DELIRIUM: diagnosis, prevention and management

Appendices

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CONTENTS

Please note: Appendices D-G and K are not included in this version. These are in separate files.

Appendix A: Scope

1 Guideline title

Delirium: diagnosis, prevention and management of delirium.

1.1 Short title

Delirium.

2 Background

a) The National Institute for Health and Clinical Excellence ('NICE' or 'the Institute') has commissioned the National Collaborating Centre for Nursing and Supportive Care to develop a clinical guideline on the diagnosis, prevention and management of delirium for use in the NHS in England and Wales. This follows referral of the topic by the Department of Health (see section 6 of this document). The guideline will provide recommendations for good practice that are based on the best available evidence of clinical and cost effectiveness.

b) The Institute's clinical guidelines support the implementation of National Service Frameworks (NSFs) in those aspects of care where a Framework has been published. The statements in each NSF reflect the evidence that was used at the time the Framework was prepared. The clinical guidelines and technology appraisals published by the Institute after an NSF has been issued have the effect of updating the Framework.

c) NICE clinical guidelines support the role of healthcare professionals in providing care in partnership with patients, taking account of their individual needs and preferences, and ensuring that patients (and their carers and families, if appropriate) can make informed decisions about their care and treatment.

3 Clinical need for the guideline

a) Delirium, sometimes called 'acute confusional state' is characterised by a disturbance of consciousness and a change in cognition that develops over a short period of time.

b) Although the clinical presentation of delirium differs considerably from patient to patient, there are several characteristic features that help make the diagnosis. The standard criteria for delirium, are described in the 'Diagnostic and Statistical Manual of Mental Disorders' [DSM IV] (1994):

- disturbance of consciousness (i.e., reduced clarity of awareness of the environment) with reduced ability to focus, sustain, or shift attention.
- a change in cognition (such as memory deficit, disorientation, language disturbance) or the development of a perceptual disturbance that is not better accounted for by a pre-existing, established, or evolving dementia.
- the disturbance develops over a short period of time (usually hours to days) and tends to fluctuate during the course of the day.
- there is evidence from the history, physical examination, and laboratory findings that: (1) the disturbance is caused by the direct physiological consequences of a general medical condition, (2) the symptoms in criteria (a) and (b) developed during substance intoxication[1], or during or shortly after, a withdrawal syndrome, or (3) the delirium has more than one aetiology".

c) Features of delirium are recent onset of fluctuating awareness, impairment of memory and attention, and disorganised thinking. Additional features may include hallucinations and disturbance of sleep-wake cycle. There are three clinical subtypes of delirium: hyperactive (characterised by hallucinations, delusions, agitation, and disorientation), hypoactive (sleepy state, uninterested in activities of living, often unrecognised or labelled as dementia) or mixed (patients can move between the two subtypes). Delirium may be present when a person is admitted to hospital (prevalent delirium) or develop during an admission (incident delirium).

d) The prevalence of delirium in hospitalised medically ill patients ranges from 10 to 31%. Most delirium occurs in the first 7 to10 days of admission or within days of surgery. Up to 50% of postoperative patients develop delirium, with patients at increased risk if they have had cardiac surgery, hip surgery or transplantation. Delirium is also commonly reported to occur in nursing homes, but is uncommon in community populations.

e) There is often difficulty in distinguishing whether a patient has delirium without dementia, has dementia alone, or has delirium with pre-existing dementia. Delirium, which has acute onset, is potentially preventable and treatable compared with dementia, which is ongoing. The severity of delirium symptoms fluctuates over a 24-hour period; this does not occur in dementia

[1] Refer to 4.1.2 c.

(with the exception of vascular dementia, Lewy body and Parkinson's disease dementia). Duration of symptoms of delirium has been reported to range from less than 1 week to more than 2 months.

f) The causes of delirium can include a general medical condition and drugs (including psychoactive, opioids or anticholinergic types) and surgery. Typically, delirium occurs in patients who have one or more risk factors, and who then experience a precipitating factor. Some groups are more at risk, for example, people with dementia, people with a severe acute illness and older people (older than 65 years). Precipitating factors include acute illness (for example, urinary infection, lower respiratory tract infection), unrelieved pain, sleep deprivation and environmental factors. In a patient with several risk factors, a small precipitant (such as a change in medication) can trigger delirium.

g) Diagnosis of delirium may be made by examining changes in cognitive function. In addition to quick assessment methods, established instruments include the confusion assessment method, used to detect delirium, and the mini-mental state examination, used to monitor the development and resolution of delirium.

h) There is a significant burden associated with this condition. Consequences of delirium may include increased length of stay in hospital or in ICU, poor functional and cognitive recovery after hospital admission, earlier onset or progression of dementia, increased hospital acquired complications (nosocomial infection, falls, pressure sores, and incontinence), new admission to long-term care and death.

i) There is a need for guidance to improve methods of appropriate identification, diagnosis, prevention and management of delirium. Failure to diagnose delirium, or misdiagnosis (mainly as dementia), can lead to inappropriate treatment being given. Delirium is often preventable and improvements in care practices and other treatments are needed. The improved management of delirium has the potential to generate cost savings.

4 The guideline

a) The guideline development process is described in detail in two publications that are available from the NICE website (see 'Further information'). 'The guideline development process: an overview for stakeholders, the public and the NHS' describes how organisations can become involved in the development of a guideline. 'The guidelines manual' provides advice on the technical aspects of guideline development.

b) This document is the scope. It defines exactly what this guideline will (and will not) examine, and what the guideline developers will consider. The scope is based on the referral from the Department of Health (see section 6 of this document).

c) The areas that will be addressed by the guideline are described in the following sections.

4.1 Population

4.1.1 Groups that will be covered

a) Adult patients (18 years and older) in a hospital setting

b) Adults (18 years and older) in long-term residential care.

4.1.2 Groups that will not be covered

a) Children and young people (younger than 18 years).

b) People receiving end-of-life care.

c) People with intoxication and/or withdrawing from drugs or alcohol, and people with delirium associated with these states.

4.2 Healthcare setting

a) The guideline will be relevant to NHS staff responsible for patients in hospital (including critical care) and long term residential care settings (including primary care health care professionals).

4.3 Clinical management

a) Assessment of risk factors and consideration of precipitants to identify people at high risk of developing delirium.

b) Diagnosis of delirium in acute, critical and long term care. This will take into consideration people presenting with learning disability, linguistic or communication problems.

c) Pharmacological and non pharmacological interventions to reduce the risk of delirium and its consequences.

d) Pharmacological and non pharmacological interventions for people with delirium to reduce the severity and duration and to prevent deterioration and major consequences of delirium including dementia.

e) Guideline recommendations will normally fall within licensed indications; Use outside a licensed indication may be recommended, including those licensed for other conditions, if clearly supported by evidence. The guideline will assume that prescribers will use a drug's summary of product characteristics to inform their decisions for individual patients.

f) The Guideline Development Group will take reasonable steps to identify ineffective interventions and approaches to care. If robust and credible recommendations for re-positioning the intervention for optimal use, or changing the approach to care to make more efficient use of resources can be made, they will be clearly stated. If the resources released are substantial, consideration will be given to listing such recommendations in the 'Key priorities for implementation' section of the guideline.

4.4 Status

4.4.1 Scope

This is the final version of the scope. The consultation period is 16 April to 14 May 2008.

NICE has published the following related guidance which may be referred to in this guideline:

- Acutely ill patients in hospital: recognition of and response to acute illness in adults in hospital. NICE clinical guideline 50 (2007). Available from www.nice.org.uk/CG050.
- Infection Control: prevention of healthcare-associated infection in primary and community care NICE clinical guideline 2 (2003). Available from www.nice.org.uk/CG2.
- Nutrition Support in adults: Nutrition support in adults: oral nutrition support, enteral tube feeding and parenteral nutrition. NICE clinical guideline 32 (2006). Available from www.nice.org.uk/CG032.
- Dementia: supporting people with dementia and their carers in health and social care. NICE clinical guideline 42 (2006). Available from www.nice.org.uk/CG042.
- Drug Misuse: opioid detoxification. NICE clinical guideline 52 (2007). Available from www.nice.org.uk/CG0452.
- Alcohol Use Disorders. Two guidelines are currently in preparation (exact titles to be confirmed). One will cover acute alcohol withdrawal and the treatment of physiological diseases associated with alcohol. The other will cover the management of planned detoxification and the psychological treatment of dependency.
- Surgical Site Infection. NICE clinical guideline in development.
- Schizophrenia (update). NICE clinical guideline in development
- Alzheimer's disease - donepezil, galantamine, rivastigmine (review) and memantine for the treatment of Alzheimer's disease. NICE technology appraisal 111 (2007). Available from www.nice.org.uk/TA111.
- Schizophrenia - the clinical effectiveness and cost effectiveness of newer atypical antipsychotic drugs for schizophrenia. NICE technology appraisal 43 (2002). Available from www.nice.org.uk/TA43.

5 Further information

Information on the guideline development process is provided in:

- 'The guideline development process: an overview for stakeholders, the public and the NHS'.
- 'The guidelines manual'.

These booklets are available as PDF files from the NICE website (www.nice.org.uk/guidelinesmanual). Information on the progress of the guideline will also be available from the website.

6 Referral from the Department of Health

"Remit: To prepare a clinical guideline on the diagnosis, prevention and management of delirium"

Appendix B: Declaration of interests

Declaration of Interests - Delirium		
Name	**Date**	**Declaration of Interest**
David Anderson	17/03/2008	1 day meeting advising on liaison psychiatry and co-morbid depression service laboratories
Andrew Clegg	20/02/2009	None declared
Melanie Gager	03/06/2008	None declared
James George	10/03/2009	I am a programme grant co-applicant for a programme grant to the National Institute of Health for Research in using the HELP programme to prevent Delirium. This application has been successful.
	update: 22/04/2009	I am a coapplicant with Professor John Young, Najma Siddiqi and Dr. John Holmes. I have received no payment for this but helped advice on the application.
Jane Healey	07/03/2008	In the course of my professional role as a Registered Nurse and employments with the NHS as an advocate for patients I aim to ensure high quality nursing care is delivered to patients with delirium. I am a member of the Nursing Midwifery Council, Royal College of Nursing and British Association of Critical Care Nurses.
Anne Hicks	18/03/2008	None declared
John Holmes	06/03/2008	I am currently on a short term (3 month) 2 day a week secondment to the Department of Health providing advice on Older People's Mental Health; this is due to be complete in May 2008. This includes advice on improving the management of delirium.
		I have researched and published in the delirium field and was a founder member of the European Delirium Association
	update: 22/04/2009	Personal pecuniary interest: I will be chairing the Programme Board for the HELP Programme.
Emma Ouldred	06/03/2008	Personal pecuniary interest: £7500 Educational grant received from Pfizer Pharmaceuticals to project manage and develop a community nurse dementia training project and resource package - awarded March 2008.
	update: 22/04/2009	Personal pecuniary interest: Applied for £500 grant to Eisai to update above resource pack and re-run community nurse dementia training project.
Najma Siddiqi	06/03/2008	Personal non-pecuniary interest: I have authored a Cochrane Review on interventions to prevent delirium in hospitalised patients and contributed to the preparation of the British Geriatric Society Guidelines on Delirium Diagnosis, Prevention and Management.
	update: 22/04/2009	Personal non-pecuniary interest: I am a co-applicant on an award by the National Institute for Health Research to fund a 5 year programme which aims to modify the Healthy Elder Life Program (HELP) for use in the NHS.

