative therapies should not cease as long as they continue to provide some benefit. The woman should remain within the health care system and provided with information about the options for continued management, recognising that women’s needs and preferences will change over time.

The second point is that women who opt out of further treatment should have the option to recommence treatment should she wish to do so. Treatment should start without having to repeat earlier interventions if they were unsuccessful.

<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>If a woman chooses not to have further treatment for urinary incontinence:</td>
</tr>
<tr>
<td></td>
<td>• offer her advice about managing urinary symptoms, and</td>
</tr>
<tr>
<td></td>
<td>• explain that if she changes her mind at a later date she can book a review appointment to discuss past tests and interventions and reconsider her treatment options. [new 2013]</td>
</tr>
</tbody>
</table>

2013 Update
6 Pharmaceutical therapies

6.1 Antimuscarinic drugs

Introduction
Drugs with antimuscarinic action are used to treat OAB. They block muscarinic receptors in the bladder, which reduces the ability of bladder muscle to contract and affects bladder sensation reducing urinary urgency and the related symptoms of urgency incontinence, frequency and nocturia. The drugs differ in their selectivity for various muscarinic receptors, and some drugs have additional actions such as direct smooth muscle effects.

This chapter includes the following reviews of evidence:

- The existing review from the 2006 guideline that compared antimuscarinic drugs with placebo in clinical trials. That review provided evidence that flavoxate, imipramine, other tricyclic antidepressants and propantheline offered little or no improvement and they were not recommended. That evidence has not been updated and is presented again in this chapter. All other antimuscarinic drugs reviewed in the 2006 guideline or introduced since 2006 have been included in an updated review in this chapter.

- A network meta-analysis of both the placebo-controlled trials and the head-to-head trials focussing on two outcomes prioritised by the GDG to inform the health economic analysis, ‘continence status (zero episodes per day)’ and ‘discontinuation for any reason’.

- A health economic analysis incorporating the clinical data derived from the network meta-analysis:

The review of head-to-head RCTs comparing antimuscarinic drugs was also undertaken before the network meta-analysis could be completed. This review and the placebo-controlled trial evidence that was used to complete the network analysis can be found in the appendix M.

Placebo-controlled trials of antimuscarinic drugs not recommended in original guideline

Flavoxate
Two DB placebo-controlled crossover RCTs evaluated 2 weeks’ treatment with flavoxate for idiopathic DO.\textsuperscript{345,346} The first RCT in men and women (n = 41; only 25 analysed; 48% women) found no significant differences between flavoxate 200 mg t.d.s. and placebo in any urodynamic parameters. Complete results were not given for frequency, the only other outcome.\textsuperscript{345} [EL = 1−] The second RCT, in women only, found no significant differences between flavoxate 200 mg q.d.s. and placebo in frequency (median per three days 25 versus 23), nocturia (medians 3 versus 0), or leakage episodes (medians 1 versus 0) after treatment (n = 20). The most common adverse effects reported across all treatment groups were dry mouth (5–7%), and nausea or heartburn (2–7%).\textsuperscript{346} [EL = 1+] A DB randomised study compared two different daily doses of flavoxate (600 or 1200 mg), given for 4 weeks to women with sensory and/or motor urge syndrome or incontinence (n = 27). Symptoms were scored on a scale of 0 to 2; no results were provided for individual symptoms although it was reported that total scores fell from baseline in both groups. Of the urodynamic variables evaluated, greater benefit was seen with the 1200 mg dose in volume at first desire to void and in bladder volume at capacity. Nausea was reported by about 22% of the women.\textsuperscript{347} [EL = 1−]
A further RCT compared a combination of flavoxate and imipramine with bladder training. Significantly more women were subjectively or objectively cured after 4 weeks’ bladder training than with drug therapy (n = 50).[^307] [EL = 1+]

**Imipramine and other tricyclic antidepressants**

No placebo-controlled RCTs evaluating the use of imipramine for UI were identified. A DB placebo-controlled crossover RCT involving 3 week treatment periods evaluated doxepin (50–75 mg at night) in women with DO and frequency, urgency or urge UI, who had failed to respond to other drugs, mainly antimuscarinics (n = 19). Significantly greater reduction in night leakage episodes and frequency were seen with doxepin compared with placebo, and a greater increase in maximum cystometric capacity. No significant differences were reported between groups in day leakage episodes, frequency or the 1 hour pad test. More doxepin-treated women reported adverse effects than those treated with placebo (68% versus 16%).[^346] [EL = 1+]

**Propantheline**

No placebo-controlled studies were identified for propantheline.

**Evidence statements for antimuscarinic drugs not recommended in original guideline**

There is limited evidence that doxepin reduces night-time leakage episodes and nocturia. [EL = 1+]

There is no evidence of efficacy for the use of flavoxate, propantheline or imipramine for the treatment of UI or OAB. [EL = 4]

<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendation</th>
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</thead>
<tbody>
<tr>
<td>55</td>
<td>Flavoxate, propantheline or imipramine should not be used for the treatment of UI or OAB in women. [2006]</td>
</tr>
</tbody>
</table>

**Review question**

In women with OAB, what is the comparative effectiveness of the following drugs:

- darifenacin
- fesoterodine
- oxybutynin (immediate release)
- oxybutynin(extended release)
- oxybutynin (transdermal)
- oxybutynin (topical gel)
- propiverine
- propiverine(extended release)
- solifenacin
- tolterodine (immediate release)
- tolterodine(extended release)
- trospium
- trospium(extended release)

**Review introduction**

In order to identify the most useful outcomes in the review and the correct studies for inclusion, the GDG was asked to specify at the outset the length of time within which they would expect to see a benefit from antimuscarinic treatment. They were also asked to indicate the drug regimens that were relevant to the NHS to exclude papers that reported the effectiveness of regimens that were not used in clinical practice. After consideration, the GDG agreed the following:
A clinical benefit or harm would be obvious to the woman by 4 weeks and that this should therefore be the minimum time point for effectiveness reported in the review.

Only studies that used the recommended starting dose reported in the BNF should be used in the review as a reflection of current best practice.

Methodology

Background

Conventionally, each intervention would be analysed against its comparators in a series of head-to-head reviews. These reviews can be found in appendix M. The included studies within the initial head to head review were insufficient to enable the GDG to make an informed decision on which drugs to recommend and in what sequence, because a many comparisons were missing from the evidence profile. Without a more complete comparison profile it would be inappropriate to recommend specific drug therapies without speculation. For example, several of the drugs have only ever been compared against one other drug. This meant that the GDG would need to agree to the assumption that if drug A was better than drug B and drug B was better than C then A would be better than C without direct evidence.

Network meta-analysis

In order to obtain a useful comparison profile between the included drugs, a network meta-analysis (NMA) was undertaken of studies that reported the most common outcomes, ‘continence status’ and ‘discontinuation for any reason’. An additional reason for using these outcomes was that the absolute probability of treatment effect generated by the network meta-analysis could be used for the estimates of effectiveness in the health economic analysis.

A robust NMA has the potential to provide both direct and indirect comparisons between all drugs in a methodologically sound way. The NMA presented here included all studies comparing antimuscarinic drugs, including those which were reviewed in 2006. However, the inclusion of head-to-head studies only did not complete the entire network of thirteen drug comparisons (i.e. some drugs were not evaluated with a comparator that was also a comparator in another study allowing indirect comparison to be made). Therefore it was decided to include all published placebo-controlled studies to complete the network (see appendix N). With the inclusion of placebo controlled trials the network was complete because the placebo acted as the common comparator across the included RCT studies. The inclusion of placebo controlled studies was solely done with the intention to complete the NMA and not to inform recommendations. Placebo values were not used as the comparator in the analysis on which baseline probabilities of continence or discontinuation were estimated. Instead, the NMA adopted baseline probabilities derived from studies of oxybutynin (immediate release) as it was the primary recommendation for first-line drugs treatment in the previous guideline. Therefore, recommendations are based on the NMA and not on individual trials or the head-to-head reviews already undertaken.

The NMA replaced the review of head-to-head studies that was undertaken prior to the NMA. This review can be found in appendix M).

Data inputs and outcomes

To ensure a robust comparison of similar studies and retain a level of heterogeneity to ensure confidence in the NMA, the following studies were excluded;

- studies where outcomes of interest were not reported at either 4 weeks or 12 weeks
- studies that used a starting dose lower than that recommended in the BNF for that population (in one instance, we included studies which used a starting dose greater than that recommended in the BNF as no other data were available)

Data were not imputed to compensate for missing data in the study reports.

Assumptions and data used in the network meta-analysis

Table 6.1 outlines the assumptions that were agreed with the GDG prior to undertaking the meta-analysis.
**Table 6.1** Assumptions and data used in the network meta-analysis.

<table>
<thead>
<tr>
<th>Description</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>That the relative treatment effects at 4 and 12 weeks were the same, although the baseline probability of continence and discontinuation at 4 and 12 weeks were allowed to be different.</td>
<td>GDG discussion</td>
</tr>
<tr>
<td>Baseline probability of discontinuation at 4 weeks on Oxybutynin (Immediate release)</td>
<td>Published data from 1 study (Madersbacher et al., 1999) The data used were 16 events out of 145 patients (estimated probability = 0.110) Based on previous guideline recommendation for first-line treatment</td>
</tr>
<tr>
<td>Baseline probability of discontinuation at 12 weeks on Oxybutynin (Immediate release)</td>
<td>Published data from 1 study. (Drutz et al., 1999) The data used were 35 events out of 112 patients (estimated probability = 0.313).</td>
</tr>
<tr>
<td>Baseline probability of continence at 4 weeks on Oxybutynin (Immediate release)</td>
<td>Published data from 1 study (Anderson et al., 1999)* The data used were 9 events out of 32 patients (estimated probability = 0.281)</td>
</tr>
<tr>
<td>Baseline probability of continence at 12 weeks on Oxybutynin (Immediate release)</td>
<td>Published data from 1 study. (Drutz et al., 1999) The data used were 22 events out of 103 patients (estimated probability = 0.214).</td>
</tr>
</tbody>
</table>

*Data from this study was not used in the network meta-analysis as the study duration was 6 weeks not 4 weeks.

**NMA methods**

Clinical opinion is that most trials have a timescale for follow-up which reflects the time at which most discontinuations and continence will occur. Therefore, the number of discontinuations and people achieving continence at 4 and 12 weeks were modelled as probabilities rather than rates.

The probabilities of continence and discontinuation were modelled separately, although it should be noted that in general it is expected that only patients who do not discontinue will achieve continence (A woman is unlikely to achieve dryness if not taking medication as prescribed).

A binomial / logit model within a generalized linear model framework was used to model each of the two outcomes – discontinuation and continence – at 4 and 12 weeks as this model is appropriate for probability outcomes. The use of a generalized linear model framework is a unified approach for comparing the models; it reports the Deviance Information Criterion (DIC), and goodness-of-fit using the residual deviance.

Due to lack of data and acknowledging that some of the studies were very small, it was assumed that relative treatment effects were equal at 4 and 12 weeks. Few trials reported at both time points making it difficult to check this assumption. However, the assumption is clinically plausible and the evaluation of model fit seems to confirm that the chosen models fit the data well.

The trial data formed four treatment networks: discontinuation at 4 weeks and 12 weeks and continence at 4 and 12 weeks. There are several treatments which were not connected to the main network at each of the time points.
For continence, an network meta-analysis was carried out assuming binomial likelihood with a logit link, and assuming that the log-odds ratios of continence were the same at 4 and 12 weeks for trials reporting at both time points. Since there were 4 trials reporting continence status at both 4 and 12 weeks, a further network meta-analysis model was considered for continence, where the log-odds ratios of continence at 4 and 12 weeks within a trial reporting at both time points, were allowed to differ, but were assumed similar (exchangeable) with a common mean and variance.

For discontinuation, an network meta-analysis was carried out assuming binomial likelihood with a logit link, and assuming that the long odds ratios of discontinuation were the same at 4 and 12 weeks for trials reporting at both time points. Since only one trial reported at both 4 and 12 weeks, a model where the treatment effects are considered similar instead of equal could not be fitted.

The posterior distribution of the log-odds of discontinuation at 4 weeks on Oxybutynin IR was approximately normal with posterior mean -2.114 and standard deviation 0.27, which translates into a baseline probability of discontinuation on Oxybutynin IR of 11% with 95% credible interval (CrI) from 7% to 17%. The posterior distribution of the log-odds of discontinuation at 12 weeks on Oxybutynin IR was approximately normal with posterior mean -0.7959 and standard deviation 0.52, which translates into a baseline probability of discontinuation on Oxybutynin IR of 21% with 95% CrI from 15% to 30%.

The probabilities of achieving continence in the Oxybutynin IR arm of trial \( i = 1 \) for both 4 weeks and 12 weeks were modelled in the same way as the probabilities of discontinuation. The posterior distribution of the log-odds of continence at 4 weeks on Oxybutynin (immediate release) was approximately normal with posterior mean -0.9714 and standard deviation 0.4, which translates into a baseline probability of continence on Oxybutynin IR of 28% with 95% CrI from 14% to 45%. The posterior distribution of the log-odds of continence at 12 weeks on Oxybutynin (immediate release) was approximately normal with posterior mean -1.321 and standard deviation 0.24, which translates into a baseline probability of continence on Oxybutynin IR of 21% with 95% CrI from 14% to 30%.

The residual deviance and Deviance Information Criterion were used to check model fit for the identical and exchangeable within-trial log odds ratios at different time points and to compare fixed and random effects models.

**Model fit**

Convergence was assessed using the Brooks-Gelman-Rubin plots and by examination of the history plots, and was satisfactory by at least 20,000 iterations in all cases. Models were then run for a further 200,000 iterations on three separate chains, and all results are based on this further sample.

Comparing the posterior mean of the residual deviance for the Fixed Effect model with equal relative effects at 4 and 12 weeks, 70.01, to 90 data points for discontinuation, we can say that the model is a good fit to the data. Comparing the Deviance Information Criterion for the fixed and random effects models with equal relative effects (560.6 and 562.5, respectively) we conclude that there is no reason to choose the more complex Random Effect model. We will therefore report all results for the Fixed Effect model only for discontinuation.

Similarly for continence, the posterior mean of the residual deviance for the Fixed Effect model with equal effects at 4 and 12 weeks is 53.5, which means the model is a good fit to the data. When compared to 56 data points. Comparing the Deviance Information Criterion for the fixed and random effects models with equal relative effects (415.8 and 416.2, respectively,) we prefer the Fixed Effect model as it is simpler.

For continence, the posterior mean of the residual deviance for the Fixed Effect model with equal effects at 4 and 12 weeks is 53.5, which means the model is a good fit to the data. When compared to 56 data points. Comparing the Deviance Information Criterion for this model was 575.4 with posterior mean of the residual deviance of 76.0. This is not a substantial improvement in fit over the Fixed Effect model with equal relative effects. This supports the assumption of equal treatment effects at 4 and 12 weeks, and we therefore do not consider the model that relaxes this assumption any further.

We report all results for the Fixed Effect model assuming equal relative effects at 4 and 12 weeks for continence and discontinuation.
Consistency
Consistency was checked for both the continence and discontinuation networks, by fitting an inconsistency model (Dias & Welton, 2011) and comparing the model fit to the Fixed Effect model. The values of the posterior mean of the residual deviances and pD are comparable, indicating no evidence of inconsistency in this network.

Description of included studies
A total of 43 randomised controlled trials (RCT's) (Appell et al., 2001; Cardozo et al., 2004; Cartwright et al., 2011; Chapple et al., 2004; Chapple et al., 2004a; Chapple et al., 2005; Chapple et al., 2007; Chapple et al., 2007b; Choo et al., 2008; Diokno et al., 2003; Dmochowski et al., 2002; Dmochowski et al., 2008; Dmochowski et al., 2010a; Dorschner et al., 2000; Drutz et al., 1999; Haab et al., 2004; Herschorn et al., 2010a; Hill et al., 2006; Ho et al., 2010; Homma et al., 2003; Huang et al., 2012; Junemann et al., 2006; Kaplan et al., 2011; Karram et al., 2009; Madersbacher et al., 1999; Malone-Lee & Al-Buheissi, 2009; Malone-Lee et al., 2001; Millard et al., 1999; Minassian et al., 2007; Nitti et al., 2007; Rackley et al., 2006; Rogers et al., 2008; Staskin et al., 2007; Staskin et al., 2009; Steers et al., 2005; Thuroff et al., 1991; VanKerrebroeck et al., 2001; Vardy et al., 2009; Weiss et al., 2012; Yamaguchi et al., 2007; Zat'ura et al., 2010; Zinner et al., 2002; Zinner et al., 2004) with 25,153 participants were included in the NMA. In total, 12 RCT's provided data at 4 weeks (6 for continence status and 7 RCTs for discontinuation for any reason with a single study providing for both outcomes). For the 12 week analysis, 36 RCT's provided data (20 for continence status and 34 for discontinuation for any reason) with 18 studies providing data at both time-points. Four studies reported on continence status at both time-points, and a single study reported on discontinuation for any reason at both time-points.

All studies included women with overactive bladder symptoms but seven studies also included women who were dry at baseline. In these studies, only those who were incontinent at baseline were included in the continence status analysis.

The mean age of the study participants ranged from 49 years (SD 12) to 75 years (SD 6). Where reported the mean number of urgency episodes per day ranged from 2.74 (SD 1.82) to 11.4 (SD 4.0). As several studies included women who were continent at baseline, the range of number of incontinence episodes is not reported for the included studies. Where reported, the mean duration of OAB symptoms ranged from 4.2 years (SD 6.2) to 9.0 years (SD 11.2).

Review findings (Evidence profile)
Table 6.2 presents the median odds ratios and associated credible intervals for each pair-wise comparison of drugs used in the network meta-analysis. The second and third tables outline the absolute probability of continence and discontinuation for each drug at both time-points.
<table>
<thead>
<tr>
<th></th>
<th>Oxybutynin</th>
<th>Placebo</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>IR</td>
<td></td>
</tr>
<tr>
<td>0.39</td>
<td>(0.25,0.61)</td>
<td></td>
</tr>
<tr>
<td>0.55</td>
<td>(0.33,0.89)</td>
<td></td>
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<tr>
<td>0.43</td>
<td>(0.27,0.65)</td>
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</tr>
<tr>
<td>1.02</td>
<td>(0.52,1.97)</td>
<td></td>
</tr>
<tr>
<td>0.43</td>
<td>(0.28,0.66)</td>
<td></td>
</tr>
<tr>
<td>0.54</td>
<td>(0.23,1.31)</td>
<td></td>
</tr>
<tr>
<td>0.57</td>
<td>(0.36,0.88)</td>
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<tr>
<td>0.49</td>
<td>(0.26,0.91)</td>
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<td>0.87</td>
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<td>0.38</td>
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<td>0.60</td>
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<td>(0.26,0.89)</td>
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</tr>
<tr>
<td>0.49</td>
<td>(0.32,0.75)</td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>Tolterodine</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.31</td>
<td>(1.57,0.65)</td>
</tr>
<tr>
<td>0.74</td>
<td>(0.42,2.67)</td>
</tr>
<tr>
<td>0.87</td>
<td>(0.25,2.52)</td>
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<tr>
<td>0.50</td>
<td>(0.49,1.03)</td>
</tr>
<tr>
<td>0.58</td>
<td>(0.24,1.16)</td>
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<td>0.58</td>
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<td>0.60</td>
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<td>0.72</td>
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<td>0.62</td>
<td>(0.30,1.97)</td>
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<tr>
<td>0.80</td>
<td>(0.53,2.59)</td>
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<tr>
<td>0.80</td>
<td>(0.57,2.09)</td>
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<td>0.80</td>
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<td>0.34</td>
<td>(0.41,1.47)</td>
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<tr>
<td>0.34</td>
<td>(0.62,1.44)</td>
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<tr>
<td>0.34</td>
<td>(0.65,1.59)</td>
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</tbody>
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<table>
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<th></th>
<th>Placebo</th>
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</thead>
<tbody>
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<td>0.51</td>
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<td>0.37</td>
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<td>0.46</td>
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<td>0.68</td>
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<td>0.58</td>
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<tr>
<td>0.57</td>
<td></td>
</tr>
<tr>
<td>0.47</td>
<td></td>
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<td>0.55</td>
<td></td>
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<td>0.43</td>
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<tr>
<td>0.51</td>
<td></td>
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<tr>
<td>0.54</td>
<td></td>
</tr>
</tbody>
</table>

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1  For continence (UNSHADED AREA), Odds ratios (OR) lower than 1.0 favour the column defining treatment, OR’s greater than 1.0 favour the row defining treatment

2  For discontinuation (SHADED AREA), Odds ratios (OR) higher than 1.0 favour the row defining treatment, OR’s lower than 1.0 favour the column defining treatment
1. **Table 6.3** Posterior median odds ratios and credible intervals for the absolute probability at 4 weeks.

<table>
<thead>
<tr>
<th>Drug</th>
<th>Continence</th>
<th>Discontinuation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxybutynin (Immediate release)</td>
<td>0.28 (0.15, 0.46)</td>
<td>0.11 (0.07, 0.17)</td>
</tr>
<tr>
<td>Solifenacin</td>
<td>0.20 (0.08, 0.43)</td>
<td>0.04 (0.02, 0.09)</td>
</tr>
<tr>
<td>Oxybutynin (Extended release)</td>
<td>0.21 (0.08, 0.46)</td>
<td>0.06 (0.03, 0.12)</td>
</tr>
<tr>
<td>Tolterodine (Immediate release)</td>
<td>0.26 (0.11, 0.49)</td>
<td>0.05 (0.02, 0.09)</td>
</tr>
<tr>
<td>Propiverine (Immediate release)</td>
<td>0.22 (0.07, 0.53)</td>
<td>0.11 (0.05, 0.22)</td>
</tr>
<tr>
<td>Tolterodine (Extended release)</td>
<td>0.16 (0.06, 0.36)</td>
<td>0.05 (0.03, 0.09)</td>
</tr>
<tr>
<td>Propiverine (Extended release)</td>
<td>0.18 (0.07, 0.41)</td>
<td>0.06 (0.02, 0.15)</td>
</tr>
<tr>
<td>Fesoterodine</td>
<td>0.18 (0.07, 0.40)</td>
<td>0.06 (0.03, 0.12)</td>
</tr>
<tr>
<td>Trospium</td>
<td>0.21 (0.07, 0.48)</td>
<td>0.06 (0.03, 0.12)</td>
</tr>
<tr>
<td>Oxybutynin (transdermal)</td>
<td>0.19 (0.05, 0.49)</td>
<td>0.10 (0.03, 0.28)</td>
</tr>
<tr>
<td>Darifenacin</td>
<td>0.23 (0.08, 0.51)</td>
<td>0.04 (0.02, 0.09)</td>
</tr>
<tr>
<td>Trospium (Extended release)</td>
<td>0.20 (0.07, 0.43)</td>
<td>0.07 (0.03, 0.14)</td>
</tr>
<tr>
<td>Oxybutynin (topical gel)</td>
<td>0.19 (0.07, 0.42)</td>
<td>0.05 (0.02, 0.11)</td>
</tr>
</tbody>
</table>

2. **Table 6.4** Posterior median odds ratios and credible intervals for the absolute probability at 12 weeks.

<table>
<thead>
<tr>
<th>Drug</th>
<th>Continence</th>
<th>Discontinuation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxybutynin (Immediate release)</td>
<td>0.21 (0.14, 0.30)</td>
<td>0.31 (0.23, 0.40)</td>
</tr>
<tr>
<td>Solifenacin</td>
<td>0.15 (0.07, 0.30)</td>
<td>0.15 (0.09, 0.24)</td>
</tr>
<tr>
<td>Oxybutynin (Extended release)</td>
<td>0.16 (0.07, 0.33)</td>
<td>0.20 (0.11, 0.32)</td>
</tr>
<tr>
<td>Tolterodine (Immediate release)</td>
<td>0.20 (0.10, 0.35)</td>
<td>0.16 (0.09, 0.26)</td>
</tr>
<tr>
<td>Propiverine (Immediate release)</td>
<td>0.17 (0.06, 0.41)</td>
<td>0.31 (0.17, 0.50)</td>
</tr>
<tr>
<td>Tolterodine (Extended release)</td>
<td>0.12 (0.05, 0.24)</td>
<td>0.16 (0.10, 0.26)</td>
</tr>
<tr>
<td>Propiverine (Extended release)</td>
<td>0.13 (0.06, 0.29)</td>
<td>0.20 (0.09, 0.39)</td>
</tr>
<tr>
<td>Fesoterodine</td>
<td>0.14 (0.06, 0.28)</td>
<td>0.20 (0.12, 0.32)</td>
</tr>
<tr>
<td>Trospium</td>
<td>0.16 (0.06, 0.35)</td>
<td>0.18 (0.09, 0.32)</td>
</tr>
<tr>
<td>Oxybutynin (transdermal)</td>
<td>0.14 (0.05, 0.36)</td>
<td>0.28 (0.10, 0.58)</td>
</tr>
<tr>
<td>Darifenacin</td>
<td>0.18 (0.07, 0.37)</td>
<td>0.15 (0.08, 0.26)</td>
</tr>
<tr>
<td>Trospium (Extended release)</td>
<td>0.15 (0.07, 0.31)</td>
<td>0.21 (0.11, 0.37)</td>
</tr>
<tr>
<td>Oxybutynin (topical gel)</td>
<td>0.14 (0.06, 0.30)</td>
<td>0.18 (0.09, 0.31)</td>
</tr>
</tbody>
</table>

3. **Evidence statements – Odds ratios and credible intervals**

The network meta-analysis demonstrated that there was no difference in clinical benefit in terms of continence at 4 or 12 weeks between any of the active drugs compared with the exception of solifenacin over tolterodine (Extended release). The evidence for the whole network meta-analysis was high quality.

The network meta-analysis also demonstrated no difference in clinical benefit in terms of discontinuation at 4 or 12 weeks between the drugs with the exception of the following comparisons.
- Solifenacin over oxybutynin (Immediate release), propiverine (Immediate release) and Fesoterodine,
- Oxybutynin (Extended release) over Oxybutynin (Immediate release)
- Tolterodine (Immediate release) over Oxybutynin (Immediate release), Propiverine (Immediate release) and Fesoterodine
- Tolterodine (Extended release) over Oxybutynin (Immediate release), Propiverine (Immediate release) and Fesoterodine
- Fesoterodine over Oxybutynin (Immediate release)
- Trospium over Oxybutynin (Immediate release)
- Oxybutynin (transdermal) over Propiverine (Immediate release)
- Darifenacin over Oxybutynin (Immediate release),
- Oxybutynin (topical gel) over Oxybutynin (Immediate release)

The evidence for the whole network meta-analysis was high quality.

**Evidence statements – Absolute probabilities**

The absolute probability of being continent at 4 weeks ranged from 16% for Tolterodine (extended release) to 28% for Oxybutynin (immediate release). The evidence was of high quality.

The absolute probability of being continent at 12 weeks range from 12% for Tolterodine (extended release) to 21% for Oxybutynin (immediate release). The evidence was of high quality.

The absolute probability of discontinuing from treatment at 4 weeks range from 4% for Solifenacin and darifenacin to 11% for oxybutynin (immediate release) and propiverine (immediate release). The evidence was of high quality.

The absolute probability of discontinuing from treatment at 12 weeks range from 15% for Solifenacin and darifenacin to 31% for oxybutynin (immediate release) and propiverine (immediate release). The evidence was of high quality.

**Economic evidence**

**Introduction**

Health economic analyses of alternative antimuscarinic drugs have been published however none of these studies include all the drugs included in the clinical review undertaken for this guideline. This was a clinical area of the guideline that was prioritised for health economic analysis. Given new clinical data on comparative clinical efficacy and discontinuation rates were available from the network meta-analysis, a new model was developed for this guideline using clinical efficacy data obtained from the clinical review and using a clinical pathway based on the proposed guideline update pathway. The network meta-analysis of clinical studies generated probabilities of effectiveness and discontinuation that could be incorporated into a health economic model. Therefore none of the published health economic studies were presented as evidence to the GDG to inform recommendations.

**Economic evaluation question**

What is the cost-effectiveness of antimuscarinic drugs compared with no treatment and with each other as first and second-line treatment for women with overactive bladder?

**Background health economic literature**

Details of the approach taken and methods used are only reported here as background information to inform the health economic modelling and not as evidence to support recommendations. Evidence tables reporting methods and results can be found in the guideline appendix.

Six new economic evaluations of drug therapies were identified in the literature since the previous guideline was published.
Table 6.5. Summary of the health economics evaluations on drug treatment for women with OAB

<table>
<thead>
<tr>
<th>Author and year</th>
<th>Country</th>
<th>Study type</th>
<th>Drugs evaluated</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Arlandis-Guzman et al., 2011)</td>
<td>Spain</td>
<td>Cost-utility analysis (Decision analytic model)</td>
<td>Fesoterodine vs Solifenacin and tolterodine</td>
</tr>
<tr>
<td>(Cardozo et al., 2010)</td>
<td>UK</td>
<td>Cost-utility analysis (one year decision-model)</td>
<td>Solifenacin vs fesoterodine, oxybutynin IR, propiverine, tolterodine ER, tolterodine IR</td>
</tr>
<tr>
<td>(Hakkaart et al., 2009)</td>
<td>The Netherlands</td>
<td>Cost-utility analysis (Markov)</td>
<td>Solifenacin vs placebo</td>
</tr>
<tr>
<td>(Speakman et al., 2008)</td>
<td>UK</td>
<td>Cost-utility analysis (Markov)</td>
<td>Solifenacin vs tolterodine</td>
</tr>
<tr>
<td>(Herschorn et al., 2010b)</td>
<td>Canada</td>
<td>Cost-utility analysis (Markov)</td>
<td>Solifenacin vs oxybutynin plus tolterodine (as 2nd line)</td>
</tr>
<tr>
<td>(Ko et al., 2006)</td>
<td>USA</td>
<td>Cost-effectiveness analysis</td>
<td>Solifenacin vs oxybutynin, tolterodine, darifenacin and trosquist</td>
</tr>
</tbody>
</table>

Five of the studies were cost-utility analyses (Speakman et al., 2008), (Hakkaart et al., 2009), (Herschorn et al., 2010b), (Arlandis-Guzman et al., 2011) and one was a cost-effectiveness analysis (Ko et al., 2006).

All six studies adopted a modelling approach. Five studies were models of one year duration using clinical trials data for the first three months and assuming efficacy status did not change in the follow-up period up to one year. No study considered costs and effects beyond one year. Two studies (Herschorn et al., 2010b), (Cardozo et al., 2010) were based on efficacy data reported in the clinical review for this guideline. Two studies (Ko et al., 2006) and (Herschorn et al., 2010b) incorporated published data on discontinuation rates at one year in their analysis.

Four cost-utility analyses were undertaken alongside RCTs. Patient-level data were available for the health economic analysis. These studies were designed as Markov models with cycles of one month and finishing one year after the start of treatment (Cardozo et al., 2010), (Speakman et al., 2008), (Hakkaart et al., 2009) and (Herschorn et al., 2010b). This is an efficient way of modelling chronic conditions where an individual may move between several health states over time. All three studies used the same model structure as that developed in a previous study published in 1998 as this study reported QALY values for five health states based on severity of symptoms of OAB (Kobet et al., 1998). This study had derived QALY values from a willingness-to-pay study of women with OAB.

In the Markov models (where women could move between health states over time), women with OAB were assigned to a health state depending on the level of severity of their condition at the start of treatment (none were in the mild state). Every month an individual either moved health state or stayed in the same state. If an individual discontinued treatment they moved to a discontinuation state for the duration. Specific costs and health-related quality of life values were assigned to each health state depending on the level of severity of OAB and associated comorbidities. Each drug regimen was associated with different probabilities of moving between health states depending on treatment efficacy and likelihood of discontinuation. The total number of patients spent in each health state in each cycle was summed to arrive at total cost and number of quality adjusted life years associated with each drug alternative for that cohort. The studies all used estimates of QALY values for each health state from a Markov model for OAB developed in Sweden (Kobet et al., 1998) which was based on a willingness-to-pay analysis undertaken by the same study team (Johannesson et al., 1997). The three subsequent economic evaluations used the same QALY values but used patient-
level data from clinical trials to map the health state of every individual in the trial at each time point. None of these studies reported the transition probabilities of moving between health states, and patient level data was not reported.

Another recent study also adopted a decision-analytic approach rather than a Markov model structure (Arlandis et al., 2011). The study included men and women in the analysis. It did not use the same QALY values reported in the Swedish study as the previous three studies. The authors obtained data from a more recent economic study that derived QALYs from the King’s Health Questionnaire. Much higher QALY values were reported for all women with UI. No subgroup analyses were reported by severity of OAB.

Only two economic studies were based in the NHS (Cardozo et al., 2010) and (Speakman et al., 2008). The clinical efficacy data on which the earlier study is based was published prior to the 2006 cut-off date for this guideline update (Speakman et al., 2008). The study was based on a single head-to-head trial of solifenacin and tolterodine. The later study used data published in 2008 and compared six treatment scenarios and included switching to a higher dose formulation if a lower dose was not effective. Cycle length was 3 months. Outputs were measured as symptom resolution, and differentiated between symptoms of urgency and frequency. The model assumed clinical effectiveness was constant over time for women who continued with drug therapy.

The most recent study is from Spain. Clinical efficacy data were obtained from placebo-controlled trials not included in the clinical review for this guideline (Arlandis-Guzman et al., 2011). The studies from the Netherlands and the USA are both based on efficacy data published before 2006 (Hakkaart et al., 2009), (Ko et al., 2006).

Only one study from Canada was based on efficacy data reported in this guideline (Herschorn et al., 2010b). The efficacy study on which it is based evaluated solifenacin versus oxybutynin plus tolterodine as second line treatment. The STAR trial on which this study is based was published in 2010.

None of these studies provided sufficient data on their own to inform recommendations in this guideline. First, the outcomes in the Markov model studies do not correspond to the outcomes reported in this guideline (combining micturition and leakage was not considered a clinically useful outcome by the GDG). Second, transition probabilities used in the studies based on single RCTs were not reported which meant it was not possible to repeat any of these analyses with updated UK-based cost data. Third, clinical efficacy data from placebo-based trials is included in the studies that use data from meta analysis (not a single trial). Data from single placebo-based trials was not considered by the GDG to be sufficiently unbiased evidence of efficacy for head-to-head comparison of antimuscarinic drugs. The more recent models assumed constant effectiveness over time for women on treatment. Finally, none of the studies included all the antimuscarinic drugs that have shown clinical benefit in the head-to-head trials included in the systematic review for this guideline, and none of the studies were sufficiently similar in model structure to incorporate more than one published model into a new analysis evaluating all the relevant drug comparisons.

Structure of the health economic model

The health economic evaluation of antimuscarinic drugs is presented as a cost-utility analysis with quality adjusted life years (QALYs) as the outcome of interest. It is a model-based evaluation in a UK clinical setting over a 12-month period. Estimates of clinical effectiveness and other model parameters are derived from the systematic review undertaken for this guideline.

The analysis was conducted from the perspective of the UK NHS and includes the pharmacological costs and incontinence pad use. All costs were valued at 2011/12 prices and all dosages are based on product characteristics (www.medicines.org.uk). Pads use is included in the model as pads can be supplied by the NHS, but this is not always the case as the source of funding for continence pads varies across the country. They constitute a large part of the cost of incontinence which is saved by effective treatment.

The model is structured around two main model parameters: continence status (the percentage of women who are completely dry), and discontinuation rate (the percentage of women who discontinue treatment for any reason). To capture the dynamic nature of treatment of overactive bladder over time, a state transition Markov model was developed where a woman with OAB can switch between...
health states (continence/incontinence) and treatment states (continue on treatment/ discontinue treatment) from week to week up until one year. In the health economic model, the view of the GDG was that, for women with incontinence, a material improvement in their condition usually means no longer experiencing episodes of incontinence rather than a reduced rate of continence. The health related quality of life associated with reduced episodes is more difficult to estimate and existing estimates of QALY values reported in the published literature reported values of combinations of voluntary and involuntary micturition and leakage episodes. The GDG view was that a QALY based on a mix of healthy (voluntary) episodes and unhealthy (involuntary) episodes was not helpful.

In the model, a hypothetical cohort of 1000 women with OAB, start on treatment and can either continue treatment week by week or discontinue treatment. It was assumed that all women who discontinue have failed treatment with antimuscarinic drugs. The model is structured on the probability that a woman with OAB is continent and on treatment in each cycle. These probabilities are independent.

A women can be either on treatment and incontinent (treatment failure) or on treatment and continent (treatment success) or discontinuation and be incontinent (treatment failure). As the data from the network meta-analysis reported rates of discontinuation separately from rates of continence, the model was structured so that in each week, a woman could be both in a continence state and in a treatment state. When a woman discontinued treatment, she was assumed to receive no further active treatment for the duration of the model. The model assumes that a woman who discontinues treatment remains incontinent during the remainder of the course of the model (up to one year) although this is a simplification of reality in order to compare antimuscarinic treatments.

The model ran for 52 weeks to reflect the high level of discontinuation on all drug treatment at one year and the impact on quality of life of long term continence when a treatment is effective.

Analyses were undertaken for first and second-line treatment. The second-line treatment analysis explored the effects of excluding all immediate-release preparations which may not be tolerated by some women. In addition, it excluded topical gels and transdermal preparations of oxybutynin which are prescribed in the NHS.

Table 6.6 Cost and QALYs data included in the evaluation of antimuscarinic drug treatment for women with OAB

<table>
<thead>
<tr>
<th>Model state</th>
<th>Cost</th>
<th>QALY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Treatment state</td>
<td></td>
<td></td>
</tr>
<tr>
<td>On treatment</td>
<td>Drug cost only</td>
<td>None</td>
</tr>
<tr>
<td>Discontinued treatment</td>
<td>No cost</td>
<td>None</td>
</tr>
<tr>
<td>2. Continence state</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incontinent</td>
<td>Pads only</td>
<td>Treatment failure</td>
</tr>
<tr>
<td>Continent</td>
<td>No cost</td>
<td>Treatment success</td>
</tr>
</tbody>
</table>

Network meta-analysis and probabilistic sensitivity analysis

Probabilistic sensitivity analysis is an approach to evaluating the robustness of cost-effectiveness results. When there are many input parameters, NICE recommends using probabilistic sensitivity analysis to characterise uncertainty. This allows several parameters to be varied simultaneously, rather than one at time as in one-way sensitivity analysis. In a probabilistic sensitivity analysis each input is assigned a probability distribution which is defined by measures of variability (such as standard deviations). A simulation is then set up to sample inputs at random from their assumed distributions. The simulation is run a large number of times (1,000 times for this probabilistic sensitivity analysis). If one option is consistently more cost-effective than the others then there is high probability that option will always the most cost-effective option and decision-makers can have a higher level of confidence in the results of the analysis.
Four week and 12 week continence rates and 12 week discontinuation rates were varied in the probabilistic sensitivity analysis. All parameters were assumed to have a beta distribution (which limits probability values to lying between 0 and 1). One-year discontinuation rate was assumed to be constant across all antimuscarinic drugs (see Limitations below) and was not included in the probabilistic sensitivity analysis.

Net benefit is another way of reporting the data synthesising costs and benefits into equal units. For each simulation, it uses a specific willingness to pay threshold to value QALYs in monetary terms and then offsets the costs of alternatives against that valuation to arrive at a net monetary value for each intervention.

The network meta-analysis (NMA) provided baseline probabilities of continence at 4 weeks and baseline probabilities of continence at 12 weeks on oxybutynin (immediate release) which was the reference case in the NMA (since it was recommended in the previous version of the guideline). The same relative effects were then applied to obtain the absolute probabilities at 4 and 12 weeks for the other treatments.

The details of how the baseline probabilities were calculated are given in appendix N. In summary, the log-odds of continence were calculated from a meta-analysis of the oxybutynin (immediate release) arms of the selected trials. It was then assumed that the log-odds were normally distributed with the mean and variance estimated from the meta-analysis. In the main network meta-analysis program, the estimated log-odds ratios were applied to the baseline log-odds to simulate the absolute probabilities for the health economic model. The same approach was adopted for probabilities of discontinuation at 4 and 12 weeks.

One-way sensitivity analysis

One-way sensitivity analysis was not performed on effectiveness data at 4 and 12 weeks as these values derived from the best available evidence. The assumptions of effectiveness and continuation of antimuscarinic therapy after 12 weeks and up to one year were not based on good quality evidence. Therefore a sensitivity analysis was undertaken assuming no reduction in efficacy or continuation after 12 weeks and this did not change the result (see figure 2).

A second one-way sensitivity analysis was performed using recently published UK data (Wagg et al., 2012). This study reported one-year discontinuation rates for some of the antimuscarinics relevant to this health economic analysis (see appendix O). For those drugs where no data were reported, base case discontinuation rates were assumed.

Model validation

Two models were developed independently by two health economists at NCC-WCH, using the same data but without reference to the other model. Discrepancies were discussed and Excel® cell reference errors corrected in earlier drafts.

Values used in the model

Estimates of effectiveness and discontinuation rates

The efficacy data used in the economic evaluation comes from the network meta-analysis of all antimuscarinic drugs on which there is published RCTs evidence. Two outcomes were chosen on which to base the analysis, continence status and discontinuation. It was assumed that all women who discontinued did so either because of insufficient efficacy and/or intolerable side-effects. Discontinuation was assumed to lead to treatment failure and no chance of continence being achieved.

The network meta-analysis produced 20,000 simulated probabilities of continence and discontinuation of treatment for thirteen antimuscarinic drugs. A normal distribution was assumed for the log-odds of the baseline comparator drug which was oxybutynin (immediate release) at 4 and 12 weeks.

Relative treatment effects were sampled from the posterior distributions of the log-odds ratios of every alternative drug compared with oxybutynin (immediate release). These log-odds ratios were then applied to the 20,000 simulated log-odds of oxybutynin (immediate release) at 4 and 12 weeks to generate probabilities for all the other antimuscarinic drugs (see the appendix for more details about the methods of the network meta-analysis).
Table 6.7 Parameters for the baseline distributions (oxybutynin immediate release) applied in the probabilistic sensitivity analysis

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean log-odds</th>
<th>Standard deviation</th>
<th>Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxybutynin (immediate release)</td>
<td>0.9714</td>
<td>2.49</td>
<td>Normal</td>
</tr>
</tbody>
</table>

Table 6.8 Parameters for the comparator distributions (all other antimuscarinic drugs) applied in the probabilistic sensitivity analysis

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean log odds ratio*</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solifenacin</td>
<td>-0.4078</td>
<td>0.39</td>
</tr>
<tr>
<td>Oxybutinin ER</td>
<td>-0.3537</td>
<td>0.4296</td>
</tr>
<tr>
<td>Tolterodine IR</td>
<td>-0.07722</td>
<td>0.3172</td>
</tr>
<tr>
<td>Propiverine IR</td>
<td>-0.2952</td>
<td>0.5762</td>
</tr>
<tr>
<td>Tolterodine ER</td>
<td>-0.6974</td>
<td>0.3868</td>
</tr>
<tr>
<td>Propiverine ER</td>
<td>-0.54</td>
<td>0.4223</td>
</tr>
<tr>
<td>Fesoterodine</td>
<td>-0.519</td>
<td>0.3872</td>
</tr>
<tr>
<td>Trospium IR</td>
<td>-0.3314</td>
<td>0.4689</td>
</tr>
<tr>
<td>Oxybutynin transdermal</td>
<td>-0.4836</td>
<td>0.5796</td>
</tr>
<tr>
<td>Darifenacin</td>
<td>-0.2298</td>
<td>0.4713</td>
</tr>
<tr>
<td>Trospium ER</td>
<td>-0.4162</td>
<td>0.4029</td>
</tr>
<tr>
<td>Oxybutynin topical gel</td>
<td>-0.4715</td>
<td>0.4221</td>
</tr>
</tbody>
</table>

*The mean probabilities for each of the antimuscarinic drugs are reported in table 6.9, and all the data generated from the network meta-analysis can be found in appendix N.

The cost-effectiveness model drew one in ten of these simulations, starting at a random number (2,000 in all) and used these as a basis of a probabilistic sensitivity analysis constructed in an Excel® model.

There was a lack of data on efficacy and discontinuation rates at the end of one year, by type of drug. It was assumed in the base case analysis that all antimuscarinic drugs that had a higher than 20% chance of success at 12 weeks, reduced to 20% chance at 52 weeks.

The rate of discontinuation from treatment for any reason captures both women who decide to discontinue treatment because it is not working and those for whom the side effects are intolerable (or not worth the additional health benefit associated with treatment).

The systematic review undertaken for this guideline extracted data from all included studies on:

- discontinuation rates for any reason,
- discontinuation rates due to adverse effects alone, and
- rate of adverse effects at 4 and 12 weeks.

The discontinuation rate in a clinical trial is considered to be a low estimate of what would be expected in the real world as women are more likely to adhere to treatment in a trial and there is reduced loss to follow-up for other reasons, such as individual support and encouragement to continue treatment by the research team. Adverse events associated with antimuscarinic drugs may be a sign that a drug is effective and may not be associated with treatment failure. The GDG agreed
that the discontinuation rate for any reason should be the outcome for the network meta-analysis as this was likely to represent the drop-out due to discontinuation and lack of effectiveness.

It was assumed that weekly discontinuation was constant and calculated so that the cumulative rate was that reported in the network meta-analysis for each antimuscarinic drug. The GDG view was that this is likely to be an underestimate of the rate of discontinuation which is usually higher in the first 4 weeks due to lack of immediate efficacy. As the data available for this period was limited it was not possible to make a different assumption in the model.

A discontinuation rate at one year was also included in the model. It was assumed that weekly discontinuation from week 13 to week 52 was constant. Estimated discontinuation at one year was reported to be high in published studies where this was estimated. A recently published UK study reported long-term use of antimuscarinics based on a longitudinal patient database of UK prescription data for 2007 (Wagg et al., 2012). In studies reporting discontinuation rates from non–UK studies, prescribing databases and pharmaceutical industry reports are quoted (Cardozo et al., 2010). Prescribing data that provides evidence of discontinuation over time is not routinely available in the UK. Appendix O reports the longer term discontinuation rates that have been identified in the literature.

Given the lack of data providing head-to-head comparison between drugs in the same populations, the GDG agreed to use the same discontinuation rate at one year for all drugs in the baseline analysis. The baseline discontinuation rate at 12 months was set an arbitrary level of 80% by the GDG. One-way sensitivity analysis was undertaken to consider the importance of this variable in driving the relative cost-effectiveness between drug therapy options. The only antimuscarinic drug that was not included in any head-to-head comparisons was darifenacin. Therefore the efficacy and discontinuation probabilities are based on placebo controlled trials only.

Table 6.9 Mean discontinuation and continence status probabilities derived from 2,000 random simulations in the network meta-analysis

<table>
<thead>
<tr>
<th>Antimuscarinic treatment</th>
<th>Discontinuation</th>
<th>Continence status (&quot;absolutely dry&quot;)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>week 4</td>
<td>week 12</td>
</tr>
<tr>
<td></td>
<td>week 4</td>
<td>week 12</td>
</tr>
<tr>
<td>Oxybutynin IR</td>
<td>11.0%</td>
<td>31.0%</td>
</tr>
<tr>
<td></td>
<td>28.0%</td>
<td>21.3%</td>
</tr>
<tr>
<td>Solifenacin</td>
<td>4.8%</td>
<td>15.4%</td>
</tr>
<tr>
<td></td>
<td>21.4%</td>
<td>15.9%</td>
</tr>
<tr>
<td>Oxybutynin ER</td>
<td>6.6%</td>
<td>20.2%</td>
</tr>
<tr>
<td></td>
<td>22.3%</td>
<td>16.7%</td>
</tr>
<tr>
<td>Tolterodine IR</td>
<td>5.2%</td>
<td>16.5%</td>
</tr>
<tr>
<td></td>
<td>27.2%</td>
<td>20.7%</td>
</tr>
<tr>
<td>Propiverine IR</td>
<td>11.6%</td>
<td>31.7%</td>
</tr>
<tr>
<td></td>
<td>23.8%</td>
<td>18.1%</td>
</tr>
<tr>
<td>Tolterodine ER</td>
<td>5.3%</td>
<td>16.7%</td>
</tr>
<tr>
<td></td>
<td>17.1%</td>
<td>12.4%</td>
</tr>
<tr>
<td>Propiverine ER</td>
<td>7.0%</td>
<td>21.0%</td>
</tr>
<tr>
<td></td>
<td>19.4%</td>
<td>14.3%</td>
</tr>
<tr>
<td>Fesoterodine</td>
<td>6.8%</td>
<td>20.8%</td>
</tr>
<tr>
<td></td>
<td>19.6%</td>
<td>14.5%</td>
</tr>
<tr>
<td>Trospatum</td>
<td>6.1%</td>
<td>18.8%</td>
</tr>
<tr>
<td></td>
<td>23.0%</td>
<td>17.3%</td>
</tr>
<tr>
<td>Oxybutynin TD</td>
<td>11.2%</td>
<td>30.0%</td>
</tr>
<tr>
<td></td>
<td>20.7%</td>
<td>15.5%</td>
</tr>
<tr>
<td>Darifenacin</td>
<td>4.8%</td>
<td>15.3%</td>
</tr>
<tr>
<td></td>
<td>24.6%</td>
<td>18.7%</td>
</tr>
<tr>
<td>Trospatum ER</td>
<td>7.3%</td>
<td>22.0%</td>
</tr>
<tr>
<td></td>
<td>21.2%</td>
<td>15.8%</td>
</tr>
<tr>
<td>Oxybutynin TG</td>
<td>5.9%</td>
<td>18.5%</td>
</tr>
<tr>
<td></td>
<td>20.4%</td>
<td>15.1%</td>
</tr>
</tbody>
</table>

Estimates of costs

Costs were derived from the number of women who are in treatment in any week (drug costs) and the number of women who are incontinent in any week (pad use). A woman who continues to experience incontinence incurs weekly costs for both her drug treatment and continued use of pads.

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The cost and doses of drugs were taken from the British National Formulary (November 2012) and cross-checked with the NHS Electronic drug tariff. There was very good agreement on prices from these two sources. Where the prices differed slightly, the lower value was used in the model. The cost of GP and specialist consultations were not included in the estimate as it was not considered that these costs would differ by use of different drugs. This assumes that all women who start antimuscarinic drugs require follow-up in primary care whether they continue with drug treatment or not. The cost of treating adverse conditions was not included in the model (see ‘Limitations of the analysis’ for further discussion).

Table 6.10 Cost of antimuscarinic drugs included in the health economic model

<table>
<thead>
<tr>
<th>Antimuscarinic drug</th>
<th>Dose</th>
<th>Daily frequency</th>
<th>Cost per pack</th>
<th>Packsize</th>
<th>Cost per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Darifenacin (Emselsex)</td>
<td>7.5 mg</td>
<td>1</td>
<td>£ 20.90</td>
<td>28</td>
<td>£ 5.23</td>
</tr>
<tr>
<td>Darifenacin Extended release (Emselex)</td>
<td>1 mg</td>
<td>1</td>
<td>£ 20.90</td>
<td>28</td>
<td>£ 5.23</td>
</tr>
<tr>
<td>Solifenacin (Vesicare)</td>
<td>5 mg</td>
<td>1</td>
<td>£ 27.62</td>
<td>30</td>
<td>£ 6.44</td>
</tr>
<tr>
<td>Tolterodine Tartrate (non-proprietary)</td>
<td>2 mg</td>
<td>2</td>
<td>£ 4.58</td>
<td>56</td>
<td>£ 1.15</td>
</tr>
<tr>
<td>Tolterodine (Detrusitol)</td>
<td>2 mg</td>
<td>2</td>
<td>£ 29.03</td>
<td>56</td>
<td>£ 7.26</td>
</tr>
<tr>
<td>Tolterodine – ER (Detrusitol XL)</td>
<td>4 mg</td>
<td>1</td>
<td>£ 25.78</td>
<td>28</td>
<td>£ 6.45</td>
</tr>
<tr>
<td>Propiverine IR (Detrunorm)</td>
<td>15 mg</td>
<td>1</td>
<td>£ 18.00</td>
<td>56</td>
<td>£ 2.25</td>
</tr>
<tr>
<td>Propiverine – ER (Detrunorm XL)</td>
<td>30 mg</td>
<td>1</td>
<td>£ 24.45</td>
<td>28</td>
<td>£ 6.11</td>
</tr>
<tr>
<td>Fesoterodine modified release (Toviaz)</td>
<td>4 mg</td>
<td>1</td>
<td>£ 25.78</td>
<td>28</td>
<td>£ 6.45</td>
</tr>
<tr>
<td>Oxybutynin Hydrochloride (non-proprietary)</td>
<td>5 mg</td>
<td>2</td>
<td>£ 4.36</td>
<td>56</td>
<td>£ 1.09</td>
</tr>
<tr>
<td>Oxybutynin Immediate release (Cystrin)</td>
<td>5 mg</td>
<td>2</td>
<td>£ 21.99</td>
<td>84</td>
<td>£ 3.67</td>
</tr>
<tr>
<td>Oxybutynin Immediate release (Ditropan)</td>
<td>5 mg</td>
<td>2</td>
<td>£ 12.82</td>
<td>84</td>
<td>£ 2.14</td>
</tr>
<tr>
<td>Oxybutynin Extended Release (Lyrinel)</td>
<td>5 mg</td>
<td>1</td>
<td>£ 13.77</td>
<td>30</td>
<td>£ 3.21</td>
</tr>
<tr>
<td>Oxybutynin Transdermal (Kentera)</td>
<td>1 patch</td>
<td>twice weekly</td>
<td>£ 27.20</td>
<td>8</td>
<td>£ 6.80</td>
</tr>
<tr>
<td>Trospium chloride immediate release (non-proprietary)</td>
<td>20 mg</td>
<td>2</td>
<td>£ 18.20</td>
<td>60</td>
<td>£ 4.25</td>
</tr>
</tbody>
</table>
A GDG member obtained figures for the cost of continence pads from one English county. The weekly cost of supplying disposable continence products was £13,748, or £4.93 per woman. However as this estimate was NHS costs only and did not include on-going lifestyle advice (for example from physiotherapists and continence advisors or in primary care), or physiotherapy sessions, the GDG considered this to be an underestimate of the total average cost per woman per week of incontinence. In the first ‘base case’ analysis (before assessing the impact of changing key variables on cost-effectiveness), the cost of incontinence was estimated to be £8 per week which was the first estimate used in the economic model. This value was varied in the model to see if it changed the relative cost-effectiveness of the drugs. If it was found to be an important driver of the relative cost-effectiveness of drugs, then it would be important to ensure that the cost was accurately estimated. If a wide margin of error does not change the relative cost-effectiveness of drugs then an accurate estimate is less important.

The value of £8 per week is similar to that reported in the US study by Subak and colleagues who reported an annual cost of incontinence of $750 per person (Subak et al 2006).

Estimates of quality of life

Quality of life weightings (‘utilities’) for continence and incontinence have been published. There have also been data published on quality of life weightings of women experiencing varying degrees of OAB symptoms reported as a composite measure of ‘micturitions and leakages per day’ (whether these events were voluntary or involuntary was not specified). However, the studies included in the systematic review undertaken for this guideline did not report this level of detail for individual drugs and health states, only mean change in episodes of incontinence and episodes or urgency per day at 4 weeks and 12 weeks. Other published health economic models that have used this approach have had access to individual patient level data in a clinical trial, or have used statistical modelling techniques to estimate the mean change between levels of severity. The advantage of using levels of severity in a model is that it can capture improvements in quality of life that do not lead to complete recovery. However, it was the GDG’s view that an improvement in episodes of urgency or incontinence that did not lead to complete dryness may not have impact on the quality of life of women experiencing urinary problems in the same way and this improvement could not be assumed. Therefore, they chose to focus on continence status as the primary effectiveness outcome in the health economic modelling. The GDG view was that drugs that lead to the most improved continence status (complete dryness) would also be the drugs leading to the most improved symptoms without complete dryness. Therefore, the cost-effectiveness of drugs is likely to be underestimated in this analysis.

A recent health technology appraisal reported values based on a systematic review of quality of life studies (Imamura et al., 2010). This study reported a review of the literature on values and reported the quality of life weightings for “the success of treatment” and “the failure of treatment.” These weightings were used in this model as the estimates for the health states ‘continent’ and ‘incontinent’. Other published studies reported values within this range for women with different levels of severity of incontinence which supports the robustness of these estimates. Quality of life estimates reported in other studies are presented in appendix O.

Model assumptions

All health economic models are simplifications of reality. They balance the requirements from decision-makers that the outputs reflect the complexity of clinical reality, against the need to retain integrity by keeping to a minimum the number of assumptions that are required to drive the model. The GDG requested that all model assumptions and the description of those assumptions be clearly reported to maximise transparency of reporting. Table 6.11 presents the assumptions in the model alongside the GDG’s view of the rationality of that assumption, and whether the assumption was tested in further sensitivity analysis.
**Table 6.11 Assumptions used in the health economic model of antimuscarinic drugs for OAB.**

<table>
<thead>
<tr>
<th>Assumption</th>
<th>Basis of the assumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. That women who discontinue treatment with antimuscarinic drug stay off treatment for the remainder of the year. Switching treatment is not included in this model.</td>
<td>This model does not focus on the treatment pathway. Therefore it does not reflect clinical reality but compares the cost-effectiveness of all the antimuscarinic drugs considered for first line treatment.</td>
</tr>
<tr>
<td>2. That continence status should be measured as ‘completely dry’ rather than an improvement in episodes of incontinence.</td>
<td>The GDG view was “improvement” was a more subjective measure of health gain than “completely dry”. Depending on severity at the start of treatment, a change in the number of episodes could have great, little or no impact on quality of life.</td>
</tr>
<tr>
<td>3. That antimuscarinic drugs that lead to the most improved continence status (complete dryness) would also be the drugs leading to the most improved symptoms without complete dryness.</td>
<td>The assumption is that antimuscarinic drugs that are the most effective in making women with OAB completely dry are also more effective at improving symptoms. Additional benefit is associated with some improvement in symptoms so the cost-effective of drugs is likely to be underestimated in the model.</td>
</tr>
<tr>
<td>4. That women who are off treatment are incontinent for the remainder of the model (up to one year).</td>
<td>This may represent an overestimate of the number of women who are incontinent in one year as some women will resume continence without treatment.</td>
</tr>
<tr>
<td>5. That weekly continence rates are linear throughout the model, and are determined by 12-week continence rates reported in RCTs and continence rates at one year.</td>
<td>This was a simplifying assumption given the lack of data for discontinuation rates.</td>
</tr>
<tr>
<td>6. That all women with continued incontinence are offered the same package of care to manage their incontinence.</td>
<td>The baseline weekly cost of managing continence was based on pad use only. Other costs were assumed to vary little between drugs. Personal and NHS costs were included because including NHS costs only was likely to skew the analysis.</td>
</tr>
<tr>
<td>7. That adverse events stop when antimuscarinic drug treatment stops and that there are no prolonged adverse effects.</td>
<td>The GDG accepted that this was a reasonable assumption reflecting clinical practice (see 8. and 11. below)</td>
</tr>
<tr>
<td>8. That the cost of adverse events is not included in the analysis.</td>
<td>Adverse events are rare and were considered to be equally likely with all the drugs being compared. The majority of adverse events are experienced only while on treatment and will stop when treatment is discontinued.</td>
</tr>
<tr>
<td>9. That all women in the hypothetical cohort can be offered drug therapy.</td>
<td>In reality some antimuscarinics are not suitable for all women, such as oxybutynin IR in the frail elderly. This is reflected in the recommendations.</td>
</tr>
<tr>
<td>10. That no additional primary care or nursing support is required by women who are incontinent, that is, that they would require the same amount of support as women on successful treatment.</td>
<td>The GDG acknowledged that women who have successful treatment may continue to have problems with urgency or have side effects that may require additional health care. Women who continued to be incontinent are likely to have health care needs requiring support from primary care or a specialist team.</td>
</tr>
<tr>
<td>11. That the discontinuation rate at one year is the same for all antimuscarinic drugs, 80%.</td>
<td>It is widely reported that discontinuation is high for all antimuscarinic drugs at one year. No data were identified to allow the model to discriminate between drugs on the basis on discontinuation. This assumption was tested in sensitivity analysis.</td>
</tr>
</tbody>
</table>
## Results

### Analysis with initial (base case) values

The table below shows the incremental cost-effective ratios and net benefits for all the antimuscarinic drugs included in the health economic analysis.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>First line</th>
<th>Second line</th>
<th>Net benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cost</td>
<td>QALY</td>
<td>Cost per QALY</td>
</tr>
<tr>
<td>Oxybutynin IR</td>
<td>£347.07</td>
<td>0.7656</td>
<td>Dominates</td>
</tr>
<tr>
<td>Tolterodine IR</td>
<td>£353.45</td>
<td>0.7652</td>
<td>Dominated*</td>
</tr>
<tr>
<td>Propiverine IR</td>
<td>£387.87</td>
<td>0.7625</td>
<td>Dominated</td>
</tr>
<tr>
<td>No treatment</td>
<td>£416.00</td>
<td>0.7400</td>
<td>Dominated</td>
</tr>
<tr>
<td>Oxybutinin ER</td>
<td>£425.64</td>
<td>0.7610</td>
<td>Dominated</td>
</tr>
<tr>
<td>Trospium IR</td>
<td>£452.95</td>
<td>0.7616</td>
<td>Dominated</td>
</tr>
<tr>
<td>Darifenacin</td>
<td>£477.83</td>
<td>0.7632</td>
<td>Dominated</td>
</tr>
<tr>
<td>Trospium ER</td>
<td>£498.03</td>
<td>0.7599</td>
<td>Dominated</td>
</tr>
<tr>
<td>Propiverine ER</td>
<td>£515.08</td>
<td>0.7583</td>
<td>Dominated</td>
</tr>
<tr>
<td>Oxybutynin TD</td>
<td>£516.34</td>
<td>0.7596</td>
<td>Dominated</td>
</tr>
<tr>
<td>Fesoterodine</td>
<td>£523.92</td>
<td>0.7585</td>
<td>Dominated</td>
</tr>
<tr>
<td>Solifenacin</td>
<td>£524.45</td>
<td>0.7600</td>
<td>Dominated</td>
</tr>
<tr>
<td>Oxybutinin TG</td>
<td>£533.81</td>
<td>0.7592</td>
<td>Dominated</td>
</tr>
<tr>
<td>Tolterodine ER</td>
<td>£537.91</td>
<td>0.7561</td>
<td>Dominated</td>
</tr>
</tbody>
</table>

* other alternatives drugs are both cheaper and more effective

** other more expensive alternatives have a lower cost per QALY

***net benefit is calculated as (QALYs x £20,000) - cost of treatment

The weekly cost of oxybutynin (immediate release), tolterodine (immediate release) and propiverine (immediate release) were below the cost of ‘no treatment.’ Oxybutynin (immediate release) was the most cost-effective first-line antimuscarinic therapy. Tolterodine (immediate release) and propiverine (immediate release) were more costly than oxybutynin (immediate release) and were associated with marginally fewer health benefits (QALYs).

