



Information about how the guideline was developed is on the [guideline's page](#) on the NICE website This includes the evidence reviews, the scope, and details of the committee and any declarations of interest.

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## 1 Recommendations

People have the right to be involved in discussions and make informed decisions about their care, as described in [your care](#).

[Making decisions using NICE guidelines](#) explains how we use words to show the strength (or certainty) of our recommendations, and has information about prescribing medicines (including off-label use), professional guidelines, standards and laws (including on consent and mental capacity), and safeguarding.

### 2 **1.1 Information and shared decision making for people offered** 3 **hip, knee or shoulder replacement**

#### 4 **Information for people offered hip, knee or shoulder replacement**

5 1.1.1 When offering primary elective hip, knee or shoulder replacement, give  
6 the person and their families and carers (as appropriate) information  
7 specific to the procedure they are being offered. Provide information in a  
8 format they can easily understand, and follow the principles on  
9 communication, information and shared decision making in [the NICE](#)  
10 [guideline on patient experience in adult NHS services](#). Include:

- 11 • who to contact if they have questions or concerns before or after  
12 surgery
- 13 • preparing for surgery, including steps they can take to optimise their  
14 recovery (also see [the section on preoperative rehabilitation](#))
- 15 • pain after surgery and how it can be managed
- 16 • wound care
- 17 • returning to work
- 18 • returning to usual activities, for example playing sports, driving and  
19 sexual activity.

1 **Shared decision making**

2 1.1.2 Support shared decision making by discussing the options for joint  
3 replacement surgery with the person and their families and carers (as  
4 appropriate). Include in the discussion:

- 5 • the potential benefits and risks of the procedure
- 6 • the choice of implant
- 7 • the options for anaesthesia and the potential benefits and risks of each  
8 option
- 9 • what to expect before, during and after surgery, including length of  
10 hospital stay, recovery and rehabilitation
- 11 • the possible need for more surgery in the future.

To find out why the committee made the recommendations on information and shared decision making for people offered hip, knee or shoulder replacement and how they might affect practice, see [rationale and impact](#).

12

13 ***Decision aids for elective joint replacement***

14 The committee were unable to make recommendations for practice in this area. They  
15 made a [recommendation for research](#) on the components of a decision aid.

To find out why the committee were unable to make recommendations on decision aids for joint replacement see [rationale and impact](#).

16

17 **1.2 *Preoperative rehabilitation***

18 1.2.1 Give people having hip or knee replacement advice on preoperative  
19 rehabilitation. Include advice on:

- 20 • exercises that can be performed before and after surgery
- 21 • lifestyle including weight management, dietary advice and smoking  
22 cessation (see NICE's guidance on [NICE's guidance on lifestyle and  
23 wellbeing](#))
- 24 • maximising independence and wellbeing after surgery.

To find out why the committee made the recommendation on preoperative rehabilitation and how it might affect practice, see [rationale and impact](#).

## 1 **1.3 Anaesthesia**

### 2 **Anaesthesia for hip replacement**

3 1.3.1 Offer people having primary elective hip replacement a choice of:

- 4 • regional anaesthesia in combination with local infiltration anaesthesia
- 5 (LIA)
- 6 • general anaesthesia in combination with LIA.

7 Consider a nerve block as an alternative to LIA in either of the options

8 above.

To find out why the committee made the recommendation on anaesthesia for hip replacement and how it might affect practice, see [rationale and impact](#).

### 9 **Anaesthesia for knee replacement**

10 1.3.2 Offer people having primary elective knee replacement a choice of:

- 11 • regional anaesthesia in combination with local infiltration anaesthesia
- 12 (LIA)
- 13 • general anaesthesia in combination with LIA.

14 Consider adding a nerve block to either of the options above.

15

To find out why the committee made the recommendations on anaesthesia for knee replacement and how they might affect practice, see [rationale and impact](#).

### 16 **Anaesthesia for shoulder replacement**

17 1.3.3 Discuss the options for anaesthesia with people having primary elective

18 shoulder replacement, including general anaesthesia, regional

19 anaesthesia, local infiltration anaesthesia and nerve blocks.

1 The committee were unable to recommend specific options for anaesthesia for  
2 shoulder replacement. They made [recommendations for research](#) on supplementary  
3 anaesthesia, and on regional compared with general anaesthesia or a combination  
4 in elective shoulder replacement.

To find out why the committee made the recommendation to discuss the options  
for anaesthesia for shoulder replacement and why they were unable to make  
recommendations on specific options for anaesthesia see [rationale and impact](#).

5

## 6 **1.4 Tranexamic acid to minimise blood loss**

7 1.4.1 For people having primary elective hip, knee or shoulder replacement:

- 8 • Give intravenous tranexamic acid and, unless the person has renal  
9 impairment, also give 1 to 2 g of topical (intra-articular) tranexamic acid  
10 diluted in saline<sup>1</sup>, given after the final wash-out and before wound  
11 closure. Ensure that the total combined dose of tranexamic acid does  
12 not exceed 3 g.
- 13 • For people who have renal impairment give a reduced dose of  
14 intravenous tranexamic acid on its own.

To find out why the committee made the recommendations on tranexamic acid to  
minimise blood loss and how they might affect practice, see [rationale and impact](#).

## 15 **1.5 Preventing infections**

### 16 **Antibiotic or antiseptic agents in wound wash-out solutions**

17 1.5.1 Do not use an antibiotic or antiseptic agent in a wound wash-out solution  
18 for primary hip, knee or shoulder elective joint replacement.

