Primary Knee Replacement Surgery

Summary
Wirral has a significantly higher number of knee replacement procedures performed than the North West average at an estimated total cost of almost £3.1 million in 2006/07. Knee replacement surgery is an effective treatment for relieving pain and improving function and demand is likely to increase largely due to the aging population. This paper makes a number of recommendations, following a review of the evidence and national guidance. Key recommendations include;

- mapping the process from referral through to surgery and rehabilitation to identify where problems are occurring
- auditing practice to ensure that nationally agreed guidelines are being adhered to
- developing local pathways and protocols to ensure that all treatment options have been tried before referral to a surgeon is made, to reduce inappropriate referrals and to ensure equity of treatment.

Background

- Knee replacement in its present form have been undertaken clinically for over 30 years with over 30,000 operations carried out in the United Kingdom (U.K.) each year (Fisher, 2004).
- The primary purpose of joint replacement surgery is to relieve pain and restore function.
- The most common indication for a total knee replacement is degenerative arthritis (osteoarthritis) of the knee (NICE, 2001).
- Osteoarthritis (OA) is common and its prevalence increases with age. OA of the knee presents as joint pain, deformity, stiffness, a reduced range of movement and sometimes giving way.
- The underlying joint changes of OA are generally irreversible and management aims to relieve symptoms and reduce disability (NICE, 2005).

Guidelines

As OA is the most common indicator for primary knee replacement this section provides guidance around the management of this condition. ‘Best practice’ information on knee replacement is also detailed.

Osteoarthritis guidelines:
NICE guidance on OA is currently in development; due for completion December 2007. In 2001, NICE provided advice on OA not as formal guidance but to encourage appropriate transfer of patients from general to specialist services. The guidance is outlined in table 1.

Table 1: Summary of NICE advice on referrals for osteoarthritis from primary care to specialist services

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<th>PRIMARY CARE</th>
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<tr>
<td>Initial management strategies for patients include:</td>
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<td>- Reassurance and patient education</td>
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<td>- Weight reduction in obese patients</td>
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<td>- Walking aids</td>
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<td>- Patient-specific exercise programmes</td>
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<td>- Assessment and advice on cushion-soled footwear</td>
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SPECIALIST SERVICES

These are in a position to:
- Confirm or establish diagnosis
- Provide management advice coupled with physical therapies
- Assess the need for, and undertake, joint surgery and rehabilitation
- Undertake intra-articular injections of drugs

REFERRAL ADVICE

There is evidence of infection of the joint
- There is evidence of acute inflammation caused by, for example, haemarthrosis
- Giving way is a problem despite therapy
- Symptoms rapidly deteriorate and are causing severe disability
- The symptoms impair quality of life. Referral should be based on an explicit scoring system that should be developed locally in a partnership involving patients together with health care professionals in primary and secondary care. Referral criteria should take into account:
  - the extent to which the condition is causing pain
  - disability
  - sleeplessness
  - loss of independence
  - inability to undertake normal activities
  - reduced functional capacity
  - psychiatric illness

Key to referral timings:
- Is seen immediately (within a day)
- Is seen urgently (maximum wait of 2 weeks recommended but to be agreed locally)
- Is seen soon (waiting time to be agreed locally)
- Has a routine appointment (waiting time to be agreed locally)

PRODIGY Guidance has also been developed on OA of the knee; last updated in July 2006. PRODIGY is provided through the Clinical Knowledge Summaries (CKS) Service and can be accessed through the National electronic Library for Health website. The guidance targets healthcare professionals providing first contact or primary health care. The guidance outlines the treatment options available for OA of the knee and provides supporting evidence. The guidance is summarised in table 2.

Table 2: Summary of PRODIGY Guidance treatment options for osteoarthritis of the knee

NON-DRUG TREATMENTS

Consider non-drug treatment for people with knee OA at all stages:
- Braces and orthoses (shoe insoles)
- Patellar taping
- Use of a cane
- Exercise therapy, irrespective of age
- Weight loss for people with a BMI>28
- The use of a transcutaneous electrical nerve stimulation (TENS) machine or acupuncture might provide symptomatic relief but more studies are needed to
clarify the specific benefit in OA

**ANALGESIA**

If analgesia is required:
- Paracetamol (with codeine where needed) is the drug of first choice – it may be more effective if taken regularly
- Oral nonsteroidal anti-inflammatory (NSAIDs) may be required if adequate analgesia is not obtained with paracetamol
- Topical NSAIDs may have a role in people who experience acute flare-ups
- Topical capsicum may be tried if other options have failed

