NICE National Institute for Health and Care Excellence

NICE guideline

Joint replacement (primary): hip, knee and shoulder

NICE guideline

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Contents

Overview 5
Who is it for? 5
Recommendations 6
1.1 Shared decision making and information for people offered hip, knee or shoulder replacement 6
1.2 Preoperative rehabilitation 8
1.3 Anaesthesia and analgesia 9
1.4 Tranexamic acid to minimise blood loss 10
1.5 Preventing infections 11
1.6 Avoiding implant selection errors 12
1.7 Procedures for primary elective knee replacement 12
1.8 Surgical approaches and implants for primary elective hip replacement 13
1.9 Procedures for primary elective shoulder replacement 14
1.10 Postoperative rehabilitation 15
1.11 Long-term care 17
Recommendations for research 18
Key recommendations for research 18
Other recommendations for research 19
Rationale and impact 24
Shared decision making and information for people offered hip, knee or shoulder replacement 24
Decision aids for elective joint replacement 25
Preoperative rehabilitation 25
Anaesthesia and analgesia for hip replacement 26
Anaesthesia and analgesia for knee replacement 27
Anaesthesia and analgesia for shoulder replacement 28
Tranexamic acid to minimise blood loss 28
Preventing infections 29
Avoiding implant selection errors 31

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Partial and total knee replacement 31
Patella resurfacing 32
Surgical approaches for primary elective hip replacement 33
Shoulder replacement for osteoarthritis with no rotator cuff tear 34
Shoulder replacement for pain and functional loss for people with a previous proximal humeral fracture 35
Inpatient rehabilitation 35
Outpatient rehabilitation 36
Long-term care 37
Context 39
Finding more information and committee details 40

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Overview

This guideline covers care before, during and after a planned knee, hip or shoulder replacement. It includes recommendations to ensure that people are given full information about their options for surgery, including anaesthesia. It offers advice for healthcare professionals on surgical procedures and ensuring safety during operations. It also offers guidance on providing support and rehabilitation before and after surgery.

Who is it for?

- Healthcare professionals in primary, secondary and tertiary settings
- Non-NHS organisations commissioned to provide services for the NHS or local authorities
- People having knee, hip or shoulder replacement, their families and carers

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Recommendations

People have the right to be involved in discussions and make informed decisions about their care, as described in NICE's information on making decisions about 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.

1.1 Shared decision making and information for people offered hip, knee or shoulder replacement

1.1.1 Follow the recommendations on communication, information and shared decision making in the NICE guideline on patient experience in adult NHS services when discussing treatment with people offered primary elective hip, knee or shoulder replacement.

1.1.2 Support shared decision making by discussing treatment options with people offered primary elective hip, knee or shoulder replacement and their families or carers (as appropriate). Include in the discussions:

- the alternatives to joint replacement
- the potential benefits and risks of the available procedures and types of implant for joint replacement, including the possible need for more surgery in the future
- the options for anaesthesia and analgesia, and the potential benefits and risks of each option (see the section on anaesthesia and analgesia).

1.1.3 Give people offered primary elective hip, knee or shoulder replacement and their family members or carers (as appropriate) information that is:

- specific to the procedure they are being offered
- in a format they can easily understand

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- provided starting at the first appointment, then whenever needed throughout their care.

1.1.4 Give information on primary elective hip, knee or shoulder replacement that includes:

- what to expect before, during and after surgery, including length of hospital stay, recovery and rehabilitation
- who to contact if they have questions or concerns before or after surgery
- preparing for surgery, including steps they can take to optimise their recovery (see the section on preoperative rehabilitation)
- pain after surgery and how it can be managed
- wound care
- returning to work
- returning to usual activities, for example playing sports, driving and sexual activity.

For a short explanation of why the committee made these recommendations and how they might affect practice, see the rationale and impact section on shared decision making and information for people offered hip, knee or shoulder replacement.

Full details of the evidence and the committee's discussion are in evidence review A: information needs.

Decision aids for elective joint replacement

The committee did not make recommendations for specific decision aids for elective joint replacement but recognised that they could have value in shared decision making. They made a recommendation for research on the components of a decision aid.

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For a short explanation of why the committee did not make a recommendation, see the rationale on decision aids for elective joint replacement.

Full details of the evidence and the committee's discussion are in evidence review B: decision aids.

1.2 Preoperative rehabilitation

Preoperative rehabilitation for hip or knee replacement

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

- exercises to do before and after surgery that will aid recovery
- lifestyle, including weight management, diet and smoking cessation (see NICE's guidance on lifestyle and wellbeing)
- maximising functional independence and quality of life before and after surgery.