---

<sup>1</sup> At the time of consultation (October 2019), tranexamic acid solution for injection is not licensed for topical (intra-articular) use. The prescriber should follow relevant professional guidance, taking full responsibility for the decision. Informed consent should be obtained and documented. See the General Medical Council's [Prescribing guidance: prescribing unlicensed medicines](#) for further information.

To find out why the committee made the recommendation on antibiotic or antiseptic agents in wound wash-out solutions and how it might affect practice, see [rationale and impact](#).

1 **Ultra-clean air ventilation in operating theatres**

- 2 1.5.2 Use ultra-clean air ventilation in operating theatres for primary hip, knee or  
3 shoulder elective joint replacement.

To find out why the committee made the recommendation on ultra-clean air ventilation in operating theatres see [rationale and impact](#).

4 **1.6 Avoiding implant selection errors**

- 5 1.6.1 Use an intraoperative 'stop moment' to check all implant details and  
6 ensure compatibility of each component before implantation.

- 7 1.6.2 Consider intraoperative real-time data entry before implantation using a  
8 system, such as the National Joint Registry database, that provides an  
9 alert of mismatched implant components.

To find out why the committee made the recommendations on avoiding implant selection errors and how they might affect practice, see [rationale and impact](#).

10

11 **1.7 Procedures for primary elective knee replacement**

12 **Partial and total knee replacement**

- 13 1.7.1 Offer a choice of partial or total knee replacement to people with isolated  
14 medial compartmental osteoarthritis. Discuss the potential benefits and  
15 risks of each option with the person.

To find out why the committee made the recommendation on partial and total knee replacement and how it might affect practice, see [rationale and impact](#).

16 **Patella resurfacing**

- 17 1.7.2 Offer resurfacing of the patella to people having primary elective total  
18 knee replacement.

To find out why the committee made the recommendation on patella resurfacing and how it might affect practice, see [rationale and impact](#).

1 **1.8** ***Implants and surgical approaches for primary elective hip***  
2 ***replacement***

3 **Implants for primary elective hip replacement**

4 See the NICE technology appraisal guidance on [total hip replacement and](#)  
5 [resurfacing arthroplasty for end-stage arthritis of the hip](#).

6 **Surgical approaches for primary elective hip replacement**

7 1.8.1 Consider a posterior, anterolateral or direct anterior approach for primary  
8 elective hip replacement.

9 The committee were unable to make recommendations on the direct superior and  
10 supercapsular percutaneously assisted (SuperPATH) surgical approaches. They  
11 made a [recommendation for research](#) on these approaches.

To find out why the committee made the recommendation on surgical approaches for primary elective hip replacement and why they were unable to make recommendations on the direct superior and SuperPATH approaches see [rationale and impact](#).

12

13 **1.9** ***Procedures for primary elective shoulder replacement***

14 **Shoulder replacement for osteoarthritis with no rotator cuff tear**

15 1.9.1 If glenoid bone is adequate, offer conventional total shoulder replacement  
16 to people having primary elective shoulder replacement for osteoarthritis  
17 with no rotator cuff tear.

To find out why the committee made the recommendation on shoulder replacement for osteoarthritis with no rotator cuff tear and how it might affect practice, see [rationale and impact](#).

1 **Shoulder replacement for pain and functional loss for people with a previous**  
2 **proximal humeral fracture**

3 The committee were unable to make recommendations for practice in this area. They  
4 made a [recommendation for research](#) on procedures for shoulder replacement for  
5 people with a previous proximal humeral fracture.

To find out why the committee were unable to make recommendations on shoulder replacement for pain and functional loss for people with a previous proximal humeral fracture see [rationale and impact](#).

6

7 **1.10 Postoperative rehabilitation**

8 **Inpatient rehabilitation**

9 1.10.1 A physiotherapist or occupational therapist should offer rehabilitation  
10 within 24 hours of surgery to people who have had a primary elective hip,  
11 knee or shoulder replacement. Rehabilitation should include:

- 12 • advice on managing activities of daily living **and**
- 13 • home exercise programmes **and**
- 14 • mobilisation for people who have had knee or hip replacement **or**
- 15 • ambulation for people who have had shoulder replacement.

To find out why the committee made the recommendation on inpatient rehabilitation and how it might affect practice, see [rationale and impact](#).

16

17 **Outpatient rehabilitation after hip or knee replacement**

18 1.10.2 A physiotherapist or occupational therapist should offer advice on self-  
19 directed rehabilitation after primary elective hip or knee replacement  
20 before the person leaves hospital.

21 1.10.3 Ensure that people who are undertaking self-directed rehabilitation know  
22 who to contact for advice and support.

1 1.10.4 Offer supervised group or individual outpatient rehabilitation if the person  
2 has difficulties managing activities of daily living, ongoing functional  
3 impairment leading to specific rehabilitation needs, or finds that self-  
4 directed rehabilitation is not effective.

5 1.10.5 Consider supervised group or individual outpatient rehabilitation for  
6 people with cognitive impairment.

To find out why the committee made the recommendations on outpatient self-directed rehabilitation after hip or knee replacement and how they might affect practice, see [rationale and impact](#).

## 7 **Outpatient rehabilitation after shoulder replacement**

8 1.10.6 Ensure that people who are undertaking self-directed rehabilitation after  
9 primary elective shoulder replacement know who to contact for advice and  
10 support.

11 1.10.7 Offer supervised group or individual outpatient rehabilitation if the person  
12 has difficulties managing activities of daily living, ongoing functional  
13 impairment leading to specific rehabilitation needs, or finds that self-  
14 directed rehabilitation is not effective.

