Nursing management issues in hip and knee replacement surgery

Brian Lucas

Abstract

Total hip replacement (THR) and total knee replacement (TKR) are carried out for the relief of pain in hip or knee joints usually caused by osteoarthritis. Such replacements last for 10-15 years and therefore many nurses will care for patients with a THR/TKR even if that is not the primary reason for the patient seeking care. The different types of THR/TKR and how patients can be prepared for surgery are discussed. The major long-term complications of loosening or dislocation of the components of the THR/TKR and of infection are explored and the presenting symptoms are highlighted. The article is intended to be useful not only for orthopaedic nurses but also for nurses generally.

Key words: Orthopaedics ■ Surgery: patient care

In England, 428 524 total hip replacement (THR)/total knee replacement (TKR) operations were carried out between 1998 and 2003 (Department of Health (DoH), 2004). The majority of THRs/TKR prostheses last for 10-15 years so there are a large number of people walking around with such prostheses in place and it is therefore inevitable that nurses in virtually all specialties will care for someone with a THR/TKR. THRs have been in the news recently because of minimally invasive replacements, and nurses may well be asked about this by patients with hip problems. This article will provide an outline of what THRs/TKRs are, why they are undertaken, and discuss patient needs before and after these procedures. The aim is to provide information useful not only to orthopaedic nurses but also to others who come into contact with these patients before and after surgery.

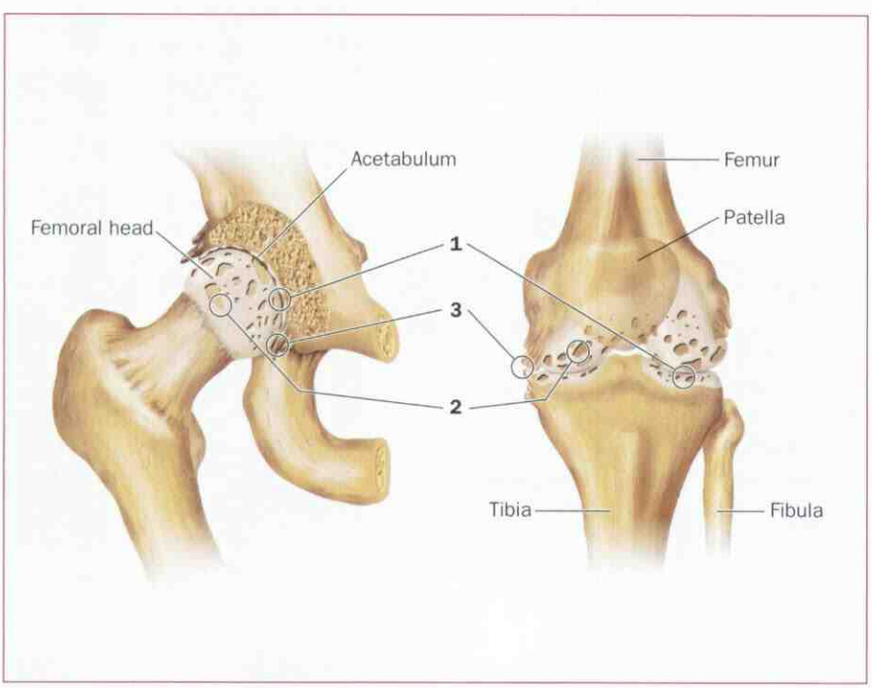

Figure 1. (a) Osteoarthritis of the hip joint, and (b) osteoarthritis of the knee joint. In a normal joint hyaline cartilage covers the articulating surfaces of the bones, a hard substance which allows pain-free smooth joint movement. In osteoarthritis three main changes occur:
1. Narrowing of joint line space due to wearing away of cartilage at ends of bones
2. As cartilage is worn away the underlying (subchondral) bone is exposed and subchondral cysts may form. Pain results from bone rubbing on bone
3. Bony outgrowths (osteophytes) develop around the edges of the joint and can limit movement.