Preoperative rehabilitation for shoulder replacement

The committee were unable to make recommendations for practice in this area. They included preoperative rehabilitation for shoulder replacement in their recommendation for research on preoperative rehabilitation.

For a short explanation of why the committee made the recommendation on preoperative rehabilitation for hip or knee replacement and how it might affect practice, and why they were unable to make recommendations on preoperative rehabilitation for shoulder replacement, see the rationale and impact section on preoperative rehabilitation .

Full details of the evidence and the committee's discussion are in evidence review C: preoperative rehabilitation.

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1.3 Anaesthesia and analgesia

Anaesthesia and analgesia for hip replacement

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

- regional anaesthesia in combination with local infiltration analgesia (LIA) **or**
- general anaesthesia in combination with LIA.

  Consider a nerve block that does not impair motor function as an alternative to LIA in either of the options above, provided it does not delay surgery significantly.

For a short explanation of why the committee made these recommendations and how they might affect practice, see the rationale and impact section on anaesthesia and analgesia for hip replacement.

Full details of the evidence and the committee's discussion are in evidence review D: anaesthesia for hip replacement.

Anaesthesia and analgesia for knee replacement

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

- regional anaesthesia in combination with LIA **or**
- general anaesthesia in combination with LIA.

  Consider adding a nerve block that does not impair motor function to either of the options above, provided it does not delay surgery significantly.

For a short explanation of why the committee made these recommendations and how they might affect practice, see the rationale and impact section on anaesthesia and analgesia for knee replacement.

Full details of the evidence and the committee's discussion are in evidence review E: anaesthesia for knee replacement

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Anaesthesia and analgesia for shoulder replacement

1.3.3 Discuss the options for anaesthesia and analgesia with people having primary elective shoulder replacement, including general anaesthesia, regional anaesthesia, local infiltration analgesia and nerve blocks.

The committee were unable to recommend specific options for anaesthesia and analgesia for shoulder replacement. They made recommendations for research on supplementary anaesthesia, and on regional compared with general anaesthesia or a combination in elective shoulder replacement.

For a short explanation of why the committee made these recommendations and how they might affect practice, see the rationale and impact section on anaesthesia and analgesia for shoulder replacement.

Full details of the evidence and the committee's discussion are in evidence review F: anaesthesia for shoulder replacement.

1.4 Tranexamic acid to minimise blood loss

In June 2020, tranexamic acid solution for injection was off label for topical (intra-articular) use. See NICE's information on prescribing medicines.

In these recommendations 'renal impairment' refers to mild to moderate renal impairment. See the summary of product characteristics for dosage reductions according to serum creatinine level. Tranexamic acid is contraindicated for people with severe renal impairment.

1.4.1 For primary elective hip or knee replacement:

- Give intravenous tranexamic acid.
- If there is no renal impairment, also apply 1 g to 2 g of topical (intra-articular) tranexamic acid diluted in saline after the final wash-out and before wound closure. Ensure that the total combined dose of tranexamic acid does not exceed 3 g.

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- If there is renal impairment, give a reduced dose of intravenous tranexamic acid on its own.

For primary elective shoulder replacement:

- Consider intravenous tranexamic acid.
- If there is no renal impairment, consider 1 g to 2 g of topical (intra-articular) tranexamic acid diluted in saline applied after the final wash-out and before wound closure. Ensure that the total combined dose of tranexamic acid does not exceed 3 g.
- If there is renal impairment and tranexamic acid is used, give a reduced dose of intravenous tranexamic acid on its own.

For a short explanation of why the committee made these recommendations and how they might affect practice, see the rationale and impact section on tranexamic acid to minimise blood loss.

Full details of the evidence and the committee's discussion are in evidence review G: tranexamic acid to minimise blood loss.

1.5 Preventing infections

Antibiotic or antiseptic agents in wound wash-out solutions

1.5.1 Follow the recommendations on antibiotic prophylaxis, wound irrigation and intracavity lavage, and antiseptics and antibiotics before wound closure in the NICE guideline on surgical site infections, for people having primary elective hip, knee or shoulder replacement.

Ultra-clean air ventilation in operating theatres

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

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For a short explanation of why the committee made these recommendations see and how they might affect practice, see the rationale and impact section on preventing infections.

Full details of the evidence and the committee's discussion are in evidence review H: wound lavage and evidence review I: ultra-clean air.

1.6 Avoiding implant selection errors

1.6.1 Use 2 intraoperative 'stop moments', 1 before implantation and 1 before wound closure, to check all implant details and ensure compatibility of each component.