Declaration of Interests - Delirium		
Name	**Date**	**Declaration of Interest**
Gordon Sturmey (GDG member until Aug 2008)	04/03/2009	None declared
Beverley Tabernacle (GDG member until Jan 2009)	14/03/2008	None declared
Wendy Harvey (nee Tomlinson)	16/07/2009	None declared
Rachel White	17/04/2008	None declared
Matthew Wiltshire (GDG member from November 2008)	19/04/2008	Referee for assessing research proposals for projects relating to emergency care for NCCHTA. £100 received for a proposal in April, 2008.
John Young	24/12/2009	None declared
	update: 23/04/2009	Personal pecuniary interest: We have learnt that we have been successful with an NIHR Programme Grant to investigate the implementation of HELP (as a USA system of care) into the UK.

Appendix C: Search strategies

Overview of search strategies

This appendix details the search strategies used in the identification of relevant studies for the guideline on diagnosis, prevention and management of delirium.

All searches were conducted on the following databases: Medline (OVID), Embase (OVID), PsycINFO (Silverplatter/OVID) Cinahl (EBSCO) and the Cochrane Library.

Searches were initially performed for articles published since 1994, the publication date of the *Diagnostic and Statistical Manual IV* (DSM IV) which is the reference standard for the diagnosis of delirium. Following guidance from the Guideline Development Group (GDG), a further search back to 1987 was carried out in order to retrieve studies using the earlier *Diagnostic and Statistical Manual III (Revised)* (DSMIII-R) as the reference standard.

Search filters were applied where appropriate, including filters for randomised controlled trials (RCT) and systematic reviews (SR). The RCT filter used was based on that recommended by Cochrane (Higgins 2005). An exclusions filter was designed to remove irrelevant results such as letters and editorials.

The search strategies for each review are reproduced below. Note that the searches make use of the controlled vocabulary which varies between databases and between search interfaces. Amendments were made where necessary in order to take these variations into account.

Where possible, searches were restricted to articles written in English. All searches were updated on August 17th 2009.

Hand searching was not undertaken by the NCC-NSC following NICE advice that exhaustive searching on every guideline review topic is not practical (Mason 2002). Reference lists of articles were checked for further articles of potential relevance.

1 Clinical questions and literature search

Question wording	Study type / filters used	Database and years
Diagnosis		
Assessment methods for identifying people at risk of delirium	All study types	Medline 1994–2009 Embase 1994–2009 Cochrane 1994–2009 Cinahl 1994–2009 PsycINFO 1994–2009
Identification of symptoms that indicate patients may have delirium		
Practical diagnostic tests for identifying patients with delirium in different settings		
Diagnostic criteria for identifying patients with delirium		
Prognosis		
Risk factors for delirium	All study types	Medline 1987–2009 Embase 1987–2009 Cochrane 1987–2009 Cinahl 1987–2009 PsycINFO 1987–2009
Precipitating factors for delirium		
Consequences of, and following, delirium		
Interventions		
Prevention of delirium in a hospital setting		
Pharmacological interventions for the prevention of delirium in a hospital setting	All study types	Medline 1994–2009 Embase 1994–2009 Cochrane 1994–2009 Cinahl 1994–2009 PsycINFO 1994–2009
Single component, non-pharmacological interventions for the prevention of delirium in a hospital setting		
Multi-component interventions for the prevention of delirium in hospital setting		
Prevention of delirium in a long-term care setting		
Pharmacological interventions for the prevention of delirium in long term care	All study types	Medline 1994–2009 Embase 1994–2009 Cochrane 1994–2009 Cinahl 1994–2009 PsycINFO 1994–2009
Single component, non-pharmacological interventions for the prevention of delirium in a long term care setting		
Multi-component interventions for the prevention of delirium in long term care		
Treatment of delirium in a hospital setting		
Pharmacological interventions for the treatment of delirium in a hospital setting	All study types	Medline 1994–2009 Embase 1994–2009 Cochrane 1994–2009 Cinahl 1994–2009 PsycINFO 1994–2009
Single component, non-pharmacological interventions for the treatment of delirium in a hospital setting		
Multi-component interventions for the treatment of delirium in a hospital setting		
Treatment of delirium in a long-term care setting		
Pharmacological interventions for the treatment of delirium in a long term care setting	All study types	Medline 1994–2009 Embase 1994–2009 Cochrane 1994–2009 Cinahl 1994–2009 PsycINFO 1994–2009
Single component, non-pharmacological interventions for the treatment of delirium in a long term care setting		
Multi-component interventions for the treatment of delirium in a long term care setting		

Question wording	Study type / filters used	Database and years
Patient information		
Information for people with delirium or at risk of delirium, and their carers	All study types	Medline 1994–2009 Embase 1994–2009 Cochrane 1994–2009 Cinahl 1994–2009 PsycINFO 1994–2009
Other		
Prevalence of delirium in different settings	All study types	Medline 1994–2009 Embase 1994–2009 Cochrane 1994–2009 Cinahl 1994–2009 PsycINFO 1994–2009

Search terms

Delirium Patient Filter

The following patient filters were developed in consultation with the GDG chair. These patient filters were initially combined with filters for randomized controlled trials (RCTs) and systematic reviews (SRs) (see below). It was then combined with an exclusions filter to remove unwanted references. The results were sifted for relevant studies.

The searches were then performed with no additional filters and again sifted for studies relevant to the guideline.

Medline

No.	Search terms
1	deliri$.ti,ab.
2	(acute adj2 (confusion$ or "brain syndrome" or "brain failure" or "psycho-organic syndrome" or "organic psychosyndrome")).mp.
3	(terminal$ adj restless$).mp.
4	toxic confus$.mp.
5	delirium/
6	confusion/
7	or/1-6
8	*psychoses, alcoholic/ or *alcohol withdrawal delirium/
9	*substance withdrawal syndrome/
10	8 or 9
11	7 not 10

1 **Embase**

No.	Search terms
1	delirium/
2	(acute adj2 (confusion$ or "brain syndrome" or "brain failure" or "psycho-organic syndrome" or "organic psychosyndrome")).mp.
3	deliri$.ti,ab.
4	(terminal$ adj restless$).mp.
5	toxic confus$.mp.
6	or/1-5
7	*alcohol psychosis/
8	*delirium tremens/
9	*withdrawal syndrome/
10	7 or 8 or 9
11	6 not 10

2

3 **PsycINFO (Silverplatter)**

No.	Search terms
#12	#6 not #11
#11	("delirium-tremens" in mj) or ("alcoholic-psychosis" in mj) or ("alcohol-withdrawal" in mj) or ("drug-withdrawal" in mj)
#10	"delirium-tremens" in mj
#9	"alcoholic-psychosis" in mj
#8	"alcohol-withdrawal" in mj
#7	"drug-withdrawal" in mj
#6	(toxic confus* in ti,ab,mj,mn) or ((terminal* adj restless*) in ti,ab,mn,mj) or ((acute near2 (confusion* or "brain syndrome" or "brain failure" or "psycho-organic syndrome" or "organic psychosyndrome")) in ti,ab,mj,mn) or (deliri* in ti,ab) or ("delirium-" in mj,mn)
#5	toxic confus* in ti,ab,mj,mn
#4	(terminal* adj restless*) in ti,ab,mn,mj
#3	(acute near2 (confusion* or "brain syndrome" or "brain failure" or "psycho-organic syndrome" or "organic psychosyndrome")) in ti,ab,mj,mn
#2	deliri* in ti,ab
#1	"delirium-" in mj,mn

4

5 **PsycINFO (OVID)**

No.	Search terms
1	exp delirium/
2	deliri$.ti,ab.
3	(acute adj2 (confusion* or "brain syndrome" or "brain failure" or "psycho-organic syndrome" or "organic psychosyndrome")).ti,ab,sh.
4	(terminal* adj restless*).ti,ab,sh.
5	toxic confus*.ti,ab,sh.
6	or/1-5
7	*drug withdrawal/
8	*alcohol withdrawal/
9	*alcoholic psychosis/
10	*delirium tremens/
11	or/7-10
12	6 not 11

6

Cinahl

No.	Search terms
S17	s12 not s16
S16	s15 or s14 or s13
S15	(mh "psychoses, substance-induced+")
S14	(mh "alcohol withdrawal delirium")
S13	(mh "substance withdrawal syndrome")
S12	s11 or s10 or s9 or s8 or s7 or s6 or s5 or s4 or s3 or s2 or s1
S11	toxic n1 confus*
S10	terminal* n1 restless*
S9	acute n2 "organic psycho?syndrome"
S8	acute n2 "psycho-organic syndrome"
S7	acute n2 "brain failure"
S6	acute n2 "brain syndrome"
S5	acute n2 confusion*
S4	deliri*
S3	(mh "delirium management (iowa nic)")
S2	(mh "confusion")
S1	(mh "delirium")

The Cochrane Library

No.	Search terms
#1	deliri*:kw,ti,ab
#2	(acute near/2 (confusion* or brain syndrome or brain failure or psycho*organic syndrome* or organic psycho*syndrome*)):kw,ti,ab
#3	(terminal* next restless*):kw,ti,ab
#4	toxic next confus*:kw,ti,ab
#5	(#1 OR #2 OR #3 OR #4)

RCT Filters

Medline

No.	Search terms
1	randomized controlled trial$.pt,sh.
2	clinical trial$.pt,sh.
3	random allocation/
4	double blind method/
5	single blind method/
6	((clin$ or control$) adj5 trial$).ti,ab.
7	((singl$ or doubl$ or trebl$ or tripl$) adj25 (blind$ or mask$)).ti,ab.
8	placebos/
9	placebo$.ti,ab.
10	random$.ti,ab.
11	(volunteer$ or "control group" or controls or prospective$).ti,ab.
12	research design/
13	or/1-12