Indications for THR and TKR

The most common reason for having a THR/TKR is osteoarthritis, a degenerative disease of synovial joints leading to loss of cartilage (*Figure 1*). Other reasons for surgery are outlined in *Table 1*. THR/TKR are usually carried out after conservative measures, such as analgesia, walking aids and lifestyle modification (weight loss, exercise, and home adaptations), have been tried (Gidwani et al, 2003). For some patients these do not relieve the symptoms and therefore surgery is considered, primarily to relieve pain. While THRs/TKRs can be revised (the old prosthesis taken out and a new one inserted) this is technically more difficult and therefore many surgeons prefer to wait until the symptoms of arthritis are having detrimental effects on the quality of patient life before undertaking surgery (Gidwani et al, 2003). However, recent research suggests that patients with more advanced disease do less well following surgery; they have health gain benefits (in terms of pain and mobility) but not to the extent of those with higher preoperative function (Holtzman et al, 2002; Kennedy et al, 2003).

Some attempts have been made to develop tools which will help practitioners to select and prioritize patients for THR/TKR, most notably the Ontario (Naylor and Williams, 1996) and New Zealand scoring systems (MacCormick et al, 2003). These tools are a set of priority criteria with a structured scoring of pain, function, movement and deformity. The total score for an individual patient can be used to identify treatment (including THR/TKR) within pre-agreed categories and/or to rank groups of patients according to priority. These can be used by medical staff or by nurse practitioners but they are not in widespread use and selection for surgery often depends on surgeon preference and patient persistence in asking for surgery. There is consequently a need to

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Accepted for publication: June 2004

develop evidence-based consensus on the appropriate indication for THR/TKR (Gunther, 2001).

Hip and knee replacement surgery

Surgery involves removing the diseased ends of the bones in the joint and replacing them with metal (cobalt chromium or titanium) and/or plastic (polyethylene) prostheses (Maher et al, 2002). While there are many different models of THR/TKR available they can be divided into two main categories depending on the nature of their fixation, namely cemented or uncemented (Maher et al, 2002). The former are fixed using polymethylmethacylate (PMMA) cement and the latter are fixed by ensuring the holes reamed in the bones are the correct size to hold the prostheses securely and by roughened surfaces on the prosthesis into which the surrounding bone grows. Uncemented prostheses are easier to remove and therefore used in younger patients who are more likely to need revision surgery (Maher et al, 2002).

Total hip replacement

In THR surgery the femoral head and neck are removed and the acetabulum cleared of any remaining cartilage (Dandy and Edwards, 2003). The prostheses consists of a femoral stem, a femoral head and an acetabular cup (*Figure 2*). The femoral components are made of metal and the acetabular component may be metal, plastic with a metal back, or plastic. Success rates, defined as the prosthesis still intact and the patient having no pain, are usually reported at around 95% of patients at 10 years (Berry et al, 2002).

Hip resurfacing is another method of treatment for hip arthritis, which involves a metal cup and a metal covering for the femoral head which preserves the femoral neck, and which in theory may improve outcome from subsequent THR (Health Technology Assessment, 2002) (*Figure 3*). This is usually reserved for younger patients, particularly those who are still physically active, as a conventional THR would loosen more quickly in these patients owing to the greater stress they may place on the THR with higher levels of physical activity. The early results are promising, with one study (Amstutz et al, 2004) demonstrating a 94.4% survival rate of the components at 4 years, but longer-term studies and those that compare it with other treatments need to be carried out (Health Technology Assessment, 2002).

With 'keyhole' or minimally invasive THR surgery the prostheses used are the same as in conventional surgery, the difference is in the surgical incision. Two methods are carried out — one incision or two incisions. With one incision a smaller incision than conventional (usually 10 cm as opposed to approximately 20 cm) is used and placed where there is less soft tissue disruption, and therefore less blood loss, less postoperative pain and reduced hospitalization time (Dorr, 2003).

With a dual incisional technique smaller incisions (5 cm and 2.5 cm) are used but surgery has to be carried out using illuminated retractors and under image intensifier (X-ray control). Surgeons using these techniques claim good results, in terms of prosthesis fixation and patient outcomes, such as pain (Dorr, 2003; Duwelius et al, 2003), but as these procedures have only been carried out for the last 5 years the long-term success rate cannot be predicted. Therefore, while patients might be glad about a potentially less invasive procedure and the possibility of a reduced length of hospital stay they need to be aware of the issues of lack of long-term results and the importance of adequate surgeon training before they can give truly informed consent (Lieberman, 2003). Nursing staff in preadmission assessment clinics and on inpatient wards therefore need to help ensure that patients understand the surgery and associated risks through education and the opportunity for asking of questions.

