Title
The Influence of Cost Information on Treatment Choice: A Mixed-Methods Study

Journal
The Journal Of Hand Surgery, 45(10)

ISSN
0363-5023

Authors
Zhuang, Thompson
Kortlever, Joost TP
Shapiro, Lauren M
et al.

Publication Date
2020-10-01

DOI
10.1016/j.jhsa.2020.05.019

Peer reviewed

HHS Public Access

Author manuscript

J Hand Surg Am. Author manuscript; available in PMC 2021 October 01.

Published in final edited form as:

J Hand Surg Am. 2020 October ; 45(10): 899–908.e4. doi:10.1016/j.jhsa.2020.05.019.

The Influence of Cost Information on Treatment Choice: A Mixed Methods Study:

Societal Cost and Decision-Making for CTS

Thompson Zhuang, BA[†],
Stanford University, VOICES Health Policy Research Center, Department of Orthopaedic Surgery

Joost T.P. Kortlever, MD[†],
Department of Surgery and Perioperative Care, Dell Medical School – The University of Texas at Austin, 1701 Trinity Street, Austin, TX, 78705, USA

Lauren M. Shapiro,
Stanford University, VOICES Health Policy Research Center, Department of Orthopaedic Surgery

Laurence Baker, PhD,
Stanford University Department of Health Research and Policy

Alex HS Harris, PhD,
Center for Health Care Evaluation VA Palo Alto Health Care System

Robin N. Kamal, MD
Stanford University, VOICES Health Policy Research Center Department of Orthopaedic Surgery

Abstract

Purpose: To test the null hypothesis that exposure to societal cost information does not affect choice of treatment for carpal tunnel syndrome (CTS).

Methods: We enrolled 304 participants using the Amazon Mechanical Turk (MTurk) platform to complete a survey where participants were given the choice between carpal tunnel release (CTR) or a less expensive option (splinting) in a hypothetical mild CTS scenario. Patients were randomized to receive information about the societal cost of CTR (cost cohort) or no cost information (control). The primary outcome was the probability of choosing CTR measured on a 6-point ordinal scale. We employed qualitative content analysis to evaluate participants' rationale for their choice. We also explored agreement with various attitudes towards healthcare costs on an ordinal scale.

Corresponding Author: Robin N. Kamal, MD, VOICES Health Policy Research Center, Department of Orthopaedic Surgery, Stanford University, 450 Broadway Street MC: 6342, Redwood City, CA 94603, rnkamal@stanford.edu, (650) 723-2257.

[†]*Author Contributions:* These authors contributed equally.

Conflict of Interest Statement: The authors declare no conflicts of interest.

Results: Participants in the cost cohort exhibited a greater probability of choosing surgery compared to those in the control cohort. The relative risk of choosing surgery after exposure to societal cost information was 1.43 (95% confidence interval [CI]: 1.11 – 1.85). Among participants who had not previously been diagnosed with CTS (n=232), the relative risk of choosing surgery after exposure to societal cost information was 1.55 (95% CI: 1.17 – 2.06). Lack of personal monetary responsibility frequently emerged as a theme in those in the cost cohort who chose surgery. The majority (94%) of participants expressed at least some agreement that healthcare cost is a major problem while only 58% indicated that they consider the country's healthcare costs when making treatment decisions.

Conclusions: Participants who received societal cost information were more likely to choose the more expensive treatment option (CTR) for mild CTS.

Clinical Relevance: Exposure to societal cost information may influence patient decision-making in elective hand surgery. A complete understanding of this influence is required prior to implementing processes towards greater cost transparency for diagnostic/treatment options. Sharing out-of-pocket costs with patients may be a beneficial approach because discussing societal cost information alone will likely not improve value of care.

Keywords

Carpal Tunnel Release; Carpal Tunnel Syndrome; Decision-Making; Societal Cost

INTRODUCTION

Carpal tunnel syndrome (CTS) is a common upper extremity condition for which both splinting and surgery have demonstrated clinical efficacy when the symptoms are nocturnal and mild.[1] Carpal tunnel release (CTR) has been shown to produce better clinical outcomes when compared to wrist splinting alone and is often recommended in patients who have failed non-operative management and/or initially present with moderate to severe symptoms.[2] In contrast, wrist splinting is a less expensive treatment for CTS that can provide symptomatic relief for a substantial proportion of patients, while preserving the option for future surgery if symptoms progress.[2–4] When a treatment decision is preference-sensitive, shared decision-making can strengthen the physician-patient relationship and may lead to improved outcomes.[5–7] However, when presenting options to patients, the physician should fully consider which treatment characteristics to present, as the selection or omission of certain characteristics can affect decision-making.[8,9] Despite extensive literature characterizing the importance of out-of-pocket costs in patient decision-making,[10–13] little is known about the influence of knowing societal costs on decision-making.

