

Ethnicity and Patient's Perception of Risk in Joint Replacement Surgery

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ABSTRACT. Objective. Despite much evidence showing racial disparities in the use of surgical procedures, it is unknown whether ethnicity affects perception of surgical risk.

Methods. We surveyed 1609 patients undergoing primary hip or knee replacement surgery. Relevant covariates including demographic data, body mass index (BMI), sex, comorbidities, education, and ethnicity were recorded. Pain and joint functional status were assessed at baseline and at 1-year followup with the Western Ontario McMaster University Osteoarthritis Index (WOMAC) pain and function scores. Risk perception was assessed with 3 survey questions.

Results. Non-European patients had greater functional disability and pain prior to surgery and demonstrated significantly greater perception of risk than European patients ($p < 0.001$). Independent of other covariates, non-European ethnicity was an independent predictor of a greater perception of risk ($p < 0.05$).

Conclusion. Patient ethnicity is an important factor to consider in understanding a patient's perception of risk in joint replacement surgery. (First Release June 15 2008; J Rheumatol 2008;35:1664-7)

Key Indexing Terms:

ARTHROPLASTY

ETHNICITY

RISK

A patient's decision to have surgery is influenced by their understanding of the risks and benefits of the procedure and for some, the strength of the patient-doctor relationship. Good communication between the physician and patient is understood to be a vital component of patient care and leads to improved satisfaction, patient compliance, and health outcomes¹⁻⁴.

A patient's race or ethnicity has been clearly shown to influence medical outcomes through both environmental and genetic risk factors⁵. Many authors have reported on the disparity in use of total joint replacement between White and Black patients; however, the reasons for these differences are not clear. Some have suggested that Black patients are referred less frequently than Whites for surgery^{6,7}, while others have proposed that a difference in willingness to undergo the surgery is an explanation for this difference in use^{8,9}.

One study has looked at ethnic differences in risk perception in knee replacement surgery as an explanation for the difference in utilization. This group showed that Black patients perceived greater risks with knee surgery than

Whites¹⁰; however, there have been no reports looking at a broader scope of ethnicities to include Asian patients. The cognitive process of risk perception likely involves several factors including previous experiences, perceptions, and critical incidents^{8,11}.

We developed risk perception questions to determine what influence ethnicity has on patient's perception of risk in orthopedic hip and knee replacement surgery. We hypothesized a priori that non-Europeans have a perception of higher surgical risk.

MATERIALS AND METHODS

Study sample. Study patients were recruited from a single Canadian academic institution, the Toronto Western Hospital, prior to undergoing primary hip or knee replacement surgery. Our inclusion criteria were patients aged 18-85 years and a diagnosis of primary or secondary osteoarthritis. All patients gave informed consent to participate in the study. All data were collected by an independent assessor not involved in medical care of the patients. The study protocol was approved by the local ethics committee.

We studied only patients from 2 fellowship-trained arthroplasty surgeons to ensure a consistent description of surgical risks to all patients. All patients were given the same description of treatment alternatives, the proposed surgical procedure, the expected postoperative course of management, and description of the risks and benefits of the anesthetic and surgical procedure. All patients were offered the opportunity to return to see the surgeon on another visit if they wished to discuss the procedure further.

Collection of data. Baseline demographic data of age, sex, level of education, and ethnicity were recorded. Education was recorded as either higher (university level or above) or lower education level (high school or below).

Defining ethnicity. Ethnicity is a term that is distinct from race as it represents not just genetic heritage but rather a composition of cultural practices, lifestyle patterns, social influences, and religious pursuits^{12,13}. Defining ethnicity in a diverse population such as Canada's is difficult as broad categories can lead to significant heterogeneity of individuals within a group^{12,13}. We chose our ethnic groups with the goal of maximizing our understanding of both genetic and cultural factors in health outcomes.

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Ethnicity was recorded by patient self-report under the categories of White, Black, European, or Asian, and patients could choose as many as were appropriate. Those patients selecting White or European were collapsed into a European category.

Baseline medical health was scored on the Charlson Comorbidity Illness Index¹⁴. Given the low frequency of comorbidity in this sample, the data were collapsed into 4 categories, a score of 0, 1, 2, or ≥ 3 . Functional status and pain level were assessed preoperatively and at 1-year followup with the Western Ontario McMaster University Osteoarthritis Index (WOMAC) function and pain scores, respectively¹⁵. The psychometric properties of the WOMAC score with respect to reliability, validity, and responsiveness have been well established¹⁵.

Risk perception. One technique by which patients' perception of risk is assessed is based on classical risk theory, of which 2 examples are Standard Gamble (SG) and Time Tradeoff (TTO) utilities^{16,17}. These metrics have different sensitivities to risk; however, they are similar in that they present patients with multiple scenarios ranging from perfect health to immediate death and vary the probabilities of the 2 until the patient becomes indifferent to the 2 states^{16,17}. We do not believe that our geriatric arthritis population makes decisions for surgery based on gaming theory of probabilities and odds and thus we elected to pursue a more qualitative method of assessing risk.

