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# Who should get a knee replacement?

The decision-making process for total knee replacement is multifaceted and involves considerations that extend beyond radiographic evidence, including patient age, comorbidities, BMI, activity levels, and total versus partial replacement.

**ABSTRACT:** Knee osteoarthritis is a prevalent and variably debilitating condition, often leading to referral for possible total knee replacement when symptoms align with radiographic evidence of osteoarthritis. However, the severity of radiographic findings does not consistently correlate with patient-reported pain levels. We explore the intricacies of patient selection for knee replacement surgery and address the complex interplay between symptoms, radiographic evidence of osteoarthritis, and realistic outcome expectations following surgery. We also emphasize the need for a nuanced understanding of the relationship between structural changes and subjective patient experience. The age factor in total knee replacement candidacy has historically led to arbitrary age-based restrictions regarding referral, with patients advised to wait until older ages. Recent studies have challenged this notion and suggested that patients younger than 55 years can experience positive outcomes. Additionally, considerations for posttraumatic arthritis versus other arthritic causes highlight the importance of individualized preoperative counseling. Implant survival and revision rates are affected by patient age at

time of surgery, activity level, and BMI, among other factors. Based on patient-reported outcomes, patients with elevated BMI, despite higher rates of complications, do benefit, barring complication. Patient satisfaction following total knee replacement is dependent on various factors, including age, activity level, severity of osteoarthritis, and gender, which highlights the need for individualized counseling, considering diverse patient profiles and potential predictors of dissatisfaction. Specifically addressing the concerns of active patients requires counseling regarding postoperative activity restrictions, considering the balance between pain relief, improved function, and potential for increased risk of revision surgery. The choice between partial and total knee replacement is explored, with a focus on indications and survivorship. In guiding primary care physicians on when to refer patients, patient-reported outcome measures such as the Oxford Knee Score can be helpful, but further practical thresholds for surgical consideration must be considered. Maximizing nonoperative management prior to or while awaiting consultation is always beneficial and recommended. Ultimately, knee osteoarthritis is a complex medical pathology that is most effectively addressed through individualized patient counseling, shared decision making, and collaboration between primary care physicians and orthopaedic surgeons to optimize outcomes and satisfaction while navigating knee replacement options and timing of surgical intervention.

**K**nee osteoarthritis is a common and often debilitating disease. Referral to an orthopaedic surgeon is appropriate when there are radiographic changes consistent with osteoarthritis that are accompanied by symptoms. However, the severity of osteoarthritis on radiographs does not necessarily correlate with the level of pain experienced by the patient. It is important for patients to understand that surgery is a pain-reducing operation, not necessarily a pain-eliminating one. Managing patient expectations is necessary for successful surgical outcomes, because despite our best efforts, not everyone is satisfied following total knee replacement. In a large systematic review of more than 1200 studies on patient satisfaction after total knee replacement, 83% of the studies reported more than 80% patient satisfaction.<sup>1</sup> However, many factors must be considered and addressed preoperatively. The review showed that predictors of satisfaction included older age, higher-grade osteoarthritis, and male sex; predictors of dissatisfaction included less severe disease, younger age, osteoarthritis as a primary diagnosis as opposed to inflammatory arthritis, and female sex.<sup>1</sup> Keeping these factors in mind, in addition to chronic unexplained pain or related disorders such as chronic myofascial pain, fibromyalgia, and other disorders related to central sensitization, we address some common concerns regarding total knee replacement by adequately counseling the patient

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ahead of the procedure. The primary care provided plays a large role in this regard and in counseling the patient that not everyone who has a knee replacement is pain-free, especially those with the above-noted conditions, and that having some pain after a total knee replacement, albeit less than the preoperative pain, is not necessarily an indication of failure and does not require multiple investigations and referrals once a thorough workup by the surgeon has ruled out failure. We outline important considerations related to knee arthroplasty, framed through several common questions from the patient's perspective.

### Am I too young (or too old)?

Should we be denying younger patients access to total knee replacement if they have a higher chance of dissatisfaction? Due to a variety of factors, including implant survival, revision rates, and activity levels, patients have been commonly told not to pursue total knee replacement until they are older and significantly debilitated, often using an arbitrary cutoff of 65 years of age. This can lead a patient to suffer unnecessarily with significant symptoms for many years to avoid a possible revision operation in the future. In a systematic review of functional outcomes in patients younger than 55 years of age, there was a greater than 50% improvement in functional knee scores, as measured by the Knee Society Score, as well as a satisfaction rate of 85.5%.<sup>2</sup> In addition, the all-cause revision rate was 5.4% for the entire cohort of 1283 total knee replacements at a mean of 10.8 years follow-up.<sup>2</sup> Also, 10-year survival for aseptic loosening alone was 98.2%.<sup>2</sup> These are encouraging findings and support total knee replacement as an excellent treatment option for younger patients with osteoarthritic knees. Therefore, the age cutoff of 65 years should be considered obsolete, and patients should not be told they need to wait until they are older.

