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Original research

Patient risk taking and spending habits correlate with willingness to pay for novel total joint arthroplasty implants

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ABSTRACT

In this study, we compare patients' risk-taking and spending behaviors to their willingness to pay (WTP) for novel implants in a joint arthroplasty. 210 patients were surveyed regarding risk-taking and spending behavior, and WTP for novel implants with either increased-longevity, increased-longevity with higher risk of complications, or decreased risk of complications compared to a standard implant. Patients with increased recreational risk-taking behavior were more WTP for increased-longevity. Patients who "rarely" take health-risks were more WTP for decreased risk of complications. Patients with higher combined risk scores were more WTP for all novel implants. Patients who paid more than $50,000 for their current car were more WTP for decreased complications. This study shows that patients' risk taking and spending behavior influences their WTP for novel implants.
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Introduction

As healthcare policy makers in the United States continue to seek to limit the growing costs of healthcare there is an increasing interest in utilizing healthcare models that emphasize better cost-awareness by all parties involved. Consequently, this focus brings forth new challenges for both the surgeon and the patient, as both would like to utilize the highest quality materials, implants, devices, etc. [1], but also we must learn to increasingly see cost as a significant factor in healthcare decisions. As such, healthcare models that increasingly "share the cost" with the patient can be an effective means of increasing the patient's role in healthcare decisions where cost is a significant factor.

Various studies in the past have used "willingness-to-pay" (WTP) as a means of measuring how much value a patient places on a certain procedure or device [1–5]. While WTP is most specifically applicable to a system where the patient shares a higher burden of healthcare costs, WTP data is also indicative of what type of care or interventions are actually important to the patient and can help guide healthcare administration in even traditional insurance models where patients pay little more than the premiums [3]. However, WTP data is perhaps most valuable to determine whether patients are willing to share the cost for an "upgraded" procedure. As an earlier study by Schwarzkopf et al. showed, only 20% of patients at their institution were satisfied with a "standard of care" implant for total knee arthroplasty (TKA) or total hip arthroplasty (THA), while 86% of patients were willing to pay for an upgraded prosthesis [4]. Therefore, WTP data may play an especially important role as further restrictions are placed on surgeons and patients regarding which total joint replacement (TJR) prostheses will be covered by payers, further placing patients' unease over settling for "standard-of-care" quality at odds with the goals of cutting healthcare costs.

TJRs, especially TKAs and THAs, are widely regarded as an effective treatment for end-stage joint arthritis [6, 7]. Each year, over 800,000 TKA and THA operations are performed [8, 9] and as the population in the United States ages, this number is projected to increase dramatically in the coming years [10, 11]. Various studies have found TJRs to be among the more cost-effective procedures when considering quality-of-life years gained per amount spent [12–17]. However, the cost of TJR operations, especially THA and TKA operations has increased substantially over the past decade, while reimbursement for the procedures has not increased similarly [9] – in fact, from 1999 to 2007, Medicare reimbursement declined by 20% for TKA and 21% for THA [18]. Consequently, this has left many surgeons and patients feeling frustrated over the

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prospect of letting cost be the determining factor in implant choice rather than quality [1]. To add to this dilemma, advances in implant technology for THA and TKA operations have led to the creation of various novel implants that may have superior longevity and decreased risks of complications, though at an increased cost which is unlikely to be covered by many insurances.

Therefore, considering the direction of healthcare policy-making, it is important to elucidate the factors that are associated with patients' WTP for novel TJR prostheses. The purpose of this study is to identify which patient characteristics are most associated with a WTP for novel, improved implants. We hypothesize that certain risk taking behaviors and spending habits will be associated with an increased WTP for a novel implant. Although some studies have previously sought to correlate patient demographics or income with WTP for TJR implants, including a previous work by Schwarzkopf et al. [19], no previous study has observed how patients' behavioral patterns or lifestyle choices contribute to their willingness to be treated with a novel technology and their WTP for novel TJR implants. Consequently, our work adds to the growing body of literature concerning risk aversement from novel technology and WTP for total joint arthroplasty prostheses.