Given the rising annual healthcare expenditures in the United States (U.S.), surpassing $3 trillion or more than $10,000 per capita,[14] and finite healthcare resources, healthcare cost containment is increasingly important. An overarching goal of value-based healthcare is the reduction of the total cost of care while maintaining care quality.[15] In a value-based care model, multiple stakeholders can assume stewardship over healthcare resources, including government, insurance, hospitals, physicians, and patients.[16–19] However, no consensus has been reached on how the responsibility for stewardship should be allocated.[17] An early focus

group study found that patients were generally unwilling to consider costs, especially costs borne by others, in medical decision-making.[20] However, participants were not asked to make a specific decision and the influence of societal costs on decision-making is likely condition-dependent. A later randomized study found that an explicit plea to reduce societal healthcare costs did not reduce requests for low-value back imaging in a hypothetical scenario.[21] In another randomized study on left ventricular assist device (LVAD) implantation for heart failure, presenting societal cost information resulted in an increased probability of choosing the more expensive, high-risk treatment option, an effect the authors attributed to the lack of personal financial responsibility (direct costs were borne by insurers) and participants equating cost with quality of care.[22] However, these choices involved either a clearly low-value option (back imaging) or a life-or-death choice (LVAD) and thus may not be generalizable to decisions in elective hand surgery that are more preference-sensitive.

Despite the large societal costs of CTS,[23] the influence of providing patients with information about societal costs on treatment decision-making in elective hand surgery remains unknown. Providing societal cost information in addition to out-of-pocket cost information might be used as a strategy to improve value of care and drive stewardship of limited healthcare resources. In this study, we tested the null hypothesis that exposure to societal cost information does not alter the probability of choosing the more expensive treatment option (CTR).

METHODS

Design

We employed convergent mixed methods with an embedded integration approach in this study. After obtaining institutional review board approval, we designed an online survey using a case of mild CTS with intermittent, nocturnal symptoms where participants were asked to choose between receiving the more expensive treatment option (CTR) or a less costly option (splinting). Participants were randomized via simple, unblocked randomization into two cohorts using Qualtrics software (Qualtrics, Provo, UT). Participants randomized into the control cohort received the clinical vignette only. Participants in the cost cohort received the clinical vignette and additional information about the societal costs of CTR.

We recruited participants on the Amazon Mechanical Turk (MTurk) interface, an online platform where registered, adult workers receive compensation for completing tasks. Participants were compensated $0.20 for taking the survey and were paid regardless of whether they finished the survey. A growing body of evidence has demonstrated the validity of MTurk as a participant recruitment tool for behavioral research, including prior work in hand surgery.[24–28]

Survey

The structure of our survey was based on surveys used in similar previous studies.[21,22] We developed a hypothetical scenario that described the symptoms of mild CTS with nocturnal symptoms and two treatment options (CTR or wrist splinting). In addition, the cost cohort

was presented with the following statement based on prior work:[23,29] "The cost of this surgery varies between $2,000 to $10,000. There are over 500,000 carpal tunnel release surgeries performed in the U.S. each year. This amounts to over $1 billion in costs to society. Assume that you personally will NOT pay for the surgery and that your insurance will pay for all the cost." Due to the difficulty of quantifying the indirect societal costs of CTR (e.g. lost income/productivity, days off work), we only provided information on the direct medical costs of the procedure. Participants were also asked to provide a brief rationale for their choice. We assessed attitudes towards healthcare costs by measuring agreement with statements similar to those previously used to distinguish between acceptors and decliners of expensive treatments.[21,22] All surveys are available as Supplemental Information (Supplemental Figure 1).

Variables

The primary outcome variable was the decision to have surgery, measured on a 6-point ordinal scale (1 = Definitely not, 6 = Definitely). For some analyses, we constructed a dichotomized outcome variable from the ordinal scale, capturing surgery ("maybe," "probably," or "definitely" have surgery) versus splinting ("maybe not," "probably not," or "definitely not" have surgery) because the clinical decision is a dichotomous one. The primary explanatory variable was exposure to societal cost information. We also collected the following demographic variables to evaluate the success of randomization: age, sex, annual household income, race, employment status, education level, relationship status, and insurance type. We evaluated attitudes towards healthcare costs by measuring agreement with various statements on a 6-point ordinal scale (1 = Strongly disagree, 6 = Strongly agree).