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

For a short explanation of why the committee made these recommendations and how they might affect practice, see the rationale and impact section on avoiding implant selection errors.

Full details of the evidence and the committee's discussion are in evidence review J: wrong implant selection.

1.7 Procedures for primary elective knee replacement

Partial and total knee replacement

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

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For a short explanation of why the committee made the recommendation and how it might affect practice, see the rationale and impact section on partial and total knee replacement.

Full details of the evidence and the committee's discussion are in evidence review K: total knee replacement.

Patella resurfacing

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

For a short explanation of why the committee made the recommendation and how it might affect practice, see the rationale and impact section on patella resurfacing.

Full details of the evidence and the committee's discussion are in evidence review L: patella resurfacing.

1.8 Surgical approaches and implants for primary elective hip replacement

Surgical approaches for primary elective hip replacement

1.8.1 Consider a posterior or anterolateral approach for primary elective hip replacement.

The committee were unable to make recommendations on the direct anterior, direct superior and supercapsular percutaneously assisted (SuperPATH) surgical approaches. They made a recommendation for research on surgical approaches in primary elective hip replacement.

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For a short explanation of why the committee made the recommendation on surgical approaches for primary elective hip replacement and how it might affect practice and why they were unable to make recommendations on the direct anterior, direct superior and SuperPATH approaches, see the rationale and impact section on surgical approaches for primary elective hip replacement.

Full details of the evidence and the committee's discussion are in evidence review M: hip replacement approach

Implants for primary elective hip replacement

For NICE technology appraisal guidance on implants for primary elective hip replacement see surgical procedures for hip replacement in the NICE Pathway on joint replacement.

1.9 Procedures for primary elective shoulder replacement

Shoulder replacement for osteoarthritis with no rotator cuff tear

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

For a short explanation of why the committee made the recommendation and how it might affect practice, see the rationale and impact section on shoulder replacement for osteoarthritis with no rotator cuff tear.

Full details of the evidence and the committee's discussion are in evidence review N: shoulder replacement – intact rotator cuff.

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

The committee were unable to make recommendations for practice in this area. They made a recommendation for research on procedures for shoulder replacement for people with a previous proximal humeral fracture.

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For a short explanation of why the committee did not make a recommendation, see the rationale on shoulder replacement for pain and functional loss for people with a previous proximal humeral fracture.

Full details of the evidence and the committee's discussion are in evidence review O: hemiarthroplasty – proximal humeral fracture.

1.10 Postoperative rehabilitation

Inpatient rehabilitation

1.10.1 A physiotherapist or occupational therapist should offer rehabilitation, on the day of surgery if possible and no more than 24 hours after surgery, to people who have had a primary elective hip, knee or shoulder replacement. Rehabilitation should include:

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

For a short explanation of why the committee made this recommendation and how it might affect practice, see the rationale and impact section on inpatient rehabilitation.

Full details of the evidence and the committee's discussion are in evidence review P: inpatient hip and knee postoperative rehabilitation and evidence review Q: inpatient shoulder postoperative rehabilitation.

Outpatient rehabilitation

1.10.2 For people who have had primary elective hip or knee replacement:

- a member of the physiotherapy or occupational therapy team should give advice on self-directed rehabilitation

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- the advice should be given before the person leaves hospital
- the advice should be adjusted in line with recommendations 1.10.5 and 1.10.6 if needed.

1.10.3 For people who have had primary elective shoulder replacement:

- a member of the physiotherapy or occupational therapy team should give advice on:
  - self-directed rehabilitation **or**
  - supervised group rehabilitation **or**
  - individual rehabilitation
- the advice should be given before the person leaves hospital
- the advice should be adjusted in line with recommendations 1.10.5 and 1.10.6 if needed.

1.10.4 Ensure that people who are undertaking self-directed rehabilitation have:

- a clear understanding of their rehabilitation goals and the importance of doing the exercises prescribed to achieve these goals
- a point of contact for advice and support.

1.10.5 Offer supervised group or individual outpatient rehabilitation to people who:

- have difficulties managing activities of daily living **or**
- have ongoing functional impairment leading to specific rehabilitation needs **or**
- find that self-directed rehabilitation is not meeting their rehabilitation goals.

1.10.6 Consider supervised group or individual outpatient rehabilitation for people with cognitive impairment.

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For a short explanation of why the committee made these recommendations and how they might affect practice, see the rationale and impact section on outpatient rehabilitation.

Full details of the evidence and the committee's discussion are in evidence review R: outpatient hip and knee postoperative rehabilitation and evidence review S: outpatient rehabilitation after shoulder replacement.

