

RESEARCH ARTICLE

Price Transparency and Consumer Perceptions of Generic and Brand-name Implants in Orthopaedic Surgery

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Abstract

Background: Some have suggested the use of generic surgical implants to curb rising costs of orthopaedic care. However, there is evidence that patients are reluctant to use generic pharmaceuticals as compared to their brand name equivalents for fear of inferior quality. Public perception of the use of generic implants remains unknown.

Methods: We conducted a cross-sectional survey using Amazon MTurk to identify factors associated with a consumer preference for generic orthopaedic screws and total hip.

Results: While much of the public (52%) sees the value of generic implants, fewer (26%) would prefer them in their own care. Most respondents (75%) trust their surgeon's choice, yet the vast majority (83%) want to be informed about the cost of their implant, even if it makes no difference in what they pay. The agreement that older implants are safer than newer implants (OR 1.9 for screws; 2.5 for hip arthroplasty), and that generics are a better value than brand name implants (OR 3.0 for screws; 4.3 for hip arthroplasty) were independently associated with a preference for generics.

Conclusion: The observation that many people view generic implants as being a good value, yet fewer would prefer to use them in their own care indicates that concerns over quality may initially limit utilization of generic implants. More evidence is needed to reassure most consumers of the safety and effectiveness of generic implants. Additionally, our findings demonstrate a desire for more implant price transparency when undergoing orthopaedic surgery.

Level of evidence: II

Keywords: Arthroplasty, Cost, Generic, Implant, Perception, Value

Introduction

Total joint arthroplasty can relieve pain and improve function. For most designs, 93% of implants are not revised for 15 years.¹ Many modifications in implant design have led to problems or no improvement in durability or physical function compared to existing designs.² Despite this, new implant designs continue to be introduced, and are more costly. The situation is similar for plates and screws. Overall,

these implants combine to form a market valued at \$45.9 billion in 2017 and which is expected to reach \$66.6 billion by 2025.³ However, in many cases, the manufacturing cost of implants makes up only 30% of the final implant price.⁴ Around 15 billion dollars are spent on arthroplasty procedures annually, with implant cost representing nearly 50% of the total hospital reimbursement.⁵

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While the use of implants in arthroplasty and orthopaedic trauma surgery will likely remain cost-effective due to their favorable outcomes, this rising cost to society may be unsustainable. With this in mind, many have proposed that the use of generic implants may help curb the increasing cost of orthopaedic surgery while providing equivalent performance.^{4,6,7} While more research is needed to determine whether generic implants are as durable and effective as their brand-name counterparts, little to no research has been done to determine patient perspectives on these issues.

We have learned from the prior implementation of generic pharmaceuticals that patient perception of the quality and safety of generics can be a considerable barrier to their use. We postulated that similar barriers would be present in the utilization of generic implants in orthopaedic surgery and sought to characterize the population's beliefs surrounding generic implants to target patient education initiatives accurately.

Study Questions

We tested the following hypotheses: 1) There are no factors independently associated with preference for a generic over a brand name implant, and 2) There are no differences between the patient perception of generic and brand name implants by type of implant (i.e., orthopaedic screws versus total hip implant).

Materials and Methods

Study Design

Our institutional review board approved this cross-sectional survey study. This study utilized surveys distributed on Amazon Mechanical Turk (MTurk), a crowdsourcing marketplace that makes it easier to perform virtual tasks, such as survey research. The survey was used to determine people's preferences regarding the choice of surgical implants (i.e., cost, brand name versus generic implant) in the setting of orthopaedic surgery. As there is little to no information currently available on this topic, we decided to utilize MTurk to gauge general opinions; a venue demonstrated to produce samples similar to those collected by conventional means.⁸ We invited all English-speaking participants on Amazon MTurk, and participants were compensated \$0.10 for their participation. After participants read a description of the study, completion of the questionnaire implied consent. Questionnaires were delivered using the Research Electronic Data Capture (REDCap), a secure web-based application.⁹