Study sample

We randomized 304 participants into either the cost or control cohorts (Figure 1). We subsequently excluded 23 (7.6%) participants because they either failed to finish the survey or finished the survey in under 60 seconds (indicating they may not have fully read through the text; chosen *a priori*), leaving 138 participants in the cost cohort and 143 participants in the control cohort for analysis. Their demographics are shown in Table 1. Forty-four (15.7%) participants had previously received a diagnosis of CTS. Of these, 9 (20.5%) had already undergone CTR. These participants with prior CTS diagnoses and/or CTR were evenly distributed over both cohorts. Five participants (1.8%) did not know whether they had been diagnosed with CTS.

Statistical Analysis

We piloted our survey in 29 MTurk participants prior to full recruitment. In the pilot, 11/15 (73.3%) participants randomized into the cost cohort favored surgery compared to 6/14 (42.9%) participants randomized into control. We performed an *a priori* sample size estimation which showed that a total of 154 participants would provide 95% power to detect a difference of at least this magnitude between the cohorts ($\alpha = 0.05$). Statistical significance was defined as $p < 0.05$ for all analyses. For categorical variables, we reported counts with

percentages and evaluated differences using Fisher's exact test. We evaluated ordinal scale responses using a Mann-Whitney U-test.

Qualitative Data Analysis

We used qualitative content analysis to evaluate participants' rationale(s) for their choice. Two members of the research team independently analyzed and conducted open coding of the responses. During open coding, the analysts reviewed responses and identified key ideas from each response, which were labeled as sub-codes. Subsequently, the analysts met and created a codebook based on key ideas and concepts derived from the sub-codes. In this process, new codes were provided until saturation was achieved, i.e. no new codes emerged from the sub-codes. All sub-codes were classified into these codes. Any discrepancies were resolved via in-person discussion between the two analysts. The codes were then analyzed to identify themes. Representative responses are included (Table S1). For convergent analysis, these qualitative data were merged with the quantitative data using an embedded integration approach.

RESULTS

Effect of Societal Cost Information on Treatment Choice

Participants in the cost cohort exhibited a greater probability of choosing surgery ($p<0.05$; Table 2). The full distribution of survey responses is shown in Figure 2. Upon dichotomization of the primary outcome variable, we found that a greater proportion of those in the cost cohort chose surgery (55.1%) compared to the control cohort (38.5%), corresponding to a relative risk of 1.43 (95% confidence interval [CI]: 1.11 – 1.85) for choosing surgery after exposure to societal cost information ($p<0.05$). Since participants with a history of CTS have more experience with and/or knowledge of CTS, societal cost information may be weighted differently in their decision-making. Thus, we then excluded all participants with a former diagnosis of CTS and re-analyzed the data. There were no substantive changes in the observations. Among participants who had not been diagnosed with CTS, the relative risk of choosing surgery after exposure to societal cost information was 1.55 (95% CI: 1.17 – 2.06). Additionally, due to potential inter-generational differences, we assessed for effect modification by stratifying the entire cohort into those below or at the median age and those over the median age. The effect of societal cost information on choosing surgery was more pronounced in the younger subgroup compared to the older subgroup (Table 3). In the younger subgroup, the relative risk of choosing surgery after exposure to societal cost information was 1.68 [95% CI: 1.23 – 2.29] compared to 1.24 [95% CI: 0.80 – 1.90] for the older subgroup.

We then performed a qualitative content analysis to identify themes in participants' rationales (Figure 3, Table S1). Monetary responsibility or concerns, specifically who would bear the cost (i.e. insurance versus patients), emerged as a theme during this analysis in both cohorts. For some who chose surgery, the lack of personal financial responsibility for surgery costs drove their decision (Table S1). For some who chose splinting, concern about personal costs (e.g. deductibles, copays) drove their decision. Upon convergent analysis, we found that the majority of participants whose rationales included monetary responsibility as

a theme were in the cost cohort and the majority of those chose surgery (Figure 3). Moreover, of the 19 participants whose responses were coded into the “insurance covers it” or “no cost to me” categories, 18 were in the cost cohort and chose surgery. Example responses included: “You said insurance would pay. I have the insurance, why not use it? I need the surgery” and “Also, my insurance would cover the cost, so I would not have to consider financial constraints. There is the possibility that in the future, I may not have the insurance payment option.”