15 1.10.8 Consider individual outpatient rehabilitation for people with cognitive  
16 impairment.

To find out why the committee made the recommendations on outpatient rehabilitation after shoulder replacement see [rationale and impact](#).

17

## 18 **1.11 Long-term care**

### 19 **Follow-up and monitoring**

20 The committee were unable to make recommendations for practice in this area. They  
21 made a [recommendation for research](#) on follow-up.

1 **Referral from primary care**

2 1.11.1 Primary care practitioners should refer people who develop new or  
3 worsening pain, limp or loss of function related to their joint replacement  
4 to the orthopaedic team.

To find out why the committee were unable to make recommendations on follow-up and monitoring in secondary care and why they made the recommendation on referral from primary care see [rationale and impact](#).

5

6 **Recommendations for research**

7 The guideline committee has made the following recommendations for research.

8 ***Key recommendations for research***

9 **1 Preoperative rehabilitation**

10 What is the clinical and cost effectiveness of preoperative rehabilitation given at least  
11 2 months before hip, knee or shoulder replacement?

12 To find out why the committee made the research recommendation on preoperative  
13 rehabilitation see [rationale and impact](#).

14 **2 Information for people having a joint replacement**

15 How should information for people having joint replacement surgery be delivered?

16 To find out why the committee made the research recommendation on information  
17 see [rationale and impact](#).

18 **3 Early mobilisation of the shoulder**

19 Is early mobilisation of the shoulder after primary elective shoulder replacement  
20 more effective than delayed mobilisation in restoring rapid return of function and  
21 relieving pain?

22 To find out why the committee made the research recommendation on early  
23 mobilisation of the shoulder see [rationale and impact](#)

1 **4 Conventional compared with reverse total shoulder arthroplasty**

2 What is the clinical and cost effectiveness of conventional compared with reverse  
3 total shoulder arthroplasty for adults having primary elective shoulder replacement  
4 for osteoarthritis with no rotator cuff tear?

5 To find out why the committee made the research recommendation on shoulder  
6 arthroplasty see [rationale and impact](#).

7 **5 Anaesthesia for knee replacement**

8 What is the clinical and cost effectiveness of adding a nerve block to regional or  
9 general anaesthesia, in combination with local infiltration anaesthesia, for primary  
10 elective knee replacements?

11 To find out why the committee made the research recommendation on anaesthesia  
12 for knee replacement see [rationale and impact](#).

13 **6 Selective resurfacing in knee replacement**

14 In adults having elective knee replacement, what is the clinical and cost  
15 effectiveness of total knee replacement with patella resurfacing compared with  
16 selective resurfacing?

17 To find out why the committee made the research recommendation on resurfacing in  
18 knee replacement see [rationale and impact](#)

19 ***Other recommendations for research***

20 **Decision aids**

21 What are the components of a decision aid to support people referred for elective  
22 joint replacement in making decisions about their treatment (for example, the type of  
23 procedure, timing and implant choice)?

24 **Supplementary anaesthesia in elective shoulder replacement**

25 In adults having elective shoulder joint replacement with general anaesthesia, what  
26 is the clinical and cost effectiveness of supplementary local infiltration anaesthesia, a  
27 nerve block or regional anaesthesia?

1 **Regional compared with general anaesthesia or a combination in elective**  
2 **shoulder replacement**

3 In adults having elective shoulder joint replacement, what is the relative clinical and  
4 cost effectiveness of general anaesthesia, regional anaesthesia, and general  
5 combined with regional anaesthesia?

6 **Avoiding implant selection errors**

7 What is the most effective technological solution for minimising wrong implant  
8 selection during joint replacement surgery?

9 **Surgical approaches in primary elective hip replacement**

10 Do the direct anterior, direct superior and supercapsular percutaneously assisted  
11 (SuperPATH) approaches to hip replacement improve patient-recorded outcome  
12 measures and reduce length of hospital stays, revision rates, neurological  
13 complications and surgical site infections compared with the posterior and  
14 anterolateral approaches?

15 **Conventional total shoulder replacement compared with humeral**  
16 **hemiarthroplasty for people aged under 60**

17 What is the clinical and cost effectiveness of humeral hemiarthroplasty compared  
18 with conventional total shoulder replacement for adults aged under 60 having  
19 primary elective shoulder replacement for osteoarthritis with no rotator cuff tear?

20 **Procedures for shoulder replacement for people with a previous proximal**  
21 **humeral fracture**

22 In adults having primary elective shoulder replacement for pain and functional loss  
23 after a previous proximal humeral fracture (not acute trauma), what is the clinical and  
24 cost effectiveness of reverse total shoulder replacement compared with humeral  
25 hemiarthroplasty?

26 **Supporting rehabilitation after hip, knee or shoulder replacement for people**  
27 **with additional needs**

28 What are the best ways to support rehabilitation after hip knee or shoulder  
29 replacement for people with additional needs (such as people with dementia, a  
30 learning difficulty or multiple disabling medical comorbidities)?

1 **Supervised compared with self-directed outpatient rehabilitation after hip or**  
2 **knee replacement**

3 What are the clinical features that identify people who are likely to benefit from  
4 supervised group or individual rehabilitation?

5 **Postoperative rehabilitation after shoulder replacement**

6 For people who have had primary elective shoulder replacement, does self-directed,  
7 supervised group or supervised individual rehabilitation produce the most  
8 improvement in health-related quality of life 2 years after surgery?

