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# Poor expectations of knee replacement benefit are associated with modifiable psychological factors and influence the decision to have surgery: A cross-sectional and longitudinal study of a community-based sample

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ABSTRACT

*Background*: Total knee arthroplasty (TKA) is a highly effective surgery, but is underutilized by some patient groups. This study determined factors associated with a person's expectations with respect to pain and walking function following a TKA procedure, should they elect to undergo a TKA.

*Methods*: A total of 3542 people were studied with or at risk of knee osteoarthritis and enrolled in the community-based Osteoarthritis Initiative (OAI). Multivariable logistic regression analyses identified demographic, socioeconomic, osteoarthritis-related, joint replacement awareness, and psychological correlates as poor outcome expectations. Logistic regression determined if outcome expectation was associated with future knee arthroplasty utilization.

*Results*: Approximately 25% of the sample expected a poor outcome. Several factors were associated with poor pain outcome expectation, with the most powerful being African American race (Odds Ratio (OR) = 2.11, 95% CI = 1.69, 2.64) and an interaction between clinical depression symptoms and pain catastrophizing (OR = 3.17, 95% CI = 2.26, 4.44 when both were coded 'yes'). Whether a person had knee OA did not affect expectations. Pain outcome expectations were strongly associated with future TKA utilization (OR = 4.9, 95% CI = 2.2, 11.1).

*Conclusion*: A variety of modifiable psychological factors impact people's expectations of the extent of pain and walking difficulty following a potential future TKA. Expectations strongly predict future TKA utilization. Given the high prevalence of knee osteoarthritis, mass media educational interventions for the population may assist in better aligning expectations with evidence-based knee arthroplasty outcomes and lead to more appropriate utilization of an effective procedure.

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## 1. Introduction

Total knee arthroplasty (TKA) is among the most common major surgical procedures conducted in the United States of America (USA), with over four million people currently living with a knee implant [1]. High demand for TKA is supported by

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strong evidence indicating that the procedure is cost-effective [2], reduces pain, and improves function for approximately 80% of those undergoing the procedure [3,4]. Given the aging population and the increasing demand for the procedure, estimates suggest that up to 3.5 million annual TKA surgeries will be conducted in the USA by 2030 [5]. However, these projections have raised concerns of potential overutilization of the procedure [6–10]. There also is likely to be a substantial population that is underutilizing the procedure; for example, African Americans have been found to utilize TKA at a 40% lower rate than Caucasians [11].

Because of the elective nature of TKA, factors beyond medical necessity affect utilization. Deterrents include prior negative medical and surgical encounters, lack of awareness of the procedure, and assumptions that painful knee osteoarthritis (OA) is expected with aging [12]. These deterrents likely affect a person's expectations of the risks and benefits derived from TKA and, thus, their willingness to undergo the procedure. A person with negative expectations of pain and function outcomes of TKA may unnecessarily delay or avoid surgery, as compared with someone who anticipates a positive outcome. Recent studies have shown that in otherwise appropriate candidates for TKA, unrealistically poor pain or walking outcome expectations are powerful predictors of willingness to undergo the procedure [13,14]. Because knee pain is the critical element driving demand, patients' pain expectations following surgical recovery play an important role in prognosis and willingness to undergo TKA [15].

It is believed that, to date, no other studies have examined the factors associated with outcome expectations following a potential TKA in a large population within the complete spectrum of OA, with Kellgren–Lawrence [16] grades (K–L) of 0–4. It is important to determine factors associated with poor outcome expectations, because behavioral interventions could be developed to align patient expectations with outcomes that are supported by evidence [17]. This in turn may lead to appropriate utilization of this highly effective procedure by people who initially would not have undergone TKA because of unrealistically poor expectations of outcome.

Using the community-based Osteoarthritis Initiative (OAI) dataset [18], the present study was designed to answer the following questions: (1) What factors are associated with an expectation of moderate, or worse, knee pain following recovery in people with and without knee OA who may undergo a TKA?; (2) What factors are associated with an expectation of moderate, or worse, walking difficulty following recovery in people who may undergo a TKA?; and (3) Do pain and walking expectations predict TKA utilization in people who underwent TKA one to three years later?

Given that pain-coping strategies shape a person's interpretation of painful stimuli, and that pain plays a key role in driving patient demand for [15] and satisfaction with TKA [19,20], the primary hypotheses were that: (1) worse pain coping (e.g., depressive symptoms and pain catastrophizing) would be associated with poor TKA outcome expectations; and (2) pain and walking outcome expectations would be associated with utilization of future TKA.

## 2. Methods

### 2.1. Participants

The present population was enrolled in the OAI, a National Institute of Health (NIH) and privately funded, multi-center, prospective, longitudinal cohort study of the natural history of knee OA. The OAI has been extensively described in literature [18,21]. The study was approved by the Institutional Review Ethics Boards at each participating site (University of Maryland, Baltimore, MD; The Ohio State University, Columbus, OH; University of Pittsburgh, Pittsburgh, PA; Memorial Hospital of Rhode Island, Pawtucket, RI) as well as the central coordinating center of the University of California at San Francisco.

Inclusion criteria for the OAI were men and women with no history of TKA, recruited from the community, aged 49 to 75 years, with symptomatic knee OA, or who had one or more risk factors for developing knee OA (i.e., obesity, current knee pain, prior knee injury or surgery, or a family history of knee or hip arthroplasty). The complete study design protocol and additional information on the study are available at http://www.oai.ucsf.edu/. The sample of interest for the current study was people who attended the year-six follow-up visit. The study examined a total of 3542 people.

In a longitudinal analysis, a subset of 387 people from the radiographic knee OA parent sample also had pain and OA severity scores that approximated the range of those typically seen in people undergoing TKA. Specifically, only those people who had at least mild pain with most daily activities (Western Ontario and McMaster Universities Arthritis Index (WOMAC) Pain scores of ≥5) and K–L knee OA grades of 3 or 4, indicating moderate-to-severe knee osteoarthritis in at least one knee [13,32]. Because pain typically increases in the last few years prior to TKA, people with WOMAC pain scores as low as 5 were included in this subsample [22]. These samples were selected because: (1) the study was interested in expectations of people with no history of TKA but at potential risk of future TKA; and (2) the study wanted to know if outcome expectations obtained at the six-year visit were associated with actual TKA incidence over the following three years of data collection.

### 2.2. Outcome variables of interest

Self-assessed function-limiting knee pain that impairs daily function is the key driver of TKA care-seeking [18,19]. Therefore, the two outcome variables that were selected were self-reported estimates of expectations of the extent of pain, and walking difficulty following a potential future TKA. Specifically, participants completed a questionnaire in the OAI study that asked: "How much pain do you think people will still have after they have recovered from their knee replacement surgery?" and "How much difficulty in walking do you think people will still have after they have recovered from their knee replacement surgery?" Very similar questions have been used in other research related to TKA willingness [23]. Response options to both

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