For second-line therapy (where optimal treatment is not achieved with the first choice of antimuscarinic drug), oxybutynin (extended release) was cost-effective compared with no treatment when the top three antimuscarinic drugs for first-line treatment were excluded. Oxybutynin (extended release) had an ICER of around £600 per QALY compared with no treatment. Darifenacin was borderline cost-effective compared with oxybutynin (extended release) at around £23,000 per QALY.

This method of presenting the results does not provide evidence of uncertainty in any of the estimates of costs-effectiveness. The results of the probabilistic analysis below provides this evidence for first-line and second-line antimuscarinic drug treatments.
Probabilistic sensitivity analysis

Simulations were run for a range of willingness-to-pay (WTP) thresholds from zero to £40,000 within which NICE’s £20,000 per QALY threshold lies. Table 6.13 shows the net benefit for all antimuscarinic drugs at the £20,000 per QALY threshold, ranked in order. It shows that as first-line treatment, oxybutynin (immediate release) had the highest net benefit followed by tolterodine (immediate release) and propiverine (immediate release). A second analysis was undertaken removing the three immediate release antimuscarinic drugs with the highest chance of being cost-effective (oxybutynin, propiverine, and tolterodine). Oxybutynin topical gel and transdermal preparation were also excluded from this second analysis as these are alternative formulations of oxybutynin with similar side-effects. The second-line treatment analysis showed that oxybutynin (extended release), darifenacin and trospium (immediate release) had the highest probability of being the most cost-effective option. Of the remaining alternatives, only trospium (extended release) had a greater than 1% chance of being cost-effective. Although none of them alone had a high chance of being cost-effective (the probabilities ranged from a 30% to 38% chance), one of those three alternatives was the most cost-effective in 98% of simulations.

<table>
<thead>
<tr>
<th>Drug name</th>
<th>Probability of being the most cost-effective at £20,000 per QALY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>As 1st line treatment</td>
</tr>
<tr>
<td>Oxybutynin IR</td>
<td>45%</td>
</tr>
<tr>
<td>Tolterodine IR</td>
<td>30%</td>
</tr>
<tr>
<td>Propiverine IR</td>
<td>16%</td>
</tr>
<tr>
<td>Oxybutynin ER</td>
<td>2%</td>
</tr>
<tr>
<td>Darifenacin</td>
<td>3%</td>
</tr>
<tr>
<td>Trospium IR</td>
<td>2%</td>
</tr>
<tr>
<td>Trospium ER</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Oxybutynin TD</td>
<td>2%</td>
</tr>
<tr>
<td>Solifenacin</td>
<td>0</td>
</tr>
<tr>
<td>Propiverine ER</td>
<td>0</td>
</tr>
<tr>
<td>Oxybutynin TG</td>
<td>0</td>
</tr>
<tr>
<td>Fesoterodine</td>
<td>0</td>
</tr>
<tr>
<td>Tolterodine ER</td>
<td>0</td>
</tr>
<tr>
<td>No treatment</td>
<td>0</td>
</tr>
</tbody>
</table>

The cost-effectiveness acceptability curve (CEAC) curve is another way of displaying the data to indicate the probability that any one drug had the highest net benefit in any simulation across a wide range of willingness to pay thresholds. A CEAC curve is shown in figure 6.1 which shows that, for first-line treatment, oxybutynin (immediate release) had the highest probability of being cost-effective at all cost per QALY thresholds. For second-line treatment, where the most cost-effective first line treatments were removed from the analysis and oxybutynin transdermal and topical gel were also removed, the CEAC lines crossed as the thresholds rose (figure 6.2). Since this figure is less straightforward to interpret, a cost-effectiveness frontier showing only those treatments that are cost-effective at a specific WTP value is also presented in figure 6.3. This is simply a more succinct way of showing the same data (figure 6.3)

Net benefit is calculated as the difference between the benefit of treatment (calculated as QALYS multiplied by willingness to pay, i.e. £20,000) and the cost of treatment

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2013 Update
The analysis shows that with over 2,000 simulations sampling from the effectiveness and discontinuation distributions for all antimuscarinic therapies in the analysis, oxybutynin IR had the highest likelihood of being the most cost-effective first line treatment option at the £20,000 per QALY threshold (45% probability). This result can also be interpreted as meaning that in more than 50% of the simulations oxybutynin (immediate release) did not have the highest net benefit. There was no other drug that had a higher than 30% probability of being the most cost-effective.
Figure 6.2. Cost-effectiveness acceptability curves for second-line treatment with antimuscarinic drugs for women with OAB, base case analysis.

Figure 6.3. Cost-effectiveness frontier for second-line treatment with antimuscarinic drugs for women with OAB.

One-way sensitivity analysis

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a) Discontinuation rates

In the base case analysis, a discontinuation rate of 80% was assumed for all antimuscarinic drugs at 12 months. A new study was identified that demonstrated varying discontinuation rates at 12 months for some of the drugs included in the health economic model. Data published in a recent UK study suggested that although discontinuation was high for all drugs, more women remained on solifenacin (65% discontinuation) than on other comparative drug therapies (all over 70%) (Wagg et al., 2012). Therefore a sensitivity analysis was undertaken to establish whether using these discontinuation rates changed the ranking of cost-effectiveness in the health economic model.

For preparations that were not included in the published study, the same discontinuation rate as oxybutynin (immediate release) was assumed.

Table 6.14 Discontinuation rates for antimuscarinic drugs for OAB at 12 months based on UK data published in 2012 (Wagg et al., 2012)

<table>
<thead>
<tr>
<th>Antimuscarinic drug</th>
<th>Discontinuation rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxybutynin IR</td>
<td>78%</td>
</tr>
<tr>
<td>Solifenacin</td>
<td>65%</td>
</tr>
<tr>
<td>Tolterodine IR</td>
<td>76%</td>
</tr>
<tr>
<td>Propiverine IR</td>
<td>73%</td>
</tr>
<tr>
<td>Tolterodine ER</td>
<td>72%</td>
</tr>
<tr>
<td>Propiverine ER</td>
<td>78%</td>
</tr>
<tr>
<td>Fesoterodine</td>
<td>78%</td>
</tr>
<tr>
<td>Trospium</td>
<td>74%</td>
</tr>
<tr>
<td>Oxybutynin TD</td>
<td>78%</td>
</tr>
<tr>
<td>Darifenacin</td>
<td>83%</td>
</tr>
<tr>
<td>Trospium ER</td>
<td>78%</td>
</tr>
<tr>
<td>Oxybutynin TG</td>
<td>78%</td>
</tr>
<tr>
<td>Oxybutynin ER</td>
<td>74%</td>
</tr>
</tbody>
</table>

The estimates from Wagg et al., 2012 are all below the 80% discontinuation rate that was assumed in the base case analysis. The new values are not very far away from 80%, except for solifenacin. Using these values oxybutynin (immediate release) remained the most cost-effective option for first-line treatment (figure 6.4).

A second sensitivity analysis assumed no change in discontinuation or effectiveness after 12 weeks. This was undertaken to evaluate the cost-effectiveness of drugs under ‘best possible scenario’ conditions to evaluate the importance of the cost of discontinuation after 12 weeks rather than to test a realistic assumption. This assumption favours antimuscarinic drugs that are more effective at 12 weeks, making them relatively more cost-effective at one year than the base case model. However, changing this assumption did not change the ranking of cost-effectiveness between the antimuscarinic drugs (Figure 6.4). Oxybutynin (immediate release) remained the most cost effective option.

b) Cost of adverse events

The original (base case) model assumed no additional costs associated with the side-effects of treatment. This was based on the GDG view that adverse events lasting longer than the period of treatment were very rare and the consequences of the most common adverse events (such as dry mouth and constipation) would not have a lasting effect on quality of life. However, women who
discontinue treatment due to adverse events may require additional primary care support and this was not included in the base case analysis. Also, in very rare cases, there has been concern raised that oxybutynin (immediate release) may be associated with acute delirium requiring hospitalisation.

To take these additional costs into account, the health economic model was analysed with the following data included:

- 2 additional GP visits every eight weeks for women who discontinue antimuscarinic treatment and are no longer on active treatment for the remainder of the model. Cost per GP surgery consultation, £36 (Curtis, 2010)
- A hospitalisation episode for delirium in all age of 1 in 5000 women on oxybutynin (immediate release) was assumed. This was a GDG estimate based on the published literature on incidence of acute delirium with antimuscarinic drugs. The cost of hospitalisation was based on HRG code WD11Z (All Patient over 69 years with a mental health primary diagnosis treated by a non-specialist mental health service provider), local tariff £2029. Data provided by a GDG member based on local hospital data.

The inclusion of additional GP visits every two months increased the weekly cost of incontinence from £8 to £12.50. The cost of hospitalisation (approximately £2,000 per episode) for one in five thousand women on oxybutynin (immediate release) raised the average weekly cost of treatment from £1.09 to £1.49. The yearly cost of tolterodine (immediate release) was £534 per woman and £537 for oxybutynin (immediate release). All other options were more expensive and less effective than oxybutynin (immediate release) (table 6.16). The probability of oxybutynin (immediate release) being the most cost-effective reduced from 45% to 41%, with the probability rising for tolterodine (immediate release), and rising for propiverine (immediate release) and darifenacin. Oxybutynin (extended release) and trospium (immediate release) had a higher chance of being cost-effective as the cost of oxybutynin (immediate release) was increased.

<table>
<thead>
<tr>
<th>Antimuscarinic drug</th>
<th>Base case probabilities</th>
<th>New probabilities with higher cost data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxybutynin IR</td>
<td>45%</td>
<td>41%</td>
</tr>
<tr>
<td>Tolterodine IR</td>
<td>30%</td>
<td>31%</td>
</tr>
<tr>
<td>Propiverine IR</td>
<td>16%</td>
<td>17.5%</td>
</tr>
<tr>
<td>Oxybutynin ER</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Darifenacin</td>
<td>3%</td>
<td>3.5%</td>
</tr>
<tr>
<td>Trospium</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Trospium ER</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Oxybutynin TD</td>
<td>0%</td>
<td>0</td>
</tr>
<tr>
<td>Solifenacin</td>
<td>0%</td>
<td>0</td>
</tr>
<tr>
<td>Propiverine ER</td>
<td>0%</td>
<td>0</td>
</tr>
<tr>
<td>Oxybutynin TG</td>
<td>2%</td>
<td>3%</td>
</tr>
<tr>
<td>Fesoterodine</td>
<td>2%</td>
<td>0</td>
</tr>
<tr>
<td>Tolterodine ER</td>
<td>0%</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 6.15 Probabilities of cost-effectiveness at £20,000 per QALY for first line antimuscarinic drugs with higher cost scenario, comparison with base case cost scenarios.

2013 Update
### Table 6.16
Incremental cost effectiveness ratios (ICERs) for first-line treatment with antimuscarinic drugs for OAB with additional costs of primary and secondary care included. One year analysis.

<table>
<thead>
<tr>
<th>Drug</th>
<th>Cost</th>
<th>QALYs</th>
<th>ICER 1st line</th>
<th>ICER 2nd line</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tolterodine IR</td>
<td>£533.90</td>
<td>0.7652</td>
<td>£698</td>
<td>not in analysis</td>
</tr>
<tr>
<td>Tolterodine ER</td>
<td>£737.63</td>
<td>0.7561</td>
<td>dominated</td>
<td>dominated</td>
</tr>
<tr>
<td>Oxybutynin IR</td>
<td>£536.86</td>
<td>0.7656</td>
<td>£7,400</td>
<td>not in analysis</td>
</tr>
<tr>
<td>Propiverine IR</td>
<td>£573.99</td>
<td>0.7625</td>
<td>dominated</td>
<td>not in analysis</td>
</tr>
<tr>
<td>Oxybutynin ER</td>
<td>£615.07</td>
<td>0.7610</td>
<td>dominated</td>
<td>£14,604</td>
</tr>
<tr>
<td>Trospium</td>
<td>£640.92</td>
<td>0.7616</td>
<td>dominated</td>
<td>extended dominance</td>
</tr>
<tr>
<td>No treatment</td>
<td>£650.00</td>
<td>0.7400</td>
<td>dominated</td>
<td>dominated</td>
</tr>
<tr>
<td>Darifenacin</td>
<td>£662.48</td>
<td>0.7632</td>
<td>dominated</td>
<td>£21,101</td>
</tr>
<tr>
<td>Trospium ER</td>
<td>£689.62</td>
<td>0.7599</td>
<td>dominated</td>
<td>dominated</td>
</tr>
<tr>
<td>Oxybutynin TD</td>
<td>£708.65</td>
<td>0.7596</td>
<td>dominated</td>
<td>not in analysis</td>
</tr>
<tr>
<td>Propiverine ER</td>
<td>£710.25</td>
<td>0.7583</td>
<td>dominated</td>
<td>dominated</td>
</tr>
<tr>
<td>Solifenacin</td>
<td>£715.81</td>
<td>0.7600</td>
<td>dominated</td>
<td>dominated</td>
</tr>
<tr>
<td>Fesoterodine</td>
<td>£718.66</td>
<td>0.7585</td>
<td>dominated</td>
<td>dominated</td>
</tr>
<tr>
<td>Oxybutynin TG</td>
<td>£726.96</td>
<td>0.7592</td>
<td>dominated</td>
<td>not in analysis</td>
</tr>
</tbody>
</table>
Figure 6.4 Cost-effectiveness acceptability curve for first-line treatment with antimuscarinic drugs for women with OAB – assuming published UK discontinuation rates (Wagg et al., 2012)

Figure 6.5. Cost-effectiveness acceptability curve for first line treatment with antimuscarinic drugs for women with OAB – assuming no change in effectiveness or discontinuation after 12 weeks
Economic summary

Oxybutynin (immediate release) was the most cost-effective first-line treatment for women who are offered antimuscarinic therapy. It was both less expensive and more effective than no treatment and was the most cost-effective option for first-line treatment in 45% of simulations in the probabilistic sensitivity analysis. Tolterodine (immediate release) and propiverine (immediate release) were less effective and more expensive than oxybutynin (immediate release) but were cost-saving compared with no treatment which incurred a cost of approximately £8 a week per woman. The cost per woman per year was £347, £353 and £388 (see table 6.12) for oxybutynin, tolterodine, and propiverine (all immediate release) respectively. Therefore the opportunity cost of choosing a more expensive antimuscarinic drug was around £41 per woman per year. This can be interpreted as the cost (or ‘benefit foregone’) of offering a choice of one of three immediate release antimuscarinic drugs as first-line treatment.

In cases where immediate-release drug preparations are not tolerated, the cost-effectiveness of second line treatments using extended release preparations only was evaluated. Oxybutynin (extended release) was the most cost-effective option £426 per QALY compared with no treatment (see table 6.12). Trospium (immediate release) and darifenacin were equally effective but cost more than oxybutynin (extended release) incurring a cost per woman per year of £453 and £478 (see table 6.12) respectively (no cost per QALY was identified for these drugs as they were dominated by oxybutynin extended release). The ‘benefit foregone’ of offering a choice of antimuscarinic drugs as second-line treatment was around £52 per woman per year. The probabilistic sensitivity analysis indicated that no single drug had a high probability of being cost-effective. The highest probabilities were for oxybutynin (extended release), darifenacin, and trospium (immediate release) which were all between 30% and 38%. Furthermore, the probability that one of these three drugs was the most cost-effective option in any simulation was 98%.

There was a lack of evidence about longer term (12-months and longer) discontinuation and how this differs between antimuscarinic drugs. The first base case assumption assumed that all drugs had a discontinuation rate of 80% at 12 months, reflecting the current evidence about drug treatment for OAB in general. A sensitivity analysis was undertaken with new data that reported discontinuation rates for specific antimuscarinic drugs. The results did not change the overall conclusion of the analysis. Oxybutynin (immediate release) remained the most cost effective drug for first line treatment with immediate-release tolterodine and propiverine the next best options.

Similarly, maintaining a constant discontinuation and effectiveness rate after 12 weeks did not change the ranking of drugs. Oxybutynin (immediate release) still had the highest chance of being the most cost-effective (45%, see figure 6.5). The probability was 29% and 16.5% (see figure 6.5) for immediate release tolterodine and propiverine respectively, with all other probabilities lower than 10%.

The effect of increasing the cost associated with antimuscarinic drug treatment was also explored. The base case analysis assumed no additional costs associated with discontinuation and treatment of adverse effects. An additional analysis was undertaken which included costs of GP care after discontinuation (as a proxy for any primary or community care). It was assumed that women who discontinued antimuscarinic treatment would require an additional GP surgery visit every 8 weeks for the remainder of the year of the model. This visit was assumed to be additional to any regular check-ups that might be offered to all women with OAB regardless of whether they are treated with antimuscarinic drugs and would therefore be common to all women. The cost of managing rare and acute events requiring hospitalisation that have been associated with oxybutynin (immediate release) was also included in this analysis. An additional cost of £2,000 per episode for one in five thousand women was included in the cost of oxybutynin (immediate release). The risk of hospitalisation increased the cost of oxybutynin (immediate release) from £1.09 to £1.49 per woman per week. Although the incremental cost per QALY increased for all treatment options, oxybutynin (immediate release) was still the most cost-effective option at an acceptable cost per QALY. Oxybutynin (immediate release) was the most cost-effective option in 41% of simulations.

Limitations of the analysis

The assumptions in the model are set out in table 6.11. It was requested by the GDG to explain the key decisions that were made in the evaluation and to make the GDG’s assumptions fully transparent.
The discussion of the GDG’s view of the clinical reality of these assumptions is also reported in the translation of the evidence to recommendations.

Adverse events were assumed not to incur additional costs or to continue beyond treatment. Women on treatment were assumed to have few or no adverse effects in the base case analysis (sufficient to change the relative cost-effectiveness of antimuscarinic drugs) and women no longer on antimuscarinic treatment were assumed to have no lasting side-effects. The GDG were aware that treatment of antimuscarinic drugs are associated with rare but acute side-effects, but that these trends to be associated with an older class of drugs that have been found to be cost-ineffective. However, since oxybutynin (immediate release) is [an older drug and concerns have been raised about its side effect profile], a sensitivity analysis was undertaken taking into account the cost of hospitalisation associated with acute side effects.

The longer term effectiveness of antimuscarinic drug therapy could not be determined with the available data. It is well documented that the discontinuation rates for all antimuscarinic drugs is high, and there is recent data that shows there may be a difference between antimuscarinic drugs in discontinuation at one year but this has not been shown definitively in long-term head-to-head studies. In the first (base case) analysis, the health economic model assumed a common one year discontinuation rate for all drugs in the baseline analysis. The value was set an approximate level of 80% by the GDG. Since continence is associated with continuation of treatment, anti muscarinic drugs with higher rates of continence would also have higher continuation rates. The effect would be to make drugs that have higher rates of long term use even more cost-effective than the alternatives. This assumption was tested in sensitivity analysis using other assumptions and these changes to the model did not change the results.

Although the model considered the cost-effectiveness of antimuscarinics for first- and second-line treatment, the effectiveness data on which the model is based came from trials of first-line treatment only. It did not include data on the effectiveness of a second antimuscarinics once a first drug had failed. Therefore it is an assumption of the model that the effectiveness rates would be similar for both populations. The model may overestimate the cost-effectiveness of second line antimuscarinic drugs. However, the GDG did not consider that the difference in effectiveness between the different antimuscarinic drugs would change in second-line treatment and the recommended treatments were sufficiently cost-effective for a reduction in effectiveness in second line treatment not to overturn the results.

The analysis did not include the cost of treating adverse events, the need for hospitalisation or long term care as a result of serious adverse events. The range and incidence of adverse events by drug were not included in all the individual studies in the systematic review and were not reported to the GDG as they were not the outcomes prioritised by the group. The GDG view was that a large proportion of adverse events associated with antimuscarinic drugs only continued as long as the patient was on drug therapy and resolved quickly after discontinuation. The GDG view was that the cost to the NHS of managing rare adverse events such as psychosis could be very high but that there is a lack of evidence about whether the rates of these conditions differ by type of antimuscarinic drugs used.

Evidence to recommendations

Relative value placed on the outcomes considered

In the head-to-head review, all seven prioritised outcomes were reported, these can be found in appendix M.

For the NMA and health economic model, the GDG agreed that the outcomes of interest should be continence status (“absolutely dry”) and discontinuation rates (any reason). Continence status is an unambiguous outcome that is not relative to the current health status of the women. The adverse events reported with antimuscarinic treatment are common, especially dry mouth, which leads to high numbers of women dropping out of treatment. Therefore evidence that reported discontinuation rates was also prioritised for this question. Discontinuation rates (any reason) was chosen as the outcome rather than the rate of adverse events.
Consideration of clinical benefits and harms

Head-to-head review

The head-to-head review included a limited number of comparisons for each antimuscarinic drug. The GDG concluded that it would not be appropriate to base its recommendations on individual head-to-head comparisons due to the lack of data across all comparisons. A study showing benefit against a single comparator does not suggest a universal benefit against all other comparators.

The GDG opted to abandon the head-to-head review in August 2012 and replace it, in full, with a network meta-analysis.

Network meta-analysis

The evidence profile of the drugs for continence status showed that there was no statistically significant difference in effectiveness between the thirteen antimuscarinic drug preparations included in the review, with the exception of solifenacin over tolterodine (extended release).

The GDG did note that there are evident positive and negative trends in the data. For continence, the odds ratios favoured oxybutynin (immediate release) compared with all other drugs and favoured tolterodine (immediate release) except when compared with oxybutynin (immediate release). However, none of these results were statistically significant.

The network analysis outputs for discontinuation rates were more conclusive. Oxybutynin (immediate release) was shown to have a significantly higher discontinuation rate in comparison with all other drugs except propiverine (immediate release and extended release), oxybutynin (transdermal) and trospium (extended release). No other drug had significantly higher discontinuation rate compared with its comparators.

The probabilities shown in the posterior medians calculations show the absolute effect of each of the drugs. The absolute effect of each drug is as important as the relative difference between drugs, given as odds ratios with the NMA. The GDG noted that the difference between the drugs, for both outcomes, was small and all values showed that all antimuscarinic drugs were effective for the majority of women.

The GDG concluded that no drug should be removed or recommended based solely on the clinical data presented. Instead, these data were used in a health economic model and it was this model that was to be used as the decision making tool.

Consideration of health benefits and resource uses

The health economic model showed that oxybutynin (immediate release) was the most cost-effective option due to higher rates of effectiveness and its low price relative to all other options except non-proprietary tolterodine (immediate release). The probabilistic sensitivity analysis showed that oxybutynin (immediate release) was the most cost-effective option for first line treatment in 45% of model simulations, with tolterodine (immediate release) the most cost effective in 30% of simulations and propiverine (immediate-release) in 16%. Solifenacin, fesoterodine, tolterodine (extended release), oxybutynin (topical gel) and propiverine (extended-release) had a zero per cent chance of being cost-effective as first-line drugs. Fesoterodine had a zero per cent chance of being cost-effective as second-line treatment, solifenacin, tolterodine (extended release) and propiverine (extended release) had less than 1% probability and trospium (immediate release) 2%. The cost per woman per year was above £500 for these four drugs compared with around £350 for oxybutynin (immediate release).

The GDG therefore decided to recommend that these drugs should not be offered since they cost more without commensurate improvement in effectiveness.

The GDG acknowledged that there is a perception that oxybutynin (immediate-release) is not well tolerated by women with OAB. It is perceived as an inferior treatment option by many clinicians. There was a concern that women who do not get optimal efficacy with their first antimuscarinic drug could be discouraged from their experience from trying another antimuscarinic drug. Also, clinicians’ low expectations of the likelihood of success with oxybutynin (immediate-release) might adversely affect a woman’s willingness to tolerate the side-effects that indicate the drug is working effectively. Therefore the GDG decided to recommend two other immediate-release antimuscarinic drugs which the health economic analysis showed were cheaper than no treatment since no treatment incurs a cost of managing the symptoms of urinary incontinence. There was a cost associated with having a choice of first-line antimuscarinic drugs of around £40 per woman per year (the difference in cost per
woman per year of choosing a higher cost drug versus a lower cost drug). The GDG considered that this additional cost to the NHS was acceptable. Women should therefore be offered one of three antimuscarinic drugs (oxybutynin (immediate release), tolterodine (immediate release) and propiverine (immediate release) based on the side-effect profiles and the individual woman’s preferences.

Women should be offered an alternative antimuscarinic drug if the first drug did not achieve optimal effectiveness according to the woman. The immediate-release antimuscarinic drugs need to be taken more than once a day. This can be a barrier to effective treatment for some women and may one of the reason why optimal effectiveness is not achieved. Also the adverse events of these drugs may be similar because of the immediate-release action of the drug. The health economic model found that oxybutynin (extended release), darifenacin and trospium (extended release) all had a higher than 30% chance of being the most cost-effective option. Choosing one of those three alternatives was the most cost-effective option in 98% of simulations.

Therefore, the choice of second-line treatment should be either the other two immediate release preparations recommended as first-line treatment or trospium (extended release), oxybutynin (extended release), tolterodine (extended release) or darifenacin if it is suspected that the immediate release formulation of the drug is the cause of the first-line unsuccessful treatment.

Quality of evidence

The network meta-analysis was undertaken because there was sufficient data when placebo trials were included to complete a network with all 13 drugs included. Basing recommendations on a review of head-to-head trials would require the assumption that a benefit found in one comparison would translate to other comparison where there is no RCT data and the GDG was not satisfied that this was the case. The odds ratios from the head-to-head studies were used to validate the findings from the NMA. Some RCTs used in the head-to-head review were removed from the NMA because they had included doses that were above the recommend level.

To complete the network RCT data was taken from placebo controlled trials in addition to the evidence from head-to-head studies. For one drug (darifenacin) there were no head-to-head reporting continence status so evidence of effectiveness reported is based on placebo-controlled trials only. This is a legitimate methodological approach but it is acknowledged that the evidence driving the cost-effectiveness model is weaker than it would be if it had been possible to include only head-to-head trials in the analysis.

Other considerations

Starting treatment with antimuscarinic therapy

Antimuscarinic treatment should be considered for women who have not achieved success with conservative management alone. Antimuscarinic drugs can also be considered as an adjunct to conservative management in some circumstances (see conservative management, chapter 4).

The GDG noted that antimuscarinic drug therapy can be offered before establishing whether the cause of the OAB symptoms is detrusor overactivity. The evidence in the review included populations in whom DOA had been proven as well as populations in whom urodynamics had not been performed. Therefore, the recommendations are applicable to both groups.

Treatment should be initiated on the lowest dose to reduce the likelihood of side-effects. Because of the risk of high anticholinergic load, the GDG recommended that the initial dose of a new medication should be at the BNF quoted minimum effective amount. It was reasoned that this would allow enough scope to increase the dose to optimise effectiveness until the time of medication review.

The GDG view was that women should be given all the information about treatment effects and side-effects including information about the lack of evidence of long-term effectiveness. The GDG’s view was that if a woman receives information reporting adverse effects and the time it takes for effective treatment to be noticeable there is greater chance that she will continue treatment. This increases the likelihood that treatment will be effective and mild adverse effects will be tolerated.

When deciding on which drug should be offered or whether these drugs are appropriate for an individual woman, the decision should take into account; the frequency and route of administration, co-existing conditions (for example SUI) and the ongoing use of other medications (related and unrelated to OAB).
The GDG noted that some women may not get optimal outcomes with oral medication (for example those who have difficulty swallowing. Therefore, a transdermal alternative may be offered for these women. The topical gel formulation for oxybutynin should not be used as it is not currently licensed in the UK for this condition. No recommendation has been made for this preparation.

**Switching to another antimuscarinic drug**

If a drug is not providing optimal benefit then normally another effective antimuscarinic drug should be offered. However, the GDG acknowledged that while most women will be willing to try a different drug, others will be reluctant for various reasons. For some women, the idea of long-term medication is difficult to accept or they may have had significant side-effects from the first drug and so are less keen to try another one. Discussion of the treatment options should be an integral part of the medication review (see below).

**Frail older women**

Antimuscarinic drugs may work differently in particular patient groups, for example, frail older women and women with multiple co-morbidities of any age. These drugs have differing affinities for antimuscarinic receptors within the brain and a variable ability to cross the blood brain barrier. This impacts on the potential for adverse effects on cognitive function, both in the short-term, with a risk of acute confusional states, and in the longer term. This is particularly important in the context of absolute anticholinergic load, that is, the number of other medications the women is taking that have anticholinergic activity. These patients groups should still be offered treatment with these drugs for overactive bladder symptoms, but only after a full medication review.

The GDG defined a frail older woman as one with multiple comorbidities, functional impairments related to age such as walking or dressing difficulties and any degree of cognitive impairment. Although all women at risk of high anticholinergic load should be prescribed drugs for overactive bladder with caution, the GDG felt an explicit recommendation should be made to prohibit the use of oxybutynin because of the risk of impairment of daily functioning which is common, as well as the less common risk of chronic confusion. In very rare cases, women can experience acute delirium which is a serious adverse event that may require hospitalisation.

**Medication reviews**

The GDG noted the evidence suggests high rates of discontinuation with all antimuscarinic drugs due to adverse effects and that there is a lack of data on long-term efficacy. Women should be told explicitly about the likelihood of success and failure with a specific drug before they start treatment. They should also be told about the known side-effects of each drug such as dry mouth and constipation and that side-effects may indicate that the treatment is working. They should also be made aware that they may not become aware of a positive effect on their condition before four weeks of treatment and should be encouraged to persevere for this period of time if possible. Realistic expectations of treatment are likely to improve continuation with antimuscarinics and increase the likelihood of successful treatment in the short and medium term.

Some women on antimuscarinics may stop taking the treatment soon after starting due to intolerable side-effects. If they do not notify their health care professional that they have withdrawn from treatment they may continue to have untreated symptoms. A prescribed medication review has been recommended to allow efficient management of women’s drug regime and provide support for women who may not request it for themselves. The evidence suggested that four weeks is a minimum time for the optimal effect to become apparent with antimuscarinic treatment. A review at this stage would be the earliest point in most women’s treatment to measure effect. However, an earlier review may be required and access to advice should be available. If a woman shows limited improvement, no improvement or reported intolerable adverse effects, then treatment should be amended. This amendment could be either a change in dosage, a change in drug or switching to another type of treatment.

The 4-week review should be arranged for women on new treatment and after change to treatment to check progress. This meeting can happen in clinic or remotely (via telephone).

The GDG’s expert opinion was that once a woman continues treatment beyond 12 weeks a further review should be offered around this time to assess on-going effectiveness. At this point, if the outcomes of the treatment remain satisfactory to the woman, treatment should continue as long as it...
remains effective. If the outcomes are unsatisfactory, a change in treatment or dose should be considered and reviewed again four weeks after the change is made.

Long-term follow-up of on-going treatments should take place alongside medication reviews. These medication reviews usually take place annually or every 6 months if the woman is 75 years or older. The annual/bi-annual reviews can take place in primary care.

If antimuscarinic drug treatment is not successful, the options for further management (both non-therapeutic interventions and invasive therapy) should be reviewed with the woman. Not all women will opt for further invasive treatment. Their health care needs will still require review as they (and where appropriate their carers) continue to manage the physical and emotional demands of their condition, which will change over time.

For women who wish to consider invasive treatment a referral to an MDT should be arranged. Urodynamic testing should also be offered in conjunction with the referral to the MDT.

### Number 51
**Recommendation**

**General principles when using antimuscarinic drugs**

When offering antimuscarinic drugs to treat OAB always take account of:

- the woman's coexisting conditions (for example, poor bladder emptying)
- use of other existing medication affecting the total anticholinergic load
- risk of adverse effects. [new 2013]

**Number 52**

Before antimuscarinic drug treatment starts, discuss with women:

- the likelihood of success and associated common adverse effects, and
- the frequency and route of administration, and
- that some adverse effects such as dry mouth and constipation may indicate that treatment is working, and
- that they may not see the full benefits until they have been taking the treatment for 4 weeks. [new 2013]

**Number 53**

Prescribe the lowest recommended dose when starting a new antimuscarinic drug treatment. [new 2013]

**Number 54**

If a woman’s antimuscarinic drug treatment is effective and well tolerated, do not change the dose or drug. [new 2013]

### Choosing antimuscarinic drugs

**Number 55**

Flavoxate, propantheline and imipramine should not be used for the treatment of UI or OAB in women. [2006]

**Number 56**

Do not offer oxybutynin (immediate release) to frail older women. [new 2013]

**Number 57**

Do not offer the following to treat OAB or mixed UI:

- solifenacin, or
- propiverine (extended release), or
- fesoterodine, or
- trospium (extended release), or
- tolterodine (extended release) [new 2013]

**Number 58**

Offer the following choices first to women with OAB or mixed UI:

- oxybutynin (immediate release), or
- tolterodine (immediate release), or
- propiverine (immediate release). [new 2013]

**Number 59**

If the first-line treatment for OAB or mixed UI is not well tolerated, offer one of the

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9. The GDG defined ‘frail older women’ as those with multiple comorbidities, functional impairments such as walking or dressing difficulties and any degree of cognitive impairment.

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following as a second-line antimuscarinic drug treatment:
- trospium (immediate release), or
- oxybutynin (extended release), or
- darifenacin, or
- an alternative Immediate release drug (from recommendation 58). [new 2013]

60 Offer a transdermal antimuscarinic only to women unable to tolerate oral medication. [new 2013]

Reviewing antimuscarinic drug treatment

61 Offer a face-to-face or telephone review 4 weeks after the start of each new antimuscarinic drug treatment. Ask the woman if she is satisfied with the therapy and:
- if improvement is optimal, continue treatment, or
- if there is no or suboptimal improvement or intolerable adverse effects change the dose, or try an alternative antimuscarinic drug, and review again 4 weeks later. [new 2013]

62 Offer review before 4 weeks if the adverse events are intolerable. [new 2013]

63 Consider referral if the woman does not want to try another antimuscarinic drug, but would like to have specialist treatment. [new 2013]

64 Consider a further face-to-face or telephone review if a woman’s condition stops responding optimally to treatment after an initial successful 4 week review. [new 2013]

65 Review women who remain on long-term drug treatment for UI or OAB annually in primary care (or every 6 months for women over 75). [new 2013]

66 If antimuscarinic drug treatment is not successful, discuss the options for further management (non-therapeutic interventions and invasive therapy) with the woman:
- If she would like to think about invasive therapy, arrange urodynamic investigation to determine whether detrusor overactivity is present.
- If she does not wish to explore invasive therapy see recommendation 50. [new 2013]

6.2 Desmopressin

Desmopressin (also known as DDAVP) is a synthetic analogue of vasopressin or antidiuretic hormone, which acts by inhibiting diuresis while avoiding vasopressive effects. Used at night, it decreases nocturnal urine production.

Nocturia

Three DB placebo-controlled RCTs evaluated the use of desmopressin for nocturia. One evaluated 3 weeks’ treatment in women (n = 144), who were then offered continued desmopressin treatment for up to 1 year. The two other RCTs were smaller crossover studies that evaluated 2 weeks’ treatment (n = 17, n = 25), one of which enrolled men and women. An oral formulation of desmopressin was used in two studies (dose ranging from 100 to 400 μg), and an intranasal formulation in the third (dose 20 μg).

In the 3 week RCT in women, significantly greater improvements were seen with desmopressin in all nocturia-related outcomes (nocturia episodes, volume of nocturnal voids, duration of sleep to first nocturnal void, diuresis, ratio of day/night to 24 hour urine volume), and a reduction in the ‘bothersome factor’ of nocturia (assessed using BFLUTS). Follow-up of women who took desmopressin for up to 1 year indicated sustained benefit in the outcomes measured (50% or greater reduction in nocturia, duration of sleep to first nocturnal void, ‘bothersome factor’). [EL = 3]
In the crossover study in men and women, nocturia episodes and nocturnal diuresis were significantly lower with desmopressin compared with placebo, with no significant change in either group in 24 hour diuresis.\textsuperscript{415} [EL = 1+] Nocturnal frequency and urine output were significantly reduced with desmopressin (from baseline and compared with placebo) in the crossover study in women only, with no significant change in diurnal outcomes.\textsuperscript{416} [EL = 1+]

**Urinary incontinence**

A placebo-controlled ‘pilot’ RCT evaluated the use of desmopressin in the treatment of women with daytime UI. Four sequences of desmopressin 40 \( \mu \)g (seven doses) or placebo (three doses) were evaluated, with treatment administered intranasally when required. At both 4 and 24 hours after dose administration, the number of periods with no leakage was greater with desmopressin compared with placebo, and the volume voided or leaked during a UI episode lower with active treatment, although the confidence intervals for all mean values overlapped, indicating that differences were not statistically significant.\textsuperscript{417} [EL = 1+]

**Adverse effects**

Adverse effects reported across the short-term studies included headache, nausea, hyponatraemia, abdominal pain, frequency, dry mouth, dizziness, fatigue, peripheral oedema and earache.\textsuperscript{415–417} In the longer term study (up to 1 year), the most frequent adverse effects related to treatment in women were: hyponatraemia 12\% (none required treatment, none with sodium below 125 mmol/l); headache 7\%; frequency, peripheral oedema and UTI (each 3\%); and nausea and dizziness (each 2\%).\textsuperscript{414}

**Evidence statements for desmopressin**

The use of desmopressin significantly reduces nocturia. There is insufficient evidence that desmopressin reduces incontinence in adult women. A reduction in serum sodium is very common (more than 10\%). [EL = 1+]

Symptomatic hyponatraemia due to therapy with desmopressin may be more common in elderly women, and is more likely to occur soon after treatment initiation. Pretreatment and early posttreatment (72 hours) serum sodium monitoring is recommended. Where there are new symptoms or a change in medication, further measurement of serum sodium is recommended. [EL = 4]

**Evidence to recommendation 2013**

The GDG chose to update the recommendation for desmopressin in light of the cautions outlined within the BNF.

<table>
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<tr>
<th>Number</th>
<th>Recommendation</th>
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<tbody>
<tr>
<td>67</td>
<td>The use of desmopressin may be considered specifically to reduce nocturia in women with UI or OAB who find it a troublesome symptom. Use particular caution in people with cystic fibrosis and avoid in those over 65 years of age or with cardiovascular disease or hypertension. [2006, amended 2013]</td>
</tr>
</tbody>
</table>

### 6.3 Diuretics

Only one RCT involving women was identified. This was a small DB placebo-controlled crossover study that evaluated bumetanide 1 mg for the treatment of nocturia in men and women (\( n = 33; 28 \) completed; 13 women). Treatment was given 4–6 hours before bedtime for 2 weeks. Weekly nocturia episodes were significantly fewer after bumetanide treatment compared with placebo (10 versus 14).\textsuperscript{418} [EL = 1+] No studies evaluating furosemide in women were identified.

**Evidence statement for diuretics**

There is insufficient evidence to support the use of diuretics for the treatment of nocturia in women with UI. [EL = 1+]
6.4 Duloxetine

Duloxetine is a serotonin and noradrenaline reuptake inhibitor that acts chiefly in the sacral spinal cord. It is thought that the resultant increase in pudendal nerve activity increases urethral sphincter contraction and closure pressure. It is licensed for use in moderate to severe stress UI.

A systematic review has considered the effectiveness of serotonin and noradrenaline reuptake inhibitors (duloxetine) for the treatment of stress UI. Because some of the studies included in the review were only published as abstracts, and because some relevant studies were not included in the review, all relevant studies are considered individually.

Six DB placebo-controlled RCTs evaluated the effectiveness of duloxetine for the treatment of predominant stress UI in women, five of which were considered to be of good quality [420–424] [EL = 1+]

A further RCT compared duloxetine (with or without PFMT) with PFMT alone or no active treatment (placebo drug and sham PFMT) in women with stress UI, 11% of whom had had prior continence surgery (n = 201). [229]

Of the six placebo-controlled RCTs, one was a 12 week dose-ranging study, comparing 20, 40 and 80 mg daily doses of duloxetine in women with at least four leakage episodes per week (n = 553) [420].

Three other 12 week studies, identical in design, evaluated duloxetine 80 mg in women with at least seven (mean about 17) leakage episodes per week (total n = 1635). [421–423] The fifth study considered the impact of duloxetine 80 mg on QOL after 9 months’ treatment (n = 451). [424] [EL = 1+] One study evaluated duloxetine use in women awaiting surgery for stress UI (n = 92). [425] [EL = 1−] Across the six studies, between 8% and 18% had had prior continence surgery. Up to 35% of women across four studies performed PFMT. [420–423]

The outcomes evaluated across the 12 week studies were leakage episodes, voiding interval, QOL (I-QOL) and patient global impression of improvement (PGI-I). The findings for duloxetine 80 mg per day (40 mg b.d.) compared with placebo were as follows:

- leakage episodes: significantly greater median reductions with duloxetine in each study (range of median reductions 50–64% versus 28–41% placebo) [420–423]
- voiding interval: significantly greater increases with duloxetine in each study (range of mean increases 15–34 minutes versus 4–9 minutes) [420–423]
- QOL: significantly greater improvement (I-QOL) with duloxetine in three studies; [420–422] no significant difference between groups in one [423]
- PGI-I: significantly more women reported improvement with duloxetine in three studies; [420–422] no significant difference between groups in one. [423] [EL = 1+]

The lower daily duloxetine dose of 20 mg b.d. (40 mg daily) was associated with significantly greater reductions in leakage episodes and in frequency compared with placebo, but not in QOL or PGI-I [420] [EL = 1+]

The RCT that focused on QOL as an outcome after 9 months’ treatment found no significant differences between duloxetine 80 mg and placebo in increases in I-QOL scores or in PGI-I at 3 or 9 months. About one-quarter of the women had dropped out of the study at the endpoint. [424] [EL = 1+]

In the study of women awaiting surgery, significantly greater improvements in leakage episodes, I-QOL and PGI-I scores were seen with duloxetine compared with placebo. A ‘willingness to consider surgery’ questionnaire indicated that a greater proportion of women treated with duloxetine versus placebo would change their mind about having surgery, although seven women (one duloxetine, six placebo) were excluded from this analysis. [425] [EL = 1−]

In the comparison of duloxetine 80 mg (with or without PFMT) with PFMT alone or no active treatment (sham PFMT and placebo drug), PFMT involved a target of 200 contractions a week (over 4 days), and the ‘knack’. Sham PFMT involved contracting hip abductor muscles. Significantly greater reductions in leakage episodes were reported with duloxetine (with or without PFMT) compared with PFMT alone after 12 weeks’ treatment. Global improvement and I-QOL scores indicated greater improvement in the duloxetine plus PFMT group compared with no active treatment. [229] No significant...
differences were reported between the PFMT and placebo groups in any outcome (leakage episodes, global improvement, I-QOL scores) after 12 weeks’ treatment.229 [EL = 1+]

Adverse effects

Across all studies, significantly more women in all duloxetine dosage groups discontinued treatment owing to adverse effects compared with placebo (range 15–33% versus 0–6%). Nausea was significantly more common with all daily dosages of duloxetine (range 13–46% versus 2–13% placebo), and accounted for a significant proportion of withdrawals compared with placebo in one study.425 Other adverse effects that occurred significantly more commonly with duloxetine in two or more studies were dry mouth, constipation, fatigue, insomnia, dizziness, increased sweating, vomiting and somnolence.229,421–423,425 Adverse effects occurring in the PFMT and no active treatment arms of the duloxetine study were pooled, and thus a distinction between duloxetine and PFMT or no active treatment is not possible.229

Cost effectiveness of duloxetine

Duloxetine is the only drug therapy currently available for stress UI. As part of this guideline, we considered the cost effectiveness of duloxetine in order to inform recommendations about the sequencing of conservative therapies, something that could potentially have a large impact on clinical practice.

One published article considered the cost effectiveness of duloxetine.428 This described a state transition (Markov) model to evaluate the cost effectiveness of duloxetine alone or in combination with PFMT against ‘standard’ treatment (PFMT and surgery), either as a first-line treatment or as second line to PFMT for stress UI, over 2 years. The Markov approach was adopted so as to capture the effect of waiting times on access to services, with a concomitant effect on deferred costs and benefits. The results of the model suggested that, using a willingness to pay threshold of £30,000 per QALY, duloxetine was a cost effective treatment for stress UI. Using baseline assumptions, the authors reported that the ICER of duloxetine alone when used first-line was £8,730 per QALY and £5,854 per QALY when used first-line in combination with PFMT.428 When used second-line to PFMT, duloxetine dominates standard treatment.

The health economics model of the use of duloxetine as a first-line treatment for stress UI in women used in this study factored in delays for access to services.426 Clinical trials would normally try to eliminate differential timings of treatment, to ensure a like-for-like comparison. Similarly, it could be argued that economic evaluation should be neutral with respect to treatment timing so that the results are not contingent on a particular service configuration. Indeed, it seems that service delivery should be configured to produce cost effective health care rather than be a driver of what is deemed cost effective. Therefore, two additional health economics models, which did not consider access times to health services, were developed for this guideline. The first sought to compare the cost effectiveness of PFMT versus duloxetine as a first-line treatment for women with moderate to severe stress UI, which is assumed to be 14 or more leakage episodes per week. In this model, treatment effects and costs were based on a 52 week time frame. A second model, based on a 2 year follow-up, assessed the cost effectiveness of duloxetine versus surgery as a second-line treatment for women with moderate to severe stress UI in whom first-line treatment with PFMT had been unsuccessful. These models are described in detail in Appendix U.

Under baseline assumptions, PFMT ‘dominates’ duloxetine as a first-line treatment. This means that it is both more effective and less costly. The sensitivity analyses undertaken (and detailed in Appendix U) did not change this conclusion. The second-line treatment model suggests that surgery is more cost effective than duloxetine. Surgery is more costly but the ICER, in the baseline analysis, falls below the £20,000 per QALY threshold used by NICE as a willingness to pay benchmark for cost effectiveness.

Evidence statements for duloxetine

Short-term studies (up to 12 weeks) suggest that the use of duloxetine is associated with a reduction in leakage episodes, an increased voiding interval and improved quality of life in women with stress UI or mixed UI where stress-related leakage is the predominant symptom. Between-group differences are clinically small. Adverse effects, particularly nausea, and discontinuation rates are very common (more than 10%). There is a lack of long-term safety data. The combination of duloxetine and PFMT is more effective than no treatment. It remains unclear whether the combination is better than either treatment alone. [EL = 1+]
An economic model constructed for the purposes of this guideline suggested that PFMT is more cost effective than duloxetine alone as first-line treatment for stress UI. This result was generally not affected by making plausible changes to model parameters in favour of duloxetine. While the model was based on the best available clinical evidence, there is a lack of long-term effectiveness data for either treatment. A second model suggested that surgery was cost effective relative to duloxetine as a second-line treatment to PFMT. However, duloxetine was the lower cost treatment option and therefore its use does not necessarily impose opportunity costs on the NHS relative to surgery.

### Number Recommendation

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<tbody>
<tr>
<td>68</td>
<td>Duloxetine is not recommended as a first-line treatment for women with predominant stress UI. Duloxetine should not routinely be used as a second-line treatment for women with stress UI, although it may be offered as second-line therapy if women prefer pharmacological to surgical treatment or are not suitable for surgical treatment. If duloxetine is prescribed, women should be counselled about its adverse effects. [2006]</td>
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#### 6.5 Oestrogens

Oestrogens help to maintain health of the tissues that are essential for normal pressure transmission in the urethra. This includes the sphincter muscles, urothelium and vascular tissues, as well as the urethral secretions that may help to create a 'seal'. Oestrogen replacement has been promoted as a solution to UI in postmenopausal women, although its chief mode of action is unclear.

Four systematic reviews of oestrogens for the treatment of UI and/or OAB were identified, which were completed at different times and which considered different questions. Therefore, studies included in these reviews were considered individually, together with other relevant RCTs.

Ten RCTs evaluated the use of oestrogens for the treatment of postmenopausal women with stress UI or other types of UI or OAB. Four further RCTs that primarily evaluated the effects of oestrogen on symptoms of vaginal atrophy reported some data for urological symptoms. Additionally, secondary analyses of data from three RCTs that were designed to evaluate the benefits and risks of hormone replacement therapy (HRT) provide data on UI and/or OAB.

The comparator group was placebo in all except two studies. One of these two studies is also considered in the physical therapies section and involved a comparison of PFMT with oestrogen, electrical stimulation and no treatment. The second study compared two oestrogen preparations.

### Intravaginal oestrogens

Five RCTs evaluated the use of intravaginal oestrogens for UI and/or other urological symptoms. Two RCTs enrolled women with stress UI (n = 100). One reported significantly greater subjective improvement of incontinence with intravaginalestriol compared with placebo at 6 months (68% versus 16%, n = 88). [EL = 1+] No comparisons were made between the conjugated oestrogen cream and control groups in the 3 month RCT; cure rates were 12% versus 0 [EL = 1+]

One RCT compared two intravaginal oestrogen preparations (the estradiol vaginal ring with estriolpessaries) in women with urgency, frequency, stress or urge UI. No significant differences were seen between groups in any outcome after 6 months' treatment (subjective improvement; responder or cure rates for urgency, frequency, nocturia, urge or stress UI). Responder rates across all outcomes ranged from 51% to 61%, and cure rates from 27% to 44% (n = 251). [EL = 1+]

Two placebo-controlled RCTs, in which an intravaginal oestrogen preparation was used to treaturogenital symptoms, reported the following: [EL = 1+]

- The prevalence of UI and frequency/nocturia fell to a greater extent with an intravaginalestradiol tablet than with placebo at 1 year (UI prevalence 18% versus 10%; frequency/nocturia 38% versus 10%) but no between-group analyses were reported. At baseline, 28% of women had UI and 43% frequency or nocturia (n = 1612). [EL = 1+]
Systemic oestrogens for UI or OAB

Three RCTs evaluated oral oestrogens for the treatment of stress UI for 3 or 6 months.\textsuperscript{432-434} The oestrogens evaluated were conjugated equine oestrogen (CEE) with medroxyprogesterone acetate (MPA), given for 10 days a cycle;\textsuperscript{432} estradiol;\textsuperscript{433} and estrone.\textsuperscript{434} No significant differences were seen between oestrogen and placebo groups in any outcome across the studies (leakage episodes, pad tests, frequency, QOL, perception of improvement, objective cure).\textsuperscript{432-434}\textsuperscript{[EL = 1+]}

Two RCTs evaluated systemic oestrogens for the treatment of stress or urge UI.\textsuperscript{435,436} One reported no differences between a subcutaneous estradiol or placebo implant in subjective outcomes (self-reported cure, leakage episodes, frequency) after 6 months' treatment (n = 40).\textsuperscript{436} [EL = 1+] [EL = 1+] In the second RCT, improvements in leakage episodes, frequency and urgency were seen after 3 months' treatment with oral estriol and placebo, but no between-group differences were reported (n = 56).\textsuperscript{435} [EL = 1-]

A further RCT evaluated CEE+MPA in female nursing home residents who were incontinent. No significant differences were found between CEE+MPA and placebo groups in any outcome (leakage, bladder capacity), although only data from 21 of the 32 women randomised, who completed 6 months' treatment, were analysed.\textsuperscript{43}\textsuperscript{[EL = 1-]}

Systemic oestrogens for urogenital symptoms

Three RCTs that primarily evaluated the effects of systemic oestrogen on symptoms of vaginal atrophy reported some continence data.\textsuperscript{440-442} One of these studies compared oral estradiol and estriol with placebo in women with stress or mixed UI. At 4 months, a higher cure rate was reported for women on active treatment compared with placebo, although no baseline data were given (n = 29).\textsuperscript{440} [EL = 1-] A second RCT comparing oral estradiol with placebo in women with stress, urge or mixed UI was of unclear duration (3 or 6 months) and only reported that symptoms were alleviated in the majority of women with urge or mixed UI (n = 34).\textsuperscript{441} [EL = 1+] No significant changes in frequency were reported with oral estriol or placebo in a 10 week RCT investigating the effects of oestrogen on vaginal flora, cytology and urogenital symptoms (n = 35).\textsuperscript{442} [EL = 1+]

Studies evaluating HRT for other indications

Data from two RCTs that were designed to evaluate the benefits and risks of HRT have been analysed with respect to continence outcomes. In the ‘HERS’ RCT,\textsuperscript{444} which compared CEE+MPA with placebo, 55% of women had UI (stress, mixed or urge) at baseline (n = 1525).\textsuperscript{444} After 4 years' treatment, significantly fewer women in the HRT group reported improvement and significantly more reported worsening of UI symptoms, compared with the placebo group. Leakage episodes were increased in the HRT group compared with placebo.\textsuperscript{444} In women who did not have UI at baseline, the risk of reporting any type of UI at study end was also significantly higher in the HRT group.\textsuperscript{457} [EL = 1+] [EL = 1++]

In women enrolled in the Women’s Health Initiative (WHI) RCTs (CEE+MPA versus placebo\textsuperscript{447} or CEE versus placebo\textsuperscript{448}), 85% had continence data at baseline and at 1 year (n = 23 296). In women who were continent at the beginning of the study (35%), the relative risk of incident UI of any type at 1 year was significantly higher in the CEE+MPA and CEE groups compared with placebo. When the relative risk of each type of UI was considered separately, all results remained significant except for the risk of urge UI in the CEE+MPA versus placebo study. The relative risk of worsening prevalent UI (leakage quantity and episodes, limitations of daily activities, bother factor) was also significantly higher with HRT compared with placebo.\textsuperscript{448} [EL = 1++]

A further placebo-controlled RCT, which evaluated both CEE and raloxifene for the prevention of osteoporosis in postmenopausal women, reported a significantly higher incidence of UI with CEE compared with other treatment groups at 3 years. Fewer women treated with oestrogen reported improvement of pre-existing UI (n = 619).\textsuperscript{449} [EL = 1+]
Adverse effects

Adverse effects reported across the studies of intravaginal oestrogens (mostly uncommon) included vaginal irritation or discomfort, burning and itching, breast pain, and vaginal spotting or discharge. One study reported that no systemic adverse effects occurred. Adverse effects reported with systemic oestrogens included breast tenderness, vaginal spotting and increased vaginal discharge. No adverse effects were reported in two RCTs. In the HERS study, the risk of venous thromboembolism was significantly higher with CEE+MPA compared with placebo. In the WHI studies, the risk of stroke was significantly higher with CEE+MPA (mean follow-up 5.2 years) and with CEE (mean follow-up 6.8 years), compared with placebo. The risk of coronary heart disease, venous thromboembolism and invasive breast cancer was also significantly higher with CEE+MPA compared with placebo.

Evidence statements for oestrogens

Short-term studies (up to 6 months) of intravaginal oestrogens suggest some improvement in symptoms of incontinence and frequency in postmenopausal women who have urogenital symptoms secondary to vaginal atrophy. There is a lack of evidence to support the use of intravaginal oestrogens for the treatment of UI. Systemic oestrogen does not confer any benefit in women with UI and there is evidence that it may increase the likelihood of developing incontinence in postmenopausal women. Systemic oestrogens are associated with increased risk of systemic adverse effects such as thromboembolism.

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<tr>
<th>Number</th>
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<tbody>
<tr>
<td>69</td>
<td>Systemic hormone replacement therapy is not recommended for the treatment of UI. [2006]</td>
</tr>
<tr>
<td>70</td>
<td>Intravaginal oestrogens are recommended for the treatment of OAB symptoms in postmenopausal women with vaginal atrophy. [2006]</td>
</tr>
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</table>
7 Invasive procedures for overactive bladder

7.1 Introduction

When conservative treatment of OAB symptoms, has failed it is usual to consider surgical therapy. The objective of all surgery for OAB symptoms should be to restore the woman's lower urinary tract function as closely as possible to normal, with minimum short and long-term morbidity and for this improvement to be durable; indeed, this is the expectation of most patients. Such ideal outcomes are often unrealistic in women with OAB symptoms. There is a lack of relevant information for women to help them to arrive at realistic expectations about the likely outcomes of surgical treatment. This includes the chance of potential perioperative complications and long-term adverse effects.

The range of procedures is wide, but in principle all surgical procedures for OAB due to detrusor overactivity aim to reduce involuntary detrusor contractions and thereby improve OAB symptoms. The best chance of long-term success lies with the primary procedure. Therefore this chapter should be read in conjunction with the section in the guideline on surgical competence. Many procedures have been described to treat OAB symptoms over the last century; this guideline addresses only those procedures that are currently in common clinical practice.

7.2 Initial advice and multidisciplinary team considerations before offering invasive treatment for OAB

At this point in the treatment pathway for OAB symptoms the GDG considered the value of offering treatment to a woman after a multidisciplinary team (MDT) has reviewed the case. A separate clinical question was not included in the scope for initial advice or the value of a multidisciplinary team. Consequently a review of evidence has not been undertaken. The recommendations for a multidisciplinary team have arisen out of reviews for other interventions and GDG discussion of treatment options and considerations when choosing optimal therapy for women with OAB and SUI symptoms. As such, a review of evidence is not presented and there is no translation of evidence to recommendations. The text below is the GDG's justification of recommendations that should be followed when considering any treatment option (including no further treatment) for women who have failed conservative management and antimuscarinic drug therapy.

Currently accepted practice is to offer lifestyle interventions, behavioural modifications and antimuscarinic medications as initial treatments. Where the outcomes of these treatments are not optimal, a range of surgical interventions may be considered. These procedures aim to increase the capacity of the bladder, by altering or modulating its nerve supply and contractility, or to bypass the lower urinary tract completely. It is inherent in several of these procedures that contractility of the detrusor is reduced; hence difficulty voiding is a very common adverse effect. A woman may only be considered suitable for such procedures if she is both willing and demonstrably able to undertake clean intermittent self-catheterisation (CISC) or have available assistance to do so.

The GDG consensus view was that the composition of the urinary incontinence MDT team should include the minimum of a specialist nurse, surgeon and physiotherapist. These three members should only be considered as membership, although others may be included. The professionals in the MDT should have responsibilities in both the community and secondary/tertiary care, thereby reflecting the varied treatment environments that women have come from and will be managed within. The composition and setting of the MDT will allow a comprehensive overview of each patient and allow the consideration of past and future treatments from experts in each intervention available.
The MDT should also review all women at this stage of the pathway regardless of whether they choose to continue with active treatment for their OAB symptoms. Women who do not wish to consider invasive treatments following unsuccessful conservative treatments and antimuscarinic drugs, should be provided with further information about their options (chapter 4 for further information). Furthermore PTNS may be considered as an alternative treatment for these women (chapter 4)

See also the evidence to recommendation text for BoNT-A and SNS (sections 7.3 and 7.4 in this chapter) for further information about the value of an MDT.