Outcome measures

Participants first provided demographic information such as age, gender, race/ethnicity, level of education, household income, insurance status, and prior orthopaedic surgeries. Next, participants were given a definition of an orthopaedic implant and presented with several general statements about orthopaedic implants and asked to state their level of agreement on the Likert scale (Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree). We presented the participants with

a definition of a generic implant, the pros and cons of generic implants, and a hypothetical scenario in which they required an operation using either generic or brand name screws. We asked participants to state their agreement with statements about the perceived effectiveness, quality, and value of the generic and brand-name screws. We then asked how much each participant would be willing to pay to have brand name screws as opposed to generic screws. Finally, we repeated the process with a hypothetical scenario in which the participant required a hip replacement surgery using either a generic or brand name hip implant. We asked the participants to state their level of agreement with the same effectiveness, quality, and value statements as for the screws as well as their willingness to pay to have a branded hip implant versus a generic hip implant.

Statistical Analysis

Histograms showed relatively normal distributions of the data. We described continuous variables as mean \pm standard deviation (SD) and range, while we described discrete variables as proportions. We compared responses to questions exploring preferences for generics by implant type using McNemar's tests. Participants' responses regarding preferences or beliefs were dichotomized in analyses for ease of interpretation. Consumers who agreed or strongly agreed with the statements were categorized into one group, while those who disagreed, strongly disagreed, or who were neutral were classified into the other. We used logistic regression to evaluate the relationship between predictor variables and perceptions about generics, because of our substantial sample size and sufficient power; we included all demographic variables in the models. We excluded all participants with missing data from the analysis. We considered $P < 0.05$ significant.

An a priori power calculation determined that a sample size of 988 participants was needed to answer our primary study question with 95% statistical power (with $\alpha = 0.05$) to detect an OR of 1.3 for the correlation of factors associated with preference for generic implants. To account for incomplete surveys, we enrolled around 25% more participants (total of 1252).

Results

Study Population

Our final study population included 1158 participants after the exclusion of 94 (7.5%) participants due to incomplete surveys [Table 1]. Of the 1158 participants, 630 (54%) were women with a mean age of 35 (12). The majority were of the self-described white race (N=735; 63%), had completed college (N=481; 42%), and had private insurance (N=584; 50%). Additionally, 634 (55%) of participants had previously undergone orthopaedic surgery.

General Perceptions about Orthopaedic Implants

Most participants endorse a preference for newer implants, with 82% believing that newer implants are

Table 1. Characteristics of Survey Population

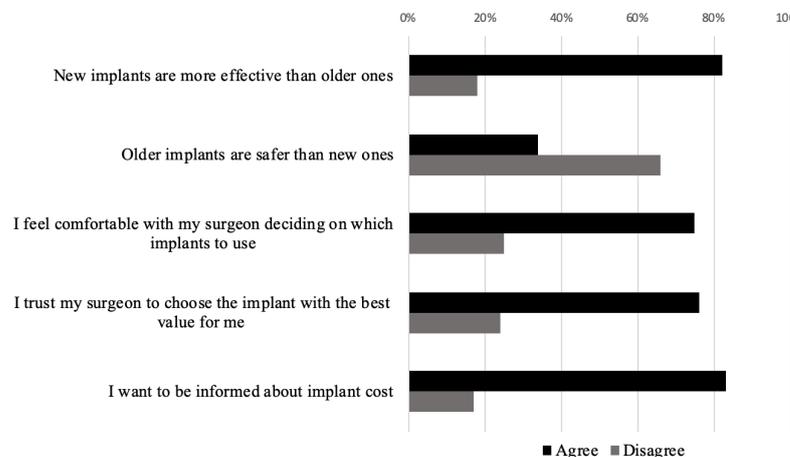
	N=1158	Percentage
Mean age, years (SD)	35 (12)	
Sex (Male)	528	46%
Education		
Highschool or less	139	12%
Some college	228	20%
College graduate	481	42%
Graduate school	310	27%
Race		
African American/Black	103	9%
Hispanic	76	7%
Asian	220	19%
Caucasian/White	735	63%
Other	24	2%
Total household income		
<\$20,000	190	16%
\$20,000-\$39,000	273	24%
\$40,000-\$59,000	258	22%
\$60,000-\$79,000	193	17%
\$80,000-\$100,000	124	11%
>\$100,000	120	10%
Health insurance		
Medicare	224	19%
Medicaid	137	12%
Private	586	51%
None	112	10%
Other	99	9%
Prior Orthopaedic Surgery	634	55%