9 **Follow-up after shoulder replacement**

10 What is the optimum time between follow-up appointments for people who have had  
11 shoulder replacement, who should lead follow-up and how this should be organised  
12 between hospital and community care?

13 **Rationale and impact**

14 These sections briefly explain why the committee made the recommendations and  
15 how they might affect practice. They link to details of the evidence and a full  
16 description of the committee's discussion.

17 ***Information and shared decision making for people offered hip,***  
18 ***knee or shoulder replacement***

19 [Recommendations 1.1.1 and 1.1.2](#)

20 **Why the committee made the recommendations**

21 Studies using interviews and focus groups highlighted the importance of giving easily  
22 understandable information to people before they have joint replacement surgery.  
23 Specific areas of concern included preparing for surgery, managing postoperative  
24 pain and aftercare at home, expected recovery time and returning to work. The  
25 committee also drew on their own experience to detail the information that should be  
26 given to people offered hip, knee or shoulder replacement.

27 The committee highlighted the importance of supporting shared decision making  
28 when discussing options for hip, knee or shoulder replacement. People offered these

1 procedures should have the opportunity to express their preferences in light of the  
2 potential benefits and risks of the procedure itself, the anaesthesia, the choice of  
3 implant and what the outcomes are likely to be in the short and long terms.

#### 4 **How the recommendations might affect practice**

5 The recommendations largely reflect current practice and are not expected to result  
6 in substantial changes.

7 Full details of the evidence and the committee's discussion are in [evidence review A:  
8 information needs.](#)

#### 9 ***Decision aids for elective joint replacement.***

##### 10 **Why the committee were unable to make recommendations for practice**

11 Evidence showed that use of a decision aid can be beneficial for people having  
12 elective joint replacement surgery. However, the content of joint replacement  
13 decision aids varies widely and the definition of what constitutes a joint replacement  
14 decision aid is unclear. The committee's view is that a decision aid should not simply  
15 be a means of providing information, but should actively help people to participate in  
16 making decisions about their care. Because of the lack of clear evidence enabling  
17 comparison of joint replacement decision aids, the committee were unable to make a  
18 recommendation for the use of any specific decision aid. They made a  
19 [recommendation for research](#) on the components of a decision aid for joint  
20 replacement.

21 Full details of the evidence and the committee's discussion are in [evidence review B:  
22 decision aids.](#)

23 [Return to recommendations](#)

#### 24 ***Preoperative rehabilitation***

25 [Recommendation 1.2.1](#)

##### 26 **Why the committee made the recommendation**

27 Evidence from non-NHS settings showed that preoperative rehabilitation reduced  
28 length of hospital stay for adults having a hip or knee replacement. Although hospital

1 stays for this type of surgery in the NHS are usually shorter than in non-NHS  
2 settings, the committee thought that these reductions might be achieved in NHS  
3 settings if preoperative rehabilitation is provided. The economic evidence suggested  
4 that the cost of preoperative rehabilitation programmes would be recouped by  
5 shorter hospital stays.

6 The committee agreed, based on the evidence and their experience, that  
7 preoperative rehabilitation should, as a minimum, provide advice on exercises,  
8 lifestyle and ways to maximise independence and wellbeing after surgery.

9 There was no evidence on preoperative rehabilitation for people having shoulder  
10 replacement. The committee agreed that the benefits seen in people having hip and  
11 knee replacement might not apply to those having shoulder replacement, and made  
12 a [recommendation for research](#) to include preoperative rehabilitation for people with  
13 shoulder replacement.

#### 14 **How the recommendation might affect practice**

15 Current practice varies widely, ranging from no preoperative rehabilitation to  
16 comprehensive individualised preoperative rehabilitation programmes. The  
17 recommendation will not involve a significant change in practice for services because  
18 most already offer preoperative rehabilitation advice to everyone having hip or knee  
19 replacement. For some services, providing information, exercise and lifestyle advice  
20 may increase the time needed from the multidisciplinary team. However, this cost  
21 can be expected to be offset by reductions in length of hospital stays.

22 Full details of the evidence and the committee's discussion are in [evidence review C:  
23 preoperative rehabilitation](#).

24 [Return to recommendations](#)

#### 25 ***Anaesthesia for hip replacement***

26 [Recommendation 1.3.1](#)

#### 27 **Why the committee made the recommendation**

28 Evidence confirmed that regional and general anaesthesia are equally effective for  
29 people having hip replacement surgery.

1 Based on their experience, the committee agreed that using multiple types of  
2 anaesthesia reduces postoperative pain. Clinical evidence showed that local  
3 infiltration anaesthesia (LIA) or a nerve block are both beneficial when used with  
4 general or regional anaesthesia. However, the cost of LIA is minimal and its  
5 administration does not increase theatre time whereas a nerve block is only likely to  
6 be cost effective if it can be administered in around 5 minutes, and if long-term  
7 outcomes are taken into account. A nerve block can therefore be considered if  
8 systems and staff are in place to ensure that it does not increase theatre time by  
9 more than 5 minutes, to minimise resource impact.

10 There was no evidence to support the use of LIA together with a nerve block in  
11 regional or general anaesthesia.

### 12 **How the recommendation might affect practice**

13 All orthopaedic units currently offer a choice of general or regional anaesthesia. Most  
14 augment this with either LIA or a nerve block. Although the cost of nerve blocks  
15 varies, it is not expected that services currently offering LIA will change to nerve  
16 blocks. This recommendation is unlikely to lead to significant changes in practice.