**Recommendations**

<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>71</td>
<td>The multidisciplinary team (MDT) for urinary incontinence should be drawn from community and secondary or tertiary care and include as a minimum:</td>
</tr>
<tr>
<td></td>
<td>- a specialist surgeon</td>
</tr>
<tr>
<td></td>
<td>- a specialist nurse</td>
</tr>
<tr>
<td></td>
<td>- a specialist physiotherapist. [new 2013]</td>
</tr>
<tr>
<td>72</td>
<td>Offer invasive therapy for OAB and SUI symptoms only after a clinical review by the MDT. [new 2013]</td>
</tr>
<tr>
<td>73</td>
<td>Discuss the recommendations made by the MDT at the clinical review with the woman. [new 2013]</td>
</tr>
<tr>
<td>74</td>
<td>Any woman wishing to consider surgical treatment for UI should be informed about the benefits and risks of surgical and non-surgical options. Counselling should include consideration of the woman’s child-bearing wishes. [2006]</td>
</tr>
</tbody>
</table>

### 7.3 Botulinum toxin

**Introduction**

Botulinum toxin is a potent neurotoxin derived from the bacterium *Clostridium botulinum*. Two strains are available for clinical use, types A and B. Botulinum toxin is known to block the release of acetylcholine and it will temporarily paralyse any muscle into which it is injected. However, the precise mechanism of action when injected into the detrusor muscle is unknown. It is injected directly into the bladder wall and usually performed as a day case procedure using a flexible cystoscope. This can be carried out under a local or general anaesthetic according to the wishes of the patient and local service provision. There are currently two preparations of botulinum toxin A available in the UK, BOTOX® (Allergan Ltd) and Dysport® (Ipsen Ltd). These have different formulations and molecular structures. Safety and efficacy may not be the same for both products.

**Review question**

In women with idiopathic overactive bladder, what is the effectiveness of BoNT-A when compared with placebo?

**Review introduction**

In order to extract the most useful information from the evidence the GDG was asked specific questions relating to the length of time to see improvement in symptoms, and the most appropriate doses of BoNT-A. The GDG consensus was as follows:

- under normal circumstances BoNT-A would be expected to last approximately 6 months and, thus, the injection would be repeated about every 6-12 months

- 200U is the commonly used dose
• if 200U is better than placebo then it would be useful to know whether different doses are also effective. If 200U is worse than placebo then the efficacy of different doses versus placebo should be investigated.

**Description of included studies**

### BoNT-A 200U versus placebo

Five randomised controlled trials (RCTs) were included in this review. All participants had OAB symptoms and had not responded to previous treatments including bladder training, pelvic floor exercise and antimuscarinic drugs. Detrusor overactivity was the cause of the overactive bladder symptoms in between 79.2% and 100% of the populations reported in four studies. This information was not recorded in the remaining study (Flynn et al., 2009). Three studies included women only (Brubaker et al., 2008), (Flynn et al., 2009); (Tincello et al., 2012). The other two included men and women; in one, 55.9% of participants were female (Sahai et al., 2007) and in the other 92.0% were female (Dmochowski et al., 2010).

The mean (SD) age of participants ranged from 50.3 to 75.4 years (SD 10.5) but was not reported in one (Tincello et al., 2012). The mean (SD) number of incontinence episodes per day was 3.98 (SD 2.7) to 6.86 (SD 6.29) but was not reported in one study (Flynn et al., 2009) and mean (SD) number of urgency episodes was 8.15 (SD 3.6) to 9.5 (SD 2.22), per day but was not reported in two studies (Tincello et al., 2012); (Flynn et al., 2009). The mean (SD) duration of symptoms was only reported in one study which was 117.9 (SD 109.8) months (Dmochowski et al., 2010).

Two studies (Dmochowski et al., 2010); (Sahai et al., 2007) were funded or supported by Allergan Ltd, and two by the US NIH (Flynn et al., 2009), (Brubaker et al., 2008) and the fifth study (Tincello et al., 2012) was funded by charities.

### BoNT-A 200U versus BoNT-A 100U

Two randomised controlled trials (RCTs) were included in this review. All participants had OAB symptoms and had not responded to previous treatments including antimuscarinic drugs. Detrusor overactivity was the cause of OAB symptoms in 80.4% of participants in one study (Dmochowski et al., 2010) and not reported in the second (Altaweel et al., 2011). 89.7% were female in one study (Dmochowski et al., 2010) and the number of women in the second study was not reported (Altaweel et al., 2011).

The mean (SD) age of participants was 58.3 years (SD 14.1) in one study (Dmochowski et al., 2010) but was not reported in one (Altaweel et al., 2011). The mean (SD) number of urge incontinence episodes ranged from 3.65 (SD 2.9) to 4.0 (No SD) and the mean number of urgency episodes was between 9.3 (SD 4.0) and 10.4 (No SD). The mean (SD) duration of symptoms was only reported in one study which was 103.2 (SD 92.9) months (Dmochowski et al., 2010).

One study (Dmochowski et al., 2010) was funded by Allergan, and there was no funding source reported for the second study (Altaweel et al., 2011).

The following GRADE profiles shows the evidence for BoNT-A 200U for OAB symptoms caused by detrusor overactivity (in 4 of the 5 RCTs and a majority of the population in the other) compared to placebo (Table 7.1) and BoNT-A 100U (Table 7.2) by outcome in order of GDG ranked importance.

### Evidence profile

**Table 7.1** GRADE findings for comparison of BoNT-A 200U with placebo

<table>
<thead>
<tr>
<th>Number of studies</th>
<th>Number of women</th>
<th>Effect</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BoNT-A 200U</td>
<td>Placebo</td>
<td>Relative (95% CI)</td>
</tr>
<tr>
<td>Patient satisfaction with treatment (assessed with: self-report as 'improved' or 'not improved')</td>
<td>No evidence reported</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incontinence episodes (Better indicated by lower values)</td>
<td>No evidence reported</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Update**

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### Evidence statements

- Patient satisfaction with treatment
- No studies were identified for this outcome.
Self reported rate of absolute symptom reduction: number of episodes of incontinence per day
A meta-analysis of four RCT’s showed no difference in clinical benefit between BoNT-A and placebo. The evidence was of high quality.

Self reported rate of absolute symptom reduction: number of episodes of urgency per day
A meta-analysis of three RCT’s showed no difference in clinical benefit between BoNT-A and placebo. The evidence was of high quality.

Continence status
A meta-analysis of three RCT’s showed a clinical benefit in favour of BoNT-A 200U over placebo. The evidence was of high quality.

Incontinence-specific quality of life
A meta-analysis of three studies showed a clinical benefit in favour of BoNT-A 200U over placebo. The studies also reported that women who received BoNT-A 200-U had improved incontinence-specific QOL, in comparison to those women who received placebo, that was equivalent to an improvement of 34 (95% CI 45 to 23) points on the Incontinence-Quality of Life scale. The evidence was of high quality.

Adverse effects
A meta-analysis of five RCT’s showed a clinical benefit in favour of placebo over BoNT-A 200U. Women who received BoNT-A 200U were more likely to need to self-catheterise than those who received placebo. The evidence was of high quality.

Psychological outcomes
No studies were identified for this outcome.

Post-void residual volume
No studies were identified for this outcome.

Evidence profile
The following GRADE profile shows the evidence for BoNT-A 200U for OAB caused by detrusor overactivity compared to BoNT-A 100U by outcome in order of GDG ranked importance. None of the studies reported patient satisfaction with treatment, number of incontinence episodes per day, urgency episodes per day, incontinence-specific quality of life or psychological outcomes.

Table 7.2 GRADE findings for comparison of BoNT-A 200U with BoNT-A 100U

<table>
<thead>
<tr>
<th>Number of studies</th>
<th>Number of women</th>
<th>Effect</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BoNT-A 200U</td>
<td>BoNT-A 100U</td>
<td>Relative (95% CI)</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Patient satisfaction with treatment</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>No evidence reported</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Incontinence episodes (Better indicated by lower values)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Dmochowski et al., 2010)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>53</td>
<td>54</td>
<td>MD 0.13 lower (1.04 lower to 0.78 higher)</td>
<td>MODERATE</td>
</tr>
<tr>
<td>Urgency episodes (Better indicated by lower values)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Dmochowski et al., 2010)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>53</td>
<td>54</td>
<td>MD 0.12 higher (1.26 lower to 1.5 higher)</td>
<td>VERY LOW</td>
</tr>
</tbody>
</table>

Continence status
Evidence statements

Patient satisfaction with treatment
No studies were identified for this outcome.

Self reported rate of absolute symptom reduction: number of episodes of incontinence per day
A single RCT showed no difference in clinical benefit between BoNT-A 200U and BoNT-A 100U. The evidence was of moderate quality.

Self reported rate of absolute symptom reduction: number of episodes of urgency per day
A single RCT showed no difference in clinical benefit between BoNT-A 200U and BoNT-A 100U. The evidence was of very low quality.

Continence status
A meta-analysis of two RCT’s showed a clinical benefit in favour of BoNT-A 200u over BoNT-A 100U. The evidence was of low quality.

Incontinence-specific quality of life
No studies were identified for this outcome.

Adverse effects
A meta-analysis of two RCT’s showed no clinical benefit for either BoNT-A 200U or BoNT-A 100U. The evidence was of very low quality.

Psychological outcomes
No studies were identified for this outcome.

Post-void residual volume
A single RCT’s showed no clinical benefit for either BoNT-A 200U or BoNT-A 100U. The evidence was of low quality.

Health economics profile
The health economic evaluation (found in subchapter 7.9) suggests that BoNT-A, was a cost-effective intervention with an estimated ICER of under £16,000 per QALY. The probabilistic sensitivity was
conclusive that it was a more cost-effective treatment than SNS or no active treatment for women who can intermittently catheterise.

The one-way sensitivity analysis on key model parameters did not change this result.

Evidence to recommendations

Relative value placed on the outcomes considered

The GDG prioritised self-reported patient satisfaction, clinical improvement and adverse effects reported in the evidence for this intervention. The need for clean intermittent catheterisation (CIC) was specified as the most important adverse effect because women who are unable to catheterise should not be offered BoNT-A.

Consideration of clinical benefits and harms

The evidence of benefit for women with proven detrusor overactivity was uncertain for BoNT-A in comparison to placebo. High quality RCTs reported no reduction in episodes of urgency or incontinence and no improvement in patient satisfaction. However the evidence did indicate an improvement in the number of women who were absolutely dry (continence status) and in quality of life for women who were given BoNT-A injections for OAB.

The studies also identified higher levels of self-catheterisation reported as an adverse outcome in women treated with BoNT-A compared with placebo.

Three outcomes (continence status, incontinence specific quality of life and adverse effects) showed a greater difference in effectiveness for BoNT-A versus placebo than the minimum differences specified by the GDG for these outcomes at the outset. This means that the difference in effect was clinically meaningful for these outcomes. The remaining outcomes (patient satisfaction with treatment, self-reported rate of absolute symptom reduction) did not show a clinically meaningful difference between BoNT-A and placebo.

The GDG considered the trade-off between improvements in quality of life associated with BoNT-A and the risk of harm associated with CIC. Women’s preferences and levels of tolerance of adverse events are not the same. The GDG noted that current practice dictates that around 20-25% of women would be required to catheterise after treatment with BoNT-A; however this may be an overestimation in normal clinical practice.

The GDG also noted that treatment for OAB with BoNT-A is a relatively new procedure that is outside the current UK license for this drug. As a consequence, there is no UK or international data on the longer term effects of the use of BoNT-A for this condition.

The physiological action of BoNT-A is probably only effective in women where detrusor overactivity is the cause of their OAB. It is believed that BoNT-A injected into the walls of the bladder paralyses the detrusor muscle so that it is no longer contracts involuntarily. Therefore, BoNT-A will probably not be effective for women for whom detrusor overactivity is not the cause of their symptoms although this has not been analysed by scientific study.

The GDG concluded that there was sufficient evidence of efficacy to support the use of BoNT-A provided it was a cost-effective option compared with the alternatives. However, only women who had proven detrusor overactivity identified by urodynamic investigation should be considered for treatment.

Quality of evidence

The population, intervention and outcome of the included studies were as specified in the review protocol for this question with the exception of the timing of follow up assessment. The protocol specified that follow-up should be six months as this was the time to follow-up that the GDG considered would show some benefit from BoNT-A. However, in one study women were assessed after 12 weeks, and in a second study, they were only assessed after 9 months. There were few drop-outs in the studies included in the review.

Where data were pooled for meta-analysis there was a low level of heterogeneity indicating that the effect of BoNT-A versus placebo was similar in the included studies. This increases the confidence in synthesising the results of different studies in a meta-analysis.

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There was no imprecision in the review findings for any outcome. This increases the confidence that the true effect of BoNT-A versus placebo was observed in the included studies.

Consideration of health benefits and resource use

The health economics suggests that BoNT-A was a cost-effective intervention both as in comparison with no active treatment and also in comparison with its closest comparator, SNS. On the basis of a favourable clinical efficacy and the health economic profile, the GDG felt that on balance, the evidence justified the recommendation to offer BoNT-A as the first intervention to be routinely offered to women who have had unsuccessful conservative treatment (including antimuscarinic drugs) and have proven detrusor overactivity.

Other considerations

Sequencing of treatment

The GDG considered the sequence of treatments for OAB, when BoNT-A should be offered and to whom. All the published studies identified for the clinical review considered the effectiveness of BoNT-A in populations in which conservative treatment (including at least one antimuscarinic drug) had failed, albeit over different time periods and for different doses of BoNT-A. The evidence reflected clinical practice in the NHS where BoNT-A is usually offered after conservative treatments (lifestyle advice and antimuscarinic drugs) have failed. BoNT-A is a more invasive treatment than drug therapy requiring specialist input usually in a secondary care setting whereas treatment with antimuscarinic drugs can be offered in a primary care setting without delay. For these reasons, the GDG view was that the evidence supported the use of BoNT-A after conservative management for women willing, and able, or assisted by their carers, to catheterise.

Need for catheterisation

For some women, BoNT-A will not be an option because they are unable to catheterise, normally because of co-existing conditions preventing the patient or their carer (with the woman’s consent) from carrying out the procedure. It requires physical dexterity, it may be emotionally demanding, and it may be required over variable lengths of time. Furthermore there are women who have a cultural or ethical objection to catheterisation. It may therefore not be practical to implement BoNT-A as a long-term strategy in some women. These women should be offered sacral nerve stimulation instead (see section 7.4).

Ensuring that women and their carers understand what is involved in CIC prior to starting treatment (including the on-going risk of urinary tract infection and urinary retention if they do not catheterise), along with follow-up support, is central to effective management. In order to ensure that a woman or her carer understands the implications of catheterisation and can tolerate on-going CIC independent of health professional assistance, it is necessary that training and demonstration of the technique is undertaken before BoNT-A is offered.

MDT review

The GDG’s view was the BoNT-A should only be offered after a full review by a multidisciplinary team including a specialist surgeon to oversee the review of the woman’s health care needs and a professional competent in teaching CIC and capable of offering a full discussion of the physical and emotional demands of treatment with BoNT-A. The women, and where appropriate her carer, should feel satisfied that they are able to catheterise confidently prior to the start of treatment with BoNT-A. The discussion should also explain the known risks and benefits of treatment as well as the absence of evidence of the long term effects, the variation in duration of effect and the frequency of injections required for optimum treatment which can vary between women.

Access to repeat treatment

The effect of BoNT-A on bladder function reduces over time so that the treatment needs to be repeated. Effects can diminish fairly rapidly so that access to repeat BoNT-A injections needs to be fairly rapid. Women who have had a previous injection require routine follow-up every four to six months to monitor their symptoms and provide additional support if required. Women also need to be able to self-refer back quickly within that time frame into the multidisciplinary team for repeat BoNT-A injections to prevent a rapid return of symptoms. The time-limited effectiveness of therapy requires women to have confidence that they can access prompt specialist review and, where appropriate,
repeat BoNT-A injections when they require them. Services that offer BoNT-A injections have to be set up for this to be possible.

**Treatment dose**

A meta-analysis of two RCTs showed that using a dose of 200U had a significant benefit in continence status when compared with a dose of 100U. The review did not, however, find any significant difference in the frequency of adverse events. The GDG therefore concluded that increasing the dose of BoNT-A to 200U would be beneficial without the increased frequency of adverse events that may be expected in other circumstances.

The GDG noted that there may be an increased requirement of catheterisation with an increased dose, however it was concluded that catheterisation was an accepted part of BoNT-A treatment and therefore not an appropriate consideration when concluding the risks and benefits of the dose.

**Botulinum toxin B**

A crossover placebo-controlled RCT evaluated botulinum toxin B in men and women with refractory DO, most of idiopathic origin. After treatment periods of 6 weeks, a statistically significant increase in mean voided volume, and reductions in leakage episodes and frequency, were seen, together with improvements in five of nine domains of KHQ. Transient adverse effects were urinary retention, constipation and dry mouth (n = 20; 17 women)\(^{548}\) \([\text{EL} = 1 +]\)

A case series evaluated several doses of botulinum toxin B (between 2500 and 15 000 units) in women with OAB. Women were followed for the duration of response. Except for one woman, significant reduction from baseline in frequency was reported with all doses in all women, with duration of response significantly related to dose (19–25 days at lower dose, 80–98 days at the higher dose). Adverse effects were reported to be mild, which were transient injection site discomfort, and mild general malaise and dry mouth (n = 15)\(^{549}\) \([\text{EL} = 3]\)

**Recommendations**

<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td>After MDT review, offer bladder wall injection with BoNT-A(^{10}) to women with proven detrusor overactivity that has not responded to conservative management (including antimuscarinic drug therapy). [new 2013]</td>
</tr>
<tr>
<td>76</td>
<td>Use 200 units when offering BoNT-A. [new 2013]</td>
</tr>
<tr>
<td>77</td>
<td>Discuss the risks and benefits of treatment with BoNT-A with women before seeking informed consent, covering:</td>
</tr>
<tr>
<td></td>
<td>• likelihood of being symptom free or having a large reduction in symptoms</td>
</tr>
<tr>
<td></td>
<td>• the risk of clean intermittent catheterisation and the potential for it to be required for variable lengths of time after the effect of the injections have worn off</td>
</tr>
<tr>
<td></td>
<td>• the absence of evidence on long-term risks, duration of effect, and the number of injections required for optimum treatment</td>
</tr>
<tr>
<td></td>
<td>• the risk of adverse effects including an increased risk of urinary tract infection. [new 2013]</td>
</tr>
<tr>
<td>78</td>
<td>Start treatment with BoNT-A only if women:</td>
</tr>
<tr>
<td></td>
<td>• have been trained in clean intermittent catheterisation and have performed the technique successfully, and</td>
</tr>
<tr>
<td></td>
<td>• are able and willing to perform clean intermittent catheterisation on a regular basis for as long as required. [new 2013]</td>
</tr>
</tbody>
</table>

\(^{10}\) At the time of consultation (February 2013), botulinum toxin type A did not have a UK marketing authorisation for this indication. The prescriber should follow relevant professional guidance, taking full responsibility for the decision. Informed consent should be obtained and documented. The patient should provide informed consent, which should be documented. See the General Medical Council’s [Good practice in prescribing medicines – guidance for doctors](http://www.gmc-uk.org/Good_practice_in_prescribing_medicines) for further information.
Offer specialist follow-up at 4 to 6 months to women having treatment for OAB with BoNT-A or sooner if symptoms return. [new 2013]

Tell women how to self-refer for prompt specialist review if symptoms return following a BoNT-A procedure. Offer repeat treatment as necessary. [new 2013]

Do not offer botulinum toxin B to women with proven detrusor overactivity. [2013]

### Number  Research recommendations

| RR11 | What is the long-term effectiveness, optimal dose and optimal frequency of repeat therapy of botulinum toxin A (BoNT-A) in women with OAB based on detrusor overactivity including risk of adverse events such as urinary infection?

**Why this is important**

There are currently no trials looking at long-term outcomes, optimal dose, optimal frequency and long-term adverse effects of BoNT-A for women with OAB. Further research into these outcomes would have an impact on future updates of key recommendations within the guideline and would impact on how resources are used within urinary incontinence services. Effective treatment with BoNT-A may require repeated injections to remain effective but the frequency of these is not reported in the current data. BoNT-A has the potential to cause incomplete bladder emptying resulting in the need for women to perform catheterisation indefinitely. This not only has financial implications but catheterisation and the morbidity associated with it will not always be acceptable to women. Additionally there are currently no data on whether repeated BoNT-A injections alter bladder function.

### 7.4 Sacral nerve stimulation

#### Introduction

The principle of neuromodulation is that electrical stimulation of the sacral reflex pathway will inhibit the reflex behaviour of the bladder and reduce detrusor overactivity. Permanently implantable sacral nerve root stimulators have been developed to provide chronic stimulation directly to the S3 nerve roots. Patients first undergo a percutaneous nerve evaluation (PNE) in which a needle is inserted through the sacral foramina under local anaesthetic. This is connected to an external stimulation source and left in place for a few days. Those who show satisfactory response (normally a 50% improvement of symptoms) to the PNE may then proceed to a permanent implant.

#### NICE interventional procedure guidance

Guidance on sacral nerve stimulation (SNS) for OAB symptoms was issued by the Intervventional Procedures Programme of NICE, in 2004. It states that: ‘Current evidence on the safety and efficacy of sacral nerve stimulation for overactive bladder symptoms appears adequate to support the use of this procedure provided that the normal arrangements are in place for consent, audit and clinical governance.’

The systematic review conducted to inform the NICE interventional procedures (IP) guidance aimed to evaluate the efficacy and safety of SNS for urgency UI and urgency-frequency of any aetiology (OAB dry) in men and women. In considering the effectiveness of SNS within this guideline, studies of any design that were conducted in women with idiopathic OAB wet or OAB dry are of relevance. Studies that only reported results for PNE (‘test stimulation’) are not considered, as these do not address effectiveness of the implanted device. One additional case series to those considered by NICE IP was identified.

All studies considered SNS in the S3 foramen via an implanted device. Most studies included men and women. The majority also included patients with urinary retention as well as OAB or OAB dry;
only a few reported data separately for patients with UUI or OAB dry. Overall, the proportions who responded to PNE, in studies that reported this, ranged from 28% to 63% (median 42%).

**Review questions**

1. In women with OAB symptoms, what is the effectiveness of sacral nerve stimulation (SNS) compared with no active treatment?
2. In women with OAB symptoms caused by detrusor overactivity, what is the effectiveness of sacral nerve stimulation (SNS) compared with no active treatment?

**Description of included studies**

No new evidence was identified on the efficacy of SNS for OAB symptoms and OAB caused by urodynamically proven detrusor overactivity. The description of included studies relates to evidence published in the 2006 guideline.

**Randomised controlled trials**

Three RCTs evaluated SNS in men and women (mostly women) who had failed prior conservative and/or surgical treatment for UUI \(^{514,515}\) or urgency-frequency (OAB dry). \(^{516}\) Two of the three RCTs were conducted by the Sacral Nerve Stimulation Group. \(^{515,516}\)

The RCTs had a 6 month controlled phase after which patients in the control groups were offered the implant. The quality of the RCTs was considered to be poor: of the OAB studies, some only analysed data from patients who completed treatment; others did not state whether intention-to-treat analysis was undertaken; none provided sufficient data to determine whether groups were similar at baseline, other than in the intervention given. \([EL = 1]\)

After 6 months’ treatment in patients with UUI, leakage episodes, leakage severity and pad usage were significantly lower with SNS compared with control (continued prior treatment). \(^{514,515}\) Scores on the SF-36 physical health status domain were significantly higher in the SNS group. \(^{515}\) Following crossover of patients in the control groups to receive sacral nerve stimulation, the following results were reported:

- treatment failure in 21% of patients followed up (median 18 months, range 6–36 months); very common adverse effects were pain at implant site, lead migration and leg pain; common effects were leg stimulation, disturbed bowel function, urinary retention, vaginal cramps, anal pain and skin irritation at implant site (\(n = 44\); 91% women) \(^{514}\) \([EL = 3]\)
- 52% of patients were dry at 18 months and a further 24% reported at least 50% reduction in leakage episodes (\(n = 58\)); at 3 years, 46% were dry and 13% improved \((n = 41\), of 98 originally randomised) \(^{515,517}\)

In the RCT of patients with urgency-frequency (OAB dry), after 6 months’ treatment, frequency was significantly reduced, mean voided volume and bladder volume at first sensation to void were significantly increased in the SNS group compared with control, with improvements in several SF-36 domains in the active treatment group \((n = 51\); 90% women) \(^{516}\) \([EL = 1]\). At 2 years follow-up of 21 patients, 43% had at least 50% reduction in frequency and 62% had at least 50% increase in voided volume. \(^{517}\) \([EL = 3]\)

Of 157 patients enrolled across the Sacral Nerve Stimulation Group studies, 33% had adverse events that required surgical revision. Pain at stimulator or implant sites was very common, and lead migration, infection or skin irritation requiring removal of the implant were common \(^{515,516}\) \([EL = 3]\)

**Case series**

The Italian National Registers \(^{518}\) and twelve case series \(^{513,519–529}\) reported the outcomes of sacral neuromodulation in patients with UUI or OAB dry resistant to conservative treatment. All except one study \(^{527}\) included men and women and did not report results separately for women. The majority of studies included people with urinary retention or voiding difficulty, as well as OAB and/or UUI. \(^{518–529}\)

Four studies reported results of patients with idiopathic UUI or OAB dry separately. \(^{518,520,521,523}\) Some studies included a minority of patients with neurogenic bladder.
The number of patients included in each study ranged from 12 to 113 (total 550), with eight studying fewer than 50 patients. The mean duration of follow-up ranged from 8 months to 5 years; reasons for withdrawal or missing data were not generally given. The Italian National Register included both retrospective and prospective data, which were considered separately (total $n = 196$). The outcomes considered were bladder diary variables, continence status, satisfaction, QOL, urodynamic variables and adverse effects and complications.

**Evidence statement**

No new evidence was identified on the efficacy of SNS for OAB and OAB caused by detrusor overactivity. The description of included studies relates to evidence published in the 2006 guideline.

**Bladder diary**

These outcomes were considered in nine studies, with significant reduction in leakage episodes and frequency reported in five studies with up to 5 years follow-up. Another two studies found variable reductions in leakage episodes and frequency at various time points. No significant change was seen in these outcomes in one study ($n = 12$), and a significant change in frequency only in one other ($n = 15$).

**Continence status**

Subjective or objective cure or improvement was considered in eight studies, with varying definitions of cure, success or improvement used. Across the studies, at least some improvement was reported in 39–77% of patients (median 63%). In a study with follow-up to 41 months, cure rates fell to 39% from 59% at 12 months.

**Satisfaction and quality of life**

A satisfaction rate of 68% was reported at mean follow-up of 2 years in one study. Three studies found significant improvement in QOL (IIQ at mean 8 months or I-QOL at 18 months).

**Adverse effects and complications**

Complications relating to the device were reported across 11 studies. These were:

- pain or discomfort: median 11% (range 2–34%)
- technical device problems, e.g. current-related problems, device malfunction: median 11% (3–42%)
- lead problems: median 6% (3–11%).

Surgical intervention for these complications was reported in between 7% and 66% (median 22%) of patients, across seven studies. Removal of the implant was required in 4–11% (median 7%) in three studies.

Other adverse effects were cases of seroma formation, disturbed bowel function (1–7%), wound dehiscence or infection (3–15%), infection (2–9%), toe flexion (8%) and pain (abdominal, leg, pelvis and gluteal incision) (2–20%).

A cost–consequence analysis was undertaken for sacral nerve stimulation – see Appendix G for further details.

Up to two-thirds of patients achieve continence or substantial improvement in symptoms after SNS, and the available data show that beneficial effects appear to persist for up to 3–5 years after implantation. Around one-third of patients may require re-operation, most often owing to pain at the implant site, infection, or the need for adjustment and modification of the lead system. Permanent removal of the electrodes may be required in one in ten patients. Developments in the devices and leads have resulted in reduced rates of complications since introduction of the technique. [EL = 4]

**Health economics profile**

Two cost-effective analyses were undertaken for two populations (see section 7.9.); one for women who are unable to catheterise and one for women are able to catheterise.
For the first population (women who are unable to catheterise), SNS was only compared with no active treatment as BoNT-A was not an option for these women. The analysis suggested that the ICER was just below £25,000 per QALY. This would indicate, using a £20,000 QALY threshold, it is not cost-effective to routinely offer SNS. However the sensitivity analysis showed that small change (3 percentage points) in the improvement of health related QALY lead to the ICER for SNS falling below the £20,000 per QALY threshold.

In the second population, (women who are able to catheterise) SNS was compared with BoNT-A and no active treatment to consider which treatment should be offered first, and which alternative option should be offered if first-line treatment is not successful.

The model suggested that BoNT-A had the highest probability of being cost-effective at a £20,000 per QALY threshold.

Routinely offering SNS after unsuccessful BoNT-A treatment was found to be not cost-effective at a £20,000 per QALY threshold. At a willingness to pay threshold of £30,000 per QALY the probability of offering SNS after BoNT-A being cost-effective is more favourable. The probabilistic sensitivity analysis suggested that only above the £30,000 per QALY threshold did BoNT-A and BoNT-A followed by SNS have an equal chance of being cost-effective. The ICER for BoNT-A following SNS was estimated at around £33,500 per QALY.

The sensitivity analysis showed that a small change (7 percentage points) in the improvement of health-related quality of life associated with continence would lead to SNS following BoNT-A falling below the £20,000 per QALY threshold.

Consideration of health benefits and resource use

The model was designed to inform the GDG BoNT-A or SNS should be offered as the first-line treatment after conservative management and also whether to offer both treatments, and if so in what order, before consideration of the other more invasive interventions. The cost-effectiveness analysis suggested that SNS is unlikely to be cost-effective in women who are unable to catheterise. It is also unlikely to be cost-effective as a first or second-line treatment in women who are able to catheterise (and therefore can have BoNT-A treatment). However while the GDG accepted the conclusions based on the data and assumptions that went into the model, it was suggested that there were other considerations not captured in the economic analysis.

Firstly, although the model compared SNS and BoNT-A, the model did not include all the possible interventions that could be considered as a second-line treatment. The GDG noted that while BoNT-A was included as a comparator, augmentation cystoplasty and urinary diversion were not as they would not be considered as a first-line treatment option.

The GDG felt that to not recommend SNS would mean that augmentation cystoplasty and urinary diversion would be the only viable alternatives in this scenario. The clinical opinion of the GDG was that both of these interventions would involve a more serious surgical procedure and would have far greater lifelong implications. The GDG concluded that these were more costly and less effective and less acceptable options to patients than SNS. The complications and severity of these two interventions are explained in more detail in subchapters 7.5 and 7.6 respectively. The GDG did not believe the implementation of a recommendation to remove SNS as a treatment choice was feasible or reasonable within current practice when, for most women, urinary diversion and augmentation cystoplasty would be unacceptable.

Secondly, the GDG agreed that the QALY gain reported in the model population did not reflect the population with OAB symptoms who would be considered for SNS. The GDG noted that the QALY values came from a recent review in an HTA paper that reported the QALY gain associated with all successful treatment of OAB symptoms (Immamura et al., 2010). The GDG argued that while this value was accurate early in the pathway, it does not reflect the QALY benefit that women at this point in the pathway would experience following successful treatment. The GDG suggested that for women to get to this point they will have had numerous unsuccessful interventions and therefore would have a more serious symptom profile. The sensitivity analysis showed that an increased improvement in QALY would make SNS cost-effective, this was considered reasonable by the GDG as a realistic reflection of this population.
Evidence to recommendations

The usual sub-headings in this section are not used, since the GDG did not consider new clinical evidence for this question. The rest of this section explains changes to the recommendations on how to use SNS and who should be involved in the decision to offer treatment. Recommendations are based on GDG consensus of best clinical practice when offering SNS.

Multidisciplinary teams

The GDG noted that there has been a significant increase in the use of sacral nerve stimulation since publication of the previous guideline although it is not available in all centres across the NHS. The decision to offer SNS should be made by a multi-disciplinary team including the nurse or physiotherapist who has been involved in the care of the woman with UI up to this point, as well as the surgeon responsible for carrying out the procedure. This is the minimum membership of a MDT taking this decision and the team may include other health care professionals depending on local treatment centre policy.

Urodynamics investigation

The GDG acknowledged that the recommendation to use SNS in the previous version of the guideline implied that this treatment could only be offered after urodynamic investigation and a positive diagnostic test for detrusor overactivity but this was not explicit. The GDG decided that more emphasis was required on the importance of proving that the woman’s symptoms are caused by detrusor overactivity and this was added to the first recommendation.

Sequence of treatment

The GDG view is that SNS should only be offered after a negative or poor response to lifestyle and behavioural interventions and antimuscarinic treatment (see subchapter 5.2). The evidence only included populations who had already received conservative treatments (including antimuscarinic treatment). Furthermore, the cost for the implantation of a device is considerable in comparison to conservative treatments that can be offered earlier. Therefore the GDG determined that there is no clinical or cost-effectiveness justification to consider offering SNS before conservative management.

The health economic model (see subchapter 7.9) considered the order of treatment following unsuccessful conservative treatment. In summary, the health economic and clinical data showed that SNS had a lower probability of being cost-effective than BoNT-A at a £20,000 per QALY threshold. Therefore BoNT-A should be offered first to women able to catheterise. For women who are unable to catheterise, SNS was a cost-effective option compared with no treatment.

Percutaneous nerve evaluation

The GDG consensus was that the implantation of an InterStim device should only be carried out after the woman has responded positively to percutaneous nerve evaluation. This is normally demonstrated by a greater than 50% improvement in symptoms. Therefore, when SNS is considered for an individual woman, it should be assumed that treatment includes the test stimulation (or stage one) phase.

Specialist long term follow-up

The GDG consensus was that in view of the lack of long term data on treatment efficacy and side-effects, specialist long term follow-up is required for women who are treated with SNS. Furthermore because of the length of time between battery replacements (estimated by the GDG to be required every 7 years on average), if symptoms return the patient should be able to access prompt specialist referral and consultation.

Recommendations

<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendation</th>
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<tbody>
<tr>
<td>82</td>
<td>Offer sacral nerve stimulation (SNS) to women after MDT review if:</td>
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<tr>
<td></td>
<td>• their OAB has not responded to conservative management including antimuscarinic drugs, and</td>
</tr>
<tr>
<td></td>
<td>• they are unable to perform clean intermittent catheterisation. [new 2013]</td>
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Consider SNS after MDT review if a woman's OAB has not responded to conservative management (including antimuscarinic drugs) and BoNT-A. [new 2013]

Discuss the long-term implications of SNS with women including:
- the need for peripheral nerve evaluation test stimulation and probability of the test's success
- the risk of failure
- the long-term commitment
- the need for surgical revision
- the adverse effects. [new 2013]

Tell women how to self-refer for prompt specialist review if symptoms return following an SNS procedure. Offer repeat treatment as necessary. [new 2013]

<table>
<thead>
<tr>
<th>Number</th>
<th>Research recommendations</th>
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<tbody>
<tr>
<td>RR12</td>
<td>Further RCT evidence is required for drugs, BoNT-A and SNS in women with OAB due to idiopathic detrusor overactivity</td>
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<tr>
<td>RR13</td>
<td>What is the effectiveness and what is the optimum sequence of treatment with BoNT-A and sacral nerve stimulation (SNS) for the treatment of OAB after failed conservative (including drug) treatment?</td>
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</table>

**Why this is important**

It is not currently known which treatment option, either BoNT-A or SNS, is the most effective in the medium and long-term for women with OAB in whom initial treatment, including antimuscarinic drugs, has failed. The initial outlay for SNS is high but when successful it appears to be effective. BoNT-A also has a high failure rate but a lower outlay and it is not yet understood the cost threshold (in terms of treatment cycles or length of follow-up) at which BoNT-A is likely to be the less cost-effective option compared with SNS. Currently, funding for SNS is on an individual basis due to its high cost, leading to geographical inequalities in access. A head-to-head longitudinal study of these 2 treatments would determine both which should be offered first and at what point in the treatment pathway. Such studies have not been done. This evidence could reduce inequalities in access to treatment. In subsequent NICE guidance evidence would be available to inform recommendations on the treatment pathway and at which point in the treatment pathway for OAB each of these options should be offered. It would also provide more robust information to patients about the risk of adverse events and support women’s choice about whether to proceed with treatment.

### 7.5 Augmentation cystoplasty

Augmentation cystoplasty aims to increase functional bladder capacity by bivalving the bladder wall and incorporating a segment of bowel into the resultant defect. Most commonly, this has been a segment of ileum but ileocaecal and sigmoid segments are occasionally used. Other vascularised bowel segments have been used, with and without their surface epithelium, but these techniques have been largely experimental or applied to children.

No prospective controlled trials were identified that evaluated augmentation cystoplasty for the treatment of UUI or OAB in women. One case series reported outcomes of the intervention in women with idiopathic UUI who had not responded to prior treatment (conservative and surgical). About half the women also had evidence of interstitial cystitis on cystoscopy. Additionally, about half underwent Burch colposuspension for stress UI. At mean follow-up of about 5 years, 53% were continent, 53% were satisfied with treatment, 25% had occasional leaks and 18% were incontinent. One-quarter required treatment with antimuscarinics, and about one-quarter patch revision or further surgery. Very common adverse effects were recurrent UTI (49%), mucus retention requiring intermittent
catheterisation (20%) and chronic diarrhoea (12%). Other adverse effects were partial bowel obstruction (8%) and cases of incisional hernia, bladder calculus and augmentation necrosis (n = 51).^530 [EL = 3]

Another five case series reported outcomes of augmentation cystoplasty in men and women with neurogenic or idiopathic DO.^531–535 Concomitant surgery was performed in 15–33% of patients in three studies.^531,532,535 One study reviewed patients who had either cystoplasty or detrusor myectomy, but did not report the time point of the outcomes considered and it is thus not considered further.^534 One only reported satisfaction with surgery, which was noted in 78%.^535 The other three studies reported the following effects on urinary symptoms:

- significant reduction in urgency and UUI; 53% cured or much improved at mean follow-up 20 months (n = 45)^533
- about 90% of patients had improved frequency; significant reduction in urinary symptom scores at 12 months (n = 48)^531
- 90% cured at 12 months mean follow-up (n = 40).^532

Two of the studies also considered urodynamic outcomes: one reported no significant change in the parameters measured,^533 while the other reported significant increase in total bladder capacity.^531 Across these studies, adverse effects or complications reported were:

- recurrent UTI (median 37%, range 5–58%)^531–533,535
- voiding dysfunction (18–39%),^532,533,535 problems with CISC 11%^531
- disturbed bowel habit: increased bowel frequency (22–25%),^531,535 faecal incontinence (17%), diarrhoea (11%), constipation (4%).^531

Other complications included mucus plug retention (3%),^532 anastomotic leak (2%),^531 persistent urine leak (3%),^532 incisional hernia (4–6%),^531,533 calculus formation (2%),^531 and urethral stricture (2–4%).^531,533

A narrative review on augmentation cystoplasty included complications of the procedure in a series of 267 patients at 5–17 years follow-up. However, the indications for the procedure were not clear. Short-term complications were small intestine obstruction (2%), infection (1.5%), thromboembolism (1%), bleeding (0.75%) and fistula (0.4%). Long-term complications were CISC (38%), UTI (20% symptomatic), stones (13%), metabolic disturbance (16%), deterioration in renal function (2%) and bladder perforation (0.75%).^536 [EL = 3]

Evidence statements for augmentation cystoplasty

Data on augmentation cystoplasty in women with OABare limited to case series. Cure or improvement has been reported in at least half of patients with idiopathic DO. Postoperative complications such as bowel disturbance, metabolic acidosis, mucus production and/or retention in the bladder, UTI and urinary retention are common or very common. There is a high incidence of recurrent UTI postoperatively, and many patients will need to self-catheterise. [EL = 3] Malignant transformation in the bowel segment or urothelium has been reported in a small number of cases. [EL = 4]

Evidence to recommendations (2013)

Although augmentation cystoplasty was not reviewed within the 2013 guideline update, to improve the implementation of the recommendation the GDG have included a note of clarification on the indications of its use.

The GDG noted that following augmentation cystoplasty there has been a reported long-term risk of bladder cancer. Therefore women should have annual cystometry appointments as a precautionary measure immediately following the procedure.

<table>
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<th>Recommendation</th>
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<tbody>
<tr>
<td>86</td>
<td>Augmentation cystoplasty for the management of idiopathic detrusor overactivity should be restricted to women who have not responded to conservative treatments</td>
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and who are willing and able to self-catheterise. Preoperative counselling for the woman or her carer should include common and serious complications: bowel disturbance, metabolic acidosis, mucus production and/or retention in the bladder, UTI and urinary retention. The small risk of malignancy occurring in the augmented bladder should also be discussed. Provide life-long follow-up. [2006, amended 2013]

7.6 Urinary diversion

Urinary diversion implies that urine drainage has been rerouted away from the urethra. This is most commonly achieved by means of transposing the ureters to an isolated segment of ileum, which is used to create a permanent cutaneous stoma (ileal conduit). Urine, which drains continuously, is collected in a stoma bag, which is attached to the skin of the abdominal wall. Other bowel segments can be used including jejunum and colonic segments but these are unusual. Continent urinary diversion may be achieved by creation of a catheterisable abdominal stoma, or by formation of a rectal bladder. These techniques are largely employed in children and patients with neurogenic bladder dysfunction and rarely in adult women with UUI.

Little information on the outcomes of urinary diversion in women with idiopathic UUI/OAB was identified. Some data on the complications of urinary diversion, for benign conditions, are provided in a case series of men and women with neurogenic disease (76%), or intractable UI or interstitial cystitis (24%). After a minimum of 2 years follow-up, very common complications were vesical infection (52%), stoma problems including parastomal hernia, and upper tract dilatation (n = 93; 63% women).\(^{537}\) [EL = 3]

Stress UI

A retrospective study of women with stress UI who underwent ileal loop diversion also reported complications relating to the procedure (n = 18; minimum 1 year follow-up). Overall, eight women required surgical revisions of the loops/stomas and eight required formation of a vesicovaginal fistula arising from complications related to the defunctioned bladder.\(^{538}\)

Evidence statement for urinary diversion

There are limited data on the outcomes of urinary diversion in women with UUI/OAB. Where the procedure has been used in men and women with benign conditions, vesical infection, stoma related problems and the need for surgical revisions occur very commonly. [EL = 3]

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<th>Recommendation</th>
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<tr>
<td>87</td>
<td>Urinary diversion should be considered for a woman with OAB only when conservative treatments have failed, and if BoNT-A, sacral nerve stimulation and augmentation cystoplasty are not appropriate or are unacceptable to her. Provide life-long follow-up. [2006, amended 2013]</td>
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7.7 Detrusor myectomy

Detrusor myectomy aims to improve the functional bladder capacity by excising bladder muscle from the fundus of the bladder while leaving the mucosa intact, thus creating a permanent wide-necked diverticulum. The defect is usually covered with a segment of mobilised omentum. Theoretically, this should avoid the complications associated with bowel interposition.

No prospective controlled trials were identified that evaluated detrusor myectomy for the treatment of UUI/OAB in women. One case series reported the outcomes of detrusor myectomy in men and women with idiopathic or neurogenic DO, resistant to antimuscarinic drug treatment (n = 30; 20 women). Improvement was reported in 19 of 24 patients with idiopathic DO, with minimum follow-up of 2 years (median 6.5 years, maximum ∼12). Three patients underwent further treatment (two ileal

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conduit, one colposuspension for stress UI). Other outcomes were not reported separately for patients with idiopathic DO. There was one case of bowel perforation. Overall, one-third of patients required intermittent self-catheterisation (ISC). \(^{339,540}\) [EL = 3]

Evidence statement for detrusor myectomy

All case series on detrusor myectomy include patients with both neurogenic bladder dysfunction and those with idiopathic detrusor overactivity. While urodynamic parameters may improve in some patients, the clinical outcomes are unclear; hence the role of detrusor myectomy in the treatment of detrusor overactivity is not yet established. [EL = 3]

### 7.8 Vanilloid receptor agonists

Resiniferatoxin, originating from cactus, has a similar action to capsaicin (chilli pepper). Intravesical instillation of resiniferatoxin was considered in two case series of patients with OAB, one in women (\(n = 30\))\(^{550}\) and another in men and women (\(n = 41; 20\) women).\(^{551}\) The duration of follow-up is unclear in one study, making interpretation of the results presented difficult.\(^{551}\) In the other study, in women refractory to antimuscarinic treatment, urgency and urge UI were significantly reduced 1 month after resiniferatoxin treatment. Adverse effects were not considered.\(^{550}\) [EL = 3]

No relevant studies of sufficient quality regarding the use of capsaicin were identified.

Reduction in OAB and urgency in women has been reported in one case series, 1 month after intravesical instillation of resiniferatoxin. [EL = 3]

### 7.9 Sequence of surgical procedures for overactive bladder – economic evaluation

**Introduction**

The economic evaluation considered the cost-effectiveness of SNS alone for women unable to catheterise, and single and combination treatment strategies for women for whom both SNS and BoNT-A are treatment options. Where the evidence was reported, data from the systematic review for this guideline was used to inform the model. Evidence of the effectiveness of combined treatment options was not searched for in the systematic review for this guideline, therefore an assumption was made that the effectiveness of BoNT-A and SNS used one after the other is independent of each other. This assumption was made in order to develop a model that reflected real decisions for the NHS rather than using direct evidence from the clinical review. The explicit assumptions used in this economic evaluation are presented below alongside the GDG’s consideration of their validity.

**Background health economic literature**

The health economic studies identified in the published studies did not form part of the evidence base for the recommendations on treatments for overactive bladder are only reported here as background information to inform the health economic modelling. None of the published health economic studies were presented as evidence to the GDG. However, clinical data from published health economic evaluations were incorporated into the model where specific model parameters were not included in the review. The evidence from published health economic models that informed the health economic analysis for this guideline is presented as background information below. Evidence tables reporting methods and results can be found in the guideline appendix.

The health economic review considered studies published since 2006 that had compared BoNT-A and neuromodulation in a cost-effectiveness analysis that could inform the structure and model parameters for the model developed for this guideline.

Three new health economic analyses were identified with relevant comparisons, one from the USA (Siddiqui et al., 2009), one from the Netherlands (Wu et al., 2010) and one from Spain (Arlandis et al., 2011).
2011) All three developed Markov decision models and all studies identified the study population as women with OAB symptoms who had failed conservative management including treatment with an anticholinergic drug.

Saddiqui and colleagues compared BoNT-A and neuromodulation for the treatment of refractory UUI. A Markov decision model was developed with three-month cycles. This model provided additional data for the health economic model developed for this guideline as it included variables that were not part of the guideline clinical review. The population included in Saddiqui’s analysis was women with refractory idiopathic detrusor overactivity. The additional variables were: the probability of retention of urine after treatment with BoNT-A requiring additional health care, the probability of contracting a urinary tract infection (UTI) in a treatment cycle of BoNT-A, and the probability of retention together with UTI.

Leong and colleagues compared SNS and BoNT-A and included in each arm, the possibility of switching to the other treatment if the first failed. If a patient failed both, then no other treatment options were offered. This clinical pathway was adopted for the health economic model for this guideline. Effectiveness data was identified in non-randomised trials with additional parameter estimates derived from an expert clinical panel.

Arlandis compared SNS, PTNS, optimal medical management and BoNT-A. The analysis was conducted over a ten year period. This was the time frame adopted for the economic model for this guideline because the GDG considered that sacral nerve stimulation, when successful, would provide health benefits for at least this time frame. The treatment cycles were a year-long so trial data could not be used as they did not report this length of follow-up. Effectiveness data was identified in non-randomised trials with additional parameter estimates derived from an expert clinical panel.

Although all three studies included the relevant comparators for the cost-effectiveness analysis for this guideline, none of these studies were undertaken in the NHS. They were not based on the outcome that the GDG considered to be the most relevant for this analysis (see ‘Outcomes’ below) and used estimates of effectiveness which are superseded by the clinical review for this guideline. This review was based on randomised controlled trial evidence and, for longer term data, on the expert opinion of the GDG.

**New health economic analysis**

**Structure**

A model was developed that compared four treatment strategies.

1) Treatment with BoNT alone, or

2) Treatment with SNS alone, or

3) Treatment starting with BoNT-A and then offering SNS if BoNT-A is ineffective, or

4) Treatment starting with SNS and then offering BoNT-A if SNS (or test stimulation SNS) is ineffective.

On-going medical management was not considered an option since at this stage of the treatment pathway it was assumed that women have already failed to respond adequately to the antimuscarinic drugs recommended in this guideline.

A second antimuscarinic drug was not included as a treatment alternative in any analysis. The GDG view was that in the time needed to be referred to secondary care, there is time to try an alternative antimuscarinic drug after referral to secondary care. In this case a second drug is seen as an alternative to SNS or BoNT-A. The option of on-going medical management after the failure of two antimuscarinic drugs was not seen as a viable treatment alternative on the NHS.

PTNS was not included as a treatment option because the GDG did not consider there to be sufficient evidence to recommend its use on effectiveness grounds (see chapter 4).

Two separate and independent analyses were undertaken based on this model. The first analysis considered the cost-effectiveness of SNS for women who cannot tolerate CIC, for example because of a co-existing condition. For this group, the only treatment options were strategies 2 and 5 because any strategy that included BoNT-A may require CIC.
The second analysis considered treatment for women who are able to tolerate CIC, for whom both SNS and BoNT-A are viable treatment options. For this group, the cost-effectiveness of all treatment strategies were included in the analysis.

The health economic model followed a hypothetical cohort of women with OAB caused by detrusor overactivity over a hypothetical 10-year treatment period. This was the time frame adopted for the economic model for this guideline because it was the time frame adopted in a recent health economic model (Arlandis et al., 2011) although there was a lack of long term data on efficacy. The GDG considered that, given that both SNS and BoNT-A are relatively new technologies and data on longer term effects have not yet been collected, the time frame reflected current clinical know-how about these interventions.

Effectiveness data was identified in non-randomised trials with additional parameter estimates derived from an expert clinical panel. Each treatment cycle lasted 3 months. In each cycle, there was a probability that a woman was either on successful treatment (continent) or on unsuccessful treatment (incontinent). Depending on the treatment strategies, a women on unsuccessful treatment could be offered an alternative in the next 3-month cycle or revert to no active treatment. No active treatment was an "absorbing state" meaning that women could move to another state from this one for the rest of the model term.

This highly structured pathway did not exactly reflect clinical practice in the NHS but allows the model to estimate the costs and outcomes for each treatment pathway without the added complications of other treatment options. It is a simplification of reality and not all decisions and health states are represented. For example, mortality is not factored into the model for simplification purposes because it was not thought that differences in mortality between treatment arms would affect the relative cost-effectiveness of treatment options. Since the analysis did not include death, it was assumed that all women would be alive at the end of the model term.

At the beginning (time zero), all the women were in an incontinent state. The first and second strategies – treatment with either BoNT-A or SNS alone – are straightforward. For both strategies, women were either in a continent state and continued treatment or in an incontinent state and stopped treatment.

In strategy 1 (SNS alone), the implant remains in place until either there were complications or the battery in the device needs replacing in the seventh year of use. The probability of complications arising from the use of SNS is included in the model. Complications can lead to revision and continuation with SNS or removal of the implanted device. If a woman stopped treatment with SNS she reverts to no active treatment (management with pads only) for the remainder of the model term.

In strategy 2 (BoNT-A alone), the woman is assumed to require another course of treatment every 9 months on average. During a cycle, a woman can be either continent or incontinent, and have complications or no complications. The complications included in the model are urinary tract infection and retention. These complications do not lead directly to discontinuation of treatment but the cost of treatment is included in the model. If a woman stops treatment with BoNT-A, no additional service associated with BoNT-A is required.

For the third and fourth strategies (one treatment, then switching to the other if that fails) the pathway is more complex. In strategy 3, women could be offered BoNT-A first and if is initially unsuccessful they go straight to SNS (percutaneous nerve evaluation) within the first three months of treatment. If BoNT-A treatment is successful, they continue to be treated this way until either the end of the model term or until the treatment is no longer successful. A proportion of women are assumed to have complications in each BoNT-A cycle but this is assumed not to have a direct effect on treatment efficacy (but does incur costs). If SNS is successful, they continue with SNS until the end of the model term or until it is no longer effective. Complications may require surgical revision or removal which incurs additional costs. If SNS is also unsuccessful, they stop treatment. They revert to no active treatment (management with pads only) for the rest of the model term.

In strategy 4, women may be offered test stimulation with SNS in the first three-month cycle. If this is successful, they will go on to have a permanent SNS implant in the following 3-month cycle. If SNS fails, the implant is removed and women are offered BoNT-A in the following cycle of treatment. If BoNT-A is effective they remain on BoNT-A until the end of the model term or until it is no longer effective.
effective. If BoNT-A is not effective, they stop treatment. They revert to no active treatment (management with pads only) for the rest of the model term.

The model uses the effectiveness probabilities published in this guideline where possible (table 1) to determine the proportion of women in a successful treatment state (either SNS or BoNT-A) or in a persistent OAB (no active treatment) state at every time point. The costs and outcomes associated with each strategy are calculated for each time point. The definition of successful treatment used in this model is zero episodes of continence per day or “completely dry”. There was considerable discussion about these assumptions with the GDG during development, as other health economic models have measured success as a proportion of women with improved symptoms. However, the benefit to women of improved symptoms is more uncertain than symptom-free days. (See Outcomes below for further discussion).

At the end of the ten-year time-frame, the costs and outcomes (measured in quality-adjusted life years) can be compared. Where one strategy is both more expensive and more effective the additional cost per QALY can be estimated. Since the data points used in the model are uncertain, the model can be made probabilistic to estimate the likelihood that any strategy is cost-effective. This approach can help quantify the uncertainty in the model results. Costs were discounted at 3.5% per year and QALYs at 3.5% per year. An NHS perspective for costs was adopted, which assumed that all costs (including incontinence pads) were born by the NHS.

Data used in the model

Tables 7.3 to 7.5 below present the values that are used in the model and model assumptions agreed with the GDG.

Table 7.3 Effectiveness parameters used in the health economic model comparing BoNT-A and sacral nerve stimulation treatment strategies.

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
<th>Included in PSA*</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BoNT-A:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Failure rate after three months of BoNT-A</td>
<td>0.40</td>
<td>Yes</td>
<td>From UI guideline update clinical review. This is calculated from the NCC review of the cumulative 6-month failure rate (64%). The rate was assumed to be the same at 3 and 6 months. N=191 women</td>
</tr>
<tr>
<td>2. Failure rate after six months of BoNT-A</td>
<td>0.40</td>
<td>Yes</td>
<td>See parameter 1. above</td>
</tr>
<tr>
<td>3. Failure rate at nine months</td>
<td>0.01</td>
<td>No</td>
<td>This is based on the assumption that BoNT is a successful treatment for women for whom it is successful at 6 months, with a failure rate of only 1%. Data were not identified for time periods greater than 6 months.</td>
</tr>
<tr>
<td>4. Failure rate at twelve months of BoNT-A</td>
<td>0.01</td>
<td>No</td>
<td>See parameter 3. above</td>
</tr>
<tr>
<td>5. Failure rate in every cycle after twelve months</td>
<td>0.01</td>
<td>No</td>
<td>See parameter 3. above</td>
</tr>
<tr>
<td>6. Rate of retention with BoNT-A</td>
<td>0.33</td>
<td>No</td>
<td>Not from UI guideline update clinical review but published in a health economic model (Siddiqui et al., 2009)</td>
</tr>
</tbody>
</table>
DRAFT FOR CONSULTATION

7. Rate of UTI with retention  0.75  No  See parameter 6. above
8. Rate of UTI with no retention  0.19  No  See parameter 6. above
9. Rate of repeat injections in women who are successful on BoNT-A  1.00  No  Based on UI guideline update clinical review. N= 68 women.

SNS:

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Cost</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percutaneous nerve evaluation</td>
<td>£1,485</td>
<td>Bottom-up costing, see Appendix P</td>
</tr>
<tr>
<td>Permanent implant of tined lead</td>
<td>£8,641</td>
<td>Bottom-up costing, see Appendix P</td>
</tr>
<tr>
<td>Removal of permanent implant</td>
<td>£923</td>
<td>Bottom-up costing, see Appendix P</td>
</tr>
<tr>
<td>Cost of minor complications</td>
<td>£210</td>
<td>Updated from (Wu et al., 2009)</td>
</tr>
</tbody>
</table>

* probabilistic sensitivity analysis (see below)

Costs

The cost table (table 7.4) is a summary of the total costs. Where possible, data supplied from manufacturers was checked with NHS sources. The cost for SNS used in the model assumed that all women had a percutaneous nerve evaluation. An alternative procedure is the two-stage tined lead requiring only one lead implantation. The cost of this process is not included in the table of costs because it is currently a less widespread procedure. Data on pad and catheter use was supplied by expert members of the GDG. All women who fail PNE incur a cost of removal and all women who get no benefit from SNS have to have the lead removed. These are additional costs to the NHS. The cost of adverse events was also included as reported in previous health economic models.

It was assumed that women who are treated with BoNT-A receive follow-up injections every 9 months. This was a GDG assumption based on their clinical experience. This is a longer interval between injections than assumed in previous health economic models.

Appendix P reports all the data and sources in more detail.

Table 7.4 Treatment and adverse event cost for BoNT-A, SNS and ‘no active treatment’ used in the model

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Cost</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNS:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percutaneous nerve evaluation</td>
<td>£1,485</td>
<td>Bottom-up costing, see Appendix P</td>
</tr>
<tr>
<td>Permanent implant of tined lead</td>
<td>£8,641</td>
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</tr>
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<td>Removal of permanent implant</td>
<td>£923</td>
<td>Bottom-up costing, see Appendix P</td>
</tr>
<tr>
<td>Cost of minor complications</td>
<td>£210</td>
<td>Updated from (Wu et al., 2009)</td>
</tr>
</tbody>
</table>

BoNT-A

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Cost</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BoNT-A unit cost</td>
<td>£1,016</td>
<td>Based on £745 per injections reported in (Kalsi et al., 2013)</td>
</tr>
</tbody>
</table>
2006) (price yr 2003/4), uplifted to 2010 prices. Also includes 4 catheters per day at £1.40 each (GDG estimate)

Includes consultant care, tests and drugs, and post-op follow-up (original 2003/4 drug costs, £190)

<table>
<thead>
<tr>
<th>Adverse events</th>
<th>Cost</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment for UTI</td>
<td>£34</td>
<td>From UK NHS RCT of management strategies for urinary tract infections (Turner et al., 2010)</td>
</tr>
<tr>
<td>Cost to the NHS of incontinence (Pads)</td>
<td>£8 per week</td>
<td>GDG opinion based on weekly pad use. No other additional health care resources were assumed</td>
</tr>
<tr>
<td>Cost of urinary retention</td>
<td>£70</td>
<td>Non consultant-led face-to-face outpatient (PSSRU, 2012)</td>
</tr>
<tr>
<td>SNS management of complications</td>
<td>£50</td>
<td>(Turner et al., 2010)</td>
</tr>
</tbody>
</table>

1

Outcomes

The GDG chose to use the outcome “continent - completely dry” in the health economic analysis. Their view was that an older paper which published utility values for states of incontinence may have led to an overestimation of effectiveness of treatments for OAB symptoms by combining micturition (both voluntary and involuntary) and leakage per day (Kobelt et al 1998). The GDG did not consider this a useful outcome in measuring incontinence because there was no definition of what the micturition rate per day would be for a woman who did not have incontinence.

Kobelt’s study defined the best possible health state as less than nine episodes of micturition or leakage per day rather than zero episodes of incontinence which the GDG considered was the most important outcome for patients. The utility values published in this study became the standard values used in economic evaluation of urinary incontinence treatments published subsequently (and reviewed in the previous guideline). The GDG view was that a less ambiguous outcome was chosen which was continent (completely dry) or incontinent (one or more episodes of leakage). The GDG view was that treatment strategies that led to the highest probability of being completely dry would also be the strategies with the highest number of women who were continent by other measures of success (for example, ≥50% improvement in symptoms). An economic analysis based on a narrower less ambiguous definition of continence would be very likely to underestimate the cost-effectiveness of the more effective treatment strategies compared with the alternatives. In clinical reality, the alternative that showed it was cost-effective would probably be even more cost-effective if the benefit for women who improved but did not become fully continent was also included in the analysis.