The cause of the young arthritic knee is important to consider, because a post-traumatic arthritic knee presents unique challenges compared with a more typical arthritic knee. Brockman and colleagues<sup>3</sup>

demonstrated that the incidences of wound infections (both superficial and deep) and deep vein thrombosis were higher in patients with posttraumatic arthritis. Patients with posttraumatic arthritis also had a higher prevalence of drug and alcohol abuse, psychosis, and liver disease, whereas osteoarthritic patients more commonly had obesity, diabetes, heart disease, and lung disease as comorbidities.<sup>3</sup> This further illustrates differences between these two patient populations and suggests that they

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would require different types of preoperative counseling to achieve a satisfactory postoperative result. However, these are generalizations based on cohort analyses; each patient should be evaluated as an individual. One of the most common reasons for osteoarthritis at a younger age is a previous knee ligament injury, which carries far fewer risks and technical difficulties than a patient with a significant fracture that is affecting the knee joint.

In a systematic review and meta-analysis conducted to establish how long a knee replacement lasts, approximately 82% of total knee replacements lasted 25 years or more.<sup>4</sup> It is important to discuss revision rates in patients with total knee replacement who are younger than 60 years of age, because they have a significantly increased lifetime risk of revision surgery: up to one in three for patients aged 50 to 55 years.<sup>5</sup> Revision rates following total knee replacement are a much more salient point for the younger patient as compared to the older patient. In discussion with the potential surgical patient, the risk of future revision surgery versus quality of life indicators should be considered. In our opinion, having a one-in-three lifetime risk of revision

surgery is not significant enough to warrant a patient suffering unnecessarily for a decade or more, but this is a shared decision that should be made with the patient.

Elderly patients tend to do better than younger patients when considering patient-reported outcome measures. However, in this patient cohort, comorbidities and the ability to recover and lead a fulfilling functional life after surgery play a significant role in the shared decision-making discussion with the patient and their family. Consideration should be given to whether the patient is healthy enough to undergo the procedure and tolerate the recovery process. If they are healthy, willing, and disabled enough, then knee replacement can give them pain-free years at the end of their life. For instance, an elderly patient with severe chronic obstructive pulmonary disease or congestive heart failure and very limited functional mobility will not benefit from the increased mobility afforded by a total knee replacement compared with a healthy elderly patient who would otherwise be active without debilitating knee pain.

### Is my BMI too high?

Any physician who cares for patients with knee osteoarthritis, whether a primary care physician or an orthopaedic surgeon, understands the difficulty of managing a patient with an elevated BMI and concomitant painful knee symptoms. Patients often find it difficult to stay active, which can negatively impact their overall health and weight. Even in highly motivated patients who have an elevated BMI, low-impact exercise activities, such as cycling and swimming, pose unique challenges that can be equipment- or access-related or may be due to issues such as body image, which can have serious psychosocial implications. Psychosocial issues may be deep-rooted and may have developed over many years; therefore, a cursory evaluation by a surgeon will miss these unspoken concerns. Patients with an elevated BMI often present with pain symptoms that are disproportionate to the degree of radiographic change present, not because they are more likely to talk

about experiencing pain, but because of mechanical overload and the complex role that obesity and metabolic syndrome play in the initiation and progression of knee osteoarthritis.<sup>6</sup> The physician should maximize nonoperative measures that, if applied along with weight loss, often result in significant symptom improvement. From a biomechanical standpoint, excess weight contributes to an increased mechanical burden with altered dynamic movement and loading patterns.<sup>7</sup> It is important to explain to patients that the knee is a joint that does not like extra weight and that weight loss may allow them to avoid surgical intervention, because these patients already have a higher perioperative risk profile than those without an elevated BMI. Telling a patient with an elevated BMI to lose a certain number of pounds before surgery is unhelpful. These patients may have struggled with obesity for many years, often decades, and are often not equipped to lose weight on their own. They need assistance by being referred to a medical weight-loss clinic, where they can receive medical and counseling support and possible referral to bariatric surgery, if necessary, as discussed by Zentner and colleagues in part 2 of this theme issue. Finally, BMI is a poor indicator of surgical risk, and using the BMI cutoff of 30 will greatly restrict many patients from receiving a complication-free surgical procedure.<sup>8</sup> Morbid obesity with a BMI greater than 40 carries a serious risk of complications.<sup>9</sup> Also, the surgical risks depend on the distribution of fat relative to the joint. A patient with central obesity will have a higher risk of medical complications as opposed to surgical complications, whereas a patient with a large periarticular soft tissue envelope will have higher risk of early reoperation and infection.<sup>10</sup>

