Clin Orthop Relat Res (2023) 481:422-426
DOI 10.1097/CORR.0000000000002571

Clinical Orthopaedics and Related Research®
A Publication of The Association of Bone and Joint Surgeons®

Editor's Spotlight/Take 5

Published online: 6 February 2023

Editor's Spotlight/Take 5: Which Factors Are Considered by Patients When Considering Total Joint Arthroplasty? A Discrete-choice Experiment

Seth S. Leopold MD[1]

All surgeons I know take it as a point of pride that we care about our patients, and a crucial way we express that care is by helping our patients make good decisions. This is all the more true when the stakes are high, like when a patient is thinking about major surgery. In that moment, surgeons have a special, perhaps even a sacred [3], obligation to help the patient get it right.

For this reason, regardless of whether or not you're an arthroplasty surgeon, I'm asking you—begging you, for the first time in my 10 years here—to read through to the end of this essay, to read the interview that follows, and to read this month's Editor's Spotlight article itself before you do anything else today.

The reason is that this paper, by Dr. Hany Bedair's team at Harvard and his colleagues at Massachusetts General Hospital and Newton-Wellesly Hospital in Newton, MA, USA [4], identified some widely shared perceptions among patients who were contemplating major, elective surgery that are so out-of-whack that I can only understand them by believing that these patients had no idea of what was at stake.

Example: To improve physical function from 50% to 100%, patients said they were willing to undergo a joint replacement even if it carried a 37% absolute risk of infection. You read that right: To improve function from fair to perfect, patients would sign on the dotted line even if doing so gave them a more than a one-in-three chance of getting a limb- and perhaps even life-threatening deep prosthetic infection.

Hany S. Bedair MD

Another example: To reduce pain from severe to minimal, patients were willing to accept a hypothetical absolute (and not merely an incrementally increased) 27% risk of infection. Yes, for that trade, patients were okay with a greater than one-in-four chance of this devastating complication.

This was not some collection of the desperate, the uneducated, or the uncared-for. Demographically speaking, this study's patient group looked like what you'd imagine if you blended an academic practice with a reasonably upscale community practice. Seven in 10 patients had a 4-year college degree or more, 90% were employed or retired from work, and more than 80% had

A note from the Editor-In-Chief: In "Editor's Spotlight," *one of our editors provides brief commentary on a paper we believe is especially important and worthy of general interest. Following the explanation of our choice, we present "*Take 5," *in which the editor goes behind the discovery with a one-on-one interview with an author of the article featured in* "Editor's Spotlight." *We welcome reader feedback on all of our columns and articles; please send your comments to eic@clinorthop.org.*

The author certifies that there are no funding or commercial associations (consultancies, stock ownership, equity interest, patent/licensing arrangements, etc.) that might pose a conflict of interest in connection with the submitted article related to the author or any immediate family members.
All ICMJE Conflict of Interest Forms for authors and *Clinical Orthopaedics and Related Research*® editors and board members are on file with the publication and can be viewed on request.
The opinions expressed are those of the writers, and do not reflect the opinion or policy of *CORR*® or the Association of Bone and Joint Surgeons®.
This comment refers to the article available at: DOI: 10.1097/CORR.0000000000002358.
S. S. Leopold ✉, *Clinical Orthopaedics and Related Research*®, 300 S. Northwest Highway, Suite 203, Park Ridge, IL 60068, USA, Email: sleopold@clinorthop.org

[1]Editor-in-Chief, *Clinical Orthopaedics and Related Research*®, Park Ridge, IL, USA

Editor's Spotlight/Take 5

50% of their physical function or better. More than half had moderate pain or less. Although there were differences between men and women, and between patients who were working versus those who were not, those differences paled in the face of the main finding: All groups were ready to accept a level of risk that doesn't even have a speaking relationship with good sense.

Anyone who has ever treated (or known someone who has experienced) a prosthetic joint infection would find this level of enthusiasm for surgery to be inexplicable. For a surgeon to be aware of it and not try to temper it—dramatically—would be unconscionable.

We've long known that patients seek surgery to improve pain and function; that's certainly the driver for most patients contemplating arthroplasty (indeed for most patients contemplating most major elective orthopaedic surgery). But this paper calls us to action. We need to interrogate this issue in every surgical counseling session: To get the improvements in pain and function that a patient seeks, what is that patient's understanding of the likelihood of infection (or death, or other serious complication)? Does the patient really understand how bad some of these surgical misadventures can be, or what life after a serious complication might look like?