A range of values for health state quality of life (utility) values are published in health economic models. A recent HTA included a comprehensive review of health-state utilities associated with urinary incontinence. The review was published as part of a cost-effectiveness model for treatments for stress urinary incontinence (Imamura et al 2010). It included a study by Haywood and colleagues that reported generic quality of life scores (EQ-5D) obtained by questionnaire from women with successful and unsuccessful treatment. EQ-5D scores can be converted into the health related quality of life weightings to drive QALYs. Haywood reported a median EQ-5D score of 0.85 (SD 0.23) for women with successful treatment (no episodes of incontinence). At five months, the mean score for women who said they had no benefit from treatment for their condition (remained in an incontinent state) was reported as 0.74 (SD 0.38). The HTA cost-effectiveness analysis used these utility values to define treatment success and treatment failure of treatments for SUI. Using the ‘treatment failure’ utility value to represent incontinence may not capture the variability of continence states and improvements in women’s continence status who nonetheless do not reach a fully continent state. The GDG felt that it was a plausible assumption that treatments which increase the proportion of women who are fully continent also improve the proportion of women who have some benefit but without achieving full continence. Therefore the analysis is likely to underestimate the effectiveness
of the more effective treatments and the treatments identified as cost-effective are likely to be even more cost-effective than reported. The base case values used in the model are those reported in the HTA report, converted into three-month cycle values. These values were varied in the one-way sensitivity analysis.

**Table 7.5** Health-related quality of life values for urinary incontinence used in the health economic model

<table>
<thead>
<tr>
<th>Health state</th>
<th>EQ-5D value per year</th>
<th>EQ-5D value per three month cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continent (completely dry)</td>
<td>0.85</td>
<td>0.2125</td>
</tr>
<tr>
<td>Incontinent</td>
<td>0.74</td>
<td>0.185</td>
</tr>
</tbody>
</table>

**Probabilistic sensitivity analysis**

There were sufficient data to undertake a sensitivity analysis that included five model parameters. All other model parameters were assumed to be fixed, including costs as unsufficient data could be identified to allow this to be included as a variable model parameter. Complication rates for BoNT-A included retention and urinary tract infection only. Data for these adverse events were not included in the systematic review and were taken from data published in previous health economic models (see table 7.4 above).

**Table 7.6** Parameters for the distributions applied in the probabilistic sensitivity analysis

<table>
<thead>
<tr>
<th>Item</th>
<th>Alpha</th>
<th>Beta</th>
<th>Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Failure rate BoNT-A at 6 months</td>
<td>123</td>
<td>68</td>
<td>Beta</td>
</tr>
<tr>
<td>SNS test stimulation failure rate</td>
<td>184</td>
<td>145</td>
<td>Beta</td>
</tr>
<tr>
<td>SNS complication rate at 6 months</td>
<td>83</td>
<td>74</td>
<td>Beta</td>
</tr>
<tr>
<td>Surgical revision rate following complications</td>
<td>51</td>
<td>106</td>
<td>Beta</td>
</tr>
<tr>
<td>Maintenance of efficacy after test simulation in first 3 months*</td>
<td>64.31</td>
<td>44.69</td>
<td>Beta</td>
</tr>
</tbody>
</table>

**Assumptions in the model**

The table below summarises the assumptions that the GDG has agreed in order to develop this model. The GDG were keen that the assumptions in this model were transparent so that readers could follow the decisions that were made and the consequences where possible. They also wanted the model to reflect clinical experience and NHS practice.

**Table 7.7** Assumptions used to construct the health economic model comparing BoNT-A and SNS treatment strategies

<table>
<thead>
<tr>
<th>Assumption</th>
<th>Further explanation and consideration by the GDG</th>
</tr>
</thead>
<tbody>
<tr>
<td>That all women in each strategy are able to have that treatment. Women who cannot tolerate clean intermittent catheterisation (CIC) are not offered BoNT-A</td>
<td>This assumption only holds for the health economic analysis for women who are able to catheterise. The other economic analysis assumes that women who cannot tolerate CIC and are only offered SNS or no active treatment</td>
</tr>
</tbody>
</table>
That the effectiveness of BoNT-A and SNS are independent of each other so that the likelihood of success with SNS is not affected by treatment failure using BoNT-A and vice versa.

The GDG considered this to be a strong simplifying assumption but that making any other assumptions (that these populations are different) would require estimations for the efficacy of treatment for different populations, which the GDG did not feel able to do without data.

That treatment efficacy and the risk of failure is the same every cycle, independent of how long a woman has been on treatment.

This is a strong assumption, but no data was identified to inform this parameter. The GDG recognised that it is a simplification of reality. However, using values based on expert opinion would add to complexity without any guarantee that these would be a more robust estimate.

That all women who fail SNS test stimulation proceed to treatment with BoNT in the next cycle with no second attempt. None refuse BoNT-A as an alternative treatment.

This model is to compare SNS and BoNT-A as alternative strategies. For women who cannot tolerate BoNT-A, there is no alternative to SNS or “no treatment” so they are not included in this analysis.

That all women who succeed with a test stimulation of SNS proceed with SNS.

The GDG view was that once women have agreed to SNS, nearly all would continue with a permanent implant. The small numbers of women that refuse would not change the overall conclusion of the analysis.

That all women who fail their first treatment with BoNT-A proceed directly to SNS.

The model does not include the cost/outcome associated with a second treatment with BoNT-A at the same or a higher dose as there was no clinical data on the effectiveness of this strategy.

That there is no additional loss of health-related quality of life associated with complications resulting from SNS or BoNT-A.

We do not have data on this and, thus far, it has not been included. If it should be, we have to agree a meaningful decrement in mean quality of life.

That women who require a surgical revision are incontinent during that cycle.

The GDG recognised that some women may have some benefit from SNS while requiring a revision, but that it was far more likely that women would seek medical attention due to device failure.

That all women who require a surgical revision following SNS consent to having a revision.

This was an assumption in other health economic models and seen as reasonable by the GDG.

That women who are successfully treated with BoNT-A require additional injections with BoNT-A every nine months on average.

This was an estimate by clinical experts within the GDG.

That women who fail treatment with BoNT are not offered a second treatment.

The GDG considered that it is usual practice in the NHS not to repeat a course of BoNT-A injections if a woman had not had any benefit from the first course. This was common across study protocols in the RCT evidence included in the systematic review.

That the cost of repeat injections is the same as the first treatment.

The GDG considered that to be a reasonable assumption in the NHS, although recognised that the first course included more information-giving and assessment. This was considered not to affect the overall conclusion of the analysis.

That the complications associated with SNS are UTI and retention only and these events have no impact on treatment efficacy.

This is a simplification of the model that reflects other health economic analyses. Some models (Arlandis and colleagues 2011) included a more extensive range of adverse events which increased the complexity of the model. These adverse outcomes
were not prioritised by the GDG for the UI update guideline systematic review given the rarity of these events. It was not considered to affect the overall results of the analysis.

Evidence for long term complications was not prioritised by the GDG for the UI update systematic review. The GDG acknowledged the lack of evidence in this area as a weakness in the evidence for all treatment for OAB. Medical review may be more frequent for women on SNS, or alternatively women on no treatment and who are incontinent may require more (and different) long term health care support. The cost of this support was not known but not considered sufficient to change the results of the analysis.

That the long-term cost of SNS includes the cost of managing complications and undertaking revisions only.

That women who fail SNS and BoNT have persistent UI for the remainder of the model term

That all women who are incontinent require incontinence pads to manage their incontinence

That women who are continent incur no additional costs apart from their treatment

Longer term effectiveness data are assumed to be the same as at 3 years

All women are alive at the end of the model term

That women who fail SNS and BoNT have persistent UI for the remainder of the model term. This is a simplification of the model that may not reflect NHS practice as women are likely to be reviewed and offered additional support which is a cost to the NHS that has not been included. It was not considered that this would change the result of the model. Given that they have not had any benefit from medical or surgical intervention, it is unlikely that they will experience full continence for the remainder of the model term.

That all women who are incontinent require incontinence pads to manage their incontinence. This reflects the experiences of GDG members who care for women who are not on active treatment.

That women who are continent incur no additional costs apart from their treatment. This does not reflect reality but the exact cost is not known and the additional cost of their management was not deemed to be sufficiently different from women who remain incontinent (usually a regular clinical review in primary care) to change the magnitude of cost-effectiveness in this model.

Longer term effectiveness assumptions were not included in the probabilistic sensitivity analysis.

One-way sensitivity analysis was also undertaken on the key model. The purpose was to understand the importance of a specific estimate used in the model in driving the cost-effectiveness results. However, changing a model parameter within a reasonable range (decided by the GDG) could not be predicted to change the results of the analysis.

Approach to sensitivity analysis

Table 7.4 above indicates the model parameters that were included in the analysis and 7.6 indicate the model parameters included in the probabilistic sensitivity analysis. Where data were identified from trials, the evidence (model variables) was used to parameterise the probabilistic sensitivity analysis in the model. The probabilistic sensitivity analysis was based on 1000 random simulations derived from the data identified in clinical trials. The smaller the trials on which data inputs are based, the more variation would be expected in the simulation, indicating more uncertainty in the results. Not all model parameters were made probabilistic, only those for which there was trial data. Long-term effectiveness assumptions were not included in the probabilistic sensitivity analysis.
change the order of cost-effectiveness making a different strategy the most cost-effective relative to the others. If a suggested change in a variable changes the conclusion of the analysis, then the GDG may have less confidence in that conclusion. The GDG may decide that the results of the model are not conclusive and therefore do not support any specific guideline recommendation. Therefore all model parameters were varied within realistic ranges derived from other sources of published data or GDG opinion.

Model validation

A second health economist reviewed the methods, model structure, data inputs and results of the model, and changes were made to earlier drafts.

Results

In the first analysis, treatment with SNS for women who cannot tolerate catheterisation was compared with no active treatment.

Table 7.8 Cost-effectiveness of SNS versus no active treatment (NAT) for women with OAB

<table>
<thead>
<tr>
<th>Treatment option</th>
<th>10-year discounted cost</th>
<th>10-year discounted QALYs</th>
<th>ICER¹¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAT</td>
<td>£3,581</td>
<td>6.37</td>
<td></td>
</tr>
<tr>
<td>SNS only</td>
<td>£13,526</td>
<td>6.71</td>
<td>£29,144</td>
</tr>
</tbody>
</table>

Table 7.8 shows that SNS costs around £14,000 over a ten-year period but is more effective than no active treatment which costs around £3,500 over ten years. Nearly all the additional cost of SNS occurs in the first year with no additional costs until year 7 when the SNS battery requires replacement. The cost of no active treatment is the cost of daily pads over ten years as the cost of medical review was assumed to be the same.

The difference in total QALYs over ten years assumes that women who are incontinent have around a 13% decrement in quality of life from 0.85 to 0.74 (table 7.5 above). The analysis shows that SNS was only cost-effective if the willingness-to-pay per QALY threshold is under £30,000 per QALY. Table 7.8 above shows the small additional benefit (6.56 QALYs versus 6.18 for no active treatment) which is a result of the probability of PNE failure (58%) and SNS failure every three months (88%) used in the model.

In the second analysis, women who can tolerate CIC are offered either BoNT-A alone, BoNT-A followed by SNS if the first treatment fails, or SNS followed by BoNT-A if the first treatment fails.

Table 7.9 presents the treatment alternatives in ranked order of cost (lowest to highest). The notes in the table explain which strategies are being compared in each row.
### Table 7.9 Mean estimates of the cost-effectiveness of four treatment strategies for women with OAB, in order of cost (1000 simulations)

<table>
<thead>
<tr>
<th>Treatment option</th>
<th>10-year discounted cost</th>
<th>10-year discounted QALYs</th>
<th>ICER</th>
<th>Notes on the cost-effectiveness comparisons</th>
</tr>
</thead>
<tbody>
<tr>
<td>No active treatment</td>
<td>£3,581</td>
<td>6.37</td>
<td></td>
<td>This shows the additional cost and effectiveness of BoNT-A only compared with no active treatment</td>
</tr>
<tr>
<td>BoNT-A only</td>
<td>£8,008</td>
<td>6.65</td>
<td>£16,017</td>
<td></td>
</tr>
<tr>
<td>SNS only</td>
<td>£13,526</td>
<td>6.71</td>
<td>£85,093</td>
<td>This shows the additional cost and effectiveness of ‘SNS only’ compared with ‘BoNT-A only’. This is a different ICER than that reported in table 7.8 which compared ‘SNS only’ with no active treatment</td>
</tr>
<tr>
<td>BoNT-A first then SNS</td>
<td>£15,526</td>
<td>6.89</td>
<td>£30,876</td>
<td>This shows the additional cost and effectiveness of ‘BoNT-A first’ compared with ‘BoNT-A only’ (adding SNS to the BoNT-A treatment strategy)</td>
</tr>
<tr>
<td>SNS first then BoNT-A</td>
<td>£16,799</td>
<td>6.89</td>
<td>£342,864</td>
<td>This shows the additional cost and effectiveness of ‘SNS first’ compared with ‘BoNT-A first’</td>
</tr>
</tbody>
</table>

On average, ‘BoNT-A only’ was cost-effective compared with no active treatment as the mean ICER is under £17,000, and therefore below the £20,000 per QALY threshold. ‘SNS only’ was not a cost-effective strategy in the base case analysis (that is, accepting all the original model assumptions). Yje ICER for BoNT-A first, followed by SNS if BoNT-A failed was just outside the NICE threshold for cost-effectiveness but the ICER for SNS first followed by BoNT-A was very high as the difference in effectiveness was so marginal between the strategies.

The additional cost per QALY of SNS alone compared with BoNT-A alone was over £85,000 using base case assumptions and data. The ICER is high because the health gain of SNS alone compared with BoNT-A is small (the model estimates that SNS provides an additional 0.06 QALYs of health benefit over ten years). In the base case analysis, 58% of women who were offered SNS failed the test stimulation before a permanent implant can be inserted. These women did not have any benefit from SNS treatment in the ten-year period although they incur some costs (of the test stimulation). The ‘SNS first’ treatment strategy was a more expensive and marginally more effective than ‘BoNT-A first’. Sensitivity analysis was undertaken to explore the impact of changing the test stimulation failure rate (see below).

There is a paucity of long-term data on the effectiveness of any of the treatment options. Even the data for the first six months, although derived from high quality evidence, comes from small trials. The next section explores the results using probabilistic sensitivity analysis which takes into account parameter uncertainty in some of the model inputs.

Figure 1 shows all four active treatment strategies and the likelihood that any of them are cost-effective at different thresholds of willingness-to-pay for a quality-adjusted life year for women for whom BoNT-A is an option.
The graph shows that at a cut-off of £20,000 per QALY, BoNT-A alone was most likely to be the cost-effective option for women who are able to catheterise (with probability of 100%). However, at a higher willingness-to-pay threshold (£30,000 per QALY) BoNT-A followed by SNS ("BoNT-A first") was cost-effective nearly 30% of the time, however, BoNT-A only was still the most likely to be cost-effective. The graph illustrates the lower level of certainty as the willingness-to-pay for a QALY rises.

Figure 7.1. Cost-effectiveness acceptability curves for SNS and BoNT-A strategies for women with OAB

The table below shows that BoNT-A only had the highest net benefit at £20,000 per QALY (calculated as the QALY value multiplied by £20,000, subtracted by the cost of the strategy). The confidence intervals were narrow but the lower confidence interval does not cross the upper confidence interval of the 'BoNT-A first' strategy, indicating the high level of certainty of this result. The net benefit for 'BoNT-A first', 'SNS only' and 'SNS first' cross each other strategy, indicating uncertainty that there is a true difference in net benefit between these strategies.
Table 7.10 Net benefit and confidence of surgical treatments for OAB at £20,000 per QALY

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Net benefit</th>
<th>Confidence intervals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>£20,000 per QALY</td>
<td>CI max</td>
</tr>
<tr>
<td>BoNT-A only</td>
<td>£124,914</td>
<td>£123,688</td>
</tr>
<tr>
<td>BoNT-A first</td>
<td>£122,261</td>
<td>£120,951</td>
</tr>
<tr>
<td>SNS only</td>
<td>£120,693</td>
<td>£119,045</td>
</tr>
<tr>
<td>SNS first</td>
<td>£121,075</td>
<td>£119,540</td>
</tr>
</tbody>
</table>

One-way sensitivity analysis

The table below shows the impact of changes in specific variables on the model outputs. The fourth column indicates whether the order of cost-effectiveness changed as a result of changing a specific parameter in the model.

Table 7.11 One-way sensitivity analysis varying key parameters in the model for women able to catheterise

<table>
<thead>
<tr>
<th>Variable</th>
<th>Base case value</th>
<th>Variation range</th>
<th>Result</th>
<th>Notes and interpretation of the results</th>
</tr>
</thead>
<tbody>
<tr>
<td>BoNT variables:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Failure rate for BoNT between 3- and 6 months</td>
<td>0.40</td>
<td>0.40 – 0.80</td>
<td>Insensitive</td>
<td>At 0.80 BoNT-A failure rate at 3 and 6 months, ‘SNS first’ was approximately the same cost as ‘BoNT-A first’ (£14,551 vs £14,708) but ‘BoNT only’ still had the highest chance of being the most cost-effective strategy (almost 100%).</td>
</tr>
<tr>
<td>Failure rate for BoNT after 6 months</td>
<td>0.01</td>
<td>0.01-0.20</td>
<td>Insensitive</td>
<td>At 0.20, only the ‘BoNT-A only’ strategy was below £20,000 per QALY</td>
</tr>
<tr>
<td>Cost BoNT</td>
<td>£1,016</td>
<td>£500 - £1,500</td>
<td>Insensitive</td>
<td>At the lower cost of BoNT-A only the ‘BoNT-A only’ strategy was below the £20,000 threshold for cost-effectiveness (£8,145) but no other strategies were under the threshold. At £1500, ‘BoNT-A only’ was above the £20,000 threshold for cost-effectiveness (£23,603).</td>
</tr>
<tr>
<td>SNS variables</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PNE failure (test)</td>
<td>0.58</td>
<td>0.2-0.8</td>
<td>Insensitive</td>
<td>At a failure rate of 0.2, none of the ICERs for strategies involving SNS were below £30,000, although ‘BoNT first’ was only just above £30,000 per QALY compared with ‘BoNT alone’. At a PNE failure rate of 0.8, the ‘SNS only’ strategy was both more expensive and less effective than ‘BoNT-A only’. The ‘BoNT-A first’ strategy and the ‘SNS first’ strategies remained cost-ineffective relative to ‘BoNT-A only’.</td>
</tr>
<tr>
<td>SNS implant efficacy</td>
<td>0.88</td>
<td>0.88-1.0</td>
<td>Insensitive</td>
<td>At 100% efficacy, the ICER strategies using SNS were lower than at 88% efficacy, but only the ‘BoNT-A first’ strategy was below £30,000 per QALY relative to ‘BoNT-A only’ (£28,670).</td>
</tr>
</tbody>
</table>
At a cost of the SNS implant of £2,000, the ICER for ‘SNS only’ for women who cannot tolerate BoNT-A dropped below £20,000 per QALY.

At a cost of SNS implant of £5,000, ‘BoNT-A only’ and ‘BoNT-A first’ had an equal chance of being cost-effective (43%) at a threshold of £26,000 per QALY.

The ‘SNS only’ and ‘SNS first’ strategies were not cost-effective.

By increasing the utility value of continence to 0.91 (6 percentage points), the ICER for ‘BoNT-A first’ relative to ‘BoNT-A only’ was just above the £20,000 per QALY threshold for cost-effectiveness (£20,466).

For women who are unable to catheterise, SNS was cost-effective when the utility value for continence was 0.90 (£19,965 per QALY).

Order of cost-effectiveness not changed but magnitude of net benefit for all strategies was increased and the difference between SNS and BoNT-A strategies (the single treatment and double treatment strategies) increased.

The model was sensitive to the estimates of health-related quality of life values assumed in the model.

Increasing the health status of continence up three percentage points from 0.85 to 0.90 made the SNS strategy cost-effective relative to no active treatment for women who are unable to self catheterise.

Increasing the health status continence from 0.84 to 0.91, made the ICER for ‘BoNT-A first’ relative to ‘BoNT-A only’ cost-effectiveness with an ICER of £20,466 (see table below for all one-way sensitivity analyses).

The results were also sensitive to the cost of SNS implants. Reducing the procedure cost to £5,000 brought the cost-effectiveness of SNS for women who cannot tolerate BoNT-A below the £20,000 per QALY threshold. The treatment strategies that included SNS (‘BoNT-A first’ or ‘SNS only’) ICERs were both above £40,000 per QALY.

**Conclusion**

**Treatment options for women who cannot catheterise**

For women who are unable to intermittently catheterise, the model suggests that SNS is a cost-effective option compared with no active treatment, but only if a threshold higher than £20,000 per QALY threshold is adopted. However the analysis was sensitive to changes in the health-related quality of life values used. A small increase in quality of life associated with continence made SNS cost-effective relative to no active treatment for women unable to catheterise. For SNS to be recommended for this population, the GDG would need to be convinced that the health benefit of treatment is greater for than reported in the recent HTA review (Imamura et al., 2010).
Treatment options for women who are able to catheterise

Using base case assumptions, the probabilistic sensitivity analysis indicated that BoNT-A alone was very likely to be the most cost-effective option compared to all other alternatives the lower cost per QALY threshold (£20,000) as it was the most cost-effective option in 100% of 1000 simulations. The cost-effectiveness analysis suggests that it is is cost-effective to offer BoNT-A alone for women who can tolerate intermittent self-catheterisation.

In the base case analysis (data presented in tables 7.8 and 7.9), the additional cost per QALY of offering BoNT-A first and then SNS if BoNT-A fails fell outside the upper limit for cost-effectiveness (£30,876). If a women is able to tolerate BoNT-A the analysis does not provide robust evidence that it is cost-effective to offer SNS as a second treatment if BoNT-A is unsuccessful. However, results were sensitive to the quality of life estimates. Small increases in the changes in quality of life following successful treatment (or reduction in quality of life at the start of treatment) changed the result.

Limitations of the analysis

Although the model captured some of the complexity in treatment options available in the NHS, it is a simplification of reality and does not reflect all of the complexity of clinical experiences of women with OAB in this phase of treatment. Nevertheless the GDG considered the values and assumptions that should be incorporated into the model throughout the development process and were satisfied that the assumptions reflected their own clinical experience and NHS practice.

The choice of outcome (continence status, defined as zero episodes of incontinence) was defined early on in the stakeholder consultation on the draft scope. The GDG supported the use of this outcome as it was the most important outcome to women with OAB and was strongly correlated to all other quality of life outcomes. Interventions with a higher rate of absolute continence were associated with higher rates of improvement in continence episodes or urgency and incontinence per day. The health states associated with moving from incontinence to continence can be defined unambiguously whereas the state of moving from a higher to lower number episodes of urgency or incontinence cannot. The GDG considered that studies that define improvement as a proportional change in episodes of incontinence are more open to interpretation than an absolute change in health state.

The model assumed that women who are offered SNS first are the same population that could be offered BoNT-A first. There were no head-to-head comparisons of SNS and BoNT-A so the assumption is that the studies were on sufficiently similar populations. The GDG was satisfied that this was an acceptable assumption based on the descriptions of population in the studies included in the analysis.

The model also assumed that, for the two-treatment strategies, the populations are the same for treatment one and treatment two. Women who fail BoNT-A have the same change of success with SNS as all women with OAB and the same assumption is made for those who fail SNS first. This assumes that women who fail BoNT-A do not have a higher probability of failure with SNS. There is no data to support or refute this assumption, but the GDG accepted this limitation of the model.

This model was based on clinical data identified in the systematic review undertaken for this guideline update but not all parameters in the model were updated for the clinical guideline. There was a lack of long term data to populate the model and a lack of direct evidence comparing BoNT-A and SNS in the same study.

Data from previous models described in the literature review were included where data were not available. This included adverse events such as urinary retention and urinary tract infection. The GDG did not consider that these data were critical to the model and including updated data would not be likely to change the overall results.

The GDG was keen for the simplifying assumptions in the model to be explicit for transparency and also to show the limitations in the data available for this type of analysis. The GDG were aware that other models include a wider range of adverse events associated with each treatment option and have made other assumptions about longer term effectiveness and discontinuation rates. The GDG considered that adding more complexity to a model where baseline data on effectiveness and longer term continuation rates were not robust would not be a good use of additional analytical resources.
The health economic model incorporated the GDG’s understanding of how decision-making works in the NHS for women with OAB symptoms who have failed medical management. The GDG did not believe that medical management, after it has not been effective, would be a viable alternative to surgical intervention and is not included in the model. The model captures the two treatment options the GDG considered viable for women with OAB who are able to catheterise. It also reflects the GDG’s expertise in making assumptions about effectiveness of care where data is lacking as well as their expertise in understanding the costs of these treatments for the NHS. Therefore it represents the GDG’s “best guess” as to the relative cost-effectiveness of SNS and BoNT-A, acknowledging that there are important gaps in the data which have to be filled with clinical knowledge and understanding of how these treatments are offered across the NHS.

The GDG’s consideration of the economic evidence and the recommendations relating to sequencing of treatments for women with OAB can be found in the separate sub-chapters for each specific intervention.
8 Surgical procedures for stress urinary incontinence

8.1 Introduction

The large number of different procedures described for the surgical management of stress UI reflects the numerous theories proposed to explain the pathophysiology of the condition and the continuing search for a procedure that can successfully deal with all cases. Although the range of procedures described is bewildering, a recent proposal for a new surgical classification simplifies them into those that aim to augment urethral closure and those that aim to support or stabilise the bladder neck or urethra.

In 1997–98 approximately 8000 operations for stress UI were carried out in England (over a 12 month period). By 2004–05 the annual number had increased by 16% since that time, despite an approximately 90% reduction in the numbers of colposuspension and needle suspension procedures, and a 30–50% reduction in bladder neck buttress, sling and periurethral injection procedures. The increase was entirely made up by the rapid introduction of tension-free vaginal tape and similar mid-urethral tape procedures (see Figure 8.1).

These trends in surgical techniques applied in the treatment of stress UI appear to be having a substantial impact on resource utilisation within acute hospital trusts. The average length of hospital stay for women undergoing surgical treatment has reduced by over 50% since the introduction of mid-urethral tapes in 1998. As a result, the number of hospital bed days used in the treatment of stress UI has reduced by a similar amount (see Figure 8.2).

The reduction in peri- and post-operative morbidity associated with mid-urethral tapes has resulted in a dramatic increase in their use in the treatment of stress incontinence of urine over the last decade. Less than 10% of women will have one of the previous generation of procedures (colposuspension, fascial sling) as a primary or secondary procedure. The transobturator route has gained popularity over the retropubic route.

The majority of procedures in the UK are performed under general anaesthesia and most patients will be discharged home on the day of surgery. This has resulted in a reduction in use of hospital beds for this surgery.

8.2 Initial advice and multi-disciplinary team considerations before offering surgical treatment for SUI

A review of the evidence for initial advice and the multidisciplinary team (MDT) has not been undertaken. The text below is the GDG’s justification of recommendations that should be followed when considering surgical treatment options.

The GDG’s view is that a urinary incontinence MDT is an integral part of the treatment pathway for women with urinary incontinence who have had unsuccessful conservative treatments. The role of the MDT discussed in the surgical OAB chapter (see subchapter 7.2) is identical when invasive SUI interventions are considered. Therefore the recommendations below apply to both SUI and OAB procedures and are repeated from subchapter 7.2.
The choice of interventions to offer a woman with SUI or mixed UI should take into account the risks
and benefits of each treatment option, and the MDT process is a fundamental part of this decision-
making process. Further details on the specifications for the MDT are in the review of primary tape
procedures (subchapter 8.3).

The consensus of the GDG was that the composition of the MDT should include the minimum of a
specialist nurse, surgeon and a physiotherapist. These three should only be considered as the core
membership; other health care professionals may also have a role. The MDT should include
professionals who have responsibilities in the community and secondary/tertiary care, thereby
reflecting the varied health care settings women have already received treatment in, as well as
settings where they may be managed in the future. The composition and location of the MDT should
allow a comprehensive overview of each patient that includes consideration of past and future
treatments by clinical experts in those interventions. The existence of an MDT should lead to joint
decision-making thereby mitigating against the perceived risk of a single surgeon acting alone (for
example, by restricting a patient's choice of procedures to those with which the surgeon is familiar).

The MDT should review all women at this stage of the pathway regardless of whether they chose to
continue with active treatment for their SUI symptoms. Women who do not wish to proceed to
invasive treatments should be provided with relevant information about their options including how to
access the MDT team to discuss treatment in the future (see chapter 4 for further information).

### Recommendations

<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendations</th>
</tr>
</thead>
</table>
| 71     | The multidisciplinary team (MDT) for urinary incontinence should be drawn from community and secondary or tertiary care and include as a minimum:  
- a specialist surgeon  
- a specialist nurse  
- a specialist physiotherapist. [new 2013] |
| 72     | Offer invasive therapy for OAB and SUI symptoms only after a clinical review by the MDT. [new 2013] |
| 73     | Discuss the recommendations made by the MDT at the clinical review with the woman. [new 2013] |
| 74     | Any woman wishing to consider surgical treatment for UI should be informed about the benefits and risks of surgical and non-surgical options. Counselling should include consideration of the woman's child-bearing wishes. [2006] |

### 8.3 Procedures to suspend the vaginal wall

#### 8.3.1 Introduction

Many procedures have been devised that share the common objective of preventing the downward
displacement of the urethra which plays a part in the pathogenesis of stress UI. These include
retropubic suspension procedures such as the Burch colposuspension, Marshall–Marchetti–Krantz
(MMK) and vagino-obturator shelf procedure, each of which secures the paraurethral or vaginal
tissues to a fixed structure by means of sutures.

A separate group of procedures was devised to be minimally invasive and suspend the paraurethral
tissues by means of a suspensory suture, usually inserted under endoscopic control and secured to
the rectus sheath to provide support. These include the Raz, Pereyra, Stamey and Gittes procedures.

Sling operations aim to stabilise the urethra by placing a strip of material around the underside of the
urethra and securing the ends to a fixed structure above. These differ in numerous ways but could be
classified according to the following framework:

- the tissues to which they are fixed (pubic arch or rectus sheath)
the route by which they are inserted:

- traditional open surgery:
  - abdominal
  - combined abdomino-vaginal
- minimally invasive:
  - retropubic space (from bottom upwards or from top downwards)
  - obturator foramen (from outside inwards or from inside outwards)

the materials used:

- synthetic – the various materials used in hernia repair were classified as follows:\(^{615}\) this classification has been adopted to describe materials used in surgery for UI and POP:
  - type I – macroporous with pore size greater than 75 microns (allowing macrophages, fibroblasts, blood vessels, collagen fibres to penetrate pores), for example Prolene \(^\text{®}\) , Marlex \(^\text{®}\) , Trelex Natural \(^\text{®}\)
  - type II – microporous with pore size less than 10 microns, for example Gore-Tex \(^\text{®}\) , DualMesh \(^\text{®}\)
  - type III – macroporous, but with multifilamentous or microporous components, for example PTFE mesh (Teflon\(^\text{®}\) , braided Dacron\(^\text{®}\) (Mersilene\(^\text{®}\) , braided polypropylene mesh (Surgipro\(^\text{®}\) )
  - type IV – submicron pore size, for example Silastic, Cellgard, Preclude \(^\text{®}\) Pericardial Membrane, Preclude \(^\text{®}\) Dura-substitute

- moulded
- woven tapes
- biological:
  - autograft, for example autologous rectus fascia, vaginal wall
  - allograft, for example cadaveric dura mater
  - xenograft, for example porcine dermis, porcine small bowel submucosa.

The emphasis on recent innovations in sling surgery has been for slings to be placed with ‘no tension’ under the urethra while this may not have been the case with early surgical reports of sling techniques.

Other procedures such as anterior colporrhaphy and abdominal paravaginal repair are aimed primarily at treating POP but may have a secondary effect in preventing associated stress UI.

**Studies considered for the 2006 review of procedures to suspend the vaginal wall**

Evidence on relative effectiveness of procedures described in this section is derived from RCTs. Due to the relatively short duration of follow-up in RCTs of surgical interventions, studies of other designs, notably cohort studies or case series, were considered if they provided information on outcomes over the longer term. Four systematic reviews of relevance have been published on the Cochrane library, considering open retropubic colposuspension\(^{616}\) laparoscopic suspension\(^{617}\) (also published elsewhere),\(^{618}\) bladder neck needle suspension\(^{619}\) and anterior vaginal repair.\(^{620}\) Further, earlier reviews evaluating surgery for stress UI have been published.\(^{621–623}\) Owing to the substantial overlap of studies included in the Cochrane reviews, and because the reviews included abstracts that have not subsequently been published, the primary data, and further studies published, were considered
alongside the reviews. Where pooling of studies and outcomes within the Cochrane reviews was deemed to be appropriate, the results are described in this section.

Other related guidance
The Interventional Procedures Programme of NICE issued guidance on bone-anchored cystourethropexy in 2003, stating that ‘current evidence of the safety and efficacy of bone-anchored cystourethropexy does not appear adequate to support the use of this procedure without special arrangements for consent and for audit or research’. Therefore, this procedure is not considered further within this guideline.

8.3.2 Synthetic tapes

Introduction
The principle of all continence procedures is that they provide a tension-free support to the mid-urethra or bladder-neck, which comes under tension when the patient strains or coughs, hence slightly obstructing the urethra. Synthetic mid-urethral tapes are inserted via a small sub-urethral incision and small incisions in the supra-pubic or perineal area, depending on the type of trocar (curved metal needle) used. As a result of the minimal access approach, there is a very much reduced hospital stay and morbidity for the patient with a speedier recovery. This is balanced by complications which include tape erosion, pain and the risk of vessel/nerve or organ damage due to the minimal access approach.

Different approaches can be used, including retropubic “bottom-up” and “top-down” and transobturator “inside-out” and “outside-in”. More recently a single incision approach have been introduced whereby the synthetic tape is inserted via a single vaginal incision.

The tension-free vaginal tape was first introduced into clinical practice in 1996, by Ulf Ulmsten (Ulmsten et al., 1998) and was one of the first urogynaecological procedures to be subjected to a multicentre RCT in this country (Ward et al., 2008a). Prior to this, the majority of continence procedures had been performed by an abdominal route, such as the Burch colposuspension, Marshall-Marchetti-Krantz procedure or the sub-urethral sling using muscle tissue harvested from the patient (characteristically rectus sheath). Needle suspension procedures had also been used but proved unsuccessful over time.

Other relevant guidance
The NICE technology appraisal programme issued guidance on tension-free vaginal tape in February 2003. The technology appraisal is updated within this guideline by addressing a question on the procedure. The HTA informing the NICE guidance identified five RCTs (three published as abstracts), nine non-randomised comparative studies (all published only as abstracts), 66 case series (44 published as abstracts) and two population-based registries evaluating TVT. The fully published data identified for TVT, and considered within this guideline, are as follows.

- eight RCTs comparing TVT with colposuspension
- two RCTs comparing TVT with an autologous fascial sling
- ten RCTs or non-randomised controlled trials comparing TVT with other slings or tapes (porcine dermal collagen sling, transobturator tape, suprapubic arc sling, intravaginal slingplasty and polypropylene mesh sling)
- one cohort study comparing different surgical approaches to TVT insertion (caudocranial or craniocaudal)
- 83 case series, the majority published subsequent to the HTA.

Where the TVT abbreviation is used in the text, this indicates the Gynecare TVT device.

Review question
What is the comparative effectiveness (in both the short- and long-term) of surgical approaches for mid-urethral procedures in women undergoing their primary surgical tape procedure?

- retropubic “bottom-up”
● retropubic “top-down”
● transobturator “outside-in”
● transobturator “inside-out”
● single incision

**Methodological approach for short-term outcomes review**

Only randomised controlled trials reporting data at 12 months’ follow up were included in the review of short-term outcomes.

The included studies reported a variety of adverse effects. The GDG chose to focus on those adverse events or complications which are most important from a woman’s perspective to allow her to make an informed decision about treatment on the basis of the risks and benefits of each procedure. These include tissue injury (bladder, urethra or vaginal wall perforation), tape erosion, urinary retention rate, rate of voiding dysfunction and de novo overactive bladder symptoms after surgery.

**Overview of the evidence**

The following comparisons were identified in the evidence. Evidence identified in the 2006 guideline review was also included in the GRADE because of the limited evidence for these interventions.

- retropubic “bottom-up” versus retropubic “top-down” – three RCTs
- retropubic “bottom-up” versus transobturator “outside in” – eleven RCTs
- retropubic “bottom-up” versus transobturator “inside out” – thirteen RCTs
- retropubic “bottom-up” versus single incision – five RCTs
- transobturator “outside in” versus retropubic “top-down” – one RCT
- transobturator “outside in” versus transobturator “inside out” – three RCTs
- transobturator “inside out” versus single incision – five RCTs

**Retropubic “bottom-up” versus retropubic “top-down”**

**Description of included studies**

Two randomised controlled trials (RCTs) were included in the 2006 guideline (Andonian et al., 2005; Tseng et al., 2005) which compared retropubic “top-down” with retropubic “bottom-up”. One new study was included in the update (Lord et al., 2006).

The mean age of participants ranged from 50.4 (SD 11.5) to 62.6 (SD 10.6) years. The mean number of incontinence episodes and the duration of symptoms was not reported in any study.

Two studies included women with mixed urinary incontinence (Andonian et al., 2005; Lord et al., 2006). Concomitant surgery was performed in two studies (Andonian et al., 2005; Tseng et al., 2005).

The “top-down” device in the two studies was SPARC (American Medical Systems Inc, Minnetonka, MN, USA). The “bottom-up” device in both studies was Gynecare (Ethicon, Johnson & Johnson, Somerville, NJ, USA) (Andonian et al., 2005; Tseng et al., 2005). The manufacturer of the devices used in Lord et al., 2006 was unclear.

**Evidence profile**

**Table 8.1** GRADE findings for retropubic “bottom-up” versus retropubic “top-down”

<table>
<thead>
<tr>
<th>Number of studies</th>
<th>Number of women</th>
<th>Effect</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>retropubic ‘bottom-up’</td>
<td>retropubic ‘top-down’</td>
<td>Relative (95% CI)</td>
<td>Absolute (95% CI)</td>
</tr>
<tr>
<td>Patient satisfaction</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Incontinence episodes</th>
<th>No evidence reported</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Continence status</strong></td>
<td></td>
</tr>
<tr>
<td>2 (Andonian et al., 2005; Tseng et al., 2005)</td>
<td>67/74 (90.5%)</td>
</tr>
<tr>
<td>Incontinence-specific quality of life (Better indicated by lower values)</td>
<td>No evidence reported</td>
</tr>
<tr>
<td><strong>Psychological outcomes</strong></td>
<td>No evidence reported</td>
</tr>
<tr>
<td>Post void residual volume</td>
<td>No evidence reported</td>
</tr>
<tr>
<td><strong>Tissue injury</strong></td>
<td></td>
</tr>
<tr>
<td>3 (Andonian et al., 2005; Lord et al., 2006; Tseng et al., 2005)</td>
<td>11/221 (5%)</td>
</tr>
<tr>
<td><strong>Erosion rate</strong></td>
<td></td>
</tr>
<tr>
<td>1 (Andonian et al., 2005)</td>
<td>0/43 (0%)</td>
</tr>
<tr>
<td><strong>Retention</strong></td>
<td></td>
</tr>
<tr>
<td>1 (Andonian et al., 2005)</td>
<td>4/43 (9.3%)</td>
</tr>
<tr>
<td><strong>De novo overactive bladder symptoms</strong></td>
<td></td>
</tr>
<tr>
<td>1 (Tseng et al., 2005)</td>
<td>2/31 (6.5%)</td>
</tr>
<tr>
<td><strong>Voiding dysfunction</strong></td>
<td>No evidence reported</td>
</tr>
</tbody>
</table>

**Evidence statement**

No studies were identified for the outcomes of

- patient satisfaction with treatment,
- number of episodes of incontinence per day,
- Incontinence-specific quality of life.
- psychological outcomes and
Continence status
A meta-analysis of two RCTs showed no difference in clinical benefit between retropubic “bottom-up” and retropubic “top-down”. The evidence was of moderate quality.

Tissue injury
A meta-analysis of three RCTs showed no difference in clinical benefit between retropubic “bottom-up” and retropubic “top-down”. The evidence was of low quality.

Erosion rate
One RCT showed no difference in clinical benefit between retropubic “bottom-up” and retropubic “top-down”. The evidence was of low quality.

Retention
One RCT showed no difference in clinical benefit between retropubic “bottom-up” and retropubic “top-down”. The evidence was of low quality.

De novo overactive bladder symptoms
One RCT showed no difference in clinical benefit between retropubic “bottom-up” and retropubic “top-down”. The evidence was of low quality.

Retropubic “bottom-up” versus transobturator “outside in”

Description of included studies
Eleven randomised controlled trials compared the transobturator “outside-in” with retropubic “bottom-up” (Andonian et al., 2007; Barber et al., 2008; Barry et al., 2008; El-Hefnawy et al., 2010; Freeman et al., 2011; Porena et al., 2007; Ross et al., 2009; Scheiner et al., 2012; Schierlitz et al., 2008; vid-Montefiore et al., 2006; Wang et al., 2010b).

The mean age of participants ranged from 45 ± 7 to 61.8 ± 10.7 years. The mean number of incontinence episodes was only reported in two studies (Barber et al., 2008; Freeman et al., 2011) and ranged from a median of 2.3 episodes (range 0 to 8.3) to a median of 7 episodes (interquartile range 6 to 9). The duration of symptoms was reported in three studies (Barber et al., 2008; Porena et al., 2007; Wang et al., 2010b) and ranged from 3.7 (SD 2) to 4.7 (SD 4.6) years.

Seven studies included women with mixed urinary incontinence (Andonian et al., 2007; Barber et al., 2008; El-Hefnawy et al., 2010; Freeman et al., 2011; Porena et al., 2007; Scheiner et al., 2012; vid-Montefiore et al., 2006). Concomitant surgery was performed in five studies (Andonian et al., 2007; Barber et al., 2008; El-Hefnawy et al., 2010; Scheiner et al., 2012; Wang et al., 2010b).

The transobturator “Outside-in” device was Obtape (Mentor-Porges, Le Plessis-Robinson, France) in two studies (Andonian et al., 2007; Porena et al., 2007); it was Monarc (American Medical Systems, Minnetonka, MN, USA) in four studies (Barber et al., 2008; Barry et al., 2008; Freeman et al., 2011; Schierlitz et al., 2008); Obtryx Halo (Boston Scientific, Natick, MA, USA) in one study (Ross et al., 2009) and I-STOP in one study (vid-Montefiore et al., 2006). In three studies (El-Hefnawy et al., 2010; Scheiner et al., 2012; Wang et al., 2010b) the transobturator “outside-in” device manufacturer was not stated.

The retropubic “bottom-up” device was Gynecare (Ethicon, Johnson & Johnson, Somerville, NJ, USA) in six studies (Andonian et al., 2007; Barber et al., 2008; Barry et al., 2008; Freeman et al., 2011; Porena et al., 2007; Wang et al., 2010b) Advantage (Boston Scientific, Natick, MA, USA) in one study (Ross et al., 2009) and I-STOP in one study (vid-Montefiore et al., 2006). In three studies (El-Hefnawy et al., 2010; Scheiner et al., 2012; Schierlitz et al., 2008) the retropubic “bottom-up” device manufacturer was not stated.
## Evidence profile

### Table 8.2 GRADE findings for retropubic “bottom-up” versus transobturator “outside in”

<table>
<thead>
<tr>
<th>Number of studies</th>
<th>Number of women</th>
<th>Effect</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>retropubic “bottom-up”</td>
<td>transobturator “outside-in”</td>
<td>Relative (95% CI)</td>
</tr>
<tr>
<td><strong>Patient satisfaction</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 (Barber et al., 2008; Freeman et al., 2011; Ross et al., 2009; Scheiner et al., 2012; Wang et al., 2010b)</td>
<td>342/436 (78.4%)</td>
<td>294/386 (76.2%)</td>
<td>RR 1.03 (0.91 to 1.16)</td>
</tr>
<tr>
<td><strong>Incontinence episodes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No evidence reported</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Continence status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 (Andonian et al., 2007; Barber et al., 2008; El-Hefnawy et al., 2010; Freeman et al., 2011; Porena et al., 2007; Ross et al., 2009; Scheiner et al., 2012; Wang et al., 2010b)</td>
<td>454/608 (74.7%)</td>
<td>420/560 (75%)</td>
<td>RR 1.01 (0.94 to 1.08)</td>
</tr>
<tr>
<td><strong>Incontinence-specific quality of life (Better indicated by lower values)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 (Ross et al., 2009; Scheiner et al., 2012; Wang et al., 2010b)</td>
<td>212</td>
<td>194</td>
<td>-</td>
</tr>
<tr>
<td><strong>Psychological outcomes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No evidence reported</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Post void residual volume</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No evidence reported</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Tissue injury</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 (Andonian et al., 2007; Barber et al., 2008; Barry et al., 2008;</td>
<td>50/818 (6.1%)</td>
<td>27/745 (3.6%)</td>
<td>RR 1.51 (0.67 to 3.43)</td>
</tr>
</tbody>
</table>
### Erosion rate

<table>
<thead>
<tr>
<th>Study</th>
<th>Evidence Statement</th>
<th>Number of Episodes</th>
<th>Number of Erosions</th>
<th>Risk Ratio (95% CI)</th>
<th>Change per 1000 (Range)</th>
<th>Evidence Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 (Andonian et al., 2007; Barber et al., 2008; El-Hefnawy et al., 2010; Freeman et al., 2011; Porena et al., 2007; Ross et al., 2009; Scheiner et al., 2012)</td>
<td></td>
<td>10/538 (1.9%)</td>
<td>19/489 (3.9%)</td>
<td>RR 0.46 (0.18 to 1.18)</td>
<td>21 fewer per 1000 (from 32 fewer to 7 more)</td>
<td>LOW</td>
</tr>
</tbody>
</table>

### Retention

<table>
<thead>
<tr>
<th>Study</th>
<th>Evidence Statement</th>
<th>Number of Episodes</th>
<th>Number of Erosions</th>
<th>Risk Ratio (95% CI)</th>
<th>Change per 1000 (Range)</th>
<th>Evidence Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 (Andonian et al., 2007; Barber et al., 2008)</td>
<td></td>
<td>11/168 (6.5%)</td>
<td>8/159 (5%)</td>
<td>RR 1.27 (0.52 to 3.13)</td>
<td>14 more per 1000 (from 24 fewer to 107 more)</td>
<td>LOW</td>
</tr>
</tbody>
</table>

### De novo overactive bladder symptoms

<table>
<thead>
<tr>
<th>Study</th>
<th>Evidence Statement</th>
<th>Number of Episodes</th>
<th>Number of Erosions</th>
<th>Risk Ratio (95% CI)</th>
<th>Change per 1000 (Range)</th>
<th>Evidence Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 (Andonian et al., 2007; Barber et al., 2008; Wang et al., 2010b)</td>
<td></td>
<td>26/238 (10.9%)</td>
<td>25/229 (10.9%)</td>
<td>RR 1.02 (0.36 to 2.86)</td>
<td>2 more per 1000 (from 70 fewer to 203 more)</td>
<td>VERY LOW</td>
</tr>
</tbody>
</table>

### Voiding dysfunction

<table>
<thead>
<tr>
<th>Study</th>
<th>Evidence Statement</th>
<th>Number of Episodes</th>
<th>Number of Erosions</th>
<th>Risk Ratio (95% CI)</th>
<th>Change per 1000 (Range)</th>
<th>Evidence Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 (Freeman et al., 2011; Porena et al., 2007; Wang et al., 2010b)</td>
<td></td>
<td>16/236 (6.8%)</td>
<td>13/245 (5.3%)</td>
<td>RR 1.27 (0.62 to 2.57)</td>
<td>14 more per 1000 (from 20 fewer to 83 more)</td>
<td>LOW</td>
</tr>
</tbody>
</table>

1 Evidence statement

No studies were identified for the outcomes of

- number of episodes of incontinence per day,
- psychological outcomes and
- post-void residual volume.
Patient satisfaction with treatment
A meta-analysis of five RCTs showed no difference in clinical benefit between retropubic “bottom-up” and transobturator “outside-in”. The evidence was of moderate quality.

Continence status
A meta-analysis of eight RCTs showed no difference in clinical benefit between retropubic “bottom-up” and transobturator “outside-in”. The evidence was of high quality.

Incontinence-specific quality of life
A meta-analysis of three RCTs showed no difference in clinical benefit between retropubic “bottom-up” and transobturator “outside-in”. The evidence was of low quality.

Tissue injury
A meta-analysis of ten RCTs showed no difference in clinical benefit between retropubic “bottom-up” and transobturator “outside-in”. The evidence was of very low quality.

Erosion rate
A meta-analysis of seven RCTs showed no difference in clinical benefit between retropubic “bottom-up” and transobturator “outside-in”. The evidence was of low quality.

Retention
A meta-analysis of two RCTs showed no difference in clinical benefit between retropubic “bottom-up” and transobturator “outside-in”. The evidence was of low quality.

Voiding dysfunction
A meta-analysis of three RCTs showed no difference in clinical benefit between retropubic “bottom-up” and transobturator “outside-in”. The evidence was of low quality.

De novo overactive bladder symptoms
A meta-analysis of three RCTs showed no difference in clinical benefit between retropubic “bottom-up” and transobturator “outside-in”. The evidence was of very low quality.

Retropubic “bottom-up” versus Transobturator “inside-out”
Description of included studies
Thirteen RCTs compared the transobturator “inside-out” with retropubic “bottom-up” (Aniuliene, 2009; Araco et al., 2008; Deffieux et al., 2010; Karateke et al., 2009; Krofta et al., 2010; Laurikainen et al., 2007; Liapis et al., 2006; Scheiner et al., 2012; Teo et al., 2011; Wang et al., 2009; Wang et al., 2011; Zhu et al., 2007; Zullo et al., 2007)

The mean age of participants ranged from 49 (SD 9.5) to 57.8 (SD 10.4) years. The mean number of incontinence episodes was not reported in any of the included studies. The duration of symptoms was reported in six studies (Aniuliene, 2009; Araco et al., 2008; Laurikainen et al., 2007; Liapis et al., 2006; Wang et al., 2009; Wang et al., 2011) and ranged from 4.4 (SD 3.1) to 10.3 (SD 9.3) years.

Two studies included women with mixed urinary incontinence (Deffieux et al., 2010; Scheiner et al., 2012). Concomitant surgery was performed in three studies (Scheiner et al., 2012; Wang et al., 2009; Zhu et al., 2007). The transobturator “inside-out” device was Gynecare (Ethicon, Johnson & Johnson, Somerville, NJ, USA) in eight studies (Aniuliene, 2009; Araco et al., 2008; Deffieux et al., 2010; Krofta et al., 2010; Laurikainen et al., 2007; Liapis et al., 2006; Wang et al., 2009; Zhu et al., 2007). In five studies (Karateke et al., 2009; Scheiner et al., 2012; Teo et al., 2011; Wang et al., 2011; Zullo et al., 2007) the TVT-O device manufacturer was not stated.

The retropubic “bottom-up” device was Gynecare (Ethicon, Johnson & Johnson, Somerville, NJ, USA) in seven studies (Aniuliene, 2009; Araco et al., 2008; Deffieux et al., 2010; Krofta et al., 2010; Laurikainen et al., 2007; Wang et al., 2009; Zhu et al., 2007).

In six studies (Karateke et al., 2009; Liapis et al., 2006; Scheiner et al., 2012; Teo et al., 2011; Wang et al., 2011; Zullo et al., 2007) the retropubic “bottom-up” device manufacturer was not stated.
## Evidence profile

### Table 8.3 GRADE findings for retropubic “bottom-up” versus transobturator “inside out”

<table>
<thead>
<tr>
<th>Number of studies</th>
<th>Number of women</th>
<th>Effect</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>retropubic “bottom-up”</td>
<td>transobturator “Inside out”</td>
<td>Relative (95% CI)</td>
</tr>
<tr>
<td><strong>Patient satisfaction</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 (Defrieff et al., 2010; Karateke et al., 2009; Krofta et al., 2010; Liapis et al., 2006; Scheiner et al., 2012)</td>
<td>342/431 (79.4%)</td>
<td>312/391 (79.8%)</td>
<td>RR 1.01 (0.94 to 1.08)</td>
</tr>
<tr>
<td><strong>Incontinence episodes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No evidence reported</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Continence status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 (Aniuliene, 2009; Araco et al., 2008; Defrieff et al., 2010; Karateke et al., 2009; Krofta et al., 2010; Laurikainen et al., 2007; Liapis et al., 2006; Scheiner et al., 2012; Teo et al., 2011; Wang et al., 2009; Wang et al., 2011; Zullo et al., 2007)</td>
<td>894/1094 (81.7%)</td>
<td>795/1081 (73.5%)</td>
<td>RR 1.07 (0.96 to 1.19)</td>
</tr>
<tr>
<td><strong>Incontinence-specific quality of life (Better indicated by lower values)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 (Karateke et al., 2009; Krofta et al., 2010; Scheiner et al., 2012; Zullo et al., 2007)</td>
<td>304</td>
<td>295</td>
<td>-</td>
</tr>
<tr>
<td><strong>Psychological outcomes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No evidence reported</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Post void residual volume</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No evidence reported</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Tissue injury

<table>
<thead>
<tr>
<th>Study (year)</th>
<th>Cases (95% CI)</th>
<th>RR (95% CI)</th>
<th>Additional outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aniuliene et al., 2009; Araco et al., 2008; Deffieux et al., 2010; Karateke et al., 2009; Krofta et al., 2010; Laurikainen et al., 2007; Liapis et al., 2006; Scheiner et al., 2012; Teo et al., 2011; Wang et al., 2011; Zullo et al., 2007</td>
<td>27/934 (2.9%)</td>
<td>RR 1.31 (0.68 to 2.51)</td>
<td>5 more per 1000 (from 6 fewer to 26 more)</td>
</tr>
</tbody>
</table>

### Erosion rate

<table>
<thead>
<tr>
<th>Study (year)</th>
<th>Cases (95% CI)</th>
<th>RR (95% CI)</th>
<th>Additional outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Araco et al., 2008; Deffieux et al., 2010; Karateke et al., 2009; Krofta et al., 2010; Laurikainen et al., 2007; Liapis et al., 2006; Scheiner et al., 2012; Teo et al., 2011; Wang et al., 2009</td>
<td>15/913 (1.6%)</td>
<td>RR 1.09 (0.52 to 2.29)</td>
<td>1 more per 1000 (from 7 fewer to 20 more)</td>
</tr>
</tbody>
</table>

### Retention

<table>
<thead>
<tr>
<th>Study (year)</th>
<th>Cases (95% CI)</th>
<th>RR (95% CI)</th>
<th>Additional outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aniuliene, 2009; Krofta et al., 2010; Laurikainen et al., 2007; Liapis et al., 2006; Wang et al., 2009; Wang et al., 2011; Zullo et al., 2007</td>
<td>32/672 (4.8%)</td>
<td>RR 2.44 (1.29 to 4.6)</td>
<td>29 more per 1000 (from 6 more to 72 more)</td>
</tr>
</tbody>
</table>

### De novo overactive bladder symptoms

<table>
<thead>
<tr>
<th>Study (year)</th>
<th>Cases (95% CI)</th>
<th>RR (95% CI)</th>
<th>Additional outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Araco et al., 2008; Karateke et al., 2009; Krofta et al., 2010; Laurikainen et al., 2007; Liapis et al.,</td>
<td>48/727 (6.6%)</td>
<td>RR 0.9 (0.58 to 1.41)</td>
<td>7 fewer per 1000 (from 31 fewer to 30 more)</td>
</tr>
</tbody>
</table>
Evidence statement

No studies were identified for the outcomes of

- number of episodes of incontinence per day,
- psychological outcomes and
- post-void residual volume.

Patient satisfaction with treatment

A meta-analysis of five RCTs showed no difference in clinical benefit between retropubic “bottom-up” and transobturator “inside-out”. The evidence was of high quality.

Continence status

A meta-analysis of twelve RCTs showed no difference in clinical benefit between retropubic “bottom-up” and transobturator “inside-out”. The evidence was of low quality.

Incontinence-specific quality of life

A meta-analysis of four RCTs showed no difference in clinical benefit between retropubic “bottom-up” and transobturator “inside-out”. The evidence was of moderate quality.

Tissue injury

A meta-analysis of eleven RCTs showed no difference in clinical benefit between retropubic “bottom-up” and transobturator “inside-out”. The evidence was of low quality.

Erosion rate

A meta-analysis of nine RCTs showed no difference in clinical benefit between retropubic “bottom-up” and transobturator “inside-out”. The evidence was of low quality.

Retention

A meta-analysis of seven RCTs showed a clinical benefit in favour of transobturator “inside-out”. The evidence was of high quality.

De novo overactive bladder symptoms

A meta-analysis of seven RCTs showed no difference in clinical benefit between retropubic “bottom-up” and transobturator “inside-out”. The evidence was of low quality.

Voiding dysfunction

One RCT showed no difference in clinical benefit between retropubic “bottom-up” and transobturator “inside-out”. The evidence was of low quality.

Retropubic “bottom-up” versus single incision

Description of included studies

Five RCTs (Abdelwahab et al., 2010; Andrada et al., 2011; Barber et al., 2012; Basu & Duckett, 2010; Wang et al., 2011) compared the retropubic “bottom-up” tension-free vaginal tape compared with the single incision approach. The mean age of participants ranged from 39.2 ± 9 years to 57.3 ± 9.5 years. In two studies the mean duration of symptoms ranged from 4.4 ± 3.6 years to 9 years (no SD reported) (Andrada et al., 2011; Wang et al., 2011). The mean number of incontinence episodes per day was 3 (range 0 to 16) in one study (Andrada et al., 2011). Two studies included women with
mixed urinary incontinence (Barber et al., 2012; Basu & Duckett, 2010). Concomitant surgery was not performed in any of the studies.

The retropubic “bottom-up” device was Gynecare (Ethicon, Johnson & Johnson, Somerville, NJ, USA) in one study (Barber et al., 2012) and was not clearly reported in four studies (Abdelwahab et al., 2010; Andrade et al., 2011; Basu & Duckett, 2010; Wang et al., 2011).

The single incision device was TVT-Secur (Gynecare, Ethicon, Johnson & Johnson, Somerville, NJ, USA) in four studies (Abdelwahab et al., 2010; Andrade et al., 2011; Barber et al., 2012; Wang et al., 2011) and MiniArc (American Medical Systems, Minnetonka, MN, USA) in one study (Basu & Duckett, 2010).

Evidence profile

Table 8.4 GRADE findings for comparison of retropubic “bottom-up” versus single incision

<table>
<thead>
<tr>
<th>Number of studies</th>
<th>Number of women</th>
<th>Effect</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>retropubic 'bottom-up'</td>
<td>Single-incision</td>
<td>Relative (95% CI)</td>
</tr>
<tr>
<td>Patient satisfaction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Barber et al., 2012)</td>
<td>91/127 (71.7%)</td>
<td>87/136 (64%)</td>
<td>RR 1.12 (0.95 to 1.32)</td>
</tr>
<tr>
<td>Incontinence episodes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No evidence reported</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Continence status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 (Barber et al., 2012; Wang et al., 2011)</td>
<td>107/159 (67.3%)</td>
<td>100/170 (58.8%)</td>
<td>RR 1.21 (0.93 to 1.57)</td>
</tr>
<tr>
<td>Incontinence-specific quality of life (Better indicated by lower values)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No evidence reported</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychological outcomes</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>No evidence reported</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Post void residual volume</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No evidence reported</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tissue injury</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 (Abdelwahab et al., 2010; Andrade et al., 2011; Barber et al., 2012; Basu &amp; Duckett, 2010; Wang et al., 2011)</td>
<td>12/289 (4.2%)</td>
<td>4/294 (1.4%)</td>
<td>RR 2.48 (0.80 to 7.75)</td>
</tr>
<tr>
<td>Erosion rate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Barber et al., 2012)</td>
<td>1/127</td>
<td>0/136</td>
<td>RR 3.21 (0.13 to -)</td>
</tr>
</tbody>
</table>
Retention

<table>
<thead>
<tr>
<th>Retention</th>
<th>%1/32</th>
<th>%0/34</th>
<th>RR 3.18 (0.13 to 75.38)</th>
<th>-</th>
<th>VERY LOW</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Wang et al., 2011)</td>
<td>1/32</td>
<td>0/34</td>
<td>RR 3.18 (0.13 to 75.38)</td>
<td>-</td>
<td>VERY LOW</td>
</tr>
</tbody>
</table>

De novo overactive bladder symptoms

No evidence reported

Voiding dysfunction

No evidence reported

Evidence statement

No studies were identified for the outcomes of

- number of episodes of incontinence per day,
- incontinence-specific quality of life,
- psychological outcomes,
- post-void residual volume,
- de novo overactive bladder symptoms and
- voiding dysfunction.

Patient satisfaction with treatment

One RCT showed no difference in clinical benefit between retropubic “bottom-up” and single incision. The evidence was of low quality.

