

# KNEE REPLACEMENT: A GUIDE TO GOOD PRACTICE



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## PREFACE

This document is a guide to current best practice for knee replacement. It represents a consensus statement from the British Orthopaedic Association and the British Association for Surgery of the Knee.

It is hoped that Surgeons, Trusts and Purchasers will use this document during discussion on manpower, funding and resources related to the provision of orthopaedic and knee surgery services such that ultimately all patients will have access to best practice in knee replacement.

# 1. INTRODUCTION

- 1.1 This document is a statement of best practice in primary knee replacement and has been approved by the Council of the British Orthopaedic Association and by The British Association for Surgery of the Knee.
- 1.2 When establishing standards in a cash limited system with regional variations in manpower and facility we acknowledge that an acceptable level of care may fall below best practice.
- 1.3 Many studies of knee replacement identify its cost effectiveness<sup>1,2</sup> and high patient satisfaction rates in the short term<sup>3</sup>.  
The majority of patients are relieved of the pain and disability from knee arthritis, which may have compromised their quality of life and their independence before operation.<sup>4,5,6</sup>
- 1.4 There is a wide variation in the types of implants used, surgical techniques, post operative surveillance, and longer term outcomes across the UK.<sup>7</sup>
- 1.5 From available data, the document identifies current best practice in general terms. It is not a statement which claims to be applicable to all patients or in all circumstances.

Each consultant and those working under the supervision of a consultant must continue to take into account the individual requirements of the patient.

Presently, there is a shortfall of auditable standards for the operation and associated care. Standards can only be set by the widespread collection of uniform data centred on NHS Trusts and made available for regional and national audit. Recent moves towards the setting up of a fully funded national knee replacement registry are to be applauded.

- 1.6 This document should be read in conjunction with “The Advisory Book on Consultant Trauma and Orthopaedic Services”; British Orthopaedic Association 1999.

## **2. THE INDICATIONS FOR THE OPERATION**

Severe pain and disability with accompanying radiological changes in the knee are almost always the indications for the operation, in patients where conservative treatment has failed or is futile. Occasionally there may be an indication to replace a knee because of progressive deformity and/or instability, and pain may not necessarily be the most significant factor. Where co-morbidities exist, risk benefit considerations may rule out the operation in an individual patient.

## **3. THE OUTPATIENT CONSULTATION**

- 3.1 The pain and suffering of patients waiting for treatment is self evident. Government targets for a first NHS outpatient appointment are neither universally achievable, or sustainable, given the shortage of consultant orthopaedic surgeons in the UK.
- 3.2 Discussion regarding operative management of knee arthritis should ideally involve a surgeon with The Certificate of Completion of Surgical Training, or consultant, who, by definition, is on the GMC’s Specialist Register.
- 3.3. The British Orthopaedic Association regards 15-20 minutes as the minimum time allowed for the first consultation <sup>8</sup>

- 3.4 A confidential environment with access for relatives, and the reliable availability of notes and radiographs are essential for the consultation.
- 3.5 After clinical examination and general medical assessment the surgeon should provide the patient with an explanation of the problem in understandable language and discuss the available treatment options.
- 3.6 The Surgeon must offer information on the risks and benefits of any suggested treatment and the outcomes of performance of any proposed knee replacement where appropriate. The precise reasons for the operation should be given.
- 3.7 The letter to the General Practitioner should confirm that these discussions have taken place and that the patient wishes to proceed with surgery.

#### **4. WAITING FOR THE OPERATION**

- 4.1 In a cash-limited service, there is likely to be a delay before elective operations can be carried out. Consultants are expected to manage their waiting lists ethically and patients should be admitted for operation according to clinical priority and social circumstances.

#### **5. PRE-OPERATIVE ASSESSMENT**

- 5.1 A managed system of pre-operative assessment is recommended as good practice, and as with hip replacement such arrangements are now commonplace <sup>9</sup> They allow the most efficient use of scarce resources.
- 5.2 Pre-operative assessment clinics staffed by Doctors and Nurses working to guidelines with the ability to involve Anaesthetists and Professions Allied to Medicine guard against cancellations, identify

co-morbidities and allow discharge planning. There is also an opportunity for patient education.