Table 1. Reasons for THR/TKR surgery

Clinical condition	Reason for surgery
Rheumatoid arthritis	Destruction of articular cartilage and bony erosions
Previous injury or surgery to/adjacent to joint	Abnormal wearing of joint surfaces due to changes in anatomic alignment of joint following injury or surgery
Previous childhood hip disease (for THR)	Conditions affecting normal development of hip joint in childhood — developmental dysplasia of hip (DDH), Perthes disease, slipped upper femoral epiphysis (SUFE)
Avascular necrosis (for THR)	Death of femoral head due to trauma (up to 8 years after traumatic event), alcohol abuse
Ankylosing spondylitis (for THR)	Bony ankylosis (loss of movement) of hip joint

Source: Dandy and Edwards (2003); THR = total hip replacement; TKR = total knee replacement

Total knee replacement

In TKR surgery the distal (lower) end of the femur and the proximal (upper) end of the tibia are excised. The tibial and femoral components are metal with a plastic tray between on which the femoral component moves (*Figure 4*). From a technical point of view it is common for studies to report 95% survivorship of the prosthesis at 10 years (e.g. Font-Rodriguez et al, 1997).

For patients with osteoarthritis only in

Figure 2. (a) Example of femoral head and stem of total hip replacement (THR). With permission Zimmer Inc. (b) Examples of acetabular components of THR. The acetabular cups on the left are shown without the plastic lining. With permission Zimmer Inc. (c) X-ray view of THR.

the medial or lateral compartment of the knee a unicondlyar knee replacement may be considered (*Figure 5*) as it is a tissue conserving operation, a smaller procedure and usually allows a greater degree of flexion post-surgery (up to 120 degrees, as opposed to 100 degrees following TKR) (Ashraf et al, 2003). However, there are some doubts about the long-term survivorship of these implants — most research studies report 10-year survivorship of 85–90% for medial unicondylar replacements (Ashraf et al, 2003), and much less for lateral replacements which are performed only rarely.

Unicondylar replacements are therefore not used in all centres of orthopaedic surgery. While both THR and TKR are considered successful operations bringing many benefits, in particular pain relief, there are a number of patient concerns and outcomes which need to be considered. The remainder of the article will outline these.

Figure 4. (a) Example of total knee replacement (TKR). With permission Zimmer Inc. The upper component is fixed to the lower end of the femur, the lower component to the upper end of the tibia, with the plastic tray in between. The femoral component glides on the plastic tray when the knee is bent (b) lateral X-ray view of TKR.

Preparation for surgery

Patients who require a THR or TKR need to be prepared for surgery before admission. This preparation should include physical and psychosocial assessment and subsequent action planning.

Physical preparation

As far back as the 1970s it was suggested that patients be assessed for fitness for surgery before admission and in orthopaedic care the 1980 Duthie Report (Department of Health and Social Security, 1981) concluded that preoperative assessment would improve efficiency of the service (Fellows et al, 1998). Preoperative assessment has been shown to be effective in identifying patients who are not fit for surgery or who do not want/require it, with 37% of patients in one study not proceeding to surgery (Fellows et al, 1998). While it is beneficial to the hospital that these patients are identified before admission, the resulting vacant operating theatre slots may be difficult to fill with fit and willing patients in the 1–2 weeks available. The emotional cost to the patient who has waited for up to 9 months for surgery and who is then deferred because he/she is unfit must also not be underestimated.

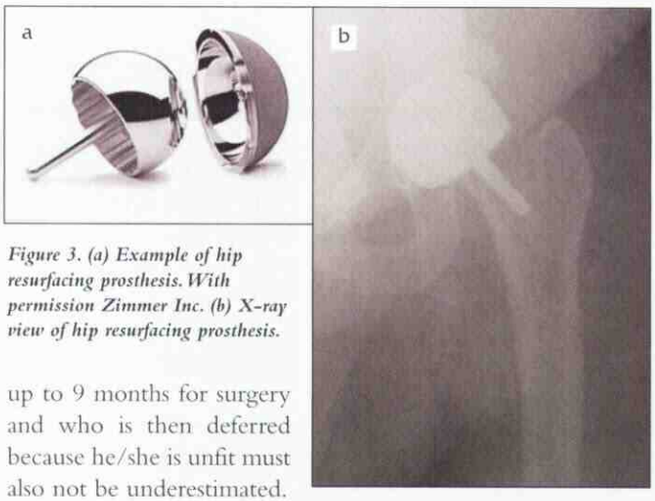

Figure 3. (a) Example of hip resurfacing prosthesis. With permission Zimmer Inc. (b) X-ray view of hip resurfacing prosthesis.