Continence status

Two RCTs showed no difference in clinical benefit between retropubic “bottom-up” and single incision. The evidence was of very low quality.

Tissue injury

Five RCTs showed no difference in clinical benefit between retropubic “bottom-up” and single incision. The evidence was of low quality.

Erosion rate

One RCT showed no difference in clinical benefit between retropubic “bottom-up” and single incision. The evidence was of very low quality.

Retention

One RCT showed no difference in clinical benefit between retropubic “bottom-up” and single incision. The evidence was of very low quality.

Transobturator “outside in” versus retropubic “top down”

Description of included studies

One RCT (Wang et al., 2006a) compared the transobturator “outside in” approach with the retropubic “top down” approach. The mean age of participants ranged from 50.5 ± 11.9 years to 51.4 ± 10.1 years. The mean duration of symptoms and episodes of incontinence were not reported. Women with mixed urinary incontinence did not appear to be included, and concomitant surgeries were not performed.

The transobturator “outside in” device was MONARC and the retropubic “top down” device was SPARC (both American Medical Systems, Minnetonka, MN, USA).
Evidence profile

Table 8.5 GRADE findings for transobturator “outside in” versus retropubic “top down”

<table>
<thead>
<tr>
<th>Number of studies</th>
<th>Number of women</th>
<th>Effect</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>transobturator “Outside-in”</td>
<td>retropubic “Top-down”</td>
<td>Relative (95% CI)</td>
<td>Absolute (95% CI)</td>
</tr>
<tr>
<td>Patient satisfaction</td>
<td>No evidence reported</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incontinence episodes</td>
<td>No evidence reported</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continence status</td>
<td>No evidence reported</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incontinence-specific quality of life (Better indicated by lower values)</td>
<td>No evidence reported</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychological outcomes</td>
<td>No evidence reported</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post void residual volume</td>
<td>No evidence reported</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tissue injury</td>
<td>1 (Wang et al., 2006a)</td>
<td>4/31 (12.9%)</td>
<td>1/31 (3.2%)</td>
</tr>
<tr>
<td>Erosion rate</td>
<td>No evidence reported</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retention</td>
<td>No evidence reported</td>
<td></td>
<td></td>
</tr>
<tr>
<td>De novo overactive bladder symptoms</td>
<td>No evidence reported</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voiding dysfunction</td>
<td>No evidence reported</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Evidence statement
No studies were identified for the outcomes of
- number of patient satisfaction with treatment,
- episodes of incontinence per day,
- continence status,
- incontinence-specific quality of life,
- psychological outcome,
post-void residual volume,
erosion rate,
retention,
de novo overactive bladder symptoms and
voiding dysfunction.

Tissue injury
One RCT showed no difference in clinical benefit between transobturator “outside-in” and retropubic “top-down”. The evidence was of very low quality.

Transobturator “outside in” versus transobturator “inside out”

Description of included studies
Three RCTs (Abdel-Fattah et al., 2010; But & Faganelj, 2008; Scheiner et al., 2012) compared the transobturator “outside in” with the transobturator “inside out”. The mean age of participants ranged from 51.5 years (SD not reported) to 59.3 ± 12.1 years. The mean duration of symptoms ranged from 6.4 to 7.9 years (no SD reported) in one study (But & Faganelj, 2008) but was not reported in two studies (Abdel-Fattah et al., 2010; Scheiner et al., 2012). All three studies included women with mixed urinary incontinence. Concomitant surgery was performed in one study (Scheiner et al., 2012).

The transobturator “inside-out” device manufacturer was not clearly reported in any of the three studies. The transobturator “outside-in” device in Abdel-Fattah et al., 2010 was ARIS® (Coloplast Corp., Minneapolis, MN, USA) and was not clearly reported in two studies (But & Faganelj, 2008; Scheiner et al., 2012).

Evidence profile

Table 8.6 GRADE findings for transobturator “outside-in” versus transobturator “inside-out”

<table>
<thead>
<tr>
<th>Number of studies</th>
<th>Number of women</th>
<th>Effect</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>transobturator t “Outside-in”</td>
<td>transobturator “Inside-out”</td>
<td>Relative (95% CI)</td>
</tr>
<tr>
<td>Patient satisfaction</td>
<td>2 (Abdel-Fattah et al., 2010; Scheiner et al., 2012)</td>
<td>139/211 (65.9%)</td>
<td>150/210 (71.4%)</td>
</tr>
<tr>
<td>Incontinence episodes</td>
<td>No evidence reported</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contingence status</td>
<td>2 (Abdel-Fattah et al., 2010; Scheiner et al., 2012)</td>
<td>127/211 (60.2%)</td>
<td>147/210 (70%)</td>
</tr>
<tr>
<td>Incontinence-specific quality of life (Better indicated by lower values)</td>
<td>1 (Scheiner et al., 2012)</td>
<td>28</td>
<td>28</td>
</tr>
<tr>
<td>Psychological outcomes</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
No evidence reported

### Post void residual volume

No evidence reported

### Tissue injury

<table>
<thead>
<tr>
<th>Group</th>
<th>Abdel-Fattah et al., 2010; But &amp; Faganelj, 2008; Scheiner et al., 2012</th>
<th>28/271 (10.3%)</th>
<th>8/270 (3%)</th>
<th>RR 3.02 (1.26 to 7.25)</th>
<th>60 more per 1000 (from 8 more to 185 more)</th>
<th>HIGH</th>
</tr>
</thead>
</table>

### Erosion rate

<table>
<thead>
<tr>
<th>Group</th>
<th>Abdel-Fattah et al., 2010; Scheiner et al., 2012</th>
<th>9/211 (4.3%)</th>
<th>3/210 (1.4%)</th>
<th>RR 2.44 (0.58 to 10.19)</th>
<th>21 more per 1000 (from 6 fewer to 131 more)</th>
<th>LOW</th>
</tr>
</thead>
</table>

### Retention

No evidence reported

### De novo overactive bladder symptoms

No evidence reported

### Voiding dysfunction

No evidence reported

---

### Evidence statement

No studies were identified for the outcomes of

- number of episodes of incontinence per day,
- psychological outcome,
- post-void residual volume,
- retention,
- de novo overactive bladder symptoms and
- voiding dysfunction.

**Patient satisfaction with treatment**

Two RCTs showed no difference in clinical benefit between transobturator "inside-out" and transobturator "outside-in". The evidence was of high quality.

**Continence status**

Two RCTs showed a clinical benefit in favour of transobturator "inside-out". The evidence was of high quality.

**Incontinence-specific quality of life**

One RCT showed no difference in clinical benefit between transobturator "inside-out" and transobturator "outside-in". The evidence was of low quality.

**Tissue injury**

Three RCTs showed a clinical benefit in favour of transobturator "inside-out". The evidence was of high quality.
Erosion rate
Two RCTs showed no difference in clinical benefit between transobturator “inside-out” and transobturator “outside-in”. The evidence was of low quality.

Transobturator “inside-out” versus single incision
Description of included studies
Five RCTs compared the transobturator inside out with the single incision(Hinoul et al., 2011; Hota et al., 2012; Masata et al., 2012; Oliveira et al., 2011; Tommaselli et al., 2010).

The mean age of participants ranged from 52.0 ± 11.7 to 58.2 ± 9.1 years. The mean number of incontinence episodes (reported as pads per day) was reported in only one study and was 2.5 ± 1.3 in the single incision group and 3.1 ± 2.0 in the transobturator “inside-out” group (Oliveira 2011). The duration of symptoms was reported in two studies (Oliveira et al., 2011; Tommaselli et al., 2010) and ranged from 4.0 ± 1.5 to 10.8 ± 8.5 years.

One study included women with mixed urinary incontinence (Tommaselli et al., 2010). Concomitant surgery was not performed in any of the studies.

The single incision device five studies was TVT-Secur (Gynecare, Ethicon, Johnson & Johnson, Somerville, NJ, USA) (Hinoul et al., 2011; Hota et al., 2012; Masata et al., 2012; Oliveira et al., 2011; Tommaselli et al., 2010). In all five studies TVT-Secur was placed in the hammock position.

The transobturator “inside-out” device was Gynecare (Ethicon, Johnson & Johnson, Somerville, NJ, USA) in three studies (Hota et al., 2012; Oliveira et al., 2011; Tommaselli et al., 2010). In two studies (Hinoul et al., 2011; Masata et al., 2012) the manufacturer was not stated.

GRADE profile

<table>
<thead>
<tr>
<th>Number of studies</th>
<th>Number of women</th>
<th>Effect</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>transobturator “Inside-out”</td>
<td>Single-incision</td>
<td>Relative (95% CI)</td>
</tr>
<tr>
<td>Patient satisfaction</td>
<td>1 (Hinoul et al., 2011)</td>
<td>90/98 (91.8%)</td>
<td>73/96 (76%)</td>
</tr>
<tr>
<td>Incontinence episodes</td>
<td>No evidence reported</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continence status</td>
<td>5 (Hinoul et al., 2011; Hota et al., 2012; Masata et al., 2012; Oliveira et al., 2011; Tommaselli et al., 2010)</td>
<td>177/282 (62.8%)</td>
<td>209/369 (56.6%)</td>
</tr>
<tr>
<td>Incontinence-specific quality of life (Better indicated by lower values)</td>
<td>2 (Hinoul et al., 2011; Tommaselli et al., 2011)</td>
<td>136</td>
<td>133</td>
</tr>
</tbody>
</table>
Psychological outcomes

No evidence reported

Post void residual volume

No evidence reported

### Tissue injury

<table>
<thead>
<tr>
<th>Study (et al., 2010)</th>
<th>patients</th>
<th>adverse event</th>
<th>RR (95% CI)</th>
<th>larger difference</th>
<th>evidence quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 (Hinoul et al., 2011; Masata et al., 2012)</td>
<td>0/166 (0%)</td>
<td>4/225 (1.8%)</td>
<td>RR 0.29 (0.03 to 2.56)</td>
<td>13 fewer per 1000 (from 17 fewer to 28 more)</td>
<td>LOW</td>
</tr>
</tbody>
</table>

### Erosion rate

<table>
<thead>
<tr>
<th>Study (et al., 2011; Hota et al., 2012; Tommaselli et al., 2010)</th>
<th>patients</th>
<th>adverse event</th>
<th>RR (95% CI)</th>
<th>larger difference</th>
<th>evidence quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 (Hinoul et al., 2011; Oliveira et al., 2011; Tommaselli et al., 2010)</td>
<td>1/184 (0.54%)</td>
<td>16/180 (8.9%)</td>
<td>RR 0.13 (0.03 to 0.58)</td>
<td>77 fewer per 1000 (from 37 fewer to 86 fewer)</td>
<td>HIGH</td>
</tr>
</tbody>
</table>

### Retention

<table>
<thead>
<tr>
<th>Study (et al., 2011; Oliveira et al., 2011; Tommaselli et al., 2010)</th>
<th>patients</th>
<th>adverse event</th>
<th>RR (95% CI)</th>
<th>larger difference</th>
<th>evidence quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 (Hinoul et al., 2011; Oliveira et al., 2011; Tommaselli et al., 2010)</td>
<td>6/170 (3.5%)</td>
<td>5/198 (2.5%)</td>
<td>RR 1.34 (0.4 to 4.48)</td>
<td>9 more per 1000 (from 15 fewer to 88 more)</td>
<td>LOW</td>
</tr>
</tbody>
</table>

### De novo overactive bladder symptoms

<table>
<thead>
<tr>
<th>Study (et al., 2011; Tommaselli et al., 2010)</th>
<th>patients</th>
<th>adverse event</th>
<th>RR (95% CI)</th>
<th>larger difference</th>
<th>evidence quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 (Oliveira et al., 2011; Tommaselli et al., 2010)</td>
<td>6/72 (8.3%)</td>
<td>8/102 (7.8%)</td>
<td>RR 1.34 (0.49 to 3.65)</td>
<td>27 more per 1000 (from 40 fewer to 208 more)</td>
<td>LOW</td>
</tr>
</tbody>
</table>

### Voiding dysfunction

No evidence reported

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**Evidence statement**

No studies were identified for the outcomes of

- number of episodes of incontinence per day,
- psychological outcomes,
- post-void residual volume and
- voiding dysfunction.

**Patient satisfaction with treatment**

One RCT showed a clinical benefit in favour of transobturator “inside-out” over single incision. The evidence was of moderate quality.

**Continence status**

A meta-analysis of five RCTs showed no difference in clinical benefit between single incision and transobturator “inside-out”. The evidence was of very low quality.
Incontinence-specific quality of life
A meta-analysis of two RCTs showed no difference in clinical benefit between single incision and transobturator “inside-out”. The evidence was of very low quality.

Tissue injury
A meta-analysis of two RCTs showed no difference in clinical benefit between single incision and transobturator “inside-out”. The evidence was of low quality.

Erosion rate
A meta-analysis of three RCTs showed a clinical benefit in favour of transobturator “inside-out” over single incision. The evidence was of high quality.

Retention
A meta-analysis of three RCTs showed no difference in clinical benefit between single incision and transobturator “inside-out”. The evidence was of low quality.

De novo overactive bladder symptoms
A meta-analysis of two RCTs showed no difference in clinical benefit between single incision and transobturator “inside-out”. The evidence was of low quality.
**Review of long-term outcomes**

**Methodological approach for long-term outcomes review**

Prospective observational studies with over 50 participants and a minimum follow up of 24 months were included in the review of long-term outcomes. Data from randomised controlled trials that reported outcomes at a minimum of 24 months were also included. Each arm of an included RCT was treated as a single cohort. Studies with a greater than 25% loss to follow up were excluded.

Long-term outcome data was included for the following:

- retropubic “bottom-up” at 2, 3, 5, 7, and 10 years
- transobturator “inside-out” at 2, 3 and 5 years
- transobturator “outside-in” at 2 years
- Single incision at 2 and 3 years

No long-term outcome data was identified for retropubic “top-down”

**Retropubic “Bottom-up”**

**Description of included studies**

A total of nine prospective cohort studies and data from the retropubic “bottom-up” arms of three randomised controlled trials were included in the review of long-term outcomes of retropubic “bottom-up”. Seven studies (Castillo-Pino et al., 2010; Deffieux et al., 2010; Koops et al., 2006; Lieberija-Juanos et al., 2011; Meschia et al., 2006; Nwabineli et al., 2012; Serati et al., 2012) reported on outcomes at 2 years; five studies (Koops et al., 2006; Lieberija-Juanos et al., 2011; Palva et al., 2010; Serati et al., 2012; Viereck et al., 2006), four studies (Chene et al., 2007; Doo et al., 2006; Liapis et al., 2008a; Serati et al., 2012), two studies (Liapis et al., 2008a; Serati et al., 2012) reported outcomes at 7 years and two studies (Grouitz et al., 2011a; Serati et al., 2012) reported outcomes at 10 years.

The percentage of women with mixed urinary incontinence in the included studies ranged from 19% to 35% while the percentage of women receiving concomitant surgery ranged from 8% to 31.9%.

The mean age of participants ranged from 50.5 (SD 10.2) to 62.4 (SD 9.3) years. The mean number of incontinence episodes and the mean duration of symptoms was not reported in any of the included studies.

The retropubic “bottom-up” device in four studies was TVT Gynecare (Ethicon, Johnson & Johnson, Somerville, NJ, USA). In the remaining studies the manufacturer was not stated.

**GRADE profile**

<table>
<thead>
<tr>
<th>No of studies</th>
<th>Relative effects (range)</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Patient satisfaction</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 (Nwabineli et al., 2012; Serati et al., 2012)</td>
<td>72.6% to 92.1%</td>
<td>LOW</td>
</tr>
<tr>
<td>3 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 (Palva et al., 2010; Serati et al., 2012)</td>
<td>86.8% to 87.3%</td>
<td>LOW</td>
</tr>
<tr>
<td>5 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 (Doo et al., 2006; Serati et al., 2012)</td>
<td>76.8% to 85.7%</td>
<td>LOW</td>
</tr>
<tr>
<td>Continence status</td>
<td>2 years</td>
<td>3 years</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td></td>
<td>7 studies (Castillo-Pino et al., 2010; Deffieux et al., 2010; Koops et al., 2006; Lleberia-Juanos et al., 2011; Meschia et al., 2006; Nwabineli et al., 2012; Serati et al., 2012)</td>
<td>74.1% to 95.0%</td>
</tr>
<tr>
<td></td>
<td>5 studies (Koops et al., 2006; Lleberia-Juanos et al., 2011; Palva et al., 2010; Serati et al., 2012; Viereck et al., 2006)</td>
<td>81.9% to 92.6%</td>
</tr>
<tr>
<td></td>
<td>4 studies (Chene et al., 2007; Doo et al., 2006; Liapis et al., 2008a; Serati et al., 2012)</td>
<td>69.2% to 85.7*</td>
</tr>
<tr>
<td></td>
<td>2 studies (Liapis et al., 2008a; Serati et al., 2012)</td>
<td>70.0% to 85.7%</td>
</tr>
<tr>
<td></td>
<td>2 studies (Groutz et al., 2011a; Serati et al., 2012)</td>
<td>56.7% to 85.7%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Adverse effects – Tape erosion</th>
<th>2 years</th>
<th>3 years</th>
<th>5 years</th>
<th>7 years</th>
<th>10 years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4 studies (Castillo-Pino et al., 2010; Lleberia-Juanos et al., 2011; Meschia et al., 2006; Serati et al., 2012)</td>
<td>0% to 4.1%</td>
<td>LOW</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 studies (Palva et al., 2010; Serati et al., 2012)</td>
<td>0%</td>
<td>LOW</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 studies (Chene et al., 2007; Doo et al., 2006; Liapis et al., 2008a; Serati et al., 2012)</td>
<td>0% to 1.4%</td>
<td>LOW</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 studies (Liapis et al., 2008a; Serati et al., 2012)</td>
<td>0% to 1.4%</td>
<td>LOW</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No evidence reported</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Adverse effects – Urinary retention

<table>
<thead>
<tr>
<th>Time</th>
<th>Studies</th>
<th>Rate</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 years</td>
<td>4 studies (Lieberia-Juanos et al., 2011; Meschia et al., 2006)</td>
<td>9.5% to 13.2%</td>
<td>LOW</td>
</tr>
<tr>
<td>3 years</td>
<td>1 study (Palva et al., 2010)</td>
<td>0%</td>
<td>LOW</td>
</tr>
<tr>
<td>5 years</td>
<td>2 studies (Chene et al., 2007; Doo et al., 2006)</td>
<td>2.1% to 5.3%</td>
<td>LOW</td>
</tr>
<tr>
<td>7 years</td>
<td>No evidence reported</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 years</td>
<td>No evidence reported</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Adverse effects – Voiding dysfunction

<table>
<thead>
<tr>
<th>Time</th>
<th>Studies</th>
<th>Rate</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 years</td>
<td>1 study (Castillo-Pino et al., 2010)</td>
<td>18.2%</td>
<td>LOW</td>
</tr>
<tr>
<td>3 years</td>
<td>No evidence reported</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 years</td>
<td>1 study (Chene et al., 2007)</td>
<td>0.7%</td>
<td>LOW</td>
</tr>
<tr>
<td>7 years</td>
<td>No evidence reported</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 years</td>
<td>No evidence reported</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Adverse effects – De novo overactive bladder symptoms

<table>
<thead>
<tr>
<th>Time</th>
<th>Studies</th>
<th>Rate</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 years</td>
<td>4 studies (Castillo-Pino et al., 2010; Lieberia-Juanos et al., 2011; Meschia et al., 2006; Serati et al., 2012)</td>
<td>13.3% to 24.7%</td>
<td>LOW</td>
</tr>
<tr>
<td>3 years</td>
<td>2 studies (Lieberia-Juanos et al., 2011; Serati et al., 2012)</td>
<td>17.5% to 23.1%</td>
<td>LOW</td>
</tr>
<tr>
<td>5 years</td>
<td>3 studies (Chene et al., 2007; Doo et al., 2006; Serati et al., 2012)</td>
<td>15.4% to 18.6%</td>
<td>LOW</td>
</tr>
<tr>
<td>7 years</td>
<td>1 study (Serati et al., 2012)</td>
<td>17.5%</td>
<td>LOW</td>
</tr>
<tr>
<td>10 years</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Evidence statements
No studies were identified for the outcomes of
- number of episodes of incontinence per day,
- incontinence-specific quality of life,
- psychological outcomes and
- post-void residual volume.

Patient satisfaction
This review found that up to 92% (2 studies), 87% (2 studies), 85% (2 studies), 85% (1 study) and 82% (1 study) of women were satisfied with treatment at 2, 3, 5, 7 and 10 years after the surgery respectively. The evidence was low quality.

Continence status
This review found that up to 95% (7 studies), 92% (5 studies), 85% (4 studies), 85% (2 studies) and 85% (2 studies) of women were continent 2, 3, 5, 7 and 10 years after the surgery respectively. The evidence was low quality.

Adverse effects – Tape erosion
This review found that up to 4% (4 studies) of women suffered tape erosion 2 years after the surgery, 0% (2 studies) at 3 years, 1% (4 studies) at 3 years and 1% (2 studies) 7 years respectively. The evidence was low quality.

No evidence on tape erosion 10 years after surgery was identified

Adverse effects – Urinary retention
This review found that up to 13% (4 studies) of women suffered urinary retention 2 years after the surgery, 0% (1 study) at 3 years, and 5% (2 studies) at 3 years respectively. The evidence was low quality.

No evidence on urinary retention at 7 or 10 years after surgery was identified

Adverse effects – Voiding dysfunction
This review found that up to 18% (1 study) of women suffered from voiding dysfunction 2 years after the surgery, 1% (1 study) at 5 years respectively. The evidence was low quality.

No evidence on urinary retention at 3, 7 or 10 years after surgery was identified

Adverse effects – De novo OAB symptoms
This review found that up to 24% (4 studies) of women developed de novo OAB symptoms 2 years after the surgery, 23% (2 studies) at 3 years, 18% (3 studies) at 5 years, 17% (1 study) at 7 years and 17% (1 study) at 10 years respectively. The evidence was low quality.

Transobturator “inside-out”
Description of included studies
A total of three prospective cohort studies and data from the transobturator “Inside-out” arms of two randomised controlled trials were included in the review of long-term outcomes. One randomised controlled trial (Defliefuex et al., 2010) reported outcomes at 2 years and the second (Palva et al., 2010) reported outcomes at 3 years. Data from the three cohort studies (Cheng & Liu, 2012; Groutz et al., 2011; Neuman et al., 2011) provided data at either 3 years and 5 years.

Between 27% and 72.1% of women had mixed urinary incontinence and was not reported in one study (Palva et al., 2010).

Concomitant surgery was not reported in any of the included studies.
The mean age of participants ranged from 52.4 (SD 11.1) to 56.6 (SD 10.2) years but was not reported in Palva et al., 2010. The mean number of incontinence episodes and the mean duration of symptoms were not reported in any of the included studies.

The transobturator “inside-out” device in two studies (Deffieux et al., 2010; Groutz et al., 2011) was Gynecare (Ethicon, Johnson & Johnson, Somerville, NJ, USA). The device manufacturer was not stated in the remaining studies.

**GRADE profile**

**Table 8.9** GRADE profile for long-term outcomes of transobturator “inside-out”

<table>
<thead>
<tr>
<th>Event</th>
<th>No of studies</th>
<th>Relative effects</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Patient satisfaction</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>2 years</strong></td>
<td>No evidence reported</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>3 years</strong></td>
<td>1 study (Palva et al., 2010)</td>
<td>87.1%</td>
<td>LOW</td>
</tr>
<tr>
<td><strong>5 years</strong></td>
<td>1 study (Cheng &amp; Liu, 2012)</td>
<td>87.4%</td>
<td>LOW</td>
</tr>
<tr>
<td><strong>Continence status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>2 years</strong></td>
<td>1 study (Deffieux et al., 2010)</td>
<td>87.8%</td>
<td>LOW</td>
</tr>
<tr>
<td><strong>3 years</strong></td>
<td>2 studies (Neuman et al., 2011; Palva et al., 2010)</td>
<td>75.0% to 84.9%</td>
<td>LOW</td>
</tr>
<tr>
<td><strong>5 years</strong></td>
<td>2 studies (Cheng &amp; Liu, 2012; Groutz et al., 2011)</td>
<td>69.2% to 89.3*</td>
<td>LOW</td>
</tr>
<tr>
<td><strong>Adverse effects – Tape erosion</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>2 years</strong></td>
<td>No evidence reported</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>3 years</strong></td>
<td>1 study (Palva et al., 2010)</td>
<td>0.8%</td>
<td>LOW</td>
</tr>
<tr>
<td><strong>5 years</strong></td>
<td>2 studies (Cheng &amp; Liu, 2012; Groutz et al., 2011)</td>
<td>0% to 1.0%</td>
<td>LOW</td>
</tr>
<tr>
<td><strong>Adverse effects – Voiding dysfunction</strong></td>
<td>No evidence reported</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Adverse effects – De novo overactive bladder symptoms</strong></td>
<td>No evidence reported</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>2 years</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>3 years</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Urinary incontinence in women: full guideline DRAFT (Corrected 1 March 2013) page 208 of 355
No evidence reported

<table>
<thead>
<tr>
<th>5 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 study (Groutz et al., 2011)</td>
</tr>
</tbody>
</table>

Evidence statements
No studies were identified for the outcomes of
- number of episodes of incontinence per day,
- incontinence-specific quality of life,
- psychological outcomes
- Urinary retention
- Voiding dysfunction and
- post-void residual volume.

Patient satisfaction
This review found that up to 87% (1 study) and 87% (1 study) of women were satisfied with treatment at 3 and 5 years after the surgery respectively. The evidence was low quality.
No evidence on patient satisfaction two years after surgery was identified

Continence status
This review found that up to 87% (1 study), 84% (2 studies), 89% (2 studies) of women were continent 2, 3 and 5 years after the surgery respectively. The evidence was low quality.

Adverse effects – Tape erosion
This review found that up to 1% (1 study) of women suffered tape erosion 3 years after the surgery, 1% (2 studies) at 5 years respectively. The evidence was low quality.
No evidence on tape erosion 2 years after surgery was identified

Adverse effects – Voiding dysfunction
This review found that up to 18% (1 study) of women suffered from voiding dysfunction 2 years after the surgery. The evidence was low quality.
No evidence on voiding dysfunction at 3 years after surgery was identified

Adverse effects – De novo OAB symptoms
This review found no instances of de novo OAB symptoms (1 study) 5 years after the surgery. The evidence was low quality.
No evidence on voiding dysfunction at 3 years after surgery was identified.

Transobturator “outside-in”

Description of included studies
A single prospective cohort study (Taweel & Rabah, 2010) was included in the review of long-term outcomes of transobturator “outside-in” this study reported on outcomes at 2 years. The mean age of women in this study was 50 years (range 37 to 72) but the number with mixed incontinence, mean number of incontinence episodes and the mean duration of symptoms was not reported.
The transobturator “outside-in” device manufacturer was not stated.

GRADE profile

| Table 8.10 GRADE profile for long-term outcomes of transobturator “outside-in” |
|------------------|------------------|------------------|
| No of studies    | Relative effects | Quality          |

Urinary incontinence in women: full guideline DRAFT (Corrected 1 March 2013) page 209 of 355
<table>
<thead>
<tr>
<th>Events (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Patient satisfaction</strong></td>
</tr>
<tr>
<td>2 years</td>
</tr>
<tr>
<td>1 study (Taweel &amp; Rabah, 2010)</td>
</tr>
<tr>
<td><strong>Continence status</strong></td>
</tr>
<tr>
<td>2 years</td>
</tr>
<tr>
<td>1 study (Taweel &amp; Rabah, 2010)</td>
</tr>
<tr>
<td><strong>Adverse effects – Tape erosion</strong></td>
</tr>
<tr>
<td>2 years</td>
</tr>
<tr>
<td>1 study (Taweel &amp; Rabah, 2010)</td>
</tr>
<tr>
<td><strong>Adverse effects – Urinary retention</strong></td>
</tr>
<tr>
<td>2 years</td>
</tr>
<tr>
<td>1 study (Taweel &amp; Rabah, 2010)</td>
</tr>
<tr>
<td><strong>Adverse effects – De novo overactive bladder symptoms</strong></td>
</tr>
<tr>
<td>2 years</td>
</tr>
<tr>
<td>1 study (Taweel &amp; Rabah, 2010)</td>
</tr>
</tbody>
</table>

**Evidence statements**

No studies were identified for the outcomes of

- number of episodes of incontinence per day,
- incontinence-specific quality of life,
- psychological outcomes
- voiding dysfunction and
- post-void residual volume.

**Patient satisfaction**

This review found that up to 71% (1 study) of women were satisfied with treatment 2 years after the surgery. The evidence was low quality.

**Continence status**

This review found that up to 80% (1 study) of women were continent 2 years after the surgery. The evidence was low quality.

**Adverse effects – Tape erosion**

This review found that no instances of tape erosion 2 years after the surgery. The evidence was low quality.

**Adverse effects – Urinary retention**

This review found that up to 4% (1 study) of women suffered from urinary retention 2 years after the surgery. The evidence was low quality.

**Adverse effects – De novo OAB symptoms**

This review found up to 7% (1 study) of women developed de novo OAB symptoms 2 years after the surgery. The evidence was low quality.
Single-incision

Description of included studies

A total of four cohort studies were included in the review of long-term outcomes. Three studies (Bernasconi et al., 2012; Kennelly et al., 2012; Shin et al., 2011) reported on outcomes at 2 years and the fourth study (Neuman et al., 2011) reported on outcomes at 3 years.

Between 10.8% and 67.6% of women had mixed urinary incontinence.

19.7% of women in Kennelly et al., 2012 received concomitant surgery but this was not reported in any of the included studies.

The mean age of participants ranged from 51.1 (SD 10.6) to 59.5 (SD 9.66) years. The mean number of incontinence episodes and the mean duration of symptoms was not reported in any of the included studies.

The transobturator “inside-out” device in three studies ((Bernasconi et al., 2012; Neuman et al., 2011; Shin et al., 2011) was TVT-Secur Gynecare (Ethicon, Johnson & Johnson, Somerville, NJ, USA) and in Kennelly et al., 2012 was MiniArc (American Medical Systems, Minnetonka, MN, USA).

GRADE profile

<table>
<thead>
<tr>
<th>No of studies</th>
<th>Relative effects</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Continence status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 studies (Bernasconi et al., 2012; Kennelly et al., 2012; Shin et al., 2011)</td>
<td>63.8% to 83.1%</td>
<td>LOW</td>
</tr>
<tr>
<td>3 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 study (Neuman et al., 2011)</td>
<td>85.4%</td>
<td>LOW</td>
</tr>
<tr>
<td><strong>Adverse effects – Tape erosion</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 studies (Bernasconi et al., 2012; Kennelly et al., 2012; Shin et al., 2011)</td>
<td>0% to 2.1%</td>
<td>LOW</td>
</tr>
<tr>
<td>3 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 study (Neuman et al., 2011)</td>
<td>0%</td>
<td>LOW</td>
</tr>
<tr>
<td><strong>Adverse effects – Urinary retention</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 studies (Bernasconi et al., 2012; Kennelly et al., 2012; Shin et al., 2011)</td>
<td>4.1% to 6.5%</td>
<td>LOW</td>
</tr>
<tr>
<td>3 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No evidence reported</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Adverse effects – De novo overactive bladder symptoms</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 years</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3 studies (Bernasconi et al., 2012; Kennelly et al., 2012; Shin et al., 2011) | 5.4% to 11.9% | LOW

3 years

No evidence reported

Evidence statements

No studies were identified for the outcomes of
- patient satisfaction with treatment
- number of episodes of incontinence per day,
- incontinence-specific quality of life,
- psychological outcomes
- voiding dysfunction and
- post-void residual volume.

Continence status

This review found that up to 83% (2 studies) and 85% (1 study) of women were continent 2 and 3 years after the surgery respectively. The evidence was low quality.

Adverse effects – Tape erosion

This review found that up to 2% (3 studies) of women suffered tape erosion 2 years after the surgery, and a single study reported no instances of tape erosion at 3 years. The evidence was low quality.

Adverse effects – Urinary retention

This review found that up to 6% (3 studies) of women suffered urinary retention 2 years after the surgery. The evidence was low quality.

No evidence on urinary retention 3 years after surgery was identified.

Adverse effects – De novo OAB symptoms

This review found that up to 11% (3 studies) of women developed de novo OAB symptoms 2 years after the surgery. The evidence was low quality.

No evidence on de novo OAB symptoms 3 years after surgery was identified.
### Table 8.12 Risks and benefits of recommended surgical procedures for stress urinary incontinence

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Continent &lt; 1 year</th>
<th>Perioperative events – tissue injury*</th>
<th>Continent &gt; 1 year</th>
<th>Erosion at &lt;1 year</th>
<th>Retention at &lt;1 year</th>
<th>Voiding dysfunction at &lt;1 year</th>
<th>De novo overactive bladder symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Retropubic “bottom-up”</strong></td>
<td>67% to 90% (24 studies)</td>
<td>3% to 6% (29 studies)</td>
<td>2 years</td>
<td>74% to 95% (7 studies)</td>
<td>0% to 4% (4 studies)</td>
<td>0% to 13% (4 studies)</td>
<td>18% (1 study)</td>
</tr>
<tr>
<td></td>
<td>3 years</td>
<td></td>
<td></td>
<td>81% to 92% (5 studies)</td>
<td>0% (2 studies)</td>
<td>0% (1 study)</td>
<td>No studies</td>
</tr>
<tr>
<td></td>
<td>5 years</td>
<td></td>
<td></td>
<td>69 to 85% (4 studies)</td>
<td>0% to 1% (4 studies)</td>
<td>0% to 5% (2 studies)</td>
<td>0% to 1% (1 study)</td>
</tr>
<tr>
<td></td>
<td>7 years</td>
<td></td>
<td></td>
<td>70% to 85% (2 studies)</td>
<td>0% to 1% (2 studies)</td>
<td>No studies</td>
<td>No studies</td>
</tr>
<tr>
<td></td>
<td>10 years</td>
<td></td>
<td></td>
<td>56% to 85% (2 studies)</td>
<td>No studies</td>
<td>No studies</td>
<td>No studies</td>
</tr>
<tr>
<td><strong>Transobturator “outside-in”</strong></td>
<td>60% to 75% (10 studies)</td>
<td>3% to 12% (14 studies)</td>
<td>2 years</td>
<td>80% (1 study)</td>
<td>0% (1 study)</td>
<td>4% (1 study)</td>
<td>No studies</td>
</tr>
<tr>
<td></td>
<td>3 years</td>
<td></td>
<td></td>
<td>No studies</td>
<td>No studies</td>
<td>No studies</td>
<td>No studies</td>
</tr>
<tr>
<td></td>
<td>5 years</td>
<td></td>
<td></td>
<td>No studies</td>
<td>No studies</td>
<td>No studies</td>
<td>No studies</td>
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<tr>
<td></td>
<td>7 years</td>
<td></td>
<td></td>
<td>No studies</td>
<td>No studies</td>
<td>No studies</td>
<td>No studies</td>
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<tr>
<td></td>
<td>10 years</td>
<td></td>
<td></td>
<td>No studies</td>
<td>No studies</td>
<td>No studies</td>
<td>No studies</td>
</tr>
<tr>
<td><strong>Transobturator “inside-out”</strong></td>
<td>62% to 73% (19 studies)</td>
<td>1% to 3% (14 studies)</td>
<td>2 years</td>
<td>87% (1 study)</td>
<td>No studies</td>
<td>No studies</td>
<td>No studies</td>
</tr>
<tr>
<td></td>
<td>3 years</td>
<td></td>
<td></td>
<td>75% to 84% (2 studies)</td>
<td>1% (1 study)</td>
<td>No studies</td>
<td>No studies</td>
</tr>
<tr>
<td></td>
<td>5 years</td>
<td></td>
<td></td>
<td>69% to 89% (1 study)</td>
<td>1%</td>
<td>No studies</td>
<td>No studies</td>
</tr>
<tr>
<td>Procedure</td>
<td>2 years</td>
<td>3 years</td>
<td>5 years</td>
<td>7 years</td>
<td>10 years</td>
<td></td>
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</tr>
<tr>
<td><strong>Retropubic “top down”</strong></td>
<td>No studies</td>
<td>No studies</td>
<td>No studies</td>
<td>No studies</td>
<td>No studies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2 studies)</td>
<td>(2 studies)</td>
<td>(1 study)</td>
<td>(1 study)</td>
<td>(1 study)</td>
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<tr>
<td>7 years</td>
<td>No studies</td>
<td>No studies</td>
<td>No studies</td>
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<tr>
<td>10 years</td>
<td>No studies</td>
<td>No studies</td>
<td>No studies</td>
<td>No studies</td>
<td>No studies</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Open colposuspension</strong></td>
<td>No studies</td>
<td>No studies</td>
<td>No studies</td>
<td>No studies</td>
<td>No studies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(10 studies)</td>
<td>(6 studies)</td>
<td>(1 study)</td>
<td>(1 study)</td>
<td>(1 study)</td>
<td>(1 study)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 years</td>
<td>No studies</td>
<td>No studies</td>
<td>No studies</td>
<td>No studies</td>
<td>No studies</td>
<td></td>
<td></td>
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<tr>
<td>3 years</td>
<td>No studies</td>
<td>No studies</td>
<td>No studies</td>
<td>No studies</td>
<td>No studies</td>
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<tr>
<td>5 years</td>
<td>No studies</td>
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<td>7 years</td>
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<td>No studies</td>
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<tr>
<td>10 years</td>
<td>No studies</td>
<td>No studies</td>
<td>No studies</td>
<td>No studies</td>
<td>No studies</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Autologous rectus fascial sling</strong></td>
<td>No studies</td>
<td>3% (1 study)</td>
<td>No studies</td>
<td>No studies</td>
<td>16% (1 study)</td>
<td></td>
<td></td>
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<tr>
<td>(1 study)</td>
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<td></td>
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<td></td>
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</tr>
<tr>
<td>5 years</td>
<td>No studies</td>
<td>No studies</td>
<td>No studies</td>
<td>No studies</td>
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</tbody>
</table>

*Tissue injury includes bladder perforation, vaginal wall perforation, urethral and bladder injury*
Economic evaluation of tension-free vaginal tape

An HTA of the clinical and cost effectiveness of TVT used economic modelling to compare the cost effectiveness of TVT with other common surgical procedures for the treatment of stress UI (open colposuspension, laparoscopic colposuspension, biological slings, injectable agents). Effectiveness data for the model were derived from the systematic review. One large RCT of TVT and open colposuspension did provide a direct comparison of the cure rates for these two techniques, but systematic differences in losses to follow-up between the two arms complicate the interpretation of these results.

There are few trials of the different surgical procedures and most of the literature is from case series. In particular, there was a lack of studies directly comparing TVT with surgical procedures other than open colposuspension. Therefore, comparisons between open colposuspension and these other techniques were used to infer an estimate of their effectiveness relative to TVT.

Costs were analysed from an NHS perspective, with resource use identified from existing studies, manufacturer reports and expert opinion. Unit costs for resource items were obtained from the literature, manufacturer’s price lists and NHS Reference Costs. The primary outcome measure in the model was QALYs.

A number of sensitivity analyses were undertaken to reflect trial-based uncertainty in the relative cure rates for TVT compared with open colposuspension, and the likelihood that TVT would be considered cost effective at different cost per QALY willingness to pay thresholds was estimated. Sensitivity analysis was additionally undertaken on a number of model parameters.

The modelling suggested that at baseline TVT dominates open colposuspension at 5 years. It costs £267 less per patient and produces an additional 0.00048 QALYs. This dominance result was driven by the assumptions that the women who withdrew from the trial were missing completely at random, that re-treatment colposuspension is less effective than primary colposuspension and that the failure rate of TVT will not deteriorate over time. Analysis which took account of sampling data variation suggested that there was a 93% chance that TVT would be considered cost effective if the willingness to pay for a QALY was £30,000. Sensitivity analysis suggested that changes in a number of parameters could reduce the likelihood of TVT being considered cost effective at different cost per QALY thresholds. For example, assumptions about hospital length of stay are an important driver of cost effectiveness results as it accounts for a substantial proportion of the procedure costs. The review reasoned that TVT was likely to be cost effective when compared with other surgical techniques on the assumption that it was at least as effective and cheaper. A two-year follow-up of women in an RCT of TVT versus open colposuspension has shown that prolapse is more prevalent in those who had open colposuspension.

Health economics profile 2013

One recent study was published after the 2006 guideline comparing the cost-effectiveness of surgical procedures was identified in the literature. The literature search also identified several other cost-effectiveness studies published since the 2006 guideline but either the cost data was out of date by ten years or more (Valpas et al., 2006; Ankardal et al., 2007, Dumbille et al 2006), or did not include the relevant comparators (Jacklin et al., 2010)).

The included study was from Canada and compared transobturator tape with tension-free vaginal tape. It was published in 2011 alongside a randomised controlled study and reported cost data from 2007 (Lier et al 2011). It concluded that there was no difference in health outcome (measured in QALYs) between procedures and reported the cost of transobturator “outside-in” to be lower than retropubic “bottom-up.”

One recent cost-effectiveness study using UK cost data was identified but this compared retropubic “bottom-up” with drug treatment (Duloxetine) (Jacklin et al., 2010). The cost of retropubic “bottom-up” reported in that paper was £2,044 identified from the generic NHS Tariff 2008/9 for HRG Code M03.

In the 2012 NHS Tariff, the equivalent HRG codes are for Lower Genital Tract Major Procedures with complications (£2,271) and without complications (£1,986). No distinction is made between the types of surgical procedure in the NHS Tariff. In order to undertake a health economic analysis, detailed
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costs that differentiated between surgical procedures on resource use would be required. This level of
detail on resource use was not identified in the published evidence for the NHS.

Health economic evidence statements

No recent UK-based cost-effectiveness analyses were identified in the literature. There is evidence
from a Canadian study that the costs are lower for transobturator “outside in” procedures compared
with retropubic “bottom-up” procedures but one study from Canada is not sufficient evidence to make
inferences about the relative cost-effectiveness of surgical procedures in the NHS.

There is a lack of detailed data on the differences in resource use between procedures in the NHS
which is the focus of this clinical question. A new health economic model was not prioritised for this
guideline as only one procedure had sufficient clinical evidence on which to make a comparison.

Evidence to recommendations

Relative value placed on the outcomes considered

Initially patient satisfaction was the primary outcome for measuring the success of the reviewed mid-
urethral tapes approach. As with other reviews, the GDG were concerned about how patient
satisfaction was measured across studies. Therefore, continence status was additionally selected as
an equally appropriate measure of treatment success.

Mid-urethral tapes have two adverse effect profiles; one related to the device being used and one
related to the surgical approach used. The adverse effects chosen for the review were prioritised by
the GDG as the key complications that the women should be informed of prior to surgery.

Consideration of clinical benefits and harms

‘bottom-up’ retropubic, ‘inside-out’ transobturator and ‘outside-in’ transobturator.

The evidence profile for the short-term (<1 year) effectiveness of mid-urethral tapes showed that there
was no significant difference in continence status between the following three approaches: ‘bottom-up’
retropubic, ‘inside-out’ transobturator and ‘outside-in’ transobturator.

The long-term data (>2 years) showed that continence status remained relatively consistent for up to
10 years after tape insertion for both the retropubic “bottom-up” and transoburator “inside-out”
approaches. There were fewer equivalent long-term data for transoburator “outside-in” transobturator
tape. Based on the evidence of short-term outcomes and clinical experience, the GDG consensus
was that long-term effectiveness would be equivalent to the other two approaches.

The GDG acknowledged that the retropubic “bottom-up” was the first of these procedures to be
introduced. It was included in the majority of studies and had more complete data on long-term follow
up. Whereas, the more recent alternative transoburator approaches (‘inside-out’ and ‘outside-in’) had
less evidence of effectiveness. While the short-term data for the transoburator approaches were
adequate, the procedures have not been used for a sufficiently long period for an extensive long-term
follow-up to be completed. However the GDG view was that the data on short-term effectiveness and
more limited data on the longer term showed a strong enough benefit to recommend on the condition
that women are informed of the current lack of long-term data on the transobturator approach. Based
on the evidence found for treatment success, the GDG recommended retropubic “bottom-up”,
transoburator “inside-out” and transboturator “outside-in” approaches.

Furthermore, the GDG noted that the effectiveness of the three mid-urethral tape procedures was
similar to the effectiveness of open colposuspension and autologous rectus fascial slings published in
the 2006 guideline. Therefore they agreed to retain these interventions as alternative treatment
options to mid-urethral tapes.

Single incision approach

There were a total of ten RCTs that investigated the single incision approach, all of which were
compared with either retropubic “bottom-up” or transoburator “inside out” approaches. None of the
trials demonstrated a clinical benefit of the single incision approach over the comparator procedures.
These reviews suggested that a single incision procedure had lower cure rates (measured as
‘absolutely dry’ continence status) compared with the other two procedures. Furthermore the GDG
noted that the single incision approach required more specialist training than required for the other
procedures. There is also a higher risk of more difficult revision in cases of failure with single incision

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approaches. The GDG noted that single incision tapes were introduced to clinical practice as an alternative to more conventional approaches that could be undertaken as an outpatient procedure. The rationale for its development was to assess whether it would be associated with less risk of injury and faster recovery, but the evidence does not support this. The GDG concluded that single incision tapes should not be offered routinely where other approaches are available.

**Retropubic “top-down” approach**

Three RCTs comparing retropubic “top-down” with retropubic “bottom-up” showed no significant difference between procedures. Another study comparing retropubic “top-down” with transobturator “outside-in” found no difference in immediate peri-operative outcomes and no evidence of improved long-term effectiveness using the retropubic “top-down” approach.

The GDG concluded that more evidence was required before recommending the use of retropubic “top-down” approaches to demonstrate its effectiveness compared with other mid-urethral approaches and its long-term efficacy and safety. By contrast, the long-term effectiveness of the ‘bottom-up’ retropubic approach is supported by a large body of evidence. Therefore the GDG felt that retropubic approaches should also demonstrate equal or superior long-term efficacy in order to be recommended.

**Peri-operative adverse effects**

The difference in the angle of surgical incision used in the retropubic and transobturator approach means that the risk of iatrogenic damage caused by the surgery will be different in each case. For example, the insertion of transobturator tapes present a greater risk of vaginal wall injury than the retropubic approach whereas there is a lower chance of bladder perforation. The classification of the severity of an adverse event is often misinterpreted. For example bladder perforation would be reported as a minor adverse event when seen in the short term. If it goes unnoticed however, the longer-term implications are more serious with mesh erosion into the bladder.

The GDG concluded that whilst one approach will show a reduction in risk for one specific adverse event this is offset by another increased risk in another. Therefore the GDG could not recommend a specific approach based upon differences in adverse events. The risks will be interconnected with the surgeon’s skill in a given procedure. It is therefore important that a choice is available, taking into account the expected chance of adverse events. The procedure with which a surgeon is most familiar and has most experience is likely to be safer.

**Consideration of health benefits and resource uses**

The GDG discussed the differences in the implementation costs between the different types of mid-urethral tapes reviewed. Using their clinical experience they acknowledged that the surgeon’s time and the cost of the tape did not vary significantly from one type of tape to another.

There were, however, some subtle differences that the GDG highlighted for consideration. Firstly, when using a retropubic approach there is a higher risk of bladder perforation. Therefore, in order to check for and rectify any damage, a cystoscope is routinely used at the end of the procedure. This extra cost is not incurred using the other techniques because of the substantial reduction in the chance of bladder perforation.

Detailed cost information that classifies surgical intervention by the type of procedure is not routinely available for the NHS. The consensus view was that operating theatre time, surgeon’s time, hospital stay or follow-up would differ significantly between mid-urethral tape procedures. Surgical skill and familiarity with a procedure would have an effect on the rate of adverse events and the need for revision or removal of a tape, and consequently on long-term resource use. Consequently, the GDG did not choose to recommend the least expensive surgical intervention on the basis of its procurement cost alone.

The GDG concluded that the cost difference between the recommend mid-urethral tape approaches was likely to be marginal and would not therefore affect the decision to offer a particular surgical tape procedure.
Quality of evidence

The GDG noted that the populations were not consistent in all RCTs included in the review and the GDG were concerned that some studies included women with a diagnosis of mixed UI or who had concomitant prolapse surgery. Including such patients would lead to a lower reported efficacy due to unrelated symptoms which would not be resolved by successful SUI treatment. In addition, patients some studies included women who had had previous surgery for SUI. There is evidence that secondary surgery will have differing success rates to the initial procedure (see section 8.6). The GDG also noted that the reason for secondary surgery could also have an impact on the outcome although this could not be concluded from the evidence.

The measures used to calculate continence status varied across the trials. Objective and subjective tests were used and the reporting of these meant that the potential for outcome reporting bias could not be determined.

Finally, the GDG noted that the long-term data was largely derived from observation studies whereas the short-term data was taken from RCTs only, removing this risk of bias.

Other considerations

Burch colposuspension and autologous rectus fascial sling

The GDG noted that open colposuspension is more complex and resource intensive procedure than using a mid-urethral tape; it is done under general anaesthetic with a longer recuperation period (around 8 weeks).

The GDG noted that the evidence for benefit had not changed since 2006 and chose to retain the recommendation for colposuspension and autologous rectus fascial sling. Based the GDG clinical experience, the GDG concluded that Burch colposuspension and autologous rectus fascial sling should continue to be recommended as for some women synthetic tapes are unacceptable. Women should be advised of the risks and prognosis for both procedures so that an informed decision can be made.

Selection of intervention

The population in each study included women in whom conservative treatments for SUI or mixed urinary incontinence had not been successful. As outlined elsewhere in the guideline, the GDG sought to reinforce that surgical treatments for SUI should only be offered once women have failed conservative treatments.

A range of interventions that should be considered for each individual woman based on their outcome goals and clinical history. Five procedures were recommended including bulking agents following a period of unsuccessful conservative treatment. Consultation between the MDT and patient should be integral to the decision to decide what to offer and that choice should be made based on the clinical history and a discussion with the woman of the risks and benefits for each procedure. The GDG acknowledged that in some cases women may not opt for an invasive surgical procedure following failure of conservative treatments for SUI. In these circumstances women should be referred to the recommendation 48.

Other factors may influence the choice of intervention. The primary considerations before surgery should be a woman’s co-morbidities, particularly those that increase the anaesthetic or surgical risk, or make access more difficult. A list of the more common examples to be considered is presented in table 8.13 below. Patients with additional co-morbidities or complicating factors should always be referred for discussion at a local MDT as other colleagues may have helpful ideas or have different operations in their repertoire.

Table 8.13 common co-morbidities to be considered before SUI surgery

<table>
<thead>
<tr>
<th>Anaesthetic risks</th>
<th>Surgical risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>COPD, chronic cough</td>
<td>Obesity</td>
</tr>
<tr>
<td>Diabetes</td>
<td>Previous abdominal surgery or mesh hernia repair</td>
</tr>
<tr>
<td>Neurological disease</td>
<td>Warfarin, clopidgrel etc</td>
</tr>
</tbody>
</table>


1

Surgeon experience
The choice of intervention is subjective and dependant on discussions between patient and consultant, culminating in the clinical judgements described above. It is therefore important that all types of recommended mid-urethral tapes approaches and colposuspension are made available. If a surgeon cannot offer one or more procedures then the MDT should refer to an alternative surgeon.

As described in chapter 9, the ability of the surgeon and their experience for each procedure correlates with the success of the procedure. Therefore to ensure the best outcome the recommendations in chapter 9 should also be followed.

Type of device
There is currently no stringent regulation of the type of tape devices that can be used. According to the Medicines and Healthcare products Regulatory Agency (MHRA) these devices are “class 2” products and therefore do not need to demonstrate RCT-based evidence of efficacy.

The market for new tape devices is dynamic; NHS procurement is presented with numerous options with no clear recommendation of which product should be used. Without guidance, the choice of device can be pragmatic. The GDG is aware that cheaper tape alternatives have been purchased on the assumption that all devices have equal efficacy which has not been demonstrated in clinical trials. The GDG strongly believed that the regulation and evaluation of these devices is important both for patient safety and to evaluate the short and long-term efficacy of different tapes. In order to guarantee that patients are offered safest and most effective devices, the GDG has only recommended tapes with proven efficacy based on robust RCT evidence. The GDG did however acknowledge that technological advances are frequent and that recommendations should not be used to restrict the development of new devices. Moreover, if new evidence emerges based on robust RCTs that demonstrate non-inferiority of a device compared with devices currently recommended, then it should be considered for use, depending on procurement cost and clinical judgement.

Understanding adverse events
Surgical interventions for the treatment of SUI vary in risks of adverse events. Some women may be reluctant for their treatment to include specific types of surgery. In order to alleviate their concerns, the provision of information leaflets should assist the discussion between a clinicians and a woman choosing treatment. To ensure consistency of information, a table is presented (signpost) indicating the long-term and short-term adverse events as well the predicted success rates of the recommended mid-urethral procedures tapes, open colposuspension and bulking agents.

The term erosion is used within this guideline; however there is ongoing debate about the use of this terminology. In 2011 the International Urogynaecological Association (http://www.iuga.org/) and the International Continence Society (http://www.icsoffice.org/) advised that the use of generic term “tape erosion” as used in this chapter and associated evidence tables, be discontinued as it does not necessarily suit the clinical scenarios encountered. It is recommended that it is replaced for clarity and specificity by either exposure (where the tape is visualised through separated vaginal epithelium) or extrusion (where the tape protrudes into the vaginal cavity). However, the GDG considered erosion to be suitable until an agreed terminology has been implemented.

Tape failure
Recently concerns have been raised, particularly in the USA, about the safety of the polypropylene Type 1 mesh used in both tape procedures for incontinence, and for pelvic organ prolapse. The amount of polypropylene mesh used in a tape procedure is much smaller than that for a prolapse operation. However, there are still recognised risks, including tape erosion through the vaginal mucosa, and failure of the vagina to heal over the mesh. In some cases, severe life-threatening...

Spinal injury or damage, arthritis
Liver or renal disease
Heart disease
Allergy to agents
Difficult intubation
Fractured pelvis or RTA
Problems with hip abduction
Previous retropubic surgery

2013 Update
infection has been reported. These types of tapes and meshes were introduced in the belief that they were the same as abdominal mesh procedures for hernias, but it is now recognised that the vagina is a very different environment in which to place a foreign body. Type 1 macroporous monofilament meshes are extremely inert in tests (Sangster et al., 2010) and patients can be reassured that the incidence of severe problems in tape procedures is around 5%. If erosion does occur at any stage (reports include new erosions up to 10 years post-operatively), it is usually a simple procedure to remove the area of eroded mesh and oversew the vaginal mucosa. The same rationale applies to pelvic organ prolapse meshes which have an overall incidence of erosion of about 15%. Unfortunately, the main complication of removing parts of an incontinence tape is the loss of function of the tape, leading to recurrent incontinence. Occasionally, major surgery may be required for removal of tape from the bladder or urethra (<1%). Although success rates for tapes remains high, the GDG acknowledged a removal procedure would benefit from the use of a coloured tape in the initial procedure for ease of identification.

Other materials for synthetic tapes

Slings made of silicone

No controlled trials evaluating the used of a silicone sling were identified. Three case series reported outcomes relating to this sling (reinforced with polyethylene) in women with stress UI. Two included 30 and 54 women,858,859 while the third described the complication of sinus formation in 18% of 40 women who underwent the procedure.860 The majority of women in one series had undergone prior continence surgery,859 in another, the decision to use the sling was made intra-operatively when colposuspension was seen not to be technically feasible.858 Both included a proportion of women with mixed UI (17% and 60%). Subjective cure rates were 79% at mean follow-up of 15 months,858 and both subjective and objective (pad test) cure rates were 83% in the series with complete follow-up at 3 months.859 Intra-operative complications were haemorrhage requiring blood transfusion (6%),858 and vaginal perforation, and bladder or urethral perforation (7% each; one case of urethrovaginal fistula needing sling removal).859 De novo DO and voiding difficulty was very common (more than 10%) in both; voiding difficulty required sling release in four of seven cases in one study,859 Pulmonary embolism, enterocele, and sinus formation (which required removal or trimming of the sling) occurred in 4% of women in one study.858 The third report described sinus formation in 18% of cases treated, with sling removal in each case at 3–16 months, following the procedure.860

Slings made of polytetrafluoroethylene

Three controlled trials evaluated a PTFE sling, each of which was small with maximum follow-up of about 2 years. Compared with open colposuspension in women with stress UI, and urethral hypermobility, cure rates with PTFE were not significantly different at 2.5 years (objective 85% versus 100%; subjective 93% versus 84%). At baseline, the proportion of women with DO was significantly lower in the PTFE group (41% versus 95%). De novo DO was reported in 24% versus 5%. Complications over the longer term in the sling group were erosion (12%) and urethrolysis for retention (6%) (n = 36).668,669 [EL = 1+]

One RCT compared PTFE and rectus fascial slings in women with stress UI (n = 48; 92% of whom had had prior continence surgery). Combined objective and subjective cure rates were 88% and 81%, respectively, at 6 months. Urethral erosion, recurrent UTI and de novo DO were very common with PTFE, whereas no complications were reported in the fascial sling group.861 [EL = 1–]

A quasi-RCT compared PTFE with a vaginal wall sling in women with stress or mixed (~60%) UI. Cure and satisfaction rates were high across both groups at mean follow-up of 22 months (75–100%), but no statistical analysis was reported. Complications reported were wound infection, UTI, bleeding, vaginitis and transient de novo urge UI (n = 40).862 [EL = 1–]

Seven case series evaluated slings or a soft tissue patch made of PTFE in women with stress UI (total n = 453; range 24–115).863–871 Some women in three studies had mixed UI (36–90%).863–865,871 Between 26% and 100% of women across five studies (median 56%) had had prior continence surgery.863–866,869,871 Concomitant surgery was undertaken in 26% and 78% of women in two studies.
Duration of follow-up ranged from about 1 to 5 years. All except one study considered continence, all considered complications and two reported satisfaction. The median subjective cure rate was 83% (range 72–89%). The objective cure rates, reported in two studies, were 61% and 89%. Satisfaction was reported by 81–82% of women.

Complications were:
- sling removal (all studies): median 8% (range 3–31%) for varying reasons (rejection, reactions to sling [sinus formation, granulation tissue, abdominal wound abscess, erosions of vaginal mucosa], urethral obstruction, urethral erosion, non-healing of vaginal incision, urinary retention, persistent pain, sling infections)
- wound complications or infections (three studies): median 15% (range 6–40%) \(^{863-865,869}\)
- de novo urge UI or DO (four studies): median 9% (range 0–12%) \(^{863-866,871}\)
- voiding difficulties (two studies): 22% and 37% \(^{867-869}\)
- intermittent self-catheterisation (two studies): 3% and 8% \(^{863,868,869}\)
- surgery for retention (two studies): 4% and 9% \(^{865-866}\)

Other complications noted were irritative symptoms and recurrent UTI (21%), \(^{866}\) and pelvic pain (16%). \(^{867}\) No cases of sling intolerance or of bladder or urethral erosion were seen in two studies. \(^{864,865}\)

**Tapes made of polyester**

No controlled trials were identified for slings made of polyester. Four case series evaluated the use of a polyester graft mesh (Mersilene ®), two with very limited baseline data for the women treated. \(^{872-875}\)

Each study included women with stress UI, and one stated that 69% of those followed up to 1 year had urgency or urge UI. Patient numbers ranged from 24 to 200 (median 102). Three studies noted that 25–54% of women had had prior continence surgery. \(^{872,873,875}\) Concomitant surgery was undertaken in 55% of women in one. \(^{873}\)

Duration of follow-up ranged from a mean of 2 years to 5 years. Subjective cure rates across the studies ranged from 50% to 96% (median 84%). The objective cure rate in 26% of women with follow-up of 5 years was 94%; compared with 95% at 1 year (one study). \(^{873}\)

Complications reported were:
- intra-operative: haemorrhage 2%; \(^{874}\) no cases of urethral or bladder injury \(^{872}\)
- de novo urge UI or DO (two studies): 4% and 15% \(^{872,874}\)
- retention or voiding difficulties (two studies): 1.5% and 15%; \(^{873,874}\) surgical release for retention required in 1.5%. \(^{873}\)

Other complications noted across the studies were: vaginal or inguinal sling erosion (4%; sling removed in one case), recurrent UTI (2%), superficial groin seroma/abscess (2.5%), dyspareunia (2.5%), \(^{873}\) wound haematoma/infection (11%), exposure of Prolene _N_ sutures (2%), \(^{872}\) vesicovaginal fistula (2%; repaired), minor wound complications (7%), and partial dehiscence of incision with exposure of part of sling which was resolved by trimming (3%). \(^{875}\) No cases of urethral necrosis, graft rejection or sinus formation were reported in one series. \(^{872}\)

**Recommendations**

<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>88</td>
<td>When offering a surgical procedure discuss with the woman the risks and benefits of the different treatment options for SUI using the information in table 8.12. ([\text{new 2013}])</td>
</tr>
</tbody>
</table>

89 If conservative treatment for SUI has failed, offer:

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synthetic mid-urethral tape (see recommendations 90–94) or
open colposuspension (see recommendation 95), or
autologous rectus fascial sling (see recommendation 96). [new 2013]

90 When offering a mid-urethral tape procedure, surgeons should:

- use one of the following procedures and devices for which there is current high quality evidence of efficacy and safety: :
  - TVT or Advantage for a 'bottom-up' retropubic approach
  - TVTO for an 'inside-out' transobturator approach
  - Obtape, Monarc or Obtryx Halo for an 'outside-in' transobturator approach
- only use a device that they have been trained to use (see recommendations in chapter 9)
- use type 1 macroporous polypropylene tape
- consider using a tape coloured for high visibility, for ease of insertion and revision. [new 2013]

91 If women are offered a procedure involving the transobturator approach, make them aware of the lack of long-term outcome data. [new 2013]

92 Refer women to an alternative surgeon if their chosen procedure is not available from the consulting surgeon. [new 2013]

93 Use ‘top-down’ retropubic tape procedures only as part of a clinical trial. Refer to single-incision sub-urethral short tape insertion for stress urinary incontinence (NICE interventional procedure guidance 262) for guidance on single incision procedures. [new 2013]

94 Offer a follow-up appointment, (including vaginal examination) to all women who have had continence surgery within 6 months. [new 2013]

<table>
<thead>
<tr>
<th>Number</th>
<th>Research recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>RR14</td>
<td>Newer mid-urethral procedures should be further investigated and compared with pelvic floor muscle training and accepted surgical interventions in the treatment of stress urinary incontinence.</td>
</tr>
<tr>
<td>RR15</td>
<td>What are long-term outcomes for ‘top down’ retropubic, transobturator and single incision procedures?</td>
</tr>
</tbody>
</table>

Predictive factors of tape failure

Introduction

In order to make an informed choice about proceeding with surgery for SUI women should be advised whether they have any additional risk factors which may influence the outcome or occurrence of adverse events. Finding specific indications to accurately predict the chances of tape success may enable multidisciplinary teams to make more informed decisions in offering specific interventions (or not offering any interventions at all)

Review question

What patient characteristics are predictors of primary tape failure?