14	animals/ not humans/
15	13 not 14

1

2 **Embase**

No.	Search terms
1	exp randomized controlled trial/
2	(random$ or placebo$).ti,ab.
3	((singl$ or doubl$ or trebl$ or tripl$) adj25 (blind$ or mask$)).ti,ab.
4	(clin$ adj25 trial$).ti,ab.
5	exp comparative study/
6	exp evaluation/
7	exp follow up/
8	exp prospective study/
9	(control$ or prospective$ or volunteer$).ti,ab.
10	or/1-9
11	exp human/
12	10 and 11

3

4 **PsycINFO**

No.	Search terms
1	placebo.sh.
2	clinical trials.sh.
3	random sampling.sh.
4	mental health program evaluation.sh.
5	treatment effectiveness evaluation.sh.
6	exp treatment outcomes/ or treatment outcome$.md.
7	(clinical adj2 trial$).tw.
8	(crossover or cross over).tw.
9	(((single$ or doubl$ or trebl$ or tripl$) adj5 (blind$ or mask$ or dummy)) or (singleblind$ or doubleblind$ or trebleblind$)).tw.
10	(placebo$ or random$).tw.
11	(animal not (animal and human)).po. or (animals not (animals and (human females or human males))).sh.
12	or/1-10 not 11

5
6

7 **Cinahl**

No.	Search terms
S11	(s10 or s9 or s8 or s7 or s6 or s5 or s4 or s3 or s2 or s1)
S10	control* or prospective* or volunteer*
S9	(mh "quantitative studies")
S8	(mh "placebos")
S7	(mh "random assignment")
S6	random* or placebo*
S5	(singl* n25 mask*) or (doubl* n25 mask*) or (trebl* n25 mask*) or (tripl* n25 mask*)
S4	(singl* n25 blind*) or (doubl* n25 blind*) or (trebl* n25 blind*) or (tripl* n25 blind*)
S3	(clin* n25 trial*)
S2	pt clinical trial
S1	(mh "clinical trials+")

SR Filters

Medline / Embase

No.	Search terms
1	review.pt. or review.ti. or "review"/
2	(systematic$ or evidence$ or methodol$ or quantitativ$ or analys$ or assessment$).ti,sh,ab.
3	1 and 2
4	meta-analysis.pt.
5	meta-analysis/
6	meta-analysis as topic/
7	"systematic review"/
8	(meta-analy$ or metanaly$ or metaanaly$ or meta analy$).ti,ab.
9	((systematic$ or evidence$ or methodol$ or quantitativ$) adj5 (review$ or survey$ or overview$)).ti,ab,sh.
10	((pool$ or combined or combining) adj2 (data or trials or studies or results)).ti,ab.
11	or/3-10

PsycINFO

No.	Search terms
1	(meta analysis or systematic review).sh,md.
2	literature review.sh,md.
3	(metaanal$ or meta anal$ or metasynthes$ or meta synthes$).tw.
4	((systematic or quantitative or methodologic$) adj5 (overview$ or review$)).tw.
5	((quantitativ$ or data) adj (extraction or synthesis)).tw.
6	((bids or cinahl or cochrane or embase or index medicus or isi citation or medlars or psyclit or psychlit or scisearch or science citation or (web adj2 science)) and review$).tw.
7	(pooled or pooling).tw.
8	(research adj (review$ or integration)).tw.
9	(handsearch$ or ((hand or manual) adj search$)).tw.
10	((electronic or bibliographic) adj database$).tw.
11	(mantel haenszel or peto or dersimonian or der simonian).ti,ab.
12	(fixed effect$ or random effect$).ti,ab.
13	reference list$.ab.
14	bibliograph$.ab.
15	published studies.ab.
16	relevant journals.ab.
17	selection criteria.ab.
18	or/1-17

Cinahl

No.	Search terms
S13	S12 or S11 or S10 or S9 or S8 or S7 or S6
S12	(pool* N2 data) or (combined N2 data) or (combining N2 data) or (pool* N2 trials) or (combined N2 trials) or (combining N2 trials) or (pool* N2 studies) or (combined N2 studies) or (combining N2 studies) or (pool* N2 results) or (combined N2 results) or (combining N2 results)

S11	(systematic* N5 overview*) or (evidence* N5 overview*) or (methodol* N5 overview*) or (quantitativ* N5 overview*)
S10	(systematic* N5 survey*) or (evidence* N5 survey*) or (methodol* N5 survey*) or (quantitativ* N5 survey*)
S9	(systematic* N5 review*) or (evidence* N5 review*) or (methodol* N5 review*) or (quantitativ* N5 review*)
S8	(meta-analy* or metanaly* or metaanaly* or meta analy*)
S7	(MH "Meta Analysis")
S6	S4 and S5
S5	S3 or S2 or S1
S4	(systematic* or evidence* or methodol* or quantitativ* or analys* or assessment*)
S3	TI review
S2	(MH "Systematic Review")
S1	PT review

Exclusions Filter

The following filter was designed to remove irrelevant results from searches. If used it was combined into search strategies using the NOT operator.

Medline / Embase / Cinahl

No.	Search terms
1	letter.pt.
2	letter/
3	letter$/
4	editorial.pt.
5	historical article.pt.
6	anecdote.pt.
7	commentary.pt.
8	note.pt.
9	case report/
10	case report$.pt.
11	case study/
12	case study.pt.
13	exp animal/ not human/
14	nonhuman/
15	exp animal studies/
16	animals, laboratory/
17	exp experimental animal/
18	exp animal experiment/
19	exp animal model/
20	exp rodentia/
21	exp rodents/
22	exp rodent/
23	or/1-22

Adverse Effects

The following searches were combined with the delirium patient filter to identify studies reporting pharmacological adverse effects.

Medline

No.	Search terms
1	haloperidol/ae, to
2	risperidone/ae, to
3	diazepam/ae, to
4	flunitrazepam/ae, to
5	meperidine/ae, to
6	or/1-5
7	(donepezil$ or aricept or rivastigmine or amisulpride or sultopride or olanzapine or quetiapine or valium or rohypnol or rohipnol or pethidine).mp.
8	(ae or to).fs.
9	7 and 8
10	6 or 9

Embase

No.	Search terms
1	haloperidol/ae, to
2	donepezil/ae, to
3	rivastigmine/ae, to
4	exp amisulpride/ae, to
5	olanzapine/ae, to
6	quetiapine/ae, to
7	risperidone/ae, to
8	diazepam/ae, to
9	flunitrazepam/ae, to
10	pethidine/ae, to
11	or/1-10

PsycINFO

No.	Search terms
1	"side effects".id.

Cinahl

No.	Search terms

S3	S1 AND S2
S2	(haloperidol or risperidone or diazepam or flunitrazepam or meperidine or donepezil* or aricept or rivastigmine or amisulpride or sultopride or olanzapine or quetiapine or valium or rohypnol or rohipnol or pethidine)
S1	MW "adverse effects"

The Cochrane Library

No.	Search terms
#1	(haloperidol or risperidone or diazepam or flunitrazepam or meperidine or donepezil* or aricept or rivastigmine or amisulpride or sultopride or olanzapine or quetiapine or valium or rohypnol or rohipnol or pethidine):ti,ab,kw

Patient Information

The following searches were combined with the delirium patient filter and the exclusions filter to identify papers for the review on information for patients.

Medline

No.	Search terms
1	((client$ or patient$ or user$ or carer$ or consumer$ or customer$) adj3 (attitud$ or priorit$ or perception$ or preferen$ or expectation$ or choice$ or perspective$ or view$ or satisfact$ or inform$ or experience$ or opinion$)).mp.
2	(information adj need$).mp.
3	(information adj requirement$).mp.
4	(information adj support$).mp.
5	(patient$ adj information$).mp.
6	(service$ adj2 acceptab$).mp.
7	(service$ adj2 unacceptab$).mp.
8	psycho?social.mp.
9	(patient$ adj (complian$ or adheren$ or concordan$)).mp.
10	patient education/
11	exp attitude to health/
12	exp patient acceptance of health care/
13	or/1-12

Embase

No.	Search terms
1	((client$ or patient$ or user$ or carer$ or consumer$ or customer$) adj3 (attitud$ or priorit$ or perception$ or preferen$ or expectation$ or choice$ or perspective$ or view$ or satisfact$ or inform$ or experience$ or opinion$)).mp.
2	(information adj need$).mp.
3	(information adj requirement$).mp.
4	(information adj support$).mp.
5	(patient$ adj information$).mp.
6	(service$ adj2 acceptab$).mp.

7	(service$ adj2 unacceptab$).mp.
8	psycho?social.mp.
9	(patient$ adj (complian$ or adheren$ or concordan$)).mp.
10	patient education/
11	exp attitude/
12	exp patient attitude/
13	or/1-12

1

2 **PsycINFO**

No.	Search terms
1	((client$ or patient$ or user$ or carer$ or consumer$ or customer$) adj3 (attitud$ or priorit$ or perception$ or preferen$ or expectation$ or choice$ or perspective$ or view$ or satisfact$ or inform$ or experience$ or opinion$)).mp.
2	(information adj need$).mp.
3	(information adj requirement$).mp.
4	(information adj support$).mp.
5	(patient$ adj information$).mp.
6	(service$ adj2 acceptab$).mp.
7	(service$ adj2 unacceptab$).mp.
8	psycho?social.mp.
9	(patient$ adj (complian$ or adheren$ or concordan$)).mp.
10	client education/
11	exp client attitudes/ or exp consumer attitudes/ or exp health attitudes/
12	health care delivery/
13	or/1-12

3

4 **Cinahl**

No.	Search terms
S12	S1 or S2 or S3 or S4 or S5 or S6 or S7 or S8 or S9 or S10 or S11
S11	(MH "Attitude to Health+")
S10	(MH "Patient Education")
S9	psychosocial or psycho-social
S8	patient* and (complian* or adheren* or concordan*)
S7	service* N2 unacceptab*
S6	service* N2 acceptab*
S5	patient* N1 information*
S4	information N1 support*
S3	information N1 requirement*
S2	information N1 need*
S1	((client* or patient* or user* or carer* or consumer* or customer*) and (attitud* or priorit* or perception* or preferen* or expectation* or choice* or perspective* or view* or satisfact* or inform* or experience* or opinion*))

5

6 **The Cochrane Library**

No.	Search terms
#1	(client* or patient* or user* or carer* or consumer* or customer*) near/3 (attitud* or priorit* or

	perception* or preferen* or expectation* or choice* or perspective* or view* or satisfact* or inform*)
#2	information NEXT need*
#3	information NEXT requirement*
#4	information NEXT support*
#5	service* near/2 attribute*
#6	service* near/2 acceptab*
#7	service* near/2 unacceptab*
#8	impact* OR psycholog* OR emotion* OR experience* OR subjective* OR status OR perception* OR consequence* OR sequelae OR meaning* OR rating* OR complian* OR adheren* OR concordan*
#9	(psycho-social OR psychosocial) OR (psycho NEXT social)
#10	patient NEXT education
#11	(#1OR #2OR #3OR #4OR #5OR #6OR #7OR #8OR #9OR #10)

Economics

The delirium patient filter was combined with the following filters for health economics and quality of life studies. Searches for health economics were performed on Medline, Embase, the Health Technology Appraisals (HTA) database and the NHS Economic Evaluations Database (NHSEED). The latter two databases were searched via the Cochrane Library using the delirium patient filter.