1.11 Long-term care

Follow-up and monitoring

The committee were unable to make recommendations for practice in this area. They made a recommendation for research on follow-up.

Referral from primary care

1.11.1 Primary care practitioners should refer people who develop new or worsening pain, limp or loss of function related to their joint replacement to an orthopaedic surgical service.

For a short explanation of why the committee did not make a recommendation, see the rationale on follow-up and monitoring in secondary care.

Full details of the evidence and the committee's discussion are in evidence review T: long-term follow-up and monitoring

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Recommendations for research

The guideline committee has made the following recommendations for research.

Key recommendations for research

1 Preoperative rehabilitation

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

For a short explanation of why the committee made the recommendation for research, see the rationale on preoperative rehabilitation.

Full details of the research recommendation are in evidence review C: preoperative rehabilitation.

2 Information for people having a joint replacement

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

For a short explanation of why the committee made the recommendation for research, see the rationale on information for people having a joint replacement.

Full details of the research recommendation are in evidence review A: information needs.

3 Early mobilisation of the shoulder

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

For a short explanation of why the committee made the recommendation for research, see the rationale on inpatient rehabilitation.

Full details of the research recommendation are in evidence review Q: inpatient shoulder postoperative rehabilitation.

4 Conventional compared with reverse total shoulder

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arthroplasty

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

For a short explanation of why the committee made the recommendation for research, see the rationale on shoulder arthroplasty.

Full details of the research recommendation are in evidence review N: shoulder replacement – intact rotator cuff.

5 Analgesia for knee replacement

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

For a short explanation of why the committee made the research recommendation, see the rationale on analgesia for knee replacement.

Full details of the research recommendation are in evidence review E: anaesthesia for knee replacement.

6 Selective resurfacing in knee replacement

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

For a short explanation of why the committee made the research recommendation, see the rationale on resurfacing in knee replacement.

Full details of the research recommendation are in evidence review L: patella resurfacing.

Other recommendations for research

Decision aids

What are the components of a decision aid to support people referred for elective joint

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replacement in making decisions about their treatment (for example, the type of procedure, timing and implant choice)?

For a short explanation of why the committee made the research recommendation, see the rationale on decision aids.

Full details of the research recommendation are in evidence review B: decision aids.

Supplementary analgesia or anaesthesia in elective shoulder replacement

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

For a short explanation of why the committee made the research recommendation, see the rationale on supplementary analgesia or anaesthesia in elective shoulder replacement.

Full details of the research recommendation are in evidence review F: anaesthesia for shoulder replacement.

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

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

For a short explanation of why the committee made the research recommendation, on, see the rationale on regional compared with general anaesthesia, or a combination, in elective shoulder replacement.

Full details of the research recommendation are in evidence review F: anaesthesia for shoulder replacement.

Avoiding implant selection errors

What is the most effective technological solution for minimising wrong implant selection during

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joint replacement surgery?

For a short explanation of why the committee made the research recommendation, see the rationale on avoiding implant selection errors.

Full details of the research recommendation are in evidence review J: wrong implant selection.

Surgical approaches in primary elective hip replacement

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

For a short explanation of why the committee made the research recommendation, see the rationale on surgical approaches in primary elective hip replacement.

Full details of the research recommendation are in evidence review M: hip replacement approach.

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

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

For a short explanation of why the committee made the research recommendation, see the rationale on conventional total shoulder replacement compared with humeral hemiarthroplasty for people aged under 60.

Full details of the research recommendation are in evidence review N: shoulder replacement – intact rotator cuff.

Procedures for shoulder replacement for people with a previous proximal humeral fracture

In adults having primary elective shoulder replacement for pain and functional loss after a previous proximal humeral fracture (not acute trauma), what is the clinical and cost effectiveness of reverse

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total shoulder replacement compared with humeral hemiarthroplasty?

For a short explanation of why the committee made the research recommendation, see the rationale on procedures for shoulder replacement for people with a previous proximal humeral fracture.

Full details of the research recommendation are in evidence review O: hemiarthroplasty – proximal humeral fracture.

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

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

For a short explanation of why the committee made the research recommendation, see the rationale on supporting rehabilitation after hip, knee or shoulder replacement for people with additional needs.

Full details of the research recommendation are in evidence review R: outpatient hip and knee postoperative rehabilitation.

Outpatient rehabilitation after shoulder replacement

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

For a short explanation of why the committee made the research recommendation, see the rationale on postoperative rehabilitation after shoulder replacement.

Full details of the research recommendation are in evidence review S: outpatient rehabilitation after shoulder replacement.

