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Appropriateness of Total Knee Replacement

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Total knee replacement (TKR) was developed in the 1970s and disseminated across referral centers and then community hospitals in the 1980s and 1990s. At present, TKR utilization exceeds 650,000 cases annually in the US and many more worldwide[1]. Rates of utilization differ markedly across hospital service areas, suggesting uncertainty among physicians regarding indications for TKR[2]. With TKR rates projected to increase further in coming decades[3], it is reasonable to ask whether TKRs are being done today for appropriate indications.

Generally, a procedure is considered "appropriate" for a particular patient if the anticipated net gains exceed net harms.[4, 5] This sounds simple enough but all patients are unique and available literature does not permit a detailed accounting of the short- and long-term benefits and harms associated with the many distinct clinical scenarios in which TKR is performed. The Rand group developed an approach to address this challenge.[6] In the Rand approach, clinical characteristics that affect the risks and benefits of surgery are identified on the basis of published literature and expert opinion. The appropriateness of surgery is rated by a panel of clinical experts for each of the clinically plausible combinations of these clinical characteristics. For example, one scenario might include a patient with age greater than 55, Kellgren-Lawrence (K-L) score of 4, severe pain and flexion contracture of ten degrees. A panel of clinical specialists votes on the appropriateness of recommending TKR in this scenario using a scale ranging from 1 (most inappropriate) to 9 (most appropriate). Scenarios receiving average votes of 7–9 are classified appropriate, 4–6 inconclusive and 1–3 inappropriate.

Using the Rand approach, Escobar et al in Spain developed a set of appropriateness criteria for TKR[7]. In this issue of Arthritis and Rheumatology, Riddle and colleagues apply the Escobar appropriateness criteria to 175 subjects in the Osteoarthritis Initiative (OAI) who underwent TKR. Their analyses show that the procedure was deemed inappropriate in 34% of subjects undergoing TKR, inconclusive in 22% and appropriate in just 44%. The implication that fewer than half of TKRs performed in the US are appropriate and that fully one third are inappropriate raises serious concern about overutilization. I suggest we examine the historical context of the Escobar criteria before accepting this conclusion.

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Escobar and colleagues developed the appropriateness criteria in Spain in the late 1990s. At that time, TKR was viewed largely as a treatment of last resort for subjects with advanced radiographic destruction, severe pain and marked limitations in mobility and knee motion. The 1990s were also marked by increasing focus on appropriateness and by the application of the Rand appropriateness methodology to a range of interventions[6,8].

In the 15 years since the work of Escobar and colleagues, the performance and indications of TKR have evolved[9]. Perioperative mortality is now well under 0.5%[10] and implant failures occur in less than 1% of patients annually.[11] We appreciate better now that symptoms are only loosely associated with radiograph features; that the severity of preoperative loss of motion is an important determinant of postoperative motion[12]; and, that preoperative functional status is an important predictor of postoperative function.[13,14] The importance of preoperative function as a prognostic factor has prompted clinicians to intervene earlier rather than later in the course of functional decline.

In the context of this evolution in thinking about TKR indications and outcomes, the Escobar criteria seem dated. Even the most conservative surgeons will operate today on patients with K-L3 radiographs (moderately severe joint space narrowing), knees without a flexion contracture, moderate symptoms (defined by Escobar as having some limitations of daily activities), age less than 55 and unicompartmental (e.g. medial tibiofemoral) as opposed to multicompartmental osteoarthritis. It seems particularly problematic to describe unicompartmental disease as a relative contraindication, as unicompartmental osteoarthritis is common in the setting of malalignment, a powerful and prevalent risk factor for OA.

Some authors have noted the greater improvement in pain and function among patients meeting appropriateness criteria than in those not meeting the criteria [15]. This is hardly surprising and should interpreted cautiously. If we define success as the extent of improvement in pain and function (the ‘journey’) then those who have most severe pain and functional impairment preoperatively will have greatest improvements, putatively “validating” the criteria of Escobar and colleagues. However, if success is defined as the absolute level of pain and function that patients attain following surgery (the ‘destination’) we would reach opposite conclusions: indications currently regarded as “inappropriate” – with milder levels of functional loss preoperatively -- would have better outcomes.

I agree with Riddle and colleagues, and with Escobar and colleagues, that we should be concerned about offering TKR to subjects who endorse “none” or “mild” on all items of the WOMAC pain and function scales. We cannot be sure that TKR will improve such patients at all. I have similar, substantial reservations about performing TKR subjects with no joint space narrowing at all. We are left to wonder if knee OA is the source of pain with such benign radiographs and must bear in mind that patients with less severe radiographic change are at risk for worse pain levels following TKR.[16] But before we accept that a third of TKRs performed in the US at present are inappropriate we should think carefully about whether “appropriateness” can be judged without considering the prevailing values that patients and the larger society attach to functional deterioration and preservation.

As a community of providers, we implore our patients and the public at large to engage in exercise and physical activity in order to *delay f*unctional decline and to *preserve and augment* functional status. We must consider whether it is advisable and affordable to use costly technology such as TKR in the same fashion: to maintain and augment function rather than attempt (generally with muted success) to regain function once it's gone. In the absence of policy consensus on this issue, I suggest that the decision about whether to perform TKR among patients whose treatment goals are to maintain or achieve a high level of function should be guided by the shared decision making paradigm. Patients need to understand the risks of the procedure and the modest functional gains it may afford, given their high level of preoperative function. They also should be apprised of the evidence that patients who wait until their function declines further often do not achieve as high a level of function as those who elect surgery earlier. All of this must be evaluated in the framework of the patients' preferences regarding pain, functional status and risk aversion. This discussion is complex but seems the most appropriate course given the current state of play.

We may wish as a society and a professional community to impose boundaries around this discussion of appropriateness, identifying clinical scenarios in which investing in TKR seems inappropriate in view of other potential investments. This would represent a departure from usual notions of appropriateness, which are anchored in clinical, not economic analyses. This is a subject worthy of debate. At the very least, if we are to use traditional, clinical approaches to appropriateness of TKR, we should update the criteria of Escobar and colleagues into the contemporary era of TKR.

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