- 5.3 Routine investigation of blood, urine, blood pressure and an ECG are best carried out at the pre-operative assessment.
- 5.4 Provisional discharge planning should take place in the pre-operative assessment clinic. The planning takes into consideration age, co-morbidities, home circumstances and the availability of carers.
- 5.5 Access to rehabilitation beds should be available particularly for the elderly and the more severely disabled.

## **6. THE ADMISSION TO HOSPITAL**

- 6.1 All patients should be admitted to hospital under the care of a named consultant orthopaedic surgeon who is on the specialist register with sufficient time before their knee replacement to allow pre-operative and pre-anaesthetic procedures to be completed. The limb for operation should be marked in an area which is still visible after draping, and an explanation of anaesthesia be given by the anaesthetist involved. Appropriate arrangements for blood transfusion should be in place prior to surgery. And in ideal circumstances autologous transfusion systems should be available.
- 6.2 The patient must give consent to the operation. Guidance for surgeons on this process has been given by the Senate of Surgery of Great Britain and Ireland.<sup>10</sup> Consent may be given in the outpatients, the pre-admission clinic, or in the ward.

## **7. HOSPITAL FACILITIES REQUIRED FOR THE OPERATION OF PRIMARY KNEE REPLACEMENT**

- 7.1 Primary knee replacement operations are best carried out in hospitals where Consultant back-up from other medical and surgical disciplines is readily available.
- 7.2 Access to a High Dependency Unit and/or intensive care facilities is essential.
- 7.3 Adequate numbers of trained nurses<sup>8</sup> and the skills of Professions Allied to Medicine must be available. There must be social services back-up.
- 7.4 In order to reduce the risk of infection, knee replacement patients should be nursed in orthopaedic wards in areas separate from patients who pose a potential risk of cross infection and which are staffed by a team experienced in the management of arthroplasty patients.

## **8. REQUIRED THEATRE RESOURCES**

- 8.1 The use of ultra clean air theatres is considered to be best practice for units performing knee replacement operations.<sup>11</sup>
- 8.2 The operating theatre should be dedicated to clean elective orthopaedic surgery or joint replacement. Shared facilities with other clean surgical disciplines is acceptable practice when using ultra clean air, but data supporting this practice are not available.
- 8.3 The surgeon should have trained assistance during the operation, and a trained scrub nurse fully familiar with the required complex instrumentation is mandatory. In the absence of junior medical staff, additional nursing



assistants or specifically trained Surgeon's Assistants must be available.

Sometimes more than one assistant is required.

- 8.4 A full range of specialised implants and instruments must be readily available.
- 8.5 Appropriate impenetrable clothing and drapes are essential.

## **9. THE SURGEON**

- 9.1 The completion of Higher Surgical Training and acquisition of a CCST allows a surgeon entry to the Specialist Register of the GMC and enables Consultant practice in the NHS. Consultants with this training and registration are equipped with the skills and knowledge to make judgements and exercise discretion when selecting patients for the operation.
- 9.2 The theoretical and practical skills of the Consultant Surgeon performing primary replacement operations must be maintained by continuous professional development.
- 9.3 Knee replacement operations performed by other surgeons must be supervised by Consultants. The level of supervision should be appropriate for the level of skill and experience of the operating surgeon. In the absence of consultant supervision, prospective arrangements must be made for on-site consultant cover.
- 9.4 During the 5<sup>th</sup> and 6<sup>th</sup> years of Higher Surgical Training, some trainees receive advanced training in knee surgery, including the surgical management of the more complex cases and secondary operations (revisions). They are usually appointed as Consultants to NHS posts in which knee surgery is a major component of their elective work. There is an expectation that many

more such highly specialised surgeons will need to be trained in order to cope with the anticipated increase in the volume of complex knee reconstruction.

- 9.5 The operation requires an anaesthetist with the appropriate skills and techniques for Total Knee Replacement.