Methodological approach for the review

The review classified patient characteristics by whether they were protective factors (OR<1) against or risk factors (OR>1) for predicting primary tape failure. Characteristics were identified as statistically

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12 The guideline only recommends the use of tapes with proven efficacy based on robust randomised controlled trial evidence. However technological advances are frequent, therefore the choice of tape should include devices that are shown in future clinical trials to have equal or improved efficacy at equal or lower cost.
significant, clinically significant or both. For the purposes of this review, the odds ratio for a protective factor’s lower confidence interval had to be less than 0.75 to be considered clinically significant.

**Overview of the evidence**

Evidence for factors are categorised according to their association with tape failure as follows:

- Factors found to be associated strongly (clinically significant) with tape failure (Table 8.14)
- Factors found not be associated (statistically but not clinically significant) with tape failure (Table 8.15)
- Factors found not to be associated not statistically significant) with tape failure (Table 8.16)

**Description of included studies**

Six studies (Abdel-Fattah et al., 2010a; Barber et al., 2008a; Paick et al., 2004; Paick et al., 2004b; Richter et al., 2011; Schraffordt et al., 2006) were identified, three of which were prospective cohort studies (Paick et al., 2004; Paick et al., 2004b; Schraffordt et al., 2006), two ancillary analysis of data from RCTs (Abdel-Fattah et al., 2010a; Barber et al., 2008a) and one a two-arm randomised equivalence trial (Richter et al., 2011). Studies that were ancillary analyses of data from RCTs were analysed as observational studies and so the quality rating started at low.

Two studies were from USA (Barber et al., 2008a; Richter et al., 2011), two from Korea (Paick et al., 2004; Paick et al., 2004b), one from UK (Abdel-Fattah et al., 2010a) and one from the Netherlands (Schraffordt et al., 2006). The mean age of the participants which was reported in four studies ranged from 51.3 (No SD, range from 20 to 82) to 57.2 (SD 8.6) years. The mean number of incontinence episodes was only reported in one study (Richter et al., 2011) and ranged from 2.9 (SD 2.7) episodes per day in subjects in which treatment was successful to 3.9 (SD 3.2) episodes per day in subjects in which treatment failed. The duration of SUI was reported in two studies (Paick et al., 2004; Paick et al., 2004b) and ranged from 7 months (3-10) and 10 months (1-30) respectively for the cases (tape failure) and controls (no tape failure) of one study (Paick et al., 2004) to 103 months (2-480) in another (Paick et al., 2004b).

**Evidence profile**

<table>
<thead>
<tr>
<th>Number of studies</th>
<th>Number of women</th>
<th>Effect</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of women with factor / Number with tape failure</td>
<td>Number of women with factor / Number without tape failure</td>
<td>Adjusted OR (95% CI)</td>
</tr>
<tr>
<td>Preoperative anticholinergic medication use vs no use</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Barber et al., 2008a)</td>
<td>Not reported</td>
<td>Not reported</td>
<td>6.7 (1.6 to 22)</td>
</tr>
<tr>
<td>BMI &gt;35 when compared with BMI ≤30 (patient reported outcome)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Abdel-Fattah et al., 2010a)</td>
<td>8/58 (13.79%)</td>
<td>10/247 (4.05%)</td>
<td>6.37 (1.73 to 23.44)</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th></th>
<th>MUCP ≥31 when compared with MUCP ≤30 (objective outcome)</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 (Abdel-Fattah et al., 2010a)</td>
<td>25/43 (58.14%)</td>
<td>219/245 (89.39%)</td>
<td>7.06 (2.85 to 17.48)</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Primary surgery when compared with secondary surgery (objective outcome)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 (Abdel-Fattah et al., 2010a)</td>
<td>31/44 (70.45%)</td>
<td>223/253 (88.14%)</td>
<td>6.22 (2.34 to 16.52)</td>
</tr>
</tbody>
</table>
Table 8.15 GRADE findings for all statistically significant factors

<table>
<thead>
<tr>
<th>Number of studies</th>
<th>Number of women</th>
<th>Effect</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of women with factor / Number with tape failure</td>
<td>Number of women with factor / Number without tape failure</td>
<td>Adjusted OR (95% CI)</td>
</tr>
<tr>
<td>Age per decade (outcome: recurrent SUI)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Barber et al., 2008a)</td>
<td>Not reported</td>
<td>Not reported</td>
<td>1.7 (1.1 to 2.6)</td>
</tr>
<tr>
<td>Concurrent pelvic organ prolapse surgery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Barber et al., 2008a)</td>
<td>Not reported</td>
<td>Not reported</td>
<td>2.7 (1.1 to 6.7)</td>
</tr>
<tr>
<td>Secondary surgery when compared with primary surgery (patient reported outcome)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Abdel-Fattah et al., 2010a)</td>
<td>14/61 (22.95%)</td>
<td>32/249 (12.85%)</td>
<td>2.33 (1.1 to 5.478)</td>
</tr>
<tr>
<td>Nocturia when compared with no nocturia (patient reported outcome)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Abdel-Fattah et al., 2010a)</td>
<td>44/61 (72.13%)</td>
<td>105/246 (42.68%)</td>
<td>2.18 (1.04 to 4.58)</td>
</tr>
<tr>
<td>Urgency incontinence when compared with no urgency incontinence (patient reported outcome)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Abdel-Fattah et al., 2010a)</td>
<td>44/61 (72.13%)</td>
<td>124/249 (49.80%)</td>
<td>3.35 (1.07 to 10.51)</td>
</tr>
<tr>
<td>Higher maximal flow rate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Paick et al., 2004)</td>
<td>Mean: 16ml/s (9-36)</td>
<td>Mean: 26ml/s (11-63)</td>
<td>0.90 (0.82 to 0.99)</td>
</tr>
<tr>
<td>Previous UI surgery when compared with no previous UI surgery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Richter et al., 2011)</td>
<td>49/259 (18.92%)</td>
<td>26/304 (8.55%)</td>
<td>1.99 (1.14 to 3.47)</td>
</tr>
<tr>
<td>Q-tip maximum straining less than 30 degrees, yes when compared with no</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Richter et al., 2011)</td>
<td>59/260 (22.69%)</td>
<td>42/305 (13.77%)</td>
<td>1.89 (1.16 to 3.05)</td>
</tr>
<tr>
<td>Urge score (per 10 points)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Richter et al., 2011)</td>
<td>Mean +/-SD: 7.2+/−4.0</td>
<td>Mean +/-SD: 5.6+/−3.7</td>
<td>1.97 (1.21 to 3.21)</td>
</tr>
<tr>
<td>Pad weight (per 10g)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Richter et al., 2011)</td>
<td>Mean +/-SD: 50.2+/−88.9</td>
<td>Mean +/-SD: 24.7+/−39.7</td>
<td>1.06 (1.02 to 1.1)</td>
</tr>
<tr>
<td>Outcome</td>
<td>Reference</td>
<td>Outcome 1</td>
<td>Outcome 2</td>
</tr>
<tr>
<td>---------</td>
<td>-----------</td>
<td>-----------</td>
<td>-----------</td>
</tr>
<tr>
<td>More than 20 procedures for each surgeon when compared with first 10 procedures for each surgeon (outcome 1: defined as the answer to the question 'Do you experience urinary leakage during physical activity, coughing or sneezing?' Success for SUI was defined as the answer 'no'.)</td>
<td>1 (Schraffordt et al., 2006)</td>
<td>66/184 (35.87%)</td>
<td>173/381 (45.41%)</td>
</tr>
<tr>
<td>More than 20 procedures for each surgeon when compared with first 10 procedures for each surgeon (outcome 2: defined as answer to the doctor’s question 'Do you leak during physical activity, coughing or sneezing?' asked at 2-year follow-up. The answer 'no' was defined as success. All other answers as well as 'improved' were considered as failure.)</td>
<td>1 (Schraffordt et al., 2006)</td>
<td>44/133 (33.08%)</td>
<td>220/478 (46.03%)</td>
</tr>
<tr>
<td>General anesthesia when compared with local anaesthesia</td>
<td>1 (Schraffordt et al., 2006)</td>
<td>22/122 (18.03%)</td>
<td>47/451 (10.42%)</td>
</tr>
<tr>
<td>Urge symptoms when compared with no urge symptoms</td>
<td>1 (Paick et al., 2004b)</td>
<td>Not reported</td>
<td>Not reported</td>
</tr>
<tr>
<td>Lower MUCP (reference not stated)</td>
<td>1 (Paick et al., 2004b)</td>
<td>Not reported</td>
<td>Not reported</td>
</tr>
</tbody>
</table>
### Table 8.16 GRADE findings for factors of no statistical significance

<table>
<thead>
<tr>
<th>Number of studies</th>
<th>Number of women</th>
<th>Effect</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of women with factor / Number with tape failure</td>
<td>Number of women with factor / Number without tape failure</td>
<td>Adjusted OR (95% CI)</td>
</tr>
<tr>
<td><strong>Current smoking</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Barber et al., 2008a)</td>
<td>Not reported</td>
<td>Not reported</td>
<td>0.4 (0.1 to 1.3)</td>
</tr>
<tr>
<td><strong>Functional capacity (metabolic unit, METs)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Barber et al., 2008a)</td>
<td>Not reported</td>
<td>Not reported</td>
<td>2.4 (0.4 to 15)</td>
</tr>
<tr>
<td><strong>Number of vaginal deliveries</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Barber et al., 2008a)</td>
<td>Not reported</td>
<td>Not reported</td>
<td>0.3 (0.03 to 2.4)</td>
</tr>
<tr>
<td><strong>No nocturia when compared with nocturia (objective outcome)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Abdel-Fattah et al., 2010a)</td>
<td>16/44 (36.36%)</td>
<td>134/250 (53.6%)</td>
<td>1.23 (0.52 to 2.89)</td>
</tr>
<tr>
<td><strong>No urgency incontinence when compared with urgency incontinence (objective outcome)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Abdel-Fattah et al., 2010a)</td>
<td>16/44 (36.36%)</td>
<td>117/253 (46.25%)</td>
<td>1.18 (0.33 to 4.31)</td>
</tr>
<tr>
<td><strong>Maximal cystometric capacity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Paick et al., 2004)</td>
<td>Mean: 411ml (293-699)</td>
<td>Mean: 384ml (178-549ml)</td>
<td>1.00 (1 to 1.02)</td>
</tr>
<tr>
<td><strong>Treatment group: TVT when compared with TOT</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Barber et al., 2008a)</td>
<td>Not reported</td>
<td>Not reported</td>
<td>OR 1.1 (0.5 to 2.5)</td>
</tr>
<tr>
<td><strong>Treatment group: TOT when compared with TVT-O (patient reported outcome)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Abdel-Fattah et al., 2010a)</td>
<td>35/61 (57.38%)</td>
<td>119/249 (47.79%)</td>
<td>1.46 (0.75 to 2.82)</td>
</tr>
<tr>
<td><strong>Treatment group: TVT-O when compared with TOT (objective outcome)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Abdel-Fattah et al., 2010a)</td>
<td>19/44 (43.18%)</td>
<td>131/253 (51.78%)</td>
<td>1.48 (0.68 to 3.22)</td>
</tr>
<tr>
<td><strong>Treatment group: transobturator midurethral sling when compared with retropubic midurethral sling</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Richter et al., 2011)</td>
<td>138/260 (53.08%)</td>
<td>147/305 (48.20%)</td>
<td>1.15 (0.81 to 1.63)</td>
</tr>
<tr>
<td><strong>No prolapse of cervix of vaginal vault when compared with prolapse</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Schraffordt)</td>
<td>82/119</td>
<td>343/437 (78.49%)</td>
<td>1.25 (0.66 to 2.37)</td>
</tr>
</tbody>
</table>
et al., 2006) (68.91%)

### Weekly incontinence episodes when compared with daily incontinence episodes

<table>
<thead>
<tr>
<th>Study</th>
<th>Weekly Episodes</th>
<th>Daily Episodes</th>
<th>Odds Ratio</th>
<th>Level of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Schraffordt et al., 2006)</td>
<td>4/170 (2.35%)</td>
<td>27/361 (7.48%)</td>
<td>3.01 (0.87 to 10.49)</td>
<td>LOW</td>
</tr>
</tbody>
</table>

### Q-tip test <30 degrees when compared with >/=30 degrees

<table>
<thead>
<tr>
<th>Study</th>
<th>Mean: 23 degrees (10-45)</th>
<th>Mean: 30 degrees (5-70)</th>
<th>Odds Ratio</th>
<th>Level of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Paick et al., 2004)</td>
<td>0.55 (0.09 to 3.17)</td>
<td>VERY LOW</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Previous incontinence surgery when compared with no previous urogynecological surgery

<table>
<thead>
<tr>
<th>Study</th>
<th>Previous Surgery Episodes</th>
<th>No Previous Surgery Episodes</th>
<th>Odds Ratio</th>
<th>Level of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Schraffordt et al., 2006)</td>
<td>12/200 (6.00%)</td>
<td>20/408 (4.90%)</td>
<td>0.51 (0.243 to 1.071)</td>
<td>VERY LOW</td>
</tr>
</tbody>
</table>

### VLPP <60cmH20 when compared with >/=60cmH20

<table>
<thead>
<tr>
<th>Study</th>
<th>Mean: 52cmH20 (20-104)</th>
<th>Mean: 72cmH20 (20-125)</th>
<th>Odds Ratio</th>
<th>Level of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Paick et al., 2004)</td>
<td>2.34 (0.42 to 12.89)</td>
<td>VERY LOW</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Dribbling incontinence when compared with no dribbling incontinence (patient reported outcome)

<table>
<thead>
<tr>
<th>Study</th>
<th>Dribbling Episodes</th>
<th>No Dribbling Episodes</th>
<th>Odds Ratio</th>
<th>Level of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Abdel-Fattah et al., 2010a)</td>
<td>31/61 (50.82%)</td>
<td>87/248 (35.08%)</td>
<td>0.77 (0.37 to 1.61)</td>
<td>VERY LOW</td>
</tr>
</tbody>
</table>

### No dribbling incontinence when compared with dribbling incontinence (objective outcome)

<table>
<thead>
<tr>
<th>Study</th>
<th>No Dribbling Episodes</th>
<th>Dribbling Episodes</th>
<th>Odds Ratio</th>
<th>Level of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Abdel-Fattah et al., 2010a)</td>
<td>23/43 (53.49%)</td>
<td>160/253 (63.24%)</td>
<td>0.63 (0.25 to 1.58)</td>
<td>VERY LOW</td>
</tr>
</tbody>
</table>

### Urgency when compared with no urgency (patient reported outcome)

<table>
<thead>
<tr>
<th>Study</th>
<th>Urgency Episodes</th>
<th>No Urgency Episodes</th>
<th>Odds Ratio</th>
<th>Level of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Abdel-Fattah et al., 2010a)</td>
<td>42/61 (68.85%)</td>
<td>110/247 (44.53%)</td>
<td>3.26 (0.87 to 12.26)</td>
<td>LOW</td>
</tr>
</tbody>
</table>

### No urgency when compared with urgency (objective outcome)

<table>
<thead>
<tr>
<th>Study</th>
<th>No Urgency Episodes</th>
<th>Urgency Episodes</th>
<th>Odds Ratio</th>
<th>Level of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Abdel-Fattah et al., 2010a)</td>
<td>19/44 (43.18%)</td>
<td>130/251 (51.79%)</td>
<td>0.45 (0.08 to 2.67)</td>
<td>VERY LOW</td>
</tr>
</tbody>
</table>

### BMI 31-35 when compared with <30 (patient reported outcome)

<table>
<thead>
<tr>
<th>Study</th>
<th>BMI 31-35 Episodes</th>
<th>BMI &lt;30 Episodes</th>
<th>Odds Ratio</th>
<th>Level of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Abdel-Fattah et al., 2010a)</td>
<td>22/58 (37.93%)</td>
<td>65/247 (26.32%)</td>
<td>1.91 (0.95-3.87)</td>
<td>LOW</td>
</tr>
</tbody>
</table>

### BMI 31-35 when compared with <30 (objective outcome)

<table>
<thead>
<tr>
<th>Study</th>
<th>BMI 31-35 Episodes</th>
<th>BMI &lt;30 Episodes</th>
<th>Odds Ratio</th>
<th>Level of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Abdel-Fattah et al., 2010a)</td>
<td>17/43 (39.53%)</td>
<td>66/250 (26.4%)</td>
<td>1.84 (0.81-4.17)</td>
<td>LOW</td>
</tr>
</tbody>
</table>

### BMI >35 when compared with <30 (objective outcome)

<table>
<thead>
<tr>
<th>Study</th>
<th>BMI &gt;35 Episodes</th>
<th>BMI &lt;30 Episodes</th>
<th>Odds Ratio</th>
<th>Level of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Abdel-Fattah et al., 2010a)</td>
<td>6/43 (13.95%)</td>
<td>12/250 (4.80%)</td>
<td>3.46 (0.78-15.32)</td>
<td>LOW</td>
</tr>
</tbody>
</table>

### Age 45-65yrs when compared with </=45yrs (patient reported outcome)

<table>
<thead>
<tr>
<th>Study</th>
<th>Age 45-65yrs Episodes</th>
<th>Age &lt;45yrs Episodes</th>
<th>Odds Ratio</th>
<th>Level of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Abdel-Fattah et al., 2010a)</td>
<td>40/60 (66.67%)</td>
<td>137/230 (59.57%)</td>
<td>1.99 (0.82-4.87)</td>
<td>VERY LOW</td>
</tr>
</tbody>
</table>
### Evidence statements and overview table

#### Clinically and statistically significant factors

The review found that the following factors were useful in predicting primary tape failure.

- **MUCP ≥31 when compared with MUCP ≤30** (objective outcome) (1 study)
- **BMI >35 when compared with BMI ≤30** (patient reported outcome) (1 study)
- **preoperative anticholinergic medication use** (1 study)
- **Primary surgery when compared with secondary surgery** (objective outcome) (1 study)

The evidence was of high quality.

#### Statistically significant factors

The review found that the following factors may be useful in predicting primary tape failure.

- **age (per decade)** (1 study, evidence was of moderate quality)
1. concurrent pelvic organ prolapse surgery (1 study, evidence was moderate quality)
2. secondary surgery (1 study, evidence was low quality)
3. nocturia (1 study, evidence was low quality)
4. urgency incontinence (1 study, evidence was low quality)
5. higher maximal flow rate (1 study, evidence was moderate quality)
6. previous UI surgery (1 study, evidence was moderate quality)
7. Q-tip maximum straining less than 30 degrees (1 study, evidence was moderate quality)
8. urge incontinence (1 study, evidence was moderate quality)
9. higher maximal flow rate (1 study, evidence was moderate quality)
10. previous UI surgery (1 study, evidence was moderate quality)
11. Q-tip maximum straining less than 30 degrees (1 study, evidence was moderate quality)
12. urge score (1 study, evidence was moderate quality)
13. Pad weight (per 10 g) (1 study, evidence was moderate quality)
14. More than 20 procedures for each surgeon when compared with first 10 procedures for each surgeon (outcome 1: defined as the answer to the question ‘Do you experience urinary leakage during physical activity, coughing or sneezing?’ Success for SUI was defined as the answer no.) (1 study, evidence was low quality)
15. More than 20 procedures for each surgeon when compared with first 10 procedures for each surgeon (outcome 2: defined as the answer to the doctor’s question ‘Do you leak during physical activity, coughing or sneezing?’ asked at 2-year follow-up. The answer no was defined as success. All other answers as well as improved were considered failure.) (1 study, evidence was low quality)
16. General anaesthesia when compared with local anaesthesia (1 study, evidence was low quality)
17. Urge symptoms when compared with no urge symptoms (1 study, evidence was low quality)
18. Lower MUCP (reference not stated) (1 study, evidence was low quality)

Not significant factors
The review found that the following factors were not useful in predicting primary tape failure.

19. current smoking (1 study, evidence was low quality)
20. Functional capacity (METs) (1 study, evidence was low quality)
21. Number of vaginal deliveries (1 study, evidence was low quality)
22. No nocturia when compared with nocturia (objective outcome) (1 study, evidence was very low quality)
23. No urgency incontinence when compared with urgency incontinence (objective outcome) (1 study, evidence was very low quality)
24. Maximal cystometric capacity (1 study, evidence was high quality)
25. Treatment group (TVT when compared with TOT) (1 study, evidence was low quality)
26. Treatment group: TOT when compared with TVT-O (patient reported outcome) (1 study, evidence was very low quality)
27. Treatment group: TVT-O when compared with TOT (objective outcome) (1 study, evidence was very low quality)
28. Treatment group (transobturator midurethral sling when compared with retropubic midurethral sling) (1 study, evidence was moderate quality)
29. No prolapse of cervix of vaginal vault when compared with prolapse (1 study, evidence was very low quality)
- Incontinence episodes, weekly when compared with daily (1 study, evidence was low quality)
- Q-tip <30 degrees when compared with >=30 degrees (1 study, evidence was very low quality)
- Previous incontinence surgery when compared with no previous urogynecological surgery (1 study, evidence was very low quality)
- Valsalva leak point pressure <60cmH2O when compared with >=60cmH2O (1 study, evidence was very low quality)
- Dribbling incontinence when compared with no dribbling incontinence (patient reported outcome) (1 study, evidence was very low quality)
- No dribbling incontinence when compared with dribbling incontinence (objective outcome) (1 study, evidence was very low quality)
- Urgency when compared with no urgency (patient reported outcome) (1 study, evidence was low quality)
- No urgency when compared with urgency (objective outcome) (1 study, evidence was very low quality)
- BMI 31-35 when compared with <=30 (patient reported outcome) (1 study, evidence was low quality)
- BMI 31-35 when compared with <=30 (objective outcome) (1 study, evidence was low quality)
- BMI >35 when compared with <=30 (objective outcome) (1 study, evidence was low quality)
- Age 45-65yrs when compared with <=45yrs (patient reported outcome) (1 study, evidence was very low quality)
- Age >65yrs when compared with <=45 yrs (patient reported outcome) (1 study, evidence was very low quality)
- Age 45-65yrs when compared with <=45yrs (objective outcome) (1 study, evidence was very low quality)
- Age >65yrs when compared with <=45 yrs (objective outcome) (1 study, evidence was very low quality)
- Age per decade (outcome: any UI) (1 study, evidence was low quality)
- MUCP <=30 when compared with >=31 (patient reported outcome) (1 study, evidence was low quality)
- Type of incontinence: mixed when compared with USI (patient reported outcome) (1 study, evidence was very low quality)
- Type of incontinence: USI when compared with mixed (objective outcome) (1 study, evidence was very low quality)
- Type of incontinence: stress when compared with mixed (1 study, evidence was very low quality)

<table>
<thead>
<tr>
<th>Characteristics identified as statistically significant</th>
<th>Characteristics identified as statistically significant but not clinically significant</th>
<th>Characteristics identified as both statistically and clinically significant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age per decade (outcome defined as any urinary incontinence)</td>
<td>Age per decade (outcome defined as recurrent stress urinary)</td>
<td>BMI &gt;35 when compared with &lt;=30 (patient reported outcome)</td>
</tr>
</tbody>
</table>

Table 8.17 Overview table

Urinary incontinence in women: full guideline DRAFT (Corrected 1 March 2013) page 231 of 355
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 45-65yrs when compared with ≤ 45 yrs (patient reported outcome)</td>
<td>Lower MUCP (reference not stated)</td>
</tr>
<tr>
<td></td>
<td>MUCP≥31cm water when compared with ≤30cm water (objective outcome)</td>
</tr>
<tr>
<td>Age &gt;65yrs when compared with ≤45 yrs (patient reported outcome)</td>
<td>Secondary surgery when compared with primary surgery (patient reported outcome)</td>
</tr>
<tr>
<td></td>
<td>Primary surgery when compared with secondary surgery (objective outcome)</td>
</tr>
<tr>
<td>Age 45-65yrs when compared with ≤45 yrs (objective outcome)</td>
<td>Higher maximal flow rate</td>
</tr>
<tr>
<td></td>
<td>Preoperative anticholinergic medication use when compared with no use</td>
</tr>
<tr>
<td>Age &gt;65yrs when compared with ≤45 yrs (objective outcome)</td>
<td>Concurrent pelvic organ prolapse surgery</td>
</tr>
<tr>
<td>No nocturia when compared with nocturia (objective outcome)</td>
<td>Nocturia when compared with no nocturia (patient reported outcome)</td>
</tr>
<tr>
<td>No urgency incontinence when compared with urgency incontinence (objective outcome)</td>
<td>Urgency incontinence when compared with no urgency incontinence (patient reported outcome)</td>
</tr>
<tr>
<td>Treatment group (TVT when compared with TOT, TOT when compared with TVT-O, TVT-O when compared with TOT, transobturator midurethral sling when compared with retropubic midurethral sling)</td>
<td>Pad weight (per 10 g)</td>
</tr>
<tr>
<td>Previous incontinence surgery when compared with no previous urogynaecological surgery</td>
<td>Previous UI surgery when compared with no surgery</td>
</tr>
<tr>
<td>Dribbling incontinence when compared with no dribbling incontinence (patient reported outcome)</td>
<td>Q-tip maximum straining &lt;30 degrees, yes when compared with no</td>
</tr>
<tr>
<td>No dribbling incontinence when compared with dribbling incontinence (objective outcome)</td>
<td>Urge score (per 10 points)</td>
</tr>
<tr>
<td>Urgency when compared with no urgency (patient reported outcome)</td>
<td>Urge symptoms when compared with no urge symptoms</td>
</tr>
<tr>
<td>No urgency when compared with urgency (objective outcome)</td>
<td>More than 20 procedures for each surgeon when compared with first 10 procedures for each surgeon (outcome 1)²</td>
</tr>
<tr>
<td>Current smoking</td>
<td>More than 20 procedures for each surgeon when compared with first 10 procedures for each surgeon (outcome 2)³</td>
</tr>
<tr>
<td>Functional capacity (metabolic unit, METs)</td>
<td>General anaesthesia when compared with local anaesthesia</td>
</tr>
<tr>
<td>Number of vaginal deliveries</td>
<td></td>
</tr>
</tbody>
</table>
### Evidence to recommendations

**Relative value placed on the outcomes considered**

Tape failure was identified as the primary outcome for this review. The GDG noted that the reporting of tape failure was varied in the studies identified and included both subjective measures such as responses to the Patient Global Impression of Improvement (PFI-I) questionnaire and objective measures such as an urodynamic assessment.

All predictive factors identified in the literature search were reported. The GDG chose to make recommendations using only those factors demonstrating clinical significance it was implausible to base any conclusions on statistical significance alone due to the low quality of evidence. Clinical significance was determined by an adjusted odds ratio and confidence intervals greater than 2.5 from the line of no effect. The majority of studies were either prospective cohort studies or ancillary analysis of data from RCTs.

**Consideration of clinical benefits and harms**

This review identified four indications that demonstrated clinical significance: BMI >35, MUCP ≥31, primary surgery versus secondary surgery and preoperative anticholinergic medication use.

The GDG noted that the evidence for MUCP did not agree with current clinical understanding as a higher value of MUCP reported in the evidence was associated with a higher rate of tape failure which

---

1. Defined as the answer to the question "Do you experience urinary leakage during physical activity, coughing or sneezing?"
2. Defined as answer to the doctor's question "Do you leak during physical activity, coughing or sneezing?" asked at 2-year follow-up. The answer 'no' was defined as success. All other answers as well as 'improved' were considered as failure.
3. Confidence intervals not crossing one
4. Defined as the answer to the question "Do you experience urinary leakage during physical activity, coughing or sneezing?"
5. This question was asked on the Urogenital Distress Inventory questionnaire. Success for SUI was defined as the answer 'no'.
6. Defined as answer to the doctor's question "Do you leak during physical activity, coughing or sneezing?" asked at 2-year follow-up. The answer 'no' was defined as success. All other answers as well as 'improved' were considered as failure.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Comparison</th>
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<tbody>
<tr>
<td>BMI 31-35 when compared with ≤30 (patient reported outcome)</td>
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<tr>
<td>BMI 31-35 when compared with ≤30 (objective outcome)</td>
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<tr>
<td>BMI &gt;35 when compared with ≤30 (objective outcome)</td>
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<tr>
<td>MUCP ≤30 when compared with ≥31 (patient reported outcome)</td>
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<tr>
<td>MUCP ≤30 when compared with ≥31 (objective outcome)</td>
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<tr>
<td>Maximal cystometric capacity</td>
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<tr>
<td>Valsalva leak point pressure &lt;60cmH2O when compared with ≥60cmH2O</td>
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<tr>
<td>Incontinence episodes, weekly when compared with daily</td>
<td></td>
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<tr>
<td>No prolapse of cervix of vaginal vault when compared with prolapse</td>
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<tr>
<td>Q-tip &lt;30 degrees when compared with ≥30 degrees</td>
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is contrary to the belief that a lower MUCP value indicates urethral degradation and therefore a higher rate of incontinence is expected. In clinical practice, MUCP would not be a suitable indication of failure as it is rarely considered a risk factor due to its variability with age. Tests of MUCP are not routinely undertaken in NHS clinical practice.

The evidence reporting favourable outcomes when tapes for primary surgery were compared with secondary surgery was also contrary to current clinical understanding, and the GDG concluded that the evidence on which this assumption was based was not sufficiently robust to make accurate conclusions. Patient selection and potential bias in offering secondary procedures may be the explanations for the differences observed.

The evidence for anticholinergic medication use indicated a higher chance of failure than no medication use. Anticholinergic medication use would suggest OAB which cannot be treated by a tape procedure. This indication would not influence the choice of SUI intervention but should be included in the information given to the woman before treatment.

The GDG agreed that a BMI greater than 35 was likely to be indicator for a higher rate of failed primary tape procedures. However, the evidence was not sufficiently robust to make a specific recommendation for tapes. This would require additional information beyond the general guidance offered for all surgery and its risks related to obesity. Furthermore, there are some potential predictors of failure that can be addressed with lifestyle interventions. Obesity in one such indicator that can be addressed before surgery with successful conservative treatment.

The GDG concluded that the evidence was not strong enough to make a conclusive recommendation regarding any of the four factors demonstrating clinical significance. Instead, they chose to make a research recommendation for further investigation of all the clinically and statistically significant indications reported.

Consideration of health benefits and resource uses
The GDG considered that being able to predict the chances of tape success would offer the potential savings as not offering treatment to women whose surgery is likely to fail would avoid the costs of the procedure and the cost of any subsequent failure. For some lifestyle factors such as BMI, offering conservative treatments before SUI treatment was considered to be cost-effective.

Quality of evidence
The evidence identified in this review was of varying quality from high quality to very low quality which did not allow the GDG to make conclusive recommendations. The review was limited to a very small pool of evidence and it was limited to small study populations. In addition, the GDG noted that the evidence for certain predictive factors contradicted current clinical experience.

### Number of Research recommendations

<table>
<thead>
<tr>
<th>RR16</th>
<th>What are the effects of the following predictors on tape failure?</th>
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<tbody>
<tr>
<td></td>
<td>• Age per decade (outcome defined as recurrent stress urinary incontinence)</td>
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<td></td>
<td>• Lower maximum urethral closure pressure (MUCP) (reference not stated)</td>
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<td></td>
<td>• Secondary surgery versus primary surgery (patient reported outcome)</td>
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<td></td>
<td>• Higher maximal flow rate</td>
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<td>• Concurrent pelvic organ prolapse surgery</td>
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<td>• Nocturia versus no nocturia (patient reported outcome)</td>
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<td>• Urgency versus no urgency (patient reported outcome)</td>
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<td>• Pad weight (per 10 g)</td>
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<td>• Previous UI surgery versus no surgery</td>
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<td>• Q-tip maximum straining less than 30 degrees, yes versus no</td>
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<td></td>
<td>• Urge score (per 10 points)</td>
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<td>• Urgency symptoms versus no urgency symptoms</td>
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<td></td>
<td>• More than 20 procedures for each surgeon versus first 10 procedures for each surgeon (outcome 1)</td>
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<td>• More than 20 procedures for each surgeon versus first 10 procedures for...</td>
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each surgeon (outcome 2)
- General anaesthesia versus local anaesthesia
- Body mass index over 35 versus 30 or less (patient reported outcome)
- MUCP 31 or more versus 30 or less (objective outcome)
- Primary surgery versus secondary surgery (objective outcome)
- Preoperative anticholinergic medication use versus no use

Why this is important
The factors identified for this research question are thought anecdotally by surgeons to have an impact on the outcome of tape surgery but there is little robust evidence in the literature. Certain patient factors such as younger age and increased weight are thought to produce a higher chance of recurrent symptoms. Similarly, the effect of previous incontinence surgery, concomitant prolapse surgery and the ‘learning curve’ of the surgeon are all thought to have adverse effects on outcome (including an increased chance of urgency incontinence). In addition there is little robust evidence regarding the effect of previous urgency incontinence, higher maximum flow rates, nocturia or pre-operative use of anticholinergics on the occurrence of post-operative urgency and bladder overactivity (DO). It would be useful to be able to individualise treatment by understanding these risks in more detail.

8.3.3 Colposuspension

Within the literature on suspension procedures, open colposuspension is the procedure against which others have most often been compared. Overall, most of the women included across all the studies considered were undergoing their primary surgical procedure for stress UI.

Open versus laparoscopic colposuspension

Six RCTs compared open (Burch) colposuspension with laparoscopic colposuspension in women with stress UI.624–629 Two studies included women with mixed UI (proportion not stated624 and 22%626). The studies compared open Burch colposuspension with laparoscopic colposuspension using staples.

One study had a third treatment arm, which was laparoscopic colposuspension using mesh and staples.624 A further three studies compared different suturing methods for laparoscopic suspension.630–635

Between 52 and 291 women were randomised in these studies (fewer than 100 in four studies).

Duration of follow-up ranged from 6 months to 2 years. One study only analysed results for women available at the 1 year follow-up with no attempt to consider the impact of losses to follow-up.624 [EL = 1−] One study randomised women except where they expressed a preference for one of the interventions.626 [EL = 1−] The remaining studies were of better quality.625–627,629 [EL = 1+] Varying proportions of women (0–100%) underwent additional concomitant surgery across these studies.

Each study considered objective cure rates, using varying methods, including pad testing, stress test or urodynamic assessment. Four studies found no significant differences between open and laparoscopic colposuspension in this outcome,624,626–629 one found a significantly higher cure rate with open colposuspension at 6 months (96% versus 80%; provocative testing on urodynamics),628 and the other a higher cure with laparoscopic suspension at 18 months (78% versus 85%; stress test), with no difference between groups if objective and subjective cure were considered together.625 Three studies considered subjective success and satisfaction, which were similar with both interventions.624,626,629 In the study that evaluated open colposuspension, and laparoscopic suspension with sutures or mesh and staples, objective cure rates were significantly higher at 1 year with open than laparoscopic colposuspension with mesh and staples by the stress test (92% versus 63%), with no difference between groups when assessed by a 48 hour pad test (92% versus 91% versus 76%) (n = 211).624

Peri- and postoperative complications were reported for each study. Significantly fewer women in the laparoscopic colposuspension group using mesh and staples had urinary retention for longer than 5 days.624 No other significant differences in complications were seen with open and laparoscopic colposuspension, which were bladder injury, urinary obstruction, de novo DO, haematuria, UTI, wound complications, haematoma, dyspareunia, urinary retention and enterocele.625–628
Operating time was significantly shorter in the open colposuspension group in four studies,\textsuperscript{624–627} with one not identifying a significant difference between groups.\textsuperscript{628} Conversion to open colposuspension was required in 1% and 5% of women undergoing the laparoscopic procedure in two studies.\textsuperscript{624,626} Duration of hospital stay was longer in the open group in three studies,\textsuperscript{624,626,627} and not significantly different in two.\textsuperscript{626,629} The UK MRC study also reported no significant difference between open and laparoscopic groups in the time to return to work, which applied to about half of the women studied.\textsuperscript{639}

Studies comparing different suturing methods for laparoscopic suspension

Four RCTs compared different suturing methods for laparoscopic suspension.\textsuperscript{624,630–635} Sutures were compared with mesh and staples in three studies,\textsuperscript{624,631–633} while the remaining study compared the use of double- with single-bite sutures.\textsuperscript{630}

In the study that evaluated open colposuspension, and laparoscopic suspension with sutures or mesh and staples, objective cure rates were significantly higher at 1 year with open than laparoscopic suspension with mesh and staples by the stress test (92% versus 63%), with no difference between groups when assessed by a 48 hour pad test (92% versus 91% versus 76%). No other significant differences were identified (subjective cure, ‘quality of life’ assessed on a visual analogue scale, or satisfaction). Duration of hospital stay and bladder drainage were significantly shorter in the mesh and staples group and fewer people had retention; no other differences in complication rates were noted (\(n = 211\)).\textsuperscript{624} [EL = 1−] While another RCT found no significant differences in objective cure rates at 1 year (\(n = 69\)).\textsuperscript{631} the third study comparing sutures with mesh and staples reported significantly higher objective and subjective cure rates at 1, 2 and 3 years in the sutures group; cure rates declined with time in both groups. No significant differences were noted in operating time or hospital stay or in complications (bladder injury or DO) (\(n = 60\)).\textsuperscript{632–635} [EL = 1+]

Recruitment to the RCT comparing double- with single-bite sutures was terminated early because of a notably higher cure rate in the double-grip group. Those who were treated were all evaluated at 1 year; both objective and subjective cure rates were significantly higher in the double-grip suture group. No significant differences in immediate or subsequent postoperative complications were reported between groups (\(n = 161\)).\textsuperscript{630} [EL = 1−]

Open colposuspension versus the MMK procedure

Four RCTs compared the open colposuspension and MMK procedures in women with stress UI; 22% of women in one study had mixed UI.\textsuperscript{638–639} One study also had an anterior colporrhaphy arm.\textsuperscript{639} The study with three treatment arms was of poor quality, with no baseline data provided and no definition of objective cure.\textsuperscript{639} [EL = 1−] The other studies were of better quality. The number of women randomised ranged from 30 to 170, with minimum follow-up of 6 months, up to 4 years. In three of the studies, other procedures were undertaken concomitantly in varying proportions of women; these procedures included posterior colporrhaphy, paravaginal defect repair and culdoplasty.\textsuperscript{636,637,639} One study noted that 23% had had prior vaginal surgery for prolapse and stress UI.\textsuperscript{638}

Objective and/or subjective cure or improvement rates were reported in each study. In the study with three treatment arms, the rate of combined objective and subjective cure (not precisely defined) at 4 years was significantly higher with colposuspension than with MMK or anterior colporrhaphy (\(n = 170; 91%\) analysed)\textsuperscript{639} [EL = 1−] A study that only reported subjective cure or improvement also found that significantly more women failed MMK than colposuspension at mean follow-up of 2 years (range 6 months to 5 years), when analysed using intention-to-treat (36% versus 15%) or for completers only (25% versus 7%) (\(n = 138\)).\textsuperscript{636} [EL = 1+] The remaining two studies both reported objective cure by negative stress test.\textsuperscript{637,638} [EL = 1+] One found no significant differences between colposuspension and MMK in objective (80% versus 65%) or subjective cure rates (92% versus 85%), at a minimum of 2 years follow-up (mean = 3 years) (\(n = 47\)).\textsuperscript{637} The second study, in women with stress UI with low urethral pressure and hypermobility, reported significantly higher objective (53% versus 93%) and subjective (66% versus 100%) cure rates in the MMK group at 1 year (\(n = 30\)).\textsuperscript{638}

Three of the four studies reported complications.\textsuperscript{637–639} De novo DO and urge UI were common with both procedures, and with anterior colporrhaphy.\textsuperscript{637,639} Time to normal voiding was significantly longer with MMK in one study (mean 21 versus 7 days),\textsuperscript{638} as were hospital stay and duration of catheterisation in another.\textsuperscript{637}
Colposuspension or vagino-obturator shelf versus bladder neck needle suspension or anterior colporrhaphy

Open colposuspension was compared with anterior colporrhaphy in two RCTs and in a further two which also had a Pereyra needle suspension treatment arm. Four studies compared open colposuspension or the vagino-obturator shelf procedure with needle suspension alone, one of which also had a transvaginal colposuspension arm.

Open colposuspension or vagino-obturator shelf versus anterior colporrhaphy

The four studies that compared open colposuspension with anterior colporrhaphy included women with stress UI without prior continence surgery; two specifically included women with prolapse. In women with stress UI and prolapse, one study found significantly higher objective (74% versus 42%, negative stress test) and subjective cure rates (86% versus 52%) in the colposuspension group, compared with colporrhaphy after a minimum of 8 years follow-up. Recurrence of cystocele was significantly higher in the colposuspension group (34% versus 3%). Hysterectomy was also undertaken in all women in this study (n = 71; 96% analysed). The second study compared colposuspension with the Pereyra procedure and with anterior colporrhaphy. Only women with complete data were analysed at 1 year, with only limited information on baseline characteristics of the women across groups. This study also reported significantly higher combined objective and subjective cure rates with colposuspension compared with Pereyra and anterior colporrhaphy; 87% versus 70% versus 69%, defined as negative stress test with no history of UI, and no urine loss observed at any post-surgical assessment (n = 298). [EL = 1–]

Both other studies reported significantly higher objective and subjective cure rates at 1 year with colposuspension compared with anterior colporrhaphy, or Pereyra. The study that combined objective and subjective data reported cure rates of 89% colposuspension versus 65% Pereyra versus 63% colporrhaphy at 1 year; this study only analysed results for women with complete follow-up data and gave no description of the women’s baseline characteristics (n = 127; 84% analysed). Five year follow-up data of the women cured at 1 year also showed significantly higher cure rates with colposuspension compared with both other procedures. [EL = 1–] In the second RCT, the objective and subjective cure rates with colposuspension and colporrhaphy at 1 year were 89% versus 31% (stress test), 83% versus 40% (20 minute pad test) and 95% versus 19% (subjective). Quality of life scores (IIQ) were significantly different in favour of Burch at 1 year. There were significant differences between groups in concomitant procedures undertaken in this RCT: anterior colporrhaphy for cystocele (16% versus 100%) or paravaginal defect (42% versus 6%) (n = 35). [EL = 1+]

Other than urgency symptoms, which were very common in both colposuspension and colporrhaphy, arms of one study, no other results were reported. Data on hospital parameters were also lacking.

Open colposuspension or vagino-obturator shelf procedure versus bladder neck needle suspension

Four RCTs compared open colposuspension or the vagino-obturator shelf procedure with needle suspension in women with stress UI, one of which also had a transvaginal colposuspension arm. One study noted that 42% had had prior continence surgery. Three of the four studies, which compared Burch with Stamey procedures, were considered to be of poor quality because of the use of alternate allocation rather than true randomisation, or not describing randomisation, and were additionally lacking in baseline data to enable consideration of whether groups were similar other than in the intervention. Patient numbers were 50 or 51 in the three studies; all reported higher cure rates (subjective in two, objective in one) with colposuspension at varying durations of follow-up (minimum 8–12 months). The remaining study was of better quality, although only 74% of the women were followed up to 3 years. No significant differences in objective (urodynamics) or subjective cure rates were reported between retropubic Burch, transvaginal Burch or Raz procedures at 1, 2 or 3 years follow-up (n = 204). [EL = 1+]

One RCT noted that there were no complications. Common complications were haematoma, retention, abscesses, urgency or de novo DO, wound infection, and postoperative pain in both groups, and voiding problems (not defined) in the vagino-obturator shelf procedure group. Hospital stay was longer with colposuspension compared with Stamey needle suspension in two studies.
Data from six RCTs were pooled in the Cochrane review\cite{642,644,646,648,650} to calculate risk of failure with colposuspension (open or laparoscopic) compared with needle suspension (any).\cite{616} The relative risk (RR) of subjective failure was significantly lower with colposuspension compared with needle suspension both up to and after 5 years follow-up (RR 0.56, 95% CI 0.39 to 0.81 after the first year and up to 5 years, and RR 0.32, 95% CI 0.15 to 0.71 after 5 years\cite{616}).

**Other colposuspension RCTs**

One RCT compared Burch colposuspension with abdominal paravaginal defect repair in women with stress UI and grade 1 urethrocystocele. At mean follow-up of about 2 years, objective (negative stress test) and subjective cure rates were significantly higher in the colposuspension group (100% versus 61% and 100% versus 72%, respectively). The majority of women in both groups also underwent hysterectomy and culdoplasty. Recruitment to the trial was stopped after 36 women as it was considered that paravaginal defect repair was no longer ethical in the treatment of stress UI. Persisting voiding difficulties were very common, and recurrent urethrocystocele common in both groups; *de novo* DO was common in the colposuspension group (*n* = 36).\cite{651} [EL = 1+]

Open colposuspension and pubococcygeal repair were compared in one RCT in women undergoing primary surgery for stress UI. Women with poor or absent pelvic floor contraction were excluded from the pubococcygeal repair group. At 1 year, objective cure rates were 67% with colposuspension versus 47% with repair. Subjective cure rates were 73% and 80% at 1 year, and 43% and 60% at between 5 and 7 years. Postoperative UTI was common. The median hospital stay was longer in the pubococcygeal repair group although the range of durations was similar in both groups (*n* = 45)\cite{652,654} [EL = 1–]

**Other needle suspension RCTs**

One RCT compared the Raz suspension procedure with anterior colporrhaphy in women with grade 3 or 4 cystocele, about half of whom also had urge UI. Hysterectomy was undertaken in the majority of women alongside the continence procedure. At follow-up (between 10 months and about 4 years) the failure rate was significantly higher in the anterior colporrhaphy group (27% versus 14%). Postoperative urinary retention of between 5 and 10 days was common in both groups. No other complications were reported (*n* = 80).\cite{655} [EL = 1+]

One RCT compared the Stamey suspension procedure with a porcine dermis suburethral sling in women with stress UI who were considered unsuitable for colposuspension; overall 60% had had prior continence surgery. At 2 years, subjective cure rates were 70% versus 90%. Intraoperative blood loss and postoperative infection were significantly more common in the sling group. Other common complications in both groups were bladder injury and *de novo* DO (*n* = 20).\cite{656} [EL = 1+]

**Colposuspension versus slings or synthetic tapes**

**Open colposuspension versus biological slings**

Open colposuspension was compared with dura mater sling in one RCT of women with recurrent stress UI after hysterectomy.\cite{657} The combined objective and subjective cure rates were 86% with colposuspension versus 92% with dura mater sling at follow-up of about 3 years (*n* = 72). Significantly more women in the sling group had voiding difficulty or retention postoperatively, both of which were common; and more in the colposuspension group developed rectocele. Bladder perforation and *de novo* urgency were common in both groups. Time to spontaneous voiding was significantly longer in the sling group.\cite{657} [EL = 1+]

One RCT compared colposuspension with autologous rectus fascial sling and TVT.\cite{658} Higher cure rates (negative stress test and symptom-free) were reported in the sling group at 1 year (93%) compared with open colposuspension or TVT (88% versus 87%). *De novo* DO and hesitancy were common in the colposuspension group, and retention common in the other groups (*n* = 92).\cite{658} [EL = 1+]  

**Colposuspension versus synthetic slings**

As well as the study of colposuspension, TVT and rectus fascial sling described above,\cite{658} a further seven RCTs compared colposuspension with TVT: open colposuspension in four studies\cite{659,663} and laparoscopic colposuspension in three.\cite{664,666,667} Another RCT compared open colposuspension with a polypropylene soft tissue patch sling.\cite{668,669}
Open colposuspension versus tension-free vaginal tape

Five RCTs compared open colposuspension with TVT in women undergoing primary surgery for urodynamic stress UI. Overall, 627 women were randomised to either intervention (range of numbers across studies 50–344). One study also evaluated an autologous fascial sling. Duration of follow-up ranged from 1 to a maximum of 3 years and was mostly about 2 years, although one study only provided results at 3–6 months. In the largest study, 8% of the women withdrew consent after randomisation. Further losses to follow-up occurred by the 2 year analysis, the impact of which was considered in the analysis of results. A second study also lost 17% of the women from the colposuspension arm before the end of follow-up. The other two studies did not use true randomisation or did not describe randomisation or consider whether groups were balanced at baseline in key parameters.

The study with 3–6 months follow-up reported that 72% were subjectively ‘completely’ cured at that time point. Of the other studies, each considered objective cure as an outcome, which was defined as less than 1 g or 2 g change in pad weight during a 1 hour pad test. The individual studies reported objective cure rates for colposuspension versus TVT of 80% versus 81% and 86% versus 84%, at 2 years, with the third study reporting 76% versus 82% at median follow-up of 22 months. While none of the trials identified significant differences between groups when women with complete data were analysed at follow-up, the impact of losses to follow-up were considered in the largest study. Assuming that all losses were failures or with the last observation carried forward (LOCF), the cure rate would be significantly higher with TVT. If all losses were assumed to be cured, or both presurgery withdrawals cured, and LOCF used for post-surgery withdrawals, there would be no significant difference between the interventions. In these analyses, the best and worst case cure rates were 51–87% for colposuspension and 63–85% with TVT. Other outcomes evaluated were QOL and subjective success. Significant improvements in two-thirds of questions on the BFLUTS questionnaire were seen in both groups, and similar proportions were satisfied with treatment (82% versus 85%). The rate of subjective cure or improvement was not significantly different between groups (93% versus 92%).

Complications were reported in the four studies, although one only noted that there were no ‘significant’ complications. Bladder injury or perforation was common with the TVT procedure in each study, and was noted to be significantly higher than with colposuspension in one. No other significant differences in complications were reported (de novo DO, wound infection, fever, sensory urgency). Complications reported with TVT were vaginal perforation, retropubic haematoma, vascular injury and tape erosion, and in the colposuspension arm were incisional hernia, haematoma, retention and pain at incision site.

During the 2 year follow-up period of the largest study, significantly more women in the colposuspension group required surgery for uterovaginal prolapse (5% versus none). No other significant differences were identified in further procedures required (surgery for stress UI, cystoscopy, hysterectomy, urethral dilatation). Division or trimming of the tape was undertaken in 2% of the TVT group, and incisional hernia repair in 3% of the colposuspension group.

Time to return to work and to normal activities was significantly longer with colposuspension, as were hospital stay, operating time and duration of catheterisation.

Laparoscopic colposuspension versus tension-free vaginal tape

Three studies compared laparoscopic colposuspension with TVT in women with stress UI. Prior continence surgery was an exclusion criterion in two studies (except colporrhaphy in one); the third reported that 17% in the TVT group had had prior continence surgery. The numbers of women randomised were 46, 72 and 128. Duration of follow-up in two studies was 1 year, and a mean of 11 months in the third. In two studies, one or more women withdrew after randomisation (1% and 5%), and only 88% of those treated in one study were followed-up to 1 year. One study had

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13 Bladder injury during a TVT procedure is a relatively minor complication resulting from bladder perforation by the introducing needle, and can be identified by a cystoscope used during the procedure. Although practices vary considerably, it has been managed by bladder drainage for periods of 12–48 hours and no long-term sequelae have been reported. Bladder injury during colposuspension requires formal closure and drainage for up to 5 days.
sparse methodological data, and had different mean duration of follow-up in groups, which was not adjusted for in the analysis of results.\textsuperscript{667} [EL = 1−]

Objective cure at 1 year was reported in two studies, with the third reporting combined subjective and objective cure. Within one study, the significance of the results depended on the definition of cure, with cure in significantly more women in the TVT group assessed by a stress test (86% versus 57%), but not with a 48 hour pad test (73% versus 59%).\textsuperscript{664} Severity and KHQ scores were significantly lower with TVT at 1 year, and satisfaction higher. In the second study, objective cure rates (urodynamics) were 97% versus 81% in the TVT and colposuspension groups at mean follow-up of 21 months. No significant differences were found in UDI or IIQ scores, in leakage episodes or in satisfaction at 1 or 2 years. The majority of women in the study underwent another gynaecological procedure at the same time as the continence surgery.\textsuperscript{666} In the third study, 83% of women in both groups were cured at mean follow-up of 11 or 13 months (minimum 3 months).

Intra- and postoperative complications common in both groups across the studies were bladder perforation, prolonged retention, wound infection, UTI, haematoma and pelvic abscess.\textsuperscript{565,666} In two studies 9% of the women required conversion from laparoscopic to open colposuspension.\textsuperscript{666,667} Other complications occurring less commonly were \textit{de novo} DO,\textsuperscript{665} vaginal erosion of mesh,\textsuperscript{666} transaction for voiding\textsuperscript{666} and urge symptoms\textsuperscript{665} with TVT, and port-site infection,\textsuperscript{665} postoperative ileus, pulmonary embolism and pyelonephritis with laparoscopic colposuspension.\textsuperscript{666}

Hospital stay, duration of catheterisation and operating time were significantly longer with laparoscopic colposuspension than TVT.\textsuperscript{665–667}

**Open colposuspension versus polytetrafluoroethylene soft tissue patch sling**

One RCT compared Burch colposuspension with a PTFE soft tissue patch sling in women with stress UI and urethral hypermobility. At baseline, the proportion of women with DO was significantly higher in the colposuspension group (95% versus 41%). Subjective and objective cure rates were not significantly different at 3 months or after minimum follow-up of about 2.5 years (objective 100% versus 90% and 100% versus 85%, respectively; subjective 100% versus 95% and 84% versus 93%, respectively). \textit{De novo} DO was common in both groups (24% versus 5%). Common events over the longer term in the sling groups were erosion, and urethroylisis for retention. No significant differences were found between groups in hospital stay or in time to catheter removal \(n = 36\).\textsuperscript{668,669} [EL = 1+] [EL = 1+]

**Long-term follow-up of suspension procedures**

Eleven cohort studies comparing long-term outcomes with colposuspension (Burch or MMK) and anterior colporrhaphy or needle suspension were identified.\textsuperscript{670–681} Most were retrospective reviews of cases undertaken, some with questionnaire follow-up. The duration of follow-up of these studies ranged from a minimum of 2 years to a maximum of 17 years; most had follow-up of within 5–10 years. Losses to follow-up were noted in most studies, ranging from 2% to 76% (median 40%). Patient numbers ranged from 90 to 742, with a total of 3306. Procedures were selected for specific indications, typically with colporrhaphy undertaken in women with stress UI and prolapsed of a higher grade. Those who underwent colposuspension usually had more severe stress UI. None of the studies considered the impact of potential confounding factors on the statistical significance of continence outcomes. Owing to losses to follow-up, and because of differences between groups in terms of patient characteristics, comparative outcome data derived should be viewed with caution and are not considered here. [EL = 2−]

Of the 18 case series identified for retropubic suspension procedures, most were in the form of retrospective reviews of case notes, with telephone or mailed questionnaires used for further follow-up \(n = 2568\), range 48–374.\textsuperscript{682–702} The majority of the studies evaluated the Burch colposuspension procedure, with the others being laparoscopic colposuspension or the MMK procedure. The duration of follow-up ranged from a minimum of 1 year to a maximum of 18 years; two-thirds had 5 years follow-up or more. Between 32% and 91% of those originally treated provided follow-up data. Concomitant procedures were undertaken alongside colposuspension in many of the studies, such as hysterectomy or correction of prolapse.

Long-term complications noted with colposuspension across the cohort and case series studies were:
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Data on the long-term efficacy of the insertion of biological slings for stress urinary incontinence in women are limited to autologous slings. Clinicians should therefore audit patients in the longer term.\(^{29}\)

A Cochrane systematic review considered traditional suburethral slings; the review included studies evaluating synthetic as well as biological materials.\(^{876}\) Therefore, the relevant studies included in the review are considered individually within this section.

**Controlled trials evaluating biological slings**

Nearly all RCTs of biological slings compare the autologous rectus fascial sling procedure with a range of other surgical interventions. RCTs evaluating dura mater and porcine dermal slings were also identified. Non-randomised comparisons of autologous and allograft rectus fascial or fascia lata slings were also considered.