Once a shared decision to perform total joint replacement has been made by the surgeon and patient, a frank discussion regarding perioperative risks is required so patients can make an informed decision to proceed with surgery. A study on the relationship between BMI and the risk of periprosthetic joint infection showed a nonlinear dose response with a relative

risk increase of at least four with BMI of 40 or higher.<sup>11</sup> It is also very important for patients to understand that treatment for most periprosthetic joint infections includes reoperation, long-term intravenous antibiotic therapy, worse functional outcomes, and a small chance of a nonreconstructable joint or amputation. These patients also have a

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significantly higher risk of both medical and surgical complications, as well as longer stays in hospital.<sup>12</sup> Although patients with an elevated BMI are at higher risk of complications, their clinical outcomes, if a complication does not occur, are favorable. A study of more than 500 patients who underwent total knee replacement between 1987 and 2004 indicated that morbid obesity did not affect 1-year outcomes based on Western Ontario and McMaster Universities Osteoarthritis Index scores.<sup>13</sup> Finally, different BMI cutoffs have been suggested in the literature to mitigate perioperative risk, but they continue to be affected by many variables and will ultimately be surgeon- and patient-dependent, in a shared decision-making model.

### Am I too active?

Should younger patients who are more likely to be active have long-term restrictions on certain activities? Patient questions about what they can and cannot do following total knee replacement are common, and surgeons are much more lenient with postoperative restrictions now than they were in the past. Contact sports and high-impact loading activities, such as running, tennis, basketball, soccer, hockey, and football, carry a higher risk of directly damaging

the prosthetic joint, but activity restriction following total knee replacement should be individualized based on the patient's overall physical fitness, their experience with the activity they wish to return to, their ability to appropriately rehabilitate prior to returning to activity, and their understanding of the risks associated with increased activity.<sup>14</sup> Highly motivated and educated patients who have successfully rehabilitated following total knee replacement can safely and reliably return to many activities with few restrictions, but this ability is quite variable between patients; many factors contribute to their overall postoperative return to activity. "Did you do this activity before?" is a good question to ask the patient to determine their planned postoperative regimen and potentially help guide them back to their desired activity level. In British Columbia, where skiing and noncontact hockey are common activities, many patients return to these activities without undue risk.

Young, active patients who receive total knee replacement are more likely to require revision surgery because they are higher-demand patients for a longer period. A retrospective matched cohort study of more than 1000 "active" and "inactive" patients who underwent total knee replacement found that at 2 years following total knee replacement, 27.3% of the active patients and 69.5% of the inactive patients improved their baseline activity levels, but revision rates were higher for active patients: 3.2% compared with 1.6% for inactive patients at 5 to 10 years postoperatively.<sup>15</sup> Activity level is associated with higher revision rates; therefore, patients should be counseled about this prior to surgery, but the absolute increase in higher revision rate is not large, even though it is double in relative terms.

### Should I get a partial or total knee replacement?

The choice to have any type of partial knee replacement, whether unicompartmental or patellofemoral, or a total knee replacement requires specific indications and discussion about revision rates. The most commonly



replaced single compartment is the medial compartment. The indications for unicompartmental knee replacement are unicompartmental osteoarthritis or osteonecrosis, a coronal deformity less than 15 degrees, flexion contracture less than 15 degrees, functionally intact anterior cruciate ligament and structurally intact collateral ligaments, and the absence of inflammatory arthritis.<sup>16</sup> Activity level, age, BMI, anterior knee pain, and a previous high tibial osteotomy are no longer considered contraindications to unicompartmental knee replacement, but they can factor into long-term survivorship.<sup>16</sup> The reasons for revision have varied over the years, but more recent literature suggests that polyethylene wear, progressive osteoarthritis of other compartments, aseptic loosening, and subsidence tend to be the most common modes of failure.<sup>17</sup> A systematic review and meta-analysis reported pooled estimates of survival for unicompartmental knee replacement of 85.5% at 15 years, 81.9% at 20 years, and 72.0% at 25 years.<sup>4</sup> These estimates further support unicompartmental knee replacement as a durable option for a specific patient population, although revision rates continue to be higher than those after a total knee replacement. The advantage of a partial knee replacement is better function and a quicker recovery, which needs to be balanced against the higher rate of long-term failure. Only the patient, with informed consent, can balance these competing risks and benefits prior to deciding to proceed with a partial or total knee replacement.