We modeled our risk perception questions on the Naturalistic Decision Making theory. This model seeks to understand how people make decisions in real-world contexts that are meaningful and familiar to them¹⁸. To obtain risk perception questions, we initially searched the existing literature and found no previous work relevant to our topic of hip and knee replacement surgery. We therefore developed 3 of our own questions and then assessed face validity on 20 patients, incorporating feedback from the patients on the clarity of the questions and suggestions for improvements. The final 3 questions were as follows and were scored on a Likert scale from 1 to 5: (1) How likely do you think it is that your surgery will be completely successful? (1 = high success, 5 = low success). (2) How likely do you think it is that your surgery will cause a problem (such as infection to the hip/knee prosthesis, damage to a nerve, or dislocation of the hip/knee prosthesis)? (1 = low chance, 5 = high chance). (3) How likely do you think it is that you will have a medical complication (such as pneumonia, blood clot, or heart attack)? (1 = low chance, 5 = high chance).

The following question was graded on a 4-point Likert scale ranging from very dissatisfied to very satisfied: (4) Are you satisfied with the amount of information your doctor offered you to make the decision to have hip/knee replacement surgery?

Statistical analysis. Continuous data such as age, BMI, risk score, and WOMAC pain and function scores were compared between groups using *t* tests. One-way analysis of variance (ANOVA) was used for comparing means of continuous data across multiple groups.

Categorical variables such as the Charlson score, individual risk scores, and level of education were compared between groups using the chi-square test.

We calculated the Cronbach alpha coefficient to ensure validity of summing the individual scores from the risk perception questions into one total risk score. This operation measures how well a set of variables measures a single construct. It is not a statistical test, but rather a coefficient of reliability (or consistency)¹⁹. The coefficient was 0.85 and therefore valid to sum the individual scores into one combined risk score.

Multivariate linear regression modeling was used to determine the influence of ethnicity on surgical perception of risk. Ethnicity data were collapsed into White and non-White categories. The dependent variable was the overall risk score, while the independent variables were age, BMI, Charlson Index, education, sex, surgeon, and preoperative total WOMAC score. We also created interaction terms between ethnicity and sex and between ethnicity and age to determine any effect on predicting risk scores.

All statistical analysis was done with SPSS version 13.0 (SPSS, Chicago, IL, USA). All reported *p* values are 2-tailed with an alpha of 0.05.

RESULTS

In our registry, we had complete data on 1609 out of 2100 (76.6%) total patients that comprised our study cohort. Participants and nonparticipants were not significantly different in terms of age, BMI, sex, or Charlson Index. The majority of the nonparticipants were Europeans (90.1%).

There were 1488 (92.5%) European patients, 20 (1.2%) Blacks, and 101 (6.3%) Asians. The baseline demographic characteristics of the groups are shown in Table 1. There were significant differences between groups in the demographic categories of age, sex, BMI, and Charlson Index ($p < 0.05$). There was no difference in education between groups ($p = 0.84$).

Table 2 shows that the Black and Asian patients had significantly higher total risk perception scores than Europeans ($p < 0.001$). Asian and Black patients also had greater baseline WOMAC pain and function scores compared to the Europeans, indicating greater dysfunction prior to surgery. When the ethnic groups were collapsed into one group, their mean risk scores and WOMAC scores were significantly higher than the European group ($p < 0.05$). At 1-year followup, there was no difference in WOMAC scores between the groups ($p > 0.05$).

Altogether, 1579/1609 (98.1%) of all patients reported high satisfaction with the amount of information they received from the surgeon on making their decision for surgery (Question 4).

In linear regression models, non-European ethnicity and Charlson Index were positive predictors of greater risk perception scores after adjusting for age, sex, BMI, level of education, surgeon, and preoperative WOMAC score ($p < 0.001$). There was a trend toward female sex predicting a greater perception of risk ($p = 0.08$). The beta-coefficients with 95% confidence intervals are presented for all variables in Table 3.

We tested the interaction of ethnicity with age and sex in separate models, but found no significant interaction.

DISCUSSION

Many authors have reported variations in healthcare utilization across race^{6,7,20} and sex^{7,21}; however, risk perception and its interaction with ethnicity in joint replacement surgery has not been well studied. Attitudes toward risk are an important area of study, as they may explain sociodemographic variations in health service utilization and can affect decision and cost-effectiveness analyses¹⁷. This is particularly important for joint replacement surgery, as it is the most common elective surgery performed in Canada, with 58,714 hip and knee replacements performed in Canada in 2004-2005²².