more effective than older implants, and 66% believing that they are just as safe as those which have been on the market longer. [Figure 1]. A majority of our respondents (75%) trusted their surgeon to choose the implant on their behalf; however, 83% wanted to be informed about the cost of their implant even if it made no difference in their out of pocket cost. Additionally, despite 52% of respondents agreeing that generic implants are a better value, only 26% would prefer to have a generic in their care.

Factors Associated with Preference for Generic Implants

After accounting for potential confounding with multivariable logistic regression, having private insurance was associated with a decreased preference for generic implants for both orthopaedic screws (Odds Ratio [OR] 0.69, 95% Confidence Interval [CI] 0.51-0.94) [Table 2] and total hip implants (OR 0.62, CI 0.44-0.85). Participants indicating white race were associated with decreased preference for generic total hip implants (OR 0.47, CI 0.34-0.66) but not for orthopaedic screws. Additionally, older people had less preference for generic screws (OR 0.98, CI 0.96-0.99) and total hip implants (OR 0.98, CI 0.96-0.99). However, the differences were small and of questionable relevance. Increased education was also associated with a higher preference for generic total hip implants (OR 1.2, CI 1.1-1.5) but not for orthopaedic screws. Conversely, having a prior orthopaedic surgery was associated with a preference for generic screws (OR 1.4, CI 1.1-1.9) but not for total hip implants.

Participants that agreed with the statement, "Implants that have been on the market longer are safer than newer ones," were more likely to prefer generics for both orthopaedic screws (OR 1.9, CI 1.4-2.6) and total hip implants (OR 2.5, CI 1.8-3.4). Consumers who agreed with the statement, "I trust my surgeon to choose the implant that provides the best value to me," were more likely to prefer generic screws (OR 1.6, CI 1.1-2.4) but not generic total hip implants. Finally, the perception that generic

**Figure 1. General Perceptions about Orthopaedic Implants.**

implants are a better value than brand name implants were associated with an increased preference for generic screws (OR 3.0, CI 2.2-4.1) and total hip implants (OR 4.3, CI 3.1-6.0).

Preference for Generic and Type of Implant

There were significant differences in how generic screws were perceived in comparison to total hip replacements [Figure 2]. Participants agreed that a brand name implant was more effective than a generic implant more often when considering a hip implant

as opposed to orthopaedic screws (OR 2.5, CI 1.9-3.2). Additionally, participants agreed that generics cause more complications than brand-named implants more often when considering a total hip implant (OR 1.8, CI 1.4-2.3), and more participants thought that generics were a better value for orthopaedic screws than for total hip implants (OR 0.52, CI 0.40-0.67). Despite these differences in perception, there was no significant difference in those who state they would prefer a generic implant for both screws and total hip implants (27% vs. 25%).

Table 2. Multivariable Logistic Regression of Factors Associated with Preference for Generic Implants