With this in mind there has been a suggestion that patients are managed much more 'aggressively' from the time they are placed on the waiting list. The Modernization Agency, part of the DoH, suggests early health assessment (when listed) as well as education classes a few months before the expected admission date (Modernization Agency, 2002). While a general health assessment could be undertaken by a nurse practitioner who is not familiar with the surgical procedure, information about the operation and rehabilitation needs to be undertaken by someone familiar with THR/TKR. This may be a member of the medical staff, but nurses are ideally placed to undertake this and nurse-led preoperative assessment or early health assessment is becoming increasingly common (Whyte, 2004).

It has also been suggested that physical preparation can help postoperative recovery. Ditmyer et al (2002) have used the phrase 'prehabilitation' as a conceptual intervention to patients preparing for orthopaedic surgery. It is based on the evidence that building up muscle strength mitigates to some extent the effects of immobilization because of hospitalization and surgery, and argues that a planned programme of physical therapy will improve the functional capacity of the body postoperatively. However, a recent mini-review found that there is not enough evidence to support or refute this with regard to preoperative physiotherapy and postoperative mobility after TKR (Lucas, 2004).

Figure 5. Example of unicondylar knee replacement. With permission Zimmer Inc.

Other physical preparation such as skin preparation and preoperative starving are the same as for other elective surgical procedures.

Psychosocial preparation

There is evidence that preparation for THR/TKR surgery is a complex matter and not simply a case of giving an information booklet to a patient. A systematic review of preparatory information did not establish its effectiveness (McDonnell, 1999), although this looked at information alone and not other preparation such as psychosocial support. The concept of self-efficacy (the degree of confidence that individuals have in their ability to perform specific activities successfully; Bandura, 1977) has been studied with regard to THR/TKR and it is

suggested that the degree of self-efficacy preoperatively can affect postoperative functional behaviours (Moon and Backer, 2000) and depressive symptoms (Kurlowicz, 1998), although both studies had a small sample size. It is also important to understand what patients' expectations of surgery are, and to realize that they may change over time. Lieberman et al (2003) found that 60% of 101 patients undergoing THR chose different reasons at 1 year post-surgery for undergoing the procedure than preoperatively; only pain and walking were consistently chosen reasons both before and after surgery. Changing expectations may therefore affect how satisfied patients are with the result of surgery. Mancuso et al (2001) have devised a short (17-item) questionnaire designed to elicit patients' expectations of a TKR, although care should be taken in its use as it was designed using American patients at a tertiary hospital and the patient group may therefore not be typical of those elsewhere.

Understanding patient concerns related to waiting are also important — an English study found that patients were particularly concerned before THR/TKR about surgery being cancelled, no decrease in pain, risk of losing the leg, risk of joint infection, and risk of dying (Moran et al, 2003). Nurses are well placed to undertake patient assessment so that significant issues can be addressed, such as the need to ensure patient expectations are realistic and that any self-efficacy deficits regarding postoperative rehabilitation can be remedied through education.

Preparation for discharge after surgery should begin before admission and one study suggests that age, gender, walking ability, previous community support and social circumstance are predictors of extended inpatient rehabilitation after THR or TKR (Oldmeadow et al, 2003). Primary care nurses and their orthopaedic colleagues can work together to ensure that such factors are taken into account when planning patient discharge.

Social preparation should therefore include assessment of the patient's social support network, anticipated needs on discharge (such as help with maintainig nutritional requirements) and of the need for physical aids, such as support rails, to enable a patient to enter/leave his/her home safely (Fellows et al, 1998).

After surgery

The remit of this article is not to look at general postoperative recovery but specific issues — namely patient support needs post-discharge, mobilization and dislocation, infection, loosening and long-term follow-up.

Support following discharge

Patients having THR/TKR are being discharged earlier than before. In England, for example, the mean length of stay following a cemented THR was 13.1 days in 1998-99 and 11.2 days in 2002-2003 (DoH, 2004). Length of stay may continue to decrease, not least because of the pressure on hospitals to achieve ever shorter maximum waiting times for surgery (6 months by 2005; DoH, 2000). Changing surgical techniques may also have an impact. Berger (2003) reports same-day discharge of 75 out of 88 patients following minimally invasive two incision THR, with the remainder going home the next day. Reducing length of stay may also impact on discharge destination: a US study (Ganz et al, 2003) of 11 000 patients' records in one hospital from 1990–2000 showed that as the average length of stay following THR decreased (from 9.7 to 5.3 days) fewer patients reached functional milestones (such as transferring unassisted) and more were discharged to rehabilitation centres rather than to their own homes (44% discharged to their family in 1995, 23% in 2000).