Medline

No.	Search terms
1	exp "costs and cost analysis"/
2	economics/
3	exp economics, hospital/
4	exp economics, medical/
5	exp economics, nursing/
6	exp economics, pharmaceutical/
7	exp "fees and charges"/
8	exp budgets/
9	ec.fs.
10	(economic$ or pharmacoeconomic$ or price$ or pricing$ or cost$ or budget$).ti,ab.
11	(value adj2 (money or monetary)).ti,ab.
12	(expenditure not energy).ti,ab.
13	or/1-12
14	((metabolic or energy or oxygen) adj1 cost$).ti,ab.
15	13 not 14
16	exp quality-adjusted life years/
17	quality adjusted life.tw.
18	exp "quality of life"/
19	value of life/
20	(qaly$ or qald$ or qale$ or qtime$).tw.
21	disability adjusted life.tw.
22	daly$.tw.
23	health status indicators/

24	(sf36 or sf 36 or short form 36 or shortform 36 or sf thirtysix or sf thirty six or shortform thirtysix or shortform thirty six or short form thirtysix or short form thirty six).tw.
25	(sf6 or sf 6 or short form 6 or shortform 6 or sf six or sfsix or shortform six or short form six).tw.
26	(sf12 or sf 12 or short form 12 or shortform 12 or sf twelve or sftwelve or shortform twelve or short form twelve).tw.
27	(sf16 or sf 16 or short form 16 or shortform 16 or sf sixteen or sfsixteen or shortform sixteen or short form sixteen).tw.
28	(sf20 or sf 20 or short form 20 or shortform 20 or sf twenty or sftwenty or shortform twenty or short form twenty).tw.
29	(euroqol or euro qol or eq5d or eq 5d).tw.
30	(hql or hqol or h qol or hrqol or hr qol).tw.
31	(hye or hyes).tw.
32	health$ year$ equivalent$.tw.
33	health utilit$.tw.
34	(hui or hui1 or hui2 or hui3).tw.
35	disutili$.tw.
36	rosser.tw.
37	quality of well?being.tw.
38	qwb.tw.
39	willingness to pay.tw.
40	standard gamble$.tw.
41	time trade off.tw.
42	time tradeoff.tw.
43	tto.tw.
44	or/16-43
45	15 or 44

1

2 **Embase**

No.	Search terms
1	health economics/
2	exp economic evaluation/
3	exp health care cost/
4	exp pharmacoeconomics/
5	exp fee/
6	budget/
7	(economic$ or pharmacoeconomic$ or cost$ or price$ or pricing$ or budget$).ti,ab.
8	(value adj2 (money or monetary$)).ti,ab.
9	(expenditure not energy).ti,ab.
10	or/1-9
11	((metabolic or energy or oxygen) adj1 cost$).ti,ab.
12	10 not 11
13	quality adjusted life year/
14	quality of life/
15	(qaly$ or qald$ or qale$ or qtime$).tw.
16	daly$.tw.
17	quality adjusted life.tw.
18	disability adjusted life.tw.
19	(sf36 or sf 36 or short form 36 or shortform 36 or sf thirtysix or sf thirty six or shortform thirtysix or shortform thirty six or short form thirtysix or short form thirty six).tw.
20	(sf6 or sf 6 or short form 6 or shortform 6 or sf six or sfsix or shortform six or short form six).tw.
21	(sf12 or sf 12 or short form 12 or shortform 12 or sf twelve or sftwelve or shortform twelve or

	short form twelve).tw.
22	(sf16 or sf 16 or short form 16 or shortform 16 or sf sixteen or sfsixteen or shortform sixteen or short form sixteen).tw.
23	(sf20 or sf 20 or short form 20 or shortform 20 or sf twenty or sftwenty or shortform twenty or short form twenty).tw.
24	(euroqol or euro qol or eq5d or eq 5d).tw.
25	(hql or hqol or h qol or hrqol or hr qol).tw.
26	(hye or hyes).tw.
27	health$ year$ equivalent$.tw.
28	health utilit$.tw.
29	(hui or hui1 or hui2 or hui3).tw.
30	disutili$.tw.
31	rosser.tw.
32	quality of well?being.tw.
33	qwb.tw.
34	willingness to pay.tw.
35	standard gamble$.tw.
36	time trade off.tw.
37	time tradeoff.tw.
38	tto.tw.
39	or/13-38
40	12 or 39

Epidemiology

The epidemiology searches are presented here in full with the exception of that for Cinahl (see note below).

Medline

No.	Search terms
1	incidence/
2	prevalence/
3	epidemiology/
4	ep.fs.
5	deliri$.ti,ab.
6	(acute adj2 (confusion$ or "brain syndrome" or "brain failure" or "psycho-organic syndrome" or "organic psychosyndrome")).mp.
7	(terminal$ adj restless$).mp.
8	toxic confus$.mp.
9	delirium/
10	confusion/
11	or/5-10
12	*psychoses, alcoholic/ or *alcohol withdrawal delirium/
13	*substance withdrawal syndrome/
14	12 or 13
15	11 not 14
16	delirium/ep
17	confusion/ep
18	or/5-8

19	or/1-3
20	18 and 19
21	20 or 16 or 17
22	11 and 19
23	21 or 22
24	23 not 14

1

2 **Embase**

No.	Search terms
1	incidence/
2	prevalence/
3	exp epidemiology/
4	ep.fs.
5	delirium/
6	(acute adj2 (confusion$ or "brain syndrome" or "brain failure" or "psycho-organic syndrome" or "organic psychosyndrome")).mp.
7	deliri$.ti,ab.
8	(terminal$ adj restless$).mp.
9	toxic confus$.mp.
10	or/5-9
11	*alcohol psychosis/
12	*delirium tremens/
13	*withdrawal syndrome/
14	or/11-13
15	10 not 14
16	delirium/ep
17	or/6-9
18	or/1-3
19	17 and 18
21	16 or 19
22	10 and 18
23	22 or 23
24	23 not 14

3

4 **PsycINFO**

No.	Search terms
1	exp delirium/
2	deliri$.ti,ab.
3	(acute adj2 (confusion* or "brain syndrome" or "brain failure" or "psycho-organic syndrome" or "organic psychosyndrome")).ti,ab,sh.
4	(terminal* adj restless*).ti,ab,sh.
5	toxic confus*.ti,ab,sh.
6	or/1-5
7	*drug withdrawal/
8	*alcohol withdrawal/
9	*alcoholic psychosis/
10	*delirium tremens/
11	or/7-10

12	6 not 11
13	exp epidemiology/
14	(inciden* or prevalen* or frequency or occurence* or outbreak*).ti,ab,sh.
15	13 or 14
16	12 and 15

Cinahl

The following search strategy was combined with the delirium patient filter.

No.	Search terms
S4	S1 or S2 or S3
S3	MH "Incidence"
S2	MW "Epidemiology"
S1	MH "Prevalence"

1.1 Consequences

Top level searches were carried out to provide evidence for the review of the health consequences of delirium. Searches were restricted by date to studies published since 1990 unless there was a more recently published NICE clinical guideline. Where this was the case searches were performed from the last search date of the relevant guideline. Searches were performed on Medline, Embase, the Health Technology Appraisals (HTA) database and the NHS Economic Evaluations Database (NHSEED). The searches on Medline and Embase were combined with the health economics filters detailed above.

Medline

No.	Search terms
1	*accidental falls/
2	limit 1 to yr="2004 - 2009"
3	*pressure ulcer/
4	limit 3 to yr="2005 - 2009"
5	*cognition disorders/
6	limit 5 to yr="1990 - 2009"
7	*dementia/
8	limit 7 to yr="1990 - 2009"
9	*stress disorders, post-traumatic/
10	limit 9 to yr="2005 - 2009"
11	*stroke/
12	limit 11 to yr="2008 - 2009"
13	((extrapyramidal or extra-pyramidal) adj (symptom$ or disorder$)).ti,ab.
14	limit 13 to yr="1990 - 2009"
15	*long-term care/
16	*nursing homes/
17	*homes for the aged/

18	or/15-17
19	limit 18 to yr="1990 - 2009"
20	(persist$ and deliri$).tw.
21	limit 20 to yr="1990 - 2009"
22	2 or 4 or 6 or 8 or 10 or 12 or 14 or 19 or 21

Embase

No.	Search terms
1	*falling/
2	limit 1 to yr="2004 - 2009"
3	*decubitus/
4	limit 3 to yr="2005 - 2009"
5	*cognitive defect/
6	limit 5 to yr="1990 - 2009"
7	*dementia/
8	limit 7 to yr="1990 - 2009"
9	*posttraumatic stress disorder/
10	limit 9 to yr="2005 - 2009"
11	*stroke/
12	limit 11 to yr="2008 - 2009"
13	*extrapyramidal symptom/
14	limit 13 to yr="1990 - 2009"
15	*long term care/
16	*home for the aged/
17	*nursing home/
18	or/15-17
19	limit 18 to yr="1990 - 2009"
20	(persist$ and deliri$).tw.
21	limit 20 to yr="1990 - 2009"
22	2 or 4 or 6 or 8 or 10 or 12 or 14 or 19 or 21