Less commonly performed (and indicated) are patellofemoral joint replacements. They are indicated in patients with isolated patellofemoral osteoarthritis, which is most often seen in female patients, often with an elevated BMI. Outcomes following patellofemoral joint replacement are variable; however, improvements in surgical technique, patient selection, and implant design have improved overall outcomes.<sup>18</sup> A systematic review found that patellofemoral joint replacement survivorship was 83.3% at 10 years and 66.6% at 20 years.<sup>16</sup> Survivorship is not as favorable as with total

knee replacement, but several studies have confirmed that in carefully selected patients, patellofemoral joint replacement could delay total knee replacement by 10 to 15 years in up to 80% of patients.<sup>18</sup> Overall, isolated patellofemoral osteoarthritis is a difficult problem that must be treated initially with maximal conservative measures, but in the literature, patellofemoral joint replacement is supported as a viable surgical option in highly selected patients.

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The decision about undergoing total knee replacement versus unicompartmental knee replacement versus patellofemoral joint replacement should be made between the patient and the surgeon and does not really need to be a consideration for the referring doctor. However, it is important to recognize that disease that is affecting only one compartment is not a contraindication to referral.

### When to refer?

Referral to an orthopaedic surgeon can take many months, and primary care physicians often struggle to decide whether their patient has symptoms that warrant referral. Orthopaedic surgeons would also like their offices to be filled with patients who are ready for surgery. Many different patient-reported outcome measures exist; a commonly employed measure is the Oxford Knee Score. It is a relatively short questionnaire and is easy to administer to assess function and pain related to the knee. A retrospective study reviewed pre-consultation Oxford Knee Scores over a 3-year period for a single surgeon and identified a conservative and effective threshold for knees of a score greater than 32, where patients

are unlikely to be deemed surgical.<sup>19</sup> The Oxford Knee Score can help family physicians identify patients who are likely not candidates for surgery and may instead benefit from aggressive nonsurgical measures.

A score to guide practitioners is helpful to provide objective guidelines for referral, but when patients have radiographic evidence of knee osteoarthritis with pain symptoms that are affecting their daily lives, most surgeons view that patient as a reasonable referral. Pain and the disability associated with it are the main reasons for referral. Mechanical issues such as deformity are seldom a consideration for surgery. A patient with deformity and no pain is unlikely to be offered a joint replacement.

When considering a referral, pre-referral radiographs should be performed. They should include weight-bearing anteroposterior, lateral, and, if possible, 20-degree flexed weight-bearing anteroposterior (Rosenberg) views. Rarely is an MRI or CT scan indicated. If necessary, they will be ordered by the orthopaedic surgeon. An MRI scan in an osteoarthritic knee almost always shows a degenerative meniscal tear, which is of no diagnostic power and will not affect treatment. If a patient is referred with a meniscal tear for arthroscopy when they really have significant arthritis, the expectations and the discussion that follows can be difficult and fruitless for both the patient and the surgeon.

### Summary

The decision-making process for total knee replacement is multifaceted and involves considerations that extend beyond radiographic evidence, including patient age, comorbidities, BMI, activity levels, and total versus partial replacement. Addressing these concerns requires thorough preoperative counseling and careful consideration of individual patient factors. Patient satisfaction after total knee replacement is generally high; however, it is crucial to manage patient expectations. Encouraging findings suggest that younger patients can benefit significantly from knee arthroplasty, with satisfactory functional outcomes and

long-term implant survival. The notion of a fixed age cutoff is becoming obsolete, which emphasizes the importance of individualized assessments. Furthermore, the cause of knee arthritis, especially in younger patients, introduces unique considerations.

BMI considerations in total knee replacement extend beyond a simple threshold, with a focus on overall health, perioperative risk management, and distribution of fat relative to the joint. While an elevated BMI is associated with increased risks, effective weight management strategies, including referral to a medical weight-loss clinic, can significantly improve outcomes. The discussion about BMI should move beyond arbitrary cutoffs.

Referral decisions hinge on multiple factors, but the importance of prereferral radiographs cannot be overstated: they help in facilitating accurate assessments and avoiding potential mismatches between patient expectations and surgical interventions. In navigating these complex decisions, collaborative efforts between primary care physicians and orthopaedic surgeons play a pivotal role. Effective communication, patient education, and appropriate referral will help ensure that knee arthroplasty remains a valuable and tailored intervention for patients. ■

#### Competing interests

None declared.

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