17 Full details of the evidence and the committee's discussion are in [evidence review D:  
18 anaesthesia hip](#).

19 [Return to recommendations](#)

### 20 ***Anaesthesia for knee replacement***

21 [Recommendation 1.3.2](#)

#### 22 **Why the committee made the recommendation**

23 Evidence confirmed that regional and general anaesthesia are equally effective for  
24 people having knee replacement surgery. There was no evidence to support using a  
25 combination of regional and general anaesthesia.

26 Evidence showed that adding LIA or a nerve block to regional or general  
27 anaesthesia is beneficial. Additionally, evidence suggested that adding both LIA and  
28 a nerve block to regional anaesthesia is more beneficial than adding either LIA or a  
29 nerve block alone, although this benefit was less pronounced with general

1 anaesthesia. The committee noted that the lack of evidence for these interventions  
2 may conceal their effectiveness. They made a [recommendation for research](#) to  
3 explore the use of a nerve block together with LIA in either regional or general  
4 anaesthesia for knee replacement.

5 The cost of LIA is minimal and its administration does not increase theatre time  
6 whereas a nerve block is only likely to be cost effective if it can be administered in  
7 around 5 minutes, and if long-term outcomes are taken into account. Adding a nerve  
8 block to regional or general anaesthesia with LIA can therefore be considered if  
9 systems and staff are in place to ensure that administration of a nerve block does not  
10 increase theatre time by more than 5 minutes.

### 11 **How the recommendation might affect practice**

12 In current practice regional anaesthesia for knee replacement surgery is usually  
13 augmented by LIA, a nerve block, or both. Services that use LIA are not expected to  
14 see a substantial change in practice. Those that use a nerve block are likely to see a  
15 move to LIA but this will not have a resource impact. Services that currently use both  
16 LIA and a nerve block should see a reduction in the use of nerve blocks. Services  
17 that do not currently provide nerve blocks in addition to LIA should not see an  
18 increase in resource impact as long as administration of the nerve block does not  
19 increase theatre time by more than 5 minutes.

20 Full details of the evidence and the committee's discussion are in [evidence review E:  
21 anaesthesia knee.](#)

22 [Return to recommendations](#)

### 23 ***Anaesthesia for shoulder replacement***

24 [Recommendation 1.3.3](#)

### 25 **Why the committee made the recommendation**

26 The committee emphasised the importance of discussing different options for  
27 anaesthesia with people having shoulder replacement. There was not enough  
28 evidence to support a recommendation for specific types of anaesthesia. Although  
29 benefits were seen in studies combining general with regional anaesthesia, they

1 were offset by phrenic nerve palsy events. The committee made [recommendations](#)  
2 [for research](#) to investigate supplementary anaesthesia for people having general  
3 anaesthesia and on the use of general, regional, or general with regional  
4 anaesthesia. They noted that using regional anaesthesia alone has the potential to  
5 increase day-case shoulder replacement surgery.

## 6 **How the recommendation might affect practice**

7 This recommendation is not expected to change current practice.

8 Full details of the evidence and the committee's discussion are in [evidence review F:](#)  
9 [anaesthesia shoulder](#).

10 [Return to recommendations](#)

## 11 ***Tranexamic acid to minimise blood loss***

12 [Recommendation 1.4.1](#)

### 13 **Why the committee made the recommendation**

14 Good evidence showed that, in people having primary elective hip or knee  
15 replacement, topical (intra-articular) tranexamic acid in combination with intravenous  
16 tranexamic acid reduces the number of blood transfusions needed when compared  
17 with topical or intravenous tranexamic acid alone. Although one study suggested that  
18 combining topical with oral tranexamic acid is the most clinically and cost effective  
19 administration method, this evidence was not strong enough to support a  
20 recommendation for this combination.

21 Evidence in people having primary elective shoulder replacement also showed a  
22 benefit from tranexamic acid but did not address combined administration. However,  
23 the committee reasoned that the benefits seen in hip and knee replacement would  
24 also apply in shoulder replacement. They noted that tranexamic acid is an  
25 inexpensive treatment.

26 The BNF advises a reduced dose of intravenous tranexamic acid for people with  
27 renal impairment. Because the absorption is uncertain when tranexamic acid is  
28 administered topically, the committee agreed that it should be given only  
29 intravenously to people with renal impairment.

## 1 **How the recommendation might affect practice**

2 Although the use of tranexamic acid is widespread in current practice, the method of  
3 administration varies. In the committee's experience, topical (intra-articular)  
4 tranexamic acid is commonly used in combination with intravenous tranexamic acid  
5 in hip and knee replacements, but not in shoulder replacements. Increased use of  
6 this combination in shoulder replacements might increase doses and the use of  
7 disposables. However, the associated costs are expected to be more than offset by  
8 the savings produced by a reduced need for blood transfusions.

9 Full details of the evidence and the committee's discussion are in [evidence review G:  
10 tranexamic acid](#).

11 [Return to recommendations](#)

## 12 ***Antibiotic or antiseptic agents in wound wash-out solutions***

13 [Recommendation 1.5.1](#)

### 14 **Why the committee made the recommendation**

15 No evidence was found on adding antibiotic or antiseptic agents to saline wound  
16 wash-out solution to reduce surgical site infections in people having primary elective  
17 joint replacement. The committee acknowledged that washing the wound with saline  
18 is common practice and is used to improve visibility of the operative site for the  
19 surgeon. They noted that the use of antibiotic and antiseptic agents in wash-out  
20 solutions varies across the NHS. They were concerned about the risk of increasing  
21 antimicrobial resistance through the use of these agents. They agreed that, because  
22 of this risk, other means of preventing infection in joint replacement surgery, such as  
23 prophylactic antibiotics and ultra clean-air ventilation in operating theatres, should be  
24 used.