**Tension-free vaginal tape versus porcine dermal collagen sling**

In an RCT of women who had failed conservative treatment, no significant differences were seen between TVT and porcine dermal collagen in subjective cure or improvement at 1 or 3 years, nor in satisfaction at 3 years (assessed by mailed questionnaire). Operating time, hospital stay and complication rates were not significantly different. The complications seen were haemorrhage (3% TVT versus 4% porcine fascial sling), infection (0% versus 2%), the need for sling release or urethral dilatation (5% versus 10%), ISC (3% versus 3%), *de novo* urgency or urge UI (15% versus 18%) and dyspareunia (3% versus 0%) \(\left(n = 145\right)\).\(^{718,720}\) [EL = 1+]

**Rectus fascial sling versus periurethral silicone**

One RCT compared autologous rectus fascial sling with periurethral silicone injection in women with stress UI secondary to ISD in whom conservative treatment had failed. At 6 months, no significant differences were seen between groups in subjective cure or satisfaction, QOL (UDI-6, IIQ) or on a 1 hour pad test. Significantly more women undergoing sling surgery were objectively cured (urodynamic assessment), but duration of the procedure, catheterisation, inpatient stay, and time to return to normal activities were significantly longer. No significant differences in other adverse effects were noted (voiding dysfunction, *de novo* DO, UTI). A survey of two-thirds of the women at 5 years found no statistically significant differences between groups in urinary symptoms or in satisfaction with surgery \(\left(n = 45\right)\).\(^{567}\) [EL = 1+]

**Conti"nence surgery versus periurethral collagen**

Open continence surgery (a suspension procedure in 46% and fascial sling in 54%) was compared with periurethral collagen in women with stress or mixed UI in one RCT, which found no differences in satisfaction or QOL (SF-36, IIQ) between groups at 1 year. Using intention-to-treat analysis (where treatment was considered to have failed in women with missing data), there was no significant difference in continence rates at 1 year (52% collagen, 55% surgery). If only the 89% of women who underwent the randomised intervention were considered, the continence rate with surgery was significantly higher (72% versus 53%). The incidence of adverse effects was significantly higher in the surgery group: urinary retention 13% versus 2%, transient voiding difficulty 36% versus 17%, UTI 6% versus 0% \(\left(n = 133\right)\).\(^{565}\) [EL = 1+]

**Rectus fascial sling versus tension-free vaginal tape**

Two small RCTs compared TVT with an autologous rectus fascial sling, one of which also had a colposuspension arm \(\left(n = 145\right)\). In the study with three arms, cure rates (negative stress test and symptom-free) were 87%, 88% and 93%, with TVT, open colposuspension and rectus fascial sling, respectively, at 1 year \(\left(n = 92\right)\).\(^{558}\) [EL = 1+] The second study reported cure rates (using the same criteria) of 92% in both groups at 6 months. Complications reported were *de novo* DO (0% with TVT versus 0% or 4% with rectus fascial sling), wound pain (7% versus 28%), or urinary retention (13% versus 7%).\(^{558,717}\) [EL = 1+]

**Rectus fascial sling versus self-fashioned polypropylene mesh sling**

A quasi-RCT compared a rectus fascial sling with a self-fashioned polypropylene mesh sling. At median follow-up of about 2 years, cure and satisfaction rates were similar but operating time and hospital stay were significantly shorter in the synthetic sling group. Delayed voiding occurred in more women in the fascial sling group. No other significant differences were seen between groups in complications (haematoma, dysuria, *de novo* urgency or urge UI) \(\left(n = 50\right)\).\(^{848}\) [EL = 1–] Rectus fascial sling versus polytetrafluoroethylene One RCT compared rectus fascial and PTFE slings in women...
with stress UI, 92% of whom had had prior continence surgery. Combined objective and subjective cure rates were 81% and 88%, respectively, at 6 months. No complications were reported in the fascial sling group, whereas urethral erosion, recurrent UTI and de novo DO were very common with PTFE (n = 48).861 [EL = 1–]  

Rectus fascial sling versus vaginal wall sling  
Rectus fascial and vaginal wall slings were compared in one RCT and in two non-randomised retrospective studies involving women with stress UI.877–879 All women in the non-randomised studies had had prior continence surgery. Each study was considered to be of poor quality. The RCT reported high subjective cure, and satisfaction rates (80–100%), with median follow-up of 7 months (n = 26). Transient urinary retention and de novo urge UI were very common.877 [EL = 1–] The retrospective studies reported similar ‘success’ rates with both interventions, ranging from 80% to 97%, with follow-up of 21 months, and 70 months versus 45 months (n = 232, n = 79). Other than the proportions requiring ISC (2% fascial versus 0% vaginal wall), no other significant differences were reported in the complications listed (voiding dysfunction, wound infection, urgency, de novo DO, bladder or urethral perforation, pain, seroma formation, rectocele).878,879 [EL = 2–]  

Comparing two techniques of fascial sling  
One RCT compared two techniques of fascial sling in women with urodynamic stress UI (with urge UI in 82%), 89% of whom had had prior continence surgery. Women underwent a standard fascial sling procedure or a ‘sling on a string’ (a shorter sling mounted on each end with a nylon thread), with baseline UDI scores lower in the standard group, which reflected differences in urge UI prevalence in groups (80% versus 86%). At 1 year, subjective cure rates were 84% using both techniques. Satisfaction and changes in IIQ scores were similar in both groups, whereas improvements in UDI scores were greater with the standard approach (adjusted for differences in baseline UDI data). Urinary tract complications (UTI, bladder injury or trauma, voiding difficulty and haematoma) were reported in 1–3% in at least one treatment arm (n = 168).880 [EL = 1+]  

A retrospective cohort study compared a rectus fascial sling with one reinforced with polyglactin mesh in women with urodynamic stress UI, one-third of whom also had urge UI (n = 51). Followup differed between groups (mean 8 versus 5 months). Overall, no clear difference was seen between groups in success rates, although results depended on the definition of success used (patient-determined, urodynamics or based on weekly leakage episodes). No significant differences between groups were noted in complications (wound infection, incisional hernia, voiding dysfunction, de novo DO).881 [EL = 2–]  

Dura mater sling versus open colposuspension  
One RCT compared dura mater sling with open colposuspension in women with recurrent stress UI after hysterectomy. The cure rates (combined objective/subjective) were 92% versus 86%, at about 3 years. Significantly more women in the sling group had voiding difficulty or retention postoperatively, both of which were common, and more women developed rectocele in the colposuspension group. Bladder perforation and de novo urgency were common in both groups. Time to spontaneous voiding was significantly longer in the sling group (n = 72). [EL = 1+]  

Porcine dermis sling versus Stamey needle suspension  
One RCT compared a porcine dermis suburethral sling with the Stamey needle suspension procedure in women with stress UI who were considered unsuitable for colposuspension; overall 60% had had prior continence surgery. At 2 years, subjective cure rates were 90% versus 70%. Intraoperative blood loss and postoperative infection were significantly more common in the sling group. Other common complications in both groups were bladder injury and de novo DO (n = 20).884 [EL = 1+]  

Porcine dermal collagen sling versus tension-free vaginal tape  
In an RCT of women who had failed conservative treatment, no significant differences were seen between porcine dermal collagen sling and TVT in subjective cure or improvement at 1 or 3 years, nor in satisfaction at 3 years (assessed by mailed questionnaire). Operating time and hospital stay were not significantly different, nor was the rate of complications. The complications seen were haemorrhage (4% versus 3%), infection (2% versus 0%), the need for sling release or urethral dilatation (10% versus 5%), ISC (3% versus 3%), de novo urgency or urge UI (18% versus 15%), and dyspareunia (0% versus 3%) (n = 142).719,720 [EL = 1+]  

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Autologous versus allograft slings

Seven non-randomised studies compared the outcomes of autologous and allograft slings in women with stress UI (54–60% in two studies having mixed UI). One also compared both interventions with a xenograft material (porcine dermis). All were retrospective reviews of cases undertaken, each with differences in duration of follow-up for the interventions evaluated, with drop-out rates of 4–34% of those treated in four studies; all were therefore considered to be of poor quality.

Women in six studies had prior continence surgery (19–57%). Across four studies, 16–82% underwent concomitant surgery. Between 45 and 167 women were followed up (total 786) with duration of follow-up of between 3 months and about 3 years.

Four studies compared autologous with allograft (cadaveric) fascia lata, three of which reported similar results for all outcomes (subjective cure, satisfaction, and UDI-6, IIQ-7 and SEAPI scores). The fourth study reported significantly higher cure rates in the autologous group. In three studies that compared autologous rectus fascia (or fascia lata in one) with allograft fascia lata, two found a significantly higher cure rate in the autologous group. The other did not report significant differences between groups in cure rate, although satisfaction rates were higher in the autologous group after 2 years follow-up. Operating time and hospital stay were shorter in the allograft group.

In studies that reported complications, these were:
- cases of sling failure, haemorrhage, suprapubic abscess, lower extremity neuropathy, persistent suprapubic pain and suprapubic haematoma in the allograft group,
- persistent thigh pain, abdominal wound infection and prolapse in 11%, 6% and 1%, respectively, of the autologous group,
- retention (4–7% autologous versus 2–4% allograft) and UTI (27% versus 6%) in both groups,
- between 2% and 5% of autologous, allograft and xenograft groups underwent urethrolysis for persistent voiding dysfunction.

Case series of biological slings

Autologous slings

Ten case series reported outcomes of the autologous rectus fascial sling. Patient numbers in the studies ranged from 32 to 251 (total 1280). In six studies, only 67–95% of those treated were followed up. Six studies included women with mixed UI (34–58%). Prior continence surgery was documented for between 26% and 70% of women in six studies. Concomitant surgery was undertaken in 15–65% of women across six studies.

Each study reported a mean or median duration of follow-up ranging from about 2 to 6 years; in three studies, maximum follow-up of 15–18 years was reported. Subjective cure rates ranged from 26% to 97% (median 81%); objective cure rate (one study) 93%; and cure that included subjective and objective elements 73% and 95% (two studies). Satisfaction rates of 86% and 92% were reported in two studies.

Intra-operative complications reported were:
- haemorrhage requiring transfusion: 4%
- pelvic haematoma: 0.8%
- retropubic haematoma or wound infection: 2%
- wound infection: 3%
- bladder perforation/injury: 0–7% (median 1.3%)
- urethral injury: no cases.

Postoperative complications were:
De novo urgency, urge UI or DO (seven studies): median 14% (range 2–23%)
voicing difficulty or retention either requiring intervention (sling removal or release, urethrolysis, ISC) or described as prolonged (eight studies): median 2% (range 1–9%)
transient retention (five studies): median 33% (range 1.3–94%)
lower abdominal pain (five studies): median 2.5% (range 0–25%)
UTI (three studies): median 13% (range 4–41%); recurrent UTI (two studies): 4% and 22%
sling erosion into urethra (two studies): 0% and 3%
pelvic organ prolapse (two studies): 3–4%
incisional hernia (two studies): 0.8–4.5%
abdominal wall hernia (one study): 2%.

Allograft fascia lata slings

Six case series evaluated the use of allograft fascia lata slings in women with stress UI (with 50–87% with mixed UI in three). Patient numbers ranged from 18 to 102 (total 295). Mean or median follow-up ranged from 9 to 13 months in five studies, and was 35 months in one. Three studies had follow-up data for 65–88% of the women treated. Concomitant surgery was undertaken in 11–59% in five studies, and prior continence surgery in 1–6% of women in four studies.

Median subjective cure rate was 70% (range 48–94%) across the studies, with satisfaction rates of 69% and 90% at 1 year (two studies). The study with longest follow-up reported significant improvement in QOL (IIQ-7 and UDI-6) at 1 year, which was sustained at 4 years. Intraoperative bleeding was reported in one study (1%).

Postoperative complications were:
- sling division or urethrolysis for retention (1% and 4%); ISC at 1 year in 3%.
- de novo urge UI (15%); urgency (8%).
- surgery for new onset or recurrent POP (2%); another noted no cases of recurrent cystocele.
- vaginal pain, pressure or protrusion, and bladder or kidney infection very common in one study.

No cases of bleeding, wound infection, or erosion were reported in one study.

Slings made of other biological materials

Case series reporting the outcomes of slings made from other materials were identified: porcine dermal sling procedures, vaginal wall slings, lyophilised dura mater, and cadaveric dermal grafts. The use of cadaveric human dermal sling, and bovine pericardium were described in two studies, but these studies are not considered further as both procedures used bone-anchors.

The studies evaluating the porcine dermal or small intestinal mucosa slings were small (between 25 and 50 women), and had relatively short duration of follow-up. All reported cure, improvement and failure rates, using varying definitions, and complications. The three studies that evaluated the porcine dermal sling in women with stress UI (14% mixed UI in one) had follow-up of 6 months or a mean of about 21 months. In one study, all women had had prior continence surgery, compared with 18–26% in the other two studies. In one, 43% underwent concomitant prolapse surgery. The cure rates ranged from 68% to 78%, with 9–15% improved, and failure rates of 10–25%. Common complications (1% or more and less than 10%) across the studies were UTI, wound infection, transient retention, and persisting or de novo urge UI. Cases of sling erosion into the urethral wall, retention requiring sling removal, deep vein thrombosis, and bladder injury were also reported. In one study pelvic pain for up to 3 months was common.

The case series evaluating the porcine small intestinal mucosa sling (32% of whom had concomitant surgery) reported cure and improvement rates of 79% and 9%, respectively, at 2 years. There was
one case of de novo urge UI and three of suprapubic inflammation; no women had prolonged retention (n = 34).919 [EL = 3]

In women who had stress UI and POP who underwent a lyophilised dura mater sling procedure, objective success (pad test) was seen in 89% at 6 months. There was a case each of the sling passing through the bladder and of haemorrhage requiring surgery (n = 36).914 [EL = 3]

Two case series reported 6 or 12 month outcomes of cadaveric dermal grafts, in a total of 50 women with stress UI (28% had mixed in one study). The cure rate in both studies was 68%. Complications included a case of bladder perforation, suprapubic or vaginal infection (12%), and de novo urgency (12%).915,916 [EL = 3]

Across the vaginal wall sling case series, results for 648 women treated (range 45–336) were reviewed: all had stress UI, with 47–65% in two studies having mixed UI.905–913 Duration of follow-up ranged from means of 17 to 40 months, with one reporting a minimum 5 years followup. Success or cure (variably defined) was reported in 31–93% (median 83%), and satisfaction in 62% and 93% of studies that considered this. Complications reported were bladder injury (2%), wound infection (2–5%), de novo DO or urge UI (6–10%), retention (4–12%), suture removal (1–2%), pelvic organ prolapse (2–7%), UTI (3%), dyspareunia (4%) and suprapubic pain (0.5–2%). [EL = 3]

Evidence to recommendations
For the 2013 recommendations (87 and 88) rationale see section 8.3.

Recommendations

<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendations</th>
</tr>
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<tbody>
<tr>
<td>88</td>
<td>When offering a surgical procedure discuss with the woman the risks and benefits of the different treatment options for SUI using the information in table 8.12. [new 2013]</td>
</tr>
</tbody>
</table>
| 89     | If conservative treatment for SUI has failed, offer:  
- synthetic mid-urethral tape (see recommendations 90–94) or  
- open colposuspension (see recommendation 95), or  
- autologous rectus fascial sling (see recommendation 96). [new 2013] |
| 96     | Anterior colporrhaphy, needle suspensions, paravaginal defect repair and the Marshall–Marchetti–Krantz procedure are not recommended for the treatment of stress UI. [2006] |

8.4 Operations to augment sphincter closure

8.4.1 Introduction

Procedures in this section include injection of urethral bulking agents and implants that aim to occlude the urethra.

Studies considered for this section

Evidence described in this section is derived where possible from RCTs; where RCTs were not identified or had only short duration of follow-up, case series were considered. A systematic review of periurethral injection therapy for UI has been published on the Cochrane library.554 Because most of the studies included in the review were published only as abstracts, and owing to publication of further studies, all relevant studies were considered individually. A further systematic review considered studies evaluating the silicone implantable product, which are considered individually in this section.555

The Interventional Procedures Programme of NICE has published guidance on two procedures of relevance to this area of practice:
Intramural Urethral Bulking Procedures for Stress Urinary Incontinence in Women (2005). The guidance states that ‘current evidence on the safety and short-term efficacy of intramural urethral bulking procedures for stress urinary incontinence is adequate to support the use of these procedures provided that normal arrangements are in place for clinical governance and for audit and research’ and that ‘clinicians should ensure that patients understand that the benefits of the procedures diminish in the long-term and provide them with clear written information’.27

Figure 8.1 Hospital episode statistics for England, 1994–95 to 2004–05, illustrating trends in surgery for stress UI. EBNNS = endoscopic bladder neck needle suspension, TVT = tension-free vaginal tape, AUS = artificial urinary sphincter, injections = periurethral bulking agents.
Insertion of Extraurethral (Non-Circumferential) retropubic Adjustable Compression Devices for Stress Urinary Incontinence in Women (2005), which applies to the adjustable compression therapy balloon. The guidance states that 'current evidence on the safety and efficacy of insertion of extraurethral (non-circumferential) retropubic adjustable compression devices for stress urinary incontinence in women does not appear adequate for this procedure to be used without special arrangements for consent and for audit or research'. Such devices are therefore not considered further in this guideline.

8.4.2 Intramural urethral bulking agents

The injection of a pliable bulking agent into the submucosal tissues of the urethra, or bladder neck, may increase the resistance to flow within the urethra, so preventing stress UI. The injections may be undertaken transurethrally, either using a needle passed down the operating channel of a cystoscope under direct vision, or blind, using specifically developed injection systems. Alternatively, a paraurethral approach may be taken, inserting the needle through the skin, alongside the external urethral meatus and then passing it parallel to the urethra, while visualising the area around the bladder neck by cystoscope. A variety of biological and synthetic materials are available.

Controlled trials

Six RCTs and two cohort studies compared the effectiveness of a urethral bulking agent with other bulking agents, surgical interventions or placebo in women with stress UI. A further RCT and cohort study compared different routes of urethral injection of the same products (collagen or hyaluronic acid/dextran copolymer).

Silicone versus sling

One RCT compared periurethral silicone injection with an autologous rectus fascial sling in women with stress UI secondary to ISD in whom conservative treatment had failed. At 6 months, no significant differences were seen between groups in subjective cure or satisfaction, QOL (UDI-6, IIQ) or on a 1 hour pad test. Significantly fewer women undergoing injection therapy were objectively cured (no leakage on urodynamic assessment), but duration of the procedure, catheterisation, inpatient stay, and time to return to normal activities were significantly shorter compared with the sling. No significant differences in other adverse effects were noted (voiding dysfunction, de novo DO, UTI). A telephone survey of two-thirds of the women at 5 years found no significant differences between groups in urinary symptoms or in satisfaction with surgery, although fewer women in the silicone group were satisfied (29% versus 69%) (n = 45). [EL = 1+]

Different injection routes of the same product

One RCT compared outcomes of transurethral and paraurethral placement of hyaluronic acid/dextran copolymer in women with stress UI who had failed conservative treatment. Up to three injections were given within 3 months (mean 1.7 months). No significant differences were seen between groups in subjective cure or improvement at follow-up to 1 year. Significantly more women in the paraurethral group experienced postoperative urinary retention (30% versus 5%) (n = 40). [EL = 1+]

A retrospective review of women who had either trans- or paraurethral collagen injections for stress UI also found no differences between groups in any outcome (continence status, pad usage, transient haematuria or UTI), although mean duration of follow-up differed between groups (6 versus 9 months) (n = 45). [EL = 2-]

Case series of silicone bulking agent

Nine case series evaluating the outcomes of silicone were evaluated (total n = 379; range 21–102). Eight studies included 60 women or less. Duration of follow-up ranged from 3 months to 3 years, with most between 1 and 2 years. All included women with stress UI, some of whom had had prior continence surgery (median 62%, range 19–100% across all studies).

Silicone was injected transurethrally in most studies. A single injection was given to women in two studies, while between 10% and 45% (median 18%) of women received a second injection after 3 months.
months in the other studies. A third injection was given to 3% of women in one.570 Each study reported continence status although the way in which this was reported varied widely across the studies. Given the difference in definitions, the results at maximum duration of follow-up in individual studies were:

- success rates (three studies): median 48% (range 48–74%)
- objective cure (two studies): range 48–59%
- cure or improvement in four studies that reported both: cure median 30% (range 10–45%), improvement median 28% (range 17–39%).

Continence rates reduced over the duration of follow-up.567–569,573,574 One study considered QOL, which reported significant improvements in all domains of KHQ.571,572 In one study, no complications were seen during or after treatment.573 In other studies, adverse effects reported were transient. These were:

- dysuria (six studies, combined with report of haematuria in two): median 90% (range 53–100%)
- haematuria (four studies, combined with report of dysuria in two): median 58% (range 45–100%)
- frequency (two studies): mean 74% (range 72–76%)568,569
- acute retention (six studies): median 11% (range 3–18%)
- UTI (two studies): 6%.570,574

Case series of hyaluronic acid/dextranomer copolymer bulking agent

Three case series of the hyaluronic acid/dextranomer copolymer in women with stress UI were identified (total n = 204). Women in two studies had failed conservative treatment. One reported subjective cure or improvement by about 80% of the women at 3–6 months. Of 80% followed up to 5–6 years, 56% had continued response. Overall, 55% had two or three injections (n = 20; 16 followed up to 5–6 years).595,596 [EL = 3] In the other two studies, women were followed for 1 year. A repeat injection was given to 43%. In the smaller study, 69% of women reported improvement, while objective cure or improvement was seen in 82% of those assessed (n = 22). Significant improvement in QOL (seven of ten KHQ domains) was reported (n = 42).597,598 [EL = 3] In the larger study, 77% reported at least 50% improvement, with significant reductions in leakage episodes and in 24 hour pad weight, and improvements in six of nine domains of the KHQ (n = 142).599 [EL = 3]

No adverse effects were reported in one study.595,596 Adverse effects reported across the other two, which were mainly transient, included UTI (12%), urgency (12%), haematuria (10%), dysuria (8%), urethral disorder, reduced urine flow, vaginal discomfort (all 7%), urinary retention (7–20%) and injection-site pain (4%) or infection (2%) (n = 42).597–599 [EL = 3]

Case series of carbon-coated zirconium beads bulking agent

Two case series reporting the use of carbon-coated zirconium beads were identified, which had mean follow-up duration of 9 or 10 months. One study that included men and women reported efficacy data for women separately (n = 20; 13 women).600 The other included women only, with follow-up data for only 66% of those treated (n = 46).601 Across both studies, 65% and 77% of women reported subjective cure or improvement; in the study that reported this outcome at 6 and 12 months, the proportion improved fell to one-third at 12 months.600 No cases of urinary retention were seen in one study.601 The other reported transient effects (skin reactions, urine retention in one case each).600 [EL = 3]

Case series of polytetrafluoroethylene bulking agent

Only case series studies evaluating the use of para- or transurethral PTFE in women with stress UI were identified. The outcomes considered were subjective cure or improvement, and complications.135,602–607 Mean duration of follow-up ranged from 1 to 5 years. Across the seven studies, 14–73% had had prior continence surgery. Between 22 and 56 patients were included in each study; one included men and women with results reported separately for women.604
In six studies the median subjective cure rate was 36% (range 7–70%), and median improvement rate 19% (range 11–41%). The remaining study reported a combined cure or improvement rate of 32% at 1 year, which fell to 18% at 5 years. Five of the studies considered complications. Those reported in two or more studies were:

- Acute retention (three studies): median 11% (range 3–31%)
- UTI (two studies): 3% and 4%
- Voiding difficulties (two studies): 2% and ‘common’.

Other adverse effects were burning around urethral injection site (32%), paraurethral infection (14%), dysuria or urethral discomfort (38%), foreign body granuloma (one case) and passage of PTFE plug via the urethra (12%).

Case series of hydroxylapatite bulking agent

A case series described as a preliminary evaluation of transurethral injection of hydroxylapatite (also referred to as hydroxyapatite) was identified, which enrolled ten women with stress UI. A second injection was given in seven cases. At 1 year, seven women were not using any pads or were using ‘many fewer’ pads. At about 3 years, six women were satisfied with the outcome (telephone follow-up). Complications reported were transient UTI and retention in three and five women. Other studies evaluating this material were identified.

2013 update

Glutaraldehyde cross-linked collagen has been removed from the recommendations. This update has been made as the use of collagen for this procedure is no longer undertaken in the UK.

8.4.3 Artificial urinary sphincters

The artificial urinary sphincter is a complex device that comprises an occlusive cuff inserted around the urethra which, while inflated, will exert a constant closure pressure. Pressure is maintained by means of an inflated pressure-regulating balloon. A small pump located in the labium is manually operated by the woman whenever she wishes to pass urine.

Most studies evaluating the AUS were conducted in populations outside the scope of this guideline (men and/or patients with neurogenic bladder), or studies included a mixed population but did not report data separately for women with idiopathic UI.

Six case series reported the outcomes of AUS in women with idiopathic stress UI. Across the studies 51–100% had failed prior continence surgery. The largest study included 206 women, 82% of whom had idiopathic UI, with results reported separately for this group. The other studies included between 25 and 55 women. The AUS device used was stated in five studies; except for a minority of women in two studies who received AS 791/792 or AS 742/761 sphincter, all received AS 800.

Duration of follow-up varied, with most being about 2–3 years (minimum 4 months, maximum about 9 years). Between 84% and 100% of women were subjectively cured. The largest study noted peri-
operative complications, which were injuries to the vagina, bladder neck or urethra (all common) \((n = 1168)\).^609

One series reported the duration and aetiology of device failure. At mean follow-up of about 9 years, 56% of women still had the same device \textit{in situ}, 35% had revisions, and the median duration of the implanted device was 11 years \((n = 55)\).^614

Mechanical problems were reported in 4–22% of patients across the studies, including cuff or connector leaks and pump malfunction. Device removal or revision was common (five studies) with a median of 9% (range 8–17%),^609,611–614 as was urinary retention (two studies, 1.2% and 6%).^609,610

Other complications were incisional hernia (7%),^609 urgency with or without leakage (5%),^609 haematoma of labia majora and scar (4%),^609 phlebitis (1%),^609 superficial wound dehiscence (3%),^610 pelvic abscess (3%; device removed)^610 and the need for ISC (12%).^612

**Recommendations**

<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendations</th>
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<tbody>
<tr>
<td>99</td>
<td>In view of the associated morbidity, the use of an artificial urinary sphincter should be considered for the management of stress UI in women only if previous surgery has failed. Life-long follow-up is recommended. [2006]</td>
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</table>

**8.5 The effect of hysterectomy on continence**

No evidence was identified that addressed the question of whether hysterectomy is an effective treatment for UI. While the procedure is often undertaken at the same time as surgery for UI, it is not possible to evaluate the independent impact of hysterectomy on continence.

There is some evidence regarding the influence of hysterectomy for reasons other than treatment of UI on continence status, but the data are inconsistent. A systematic review of studies found no increase in UI within the first 2 years after hysterectomy; although there was an increase in the risk of UI in women over 60 years of age who had undergone the procedure many years earlier; this was not found in younger women.^920

**Evidence statements for procedures for stress urinary incontinence**

There has been little consistency between trials of continence surgery in the types of patients recruited, the incidence of previous surgery or concomitant procedures, and the prevalence of pre-existing urge incontinence or voiding difficulty. [EL = 3]

Outcome measures have been inconsistent so comparisons between studies are difficult. Some procedures may be indistinguishable in anything other than name. There is no strong evidence of superior effectiveness for any one surgical procedure. [EL = 3]

**Procedures to augment sphincter pressure**

Controlled trials evaluating urethral bulking agents (collagen, silicone, carbon-coated zirconium beads, hyaluronic acid/dextran copolymer) for the treatment of women with stress UI are few, enrol relatively small numbers of patients and are of mixed quality. Bulking agents may be less effective than open surgery for UI, but they are associated with fewer postoperative complications. [EL = 1+] Autologous fat is no better than placebo in effecting cure or improvement of incontinence, and is significantly less effective than collagen. [EL = 2+] Otherwise, there is no evidence of greater efficacy of one injectable over another. Polytetrafluoroethylene has not been assessed in controlled trials.

Repeat injections are required in the majority of patients to achieve initial benefit. [EL = 3] There are no data on the outcome of subsequent courses of treatment.

Controlled trials show that urethral bulking agents have relatively poor efficacy. Case series show that any benefit observed declines with time, and that complications, though common or very common, are mainly transient, and include acute retention, dysuria, haematuria, frequency, and UTI. \textit{De novo} DO with urge UI was the only long-term complication documented. Uncommon but serious complications have been reported with autologous fat. [EL = 3]
Data supporting the use of artificial urinary sphincter in women with idiopathic UI are limited to case series. Subjective cure rates are high although complications requiring removal or revision are common. [EL = 3]

**retropubic suspension procedures**

Open colposuspension is an effective treatment for stress UI in women and has longevity. There is no consistent difference in effectiveness between laparoscopic and open colposuspension for any outcome measures. [EL = 1+] However, laparoscopic colposuspension consumes more resources, and skills take longer to acquire than with open colposuspension. [EL = 4]

In general, most suspension procedures are effective in the short term but the longer term outcomes for anterior colporrhaphy, abdominal paravaginal repair and needle suspension are poor when used for stress incontinence alone. [EL = 3]

Complications are common for all suspension procedures; these include voiding difficulty, urgency syndrome or development of vaginal vault and posterior wall prolapse. There is no evidence that the Marshall–Marchetti–Krantz (MMK) procedure offers any significant advantage over open colposuspension. [EL = 1+] The MMK procedure is no longer in routine clinical practice owing to the serious additional complication of osteitis pubis. [EL = 4]

**Synthetic slings**

Most RCT data regarding synthetic slings for the treatment of stress UI relate to a macroporous (type 1) polypropylene mesh inserted through the retropubic space using a bottom-up approach (e.g. TVT). This has been shown to have comparable efficacy to colposuspension (open or laparoscopic) with follow-up to 3 years. Hospital resource use is less and recovery time is shorter when compared with colposuspension. [EL = 1+] Limited data are available on outcomes beyond 3 years. [EL = 3]

Results from an economic model conducted alongside a systematic review suggest that a synthetic sling using a macroporous (type 1) polypropylene mesh, inserted through the retropubic space using a bottom-up approach (e.g. TVT) for the treatment of stress UI is more cost effective than other surgical procedures, open colposuspension in particular. This result is based on limited follow-up data and assumes that the relative differences between treatments do not change over time. Case series suggest that cure rates for TVT are sustained. Higher prevalence of prolapse in open colposuspension would increase the relative cost effectiveness of TVT. Numerous alternative synthetic sling materials and techniques have been described where the tape may be inserted by a retropubic route, bottom-up or top-down, or via the obturator foramen, outside-in or inside-out. Based on case series, these techniques appear to be effective, but there are only limited comparative data. [EL = 3] Slings using a retropubic top-down approach appear to be as effective as bottom-up retropubic techniques. [EL = 1+] Slings inserted through the obturator foramen appear to be effective in the short term but there is limited high-level evidence of their effectiveness compared with more established techniques. [EL = 1+] Long-term outcomes are unknown.

Slings using materials other than a wholly macroporous construction (e.g. type 2, 3 or 4 meshes [made of polyester, polytetrafluoroethylene, or silicone]), cannot be assumed to be of comparable efficacy and safety to those using a macroporous (type 1) polypropylene mesh inserted through the retropubic space using a bottom-up approach (e.g. TVT). [EL = 4]

Intra-operative complications are rare except for bladder perforation, which, although common, appears to have no long-term sequelae provided it is recognised and remedied at the time of surgery. Long-term complications with synthetic slings include voiding difficulties and development of urgency and urge UI. There is a lack of high-level evidence on the relative safety of sling materials or techniques. Slings employing materials other than the wholly macroporous (type 1) appear to have higher rates of erosion and infection. [EL = 3]

Patients who have undergone prior surgery are more likely to have intra-operative complications. [EL = 3]

**Biological slings**

Autologous rectus fascial sling is the most widely evaluated biological sling, which is an effective treatment for stress UI and has longevity. [EL = 1+] Short-length suspended autologous fascial sling achieves similar outcomes to full-length slings at 1 year. [EL = 1+]
Limited data show that pubovaginal sling using porcine dermis is effective. [EL = 1+] Data relating to other biological slings (autologous or allograft fascia lata, vaginal wall sling, dura mater, porcine small intestinal mucosa) are few, and generally of low evidence level and poor quality. Complications with all slings are common and include voiding difficulties and development of urgency and urge UI.

### 8.6 Secondary procedures for women who have had previous surgery

#### Introduction

Surgery may be considered for women who have previously had surgery for SUI but the procedure failed or was successful but the SUI has recurred. These cases should be seen and assessed by a sub-specialist urogynaecologist or urologist who has a caseload of over 20 such cases annually. The assessment will include investigations including urodynamics and imaging of the urethrovaginal anatomy to determine if the support provided by the previous surgery has failed or that there is a different cause of the incontinence.

#### Review question

What is the comparative effectiveness of the following interventions for women for whom the primary tape procedure has failed:

- conservative management, looking only at:
  - lifestyle interventions, specifically weight loss, fluid management and smoking cessation
  - physical therapy, specifically pelvic floor muscle training
- repeat tape procedure
- fascial sling
- colposuspension.

#### Methodological approach for the review

No comparative studies were identified for this question. Therefore the evidence was identified from the data available which was primarily case-series data. The GDG agreed a threshold of effectiveness for a secondary procedure. Any procedure that reported a cure rate of ≥ 60% was considered an adequately effective treatment option after a failed primary tape procedure.

The evidence on secondary procedures was separated into two categories

- Secondary procedures following primary tape failure
- Secondary procedures following complications of the primary tape

The evidence is presented in GRADE tables with accompanying descriptions of included studies and evidence statements

- repeat tape procedure (seven studies)
- laparoscopic Burch Colposuspension (one study)
- open Burch colposuspension (one study)
- bulking agent injection (one study)
- tape shortening procedure (two studies)
- re-suturing following erosion (one study)
- tape adjustment for voiding problems or retention (three studies)
8.6.1 Secondary procedures following primary tape failure

Repeat tape procedure

Description of included studies

Seven studies were identified (Eandi 2008, Lee 2007, Han 2012, Liapis 2009, Palva 2009, Sabadell 2011, van Baelen 2008). The mean age of participants ranged from 54.1 (SD 10.8) to 65.1 (SD 12.4) years. The mean number of incontinence episodes and mean duration of symptoms were not reported in any of the included studies. None of the studies reported urge incontinence symptoms in the pre-operative period.

The primary tape procedure was retropubic “bottom-up” in two studies (Eandi 2008, Palva 2009), transobturator “outside-in” in two studies (Lee 2007, Sabadell 2011) and was mixed in the remaining studies.

Evidence profile

Table 8.18 GRADE findings for a repeat tape procedure

<table>
<thead>
<tr>
<th>No of studies</th>
<th>Relative effects</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Events (range)</td>
<td></td>
</tr>
</tbody>
</table>

Patient satisfaction

No studies identified

Self-reported rate of absolute reduction in symptoms

No studies identified

Continence status

7 (Eandi et al., 2008; Han et al., 2012; Lee et al., 2007; Liapis et al., 2009; Palva & Nilsson, 2009; Sabadell et al., 2011; van Baelen & Delaere, 2009) 52% to 84% VERY LOW

Incontinence-specific quality of life – Urinary Incontinence Severity Score (Better indicated by lower values)

1 (Palva & Nilsson, 2009) Median scores changed from 60 (15 to 85) to 5 (0 to 60) VERY LOW

Incontinence-specific quality of life – Incontinence – Quality of Life (Better indicated by higher values)

1 (VanBaelen & Delaere, 2009) Median scores changed from 18 (no range reported) to 6 (no range reported) VERY LOW

Adverse effects – Tissue injury

1 (Liapis et al., 2009) 3.2% VERY LOW

Adverse effects – Tape erosion

1 (VanBaelen & Delaere, 2009) 0% VERY LOW

Adverse effects – Urinary retention

1 (Lee et al., 2007) 0% VERY LOW

Adverse effects – Voiding dysfunction

4 (Han et al., 2012; Lee et al., 2007; Liapis et al., 2009; Sabadell et al., 2011) 2.8% to 10.3% VERY LOW
Adverse effects – de novo OAB symptoms

<table>
<thead>
<tr>
<th>Study</th>
<th>Percentage</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Han et al., 2012; Lee et al., 2007; Liapis et al., 2009; Sabadell et al., 2011; VanBaelen &amp; Delaere, 2009</td>
<td>9.1% to 21.7%</td>
<td>VERY LOW</td>
</tr>
</tbody>
</table>

Psychological outcomes
No studies identified

Clinical outcomes
No studies identified

Evidence statements
No studies were identified for the following outcomes
- Patient satisfaction with treatment
- Self-reported rate of absolute symptom reduction
- Psychological outcomes
- Clinical outcomes

Continence status
A review of seven studies reported that up to 84% of women were continent after the repeat tape procedure. The evidence was very low quality.

Incontinence specific quality of life
Two studies found conflicting evidence of improved quality of life from the repeat tape procedure. The evidence was very low quality.

Adverse effect – Tissue injury
A single study found up to 3% of women suffered tissue injury due to the repeat tape procedure. The evidence was very low quality.

Adverse effects – Tape erosion
A single study reported no instances of tape erosion following the repeat tape procedure. The evidence was very low quality.

Adverse effects – Urinary retention
A single study reported no instances of urinary retention following the repeat tape procedure. The evidence was very low quality.

Adverse effects – Voiding dysfunction
A review of four studies found that up to 10% of women suffered from voiding dysfunction after the repeat tape procedure. The evidence was very low quality.

Adverse effects – De novo OAB symptoms
A review of five studies found that up to 21% of women developed de novo OAB symptoms after the repeat tape procedure. The evidence was very low quality.

Laparoscopic Burch colposuspension
Description of included studies
One study (de Cuyper 2008) was identified. The mean (SD) age of participants was 51.9 (8.9) years. The mean number of incontinence episodes and mean duration of symptoms were not reported in any of the four studies. 7 (50.0%) woman had occasional (<1/week) while 6 (42.9%) women had frequent (>1/week) urge incontinence symptoms in the pre-operative period.

The primary procedure was retropubic “bottom-up” in 8 (50.0%) women, transobturator “inside out” in 2 (12.5%) of women and intravaginal slingplasty (IVS) in 6 (37.5%) women.
No funding source was reported for this study.

**Evidence profile**

<table>
<thead>
<tr>
<th>No of studies</th>
<th>Relative effects</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient satisfaction</td>
<td>1 (deCuyper et al., 2008)</td>
<td>Mean (SD) satisfaction 9.36 (SD 1.08)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Events (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient satisfaction</td>
</tr>
</tbody>
</table>

**Self-reported rate of absolute reduction in symptoms**

No evidence reported

<table>
<thead>
<tr>
<th>Continence status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (deCuyper et al., 2008)</td>
</tr>
</tbody>
</table>

**Incontinence-specific quality of life**

No evidence reported

<table>
<thead>
<tr>
<th>Adverse effect – Tissue injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>No evidence reported</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Adverse effect – Tape erosion</th>
</tr>
</thead>
<tbody>
<tr>
<td>No evidence reported</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Adverse effects – Urinary retention</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (deCuyper et al., 2008)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Adverse effects – Voiding dysfunction</th>
</tr>
</thead>
<tbody>
<tr>
<td>No evidence reported</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Adverse effects – de novo OAB symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (deCuyper et al., 2008)</td>
</tr>
</tbody>
</table>

**Psychological outcomes**

No evidence reported

<table>
<thead>
<tr>
<th>Clinical outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>No evidence reported</td>
</tr>
</tbody>
</table>

**Evidence statements**

No studies were identified for the following outcomes

- Self-reported rate of absolute symptom reduction
- Incontinence-specific quality of life
- Tissue injury
- Tape erosion
- Voiding dysfunction
- Psychological outcomes
- Clinical outcomes
**Patient satisfaction with treatment**

One study was identified and reported high levels of satisfaction with laparoscopic Burch colposuspension. The evidence was of very low quality.

**Continence status**

One study contributed data to this analysis. The findings did not meet the GDG’s threshold for effectiveness. The evidence was of very low quality.

**Adverse effect – Urinary retention**

One study reported that up to 9% of women suffered from urinary retention following laparoscopic Burch colposuspension after a failed primary tape procedure. The evidence was very low quality.

**Adverse effect – De novo OAB symptoms**

One study reported that up to 9% of women developed de novo OAB symptoms following laparoscopic Burch colposuspension after a failed primary tape procedure. The evidence was very low quality.

**Open Burch colposuspension**

**Description of included studies**

One study (Giarenis 2012) was identified. The mean (SD) age of participants was 55.3 (SD 9.61) years. The mean number of incontinence episodes and mean duration of symptoms were not reported in any of the four studies. 3 (23%) of the women had detrusor overactivity symptoms. The primary procedure was retropubic “bottom-up” in 8 (61%) women and transobturator “inside out” in 5 (39%) of women.

No funding source was reported for this study.

**Evidence profile**

<table>
<thead>
<tr>
<th>Table 8.20 GRADE findings for a Burch Colposuspension</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No of studies</strong></td>
</tr>
<tr>
<td><strong>Patient satisfaction with treatment – using a 0-10 visual analogue scale</strong></td>
</tr>
<tr>
<td>No evidence reported</td>
</tr>
<tr>
<td><strong>Self-reported rate of absolute reduction in symptoms</strong></td>
</tr>
<tr>
<td>No evidence reported</td>
</tr>
<tr>
<td><strong>Continence status (zero episodes per day)</strong></td>
</tr>
<tr>
<td>1 (Giarenis et al., 2012)</td>
</tr>
<tr>
<td><strong>Incontinence-specific quality of life</strong></td>
</tr>
<tr>
<td>No evidence reported</td>
</tr>
<tr>
<td><strong>Adverse effect – Tissue injury</strong></td>
</tr>
<tr>
<td>No evidence reported</td>
</tr>
<tr>
<td><strong>Adverse effect – Tape erosion</strong></td>
</tr>
<tr>
<td>No evidence reported</td>
</tr>
<tr>
<td><strong>Adverse effect – Urinary retention</strong></td>
</tr>
<tr>
<td>No evidence reported</td>
</tr>
<tr>
<td><strong>Adverse effect – Voiding dysfunction</strong></td>
</tr>
<tr>
<td>No evidence reported</td>
</tr>
</tbody>
</table>
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Evidence statements
No studies were identified for the following outcomes

- Patient satisfaction with treatment
- Self-reported rate of absolute symptom reduction
- Incontinence-specific quality of life
- Tissue injury
- Tape erosion
- Urinary retention
- Psychological outcomes
- Clinical outcomes

Continence status
One study contributed data to this analysis. Burch colposuspension was effective at improving continence status. The evidence was of very low quality.

Adverse effect – Voiding dysfunction
One study reported that up to 7% of women suffered from voiding dysfunction following Burch colposuspension after a failed primary tape procedure. The evidence was very low quality.

Adverse effect – De novo OAB symptoms
One study reported that up to 40% of women developed de novo OAB symptoms following open Burch colposuspension after a failed primary tape procedure. The evidence was very low quality.

Bulking agent injection
Description of included studies
One retrospective chart review (Lee 2010) was identified. The median (range) age of participants was 52 (range 44 to 77) years. The mean number of incontinence episodes and mean duration of symptoms were not reported. There were no reported urge incontinence symptoms in the pre-operative period.

The primary tape procedure was TVT in 8 (34.6%) women, TVT-O in 7 (30.4%) of women, IRIS-TOT in 6 (26.1%) of women and anterior IVS in 2 (8.8%) women.

The funding source for this study was not reported.

Evidence profile

Table 8.21 GRADE findings for a bulking agent injection

<table>
<thead>
<tr>
<th>Number of</th>
<th>Number of women</th>
<th>Effect</th>
<th>Quality</th>
</tr>
</thead>
</table>

1 (Giarenis et al., 2012) 7.7% VERY LOW

Adverse effects – de novo OAB symptoms
1 (Giarenis et al., 2012) 40% VERY LOW

Psychological outcomes
No studies identified

Clinical outcomes
No studies identified
<table>
<thead>
<tr>
<th>studies</th>
<th>Comparator</th>
<th>Control</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Patient satisfaction with treatment – using a 0-10 visual analogue scale</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Lee et al., 2010a)</td>
<td>18</td>
<td>23</td>
<td>78.3%</td>
</tr>
<tr>
<td><strong>Incontinence episodes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No evidence reported</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Continence status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Lee et al., 2010a)</td>
<td>8</td>
<td>23</td>
<td>34.6%</td>
</tr>
<tr>
<td><strong>Incontinence-specific quality of life (Better indicated by lower values)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Lee et al., 2010a)</td>
<td>Increased by a mean of 19.2 points (no SD reported)</td>
<td></td>
<td>VERY LOW</td>
</tr>
<tr>
<td><strong>Psychological outcomes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No evidence reported</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Clinical outcomes – Post-void residual volume</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Lee et al., 2010a)</td>
<td>Changed from a mean (SD) of 31.0 (SD 50.7) to 30.8 (SD 41.8)</td>
<td></td>
<td>VERY LOW</td>
</tr>
<tr>
<td><strong>Tissue injury</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No evidence reported</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Erosion rate</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No evidence reported</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Retention</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No evidence reported</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>De novo overactive bladder symptoms</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No evidence reported</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Voiding dysfunction</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No evidence reported</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Evidence statements**

No studies were identified for the following outcomes

- Self-reported rate of absolute symptom reduction
- Tissue injury
- Urinary retention
- Voiding dysfunction
- De novo OAB symptoms
- Psychological outcomes

**Patient satisfaction with treatment**

One study contributed data to this analysis and reported that the injection of bulking agents met the threshold of 60% satisfaction rate. The evidence was of very low quality.
Continence status
One study contributed data to this analysis. The findings did not meet the GDG’s threshold for effectiveness. The evidence was of very low quality.

Incontinence-specific quality of life
One study contributed data to this analysis. The injection of bulking agents resulted in an improvement that met the published minimal important difference (MID) for the scale. The evidence was of low quality.

Clinical outcomes
One study contributed data to this analysis. The injection of bulking agents did not lead to a significant change in post-void residual volume. The evidence was of low quality.

Tape shortening
Description of included studies
Two studies (Han 2012, Lo 2006) met the inclusion criteria for this analysis. The mean age of women ranged from 48.7 (No SD, range 41 to 57) to 53.4 (SD 7.6) years. The mean number of incontinence episodes and mean duration of symptoms were not reported. There were no reported urge incontinence symptoms in the pre-operative period.

The primary tape procedure was retropubic “outside-in” in one study and varied in the second.

The funding source for either study was not reported.

Evidence profile

Table 8.22 GRADE findings for a tape shortening procedure

<table>
<thead>
<tr>
<th>No of studies</th>
<th>Relative effects</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient satisfaction with treatment</td>
<td>No evidence reported</td>
<td></td>
</tr>
<tr>
<td>Self-reported rate of absolute reduction in symptoms</td>
<td>No evidence reported</td>
<td></td>
</tr>
<tr>
<td>Continence status (zero episodes per day)</td>
<td>2 (Han et al., 2012; Lo et al., 2006)</td>
<td>47% to 71%</td>
</tr>
<tr>
<td>Incontinence-specific quality of life</td>
<td>No evidence reported</td>
<td></td>
</tr>
<tr>
<td>Adverse effects – Tissue injury</td>
<td>No evidence reported</td>
<td></td>
</tr>
<tr>
<td>Adverse effects – Urinary retention</td>
<td>No evidence reported</td>
<td></td>
</tr>
<tr>
<td>Adverse effects – Voiding dysfunction</td>
<td>No evidence reported</td>
<td></td>
</tr>
<tr>
<td>Adverse effects de novo OAB symptoms</td>
<td>1 (Han et al., 2012)</td>
<td>15.8%</td>
</tr>
<tr>
<td>Psychological outcomes</td>
<td>No evidence reported</td>
<td></td>
</tr>
</tbody>
</table>
Clinical outcomes

No evidence reported

Evidence statements

No studies were identified for the following outcomes

- Patient satisfaction with treatment
- Self-reported rate of absolute symptom reduction
- Incontinence-specific quality of life
- Tissue injury
- Urinary retention
- Voiding dysfunction
- Psychological outcomes
- Clinical outcomes

Continence status

Two studies contributed data to this analysis. The findings did not meet the GDG’s agreed threshold for effectiveness. The evidence was of very low quality.

Adverse effect – De novo OAB symptoms

One study reported that up to 15% of women developed de novo OAB symptoms following tape shortening after a failed primary tape procedure. The evidence was very low quality

8.5.3 Secondary procedure following complications of primary tape procedure

Re-suturing following erosion

Description of included studies

One case-series (Kuhn et al., 2003) met the inclusion criteria for this analysis. The median (range) age of participants was 52 (range 43 to 79) years. The mean number of incontinence episodes and mean duration of symptoms were not reported. There were no reported urge incontinence symptoms in the pre-operative period.

The primary tape procedure was TVT in all 5 (23.8%) of women, TOT in 6 (28.6%) women, TVT-O in 5 (23.8%) women, SPARC in 4 (19.0%) of women and was not specified in 1 (4.8%) woman.

The funding source for this study was not reported.

Evidence profile

Table 8.23 GRADE findings for a re-suturing following erosion of a primary tape procedure

<table>
<thead>
<tr>
<th>Number of studies</th>
<th>Number of women</th>
<th>Effect</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient satisfaction with treatment</td>
<td>No evidence reported</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-reported rate of absolute reduction in symptoms</td>
<td>No evidence reported</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continence status</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Evidence statements

No studies were identified for the following outcomes

- Patient satisfaction with treatment
- Self-reported rate of absolute symptom reduction
- Incontinence-specific quality of life
- Adverse effects
- Psychological outcomes
- Clinical outcomes

Continence status

One study was identified. The study reported that re-suturing to rectify erosion was effective. The evidence was of very low quality.

Tape adjustment following voiding problems or retention

Description of included studies

Three studies (Agnew et al., 2012; Molden et al., 2010; Schmid et al., 2010) met the inclusion criteria for this analysis. The age ranged from a mean of 57.7 (SD 13.7) to a median (range) of 64 (range 43 to 85) years, however age was not reported in Agnew 2012. The mean number of incontinence episodes and mean duration of symptoms were not reported. There were no reported urge incontinence symptoms in the pre-operative period.

The primary tape procedure was varied in both studies.

The funding source for either study was not reported.

Evidence profile

Table 8.24 GRADE findings for a tape adjustment for voiding problems or retention

<table>
<thead>
<tr>
<th>No of studies</th>
<th>Relative effects</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient satisfaction with treatment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No evidence reported</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-reported rate of absolute reduction in symptoms</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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No evidence reported

### Continence status (zero episodes per day)

<table>
<thead>
<tr>
<th>Study</th>
<th>Percentage</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 (Agnew et al., 2012; Molden et al., 2010; Schmid et al., 2010)</td>
<td>81% to 89%</td>
<td>VERY LOW</td>
</tr>
</tbody>
</table>

### Incontinence-specific quality of life

No evidence reported

### Adverse effects – Tissue injury

No evidence reported

### Adverse effects – Urinary retention

No evidence reported

### Adverse effects – Voiding dysfunction

<table>
<thead>
<tr>
<th>Study</th>
<th>Percentage</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 (Agnew et al., 2012; Molden et al., 2010)</td>
<td>12.7% to 19.1%</td>
<td>VERY LOW</td>
</tr>
</tbody>
</table>

### Adverse effects de novo OAB symptoms

No evidence reported

### Psychological outcomes

No evidence reported

### Clinical outcomes

No evidence reported

---

**Evidence statements**

No studies were identified for the following outcomes:

- Patient satisfaction with treatment
- Self-reported rate of absolute symptom reduction
- Incontinence-specific quality of life
- Tissue injury
- Urinary retention
- De novo OAB symptoms
- Psychological outcomes
- Clinical outcomes

---

**Continence status**

One study was identified. The findings showed that tape adjustment for voiding problems or retention was effective. The evidence was of very low quality.

**Adverse effect – voiding dysfunction**

A review of two studies reported that up to 19% of women suffering from voiding dysfunction following tape revision after a failed primary tape procedure. The evidence was very low quality.

---

**Evidence to recommendations**

**Relative value placed on the outcomes considered**

Patient satisfaction was identified as the primary outcome for measuring success. The GDG noted that the reporting of patient success was varied in the studies identified, furthermore that for some
comparisons no data was found for a validated patient satisfaction measure. Therefore, for the purposes for this review, continence status was considered equally important in measuring successful outcomes.

All of the studies considered within this review were observational studies, case series and chart reviews and no comparison could be identified. Therefore, the GDG judged an intervention a success if the effectiveness of the intervention exceeded a 60% continence status (“absolutely dry”) threshold.

**Consideration of clinical benefits and harms**

Surgical procedures for the treatment for SUI following an unsuccessful period of expectant management) have been shown to be effective (see section 8.3). Despite high success rates for these procedures, a proportion of women will require secondary procedures following unsuccessful initial treatment. For example the most common initial procedure, the mid-urethral tape, has an estimated 5% revision rate of which 2% of women require a secondary surgical procedure.

Only TVT and tape-shortening procedures were effective after a primary procedure had failed. Where a secondary procedure was required due to complications rather than failure, resuturing and tape adjustment were effective. However the evidence was not sufficiently robust to recommend which secondary procedure should be offered following any unsuccessful primary procedure. Furthermore, the GDG could not recommend a procedure after a specific primary procedure failure because of the evidence limitations (see below).

**Consideration of health benefits and resource uses**

The GDG concluded that the cost of the procedures would not differ widely irrespective as they all require similar resources and surgical theatre time. This rationale was based on the similar discussion for primary surgical options, where the costs, time and chance of revision would be similar for the different options.

The GDG considered that the decision to continue treatment would have a wider-reaching health economic impact than the choice of intervention. The considerations of the tertiary MDT should include the risk of the procedure, particularly if it is deemed that the women has had numerous surgeries previously or there is a clinical concern that any subsequent procedures have a reduced chance of success or a carry a potential risk to the woman requiring life-long care. However it was not possible to quantify these differences with the current state of knowledge about the use of these procedures in repeat operations.

**Quality of evidence**

The evidence did not lead to specific recommendations following an unsuccessful treatment. Firstly, the evidence included only low quality observational studies, case series and chart reviews; there were no studies that directly compared two secondary interventions. Secondly, the initial treatment was variable both within specific studies and between studies. Therefore it could not be assumed that the populations and primary interventions reported are sufficiently similar to make comparisons meaningful. In order to allow some conclusions to be drawn, the GDG considered the evidence for secondary interventions together in a single table and not separately by comparator. Therefore the GRADE profiles for the secondary procedures combined data from all comparisons and populations. While this approach did not allow for recommendations to be made for specific primary surgical treatment failure, it did enable the GDG to consider if there were any secondary interventions that were not effective irrespective of primary mid-urethral tape used or population.

**Other considerations**

**Multi-disciplined team**

The role of a multi-disciplined team is integral for managing women throughout their surgical treatment. All women should be reviewed following their treatment as part of a standard audit procedure regardless of the success or failure of the individual patient’s treatment.

In the event of failure or recurrence, the options for the woman should be discussed with her; if the woman makes the informed choice to explore secondary treatment options then a referral to a tertiary separate multi-discipline team with a caseload of more than 20 cases annually, should be made.
The GDG noted that continued treatment is not always acceptable to patients. Should a woman not wish to consider further surgical treatment following initial failure, conservative alternatives should be offered and management advice should be offered instead.

Tertiary specialist multidisciplinary urinary incontinence team

In order to effectively manage women proceeding to secondary treatments for SUI, the discussions about what to offer should take place in a sub-specialist MDT where a greater level of expertise and experience can be utilised. Therefore the GDG decided that the considerations discussed before offering secondary invasive treatments should be made in a separate specialist team in sub-specialist tertiary care. This team would normally consist of similar professionals found in the MDT consulted earlier in the pathway. Due to the added complexity of assessment (such as imaging) and the complexity of surgery, the tertiary team should additionally have a separate urologist and gynaecologist specialist. It is acknowledged however that some of the procedures to be considered may be outside the expertise of special interest urogynaecologists, for example fascial sling procedures. The specialist MDT should have enough experience to assist the patient's choice of treatment appropriately; therefore each team should expect to see a minimum of 20 secondary SUI cases per year to qualify for this role. The centralisation of such cases would also enable robust research into the optimal care for such patients.

Conservative management

There no data found on the effectiveness of conservative management following unsuccessful primary tape procedure. The GDG were therefore unable to recommend offering conservative treatment again and agreed that more research is required. The GDG have therefore, made a research recommend to explore the role of conservative management as an alternative to further invasive treatment following an unsuccessful initial surgical procedure for SUI.

Recommendations

<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>The MDT should review all patients whose invasive SUI procedure has failed. [new 2013]</td>
</tr>
<tr>
<td>101</td>
<td>Women whose primary surgical procedure for SUI has failed and who wish to consider further treatment should:</td>
</tr>
<tr>
<td></td>
<td>- be referred to tertiary care for assessment by a specialised multidisciplinary team, and</td>
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<td></td>
<td>- have repeat urodynamic testing including additional tests such as imaging and urethral function studies. [new 2013]</td>
</tr>
<tr>
<td>102</td>
<td>If a woman does not want continued invasive SUI procedures, offer advice as described in recommendation 50. [new 2013]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number</th>
<th>Research recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>RR17</td>
<td>What is the effectiveness of a repeat procedure following primary tape failure?</td>
</tr>
<tr>
<td>RR18</td>
<td>What is the effectiveness of re-suturing following vaginal tape erosion?</td>
</tr>
<tr>
<td>RR19</td>
<td>Which is the comparative effectiveness of a different procedure following failure of a primary tape, colposuspension and/or bulking agents intervention?</td>
</tr>
<tr>
<td>RR20</td>
<td>What is the efficacy of conservative treatments (including physiotherapy) following primary surgical procedure failure?</td>
</tr>
</tbody>
</table>
9 Competence of surgeons performing operative procedures for urinary incontinence in women

9.1 Introduction
The aim of surgery is to achieve cure of incontinence with minimum morbidity. Surgical outcomes are dependent on numerous factors including careful patient selection, accurate diagnosis and the expertise of the operating team, including in particular the skills of the surgeon. Some procedures for incontinence are technically simple, yet potentially harmful if carried out incompetently or in inappropriate patients. Others are complex and likely to require higher levels of expertise for their effective execution. The GDG were tasked specifically with describing the competence that should be expected of surgeons who are carrying out operations for incontinence in women.

Studies considered for the competence question
Competence of surgeons performing surgical procedures to treat UI or OAB in women were considered within a framework based on existing models of quality assurance, that is, with consideration of inputs (how competence is achieved), process/service (how competence is maintained), and how it is measured (e.g. auditing competence based on quality standards).

Little evidence relevant to the question was identified. Publications from professional or working groups were reviewed for existing guidance relating to competence of surgeons within this therapeutic area. Some volume–outcome data were available from intervention studies, notably of TVT, and from surveys of consultants undertaking continence surgery in the UK. Volume–outcome data relating to any type of surgery was also considered alongside that for continence surgery.

9.2 Achieving competence
Surgeons who perform operations for UI in women should have been properly trained in the specialist area of continence surgery. The route by which surgeons reach this area of practice varies. Specialist training programmes are provided by the Royal College of Obstetricians and Gynaecologists and by the Royal College of Surgeons Specialist Advisory Committee in Urology. The requirements of these training schemes are similar and are summarised as follows.

A surgeon should be knowledgeable in the anatomy, physiology and pathophysiology of female lower urinary tract and UI before undertaking surgery in this area.

He/she should possess the following generic skills related to surgery. The knowledge and generic skills described are necessary to ensure that the patient is given sufficient information on the options available to make an informed choice.
Knowledge:
- specific indications for surgery
- required preparation for surgery including preoperative investigations
- outcomes and complications of proposed procedure
- anatomy relevant to procedure
- steps involved in procedure
- alternative management options
- likely postoperative progress.

Other generic skills:
- be able to explain procedures and possible outcomes to patients and family and to obtain informed consent
- possess the necessary hand–eye dexterity to complete the procedure safely and efficiently, with appropriate use of assistance
- be able to communicate with and manage the operative team effectively
- be able to prioritise interventions.

Attitude:
- be able to recognise when to ask for advice from others
- demonstrate commitment to multidisciplinary team working with other health professionals involved in the care of women with UI.

A surgeon is expected to be able to perform an operation without supervision and be able to deal with the complications of that operation before he/she can be considered competent to perform it. The procedure should form part of his/her routine practice.

Existing surgeons should be able to demonstrate that their training, experience and current practice equates to the standards laid out for newly trained surgeons. They should work within the context of an integrated continence service, as recommended in the Department of Health’s *Good Practice in Continence Services* (2000).

Some aspects of continence surgery are likely to require a higher level of training than other procedures, which applies particularly to secondary surgical procedures. These procedures should be carried out in centres that are able to maintain their expertise and achieve good outcome for their patients, e.g., artificial urinary sphincter, urinary diversion, sacral nerve stimulation, augmentation cystoplasty and complex stress incontinence surgery.

9.3 Maintaining and measuring expertise and standards for practice

Surgeons undertaking continence surgery should be aware of and follow best practice in the management of UI, as laid out in this guideline. Surgeons should conform to standards of good medical practice (General Medical Council) and good surgical practice (Royal College of Surgeons). They should also conform to the standards of good practice as laid out by the British Association of Urological Surgeons Section of Female and Reconstructive Urology (BAUS-SFRU) and the British Society of Urogynaecology (BSUG), namely:
- Surgeons should participate in local and national audit.
- If a surgeon undertakes any new class of procedure for which he/she does not have appropriate training then he/she should seek formal training through a process of mentoring. This includes appropriate training of the surgical team.
Before undertaking new procedures surgeons must notify their trust’s clinical governance committee.

Before utilising new materials or devices in previously established procedures, the trust’s clinical governance committee should be informed.

Any intention to undertake an evaluation of a new procedure should be registered with a relevant clinical trials database.

The development of new techniques or modifications of established techniques should receive appropriate local ethical and clinical governance approval. New techniques are defined by NICE (Department of Health Health Services Circular 2003/011, 13/11/03) as one where ‘a doctor no longer in a training post is using it for the first time in his or her NHS clinical practice’.

A surgeon who encounters a serious adverse event related to the use of a device or implant, in the treatment of incontinence, should notify the MHRA through its Serious Adverse Event (SAE) reporting process.

New procedures/classes of procedure should be notified to the Interventional Procedures Programme at NICE through the NICE website.

Measuring competence

For established surgeons, the best way to measure continuing competence is through comparative audit. All surgeons should have access to information about their personal results for continence surgery. This should include data on perioperative complications and long-term outcomes. They should also be able to compare those outcomes with the experience of others through national audit.

Examples of this include the databases set up by BSUG and BAUS-SFRU. Both systems offer the facility for surgeons to record every operation they do for incontinence, and are freely available for members of those organisations, although neither is well utilised at present.

Volume–outcome research

The necessary surgical volume of any operation required to maintain competence is inadequately defined. The volume–outcome relationship has been considered in many clinical areas, such as cardiology, gastroenterology, orthopaedics, ophthalmology and breast cancer surgery, but little evaluation has been undertaken in relation to continence surgery. In systematic reviews of this research, many methodological concerns have been raised over what is considered to be a heterogeneous body of research, consisting of observational studies. Most studies retrospectively analyse routinely collected data and are not designed to analyse the complex volume–outcome relationship, which leads to many problems when interpreting the data, namely:

- inadequate consideration of confounders such as the effects of differences in case-mix and appropriateness of case selection on outcomes
- volume can relate to hospital or surgeon
- narrow outcomes are used in most studies, usually adverse (e.g. inpatient or 30 day mortality)
- thresholds for, or definitions of, high and low volume across and within procedures differ
- causality – it is unclear whether high volume–improved outcome relationships result from greater experience or whether the highest referral rate tends to be to those surgeons or centres who have the best results.