Material and Methods

Design and sample

The study was approved by our institutional review board. We conducted a prospective cross-sectional survey among patients attending tertiary medical center. All the patients included in the study were enrolled during their visit at the Orthopaedic and Arthritis center while waiting for their rheumatology clinic visit. Inclusion criteria included: presenting to the rheumatology clinic, willing and able to complete and comprehend the survey in English, being between the ages of 18–89 years old. Exclusion criteria included if the patient was currently scheduled for joint replacement surgery or if he had joint replacement surgery in the past. All patients that met inclusion criteria were invited to participate by a research assistant during the clinic visit in the before or after their rheumatology appointment. All completed surveys were collected and stored by the research staff. During the course of the clinic visit and the survey no educational material discussing implant characteristics, price or arthroplasty procedure cost was provided to the patients.

Survey instrument

Subject demographics were collected in the survey as well as patients' risk taking behavior in different aspects of their life and daily activity (Appendix I).

Patient willingness to pay and their life style risk taking behavior were examined with relation to different novel implant attributes. We presented to the patient features of a 'standard' implant which included longevity of about 15 years and risk of short-term complications (e.g. infection, fracture, dislocation, or nerve injury) estimated at 3% during the first postoperative year. We asked whether patients would be willing to pay, as well as the amount, to the cost of three 'novel implants' (The amount the patients were willing to add as a co-payment was entered as free text into the survey). We than asked the patient to define his risk taking behavior in different aspects of his daily life and recreational activity.

The 3 novel implants that were presented in the survey had the following presumed characteristics: 1) proposed longevity of 25 years accompanied by the same 3% risk of short-term complications; 2) proposed longevity of 25 years associated with an increased (5%) risk of complications; and 3) proposed standard longevity (15 years) associated with a lower 1% risk of complications (Table 1).

Table 1
Descriptions of novel implants.

'Standard' implant:	15 year lifespan with 3% reoperation risk
Novel implant 1:	25 year lifespan with 3% reoperation risk
Novel implant 2:	25 year lifespan with 5% reoperation risk
Novel implant 3:	15 year lifespan with 1% reoperation risk

Statistical analysis

To compare the willingness to pay (WTP) of groups of patients with different risk taking behavior and different spending habits, we categorized patients based on their answer to each individual question concerning risk taking behavior or spending habits. Using these groupings, we then compared the WTP for the three different implant choices across the groups. A Pearson Chi Square test was used to find statistical differences in WTP between these groups.

To better analyze overall trends in risk-taking behavior and WTP, the average risk score was calculated for each patient. This was achieved by assigning numbers to each of the patient responses in regard to frequency of risk-taking behavior; the number 0 corresponded to the response "never," 1 to the response "rarely," 2 to the response "sometimes," 3 to the response "often," and 4 to the response "very often." However, this number scale was reversed for health risk-taking behavior, with the number 0 corresponding to the response "very often" and the number 4 corresponding to the response "never." The scores for each of the risk-taking categories were summed and the patients were then divided into groups of "low," "medium," and "high" combined risk-taking scores using cutoffs of less than 5 for "low," 5 to 9 for "medium," and 10 or more for "high." These groups were then compared using the Pearson Chi Square test.

Results

Two hundred and fifty-one patients at the Orthopedic and Arthritis Center were screened for study eligibility and approached in clinic. Of those, 210 (84%) agreed to participate and 195 (78%) completed the questionnaire. Out of the 195 study participants recruited from the offices of 4 clinicians in the 9 months, 32% were male; average age was 56 years (22–89 years); 51% were <60 years old, 35% between 60–70 years old, and 14% $\geq$ 70 years old.

Comparing patients grouped based on their response to how often they participate in recreational risk-taking, there was a significant difference ($p = 0.033$) between groups in their WTP for a novel implant with a proposed 25–year longevity and a 3% reoperation risk (novel implant 1) (Table 2). Amongst these groups, those patients who "very often" participated in recreational risk-taking were the most likely to be willing to pay for novel implant 1 (increased longevity), while those patients who reported "never" participating in recreational risk-taking were the least likely to be willing to pay for novel implant 1 (increased longevity). There was no significant difference amongst these groups in terms of WTP for novel implants with either a 25 year longevity with a 5% reoperation rate (novel implant 2) or a 15 year longevity with a 1% reoperation rate (novel implant 3).

Comparing patients grouped based on their response to how often they take health risks (i.e. smoking), there was a significant difference between groups in their WTP for novel implant 3 (decreased risk) ($p = 0.032$). Those patients who reported taking health risks "very often" were the least likely to pay for novel implant 3, while those patients who reported taking health risks "rarely" were the most likely to pay for novel implant 3 (decreased

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