The Cochrane Library

NHSEED and HTA database were searched via The Cochrane Library

No.	Search terms
#1	((fall or falls or falling or faller* or fallen or slip or trip or trips or tripped):ti,ab) or (fall*):kw, from 2004 to 2009
#2	((pressure next ulcer*) or (pressure next wound*) or (pressure next damag*) or (pressure next injur*)):ti,kw,ab
#3	MeSH descriptor Pressure Ulcer, this term only
#4	(#2 OR #3), from 2005 to 2009
#5	((cognition OR cognitive* OR intellectual* OR neurological*) AND (impair* OR problem)):ti,ab,kw
#6	((cognition OR cognitive) AND (disorder* OR defect*)):ti,ab,kw
#7	(#5 OR #6), from 1990 to 2009
#8	dementia:ti,ab,kw, from 1990 to 2009
#9	((ptsd) or (posttraumatic or post-traumatic) or (post next traumatic)):ti,ab,kw

#10	MeSH descriptor Stress Disorders, Post-Traumatic, this term only
#11	(#9 OR #10), from 2005 to 2009
#12	stroke:ti,ab,kw, from 2008 to 2009
#13	((extrapyramidal or extra-pyramidal) near/2 (symptom* or disorder*)):ti,ab,kw, from 1990 to 2009
#14	(long term care or long-term care):ti,kw,ab
#15	MeSH descriptor Long-Term Care, this term only
#16	MeSH descriptor Nursing Homes, this term only
#17	MeSH descriptor Homes for the Aged, this term only
#18	(#14 OR #15 OR #16 OR #17), from 1990 to 2009
#19	(persist* and deliri*):ti,kw,ab, from 1990 to 2009
#20	(#1 OR #4 OR #7 OR #8 OR #11 OR #12 OR #13 OR #18 OR #19)

1

Appendix D: Included studies

2

3

1 # Appendix E: Methodological quality

2

1 # Appendix F: Multivariate risk factors

2

Appendix G: Excluded studies (part A) and Excluded studies reference list (part B)

Appendix H: Recommendations for future research

1. FULL LIST OF RECOMMENDATIONS FOR FUTURE RESEARCH

HP = high priority: 1, 2, 4, 5, 6

1.1 HP: Research recommendation 1

1.1.1 Are atypical antipsychotics more clinically and cost effective than placebo, typical antipsychotics, benzodiazepines or acetylcholinesterase inhibitors in preventing the development of delirium in hospital patients at high risk of delirium?

1.2 HP: Research recommendation 2

1.2.1 In hospital patients with delirium, are atypical antipsychotics better than placebo or typical antipsychotics or benzodiazepines for treating delirium?

1.3 Research recommendation 3

1.3.1 Is music therapy that is tailored to the individual's preferences, more clinically and cost effective than non-tailored music or usual care in preventing the development of delirium in hospital patients at risk of delirium?

1.4 HP: Research recommendation 4

1.4.1 For patients in long-term care, is a multicomponent non-pharmacological intervention more clinically and cost effective than usual care in preventing the development of delirium?

1.5 HP: Research recommendation 5

1.5.1 How common is delirium and what are its adverse outcomes in people in long-term care?

1.6 HP: Research recommendation 6

1.6.1 Does a staff education programme (compared with an educational leaflet or usual care) reduce the incidence of delirium and improve the recognition and recording of delirium in people in hospital?

1.7 Research recommendation 7

1.7.1 Does giving information about delirium to people in a UK hospital or long-term care, who are at risk of delirium, increase their ability to cope if delirium subsequently occurs, and does the information decrease the duration of delirium?

1.8 Research recommendation 8

1.8.1 In people with dementia, does an education programme in delirium for carers improve the recognition of acute confusion and reduce the severity and duration of delirium, compared to an education leaflet or usual care?

1.9 Research recommendation 9

1.9.1 Does an education programme for staff improve the recovery from delirium in patients in hospital compared with an education leaflet or usual care?

1.10 Research recommendation 10

1.10.1 The development and validation of a new test for delirium

1.11 Research recommendation 11

1.11.1 Is the presence of immune system markers, particularly cytokines, a risk factor for the development of delirium?

1.12 Research recommendation 12

1.12.1 What is the resource use and cost of implementing a muticomponent prevention intervention in hospital or long term care settings as compared to usual care?

2 HIGH PRIORITY RECOMMENDATIONS FOR FUTURE RESEARCH

The criteria for selecting high-priority research recommendations were considered in accordance with process outlined in 'The guidelines manual' (NICE 2009).

2.1 HP: Research recommendation 1

2.1.1 Are atypical antipsychotics more clinically and cost effective than placebo, typical antipsychotics, benzodiazepines or acetylcholinesterase inhibitors in preventing the development of delirium in hospital patients at high risk of delirium?

2.1.1.1 Summary– why the proposed research is important

The serious nature of delirium and its consequences makes it important to establish all methods of prevention. Pharmacological agents may be a simple preventative treatment for delirium, but they can also cause delirium so they should be used with caution. The evidence is limited: three low-quality studies were found, each of which was unrepresentative either of the population or the drug used, but there was some indication of clinical effectiveness. A large randomised trial (with at least 100 patients in each arm) should be conducted in hospital patients at high risk of delirium to compare atypical antipsychotics, typical

antipsychotics, benzodiazepines or acetylcholinesterase inhibitors with placebo for preventing delirium. It would be necessary to define the included population in terms of their delirium risk (for example high-risk patients could be those with two or more risk factors for delirium). The primary outcome should be the incidence of delirium, measured at least daily using a validated diagnostic tool. The severity and duration of delirium should also be recorded, together with adverse effects of the drugs, notably extrapyramidal symptoms and stroke.

Table H1: Criteria for Research Recommendation 1

Criterion	Explanation
Importance to patients or the population	Common condition, and commonly used drugs but unknown effectiveness for the prevention of this condition. Therefore new research would alter clinical practice either to increase their use in routine care, or stop use.
Relevance to NICE guidance	New knowledge/evidence that would improve strength of recommendations.
Relevance to the NHS	Potentially reduce lengths of stay but reducing the incidence of a condition that is known to extend lengths of stay
Current evidence base	Very weak
Equality	No equality issues
Feasibility	Standard trial methods
Other comments	Simple trial with potentially major implications for clinical practice and improving outcomes for the large group of people who are at risk of delirium.

2.2 HP: Research recommendation 2

2.2.1 In hospital patients with delirium, are atypical antipsychotics better than placebo or typical antipsychotics or benzodiazepines for treating delirium?

2.2.1.1 Summary– why the proposed research is important

Pharmacological interventions are currently used in clinical practice to manage the symptoms of delirium but the evidence for this is limited. One moderate-quality study showed that typical and atypical antipsychotics were clinically and cost effective compared with placebo, but there is no evidence for benzodiazepines. Pharmacological agents that alter the course of delirium or control particular symptoms might be useful in treating delirium, but we need to determined whether the drugs should be given routinely or for selected symptoms, and what adverse events may occur. A large randomised trial (with at least 100 patients in each arm) should be conducted in hospital patients with delirium to compare atypical antipsychotics, typical antipsychotics, or benzodiazepines with placebo for the treatment of delirium. The outcomes should be recovery from delirium (complete response), and the duration and severity of delirium, measured using a validated diagnostic tool. Adverse events, notably extrapyramidal symptoms and stroke, should also be recorded.

Table H2. Criteria for Research Recommendation 2

Criterion	Explanation

Importance to patients or the population	Common condition, and commonly used drugs but unknown effectiveness for the treatment of this condition. Therefore new research would alter clinical practice either to increase their use in routine care, or stop use.
Relevance to NICE guidance	New knowledge/evidence to strengthen the guidance.
Relevance to the NHS	Potentially reduce lengths of hospital stay but reducing the duration and severity of an episode of delirium.
Current evidence base	Very weak
Equality	No equity issues
Feasibility	Standard trial methods
Other comments	Simple trial with potentially major implications.

2.3 HP: Research recommendation 4

2.3.1 For patients in long-term care, is a multicomponent non-pharmacological intervention more clinically and cost effective than usual care in preventing the development of delirium?

2.3.1.1 Summary – why the proposed research is important

Although there is moderate-quality evidence of clinical and cost effectiveness for multicomponent interventions for the prevention of delirium in patients in hospital, there is no evidence in a long-term care setting. It is anticipated that such an intervention would benefit this long-term care population. A large, adequately powered, randomised trial, or a large, adequately powered, cluster randomised trial should be conducted in people in long-term care to compare a multicomponent intervention with usual care. The multicomponent intervention should include assessment by a trained and competent healthcare professional, who would recommend actions tailored to the person's needs. The intervention should include reorientation, drug review, hydration and sleep hygiene. The primary outcome should be the incidence of delirium, measured at least daily using a validated diagnostic tool. The severity and duration of delirium should also be recorded using a validated tool, together with the consequences of delirium, including admission to hospital.

Table H3. Criteria for Research Recommendation 4

Criterion	Explanation
Importance to patients or the population	There are over 400,000 people resident in care homes in England. These people are at high risk of delirium through multiple long-term conditions and frailty. An episode of delirium is likely to be associated with a step deterioration in their dependency and care needs, and have a negative impact on their quality of life.
Relevance to NICE guidance	New knowledge /evidence to strengthen the guidance
Relevance to the NHS	Disproportionately high users of NHS care. Potential to avoid acute admissions.
Current evidence base	Very weak
Equality	Under-researched group
Feasibility	Large study needed
Other comments	

2.4 HP: Research recommendation 5

2.4.1 How common is delirium and what are its adverse outcomes in people in long-term care?

2.4.1.1 Summary– why the proposed research is important

Although there is evidence for adverse outcomes consequent to delirium in hospital, there is very little evidence from long-term care. It is important to determine whether people in long-term care, who already have a high risk of death, dementia and other adverse outcomes, have a further increased risk of these outcomes if they develop delirium. The risk of hospital admission as a consequence of delirium is also unknown. A large cohort study should be conducted in people in long-term care to determine: the prevalence of delirium in this setting, and if the presence of delirium is a prognostic factor for death, dementia, admission to hospital, falls and other adverse outcomes.

The multivariate analysis conducted in this study should take into consideration the potential significant risk factors and confounding factors identified in the guideline. Such a study would also inform cost-effectiveness analyses for the prevention and treatment of delirium.

Table H4. Criteria for Research Recommendation *5*

Criterion	Explanation
Importance to patients or the population	There are over 400,000 people resident in care homes in England. These people are at high risk of delirium through multiple long-term conditions and frailty. Few data are available to facilitate NHS service responses to this group of people and to inform training of staff. design and training
Relevance to NICE guidance	New knowledge /evidence to strengthen guidance.
Relevance to the NHS	To design services more appropriate and responsive to the care needs of this large group of patients.
Current evidence base	Very weak
Equality	No equality issues
Feasibility	Study would need to be multi-centred to be sufficiently powered
Other comments	This study would also make a major contribution to the international literature on delirium as older people in care homes have been a hard to reach group internationally.