Follow-up after shoulder replacement

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

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community care?

For a short explanation of why the committee made the research recommendation, see the rationale on follow up after shoulder replacement.

Full details of the research recommendation are in evidence review T: long-term follow-up and monitoring.

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Rationale and impact

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

Shared decision making and information for people offered hip, knee or shoulder replacement

Recommendations 1.1.1 to 1.1.4

Why the committee made the recommendations

The NICE guideline on patient experience in adult NHS services describes shared decision making as part of enabling patients to actively participate in their care. It includes recommendations on giving information, encouraging discussion and supporting people to use the information to make choices about their care. The committee agreed, based on their experience, that people offered hip, knee or shoulder replacement need specific information on the treatment options that are available for them, given from their first appointment and whenever needed throughout their care, to enable them to express their needs and preferences.

The committee's experience reflected evidence from studies using interviews and focus groups that highlighted the importance of ensuring that the information given to people is clear and easily understandable to them. The studies showed that specific areas of patient concern included preparing for surgery, managing postoperative pain and aftercare at home, expected recovery time and returning to work. The committee also drew on their own experience of the information that people offered hip, knee or shoulder replacement need.

The committee noted uncertainty about the best way to deliver information and made a recommendation for research on information for people having a joint replacement.

How the recommendations might affect practice

Discussions with people having elective joint replacement are current practice, although different members of the orthopaedic multidisciplinary team may be involved, depending on local arrangements and the person's specific needs. The recommendations are not expected to result in substantial changes to this.

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Return to recommendations

Decision aids for elective joint replacement

Why the committee were unable to make recommendations for practice

The committee agreed that decision aids can be a useful way of helping people offered joint replacement surgery understand their options and make decisions about their care. Evidence from studies of decision aids for joint replacement showed that their content varied widely, and this led the committee to question what the components of a decision aid should be. Their view is that a decision aid should not simply be a means of providing information but should actively help people to participate in making decisions about their care. Because of the wide variation in the decision aids used in the studies, it was not possible to compare them with each other. The committee were therefore unable to recommend any particular decision aid for joint replacement. To investigate the question of what defines a decision aid for elective joint replacement, the committee made a recommendation for research on decision aids.

Return to recommendations

Preoperative rehabilitation

Recommendation 1.2.1

Why the committee made the recommendation

The committee agreed, based on their experience, that preoperative rehabilitation helps to prepare people for surgery, increases their ability to manage any complications of surgery, promotes understanding and engagement with postoperative rehabilitation and prepares people for life with a joint replacement.

Hip or knee replacement

Evidence showed that preoperative rehabilitation reduces the length of hospital stays for people having a hip or knee replacement, although this was for intensive rehabilitation programmes and was from settings where hospital stays are usually longer than in the NHS.

Based on the evidence and their own experience, the committee agreed that preoperative rehabilitation for people having hip or knee replacement should include advice on exercises before

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and after surgery, lifestyle and ways to maximise independence and quality of life.

Shoulder replacement

There was no evidence on preoperative rehabilitation for people having shoulder replacement. The committee noted that preoperative exercises to improve muscle function in the affected limb are often severely limited by pain for people having shoulder replacement, and agreed that the benefits seen in people having hip and knee replacement might not apply to those having shoulder replacement. They included shoulder replacement in their recommendation for research on preoperative rehabilitation.

How the recommendation might affect practice

Current practice varies widely, ranging from no preoperative rehabilitation to comprehensive individualised preoperative rehabilitation programmes. However, most services offer preoperative rehabilitation advice to everyone having hip or knee replacement, so this recommendation is not expected to lead to a substantial change in practice. For some services, providing information, exercise and lifestyle advice may increase the time needed from the orthopaedic multidisciplinary team. However, this cost can be expected to be offset by reductions in the length of hospital stays.

Return to recommendations

Anaesthesia and analgesia for hip replacement

Recommendation 1.3.1

Why the committee made the recommendation

Evidence showed that regional and general anaesthesia are equally effective for people having hip replacement surgery, so the committee recommended that a choice should be offered. There was no evidence to support a combination of regional and general anaesthesia.

Based on their experience, the committee agreed that using local or regional analgesic techniques in combination with regional or general anaesthesia reduces postoperative pain. Clinical evidence showed that, when used with general or regional anaesthesia, both local infiltration analgesia (LIA) and nerve blocks are beneficial and there was no clinical evidence to suggest that either is more beneficial than the other. However, the committee noted that some nerve blocks impair motor function and agreed that these should be avoided in hip replacement because they can delay mobilisation.