**OTHER PAIN RELIEF**

- The use of intra-articular corticosteroids is recommended as an option for short-term relief of pain and functional impairment with inflammatory flare-ups
- Glucosamine can be tried for mild knee OA if analgesia has failed or the person is intolerant of NSAIDs

**SURGERY**

- A referral should be made to an orthopaedic surgeon if the patient has severe symptomatic knee OA with pain that has not responded to medical therapy and has progressive limitation in activities of daily living
- Night-time pain in people could be a clinical marker of severe OA

The guidance refers to NICE information/advice as outlined above

The following surgical treatments are available for OA of the knee:
- Total knee replacement (TKR); for more information refer to evidence base section below
- Osteotomy may provide pain relief for some people with knee OA who are not yet candidates for TKR, particularly patients that are young and active. Osteotomy is used to realign the structure of the knee if arthritic damage is confined to one side. Osteotomy may delay the need for TKR by 5-10 years and may allow a return to sport (which is not advised after TKR)
- Fusion of the knee may be considered in young and active people, particularly when associated with severe disability
- Arthroscopic debridement may be considered for knee OA with mechanical symptoms (painful locking or catching). This procedure involves keyhole surgery that sucks out and/or washes away debris from around the knee. It is more successful in young people if there is no gross malalignment or instability, there is some articular cartilage remaining and symptoms are well localised

**Knee replacement guidelines:**
The NHS Institute for Innovation and Improvement have produced a paper *Delivering Quality and Value. Focus on: Primary Hip and Knee Replacement* in 2006 to help health organisations improve the quality of care for patients receiving knee replacements and to improve cost effectiveness of treatment. This supports an earlier paper *Improving Orthopaedic Services*, produced by the NHS Modernisation Agency in 2002. Action to improve quality and cost effectiveness of services identified in these reports are summarised in table 3.
Table 3: Summary of NHS guidance to improve knee replacement and orthopaedic services

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<th>REDUCE NUMBER OF INAPPROPRIATE REFERRALS</th>
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<td>10-40% of patients referred to an orthopaedic surgeon do not need a surgical opinion, or do not need this until other treatment options have been tried.</td>
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<td>▪ Agree care pathways to ensure consistency in clinical policies, all staff know what treatment and care should be given and patients understand the treatment plan</td>
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<td>▪ Identify and/or develop GPs with a special interest (GPwSI) in orthopaedics or musculoskeletal medicine</td>
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<td>▪ GP refers direct to other pathways (e.g. GPwSI, orthotics, podiatry)</td>
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<th>REDUCE NUMBER OF INAPPROPRIATE PATIENTS ON WAITING LISTS</th>
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<td>Up to 35% of patients waiting for joint replacements added to orthopaedic waiting lists are removed without treatment, usually because the patient is not sure whether they want surgery or they are not fit for surgery and no steps have been taken to get them fit.</td>
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<td>▪ GPs should check that the patient will consider an operation before making a referral to a surgeon</td>
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<td>▪ There should be consistent communication with the patient about the procedure, hospital stay and post-discharge care from all professionals involved; ensuring that the patient understands the process</td>
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<td>▪ There should be a clear criteria for offering surgery using a structured assessment</td>
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<td>▪ Clinical priorities should be treated first and other patients treated in chronological order</td>
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<td>▪ A comprehensive and early health assessment should be undertaken before adding the patient to the waiting list</td>
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<td>▪ Education classes to prepare the patient for surgery approx. two months before surgery (not at the beginning of their wait) should be available</td>
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<td>▪ Pre-operative assessments (POA) should be undertaken by nurses with involvement of other disciplines when required (consultant, physios, etc)</td>
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<td>▪ POA should be done approx six weeks before admission, which could reduce the postponement rate from 40% to 5%. Two weeks before admission is too late</td>
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<th>REDUCE DELAYS DURING ADMISSION AND SURGERY PROCESS</th>
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<td>Delays and bottlenecks created during the admission and surgery process mainly due to: lack of bed availability from emergency admissions and poor effective bed planning; avoidable length of stay; and poor co-ordination of the surgical process.</td>
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<td>▪ Ensure key staff and equipment are available at time of surgery; plan annual leave at least six weeks ahead</td>
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<td>▪ Co-ordination of admissions should be done by dedicated staff rather than consultants’ secretaries, liasing with relevant staff to ensure all resources are available on the day</td>
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<td>▪ There should be a rigorous policy for theatre list organisation</td>
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<td>▪ There should be dedicated trauma lists, including weekend lists</td>
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<td>▪ Admit patients on the day of surgery wherever possible; preadmission process should ensure that patients have given their consent and are medically fit for procedure; there should be guaranteed beds, staggered admissions and a standard protocol in place</td>
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<td>▪ Patients should be mobilised within 12-18 hours of surgery; anaesthetic techniques should be geared towards this and post operative pain management protocols in place</td>
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<td>▪ There should be robust discharge planning. Patients should be discharged using a criteria-based process agreed by an effective multi-disciplinary team. Patients</td>
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should be discharged when agreed criteria are met; the aim should be for patients to be discharged by mid morning on the day of discharge
- Early discharge schemes should be considered e.g. orthopaedic outreach and community rehab teams