We know that it is our job to make sure of this. This paper puts us on notice, though, that our patients badly misapprehend surgical risk. And since what's really being studied here is human nature, and not the nature of hips and knees, I think it applies broadly across the orthopaedic disciplines that offer patients major interventions.

What are you going to do about it? Join me in the Take 5 interview that follows with Dr. Bedair to hear what his plans are, and to go behind the discovery with him about one of the most disturbing papers I've read in a very long time.

Take 5 Interview with Hany S. Bedair MD, senior author of "Which Factors Are Considered by Patients When Considering Total Joint Arthroplasty? A Discrete-choice Experiment"

Seth S. Leopold MD: *Normally, I open these interviews with "Congratulations on this fascinating work," or something similar. Here, something like "Thanks for scaring me out of my socks" seems more apropos. I generally spend about a half an hour doing preoperative counseling before an arthroplasty if I know a patient well, and it's much longer if I don't. Risk is a key part of those conversations. But at no point have I ever gotten the inkling that a patient would consent to one of these operations if it had a 37% chance of a major infection. What have I been missing?*

Hany S. Bedair MD: Thank you for the opportunity to answer some questions that you, and I assume much of your readership, have regarding this study and its implications. My coauthors and I also were surprised by some of these findings, and so I appreciate the chance to unpack what they may mean beyond the eye-popping numbers you mentioned above.

Regarding what we may be missing, I think there are two basic elements. The first is one that concerns how patients, and people in general, understand the expression of risk (percentages, proportions, odds, and the like) and how they might synthesize that information to arrive at a decision. This question is beyond the scope of what we have time to discuss, but it is fascinating, and something that has puzzled behavioral experts and economists for decades. The second element, and perhaps something slightly more manageable for us to investigate, is what clinicians may fail to recognize regarding patients' perceptions of risk/reward ratios. How many of us have actually asked our patients what amount of risk they would tolerate for a potential reward that surgery might offer? I think we've focused more on the benefit and cost side than the risk side of the equation, and so we know less about the risk side of that equation and, further, how patients might process and weigh those risks against the rewards.

The benefits of lower extremity arthroplasty are well known both to doctors and their patients. *The Lancet* has dubbed THA the "Operation of the Century" [2]. These procedures offer hope to many patients who have chronic pain and the loss of function it causes. Hope is a potent motivator, and the faith that patients place in surgery to alleviate their pain and disability may be a deeper and more nuanced motivator than we as surgeons may understand. In follow-up clinical visits, many patients will tell us directly, "You changed my life, doctor" or "I could never thank you enough for giving me my life back." We have to consider what such statements convey, the gravity of such sentiments, to help us to understand how impactful chronic pain and loss of function are and how the hope of alleviating these ailments may alter the benefit/risk ratio in ways that we might not have anticipated.

During most preoperative consultations, we provide information to our patients regarding the potential benefits as well as a realistic estimation of the potential risks, but seldom do we elicit information from them regarding just how much risk they are willing to tolerate. So, I'll share with you an experience I had after the publication of this study, which made me more

confident in the fact that we don't know all the drivers of patients' decisions. I was consulted to consider doing a THA in an 18-year-old man with sickle cell disease and severe secondary hip arthritis. His hemoglobin was less than 6 mg/dL, but because of his religious beliefs, he would not accept any blood products. Because of this and other comorbidities, his risk of death after surgery was estimated to be 40%. Shockingly, this patient and his family were enthusiastic to proceed with surgery despite this extraordinarily high level of risk. I share this anecdote as a real-world example of a patient's view of risk that, as you say, may seem "out of whack" and yet both the patient and this young man's family were not just ready but eager to accept that risk in the hopes of alleviating pain. I suspect if we were to ask more patients how much risk they would be willing to accept, we would be surprised.

Dr. Leopold: *More importantly, now that we know patients are much more comfortable with risk than I am—and, I think, than most surgeons would be—what are you going to do differently when you visit with your patients to discuss major orthopaedic surgery?*

Dr. Bedair: There are two important, related take-aways. The first is that we should try to understand and mitigate the challenges that impair communication about risk to patients. The second is that our process of shared decision-making with patients may be more narrow in its focus than it should be.