### 25 **How the recommendation might affect practice**

26 This recommendation is expected to reduce the routine use of antibiotic or antiseptic  
27 agents in wash-out solutions. It is not expected to affect the use of prophylactic  
28 antibiotics and ultra-clean air ventilation in operating theatres, which are part of  
29 current practice.

1 Full details of the evidence and the committee’s discussion are in [evidence review H:](#)  
2 [wound lavage](#).

3 [Return to recommendations](#)

#### 4 ***Ultra-clean air ventilation in operating theatres***

5 [Recommendation 1.5.2](#)

##### 6 **Why the committee made the recommendation**

7 There was little good evidence on the use of ultra-clean air ventilation. Evidence  
8 from randomised controlled trials supported ultra-clean air ventilation, but these trials  
9 may not have fully reflected current practice. Evidence from observational studies  
10 supported conventional air ventilation systems, but it was unclear whether these  
11 studies followed up participants for more than 2 years, which the committee agreed  
12 is the minimum follow-up period needed to produce an accurate picture of infection  
13 rates. It was also unclear whether the registry data used in the studies produced an  
14 accurate record of the number of infections over the longer term, and whether  
15 prophylactic antibiotics were used in all of the observational studies. Although the  
16 committee noted the limitations in the evidence, they agreed that ultra-clean air  
17 ventilation is likely to be more effective at reducing surgical site infections than  
18 conventional turbulent air ventilation.

##### 19 **How the recommendation might affect practice**

20 The recommendation largely reflects current practice and is not expected to result in  
21 substantial changes.

22 Full details of the evidence and the committee’s discussion are in [evidence review I:](#)  
23 [ultra clean-air](#)

24 [Return to recommendations](#)

#### 25 ***Avoiding implant selection errors***

26 [Recommendations 1.6.1 and 1.6.2](#)

1 **Why the committee made the recommendations**

2 The committee's recommendations were based on their experience and expertise.  
3 They reasoned that a 'stop moment', when theatre staff stop other activity and  
4 formally inspect each implant component, would ensure that all components are  
5 compatible. They agreed that intraoperative real-time data entry could be considered  
6 as a further means of ensuring that mismatched components are identified before  
7 implantation. The committee agreed that research to investigate technological  
8 solutions to help avoid implant selection errors would be useful and made a  
9 [recommendation for research](#).

10 **How the recommendations might affect practice**

11 An intraoperative 'stop moment' to check implant components before implantation is  
12 common and is not expected to change current practice. Intraoperative real-time  
13 data entry is not current practice and, if implemented, is likely to increase theatre  
14 time.

15 Full details of the evidence and the committee's discussion are in [evidence review J:  
16 wrong implant selection](#).

17 [Return to recommendations](#)

18 ***Partial and total knee replacement***

19 [Recommendation 1.7.1](#)

20 **Why the committee made the recommendation**

21 Studies that compared partial with total knee replacement showed that, 5 and  
22 15 years after knee replacement, ratings on the Bristol Knee Score were better for  
23 people who had partial knee replacement. They also had shorter hospital stays and  
24 fewer incidences of deep vein thrombosis within 5 years of their surgery. However,  
25 this evidence has limited relevance because these studies either looked at implants  
26 that are no longer in use, or were restricted to people who had both knees replaced.

27 In the committee's experience, the potential benefits of partial or total knee  
28 replacement depend on individual factors such as age and physical activity level.  
29 People who have more active lifestyles might prefer the shorter recovery time

1 associated with partial knee replacement. This needs to be balanced against the  
2 evidence showing a greater likelihood of revision surgery within 10 years in partial  
3 knee replacement. However, this may be partly the result of revision surgery being  
4 suggested earlier for partial knee replacement because it is more straightforward. On  
5 balance, the committee agreed that both types of knee replacement are effective for  
6 this population, and that the benefits and risks of each should be discussed with the  
7 person.

### 8 **How the recommendation might affect practice**

9 This recommendation may result in an increase in the number of partial knee  
10 replacements undertaken. It is expected that all orthopaedic services will need to  
11 provide both partial and total knee replacement surgery. The committee noted that  
12 total and partial knee replacement are very different types of procedure, and  
13 surgeons need to ensure they perform a sufficient number of each procedure every  
14 year to ensure good surgical outcomes.

15 Total knee replacements make up the majority of current practice, so offering a  
16 choice of partial or total knee replacement is likely to increase the number of partial  
17 knee replacements. The economic evidence largely suggested that partial knee  
18 replacements are cost effective compared with total knee replacements. Therefore,  
19 increasing the proportion of partial knee replacements is likely to be cost saving.

20 Full details of the evidence and the committee's discussion are in [evidence review K:  
21 total knee replacement](#).

22 [Return to recommendations](#)

### 23 ***Patella resurfacing***

24 [Recommendation 1.7.2](#)

### 25 **Why the committee made the recommendation**

26 The committee looked at 3 options: resurfacing, no resurfacing and selective  
27 resurfacing. There was not enough clinical evidence to indicate whether any of the  
28 options was more beneficial than the others. However, strong economic evidence  
29 showed that resurfacing is cost effective compared with no resurfacing over a 10-

1 year time horizon because of reduced hospital readmissions. Because of the lack of  
2 clinical evidence, the committee also made a [recommendation for research](#) on  
3 selective resurfacing in knee replacement.