Variables	Hip Fracture Screws			Total Hip Implant		
	Odds Ratio	95% Confidence Interval	P value	Odds Ratio	95% Confidence Interval	P value
Demographics						
Age	0.98	0.96-0.99	0.001	0.98	0.96-0.99	0.003
Race (White)	0.85	0.62-1.2	0.30	0.47	0.34-0.66	<0.001
Sex (Male)	1.2	0.92-1.6	0.16	1.30	0.94-1.8	0.11
Education	1.1	0.94-1.3	0.20	1.2	1.1-1.5	0.011
Health Insurance (Private)	0.69	0.51-0.94	0.018	0.62	0.44-0.85	0.004
Annual household income	0.92	0.83-1.0	0.11	0.94	0.85-1.0	0.31
Prior orthopaedic surgery	1.4	1.1-1.9	0.015	1.3	0.96-1.80	0.084
General Perceptions						
New implants are more effective than older implants	1.5	0.97-2.2	0.067	1.2	0.80-1.91	0.35
Older implants are safer than newer implants	1.9	1.4-2.6	<0.001	2.5	1.8-3.4	<0.001
I am comfortable with my surgeon making the decision about which implants to use	1.3	0.88-1.9	0.18	1.4	0.94-2.1	0.098
I trust my surgeon to choose the implant with the best value for me	1.6	1.1-2.4	0.015	0.99	0.67-1.5	0.97
I want to be informed about implant cost	1.4	0.96-2.2	0.077	0.91	0.60-1.4	0.65
Brand-name implants are more effective than generics	0.90	0.65-1.3	0.55	0.70	0.48-1.0	0.051
Generic implants cause more complications than brand-names	1.1	0.83-1.6	0.43	1.6	1.1-2.3	0.009
Generic implants are a better value than brand-names	3.0	2.2-4.1	<0.001	4.3	3.1-6.0	<0.001
Willingness to pay for name-brand over a generic implant	0.80	0.70-0.92	0.002	0.69	0.58-0.83	<0.001

Bold indicates statistically significant results ($p < 0.05$)

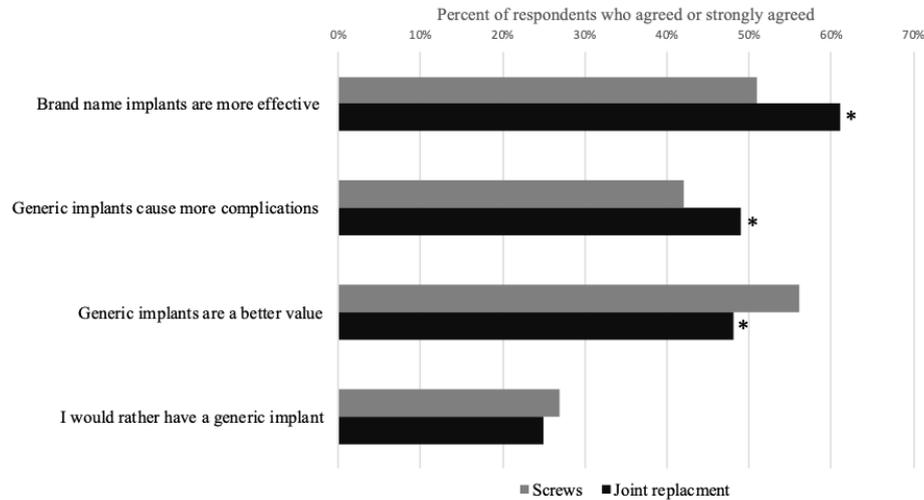


Figure 2. Views About Generic Versus Brand-Name For Hip Fracture Screws And Total Hip Implant. Asterix represents a statistically significant difference.

Discussion

According to a 2009 survey about generic medicines, 56% of Americans reported that others should use generics, while only 37% preferred to use generics themselves.¹⁰ Research has also noted misperceptions surrounding generic medications amongst poor and uninsured populations, including perceptions that generics are not real medicine, that generics are only for minor illnesses, and that the medical system cannot be trusted.^{11, 12} The authors concluded that further consumer and provider education would be necessary to help bridge these misconceptions. We designed this study to determine if similar barriers would be present in the use of generic orthopaedic implants.

Our cohort was diverse, and participant responses followed a logical pattern, which adds to the internal consistency of the study. First, consumers who agreed that older implants are safer than newer ones were more likely to prefer generic implants. This likely reflects an understanding that the proven effectiveness of a design is more important than a company track record. Second, the more participants were willing to pay for a brand name implant, the less likely they were to prefer a generic implant.