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Economic evidence showed that LIA is cost effective. For nerve blocks, the evidence on costs suggested that they are cost effective if they do not delay surgery by more than 5 minutes.

How the recommendation might affect practice

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

Return to recommendations

Anaesthesia and analgesia for knee replacement

Recommendation 1.3.2

Why the committee made the recommendation

Evidence showed that regional and general anaesthesia are equally effective for people having knee replacement surgery, so the committee recommended that a choice should be offered. There was no evidence to support a combination of regional and general anaesthesia.

Evidence also showed that adding local infiltration analgesia (LIA) or a nerve block to regional or general anaesthesia is beneficial, and that adding both LIA and a nerve block to regional anaesthesia is more beneficial than adding either on its own, although this benefit was less pronounced with general anaesthesia.

The committee noted that some nerve blocks impair motor function and agreed that these should be avoided because they can delay mobilisation. Adductor canal nerve blocks allow for a better range of movement sooner after surgery and are now more commonly used than femoral blocks, but the evidence on them was limited.

Economic evidence showed that LIA is cost effective. For nerve blocks, the evidence on costs suggested that they are cost effective if they do not delay surgery by more than 5 minutes. Because of the uncertainty about the cost effectiveness of nerve blocks added to LIA to augment anaesthesia in knee replacement, the committee made a recommendation for research on analgesia for knee replacement.

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How the recommendation might affect practice

In current practice, regional anaesthesia for knee replacement surgery is usually augmented with LIA, a nerve block, or both. The recommendation might lead services that currently augment anaesthesia with nerve blocks, either together with LIA or on their own, to change to augmenting with LIA only or to arrange services so that administering the nerve block does not delay surgery. Services that currently augment anaesthesia with an LIA only are not expected to see a substantial change in practice.

Return to recommendations

Anaesthesia and analgesia for shoulder replacement

Recommendation 1.3.3

Why the committee made the recommendation

There was not enough evidence to support recommendations on specific types of anaesthesia for shoulder replacement. Because of this uncertainty, the committee stressed the importance of discussing the options with people having this type of joint replacement. Although small benefits were seen in studies combining general anaesthesia with LIA and regional anaesthesia with LIA, they were offset by phrenic nerve palsy events. The committee made recommendations for research on supplementary analgesia or anaesthesia in elective shoulder replacement and regional, general, or regional with general anaesthesia in elective shoulder replacement. They noted that using regional anaesthesia alone has the potential to increase day-case shoulder replacement surgery.

How the recommendation might affect practice

This recommendation is not expected to change current practice.

Return to recommendations

Tranexamic acid to minimise blood loss

Recommendations 1.4.1 and 1.4.2

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Why the committee made the recommendations

Good evidence showed that, in people having primary elective hip or knee replacement, topical (intra-articular) tranexamic acid in combination with intravenous tranexamic acid reduces the number of blood transfusions needed when compared with topical or intravenous tranexamic acid alone. Although 1 study suggested that combining topical with oral tranexamic acid is the most clinically and cost-effective administration method, this evidence was not strong enough to support a recommendation for this combination.

Evidence in people having primary elective shoulder replacement also showed a benefit from tranexamic acid but did not address combined administration. However, the committee reasoned that the benefits seen in hip and knee replacement could also apply in shoulder replacement. They agreed that, although there may not be the same benefits in terms of reduced blood transfusions in shoulder replacement surgery, tranexamic acid reduces bleeding, which lessens fatigue and nausea. The committee noted that tranexamic acid is an inexpensive treatment.

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

How the recommendations might affect practice

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

Return to recommendations

Preventing infections

Recommendations 1.5.1 and 1.5.2

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Why the committee made the recommendations

Antibiotic or antiseptic agents in wound wash-out solutions

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

Ultra-clean air ventilation in operating theatres

There was little good evidence on the use of ultra-clean air ventilation in operating theatres. Evidence from randomised controlled trials supported ultra-clean air ventilation, but these trials may not fully reflect current practice. Evidence from observational studies supported conventional air ventilation systems, but it was unclear whether these studies followed up participants for more than 2 years, which the committee agreed is the minimum follow-up period needed to produce an accurate picture of infection rates. It was also unclear whether the registry data used in the studies produced an accurate record of the number of infections over the longer term, and whether prophylactic antibiotics were used in all of the observational studies.

Although the committee noted the limitations in the evidence, they agreed that ultra-clean air ventilation is likely to be more effective at reducing surgical site infections than conventional turbulent air ventilation. They agreed that patient safety is the primary consideration and that infection after a joint replacement is a serious complication. Because of this, and given the uncertainty of the evidence, the committee agreed to recommend that current practice be maintained.