Making these changes will result in improvements in clinical and managerial procedures that can be achieved with little or no increase in investment and improve cost-effectiveness of treatment.

The British Orthopaedic Association and the British Association for Surgery of the Knees have also produced a good practice guide to knee surgery in 2001. The document provides guidance right from the indications for surgery through to patient follow-up after surgery.

**Situation in Wirral**

In Wirral a total of 561 knee replacement procedures (primary or bilateral primary) were carried out between April 06 and March 07 at a total cost of nearly £3.1 million. This equates to a cost of over £5500 per operation. According to data provided by Wirral Primary Care Trust’s Information Team in 2005/06 compared to the North West, Wirral had significantly greater procedure rates for knee replacements; the second highest in the region. Figure 1 demonstrates the directly standardised rates (DSR) for knee surgery per 100,000 of the population in the North West region in 2005/06; Wirral PCT’s DSR for knee surgery was 115.18, significantly higher than the North West DSR of 78.92.

![Figure 1: Directly Standardised Rate per 100,000 population for Knee Surgery by PCT 2005/06](image)

Croydon PCT and the London Public Health Observatory estimate that between 15%-30% cost savings could be made through restricting access to knee surgery (South West London Public Health Network, 2006). These calculations were based on value judgements drawing on clinical evidence, experiences elsewhere and analyses of diagnosis data to estimate the proportion of unavoidable procedures. In Wirral, between 2006/07 it is estimated that these cost savings, based on the above calculations, would equate to between £450,000 and £900,000. However, it is not possible to make these
cost savings if there is no detailed information or evidence provided that clearly demonstrates how these cost savings can be achieved.

Nationally the average length of hospital stay for knee replacement is 9.7 days; for the top 25% of PCTs in England this ranges from 6-8 days. Wirral's figure between October 2005-06 is lower than the national average at 8.7 days but lies outside of the top performing PCTs. The readmission rate for knee replacement in Wirral during the same period was 5.1%, compared to 1.9-4.1% of the highest 25% PCT performers nationally (NHS Institute for Innovation and Improvement, 2006).

Evidence base for Primary Knee Replacements

- Reviews have found that TKR is effective in relieving pain and improving function (Ontario Ministry of Health and Long-Term Care, 2004; Scott et al. 2004; Jordan et al, 2003; American College of Rheumatology, 2000).
- According to the British Orthopaedic Association and the British Association for Surgery of the Knees (BOA and BASK) primary knee replacement may fail between five and ten years but the majority survive up to ten years (BOA and BASK, 2001).
- It has been estimated that in the U.K. over 10% of all joint replacement operations are for revision or failed prostheses (Fisher, 2003). The national joint register (NJR) launched in 2003 is building a database of information on implant performance, joint replacement surgery and best practice on hip and knee joint replacement. More reliable information on success rate of prostheses will therefore be available in the future.
- Revision operations should be planned and performed before serious bone destruction occurs, which could otherwise result in more extensive surgery later (BOA and BASK, 2001). [Note: this will be explored in more detail in a separate review – available June 2007]
- Revision total knee replacement is not as effective as primary knee replacement. Evidence has identified its effectiveness in improving function and quality of life, although a Centre for Reviews and Dissemination (CRD) review advises that these findings be viewed with some caution and may not be applicable to the U.K. (CRD, 1999). Nonetheless, the BAO and BASK still recommend that it be undertaken.
- Analysis of the Hospital Episodes Statistics (HES) data in 2000 identified higher procedure rates in regions where there were fewer centres offering procedures. The researchers suggest this may be due to how services for TKR have developed over the years. Historically, TKR has been a more demanding and difficult procedure to perform, consequently the procedure has been taken up by more specialised centres rather than orthopaedic departments (Dixon et al, 2006).
- There is a lack of consensus about factors that may predict outcome of treatment. In a review that included a search of the Cochrane electronic databases the authors concluded that age, gender, obesity, prosthesis design and surgical techniques were not consistently identified as predicting pain or function outcomes across the studies reviewed. They did however report that over 70% of the variance in outcome is unexplained (Ontario Ministry of Health and Long-Term Care, 2005).
- A systematic literature review completed by a team at the University of Minnesota similarly found no evidence that age, gender or obesity are strong predictors of
functional outcomes (although extremes of age and obesity were not actively tested) (University of Minnesota, Evidence-based Practice Center, 2003).