The perception that generics were a better value than name-brand implants was the strongest predictor of preference for generic implants in our study. However, less than half of the patients who perceived generics to be high value preferred to use a generic implant in their care, indicating that factors other than value drive preferences for orthopaedic implants. This result corresponds with the outcomes from a previous study of generic medications, which demonstrated that a positive perception of the value of generics medications was associated with actual generic medication use, but was less strongly correlated than other factors, such as prior communication with a physician about

generic medications.¹³ Additionally, this correlation may also reflect the price-quality assumption explored in fields such as economics. This phenomenon has been described by stating, “marketing actions, such as pricing, can alter the actual efficacy of products to which they are applied.” This statement was demonstrated during a study in which there was a more pronounced placebo effect associated with products purchased at full price versus those bought at a discounted rate.¹⁴ Thus, in our population, it follows that those who see the value of a generic implant are less likely to fall into this assumption. However, there are possibly other, currently unknown, factors that influence consumer preference for generic orthopaedic implants, which will require further study to describe.

We also found differences in the perception of generic implants between orthopaedic screws and hip implants. Brands were thought to be superior in quality more often when considering hip implants, while generics were felt to be a higher value more often with orthopaedic screws. Additionally, participants with prior orthopaedic surgery were more likely to prefer generic screws but not hip implants. This may reflect insight into the permanence of a total joint implant versus what may be perceived as a temporary fix in orthopaedic screws.

Finally, our study indicated that despite a majority of participants wishing to defer the choice of an implant to their surgeon, the vast majority wanted to be informed about the cost of the implants used, even if it did not affect the price they would pay. This desire for price transparency represents a significant shift from the way a majority of orthopaedic clinics practice. A cross-sectional survey of 16 practicing orthopaedic surgeons, demonstrated that none of the participants could correctly estimate the cost of any commonly used implants.¹⁵ This lack of knowledge represents systematic issues that make cost information challenging

to determine. Confidentiality clauses in medical device contracts, unpredictable price variation, and inaccessible financial data, are current barriers to cost transparency.¹⁶ However, this study demonstrates a desire from prospective patients for more implant price transparency when planning surgery. More work is needed to provide surgeons with up-to-date cost information to adequately address consumers growing concern for the economic cost of an operation. Additionally, our study did not address if patient perceptions would change based on their surgeon receiving royalties or other benefits from selecting one implant over another. Future studies are needed to evaluate how the surgeon's relationship with industry affects patient trust in their choice of implant.

This study has limitations; first, we used Amazon MTurk, a crowdsourcing marketplace utilized for tasks such as survey research. The risk of utilizing this forum is that participants might answer questions haphazardly to complete the survey quickly. Prior research also shows that survey responses may not be generalizable to the US population. However, there is some consensus that MTurk is an efficient tool for generating significant sample responses that are comparable to those collected conventionally.⁸ Additionally, there is some concern about the inclusion of web robots on MTurk; however, we took precautions for this by protecting our survey using a tool designed to discourage web robot participation. Second, this study posed questions as hypothetical preferences in a population not currently faced with an orthopaedic surgery; therefore, decisions made in this setting may not fully reflect real-world choices. Finally, the participants mean age of 35 (SD 12) represents a much younger population than the one usually faced with arthroplasty surgery, and an older population may have slightly

different insight and values. Despite these concerns, we feel that this population represents a diverse sample, both racial, socioeconomically, and regarding previous experience with orthopaedics and therefore presents valuable information to add to the orthopaedic literature.

Generic implants represent a significant potential cost savings to the overall health care system. Orthopaedic patients are increasingly aware of the economic impact of their healthcare and desire implant price transparency when undergoing surgery. Overall, participants had a better perception of generic orthopaedic screws as compared to total hip implants, and participants who thought of generics as being a better value were more likely to prefer them as compared to others. However, while 52% of consumers see the value of generic implants, only 26% would prefer to use them. Clearly, there are factors other than value which drive preferences for orthopaedic implants, and a majority of consumers still prefer brand name implants for both orthopaedic screws and total joint replacements.

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