2.5 HP: Research recommendation 6

2.5.1 Does a staff education programme (compared with an educational leaflet or usual care) reduce the incidence of delirium and improve the recognition and recording of delirium in people in hospital?

2.5.1.1 Summary– why the proposed research is important

There is some evidence from multicomponent prevention studies to suggest that an education programme for healthcare professionals who care for people at risk of delirium reduces the incidence of delirium. However, the quality of this evidence is poor. There is a need to determine whether education has an important preventative effect on the incidence of delirium. There is also a need to find out if an educational programme increases awareness of delirium, so that delirium is recorded accurately, which is not the case in the UK at present.

A cluster randomised trial should be carried out, with whole hospitals randomised to the educational interventions (thereby reducing the trial contamination effects of staff vicariously picking up education from colleagues randomised to the education programme arm). The primary outcomes (incidence of delirium and recording of delirium in the patient's healthcare record) should be measured at a minimum of three timepoints before and after the intervention.

Table H5. Criteria for Research Recommendation 6

Criterion	Explanation
Importance to patients or the population	We know that many cases of delirium are currently unrecognised in the NHS. Delayed diagnosis is associated with worse outcomes. Therefore an educational programme for improved awareness of delirium is likely to be associated with improved outcomes.
Relevance to NICE guidance	New knowledge/evidence to strengthen guidance.
Relevance to the NHS	Potential to improve patient outcomes and reduce lengths of stay
Current evidence base	Very weak
Equality	No equality issues
Feasibility	Standard trial methods
Other comments	Potentially cost effective approach to the prevention and management of delirium.

Appendix I: DSM IV and scales for measuring delirium

The criteria from the 'Diagnostic and Statistical Manual of Mental Disorders' [DSM IV] (1994) describe delirium as:

(a) disturbance of consciousness (i.e., reduced clarity of awareness of the environment) with reduced ability to focus, sustain, or shift attention.

(b) a change in cognition (such as memory deficit, disorientation, language disturbance) or the development of a perceptual disturbance that is not better accounted for by a pre-existing, established, or evolving dementia.

(c) the disturbance develops over a short period of time (usually hours to days) and tends to fluctuate during the course of the day.

(d) there is evidence from the history, physical examination, and laboratory findings that: (i) the disturbance is caused by the direct physiological consequences of a general medical condition, (ii) the symptoms in criterion (i) developed during substance intoxication, or during or shortly after, a withdrawal syndrome, or (iii) the delirium has more than one aetiology".

Typically delirium is diagnosed by examining changes in cognitive function, and this is linked to the DSM IV criteria. Validated instruments, based on the operational application of the DSM-IV or DSM-III-R diagnostic criteria, include (table I1):

Table I1: validated instruments for delirium

Instrument	Description
Confusion Assessment Method (CAM)	Long and short version of CAM Long version 10 items operationalised on DSM-IIIR criteria: • Acute change in mental status • Inattention • Altered level of consciousness • Disorganised thinking • Disorientation • Memory impairment • Perceptual disturbances • Psychomotor agitation • Psychomotor retardation • Altered sleep-wake cycle Short version 4 features: 1. Acute onset and fluctuating course 2. Inattention 3. Disorganised thinking 4. Altered level of consciousness For diagnosis of delirium, features 1 and 2 must be displayed AND either feature 3 or 4 must be displayed.

Instrument	Description
Confusion Assessment Method-Intensive Care Unit (CAM-ICU)	1. Acute onset and fluctuating course 2. Inattention 3. Disorganised thinking 4. Altered level of consciousness For diagnosis of delirium, features 1 and 2 along with feature 3 or feature 4 must be displayed Feature 2 Inattention is assessed by using the Attention Screening Examination (part a: picture recognition; part b: Vigilance A random test).
Delirium Rating Scale (DRS)	Scale consists of characteristic symptoms of delirium and is not an operationalisation of any particular DSM version; intended for use in conjunction with standardized cognitive tests Items: • Temporal onset of symptoms • Perceptual disturbance • Hallucinations • Delusions • Psychomotor behaviour • Cognitive status • Sleep-wake cycle disturbance • Liability of mood • Physical disorder • Variability of symptoms 10–item scale. Maximum of 32 points, each item rated from 0 to a maximum either of 2, 3, or 4 points, depending on the item. Symptoms rated over a 24 hour period.
Delirium Rating Scale-Revised-98 (DRS-R-98)	16 item rating scale includes: 3 'diagnostic items': • temporal onset • fluctuation • physical disorder 13 'severity symptoms': • attention, orientation, memory [short and long term] • sleep-wake cycle disturbances • perceptual disturbances and hallucinations • delusions • liability of affect • language • thought process abnormalities • motor agitation or retardation Scores range from 0 to 44; maximum total score of 46 points and maximum severity score of 39 points ; Scores of 15.25 and over indicative of delirium.
Delirium Symptom Interview (DSI)	Each domain comprised of questions and rated as present/absent 7 domains chosen by their relationship to the DSM-III criteria • Disorientation • Disturbance of sleep • Perceptual disturbance • Disturbance of consciousness • Incoherent speech • Level of psychomotor activity • Fluctuation behaviour

Instrument	Description
NEECHAM Confusion Scale	Assessed on the following 9 domains : • Responsiveness • Processing command • Orientation memory • Performance-appearance • Performance-motor • Physiology • Vital function • Oxygen stability • Continence Scores range: 0 to 30; 27–30: normal; 25–26: 'at risk' for confusion; 20–24: mildly confused 0–19: confused; ≤8: severely confused.
Delirium Index (DI)	Measurement of severity of symptoms of delirium that is based solely upon observation of the individual patient, without additional information from family members, nursing staff or the patient medical chart. Designed to be used in conjunction with the Mini-Mental State Exam (MMSE). Assessed on the following seven domains: • Inattention • Disorganised thinking • Altered level of consciousness • Disorientation • Memory impairment • Perceptual disturbances • Motor disturbances Score range 0 to 21; score for each item of 0 to 3 and 9: cannot assess; If the features inattention, disorganised thinking, disorientation or memory impairment cannot be assessed, replace by the score of item 3.
Intensive Care Delirium Screening Checklist (ICDSC)	Eight item checklist based on DSM-IV Criteria and features of delirium. • Altered level of consciousness • Inattention • Disorientation • Hallucinations or delusions • Psychomotor agitation or retardation • Inappropriate speech or mood • Sleep-wake cycle disturbance • Symptom fluctuation Checklist is based on data for the previous 24 hours. Total score 8 points. Scoring position of each item is equal to 1 point. A score of 4 or greater is a positive screen for delirium.
Memorial Delirium Assessment Scale (MDAS)	Assessed for severity on the following 10 item scale: • Reduced level of consciousness • Disorientation • Short-term memory impairment • Impaired digit span • Reduced ability to maintain and shift attention • Disorganised thinking • Perceptual disturbance • Delusions • Decreased or increased psychomotor activity • Sleep-wake cycle disturbance (disorder or arousal) Scores range from 0–30; score for each item ranges from 0 to 3, with 0=none to 3=severe; Cut off score of 13 is indicative of delirium (in cancer patients); Validated among hospital inpatients with advanced cancer or AIDS

Appendix J: Health economics appendix

Summary of included studies

Two studies aimed at the prevention of delirium in a hospital care setting, one aimed at treatment in hospital setting, and one aimed at prevention in long term care. Two studies were multi-component interventions (Rizzo 2001, Pitkala 2008), one was single component, non-pharmacological intervention (Robinson 2002), and one was a pharmacological intervention (Bracco 2007). There was one randomised controlled trial (Pitkala 2008), two non-randomised controlled trials (Rizzo 2001, Bracco 2007) and one before and after study (Robinson 2002). Multivariate analysis was done in two studies (Rizzo 2001, Bracco 2007). Two studies were carried out in the USA, one in Australia, one in Finland and one in Canada. None of the studies took a UK NHS and personal social services perspective and none measured health benefits in QALYs. All of the studies reported costs and outcomes separately. None of the studies discounted future costs and outcomes appropriately and none carried out a robust sensitivity analysis on the results of an economic analysis. As we found no published economic evaluations that were directly applicable, it was decided that an original economic evaluation should be developed to determine the cost effectiveness of the interventions considered in this guideline.

1 Table J1. Characteristics of included studies

Primary details	Design	Patient characteristics	Interventions	Outcome measures	Results	Comments
Author (Year): Pitkala 2008 Country: Finland (government funded health care) Funding: Lions Organization, Helsinki University Central Hospital, Helsinki City, the Academy of Finland Type of analysis: Cost-effectiveness	Study design: RCT Time horizon: 1 year Discounting: None Perspective: Finnish, Helsinki city hospital, resources valued at average unit costs Cost year: 2001	Consecutive delirium patients above 68 years admitted to the general medicine services. Life expectancy was predicted to be above 6 months.	Intervention: Comprehensive geriatric assessment at baseline, atypical antipsychotics were used if necessary, effective general treatments; after acute phase of delirium, patients not recovering from impaired cognition underwent detailed diagnostics of dementia and thereafter received acetyl cholinesterase inhibitors. Comparator: Received usual care. What constituted usual care was not exactly described	1) Mortality rate 2) HRQoL 3) Cost (per patient) incurred in the intervention and usual care arms	1) I:35%, C:30%, n=87, p=0.52 2) Patient's reported HRQoL, I:0.68 (SD 0.12), C:0.62 (SD 0.15); p=0.02 Intervention improved mental function, usual activities, vitality, depression and speech 3) I: €19,737; C:€19,557 (this were based on the use and unit cost of the following health services: primary hospitals, specialized hospitals, specialist consultations, psychiatrist hospitals, nursing homes, long-term care hospitals, skilled home nursing)	Mortality rate was not an adjusted estimate, and health status was measured with an ordinal scale

Primary details	Design	Patient characteristics	Interventions	Outcome measures	Results	Comments
Author (Year): Rizzo (2001) Country: USA Funding: National Institute on Aging, in-kind support from the Claude D. Pepper Older Americans Independence Centre. One of the authors was a recipient of a Midcareer Award from the National Institute on aging and a Donaghue Investigator Award from the Patrick and Cathering Weldon Donaghue Medical research Foundation Type of analysis: Cost-effectiveness	Study design: Non-randomised intervention study Time horizon: Unclear. Study participants enrollment period was 3 years Discounting: None Perspective: Hospital health care provider Cost year: 1995	70 year old patients (and those older than 70 years) with no evidence of delirium but who had intermediate or high risk of delirium	Intervention: multi-component intervention (Hospital Elderly Life Program) Comparator: Usual hospital care	1) Incidence of delirium 2) Mortality rate 3) Additional Cost (per patient) of intervention 4) Non-intervention costs 5) Overall net cost	1) Intermediate risk patients: I:6.5%,C:11.7%,p<0.5; High risk patients: I:18.5%,C:23.5%,NS; Overall:I:9.9%, C:15.0%,p<0.5 2) I:1%,C:2% 3) Intermediate risk patients: I:$564(SE 25),C:$0; High risk patients: I:$662(SE 38),C:$0; Overall:I:$592(SE 21),C:$0 4) Intermediate risk patients: I:$6,124(SE337),C:$7,565(SE$545); High risk patients: I:$7,414(SE$665),C:$6,618(SE $468); Overall:I:$6,484(SE 307),C:$7,300(SE $414) 5) Overall:I:$7,076, C:$7,300	Study was in a single hospital only and was not a randomised trial.