How the recommendations might affect practice

These recommendations are expected to reduce the routine use of antibiotic or antiseptic agents in wash-out solutions. They are not expected to affect the use of prophylactic antibiotics and ultra-clean air ventilation in operating theatres, which are current practice.

Return to recommendations

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Avoiding implant selection errors

Recommendations 1.6.1 and 1.6.2

Why the committee made the recommendations

The committee's recommendations were based on their experience and expertise. They reasoned that 2 'stop moments', when theatre staff stop other activity and formally inspect each implant component, would ensure that all components are compatible. The second stop moment provides an extra opportunity to correct an implant selection error before closure. The committee agreed that intraoperative real-time data entry could be considered as a further means of ensuring that mismatched components are identified before implantation. They also agreed that technological solutions might help and made a recommendation for research on avoiding implant selection errors.

How the recommendations might affect practice

Intraoperative 'stop moments' to check implant components before implantation are common and are not expected to change current practice. Intraoperative real-time data entry is not current practice and, if implemented, is likely to increase theatre time.

Return to recommendations

Partial and total knee replacement

Recommendation 1.7.1

Why the committee made the recommendation

One large trial showed no difference between partial and total knee replacement in quality of life, patient-reported outcome measures or revision surgery at 5 years. Partial knee replacement was shown to be more cost effective. However, the trial only reported outcomes after 5 years and the committee were aware that the benefits of total knee replacement may be seen after this. Two studies that compared partial with total knee replacement had limited relevance because they looked at implants that are no longer in use or were restricted to people who had both knees replaced.

The committee agreed that there are advantages and disadvantages to both procedures and this was broadly supported by the evidence. The outcomes for each type of surgery are thought to be

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similar although recovery after partial knee replacement tends to be faster, with a shorter stay in hospital and less pain during the recovery period. Complications such as infections, blood clots, heart attacks or stroke are rare for both procedures, but are thought to be rarer after partial than total knee replacement. Partial knee replacement leaves more of the original knee intact, but the remaining parts of the knee could develop arthritis and may need to be replaced in the future. The committee were aware that National Joint Registry data indicate a greater likelihood of revision surgery within 10 years after partial knee replacement.

The committee agreed, based on their experience, that different people weigh these relative risks or benefits differently, depending on their personal circumstances and preferences. They therefore recommended that people should be offered a choice of partial or total knee replacement after a discussion of the benefits and risks of each.

How the recommendation might affect practice

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

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

Return to recommendations

Patella resurfacing

Recommendation 1.7.2

Why the committee made the recommendation

The committee looked at 3 options: resurfacing, no resurfacing and selective resurfacing. There was not enough clinical evidence to indicate whether any of the options was more beneficial than the others. However, strong economic evidence showed that resurfacing is cost effective compared with no resurfacing over a 10-year time horizon because of reduced hospital readmissions. Because

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of the lack of clinical evidence, the committee also made a recommendation for research on selective resurfacing in knee replacement.

How the recommendation might affect practice

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

Return to recommendations

Surgical approaches for primary elective hip replacement

Recommendation 1.8.1

Why the committee made the recommendation

The committee looked at evidence on 5 surgical approaches for hip replacement: posterior, anterolateral, direct anterior, direct superior and supercapsular percutaneously assisted (SuperPATH). The evidence did not indicate that any of these approaches was more beneficial than any other. The National Joint Registry for 2017 reported that 97% of hip replacements were done using the posterior or anterolateral approach. They concluded that either of these 2 established approaches could be considered, with the choice of approach based on the knowledge and experience of the surgeon and individual patient characteristics.

There was limited evidence on the newer approaches (direct anterior, direct superior and SuperPATH) and the committee made a recommendation for research to investigate surgical approaches in primary elective hip replacement.

How the recommendation might affect practice

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

Return to recommendations

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Shoulder replacement for osteoarthritis with no rotator cuff tear

Recommendation 1.9.1

Why the committee made the recommendation

Evidence showed that conventional total shoulder replacement provides more overall benefit than humeral hemiarthroplasty. The recommendation is limited to people with adequate glenoid bone because this is necessary for conventional total shoulder replacement to be considered. For people without adequate glenoid bone, another solution, such as reverse shoulder replacement or other surgery, is needed.

The committee agreed that the type of implant should not be specified in the recommendation but should be part of shared decision making between the person having surgery and the surgeon.