Attitudes Toward Healthcare Costs

Subsequently, we evaluated attitudes towards healthcare costs using agreement with various statements on an ordinal scale, stratified by participants who chose surgery versus those who did not (Table 4). The majority of participants expressed at least some agreement with a statement indicating that healthcare cost is a major national problem, with 94% in agreement. Over 60% of participants indicated that consumers can help lower healthcare costs but only 58% of participants indicated that they consider the country’s healthcare costs during personal treatment decisions. In contrast, the majority of participants indicated that they consider out-of-pocket costs when making treatment decisions, with 95% expressing agreement. No significant differences were observed between those who chose surgery and those who chose splinting on any of the seven statements presented.

DISCUSSION

In this study, we found that exposure to societal cost information increased the probability of choosing CTR by 43%. This effect was magnified after excluding participants with former CTS diagnoses and in participants who were below or at the median age. Lack of personal monetary responsibility emerged as a theme in a qualitative analysis of the participants’ rationales for choosing surgery. These results inform efforts towards cost transparency with the intention of delivering high-value care and reveal the potential impact of providing societal cost information. For example, presenting patients with the total cost or insurer reimbursement for surgery to promote price shopping, as current price transparency initiatives advocate (e.g. public price transparency tools created by the Centers for Medicare and Medicaid Services, publication of hospital chargemasters) may have unintended consequences, as patients are often not personally responsible for the majority of healthcare costs.[30,31] Instead, cost transparency efforts should emphasize costs directly relevant to patients, i.e. out-of-pocket (OOP) costs, and institutions with pre-surgical financial planning could calculate OOP costs for patients undergoing elective surgery such as CTR to aid in decision-making. Further, other strategies to promote stewardship such as reference pricing may be a more effective means to promote higher value care.

Limitations to our study exist. Notably, since we only included U.S. participants, our results may not be generalizable to participants in other countries, especially those in single-payer systems. In a U.S. focus group study, Sommers et al. found a generally negative attitude towards insurers and an unwillingness to consider costs borne by insurers in decision-making,[20] suggesting that patient decision-making in single-payer systems could differ markedly, depending on prevailing attitudes toward the single payer. Although that study

also found antagonistic attitudes towards the U.S. government, this is not generalizable across countries. Our qualitative analysis did not detect an overtly vindictive attitude towards insurers; rather, our data suggest that lack of personal monetary responsibility likely drives decision-making in our study (Table S1). In single-payer systems where healthcare is a common resource funded via taxation, patients also do not face the direct costs of their care (but do bear indirect costs via taxes) and thus the lack of personal financial responsibility may still play a role in decision-making. However, since countries likely differ regarding societal attitudes towards shared goods and beliefs about the healthcare system, our results may still reflect a uniquely American frame of reference. Since single-payer systems also may have more rigid rules dictating when certain procedures are indicated,[32] costs might play less of a role in the decision calculus.

Our results are based on the preferences of MTurk participants, which may not be representative of the general population. However, external validity is bolstered by MTurk's access to more diverse samples than traditional methods.[24,25,33,34] Nevertheless, MTurk participants tend to be younger, more highly educated, and lower income than the general population.[35] The younger age of MTurk participants may have resulted in our participants being more likely to choose surgery as a whole, since we found that younger age modified the effect of societal cost information on choice. In fact, several participants expressed that they would rather have surgery sooner rather than later, citing their younger age and ability to recover (Table S1). Thus, presenting societal cost information may influence surgery choice more for younger populations. This effect warrants further investigation. Further, the unsupervised nature of online surveys may give rise to concerns about participant attentiveness and data quality. However, high-reputation MTurk workers, defined as those with approval ratings of 95% and over,[27] have been shown to provide high-quality data and the MTurk population may be even more attentive than traditional samples.[27,36] We attempted to ensure quality control by restricting the survey to workers with approval ratings of at least 97% and at least 5,000 former tasks completed. In addition, although the evidence on the relationship between compensation and data quality is limited, studies suggest that while compensation level may affect speed of data acquisition and attrition, it does not appear to affect data quality.[33,37] Although our participants did provide rationales for their responses, we cannot definitively exclude that our results may have been affected by compensation level. Since MTurk workers choose which tasks to complete, we cannot quantify the non-response rate and therefore cannot exclude the possibility of non-response bias.

Although our scenario presented a case where splinting and CTR were not inferior to each other, this may not be true for all cases of CTS. However, a key strength of this study was the use of randomization to account for any unobserved confounding. Another concern relates to the brevity of the cost information provided and the exclusion of other potential societal costs that could result from CTS, such as reduced work productivity and loss of income. However, we felt it was necessary to balance brevity with guarding against biasing the participants. Nonetheless, several participants mentioned loss of income as a rationale for not getting surgery now. Future studies should explore whether providing additional cost information or information from a different perspective (e.g. reduced productivity from CTS, time off work for surgery) modifies the effect.