## **10. RECORD KEEPING AND THE OPERATION NOTES**

### *Clinical Records*

- 10.1 Good records are a basic tool of clinical practice, and should be legible.
- 10.2 The records must include the name, date of birth and address of the patient, and the referring general practitioner should be identified. The hospital number should be clear. The hospital and surgeon with responsibility of care should be named.
- 10.3 The admission note should record the general medical condition of the patient as well as fitness for operation. It should contain a clinical history, the full clinical examination findings, pre-existing medical history, and all current disabilities. The purpose of the operation should be stated. All medication should be listed.
- 10.4 An explanation of the proposed procedure as well as the risks and benefits should be recorded. The type of implant to be used should be explained to the patient together with the success and failure rates of the implant if known. The operating surgeon should ideally complete the consent form with the patient. If this is done in outpatients, only a short delay should take place before the operation is undertaken. In certain circumstances (for example medial uni-compartmental replacement) patients must be made aware of the fact that if peri-operative findings indicate that a certain procedure would be

inappropriate then an alternative procedure (usually total knee replacement) may be performed. This should be recorded.

10.5 It is best practice that operative notes be made in writing, or dictated for immediate typing and signature by the operating surgeon. If a pre-arranged pro forma is being used the operating surgeon should personally complete the pro forma.

10.6 A record of the operation should be made immediately following surgery and should include: <sup>12</sup>

- The name of the operating surgeon, assistants and the name of the consultant responsible.
- The diagnosis and the procedure performed.
- Details of the incision and any additional procedures to achieve satisfactory exposure,
- Description of the findings.
- Details of all soft tissue release procedures.
- Details of significant tissue excision, transposition or augmentation.
- Details of serial numbers of prostheses and other implanted materials.
- Details of bone grafting.
- Details of component alignment and rotation.
- Post surgery flexion range.
- Tourniquet time.
- Details of sutures used.
- An accurate description of any difficulties or complications encountered and how these were overcome.
- Immediate post-operative instructions.

- The surgeon's signature and the date of the operation.
- 10.7 The anaesthetic record, signed by the anaesthetist, should contain:
- The name of the anaesthetist and, where relevant, the name of the consultant anaesthetist responsible.
  - Pre-operative assessment by the anaesthetist, and the date the assessment was performed.
  - Drugs and doses given during anaesthesia and route of administration.
  - Type and site of any regional anaesthetic used.
  - Monitoring data
  - Intravenous fluid therapy, if given.
  - Post-anaesthetic instructions
  - The anaesthetic record should be filed with the clinical notes.
- 10.8 Progress after operations, including early complications, should be listed. The date of discharge and arrangements for continuity of care should be recorded.
- 10.9 All notes should be contemporaneous and should not be altered; errors should be identified. Orthopaedic records within general hospital records should be easily identified within the case notes. All computer-assisted recording should conform to the Data Protection Act.
- 10.10 Follow-up notes should allow another doctor to assume the care of the patient at any time.
- All doctors referred to in an entry must be identified by name and designation.

- Details of written and verbal information given to general practitioners, patients, relatives and carers, whether at admission or later, must be recorded.
- Details of all investigations considered and whether the investigation has actually been requested should be noted.
- Ideally, at least one entry each day recording the patient's progress, but it is recognised that with pressures of work this is not always achievable particularly at weekends.
- An entry when the management of the patient is changed or when there is an additional procedure.
- An entry should be made whenever a doctor is called to see a patient.
- Deletions should be made with a single line and signed and dated.

10.11 All patients should have good quality antero-posterior and lateral radiographs, and ideally a 25 degree skyline radiograph before discharge from hospital, or at the first post operative outpatient visit of the knee, ideally before discharge from hospital.