#### 4 **How the recommendation might affect practice**

5 Current practice varies, with resurfacing carried out in around 35 to 40% of knee  
6 replacements. This recommendation can be expected to increase the number of  
7 knee replacement operations with patella resurfacing. There may be an initial  
8 increase in costs because of more costly hospital stays for resurfacing, but this is  
9 expected to be more than offset by reduced numbers of hospital readmissions in the  
10 long term.

11 Full details of the evidence and the committee's discussion are in [evidence review L:  
12 patella resurfacing](#).

13 [Return to recommendations](#)

#### 14 ***Surgical approaches for primary elective hip replacement***

##### 15 [Recommendation 1.8.1](#)

#### 16 **Why the committee made the recommendation**

17 The committee looked at evidence on 5 surgical approaches for hip replacement:  
18 posterior, anterolateral, direct anterior, direct superior and supercapsular  
19 percutaneously assisted (SuperPATH). The evidence did not indicate that any of  
20 these approaches was more beneficial than any other. The National Joint Register for  
21 2017 reported that 97% of hip replacements were done using the posterior or  
22 anterolateral approach. The committee also noted that the direct anterior approach is  
23 now used routinely by some surgeons and that this approach has the benefit of  
24 being minimally invasive, does not cut muscles and may shorten recovery time. They  
25 concluded that any of these 3 established approaches could be considered, with the  
26 choice of approach based on the knowledge and experience of the surgeon and  
27 individual patient characteristics. There was not enough evidence on the newer  
28 approaches (direct superior and SuperPATH) to enable the committee to make a  
29 recommendation. They made a [recommendation for research](#) to investigate these  
30 approaches.

1 **How the recommendation might affect practice**

2 The recommendation reflects most current practice and is not expected to lead to  
3 substantial changes.

4 Full details of the evidence and the committee's discussion are in [evidence](#)  
5 [review M: hip approach](#).

6 [Return to recommendations](#)

7 ***Shoulder replacement for osteoarthritis with no rotator cuff tear***

8 [Recommendation 1.9.1](#)

9 **Why the committee made the recommendation**

10 Evidence showed that conventional total shoulder replacement provides more overall  
11 benefit than humeral hemiarthroplasty. The recommendation is limited to people with  
12 adequate glenoid bone because this is necessary for conventional total shoulder  
13 replacement to be considered. For people without adequate glenoid bone another  
14 solution, such as reverse shoulder replacement or other surgery, would be needed.  
15 The committee noted that modern imaging now offers further information to surgeons  
16 when assessing the adequacy of glenoid bone stock.

17 Conventional total shoulder replacement is increasingly being offered to people aged  
18 under 60 as confidence grows in its long-term durability. There is a lack of evidence  
19 in this age group so the committee made a [recommendation for research](#) to compare  
20 conventional total shoulder replacement with humeral hemiarthroplasty.

21 The committee were unable to make a recommendation for practice on reverse total  
22 shoulder replacement in this context because of the lack of evidence and their  
23 uncertainty about its effectiveness compared with other procedures. The committee  
24 noted that although reverse total shoulder replacement was originally designed for  
25 people with a rotator cuff tear, it is being used more widely for people with no rotator  
26 cuff tear to obviate the need for early revision surgery after rotator cuff failure. The  
27 committee made a [recommendation for research](#) to compare reverse total shoulder  
28 replacement with conventional total shoulder replacement in people with  
29 osteoarthritis with no rotator cuff tear .

1 **How the recommendation might affect practice**

2 The recommendation reflects most current practice and is not expected to lead to  
3 substantial changes.

4 Full details of the evidence and the committee's discussion are in [evidence review N:  
5 joint replacement shoulder surgery](#).

6 [Return to recommendations](#)

7 ***Shoulder replacement for pain and functional loss for people with a  
8 previous proximal humeral fracture***

9 **Why the committee were unable to make recommendations for practice**

10 The committee looked at 3 types of procedures for people with a previous proximal  
11 humeral fracture: reverse total shoulder replacement, humeral hemiarthroplasty and  
12 conventional total shoulder replacement. They were unable to make  
13 recommendations for practice because of a lack of evidence. They made a  
14 [recommendation for research](#) on procedures for shoulder replacement for people  
15 with a previous proximal humeral fracture.

16 Full details of the evidence and the committee's discussion are in [evidence review O:  
17 hemiarthroplasty proximal humeral fracture](#).

18 [Return to recommendations](#)

19 ***Inpatient rehabilitation***

20 [Recommendation 1.10.1](#)

21 **Why the committee made the recommendation**

22 Evidence in people who have had primary elective hip or knee replacement showed  
23 that rehabilitation within 24 hours of surgery, including mobilisation, reduces length  
24 of hospital stays. They agreed that early discharge improves wellbeing and is likely  
25 to be cost saving. They acknowledged concern about increased pain from early  
26 mobilisation, but noted the evidence showing that, for most people, the benefits  
27 outweigh any adverse effects. The committee noted that the physiotherapist or  
28 occupational therapist may delay mobilisation if clinically necessary.

1 There was no evidence on inpatient rehabilitation after shoulder replacement.  
2 However, in the committee's experience, the benefits are similar to those seen after  
3 hip or knee replacement. They agreed that people who have had shoulder  
4 replacement should ambulate within 24 hours of surgery but mobilisation of the  
5 shoulder should not be included because it depends on the orthopaedic team's  
6 clinical assessment. They discussed the wide variation in practice in the timing of  
7 shoulder mobilisation. Some services advise using a sling for 10 days whereas  
8 others advise using it for 6 weeks. There was no evidence available on when the  
9 shoulder should be mobilised so the committee made a [recommendation for](#)  
10 [research](#).