- A Cochrane Review that explored the value of pre-operative education for hip or knee replacement concluded that there is little evidence to support the use of pre-operative education over and above standard care to improve pain, functioning and length of stay outcomes. However targeting pre-operative education to those most in need (e.g. patients with high anxiety, disability and/or with limited social support structures) may have beneficial effects (McDonald et al. 2004).
- Bilateral knee surgery can be performed under the same anaesthetic; there is evidence to suggest that rehabilitation is more rapid than if staged although there are some concerns about the morbidity of such major surgery (BOA and BASK, 2001). Patients undergoing bilateral surgery should be managed in a high dependency unit.
- Thromboelbolism can occur after surgery but there is debate regarding its incidence. Knee replacement should be regarded as a moderate risk for death from pulmonary embolism. Chemical prophylaxis may reduce the risk of non-fatal pulmonary embolism although there is a lack of rigorous scientific evidence to prove or disprove this (BOA and BASK, 2001).
- Deep vein thrombosis (DVT) occurs fairly commonly after primary knee replacement although only a very few cases develop a clinical event causing death or morbidity. There is strong evidence for the effectiveness of low dose heparin and Warfarin in reducing radiological DVT by 40-60% but death from other causes may be increased. There is also added concern about possible bleeding complications which would put the knee at considerable risk (BOA and BASK, 2001).
- The implementation of a critical pathway for knee replacement and a knee implant standardisation programme has been associated with reduced hospital costs, although a CRD review of the study questions the external validity of the analysis and transferability of the findings (CRD, 2004a). However, another review that was examined by CRD supported the view that clinical pathways appeared successful in reducing costs and length of acute care hospital stay with no compromise in patient outcomes, although recommend that again the findings be viewed with some caution (CRD, 2004b).
- NICE (2005) interventional procedure guidance state that there is not enough evidence on the safety and efficacy of mini-incision surgery for total knee replacement and the procedure should only be used with special arrangements for consent and for audit or research purposes.

Conclusion/recommendations

- Knee replacement is an effective treatment for relieving pain and improving function, but should be performed only after other treatment options have been tried.
- Demand for knee replacement is likely to increase; OA is a key indicator for surgery and risk factors for developing the condition include increasing age and obesity, both of which are rising in the U.K. Wirral in particular has a higher proportion of older people than the national average; however this does not explain Wirral’s high procedure rate as this data is age standardised.
- Trusts should comply with the input of data into the NJR and obtain patient consent to link any revision operation, re-operation or complications to the first operation.
Wirral is performing well with regards to length of hospital stay and readmissions following knee replacement when compared with the national figures, but is performing a significantly higher number of procedures than the North West average.

Key areas where improvements in procedures can be achieved at minimal cost include; consistent communication with patients, patients admitted on day of surgery, minimising the number of cancelled procedures, mobilising patients within 12-18 hours after surgery and using an agreed criteria-based process for discharge.

Trusts should ensure they are adhering to national guidance on knee replacement, namely the NICE guidance (NICE, 2005 and NICE, 2001) and the BOA and BASK guidance (BOA & BASK, 2001). Practice should be audited to identify whether this is happening and put in place measures in instances where non-adherence is identified.

Primary care pathways and protocols for OA should be developed to ensure that all treatment options have been tried before referral to a surgeon is made, to reduce the number of inappropriate referrals and to ensure equity of treatment. Note: NICE guidance on OA is due to be completed by December 2007.

Process mapping should be completed to understand the whole pathway from referral for surgery through to rehabilitation, highlighting where problems occur. An appropriate pathway and protocol should then be developed accordingly, using the two key NHS documents for guidance (NHS Institute for Innovation and Improvement, 2006; NHS Modernisation Agency, 2002).

REFERENCES


NICE (2001). *Referral Advice: A guide to appropriate referral from general to specialist services*. NICE.