10.12 There should be an agreed protocol for the retention of all documents and radiographs.

10.13 In Private Practice the whole process should follow the same high standard.

## **11. THE CHOICE OF IMPLANT AND MODE OF FIXATION.**

- 11.1 Orthopaedic Surgeons have large numbers of knee devices from which to choose<sup>7, 13</sup>. Many of these devices have not been subject to studies of outcome for as long as 10 years<sup>7</sup>
- 11.2 Care should be taken when using the term "total knee replacement" as this implies that all articular surfaces in the knee have been replaced including resurfacing of the patella. The issue of patellar resurfacing remains controversial as there is no strong data to support resurfacing or non resurfacing.<sup>14, 15, 16, 17</sup>. Surgeons practising knee replacement therefore fall into three groups, those who always resurface, those who never resurface and those who selectively resurface. In primary knee replacement implants may be unconstrained i.e., there is no direct mechanical linkage between the tibial components. Some prostheses have varying degrees of constraint and at present there is no compelling evidence to support the use of any particular design. Degenerative joint disease may be confined to one compartment and in these circumstances implants are currently available which replace both sides of the single diseased compartment<sup>18, 19, 20</sup>
- 11.3 Concerns about the long term effect of polyethylene wear debris have resulted in the development of implants which involve the use of mobile polythene bearings in both total knee replacement and uni-compartmental tibio-femoral knee replacement<sup>21, 22, 23, 24</sup>
- 11.4 Many factors determine surgeon preference for an individual implant. Influences include their trainers, consultant colleagues, a desire to improve their own results or the perceived outcomes of existing devices. The

manufacturers of knee devices can also have a significant effect on choice through the service they provide.

- 11.5 Choice of prosthesis is in many cases limited by purchasing authorities, Trust or Directorate policy and budget limitation.
- 11.6. Published results of many knee implants offer little help to the surgeon wishing to make an informed choice. Most outcome research is short term, non-comparative and does not take into account case-mix and variations in the operative technique of the operating surgeon. Importantly, there is no agreed standardisation of outcome measures for knee replacement.
- 11.7 A further confounding factor for the surgeon is that knee devices with apparently good published results have in the meantime been modified by the manufacturers and the clinically tested design is no longer available. There has been a failure to realise that even minor modifications to design, material, surface finish, or fixation techniques can dramatically alter the performance of a knee replacement.
- 11.8 The selection of knee prostheses for general use should normally be based on evidence published in peer reviewed journals. A clinical follow-up at least 10 years with a published life table and survivorship curve calculated according to best statistical practice are recommended criteria in support of the use of a particular knee prosthesis.<sup>7</sup> There should be at least a 90% ten year survival for knee prostheses.
- 11.9 In the absence of peer reviewed evidence of outcome at ten years, a device must be subject to ongoing surveillance and be part of a properly conducted controlled prospective trial. The use of such devices should have ethical approval.

## **12. PROPHYLAXIS AGAINST VENOUS THROMBOSIS AND PULMONARY EMBOLISM.**

12.1. It is well recognised that thromboembolism does occur after primary knee replacement but there is debate regarding the precise incidence of this complication. Recent evidence suggests that the prevalence of fatal pulmonary embolism, even in the absence of chemical prophylaxis, is very low following both knee and hip replacements, and much lower than quoted in historical papers.<sup>25, 26</sup>

12.2 There is no doubt that deep venous thrombosis occurs fairly commonly after primary knee replacement and can be demonstrated, by venography, in between 30 and 60% of cases at any level and 10 to 20% of cases proximally. Only a very few of these develop a clinical event causing death or morbidity.

12.3 There is no good evidence to suggest that the use of chemical prophylaxis reduces either overall mortality or fatal pulmonary embolism, and there is a known morbidity from the use of chemical prophylaxis.

In contemporary practice knee replacement should be regarded as “moderate risk” for death from pulmonary embolism. Chemical prophylaxis may reduce the risk of non-fatal pulmonary embolism, but rigorous scientific evidence is not available. There are usually no long term sequelae from this condition.

12.4 There is strong evidence for the effectiveness of low dose heparin, low molecular weight heparin and Warfarin in reducing radiological DVT by 40 to 60%<sup>27, 28</sup> but death from other causes may be increased. There is also concern regarding possible bleeding complications which may put the knee replacement at considerable risk.



- 12.5 There is significant doubt about the precise role of chemical prophylaxis in knee replacement. The surgeon should consider current evidence and if appropriate share the information with the patient.
- 12.6 Under normal circumstances, early mobilisation (24 to 48 hours) after surgery should always be considered as should the use of mechanical methods of reducing deep venous thrombosis although rigorous scientific evidence that these are effective is also lacking. These measures are free of significant side effects.