As many surgeons have come to agree, the historical, paternalistic approach typically taken in Western medicine toward surgical decision-making with patients is inferior to our current approach of shared decision-making, in which the provider elicits a patient's goals and works with the patient to make choices intended to best achieve those stated goals. One element of this process is an educational component from the surgeon to the patient regarding potential benefits and complications of surgery. What I have understood from our study is that perhaps we are not as effective as we may think at describing complications. Although some complications are easy to comprehend, for example, death, others may be less easily understood. Infection is a good example of a difficult complication for a patient naïve to the topic to understand. As you mentioned, some patients may not understand that the standard treatment for periprosthetic joint infection (PJI) goes well beyond simply receiving antibiotics. How do we, as surgeons, condense and relay all of our medical knowledge and years of experience to a patient during a visit? This is a true challenge. Spending more time and sharing more details with patients explaining PJI, staged revisions, spacers, PICC lines, and the like may help. Different educational vehicles, whether written or in video form, may be augmentative. What is curious, however, is that despite how terrible some of these treatments for infection appear to be to us as providers, some patients who have had a previous PJI and thus firsthand experience with its treatment will still elect to proceed with another joint replacement. It is hard to imagine this, but it brings me to my second point.

This second idea is that what you've identified may not be a misunderstanding, but rather a limit to our ability as surgeons to assemble and address all the drivers of patient decision-making. We can solicit more information to better characterize the severity of the pain and disability our patients feel, and how it affects their health and quality of life, and we can try to understand their goals for treatment as well as their level of risk-aversion or tolerance; all of these are fundamental to shared decision-making. But we also need to ask how much risk a patient would be willing to assume and why.

A better understanding of the "how much" and the "why" could help frame the shared decision-making process, as it might help us understand a patient's willingness to accept a 37% chance of PJI as opposed to someone unwilling to accept any risk of complications. These aversions are unique to each individual and are predicated upon many factors: current health state, social and family responsibilities, as well as general life philosophies. Physicians tend to be risk-averse, and without understanding a patient's risk tolerance profile, it can be easy to inappropriately project our own preferences. Unless we ask, we cannot possibly know how comfortable a patient may be with risk.

Dr. Leopold: *Half of the equation implied by this paper is risk. The other half is reward: what a patient might expect in terms of pain relief or restoration of function. At least 1 in 5 patients who has a knee replacement will, at full recovery, still have some pain or functional limitations. The persistent problems are often severe enough to result in dissatisfaction. How do you factor the "reward component" into a real-world conversation that is informed by the other discoveries you made in your paper about risk?*

Dr. Bedair: I believe we have much better information on the reward component of these operations, so sharing that information is easier. The challenge surgeons consistently encounter is that of the overly high expectations that some patients have. The gap between expected versus achieved experiences drives much of the dissatisfaction after surgery.

Editor's Spotlight/Take 5

Our study, which deals in hypotheticals, highlights the importance of different rewards to different patients. We found that patients considering TKA valued an improvement in function more than a reduction in pain, and those patients seeking THA strongly preferred a reduction in pain, more so than improved function. We as surgeons tend to conflate these two rewards, and we assume that reduction in pain and disability are intimately linked and equally valued by patients. This may not be the case.

Consider for a moment the common situation of a total knee replacement patient who is pain-free but cannot kneel to garden, or in prayer, or to play with his or her grandchildren. It can cause a disruption to long-standing habitual behaviors, healthful hobbies, or personally meaningful activities, the lack of which may substantially affect that patient's quality of life. It is important to address each element of reward and impart realistic understanding of potential outcomes in each domain. By addressing this distinction in how patients consider pain and function after hip or knee arthroplasty, we may be able to adjust expectations in a way that both helps calibrate risk tolerance as well as reduces dissatisfaction.

Beyond that, in this study, patients who were in severe pain at the time of the survey were the only group that consistently was willing to accept such a high risk of infection, whereas those with minimal to moderate pain were not willing to accept any risk of infection. That helps us to appreciate that a patient's desire for a specific reward is both driven by current experience even as it drives risk tolerance. Tempering expectations will likely help align risk tolerance in a way that may be more consistent with what providers are comfortable with given their knowledge and experience.