Primary details	Design	Patient characteristics	Interventions	Outcome measures	Results	Comments
Author (Year): Bracco (2007) Country: Canada Funding: Not stated Type of analysis: Cost-effectiveness	Study design: Non-randomized clinical trial Time horizon: Not clear Discounting: None Perspective: Not clear Cost year: Not clear	Patients who underwent cardiac surgery	Intervention: Use of thoracic epidural anaesthesia for cardiac surgery. Patients received 5ml test dose of 1.5% lidocaine with 1:200,000 epinephrine which was given through an epidural catheter. The block was loaded with 6 to 8 ml of 0.125% or 0.25% bupivacaine. Anaesthesia was induced with propofol (1-2mg/kg), fentanyl (2-4µg/kg), or sufentanil (0.2-0.5µg/kg) and rocuronium (0.6mg/kg) Comparator: No use of thoracic epidural anaesthesia for cardiac surgery. Anaesthesia was maintained with intravenous opioids (up to 10-15µg/kg of fentanyl), benzodiazepines (5-10mg midazolam), and sevoflurane (1-1.5 MAC)	1) Incidence of delirium 2) Mortality rate 3) Additional Cost (per patient) of intervention	1) Post-operative delirium complication rate. I:4/506, C:20/787, p<0.02, RR:0.31(95%CI 0.11 to 0.90) 2) ICU Mortality. I: 2/506, C: 14/787, p<0.04, RR: 0.22(95%CI 0.05 to 0.97). Low overall mortality incidence 3)$82	Large sample size, however, cost estimates were not based on clearly described resource use, no sensitivity analysis

Primary details	Design	Patient characteristics	Interventions	Outcome measures	Results	Comments
Author (Year): Robinson (2002) Country: USA Funding: The Retirement Research Foundation Type of analysis: Cost-effectiveness	Study design: before-and-after non-randomised study Time horizon: Intervention occurred within 5 weeks. Data collection occurred 2 weeks before and after intervention Discounting: None Perspective: Not clear. Intervention materials were purchased from retail shop Cost year: Not clear	Older adult patients in a nursing home	Intervention: Hydration program (to improve dehydration) which included a hydration assistant, an individualized plan of care incorporating the most effective techniques to administer fluid, a colourful beverage cart with colourful pitchers and glasses to enhance residents' interest in drinking, and a choice from 4 beverages at each encounter. Goal was for each resident to consume an additional 8-ounce beverage mid-morning and mid-afternoon, which would increase fluid intake to 1.5L daily Comparator: Use of usual gray coloured institutional carts, white foam cups and limited variety of beverages	1) Additional Cost of intervention 2) Cost savings due to the prevention of associated negative outcomes by intervention	1) Cost of colourful cups and assorted beverages was $3 per resident per week and average cost of employee time per resident per week was $8 2) $103 (p=0.05) per resident per week	There was no measure of delirium incidence or severity, mortality or HRQoL

1 Table J2. Assessment of the applicability of included studies

Guideline topic: Delirium	**Rizzo 2001; Clinical Question no: c1-10**	**Pitkala 2008; Clinical question no: c3-16**	**Bracco 2007; Clinical question no: c1-8**	**Robinson 2002; Clinical question no: c4-19**
Section 1: Applicability (relevance to specific guideline review question(s) and the NICE reference case2) [Yes/ Partly/ No /Unclear /NA]				
1.1 Is the study population appropriate for the guideline?	Yes	Yes	Yes	Yes
1.2 Are the interventions appropriate for the guideline?	Yes	Yes	Yes	Yes
1.3 Is the healthcare system in which the study was conducted sufficiently similar to the current UK NHS context?	No	Partly	Partly	No
1.4 Are costs measured from the NHS and personal social services (PSS) perspective?	No	No	No	No
1.5 Are all direct health effects on individuals included?	No	No	No	No
1.6 Are both costs and health effects discounted at an annual rate of 3.5%?	No	No	No	No
1.7 Is the value of health effects expressed in terms of quality-adjusted life years (QALYs)?	No	No	No	No
1.8 Are changes in health-related quality of life (HRQoL) reported directly from patients and/or carers?	No	Yes	No	No
1.9 Is the valuation of changes in HRQoL (utilities) obtained from a representative sample of the general public?	No	Yes	No	No
1.10 Overall judgement: Directly applicable/Partially applicable/Not applicable	Not applicable	Not applicable	Not applicable	Not applicable

[2] As detailed in the 'Guide to the methods of technology appraisal' (June 2008), box 5.1 (page 30). Section 5.2.3 of the guide states: 'There may be important barriers to applying reference-case methods. In these cases, the reasons for a failure to meet the reference case should be clearly specified and justified, and the likely implications should, as far as possible, be quantified.'

Table J3. Excluded studies and reasons for exclusion

Publication	Reason for exclusion
Beaupre 2006	Intervention is a complex clinical pathway with many components that were specifically developed for patients with hip fracture. It is not clear which components are aimed at reducing the incidence of delirium so the use of this evidence for the guideline population as a whole is limited.
Heyman 1995	Cost of intervention was not included
Caplan 2007	Sample size is too small
Pandharipande 2007	The intervention drug studied is neither licensed nor widely used in the UK
The Medical and Health Research Council of The Netherlands, 2007	Still an ongoing Dutch study. Study abstract has no results reported
Rubin 2006	This study was not a comparator controlled study. The study design was weak and a controlled comparison exists elsewhere in the literature (Rizzo 2001).
Webster 1999	The number of participants in one of the study arms is less than 20
Caplan 2006	Study compared the effect of delivering services at two different settings. Comparison was between two areas of rehabilitation namely, home rehabilitation and in-hospital rehabilitation.

Reference List for health economic studies

Beaupre, L. A., et al. "Reduced morbidity for elderly patients with a hip fracture after implementation of a perioperative evidence-based clinical pathway." Quality and Safety in Health Care 15.5 (2006): 375-79.

Bracco, D., et al. "Epidural anaesthesia improves outcome and resource use in cardiac surgery: A single-center study of a 1293-patient cohort." Heart Surgery Forum 10.6 (2007): 301-10.

Caplan, G. A., et al. "Does home treatment affect delirium? A randomised controlled trial of rehabilitation of elderly and care at home or usual treatment (The REACH-OUT trial) (DARE provisional record)." Age and Ageing 35 (2006): 53-60.

Caplan, G. A. and E. L. Harper. "Recruitment of volunteers to improve vitality in the elderly: the REVIVE study (DARE provisional record)." Internal Medicine Journal 37 (2007): 95-100.

Heyman, E. N. and B. A. Lombardo. "Managing costs: the confused, agitated, or suicidal patient." Nursing Economics 13.2 (118): 107-11.

Pandharipande, P. P., et al. "Effect of sedation with dexmedetomidine vs lorazepam on acute brain dysfunction in mechanically ventilated patients: the MENDS randomized controlled trial." JAMA 298.22 (2007): 2644-53.

Pitkala, K. H., et al. "Multicomponent geriatric intervention for elderly inpatients with delirium: effects on costs and health-related quality of life." Journals of Gerontology Series A-Biological Sciences and Medical Sciences 63.1 (2008): 56-61.

Rizzo, J. A., et al. "Multicomponent targeted intervention to prevent delirium in hospitalized older patients: what is the economic value (DARE structured abstract)." Medical Care 39 (2001): 740-52.

Robinson, S. B. and R. B. Rosher. "Can a beverage cart help improve hydration?" Geriatric Nursing 23.4 (2002): 208-11.

Rubin, F. H., et al. "Replicating the hospital elder life program in a community hospital and demonstrating effectiveness using quality improvement methodology (DARE structured abstract)." Journal of the American Geriatrics Society 54 (2006): 969-74.

Webster, J. R., et al. "Improving clinical and cost outcomes in delirium: Use of practice guidelines and a delirium care team." Annals of Long-Term Care 7.4 (1999): 128-34.

Health economic literature searches

Table J4: Search terms used in the Medline literature database

No.	Search terms
1	deliri$.ti,ab.
2	(acute adj2 (confusion$ or "brain syndrome" or "brain failure" or "psycho-organic syndrome" or "organic psychosyndrome")).mp.
3	(terminal$ adj restless$).mp.
4	toxic confus$.mp.
5	delirium/
6	confusion/
7	or/1-6
8	*psychoses, alcoholic/ or *alcohol withdrawal delirium/
9	*Substance Withdrawal Syndrome/
10	8 or 9
11	7 not 10
12	limit 11 to (english language and humans)
13	limit 12 to yr="1994 - 2008"
14	13 and economics/QoL filter

Table J5: The economics and quality of life filter

	Search History
1	exp "Costs and Cost Analysis"/
2	economics/
3	exp Economics, Hospital/
4	exp Economics, Medical/
5	exp Economics, Nursing/
6	exp Economics, Pharmaceutical/
7	exp "Fees and Charges"/
8	exp Budgets/
9	ec.fs.
10	(economic$ or pharmacoeconomic$ or price$ or pricing$ or cost$ or budget$).ti,ab.
11	(value adj2 (money or monetary)).ti,ab.
12	(expenditure not energy).ti,ab.
13	or/1-12
14	((metabolic or energy or oxygen) adj1 cost$).ti,ab.
15	13 not 14
16	exp Quality-Adjusted Life Years/
17	quality adjusted life.tw.
18	exp "Quality of Life"/
19	value of life/
20	(qaly$ or qald$ or qale$ or qtime$).tw.
21	disability adjusted life.tw.
22	daly$.tw.