These trends suggest that more support for patients is needed in the community after discharge, either from a dedicated team (Palmer Hill et al, 2000; Renton and Brown, 2001) or from primary care. Some of this support is related to physical care, such as monitoring of the wound and removal of clips/sutures, and certain aspects of psychosocial care. Loft et al (2003) found, in a phenomenological study, that patients felt they had a disempowered relationship with in-home professional care providers (such as nurses) and a more equitable one with non-professional care providers (e.g. those providing help with personal hygiene) after THR/TKR, but that they were not dissatisfied with this, expressing deference to the traditional expert model of health care. They desired independence and were willing to rely on expert caregivers to help them achieve this independence.

However, a study of 19 patients following elective orthopaedic surgery (Edwards, 2002) found that patients were keen to take responsibility for playing their part in trying to optimize the outcome of their surgery but many were frustrated by a lack of information and support to allow them to fulfil this role to their satisfaction. Information given to patients needs to be consistent throughout their care journey, from listing for surgery to long-term follow-up, so that patients do not receive conflicting advice. This would also help to avoid what Showalter et al (2000) found in their study, that patients after THR/TKR were distressed over not being able to resume activities they enjoyed within an expected time frame. Patient learning needs may differ according to age and education. A Finnish study found that learning needs diminished significantly after hospital discharge except in women over 60 years and less educated or retired respondents (Johansson et al, 2002).

Mobilization and dislocation

The majority of THR/TKR patients fully weight bear on the operated leg the day after surgery, although in some centres patients with an uncemented prosthesis partially weight bear initially. The emphasis is on ensuring that the joint replacement is moved within its normal range so that no adhesions or stiffness occurs; this is particularly important for TKR patients as poor movement post-surgery may require a manipulation under anaesthetic of the joint 3–4 months later (Tchejeyan, 2002). Movement after a THR/TKR is never as great as in a natural joint but both regain enough range of motion to be able to carry out activities fully such as walking, climbing stairs, sitting and standing.

One of the risks of a THR is dislocation of the prosthesis, i.e. the femoral component comes out of the acetabular cup (O'Brien et al, 1996). This manifests itself as an acutely painful episode with shortening and external rotation of the affected leg (the foot lies out to the side; Maher et al, 2002). Treatment is usually a reduction under anaesthetic with a protective brace being worn for 6 weeks (O'Brien et al, 1996). Dislocation is classified as early (within the first 6 weeks of surgery) or late. It is common for patients to have to follow certain restrictions for the first 6 weeks postoperatively to reduce this risk, namely

not crossing legs, sleeping on their back, and not getting into a bath, although a recent study examined 499 patients on whom no restrictions on postoperative mobilization were imposed and only three dislocated (Talbot et al, 2002). With shorter in-patient stays primary care nurses may be the healthcare providers who reinforce advice about precautions and who identify patients with dislocation.

An American study (Phillips et al, 2003) found that 3.9% of 58 521 patients had a dislocation within the first 26 weeks postoperatively, with the highest risk being while an inpatient. Recent evidence suggests that late dislocation of a THR is more prevalent than previously thought; for example, von Knoch et al (2002) found that out of 19 680 THRs performed between 1969 and 1995 2.6% dislocated. Of these 32% first dislocated five or more years after surgery, with the median time being 11.3 years. They concluded that late dislocation can occur because of a long-standing problem with the prosthesis that manifests late (such as malposition of the implant) or because of a new problem such as neurological decline or an episode of trauma.

TKRs are also prone to instability and dislocation, being the third most common causes of failure of a TKR and occurring in 1–2% of patients having a TKR (Clarke and Scuderi, 2003). Ten to twenty per cent of revision TKRs are performed because of instability (Clarke and Scuderi, 2003). Nurses working in fields, such as accident and emergency, may meet patients with THR/TKR instability and should consider this when patients present with sudden pain and loss of mobility in the joint.

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Infection

The cost of infection following joint replacement is not only financial but also emotional and psychological with patients and their families who expected relief from a troublesome knee or hip finding that a whole host of new problems have arisen. Infections following TKR are usually between 1–2% (Harwin, 2002) and for THR it has been reported as 0.2–1.1% in the first 26 weeks following surgery (Phillips et al, 2003).