Dr. Leopold: *I think some readers will say that these findings are so discordant that they can't possibly be correct; that these patients must have misunderstood something, perhaps something fundamental, for you to have come up with these estimates. Or perhaps patients don't really even know what a joint infection is—maybe they think it's like a tooth infection or a skin infection, something that gets better with some antibiotics. Skeptical readers may even point to an earlier, similar study [1] whose findings were much less dramatic than yours, as evidence for the contention that your conclusions were based on fundamental patient misunderstandings. Why do you think these interpretations of your work would be mistaken?*

Dr. Bedair: Although that reaction—"patients must have misunderstood something"—would be understandable, I will nonetheless point out several things. First, as you mentioned above, the patients included in the study were well educated, many were quite sophisticated, and many lived in affluent communities in the greater Boston area; I think this makes simple misunderstanding a much less likely explanation. Second, I will share with your readers something that you know but they don't: This was in fact the second time we performed this study. The results from our first study (which was on a different cohort of similar patients and it was unpublished for various reasons) were nearly identical to those published here [4]. I think that this speaks to the consistency in patients' responses to the hypothetical situations posed to them. Moreover, in a technique described as marginal substitution, we can estimate tradeoffs; that is, how to answer the question, "What level of risk is someone willing to tolerate for a given, guaranteed reward?" I think when considered in terms of tradeoffs and the fact that only those patients in the most severe pain were willing to accept any infection risk, the calculated estimates in our findings may seem somewhat more understandable.

That said, although we expected that patients would prioritize pain reduction and functional improvement, we were surprised by our findings on the risk side of the equation even beyond what we have discussed above. Patients consistently identified infection as a complication that was undesirable, so there is an understanding among our patients that this can be a devastating problem. What was curious, however, was risks that people tend to understand in more concrete terms, like death or need for reoperation, were not consistently identified as factors strongly associated with avoiding surgical treatment. This surprised the team and me, and might again point to gaps in understanding of how decisions are formed.

I'm glad you referenced the paper by Hutyra et al. [1]. We read this very well-done study with great interest, as it is one of the few that used a discrete-choice experiment in arthroplasty. I will point out, however, that the aim of that study was quite different from ours in a few key ways. Those authors sought to determine patient preferences for UKA versus TKA. There was no nonsurgical option. Secondly, the range of possible complication rates were limited and constrained by realistic estimates, while in our work we attempted to expand the rates of complications to the improbable to learn what patients might be willing to accept. Finally, those authors did not perform a marginal rate substitution calculation, which was the element of our study that has drawn such great attention. Overall, I would encourage your readers to read the study by Hutyra et al. [1] as it is quite insightful, but I would also caution that while the tool

used (namely, the discrete-choice experiment approach) was similar to our study, the study design and questions were quite different and therefore, drawing direct comparisons about risk magnitudes may not be all that informative.

Dr. Leopold: *The finding about infection in your study was so dramatic to me that I may have inadvertently de-emphasized other important or surprising findings. What surprised you, and what other important messages do you think I've missed in your paper? The between-gender differences or lack thereof? Other things?*

Dr. Bedair: The unexpected findings regarding how patients prioritize risk, whether it is accepting high rates of infection or not factoring death as an important risk, were discordant with what I had anticipated just as they were for you, and I suspect, for many of your readers. The larger concept, of course, is the key unanswered question: We do not fully understand how our patients process risk and how they weigh those risks versus the rewards. What excites me is that with this study, we've taken an important step in that direction. Certainly, it may not be as simple as we thought.

As a follow-up study to this one, we have followed this cohort of patients, those who completed our survey, to see who actually went on to have surgery. In a "sneak peek" of those results, a surprisingly large number of patients elected not to have hip or knee surgery, and some of the reasons might surprise you. I look forward to sharing more results from our follow-up study and I do hope they will be as thought-provoking as this one has been. We are analyzing that dataset now.

I am genuinely grateful for this opportunity, Dr. Leopold. Thank you again.

References

1. Hutyra CA, Gonzalez JM, Yang J-C, et al. Patient preferences for surgical treatment of knee osteoarthritis: a discrete-choice experiment evaluating total and unicompartmental knee arthroplasty. *J Bone Joint Surg Am*. 2020;102:2022-2031.
2. Learmonth ID, Young C, Rorabeck C. The operation of the century: total hip replacement. *Lancet*. 2007;370:1508-1519.
3. Ring D, Leopold SS. Editorial: The sacredness of surgery. *Clin Orthop Relat Res*. 2019;477:1257-1261.
4. Salimy MS, Humphrey TJ, Katakam A, Melnic CM, Heng M, Bedair HS. Which factors are considered by patients when considering total joint arthroplasty? A discrete-choice experiment. *Clin Orthop Relat Res*. Published online September 15, 2022. DOI: 10.1097/CORR.0000000000002358.