Hospital volume and surgeon volume may both be important, and the relative importance may vary from one procedure to another. For some procedures, such as trauma-related reconstruction, it may be the total amount of relevant surgery that is most important rather than the specific number of particular procedures. Complexity of procedures and whether their use is commonplace also influences whether a difference in outcomes can be seen for a given volume.

Although the evidence tends to suggest that higher volume is associated with better outcomes, the consistency and size of the effect varies for different procedures. A systematic review of 135 studies...
found a significant association between higher volume (hospital or surgeon) and better outcomes in about 70% of studies; none of the studies found a significant association between higher volume of any type of surgery and poorer outcome.\textsuperscript{922} In these studies, the definition of low or high volume varied according to the procedure, with median low volumes of up to 100–200 for coronary angioplasty or coronary artery bypass graft surgery; and median low volume values ranging from 1 to 73 for other procedures described (mainly in the region of 10–30).\textsuperscript{922}

Secondary surgery is unusual and can be technically challenging, and a centralisation argument probably applies. The centralisation argument holds that ‘practice makes perfect’ so concentration of cases into one centre that can carry out larger numbers of procedures will result in higher standards, not just in surgical technique, but also postoperative care.

Evidence for the effects of volume or hospital status on outcome of continence surgery

A few studies have reported the outcomes of continence surgery according to the volume of surgery undertaken. With the methodological issues relating to such studies in mind, the findings are described below.

A UK cohort study attempted to identify risk factors predictive of successful outcome 1 year after surgery for stress UI (colposuspension, anterior colporrhaphy or needle suspension). The outcomes considered were complications, symptom severity index, symptom impact index and activities of daily living. The number of cases performed by surgeons per year (20–42 versus 1–19) was not found to be associated with risk of a better or worse outcome \((n = 232).\textsuperscript{125,126} [EL = 2+]

Some information on volume–outcomes is available for TVT. One case series considered the cure rates for each of the ten surgeons who undertook the TVT procedure, which ranged from 72% to 92% and were not significantly associated with the number of procedures performed (11–250 per surgeon).\textsuperscript{812} From the Finnish national data on TVT, it was estimated that the incidence of complications was 40% in hospitals where 15 or fewer operations had been undertaken, and about 14% in centres performing more than 15 operations.\textsuperscript{813} [EL = 3]

Subgroup analysis of some aspects of the UK TVT/colposuspension RCT\textsuperscript{659,660} was undertaken, including volume–outcome and recruitment numbers, although the study was not powered to do so.\textsuperscript{922} It is difficult to put the numbers into context because those cases represent only a proportion of the continence surgery undertaken in those centres. Objective cure rates were higher for centres recruiting most patients; the categories analysed being more than 30 patients, 21–30, or fewer than 20. While it must be conceded that the effect of drop-outs on an intention-to-treat analysis is greater on units recruiting small numbers of patients, it may nevertheless be the case that there is a minimum workload consistent with optimal surgical outcome.

Other studies reflected on the learning curve with the TVT procedure. Three studies observed that the complication rate,\textsuperscript{744,775,804} or specifically bladder injury,\textsuperscript{825} was relatively higher during the surgeon’s learning curve, the threshold/definition for which differed across the studies, from the first 5, 10–20, 50 or 100 procedures.

A survey of consultants performing continence surgery in the UK in 2001 was carried out in order to establish the type and volume of surgery undertaken, the nature of postoperative complications, investigations, and follow-up \((n = 578; 54\% \text{ response rate}). The profile of respondents was general gynaecologists (40\%), gynaecologists with a special interest in urogynaecology (31\%), urologists (25\%), subspecialist urogynaecologists (3\%), with 2\% not classified. Half the respondents stated that fewer than 50 procedures per year were adequate for good surgical results, whereas the other half considered that more than 50 procedures a year were necessary. The majority specialty view was 10–20 procedures per year (61\% general gynaecologists and 59\% urologists), or 20–50 per procedures per year (68\% urogynaecology subspecialists and 61\% gynaecologists with a special interest).\textsuperscript{923} [EL = 3]

The results for the TVT device (7336 procedures) were also reported separately by the same authors, the survey participants being identified by the manufacturers of the device. Overall, 44\% performed between one and ten TVT operations in the year evaluated (2001), and 28\% performed over 25 during that year. Performing 10–20 cases of TVT under supervision was considered by 46\% of surgeons in this survey to constitute adequate training, and 43\% suggested that 20–50 cases of TVT are required to gain competence.\textsuperscript{817} [EL = 3]
Hospital status

There is some conflicting evidence that outcomes relate in part to the training status of the institution in which they are performed. In the USA, teaching centres have been shown to have higher 30-day morbidity (predominantly wound complications) across a range of specialties (general surgery, orthopaedics, urology, and vascular surgery) than non-teaching centres. Mortality was not significantly different between centres for any of the seven specialties evaluated.\textsuperscript{92} [EL = 2+]

Two studies considered outcome of continence surgery by hospital status (teaching versus nonteaching); exactly what is meant by ‘teaching’ hospitals is not clear. The risk of having complications from continence surgery was not significantly associated with hospital status in a UK cohort study (on multivariate analysis).\textsuperscript{105,106} [EL = 2+] A case series of TVT reported that the risk of postoperative complications with TVT was higher when undertaken in teaching hospitals than in non-teaching hospitals (24% versus 16%; OR 0.55, 95% CI 0.35 to 0.85) \textit{(n = 809)}.\textsuperscript{804} [EL = 3] While the studies report these observations, they do not explain the possible causes of the results seen. This may relate to overall case load, case mix (i.e. number of complex or secondary cases) or the impact of training on outcomes.

Evidence statements for competence of surgeons

There are limited data regarding the number of procedures required to learn any particular operation used in the management of urinary incontinence. There is similarly little evidence on annual workload required to maintain skills, optimise outcome and minimise morbidity. [EL = 4] From a survey of consultants performing continence surgery in the UK, the majority specialty view was that either 10–20 or 20–50 procedures per year are adequate for good surgical results. [EL = 3]

From evidence to recommendations

The GDG drew on the requirements for training schemes in gynaecology and urology in the UK to develop recommendations for training standards. The BAUS-SFRU and BSUG are currently developing training schemes and structured assessment methods specific for those undertaking continence surgery.

Cystourethroscopy is considered an integral part of several procedures used in the treatment of UI. Training in this technique is therefore deemed crucial to surgical competence in this area.

In relation to maintaining competence, the GDG agreed by consensus that a workload of 20 cases per procedure per annum was an appropriate volume, which was also supported by the survey of UK consultants. A volume of cases per procedure was recommended because a workload in one procedure does not necessarily maintain skills for other procedures. The minimum volume recommended was also agreed by GDG consensus.

Audit is an integral part of clinical governance. Regular audit of outcomes of continence surgery is considered essential to maintaining standards of practice.

<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendation</th>
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<tbody>
<tr>
<td>103</td>
<td>Surgery for UI should be undertaken only by surgeons who have received appropriate training in the management of UI and associated disorders or who work within a multidisciplinary team with this training, and who regularly carry out surgery for UI in women \textit{(see recommendation 90)}. [2006]</td>
</tr>
</tbody>
</table>
| 104    | Training should be sufficient to develop the knowledge and generic skills documented below. Knowledge should include the:  
  - specific indications for surgery  
  - required preparation for surgery including preoperative investigations  
  - outcomes and complications of proposed procedure  
  - anatomy relevant to procedure  
  - steps involved in procedure  
  - alternative management options  
  - likely postoperative progress. |
Generic skills should include:

- the ability to explain procedures and possible outcomes to patients and family and to obtain informed consent
- the necessary hand–eye dexterity to complete the procedure safely and efficiently, with appropriate use of assistance
- the ability to communicate with and manage the operative team effectively
- the ability to prioritise interventions
- the ability to recognise when to ask for advice from others
- a commitment to multidisciplinary team working. [2006]

105 Training should include competence in cystourethroscopy. [2006]

106 Operative competence of surgeons undertaking surgical procedures to treat UI or OAB in women should be formally assessed by trainers through a structured process. [2006]

107 Surgeons who are already carrying out procedures for UI should be able to demonstrate that their training, experience and current practice equates to the standards laid out for newly trained surgeons. [2006]

108 Surgery for UI or OAB in women should be undertaken only by surgeons who carry out a sufficient case load to maintain their skills. An annual workload of at least 20 cases of each primary procedure for stress UI is recommended. Surgeons undertaking fewer than five cases of any procedure annually should do so only with the support of their clinical governance committee; otherwise referral pathways should be in place within clinical networks. [2006]

109 There should be a nominated clinical lead within each surgical unit with responsibility for continence and prolapse surgery. The clinical lead should work within the context of an integrated continence service. [2006]

110 A national audit of continence surgery should be undertaken. [2006]

111 Surgeons undertaking continence surgery should maintain careful audit data and submit their outcomes to national registries such as those held by the British Society of Urogynaecology (BSUG) and British Association of Urological Surgeons Section of Female and Reconstructive Urology (BAUS-SFRU). [2006]
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2013 Update

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11 **Abbreviations and glossary**

### 11.1 Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ADL</td>
<td>activities of daily living</td>
</tr>
<tr>
<td>AE</td>
<td>adverse effects</td>
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<tr>
<td>AFR</td>
<td>acceleration of flow rate</td>
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<tr>
<td>ALPP</td>
<td>abdominal leak point pressure</td>
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<tr>
<td>AM</td>
<td>ambulatory monitoring</td>
</tr>
<tr>
<td>AUS</td>
<td>artificial urinary sphincter</td>
</tr>
<tr>
<td>BAUS–SFRU</td>
<td>British Association of Urological Surgeons Section of Female and Reconstructive Urology</td>
</tr>
<tr>
<td>b.d.</td>
<td>to be taken twice a day (bis die)</td>
</tr>
<tr>
<td>BFLUTS</td>
<td>Bristol Female Urinary Tract Symptoms (questionnaire)</td>
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<tr>
<td>BMI</td>
<td>body mass index</td>
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<tr>
<td>BNF</td>
<td>British National Formulary</td>
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<tr>
<td>BOA</td>
<td>basic office assessment</td>
</tr>
<tr>
<td>BSUG</td>
<td>British Society of Urogynaecology</td>
</tr>
<tr>
<td>CEE</td>
<td>conjugated equine oestrogens</td>
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<tr>
<td>CI</td>
<td>confidence interval</td>
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<tr>
<td>CISC</td>
<td>clean intermittent self-catheterisation</td>
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<tr>
<td>CNS</td>
<td>central nervous system</td>
</tr>
<tr>
<td>CT</td>
<td>computed tomography</td>
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<tr>
<td>DB</td>
<td>double-blind</td>
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<tr>
<td>DO</td>
<td>detrusor overactivity</td>
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<tr>
<td>DS</td>
<td>diagnostic study</td>
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<tr>
<td>EL</td>
<td>evidence level (level of evidence)</td>
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<tr>
<td>EMG</td>
<td>electromyography</td>
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<tr>
<td>ER</td>
<td>extended release</td>
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<tr>
<td>ES</td>
<td>electrical stimulation</td>
</tr>
<tr>
<td>FB</td>
<td>Fluid-Bridge</td>
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<tr>
<td>GA</td>
<td>general anaesthesia</td>
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<tr>
<td>GDG</td>
<td>Guideline Development Group</td>
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<tr>
<td>GP</td>
<td>general practitioner</td>
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<tr>
<td>Abbreviation</td>
<td>Full Form</td>
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<tr>
<td>GPP</td>
<td>good practice point</td>
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<tr>
<td>HRT</td>
<td>hormone replacement therapy</td>
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<tr>
<td>HTA</td>
<td>health technology assessment</td>
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<tr>
<td>ICER</td>
<td>incremental cost effectiveness ratio</td>
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<tr>
<td>ICI</td>
<td>International Consultation on Incontinence</td>
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<tr>
<td>ICIQ</td>
<td>International Consultation on Incontinence questionnaire</td>
</tr>
<tr>
<td>ICS</td>
<td>International Continence Society</td>
</tr>
<tr>
<td>IIQ</td>
<td>incontinence impact questionnaire</td>
</tr>
<tr>
<td>IP</td>
<td>Interventional Procedures (see IPAC)</td>
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<tr>
<td>IPAC</td>
<td>Interventional Procedures Advisory Committee (of NICE)</td>
</tr>
<tr>
<td>I-QOL</td>
<td>incontinence quality of life (questionnaire)</td>
</tr>
<tr>
<td>IQR</td>
<td>interquartile range</td>
</tr>
<tr>
<td>IR</td>
<td>Immediate release</td>
</tr>
<tr>
<td>ISC</td>
<td>intermittent self-catheterisation</td>
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<tr>
<td>ISD</td>
<td>intrinsic sphincter deficiency</td>
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<tr>
<td>ISI</td>
<td>incontinence severity index</td>
</tr>
<tr>
<td>ITT</td>
<td>intention-to-treat analysis</td>
</tr>
<tr>
<td>IVS</td>
<td>intravaginal slingplasty</td>
</tr>
<tr>
<td>KHQ</td>
<td>King’s Health Questionnaire</td>
</tr>
<tr>
<td>LA</td>
<td>local anaesthesia</td>
</tr>
<tr>
<td>LOCF</td>
<td>last observation carried forward</td>
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<tr>
<td>LPP</td>
<td>leak point pressure</td>
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<tr>
<td>LUTS</td>
<td>lower urinary tract symptoms</td>
</tr>
<tr>
<td>MC</td>
<td>multichannel (cystometry)</td>
</tr>
<tr>
<td>MHRA</td>
<td>Medicines and Healthcare products Regulatory Agency</td>
</tr>
<tr>
<td>MMK</td>
<td>Marshall–Marchetti–Krantz</td>
</tr>
<tr>
<td>MMSE</td>
<td>Mini Mental State Examination</td>
</tr>
<tr>
<td>MPA</td>
<td>medroxyprogesterone acetate</td>
</tr>
<tr>
<td>MRI</td>
<td>magnetic resonance imaging</td>
</tr>
<tr>
<td>MUCP</td>
<td>maximum urethral closure pressure</td>
</tr>
<tr>
<td>MUI</td>
<td>mixed urinary incontinence</td>
</tr>
<tr>
<td>n</td>
<td>number of patients</td>
</tr>
<tr>
<td>NA</td>
<td>not applicable</td>
</tr>
<tr>
<td>NCC-WCH</td>
<td>National Collaborating Centre for Women’s and Children’s Health</td>
</tr>
<tr>
<td>NHS</td>
<td>National Health Service</td>
</tr>
<tr>
<td>NICE</td>
<td>National Institute for Health and Clinical Excellence</td>
</tr>
<tr>
<td>NPV</td>
<td>negative predictive value</td>
</tr>
<tr>
<td>NS</td>
<td>not statistically significant</td>
</tr>
</tbody>
</table>
OAB  overactive bladder
OAB-q  overactive bladder questionnaire
o.d.  to be taken once daily
OR  odds ratio
PCT  primary care trust
PFMT  pelvic floor muscle training
PFM  pelvic floor muscle
PGI-I  patients global impression of improvement
PNE  percutaneous nerve evaluation
POP  pelvic organ prolapse
POP-Q  pelvic organ prolapse quantification system
PPIP  Patient and Public Involvement Programme
PPV  positive predictive value
PTFE  polytetrafluoroethylene
PTNS  posterior tibial nerve stimulation
PTR  pressure transmission ratio
PVR  post void residual
pt(s)  patient(s)
QALY  quality-adjusted life year
q.d.s.  to be taken four times a day (quarter die sumendus)
QOL  quality of life
r  correlation coefficient
RCT  randomised controlled trial
RR  relative risk
SA  spinal anaesthesia
SB  single-blind
SD  standard deviation
SE  standard error
SF-36  Short form 36
SIGN  Scottish Intercollegiate Guidelines Network
SII  symptom impact index
SNS  sacral nerve stimulation
SPARC  suprapubic arc sling
SSI  symptom severity index
SUI  stress urinary incontinence
SUIQQ  stress and urge incontinence quality of life questionnaire
t.d.s.  to be taken three times a day (ter die sumendus)
TENS  transcutaneous electrical nerve stimulation
11.2 Glossary

Acute trust
A trust is an NHS organisation responsible for providing a group of healthcare services. An acute trust provides hospital services (but not mental health hospital services which are provided by a mental health trust).

Afferent nerve
Nerve carrying sensory nerve impulses from a peripheral receptor towards the central nervous system.

Anterior colporrhaphy
Vaginal operation for the treatment of cystocele (anterior vaginal wall prolapse). Involves plication of the fascia between vaginal and bladder walls. With the addition of plication of the fascia beneath the urethra, it has commonly been used for treatment of stress incontinence. Can be used as an additional procedure for prolapse repair along with a continence procedure.

Antimuscarinic drugs
Class of pharmacological agents acting on neuromuscular junctions in the autonomic nervous system, used for overactive bladder syndrome.

Applicability
The extent to which the results of a study or review can be applied to the target population for a clinical guideline.

Appraisal of evidence
Formal assessment of the quality of research evidence and its relevance to the clinical question or guideline under consideration, according to predetermined criteria.

Best available evidence
The strongest research evidence available to support a particular guideline recommendation.

Bias
Influences on a study that can lead to invalid conclusions about a treatment or intervention. Bias in research can make a treatment look better or worse than it really is. Bias can even make it look as if the treatment works when it actually does not. Bias can occur by chance or as a result of systematic errors in the design and execution of a study. Bias can occur at various stages in the research process, e.g. in the collection, analysis, interpretation, publication or review of research data. For examples, see selection bias, performance bias, information bias, confounder or confounding factor, publication bias.
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Bimanual examination</td>
<td>Vaginal examination carried out using the examiner’s fingers of one hand in the vagina and of the other hand on the abdomen. Allows the description of observed and palpable anatomical abnormalities and the assessment of pelvic floor muscle function.</td>
</tr>
<tr>
<td>Biofeedback</td>
<td>The technique by which information about a normally unconscious physiological process is presented to the patient and/or the therapist as a visual, auditory or tactile signal.</td>
</tr>
<tr>
<td>Bladder diary</td>
<td>A diary that records voiding times and voided volumes, leakage episodes, pad usage and other information such as fluid intake, degree of urgency, and degree of incontinence. See also frequency–volume chart.</td>
</tr>
<tr>
<td>Bladder pain</td>
<td>Pain felt suprapubically or retropubically, and usually increases with bladder filling, and may persist after voiding.</td>
</tr>
<tr>
<td>Bladder training</td>
<td>Bladder training (also described as bladder retraining, bladder drill, bladder re-education, bladder discipline) actively involves the individual in attempting to increase the interval between the desire to void and the actual void.</td>
</tr>
<tr>
<td>Blinding or masking</td>
<td>The practice of keeping the investigators or subjects of a study ignorant of the group to which a subject has been assigned. For example, a clinical trial in which the participating patients or their doctors are unaware of whether they (the patients) are taking the experimental drug or a placebo (dummy treatment). The purpose of ‘blinding’ or ‘masking’ is to protect against bias. See also double-blind (DB) study, single-blind study.</td>
</tr>
<tr>
<td>Body mass index (BMI)</td>
<td>A person’s weight in kilograms divided by the square of their height in metres. Overweight is defined as a BMI of 25 or more, and obese as 30 or more.</td>
</tr>
<tr>
<td>Case–control study</td>
<td>A study that starts with the identification of a group of individuals sharing the same characteristics (e.g. people with a particular disease) and a suitable comparison (control) group (e.g. people without the disease). All subjects are then assessed with respect to things that happened to them in the past, e.g. things that might be related to getting the disease under investigation. Such studies are also called retrospective as they look back in time from the outcome to the possible causes.</td>
</tr>
<tr>
<td>Case report (or case study)</td>
<td>Detailed report on one patient (or case), usually covering the course of that person’s disease and their response to treatment.</td>
</tr>
<tr>
<td>Case series</td>
<td>Description of several cases of a given disease, usually covering the course of the disease and the response to treatment. There is no comparison (control) group of patients.</td>
</tr>
<tr>
<td>Causal relationship</td>
<td>Describes the relationship between two variables whenever it can be established that one causes the other. For example there is a causal relationship between a treatment and a disease if it can be shown that the treatment changes the course or outcome of the disease. Usually randomised controlled trials are needed to ascertain causality. Proving cause and effect is much more difficult than just showing an association between two variables. For example, if it happened that everyone who had eaten a particular food became sick, and everyone who avoided that food remained well, then the food would clearly be associated with the sickness. However, even if leftovers were found to be contaminated, it could not be proved that the food caused the sickness – unless all other possible causes (e.g. environmental factors) had been ruled out.</td>
</tr>
<tr>
<td>Clinical audit</td>
<td>A systematic process for setting and monitoring standards of clinical care. Whereas ‘guidelines’ define what the best clinical practice should be, ‘audit’ investigates whether best practice is being carried out. Clinical audit can be described as a cycle or spiral. Within the cycle there are stages that follow a systematic process of establishing best practice, measuring care against...</td>
</tr>
</tbody>
</table>
specific criteria, taking action to improve care, and monitoring to sustain improvement. The spiral suggests that as the process continues, each cycle aspires to a higher level of quality.

**Clinical effectiveness**
The extent to which a specific treatment or intervention, when used under *usual or everyday conditions*, has a beneficial effect on the course or outcome of disease compared with no treatment or other routine care. (Clinical trials that assess effectiveness are sometimes called management trials.) Clinical ‘effectiveness’ is not the same as efficacy.

**Clinical governance**
A framework through which NHS organisations are accountable for both continuously improving the quality of their services and safeguarding high standards of care by creating an environment in which excellence in clinical care will flourish.

**Clinical impact**
The effect that a guideline recommendation is likely to have on the treatment, or treatment outcomes, of the target population.

**Clinical importance**
The importance of a particular guideline recommendation to the clinical management of the target population.

**Clinical question**
This term is sometimes used in guideline development work to refer to the questions about treatment and care that are formulated in order to guide the search for research evidence. When a clinical question is formulated in a precise way, it is called a focused question.

**Clinical trial**
A research study conducted with patients which tests out a drug or other intervention to assess its effectiveness and safety. Each trial is designed to answer scientific questions and to find better ways to treat individuals with a specific disease. This general term encompasses controlled clinical trials and randomised controlled trials.

**Clinician**
A healthcare professional providing patient care, e.g. doctor, nurse, physiotherapist.

**Cluster**
A group of patients, rather than an individual, used as the basic unit for investigation. See also cluster design and cluster randomisation.

**Cluster design**
Cluster designs are those where research subjects are not sampled or selected independently, but in a group. For example a clinical trial where patients in a general practice are allocated to the same intervention; the general practice forming a cluster. See also cluster and cluster randomisation.

**Cluster randomisation**
A study in which groups of individuals (e.g. patients in a GP surgery or on a hospital ward) are randomly allocated to treatment groups. Take, for example, a smoking cessation study of two different interventions – leaflets and teaching sessions. Each GP surgery within the study would be randomly allocated to administer one of the two interventions. See also cluster and cluster design.

**Cochrane Collaboration**
An international organisation in which people find, appraise and review specific types of studies called randomised controlled trials. The Cochrane Database of Systematic Reviews contains regularly updated reviews on a variety of health issues and is available electronically as part of the Cochrane Library.

**Cochrane Library**
The Cochrane Library consists of a regularly updated collection of evidence-based medicine databases including the Cochrane Database of Systematic Reviews (reviews of randomised controlled trials prepared by the Cochrane Collaboration). The Cochrane Library is available on CD-ROM and the internet.

**Cohort**
A group of people sharing some common characteristic (e.g. patients with the same disease), followed up in a research study for a specified period of time.

**Cohort study**
An observational study that takes a group (cohort) of patients and follows their progress over time in order to measure outcomes such as disease or mortality rates and make comparisons according to the treatments or interventions that
patients received. Thus, within the study group, subgroups of patients are identified (from information collected about patients) and these groups are compared with respect to outcome, e.g. comparing mortality between one group that received a specific treatment and one group that did not (or between two groups that received different levels of treatment). Cohorts can be assembled in the present and followed into the future (a ‘concurrent’ or ‘prospective’ cohort study) or identified from past records and followed forward from that time up to the present (a ‘historical’ or ‘retrospective’ cohort study). Because patients are not randomly allocated to subgroups, these subgroups may be quite different in their characteristics and some adjustment must be made when analysing the results to ensure that the comparison between groups is as fair as possible.

Co-morbidity

Co-existence of a disease or diseases in the people being studied in addition to the health problem that is the subject of the study.

Confidence interval (CI)

A way of expressing certainty about the findings from a study or group of studies, using statistical techniques. A confidence interval describes a range of possible effects (of a treatment or intervention) that are consistent with the results of a study or group of studies. A wide confidence interval indicates a lack of certainty or precision about the true size of the clinical effect and is seen in studies with too few patients. Where confidence intervals are narrow they indicate more precise estimates of effects and a larger sample of patients studied. It is usual to interpret a ‘95%’ confidence interval as the range of effects within which we are 95% confident that the true effect lies.

Confounder or confounding factor

Something that influences a study and can contribute to misleading findings if it is not understood or appropriately dealt with. For example, if a group of people exercising regularly and a group of people who do not exercise have an important age difference then any difference found in outcomes about heart disease could well be due to one group being older than the other rather than due to the exercising. Age is the confounding factor here and the effect of exercising on heart disease cannot be assessed without adjusting for age differences in some way.

Consensus methods

A variety of techniques that aim to reach an agreement on a particular issue. Formal consensus methods include Delphi and nominal group techniques. In the development of clinical guidelines, consensus methods may be used where there is a lack of strong research evidence on a particular topic.

Consensus statement

A statement of the advised course of action in relation to a particular clinical topic, based on the collective views of a body of experts.

Considered judgement

The application of the collective knowledge of a guideline development group to a body of evidence, to assess its applicability to the target population and the strength of any recommendation that it would support.

Consistency

The extent to which the conclusions of a collection of studies used to support a guideline recommendation are in agreement with each other. See also homogeneity.

Conservative management

Treatment or management strategies that do not involve surgery.

Control group

A group of patients recruited into a study that receives no treatment, a treatment of known effect, or a placebo (dummy or sham treatment), in order to provide a comparison for a group receiving an experimental treatment, such as a new drug.

Controlled clinical trial

A study testing a specific drug or other treatment involving two (or more) groups of patients with the same disease. One (the experimental group) receives the treatment that is being tested, and the other (the comparison or control group) receives an alternative treatment, a placebo (dummy treatment) or no treatment. The two groups are followed up to compare differences in
outcomes to see how effective the experimental treatment was. A controlled clinical trial where patients are randomly allocated to treatment and comparison groups is called a randomised controlled trial.

**Correlation coefficient**
A measure of the degree of linear association between two variables. A significant association does not imply causation.

**Cost–benefit analysis**
A type of economic evaluation where both costs and benefits of healthcare treatment are measured in the same monetary units. If benefits exceed costs, the evaluation would recommend providing the treatment.

**Cost–consequence analysis**
A limited form of economic evaluation that considers costs alongside consequences (or outcomes) without calculating an incremental cost effectiveness ratio.

**Cost effectiveness**
Value for money. A specific healthcare treatment is said to be ‘cost effective’ if it gives a greater health gain than could be achieved by using the resources in other ways.

**Cost effectiveness analysis**
A type of economic evaluation comparing the costs and the effects on health of different treatments. Health effects are measured in ‘healthrelated units’, for example, the cost of preventing one additional heart attack.

**Cost–utility analysis**
A special form of cost effectiveness analysis where health effects are measured in quality-adjusted life years. A treatment is assessed in terms of its ability to both extend life and to improve the quality of life.

**Crossover study design**
A study comparing two or more interventions in which the participants, upon completion of the course of one treatment, are switched to another. For example, for a comparison of treatments A and B, half the participants are randomly allocated to receive them in the order A, B and half to receive them in the order B, A. A problem with this study design is that the effects of the first treatment may carry over into the period when the second is given. Therefore a crossover study should include an adequate ‘wash-out’ period, which means allowing sufficient time between stopping one treatment and starting another so that the first treatment has time to wash out of the patient’s system.

**Cross-sectional study**
The observation of a defined set of people at a single point in time or time period – a snapshot. (This type of study contrasts with a longitudinal study, which follows a set of people over a period of time.)

**Cystocele**
Herniation (protrusion) of the bladder through the wall of the vagina.

**Cystometric (bladder) capacity**
Bladder volume at the end of the filling phase of cystometry.

**Cystometry**
Cystometry is the measurement of intravesical pressure that can be carried out through a single recording channel (simple cystometry) or, more commonly, by multichannel cystometry, which involves the synchronous measurement of both bladder and intra-abdominal pressures by means of catheters inserted into the bladder and the rectum or vagina. The aim is to replicate the patient’s symptoms by filling the bladder and observing pressure changes or leakage caused by provocation tests. See also urodynamics.

**Data set**
A list of required information relating to a specific disease.

**Decision analysis**
Decision analysis is the study of how people make decisions or how they should make decisions. There are several methods that decision analysts use to help people to make better decisions, including decision trees.

**Decision tree**
A decision tree is a method for helping people to make better decisions in situations of uncertainty. It illustrates the decision as a succession of possible actions and outcomes. It consists of the probabilities, costs and health consequences associated with each option. The overall effectiveness or overall
cost effectiveness of various actions can then be compared.

**Declaration of interest**
A process by which members of a working group or committee ‘declare’ any personal or professional involvement with a company (or related to a technology) that might affect their objectivity, e.g. if their position or department is funded by a pharmaceutical company.

**Delphi method**
A technique used for the purpose of reaching an agreement on a particular issue, without the participants meeting or interacting directly. It involves sending participants a series of postal questionnaires asking them to record their views. After the first questionnaire, participants are asked to give further views in the light of the group feedback. The judgements of the participants are statistically aggregated, sometimes after weighting for expertise. See also consensus methods.

**De novo**
New onset.

**Detrusor overactivity (DO)**
An urodynamic observation characterised by involuntary detrusor contractions during the filling phase of cystometry that may be spontaneous or provoked. See also urodynamics.

**Diagnostic study**
A study to assess the effectiveness of a test or measurement in terms of its ability to accurately detect or exclude a specific disease.

**Dominance**
A term used in health economics describing when an option for treatment is both less clinically effective and more costly than an alternative option. The less effective and more costly option is said to be ‘dominated’.

**Double-blind (DB) study**
A study in which neither the subject (patient) nor the observer (investigator/clinician) is aware of which treatment or intervention the subject is receiving. The purpose of blinding is to protect against bias.

**Economic evaluation**
A comparison of alternative courses of action in terms of both their costs and consequences. In health economic evaluations the consequences should include health outcomes.

**Effectiveness**
See clinical effectiveness.

**Efferent nerve**
Nerve carrying motor impulses from the central nervous system to a peripheral effector.

**Efficacy**
The extent to which a specific treatment or intervention, under *ideally controlled conditions* (e.g. in a laboratory), has a beneficial effect on the course or outcome of disease compared with no treatment or other routine care.

**Elective**
Name for clinical procedures that are regarded as advantageous to the patient but not urgent.

**Electrical stimulation**
The application of electrical current to stimulate the pelvic viscera or their nerve supply.

**Electromyography (EMG)**
Recording of neuromuscular function from an electrode within or in proximity to a muscle. Feedback tool for pelvic floor muscle recruitment.

**Empirical**
Based directly on experience (observation or experiment) rather than on reasoning alone.

**Epidemiology**
Study of diseases within a population, covering the causes and means of prevention.

**Evidence based**
The process of systematically finding, appraising and using research findings as the basis for clinical decisions.

**Evidence-based clinical practice**
Evidence-based clinical practice involves making decisions about the care of individual patients based on the best research evidence available rather than basing decisions on personal opinions or common practice (which may not always be evidence based). Evidence-based clinical practice therefore involves
integrating individual clinical expertise and patient preferences with the best available evidence from research.

**Evidence table**
A table summarising the results of a collection of studies that, taken together, represent the evidence supporting a particular recommendation or series of recommendations in a guideline.

**Exclusion criteria**
See selection criteria.

**Experimental study**
A research study designed to test whether a treatment or intervention has an effect on the course or outcome of a condition or disease – where the conditions of testing are to some extent under the control of the investigator. Controlled clinical trials and randomised controlled trials are examples of experimental studies.

**Experimental treatment**
A treatment or intervention (e.g. a new drug) being studied to see whether it has an effect on the course or outcome of a condition or disease.

**External validity**
The degree to which the results of a study hold true in non-study situations, e.g. in routine clinical practice. May also be referred to as the generalisability of study results to non-study patients or populations.

**Extrapolation**
The application of research evidence based on studies of a specific population to another population with similar characteristics.

**Focused question**
A study question that clearly identifies all aspects of the topic that are to be considered while seeking an answer. Questions are normally expected to identify the patients or population involved, the treatment or intervention to be investigated, what outcomes are to be considered, and any comparisons that are to be made. For example, do insulin pumps (intervention) improve blood sugar control (outcome) in adolescents with type 1 diabetes (population) compared with multiple insulin injections (comparison)? See also clinical question.

**Frequency**
Increased daytime frequency is the complaint by the patient that he/she voids too often by day. See also nocturia.

**Frequency–volume chart (FVC)**
A chart that records voided volumes and times of voiding (day and night) for at least 24 hours. See also bladder diary.

**Generalisability**
The extent to which the results of a study hold true for a population of patients beyond those who participated in the research. See also external validity.

**Gold standard**
A method, procedure or measurement that is widely accepted as being the best available. Also called a reference standard.

**Good practice point (GPP)**
Recommended good practice based on the expert experience of the guideline development group (and possibly incorporating the expertise of a wider reference group). A guideline development group may produce a ‘good practice point’ (rather than an evidence-based recommendation) on an important topic when there is a lack of research evidence.

**Grade of recommendation**
A code (e.g. A, B, C) linked to a guideline recommendation, indicating the strength of the evidence supporting that recommendation.

**Grey literature**
Reports that are unpublished or have limited distribution, and are not included in bibliographic retrieval systems.

**Guideline**
A systematically developed tool that describes aspects of a patient’s condition and the care to be given. A good guideline makes recommendations about treatment and care, based on the best research available, rather than opinion. It is used to assist clinician and patient decision making about appropriate health care for specific clinical conditions.

**Guideline recommendation**
Course of action advised by the guideline development group on the basis of
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Haematuria</strong></td>
<td>The presence of blood in the urine. Macroscopic haematuria is visible to the naked eye, while microscopic haematuria is only visible with the aid of a microscope.</td>
</tr>
<tr>
<td><strong>Health economics</strong></td>
<td>A branch of economics that studies decisions about the use and distribution of healthcare resources.</td>
</tr>
<tr>
<td><strong>Health technology</strong></td>
<td>Health technologies include medicines, medical devices such as artificial hip joints, diagnostic techniques, surgical procedures, health promotion activities (e.g. the role of diet versus medicines in disease management) and other therapeutic interventions.</td>
</tr>
<tr>
<td><strong>Health technology appraisal</strong></td>
<td>A health technology appraisal, as undertaken by NICE, is the process of determining the clinical and cost effectiveness of a health technology. NICE health technology appraisals are designed to provide patients, health professionals and managers with an authoritative source of advice on new and existing health technologies.</td>
</tr>
<tr>
<td><strong>Heterogeneity</strong></td>
<td>A lack of homogeneity. The term is used in meta-analyses and systematic reviews when the results or estimates of effects of treatment from separate studies seem to be very different – in terms of the size of treatment effects or even to the extent that some indicate beneficial and others suggest adverse treatment effects. Such results may occur as a result of differences between studies in terms of the patient populations, outcome measures, definition of variables or duration of follow-up.</td>
</tr>
<tr>
<td><strong>Hierarchy of evidence</strong></td>
<td>An established hierarchy of study types, based on the degree of certainty that can be attributed to the conclusions that can be drawn from a well conducted study. Well-conducted randomised controlled trials (RCTs) are at the top of this hierarchy. (Several large statistically significant RCTs that are in agreement represent stronger evidence than say one small RCT.) Well-conducted studies of patients' views and experiences would appear at a lower level in the hierarchy of evidence.</td>
</tr>
<tr>
<td><strong>Homogeneity</strong></td>
<td>This means that the results of studies included in a systematic review or meta-analysis are similar and there is no evidence of heterogeneity. Results are usually regarded as homogeneous when differences between studies could reasonably be expected to occur by chance. See also consistency.</td>
</tr>
<tr>
<td><strong>Idiopathic</strong></td>
<td>Having no defined cause.</td>
</tr>
<tr>
<td><strong>Incidence</strong></td>
<td>The probability of developing the disease or condition under study during a defined time period, usually 1 year.</td>
</tr>
<tr>
<td><strong>Inclusion criteria</strong></td>
<td>See selection criteria.</td>
</tr>
<tr>
<td><strong>Information bias</strong></td>
<td>Pertinent to all types of study and can be caused by inadequate questionnaires (e.g. difficult or biased questions), observer or interviewer errors (e.g. lack of blinding), response errors (e.g. lack of blinding if patients are aware of the treatment they receive) and measurement error (e.g. a faulty machine).</td>
</tr>
<tr>
<td><strong>Intention-to-treat (ITT) analysis</strong></td>
<td>An analysis of a clinical trial where patients are analysed according to the group to which they were initially randomly allocated, regardless of whether or not they had dropped out, fully complied with the treatment, or crossed over and received the alternative treatment. Intention-to-treat analyses are favoured in assessments of clinical effectiveness as they mirror the non-compliance and treatment changes that are likely to occur when the treatment is used in practice.</td>
</tr>
<tr>
<td><strong>Internal validity</strong></td>
<td>Refers to the integrity of the study design.</td>
</tr>
<tr>
<td><strong>International Continence</strong></td>
<td>Multidisciplinary scientific group concerned with all aspects of urinary and...</td>
</tr>
</tbody>
</table>
Society (ICS) faecal incontinence in all patient groups.

Intervention Healthcare action intended to benefit the patient, e.g. drug treatment, surgical procedure, psychological therapy, etc.

Interventional procedure (IP) A procedure used for diagnosis or treatment that involves making a cut or hole in the patient’s body, entry into a body cavity or using electromagnetic radiation (including X-rays or lasers). NICE has the task of producing guidance about whether specific interventional procedures are safe enough and work well enough for routine use.

Intrinsic sphincter deficiency (ISD) Incompetence of the urethral sphincter mechanisms usually associated with severe stress incontinence symptoms, due to inherent weakness of the sphincter itself, as opposed to the more common problem of impaired urethral support (hypermobility).

Introitus Entrance into the vagina.

Kappa score or rating A measure of agreement between two individuals or variables, where 1 indicates perfect agreement.

‘Knack’ A conscious contraction of pelvic floor muscle preceding rises in intraabdominal pressure, e.g. with cough. Also called ‘counterbracing’.

Level of evidence (evidence level, EL) A code (e.g. 1++, 1+) linked to an individual study, indicating where it fits into the hierarchy of evidence and how well it has adhered to recognised research principles.

Literature review A process of collecting, reading and assessing the quality of published (and unpublished) articles on a given topic.

Longitudinal study A study of the same group of people at more than one point in time. (This type of study contrasts with a cross-sectional study, which observes a defined set of people at a single point in time.)

Masking See blinding.

Meta-analysis Results from a collection of independent studies (investigating the same treatment) are pooled using statistical techniques to synthesise their findings into a single estimate of a treatment effect. Where studies are not compatible, e.g. because of differences in the study populations or in the outcomes measured, it may be inappropriate or even misleading to statistically pool results in this way. See also systematic review and heterogeneity.

Methodological quality The extent to which a study has conformed to recognised good practice in the design and execution of its research methods.

Methodology The overall approach of a research project, e.g. the study will be a randomised controlled trial, of 200 people, over 1 year.

Mixed urinary incontinence (MUI) Involuntary leakage associated with urgency and also with exertion, effort, sneezing or coughing.

Multicentre study A study where subjects were selected from different locations or populations, e.g. a cooperative study between different hospitals or an international collaboration involving patients from more than one country.

Multivariate analysis An analysis where the effects of many variables are considered. It can select a subset of variables that significantly contribute to the variable in the outcome.

Negative predictive value (NPV) The proportion of people with a negative test result who do not have the disease (where not having the disease is indicated by the ‘gold’ standard test being negative).

Nocturia The complaint of having to wake at night one or more times to void. See also frequency.
Nocturnal enuresis  Urinary incontinence occurring during sleep. The term enuresis itself is synonymous with incontinence and, where it is intended to denote incontinence during sleep, it should always be qualified with the adjective ‘nocturnal’.

Nominal group technique  Urinary incontinence occurring during sleep. The term enuresis itself is synonymous with incontinence and, where it is intended to denote incontinence during sleep, it should always be qualified with the adjective ‘nocturnal’.

Nominal group technique  A technique used for the purpose of reaching an agreement on a particular issue. It uses a variety of postal and direct contact techniques, with individual judgements being aggregated statistically to derive the group judgement. See also consensus methods.

Non-experimental study  A study based on subjects selected on the basis of their availability, with no attempt having been made to avoid problems of bias.

Non-systematic review  See review.

Objective measure  A measurement that follows a standardised procedure that is less open to subjective interpretation by potentially biased observers and study participants.

Observation  Observation is a research technique used to help understand complex situations. It involves watching, listening to and recording behaviours, actions, activities and interactions. The settings are usually natural but they can be laboratory settings, as in psychological research.

Observational study  In research about diseases or treatments, this refers to a study in which nature is allowed to take its course. Changes or differences in one characteristic (e.g. whether or not people received a specific treatment or intervention) are studied in relation to changes or differences in other(s) (e.g. whether or not they died), without the intervention of the investigator. There is a greater risk of selection bias than in experimental studies.

Odds ratio (OR)  Odds are a way of representing probability, especially familiar for betting. In recent years odds ratios have become widely used in reports of clinical studies. They provide an estimate (usually with a confidence interval) for the effect of a treatment. Odds are used to convey the idea of ‘risk’ and an odds ratio of 1 between two treatment groups would imply that the risks of an adverse outcome were the same in each group. For rare events the odds ratio and the relative risk (which uses actual risks and not odds) will be very similar. See also relative risk and risk ratio.

Off-label prescribing  When a drug or device is prescribed outside its specific indication, to treat a condition or disease for which it is not specifically licensed.

Oxford grading system  A system for assessing pelvic floor muscle contraction, where 0 = no contraction, 1 = flicker, 2 = weak, 3 = moderate, 4 = good, 5 = strong.

Outcome  The end result of care and treatment and/or rehabilitation. In other words, the change in health, functional ability, symptoms or situation of a person, which can be used to measure the effectiveness of care/treatment/rehabilitation. Researchers should decide what outcomes to measure before a study begins; outcomes are then assessed at the end of the study.

Overactive bladder (OAB) syndrome  Urgency, with or without urge urinary incontinence, usually with frequency and nocturia. OAB wet is where (urge) incontinence is present, and OAB dry is where incontinence is absent.

Pad test  A diagnostic method used to detect and quantify urine loss based on weight gain of absorbent pads during a set time period.

Peer review  Review of a study, service or recommendations by those with similar interests and expertise to the people who produced the study findings or
recommendations. Peer reviewers can include professional and/or patient/carer representatives.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pelvic floor muscle training (PFMT)</td>
<td>Repetitive selective voluntary contraction and relaxation of specific pelvic floor muscles.</td>
</tr>
<tr>
<td>Pelvic organ prolapse (POP)</td>
<td>Descent of one or more of the anterior vaginal wall, the posterior vaginal wall and the apex, or the vault of the vagina towards or through the vaginal introitus.</td>
</tr>
<tr>
<td>Pelvic organ prolapse quantification (POP-Q)</td>
<td>A method for classifying the stage of prolapse, in which six specific vaginal sites (A, Ba, C, D, Bp, Ap) and the vaginal length are measured in centimetres from the introitus.</td>
</tr>
<tr>
<td>Performance bias</td>
<td>Systematic differences in care provided apart from the intervention being evaluated. For example, if study participants know they are in the control group they may be more likely to use other forms of care; people who know they are in the experimental group may experience placebo effects, and care providers may treat patients differently according to what group they are in. Masking (blinding) of both the recipients and providers of care is used to protect against performance bias.</td>
</tr>
<tr>
<td>Perineometer</td>
<td>A device for measuring the strength of pelvic floor muscle contraction. Used as a form of biofeedback during treatment, or to measure treatment outcome.</td>
</tr>
<tr>
<td>Pilot study</td>
<td>A small-scale ‘test’ of the research instrument. For example, testing out (piloting) a new questionnaire with people who are similar to the population of the study, in order to highlight any problems or areas of concern, which can then be addressed before the full-scale study begins.</td>
</tr>
<tr>
<td>Placebo</td>
<td>Placebos are fake or inactive treatments received by participants allocated to the control group in a clinical trial that are indistinguishable from the active treatments being given in the experimental group. They are used so that participants are ignorant of their treatment allocation in order to be able to quantify the effect of the experimental treatment over and above any placebo effect due to receiving care or attention.</td>
</tr>
<tr>
<td>Placebo effect</td>
<td>A beneficial (or adverse) effect produced by a placebo and not due to any property of the placebo itself.</td>
</tr>
<tr>
<td>Point estimate</td>
<td>A best single estimate (taken from research data) for the true value of a treatment effect or other measurement. For example, researchers in one clinical trial take their results as their best estimate of the real treatment effect – this is their estimate at their point in time. The precision or accuracy of the estimate is measured by a confidence interval. Another clinical trial of the same treatment will produce a different point estimate of treatment effect.</td>
</tr>
<tr>
<td>Positive predictive value (PPV)</td>
<td>The proportion of people with a positive test result who have the disease (where having the disease is indicated by the ‘gold’ standard test being positive).</td>
</tr>
<tr>
<td>Post-void residual urine (PVR)</td>
<td>The volume of urine left in the bladder immediately after voiding.</td>
</tr>
<tr>
<td>Power</td>
<td>See statistical power.</td>
</tr>
<tr>
<td>Prevalence</td>
<td>The probability of experiencing a symptom or having a condition or disease within a defined population at a defined time point.</td>
</tr>
<tr>
<td>Primary care</td>
<td>Health care delivered to patients outside hospitals. Primary care covers a range of services provided by GPs, nurses and other healthcare professionals, dentists, pharmacists and opticians.</td>
</tr>
<tr>
<td>Primary care trust (PCT)</td>
<td>A primary care trust is an NHS organisation responsible for improving the health of local people, developing services provided by local GPs and their health centres.</td>
</tr>
</tbody>
</table>
teams (called primary care) and making sure that other appropriate health services are in place to meet local people’s needs.

<table>
<thead>
<tr>
<th><strong>Primary surgery for stress UI</strong></th>
<th>Surgery for stress urinary incontinence undertaken in a woman who has not previously undergone surgery for this condition.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Probability</strong></td>
<td>How likely an event is to occur, e.g. how likely a treatment or intervention will alleviate a symptom.</td>
</tr>
<tr>
<td><strong>Prognostic factor</strong></td>
<td>Patient or disease characteristics, e.g. age or co-morbidity, that influence the course of the disease under study. In a randomised trial to compare two treatments, chance imbalances in variables (prognostic factors) that influence patient outcome are possible, especially if the size of the study is fairly small. In terms of analysis these prognostic factors become confounding factors. See also prognostic marker.</td>
</tr>
<tr>
<td><strong>Prognostic marker</strong></td>
<td>A prognostic factor used to assign patients to categories for a specified purpose, e.g. for treatment, or as part of a clinical trial, according to the likely progression of the disease. For example, the purpose of randomisation in a clinical trial is to produce similar treatment groups with respect to important prognostic factors. This can often be achieved more efficiently if randomisation takes place within subgroups defined by the most important prognostic factors. Thus if age was very much related to patient outcome then separate randomisation schemes would be used for different age groups. This process is known as stratified random allocation.</td>
</tr>
<tr>
<td><strong>Prompted voiding</strong></td>
<td>Prompted voiding teaches people to initiate their own toileting through requests for help and positive reinforcement from carers. It has been used in institutionalised patients with cognitive and mobility problems. They are asked regularly if they wish to void and only assisted to the toilet when there is a positive response.</td>
</tr>
<tr>
<td><strong>Prospective study</strong></td>
<td>A study in which people are entered into the research and then followed up over a period of time with future events recorded as they happen. This contrasts with studies that are retrospective.</td>
</tr>
<tr>
<td><strong>Protocol</strong></td>
<td>A plan or set of steps that defines appropriate action. A research protocol sets out, in advance of carrying out the study, what question is to be answered and how information will be collected and analysed. Guideline implementation protocols set out how guideline recommendations will be used in practice by the NHS, both at national and local levels.</td>
</tr>
<tr>
<td><strong>Publication bias</strong></td>
<td>Studies with statistically significant results are more likely to get published than those with non-significant results. Meta-analyses that are exclusively based on published literature may therefore produce biased results.</td>
</tr>
<tr>
<td><strong>P value</strong></td>
<td>If a study is done to compare two treatments then the P value is the probability of obtaining the results of that study, or something more extreme, if there really was no difference between treatments. (The assumption that there really is no difference between treatments is called the ‘null hypothesis’.) Suppose the P value was 0.03. What this means is that if there really was no difference between treatments then there would only be a 3% chance of getting the kind of results obtained. Since this chance seems quite low we should question the validity of the assumption that there really is no difference between treatments. We would conclude that there probably is a difference between treatments. By convention, where the value of P is below 0.05 (i.e. less than 5%) the result is seen as statistically significant. Where the value of P is 0.001 or less, the result is seen as highly significant. P values just tell us whether an effect can be regarded as statistically significant or not. In no way do they relate to how big the effect might be, for which we need the confidence interval.</td>
</tr>
<tr>
<td><strong>Quality-adjusted life years (QALYs)</strong></td>
<td>A measure of health outcome which looks at both length of life and quality of life. QALYs are calculated by estimating the years of life remaining for a patient</td>
</tr>
</tbody>
</table>
following a particular care pathway and weighting each year with a quality of life score (on a zero to one scale). One QALY is equal to 1 year of life in perfect health, or 2 years at 50% health, and so on.

**Quantitative research**
Research that generates numerical data or data that can be converted into numbers, e.g. clinical trials or the national census which counts people and households.

**Quasi experimental study**
A study designed to test whether a treatment or intervention has an effect on the course or outcome of disease. It differs from a controlled clinical trial and a randomised controlled trial in that: (a) the assignment of patients to treatment and comparison groups is not done randomly, or patients are not given equal probabilities of selection; or (b) the investigator does not have full control over the allocation and/or timing of the intervention, but nonetheless conducts the study as if it were an experiment, allocating subjects to treatment and comparison groups.

**Random allocation or randomisation**
A method that uses the play of chance to assign participants to comparison groups in a research study, e.g. by using a random numbers table or a computer-generated random sequence. Random allocation implies that each individual (or each unit in the case of cluster randomisation) being entered into a study has the same chance of receiving each of the possible interventions.

**Randomised controlled trial (RCT)**
A study to test a specific drug or other treatment in which people are randomly assigned to two (or more) groups, with one (the experimental group) receiving the treatment that is being tested and the other (the comparison or control group) receiving an alternative treatment, a placebo (dummy treatment) or no treatment. The two groups are followed up to compare differences in outcomes to see how effective the experimental treatment was. (Through randomisation, the groups should be similar in all aspects apart from the treatment they receive during the study.)

**Rectocele**
Herniation (protrusion) of the rectum into the vagina.

**Relative risk (RR)**
A summary measure that represents the ratio of the risk of a given event or outcome (e.g. an adverse reaction to the drug being tested) in one group of subjects compared with another group. When the 'risk' of the event is the same in the two groups the relative risk is 1. In a study comparing two treatments, a relative risk of 2 would indicate that patients receiving one of the treatments had twice the risk of an undesirable outcome than those receiving the other treatment. Relative risk is sometimes used as a synonym for risk ratio.

**Reliability**
Reliability refers to a method of measurement that consistently gives the same results. For example, someone who has a high score on one occasion tends to have a high score if measured on another occasion very soon afterwards. With physical assessments it is possible for different clinicians to make independent assessments in quick succession – and if their assessments tend to agree then the method of assessment is said to be reliable.

**Retrospective study**
A retrospective study deals with the present/past and does not involve studying future events. This contrasts with studies that are prospective.

**Review**
A summary of the main points and trends in the research literature on a specified topic. A review is considered non-systematic unless an extensive literature search has been carried out to ensure that all aspects of the topic are covered and an objective appraisal made of the quality of the studies.

**Risk ratio (RR)**
Ratio of the risk of an undesirable event or outcome occurring in a group of patients receiving experimental treatment compared with a comparison (control) group. The term relative risk is sometimes used as a synonym for risk ratio.

**Royal Colleges**
In the UK medical/nursing world the term Royal Colleges, as for example in
Sample
A part of the study’s target population from which the subjects of the study will be recruited. If subjects are drawn in an unbiased way from a particular population, the results can be generalised from the sample to the population as a whole.

Sampling
Refers to the way participants are selected for inclusion in a study.

Scottish Intercollegiate Guidelines Network (SIGN)
SIGN was established in 1993 to sponsor and support the development of evidence-based clinical guidelines for the NHS in Scotland.

Secondary care
Care provided in hospitals.

Secondary surgery for stress UI
Surgery for stress urinary incontinence undertaken in a woman who has previously undergone surgery for this condition.

Selection bias
Selection bias has occurred if the characteristics of the sample differ from those of the wider population from which the sample has been drawn or if there are systematic differences between comparison groups of patients in a study in terms of prognosis or responsiveness to treatment.

Selection criteria
Explicit standards used by guideline development groups to decide which studies should be included and excluded from consideration as potential sources of evidence.

Sensitivity
In diagnostic testing, this refers to the chance of having a positive test result given that you have the disease. 100% sensitivity means that all those with the disease will test positive, but this is not the same the other way around. A patient could have a positive test result but not have the disease – this is called a ‘false positive’. The sensitivity of a test is also related to its negative predictive value (true negatives) – a test with a sensitivity of 100% means that all those who get a negative test result do not have the disease. To fully judge the accuracy of a test, its specificity must also be considered.

Short form 36 (SF-36)
A generic multipurpose 36-item survey that measures eight domains of health: physical functioning, role limitations due to physical health, bodily pain, general health perceptions, vitality, social functioning, role limitations due to emotional problems, and mental health.

Single-blind (SB) study
A study in which either the subject (patient/participant) or the observer (clinician/investigator) is not aware of which treatment or intervention the subject is receiving.

Specialist
A specialist is any healthcare professional who has received appropriate training to be able to provide the particular range of specialist services he or she undertakes, and who works within the context of an integrated, multidisciplinary continence team. Particular service profiles will differ from one place to another.

Specific indication
When a drug or a device has a specific remit to treat a specific condition and is not licensed for use in treating other conditions or diseases.

Specificity
In diagnostic testing, this refers to the chance of having a negative test result given that you do not have the disease. 100% specificity means that all those without the disease will test negative, but this is not the same the other way around. A patient could have a negative test result yet still have the disease – this is called a ‘false negative’. The specificity of a test is also related to its positive predictive value (true positives) – a test with a specificity of 100% means that all those who get a positive test result definitely have the disease. To fully judge the accuracy of a test, its sensitivity must also be considered.
Stamey grading of urinary incontinence

Grade 1: urine loss only with coughing/sneezing/lifting heavy objects;
Grade 2: urine loss with minimal activities, e.g. walking or rising from sitting position;
Grade 3: totally incontinent in upright position.

Standard deviation (SD)

A measure of the spread, scatter or variability of a set of measurements. Usually used with the mean (average) to describe numerical data.

Statistical power

The ability of a study to demonstrate an association or causal relationship between two variables, given that an association exists. For example, 80% power in a clinical trial means that the study has a 80% chance of ending up with a $P$ value of less than 5% in a statistical test (i.e. a statistically significant treatment effect) if there really was an important difference (e.g. 10% versus 5% mortality) between treatments. If the statistical power of a study is low, the study results will be questionable (the study might have been too small to detect any differences). By convention, 80% is an acceptable level of power. See also $P$ value.

Stress test

A clinical test for the demonstration of stress urinary incontinence. The woman is asked to cough while the observer visualises the external urethral meatus. The test may be undertaken either after filling to a known volume, or prior to micturition, the volume being recorded thereafter. It may be undertaken supine or standing.

Stress urinary incontinence (SUI)

The complaint of involuntary leakage on effort or exertion or on sneezing or coughing.

Structured interview

A research technique where the interviewer controls the interview by adhering strictly to a questionnaire or interview schedule with pre-set questions.

Study checklist

A list of questions addressing the key aspects of the research methodology that must be in place if a study is to be accepted as valid. A different checklist is required for each study type. These checklists are used to ensure a degree of consistency in the way that studies are evaluated.

Study population

People who have been identified as the subjects of a study.

Study quality

See methodological quality.

Study type

The kind of design used for a study. Randomised controlled trials, case–control studies and cohort studies are all examples of study types.

Subject

A person who takes part in an experiment or research study.

Survey

A study in which information is systematically collected from people (usually from a sample within a defined population).

Systematic

Methodical, according to plan; not random.

Systematic error

Refers to the various errors or biases inherent in a study. See also bias.

Systematic review

A review in which evidence from scientific studies has been identified, appraised and synthesised in a methodical way according to predetermined criteria. May or may not include a meta-analysis.

Systemic

Involving the whole body.

Target population

The people to whom guideline recommendations are intended to apply. Recommendations may be less valid if applied to a population with different characteristics from the participants in the research study – e.g. in terms of age, disease state, social background.

Tertiary centre

A major medical centre providing complex treatments which receives referrals from both primary and secondary care. Sometimes called a tertiary referral centre. See also primary care and secondary care.

Timed voiding

Timed voiding (scheduled, routine or regular toileting) is a passive toileting assistance programme that is initiated and maintained by a caregiver, e.g. for
patients who cannot participate in independent toileting. Toileting is fixed by
time or event, on a regular schedule, or a schedule to match the patient’s
voiding pattern.

**Trust**

A trust is an NHS organisation responsible for providing a group of healthcare
services. An acute trust provides hospital services. A primary care trust buys
hospital care on behalf of the local population, as well as being responsible for
the provision of community health services.

**Urethral competence**

The ability of the urethral sphincter mechanisms to retain urine in the bladder
at all times other than during normal micturition.

**Urethral hypermobility**

Incompetence of the urethral sphincter mechanisms usually associated with
stress incontinence symptoms, due to failure of urethral support.

**Urethral pain**

Pain felt in the urethra and the patient indicates the urethra as the site.

**Urge urinary incontinence (UUI)**

Involuntary urine leakage accompanied by or immediately preceded by
urgency.

**Urgency**

The ‘complaint of a sudden compelling desire to pass urine which is difficult to
defer’.

**Urgency-frequency syndrome**

Another name for overactive bladder.

**Urinary incontinence (UI)**

The ‘complaint of any involuntary urinary leakage’.

**Urodynamics (UD)**

The term ‘urodynamics’ encompasses a number of varied physiological tests of
bladder and urethral function that aim to demonstrate an underlying
abnormality of storage or voiding. The term is often used loosely to mean
multichannel cystometry. See also cystometry and uroflowmetry.
Videourodynamics involves synchronous radiographic screening of the bladder
with multichannel cystometry and is so called because originally the
information was recorded to videotape. Ambulatory urodynamics involves
multichannel cystometry carried out with physiological bladder filling rates and
using portable recording devices that enable the patient to remain ambulant
during the test.

**Urodynamic stress urinary incontinence (USI)**

The demonstration of involuntary leakage of urine during increased abdominal
pressure but in the absence of detrusor contraction during filling cystometry.

**Uroflowmetry**

Uroflowmetry entails a free-flow void into a recording device that provides the
practitioner with information about the volume of urine passed, and the rate of
urine flow.

**Validity**

Assessment of how well a tool or instrument measures what it is intended to
measure. See also external validity and internal validity.

**Variable**

A measurement that can vary within a study, e.g. the age of participants.
Variability is present when differences can be seen between different people or
within the same person over time, with respect to any characteristic or feature
that can be assessed or measured.

**Voiding dysfunction**

The term is not formally defined but is used to indicate objective evidence of
abnormal voiding. This is usually based on a combination of diminished urine
flow rate, abnormal flow pattern, raised detrusor voiding pressure and the
presence of postmicturition residual urine. It is often, but not always,
associated with symptoms of voiding difficulty (hesitancy, straining, poor or
intermittent urinary stream) and/or post-micturition symptoms (sensation of
incomplete emptying, postmicturition dribble).