23	health status indicators/
24	(sf36 or sf 36 or short form 36 or shortform 36 or sf thirtysix or sf thirty six or shortform thirtysix or shortform thirty six or short form thirtysix or short form thirty six).tw.
25	(sf6 or sf 6 or short form 6 or shortform 6 or sf six or sfsix or shortform six or short form six).tw.
26	(sf12 or sf 12 or short form 12 or shortform 12 or sf twelve or sftwelve or shortform twelve or short form twelve).tw.
27	(sf16 or sf 16 or short form 16 or shortform 16 or sf sixteen or sfsixteen or shortform sixteen or short form sixteen).tw.
28	(sf20 or sf 20 or short form 20 or shortform 20 or sf twenty or sftwenty or shortform twenty or short form twenty).tw.
29	(euroqol or euro qol or eq5d or eq 5d).tw.
30	(hql or hqol or h qol or hrqol or hr qol).tw.
31	(hye or hyes).tw.
32	health$ year$ equivalent$.tw.
33	health utilit$.tw.
34	(hui or hui1 or hui2 or hui3).tw.
35	disutili$.tw.
36	rosser.tw.
37	quality of well?being.tw.
38	qwb.tw.
39	willingness to pay.tw.
40	standard gamble$.tw.
41	time trade off.tw.
42	time tradeoff.tw.
43	tto.tw.
44	or/16-43
45	15 or 44

Supplementatry tables for health economic model (Chapter 10)

Table J6: Content of the structured geriatrics consultation*

Module / Recommendation	Recommended n (%)
1. Adequate CNS oxygen delivery:	
a) Supplemental oxygen to keep saturation > 90%, preferably > 95%	18 (29%)
b) Treatment to raise systolic blood pressure > 2/3 baseline of > 90mmHg	4 (6%)
c) Transfusion to keep hematocrit > 30%	57 (92%)
2. Fluid / electrolyte balance:	
a) Treatment to restore serum sodium, potassium, glucose to normal limits (glucose < 300mg/dl, <16.5mmol/L for diabetics)	23 (37%)
b) Treat fluid overload or dehydration detected by examination or blood tests	30 (48%)
3. Treatment of severe pain:	
a) Around-the-clock acetaminophen (1 gram four times daily)	25 (40%)
b) Early-stage break-through pain: low-dose subcutaneous morphine, avoid meperidine	13 (21%)
c) Late-stage break-through pain: oxycodone as needed	3 (5%)
4. Elimination of unnecessary medications:	
a) Discontinue / minimize benzodiazepines, anticholinergics, antihistamines	42 (68%)
b) Eliminate drug interactions, adverse effects, modify drugs accordingly	13 (21%)
c) Eliminate medication redundancies	8 (13%)
5. Regulation of bowel / bladder function:	
a) Bowel movement by postoperative day 2 and every 48 hours	42 (68%)
b) D/c urinary catheter by postoperative day 2, screen for retention or incontinence	44 (71%)
c) Skin care program for patients with established incontinence	2 (3%)
6. Adequate nutritional intake:	
a) Dentures used properly, proper positioning for meals, assist as needed	35 (56%)
b) Supplements: 1 can Ensure,** 3 cans Ensure* for poor oral intake	22 (35%)
c) If unable to take food orally, feed via temporary nasogastric tube	1 (2%)
7. Early mobilization and rehabilitation:	
a) Out of bed on postoperative day 1 and several hours daily	36 (58%)
b) Mobilize / ambulate by nursing staff as tolerated, such as to bathroom	18 (29%)
c) Daily physical therapy; occupational therapy if needed	1 (2%)

Module/Recommendation		Recommended n (%)
8. Prevention, early detection, and treatment of major postoperative complications:		
	a) Myocardial infarction / ischemia - electrocardiogram, cardiac enzymes if needed	21 (34%)
	b) Supraventricular arrhythmias / atrial fibrillation - appropriate rate control, electrolyte adjustments, anticoagulation	3 (5%)
	c) Pneumonia / chronic obstructive pulmonary disease - screening, treatment, including chest therapy	27 (44%)
	d) Pulmonary embolus - appropriate anticoagulation	31 (50%)
	e) Screening for and treatment of urinary tract infection	32 (52%)
9. Appropriate environmental stimuli:		
	a) Appropriate use of glasses and hearing aids	3 (5%)
	b) Provision of clock and calendar	0 (0%)
	c) If available, use of radio, tape recorder, and soft lighting	0 (0%)
10. Treatment of agitated delirium:		
	a) Appropriate diagnostic workup / management	1 (2%)
	b) For agitation, calm reassurance, family presence, and /or sitter	2 (3%)
	c) For agitation, if absolutely necessary, low-dose haloperidol 0.25 - 0.5mg every 4 hours as needed; if contraindicated, use lorazepam at same dose	12 (19%)

* Taken from Marcantonio 2001, ** Ensure is the trade name of a nutritional supplement

Table J7: Risk factors targeted in the Inouye study (1999), the materials used and instructions in the intervention group of the study, and the anticipated NHS resources required to apply the intervention protocol to NHS patients

Targeted Risk Factors	Materials and instructions	Which extra NHS resources?	Which NHS resources are assumed to be available?
1. Cognitive Impairment a. Orientation protocol b. Therapeutic-activities protocol	Board with names of care-team members and day's schedule; communication to re-orientate to surroundings 3 x daily Cognitively stimulating activities 3 x daily (e.g. discussion of current events, structured reminiscence, or word game)	1) Standard word game	1) Board, pens 2) Time resources for reorientation related communication
2. Sleep Deprivation a. Non-pharmacological sleep protocol b. Sleep enhancement protocol	At bedtime, warm drink (milk or herbal tea), relaxation tapes or music, and back massage, once daily Unit-wide noise-reduction strategies (e.g. silent pill crushers, vibrating beepers, and quite hallways) & schedule adjustments to allow sleep (e.g. rescheduling of medications and procedures), once daily	1) Relaxation tapes or music	1) Warm drink 2) Resources for back massage 3) We did not account for unit-wide noise-reduction strategies 4) Time resources for adjustments to allow sleep

Targeted Risk Factors	**Materials and instructions**	**Which extra NHS resources?**	**Which NHS resources are assumed to be available?**
3. Immobility Early mobilization protocol	Ambulation or active range of motion exercises 3 times daily. Minimising use of immobilising equipment (e.g. Bladder catheters, physical restraint)		1) Time resources for mobility enhancement resources
4. Visual Impairment Vision protocol	Visual aids (e.g. glasses or magnifying lenses) and adaptive equipment (e.g. large illuminated telephone key pads, large prints books, fluorescent tape on call bell), with daily reinforcement of their use		1) Large print books are already available 2) Time resources for daily reinforcement
5. Hearing Impairment Hearing protocol	Portable amplifying devices, earwax disimpaction & special communication techniques, with daily reinforcement of these adaptations		1) Time resources for earwax disimpaction, special communication techniques and daily reinforcement
6. Dehydration Dehydration protocol	Early recognition and volume repletion (e.g. encouragement of oral fluid intake)		1) Dehydration prevention protocol is included in usual care

Table J8: Key Hospital Elder Life Program Staff ‡

Role	Description
Elder Life Nurse Specialist (Master's prepared nurse with training and experience in geriatric nursing)	* Performs daily nursing assessment on all enrolled patients, rounds daily with staff nurses, and conducts the Elder Life nursing interventions that particularly focus on preventing cognitive and functional decline, encouraging mobility, limiting immobilizing medical equipment (restraints, Foley catheters), and reviewing medication lists for psychoactive medications
	* Provides educational activities for nursing staff, including daily one-on-one bedside teaching, informal small group educational sessions, frequent bulletin board updates, monthly newsletter and monthly continuing education in-services on geriatric nursing issues; serves as an educational resource and as a role model for geriatric nursing care
	* Conducts interdisciplinary rounds held twice a week to review all patients in the program, and follows up to assure implementation of recommendation from these rounds
	* Communicates recommendations for interventions and medication changes to the physician staff on a daily basis
	* Serves as a liaison to nursing and other health care specialities in the hospital
	* Assists with discharge planning and assuring communication with community agencies for care after discharge on an as-needed basis (e.g., visiting nurse associations, meals-on-wheels, assisted living, and nursing homes).
Elder Life Specialist / Volunteer Coordinator (Bachelor's prepared [master's preferred] in human services or a healthcare-related field, with geriatric experience, supervisory experience, and excellent communication and organizational skills)	* Unique role created for the Hospital Elder Life Program, combining responsibilities for program operations, interventions, and volunteer coordination
	* Screens all older patients within 48 hours of admission and enrolls appropriate patients into the program; develops an individualized care plan of Hospital Elder Life Program interventions for each patient
	• Conducts program interventions and assures that all volunteer interventions are completed; records and tracks all intervention adherence and program outcome variables; and participates in rotating on-call schedule to assure weekend and holiday coverage
	* As volunteer coordinator, recruits (in collaboration with hospital volunteer services), trains, and schedules all volunteers for the program; creates volunteer assignments on a daily basis (assigning patients and interventions); tracks volunteer adherence with all interventions and intervenes for any adherence problems; provides ongoing volunteer feedback, support, and quarterly performance reviews; creates volunteer newsletter; and runs volunteer educational / support groups

Role	Description
Geriatrician (Board-certified in geriatric medicine, with at least 2 years of experience in geriatric practice including acute care experience)	* Provides geriatric medicine expertise and back-up to the Elder Life nurse specialist and staff
	* Participates in the twice-weekly Hospital Elder Life Program interdisciplinary rounds
	* Provides targeted consultation to the nurse specialist, Elder Life Specialists and floor nurses on geriatric issues, and serves as liaison with the medical staff on an as-needed basis
	* Offers geriatric consultations on Hospital Elder Life Program patients when requested by the patient's attending physician
	* Provides education for the physician staff on geriatric issues through formal lectures, rounds, and one-on-one interaction
Program Director (This role may be assumed by the geriatrician, nurse specialist, or Elder Life Specialist and provides overall leadership for the program)	* Oversees and supervises the entire program, verifies that all interventions are being fully and consistently implemented, holds regular staff meetings, ensures staff performance, and implements and monitors all quality improvement procedures
	* Tracks the program budget and timeline, prepares progress reports for the hospital and funders, and monitors pertinent program outcomes

‡ Inouye 2000

Appendix K: GRADE