Infection can be superficial, i.e. involving the skin, subcutaneous tissue and areas above the fascia, and deep, occurring below the fascia with/without disruption of the superficial tissue. It can also be divided into early or late infection with early usually being considered as within 3 months of surgery (Harwin, 2002).

Infection can be as a result of three types of contamination — direct at the time of surgery, secondary due to problems with wound healing or drainage, and via haematogenous seeding from remote places such as the urinary tract, skin ulcers, and abscesses (Harwin, 2002). Preoperative factors can influence the risk individual patients have of developing an infection (Cushner and Scott, 2002), including smoking, anaemia, nutritional and vascular status; therefore, preoperative screening is important. Other factors thought to influence the risk of infection are surgical technique and previous surgery (Cushner and Scott, 2002), and operating theatre conditions — laminar-flow air theatres and minimizing the number of personnel in theatre can both help to reduce the risk (Harwin, 2002). It is routine for all patients having insertion of metalwork (including THR/TKR) to have prophylactic antibiotics, usually three doses of intravenous cefuroxime (British Orthopaedic Association, 1999).

Infection is detected through physical symptoms (discharge, redness, swelling, pain on movement), laboratory tests (white cell count, erythrocyte sedimentation rate, and C-reactive protein), and imaging studies such as a bone scan (Della Valle et al, 2004). Nurses can play an important part in detection of both early and late infections — patients often complain of pain that was not present before and also pain at rest and at night, which is not common following joint replacement.

For superficial infections antibiotics and wound care will usually resolve the problem. For deep infections the treatment usually has to be more radical, including removal of the prosthesis and insertion of a new one; this can be as a one-stage procedure or two-stage (Harwin, 2002). In the latter, the prosthesis is removed and the deep tissues cleaned and debrided and the patient is treated with antibiotics until there is no evidence of infection, and then another replacement is inserted. This can be many months later and a worrying time for patients. For TKRs a ‘spacer’ or rigid bar may be inserted in the joint which allows weight bearing but little flexion of the knee until the second replacement is inserted (Harwin, 2002).

Loosening of prosthesis

Seventy-nine per cent of failures of THRs are as a result of aseptic loosening (Wimhurst, 2003). In one study of 212 TKRs (Sharkey et al, 2002) component loosening was a common cause of early and late knee replacement failure, 16.9% and 34.4% respectively. The exact pathophysiology of loosening is not fully understood but it appears that it is a combination of migration (movement of the prosthesis, possibly due to failure of bone around it) and wear debris (particles of the metal/plastic components which activate macrophages and stimulate bone destruction around the prosthesis).

Loosening of a THR/TKR may not produce any pain or loss of mobility in the early stages but if it is allowed to progress too far the amount of bone lost can make it difficult to produce an acceptable result with revision surgery. The long-term clinical follow-up of patients following THR/TKR is therefore advocated (Teeny et al, 2003) but there is no agreement on how frequent this should be and there are resource implications in terms of staff time and clinic facilities. One answer has been to develop nurse practitioner follow-up of patients following THR/TKR (Lucas, 2002; Jackson, 2003). All nurses should be aware, however, that THR/TKR patients who develop previously unexperienced pain should seek a professional opinion even if they are not receiving regular orthopaedic follow-up.

Conclusion

THR and TKR are both very successful surgical procedures which provide millions of patients worldwide with relief from the pain of hip or knee disease. However, careful preparation of patients for surgery and attention to their needs after discharge are necessary if the full benefits of surgery are to be realized. While orthopaedic nurses play a key role in this other nurses may also identify and help meet particular patients' needs. BJN

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KEY POINTS

- A total of 428 524 total hip replacements (THRs) and total knee replacements (TKRs) were carried out in England between 1998 and 2003.
- The majority of THRs/TKRs are carried out for the relief of chronic hip or knee pain, usually caused by osteoarthritis.
- THR/TKR are successful operations with over 90% of patients still having a pain free and working joint at 10 years post-surgery.
- Careful preparation is required before surgery to ensure that patients have realistic expectations and are physically and psychosocially ready for the operation.
- With reductions in length of stay following a THR/TKR primary care nurses are increasingly likely to be caring for such patients after discharge and identifying early complications such as infection or dislocation.
- The major long-term complications of THR/TKR are loosening of the prosthesis, dislocation, and infection. Patients and nurses who come into contact with them, need to recognize the symptoms of these complications.