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

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

How the recommendation might affect practice

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

Return to recommendations

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

Why the committee were unable to make recommendations for practice

The committee looked at 3 types of procedures for people with a previous proximal humeral fracture: reverse total shoulder replacement, humeral hemiarthroplasty and conventional total shoulder replacement. They were unable to make recommendations for practice because of a lack of evidence. They made a recommendation for research on procedures for shoulder replacement for people with a previous proximal humeral fracture.

Return to recommendations

Inpatient rehabilitation

Recommendation 1.10.1

Why the committee made the recommendation

Evidence in people who have had primary elective hip or knee replacement showed that rehabilitation within 24 hours of surgery, including mobilisation, reduces length of hospital stays. The committee agreed that early discharge improves quality of life and is likely to be cost saving. They acknowledged concern about increased pain from early mobilisation, but noted the evidence showing that, for most people, the benefits outweigh any adverse effects.

The committee agreed that the first contact with the person should be made or led by a physiotherapist or occupational therapist who can assess whether the person is medically unwell or has specific needs. They may delay rehabilitation if clinically necessary. The committee agreed that some aspects of rehabilitation can be provided by a member of the physiotherapy or occupational therapy team with suitable training and support.

In the committee's experience, rehabilitation, including mobilisation, is best started on the day of surgery, but they acknowledged that this is not always possible if the operation is finished late in the day.

There was no evidence on inpatient rehabilitation after shoulder replacement. However, in the committee's experience, the benefits are similar to those seen after hip or knee replacement. They

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agreed that people who have had shoulder replacement should ambulate within 24 hours of surgery, but mobilisation of the shoulder depends on the orthopaedic team's clinical assessment. The committee noted that the timing of shoulder mobilisation varies widely in practice, with some services advising use of a sling for 10 days and others advising it for 6 weeks. There was no evidence available on when the shoulder should be mobilised so the committee made a recommendation for research on early mobilisation of the shoulder.

How the recommendation might affect practice

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

Return to recommendations

Outpatient rehabilitation

Recommendations 1.10.2 to 1.10.6

Why the committee made the recommendations

The committee agreed that outpatient rehabilitation after hip, knee or shoulder replacement is essential. Evidence suggested that, for people who have had hip or knee replacement, self-directed rehabilitation and supervised rehabilitation are similarly effective. Compared with self-directed rehabilitation, supervised rehabilitation is very costly. The committee agreed that, in their experience, self-directed rehabilitation is effective for most people after hip or knee replacement if undertaken with advice, and ongoing support if needed, from the physiotherapy or occupational therapy team.

There was no evidence to enable the committee to compare self-directed with supervised outpatient rehabilitation for people who have had shoulder replacement, so they recommended that advice may be given on either self-directed or supervised rehabilitation. They also made a recommendation for research on outpatient rehabilitation after shoulder replacement.

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The committee agreed, based on their experience, that provision needs to be made for people with additional needs that make self-directed outpatient rehabilitation difficult or who find that it is not meeting their rehabilitation goals, and who would benefit from supervised group or individual rehabilitation. They noted the lack of evidence in this area and made a recommendation for research on supporting rehabilitation for people with additional needs.

How the recommendations might affect practice

Although the proportions of people having self-directed or supervised rehabilitation after elective joint replacement are not known, it is likely that the recommendations will increase the proportion having self-directed rehabilitation and decrease rehabilitation costs.

Return to recommendations

Long-term care

Recommendation 1.11.1

Why the committee were unable to make recommendations on follow-up and monitoring

There was no evidence available to inform recommendations on long-term follow-up and monitoring after joint replacement surgery. The committee were aware of an ongoing study to investigate follow-up after hip and knee replacement surgery. That study does not include people who have had shoulder replacement, so the committee made a recommendation for research on follow-up after shoulder replacement.

Why the committee made the recommendation on referral from primary care

The committee agreed that, in the absence of recommendations on follow-up and monitoring after hip, knee or shoulder replacement surgery, a recommendation is needed to ensure that people who have problems with their joint replacement are referred to an orthopaedic surgical service. Primary care practitioners are expected to use their clinical judgement to determine the urgency of the referral.

How the recommendation might affect practice

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

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Return to recommendations

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Context

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

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

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

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

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Finding more information and committee details

You can see everything NICE says on this topic in the NICE Pathway on joint replacement.

To find our guidance on related topics, including guidance in development, see NICE's webpage on musculoskeletal conditions.

For full details of the evidence and the guideline committee's discussions, see the evidence reviews. You can also find information about how the guideline was developed, including details of the committee.

NICE has produced tools and resources to help you put this guideline into practice. For general help and advice on putting our guidelines into practice, see resources to help you put NICE guidance into practice.

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Accreditation



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