Our results demonstrate that non-European ethnicity and a greater comorbidity were positive predictors of surgical risk perception in joint arthroplasty patients. This finding of a greater perception of risk in non-European patients is con-

Table 1. Demographic data compared across ethnicities.

Characteristic	Europeans, n = 1488	Blacks, n = 20	Asians, n = 101	p
Mean age, yrs, (SD)	69.7 (12.1)	65.4 (11.5)	66.6 (11.8)	0.015
% Male	43.2	25.0	30.7	0.02
Mean BMI (SD)	30.4 (6.7)	32.0 (8.0)	28.8 (4.7)	0.04
Charlson Index (%)				
0	822 (55.2)	13 (65)	42 (41.6)	0.009
1	426 (28.6)	3 (15)	45 (44.6)	
2	160 (10.8)	4 (20)	11 (10.8)	
≥ 3	80 (5.4)		3 (3.0)	
% Higher education	51.3	50	54.5	0.84

Table 2. Risk scores and Western Ontario and McMaster University index (WOMAC) scores compared across the various ethnicities.

Score	Europeans, n = 1488	Blacks, n = 20	Asians, n = 101	p
Risk scores, Question 1				
1, 2	1404	20	94	< 0.001
3-5	84	0	7	
Risk scores, Question 2				
1, 2	1346	16	86	< 0.001
3-5	142	4	15	
Risk scores, Question 3				
1, 2	1381	19	88	< 0.001
3-5	107	1	13	
Mean total risk score (SD)	3.9 (1.7)	5.2 (1.2)	4.9 (1.7)	< 0.001
Preoperative WOMAC scores				
Total	52.9 (20.6)	54.6 (15.8)	60.5 (16.7)	0.001
Pain	10.6 (3.7)	11.1 (3.6)	11.5 (3.6)	0.003

Table 3. Linear regression modeling for ethnicity as a predictor of mean risk score adjusted for age, sex, BMI, Charlson Index, level of education, surgeon, and baseline total WOMAC score.

	Preoperative Beta Coefficient (95% CI), Total Risk Score	p
Ethnicity	0.88 (0.61, 1.1)	< 0.001
Age	0.001 (-0.006, 0.009)	0.73
BMI	0.001 (-0.01, 0.01)	0.87
Charlson Index	0.27 (0.18, 0.37)	< 0.001
Sex	0.16 (-0.02, 0.33)	0.08
Preoperative WOMAC	0.003 (-0.001, 0.007)	0.19
Education	-0.1 (-0.28, 0.07)	0.26
Surgeon	0.01 (-0.19, 0.16)	0.90

sistent with the findings of other authors in knee replacement¹⁰, carotid endarterectomy²³, and cardiac care patients²⁴. We also found that the ethnic patients had significantly greater baseline pain and dysfunction prior to surgery than European patients. This may be explained by our finding that these patients perceive greater risk with surgery and therefore avoid surgery until the pain reaches a greater threshold. Importantly, surgical outcomes were equal in Europeans and non-Europeans, indicating that perception of

increased risk among non-Europeans was not supported by actual results. Other authors have shown that preoperative functional status predicts postoperative functional outcome in joint replacement surgery²⁵⁻²⁷; however, our data showed that non-Europeans had a greater relative benefit from surgery than Europeans.

Classification systems for defining ethnicity in a diverse nation such as Canada are challenging. Ethnic descriptions should take into account issues such as ancestry, geographic origin, birthplace, language, and religion¹³. One explanation as to why our non-European patients had greater perception of risk with surgery may be familiarity with the procedures. Ibrahim, *et al* showed that Black patients were less likely than Whites to have heard of total joint replacement, or to have had a family member or friend that had undergone the procedure²⁸. Moreover, if the Black patients did know someone that had had the procedure, they were more likely to report having only heard poor outcomes for the surgery²⁹. Other potential factors that may contribute to this increased perception of risk are that some ethnic groups prefer to control their disease through prayer or complementary medicine, and likely view Western medicine with great skepticism^{30,31}.

One potential limitation of our study is the use of nonva-

validated questions to assess patient's perception of risk of hip and knee replacement surgery. However, this was a necessary step as we found no validated questions assessing risk perception in this patient population. Also, we did not ask patients their country of birth, but having now shown that ethnicity is an important variable to study, future work will be directed toward understanding generational effects. Moreover, future work will include greater sample sizes of ethnicities such that we may analyze the influence of each individual ethnicity on risk perception in contrast to the broader categories of European and non-European.

Understanding ethnic variations in the perception of risk in joint replacement surgery is complex. Simply communicating the evidence for the effectiveness of a treatment option to a patient may not be enough to alleviate their uncertainty about surgery³². Future work should be directed toward understanding patient preferences for receiving information. This includes the amount of information they wish to hear and mode of presentation — including the framing of information; for example, expressing risk as relative risk, absolute risk, or comparing to everyday risk¹⁷.

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