### **13. PROPHYLAXIS AGAINST INFECTION**

- 13.1 Patients, prior to knee replacement, should be clinically screened for active infection.
- 13.2. Although there is no specific data relating to knee replacement, we believe that as with hip replacement, all patients should receive an intravenous broad spectrum antibiotic at induction of anaesthesia.<sup>29</sup>
- 13.3 The knee replacement should be performed in ultra clean air theatres.<sup>30</sup>
- 13.4 Antibiotic impregnated bone cement should be used.
- 13.5 In the absence of any specific data relating to knee replacement, we believe that evidence from hip replacement studies support the administration of an appropriate antibiotic in the event of peri-operative urinary catheterisation.<sup>31</sup>

### **14 SURGICAL TECHNIQUE**

- 14.1 Any anterior incision which allows adequate exposure of the distal end of the femur, proximal end of the tibia and the posterior articular

surface of the patella is acceptable.

- 14.2 The recognised complications of particular approaches should be explained to the patient.
- 14.3 Implants may be inserted with or without cement. In cemented knee replacement the bone surfaces should be cleaned, irrigated and dried before application of bone cement and cement should be compressed where possible.
- 14.4 For cementless knee replacement, adequate preparation of the bone and stable fixation of the implants must be achieved at operation.
- 14.5 Where possible tension in the medial and lateral soft tissue structures should be balanced in both flexion and extension and excessive tension on one side in either flexion or extension should be avoided.
- 14.6 After implantation the patellar tracking should be checked and appropriate adjustment made if not satisfactory. It is essential to check the integrity of the extensor mechanism before closure.
- 14.7 Leg length equality cannot be achieved in every case.
- 14.8 Flexion deformity should always be corrected at the time of surgery, but may still be noted at follow-up despite appropriate post-operative rehabilitation.
- 14.9 In appropriate cases, bilateral simultaneous or sequential knee replacement may be performed under the same anaesthetic. There is evidence to suggest that rehabilitation is more rapid than after staged procedures,<sup>32,33</sup> but there are some concerns about the morbidity of such major surgery.<sup>34</sup> Patients undergoing bilateral surgery should be managed in a high dependency unit.

## **15. EARLY POST-OPERATIVE CARE**

- 15.1 It is important to confirm neurovascular integrity in the operated limb at an early stage.
- 15.2 Mobilisation, the achievement of full extension and an increasing flexion range should be supervised by a physiotherapist experienced in the management of patients following knee replacement. Patients undergoing knee replacement at the end of the working week should have access to physiotherapy at the weekend. Adequate provision for outpatient physiotherapy is also required.

## **16. THE FOLLOW-UP OF PATIENTS AFTER TOTAL KNEE REPLACEMENT**

- 16.1 The follow-up arrangements that surgeons and hospitals make for total knee replacement patients vary across the UK. Many surgeons discharge patients within one year and few patients are followed beyond five years.
- 16.2 Primary knee replacement may fail between five and ten years but the majority fail after ten years. For best practice, patients should be followed up clinically and radiologically in the long term, however this is rarely possible with current resources. We believe that ideally a minimum requirement is an AP and Lateral Xray at five years, and each five years thereafter.
- 16.3 Failure from aseptic loosening of a knee replacement is often silent – the patient does not complain. Regular follow-up identifies the patient at risk of progressive failure. Exchange or revision operations should be planned and

performed before massive bone destruction occurs, as delay may result in the need for much more extensive surgery which is more demanding of resources and has a greater risk of failure. Revision procedures are less successful than primary operations.

- 16.4 Follow-up by using questionnaires with X-ray checks by non-medically qualified practitioners is used in some centres, but there is no audit evidence of the efficacy of such arrangements.
- 16.5 Resources must be made available for prolonged follow-up and data from each Trust should be available and obtainable in a common format for regional and national audits. The establishment of a national knee arthroplasty register must be seen as a priority and must be adequately funded.

## **17. DOCUMENT REVIEW DATE**

- 17.1 This document should be reviewed five years from the date of publication.

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