### 11 **How the recommendation might affect practice**

12 The recommendation largely reflects current practice and is not expected to result in  
13 substantial changes. Starting inpatient rehabilitation within 24 hours of surgery might  
14 mean that some hospitals will need to reorganise or increase physiotherapy and  
15 occupational therapy services to ensure they are available throughout weekends for  
16 people who have surgery on a Friday or Saturday. Most hospitals will already have  
17 physiotherapy or occupational therapy staff present at weekends; however, in some  
18 hospitals they may not be seeing elective hip and knee replacement patients as part  
19 of current practice. For those hospitals that do need to take on additional staff, these  
20 costs are expected to be offset by a reduction in the length of hospital stays.

21 Full details of the evidence and the committee's discussion are in [evidence review P:](#)  
22 [inpatient hip and knee postoperative rehabilitation](#) and [evidence review Q: inpatient](#)  
23 [shoulder postoperative rehabilitation](#).

24 [Return to recommendations](#)

### 25 ***Outpatient rehabilitation after hip or knee replacement***

26 [Recommendations 1.10.2 to 1.10.5](#)

### 27 **Why the committee made the recommendations**

28 The committee agreed that outpatient rehabilitation after hip or knee replacement is  
29 essential. Evidence suggested that self-directed rehabilitation and supervised  
30 rehabilitation are similarly effective. Moreover, supervised rehabilitation represents a

1 substantial cost to services. The committee noted that, in their experience, self-  
2 directed rehabilitation is effective for most people if undertaken with advice, and  
3 ongoing support if needed, from a physiotherapist or occupational therapist.

4 The committee recognised that provision needs to be made for people with  
5 additional needs that make self-directed outpatient rehabilitation difficult or  
6 ineffective, and who would benefit from supervised group or individual rehabilitation.  
7 They noted the lack of evidence in this area and made [recommendations for](#)  
8 [research](#) to investigate how to identify people in these groups and how best to  
9 support their rehabilitation.

#### 10 **How the recommendations might affect practice**

11 The recommendations reflect current practice and are not expected to result in  
12 substantial changes.

13 Full details of the evidence and the committee's discussion are in [evidence review R:](#)  
14 [outpatient hip and knee postoperative rehabilitation](#).

15 [Return to recommendations](#)

#### 16 ***Outpatient rehabilitation after shoulder replacement***

17 [Recommendations 1.10.6 to 1.10.8](#)

#### 18 **Why the committee made the recommendations**

19 There was no evidence to enable the committee to make recommendations for all  
20 people who have shoulder replacement surgery so they made a [recommendation for](#)  
21 [research](#). They agreed, based on their experience, that provision needs to be made  
22 for people with additional needs that make self-directed outpatient rehabilitation  
23 difficult or ineffective, and who would benefit from supervised group or individual  
24 rehabilitation.

#### 25 **How the recommendations might affect practice**

26 The recommendations reflect current practice and are not expected to result in  
27 substantial changes.

1 Full details of the evidence and the committee's discussion are in [evidence](#)  
2 [review S: outpatient rehabilitation after shoulder replacement](#).

3 [Return to recommendations](#)

#### 4 ***Follow-up and monitoring***

##### 5 **Why the committee were unable to make recommendations**

6 There was no evidence available to inform recommendations on follow-up and  
7 monitoring after joint replacement surgery. The committee were aware of an ongoing  
8 study to investigate follow-up after hip and knee replacement surgery. That study  
9 does not include people who have had shoulder replacement, so the committee  
10 made a [recommendation for research](#) on follow-up after shoulder replacement.

11 Full details of the evidence and the committee's discussion are in [evidence review T:](#)  
12 [long-term monitoring](#).

13 [Return to recommendations](#)

#### 14 ***Referral from primary care***

15 [Recommendation 1.11.1](#)

##### 16 **Why the committee made the recommendation**

17 The committee agreed that, in the absence of recommendations on follow-up and  
18 monitoring after joint replacement surgery, a recommendation is needed to ensure  
19 that people who have problems with their joint replacement are referred to the  
20 orthopaedic team.

##### 21 **How the recommendation might affect practice**

22 The recommendation reflects current practice and is not expected to result in  
23 changes.

24 Full details of the evidence and the committee's discussion are in [evidence review T:](#)  
25 [long-term monitoring](#).

26 [Return to recommendations](#)

## 1 **Context**

2 Hip, knee and shoulder joint replacements are among the most common orthopaedic  
3 operations performed in the UK. Around 90% of joint replacements are done to  
4 reduce pain and restore function in joints affected by osteoarthritis.

5 Surgical procedures for joint replacement vary. In addition, a wide range of joint  
6 implants are used. They can be made of metal, plastic or ceramic, and can be fixed  
7 into place using a variety of methods. These factors can all affect the longevity of the  
8 implant. They also have an effect on short-term outcomes such as postoperative  
9 pain and complications.

10 There are wide variations in the care provided before, during and after joint  
11 replacement surgery, particularly the provision of rehabilitation. This care is a vital  
12 factor in the success of this surgery.

13 The guideline aims to ensure that people having joint replacement surgery  
14 understand the various options and are offered the best possible care before, during  
15 and after their surgery.

## 16 **Finding more information and resources**

17 To find out what NICE has said on topics related to this guideline, see our web page  
18 on [musculoskeletal conditions](#).

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