Our results are consistent with those recently reported by Kwon et al, who examined the effect of total cost information on choosing LVAD implantation when participants were asked to choose for themselves or for another. The authors found that exposure to total cost information increased the odds of choosing the expensive LVAD implantation option by 42%. However, when they analyzed their data only for participants who were choosing for themselves, the effect of total cost became smaller (with an 8% difference between the cohorts).[22] Cost information may play only a small role in that study because LVAD implantation is a life-preserving treatment and therefore cost information may be a less important factor in participants' decision-making. Riggs et al. found in a large online study that a direct, altruistic appeal to reduce healthcare costs did not influence requests for low-value back imaging tests.[21] In prior work, patients were unwilling to consider costs borne by others in medical decision-making.[20] However, these studies have not been replicated in hand surgery where treatments are often discretionary and there is often treatment equipoise. In elective hand surgery, where mortality is not a factor, we observed a significant difference in treatment choice between the cost and control cohorts, with the former more likely to choose surgery. Taken together, these results suggest that increasing societal cost transparency is an ineffective means to reduce healthcare costs. On the contrary, exposure to societal cost information in hand surgery may lead to a "raiding of the healthcare commons", in which consumers deliberately choose costlier treatments knowing that society will bear the additional costs.

Although most participants in our study agreed that healthcare cost is a major problem in the U.S., only 58% indicated that they consider the country's healthcare costs when making treatment decisions. These results are similar to those previously reported by Riggs et al. and Kwon et al., who found that while the majority of their participants agreed that healthcare costs are a major problem, substantially fewer believed that patients should help control healthcare costs.[21,22] Similarly, our participants recognized increasing healthcare costs as a societal problem, but many did not feel a personal responsibility to consider those costs in medical decision-making. Therefore, a larger stewardship role may be required of physicians and/or health systems to curb rapidly rising healthcare costs. These results are relevant as health policy shifts towards increased cost transparency with both physicians and patients.[31] Where prior work has suggested that transparency with out-of-pocket costs can lead to less discretionary, less costly treatment options,[38,39] total cost information does not lead to the same result. Although patients have demonstrated interest in understanding out-of-pocket costs[13,39–41] and including this information during shared decision-making has garnered increasing support,[7] discussing total cost information will likely not improve value of care.

A previous study has shown that the majority of U.S. physicians believe that patients have a "major responsibility" in reducing healthcare costs.[17] Subsequent efforts to reduce healthcare costs at the patient level have largely focused on incentivizing patients through out-of-pocket costs. For example, reference pricing, a model in which the insurer pays a set price determined by the lower price range for a service with the remainder paid by the patient, has successfully altered patient behavior to achieve substantial cost savings in cataract surgery, shoulder and knee arthroscopy, and knee and hip arthroplasty.[42–46] However, reference pricing has only been applied to services for which there is a wide range in cost with little variation in quality. Additional efforts are needed towards the design of

novel strategies to leverage cost-sharing to improve value-based care in hand surgery. Such strategies should focus on out-of-pocket costs and avoid discussing total costs because the latter increased demand for an expensive treatment option (CTR) in our study.

In conclusion, our results demonstrate that exposure to societal cost information increased a participant's probability of choosing the more expensive treatment option (CTR) compared to inexpensive splinting for CTS, especially in younger participants. Although most participants agreed that healthcare costs are a major problem, many do not personally consider the country's healthcare costs in medical decision-making.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgements:

This work was supported by a National Institutes of Health K23AR073307-01 award (RNK). The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH.

REFERENCES

1. Keith MW, Masear V, Chung KC, et al. American Academy of Orthopaedic Surgeons Clinical Practice Guideline on The Treatment of Carpal Tunnel Syndrome. JBJS. 2010;92(1). https://journals.lww.com/jbjsjournal/Fulltext/2010/01000/American_Academy_of_Orthopaedic_Surgeons_Clinical.28.aspx.
2. Gerritsen AM, de Vet HW, Scholten RM, Bertelsmann FW, de Krom MM, Bouter LM. Splinting vs surgery in the treatment of carpal tunnel syndrome: A randomized controlled trial. JAMA. 2002;288(10):1245–1251. doi:10.1001/jama.288.10.1245 [PubMed: 12215131]
3. Carlson H, Colbert A, Frydl J, Arnall E, Elliot M, Carlson N. Current options for nonsurgical management of carpal tunnel syndrome. Int J Clin Rheumtol. 2010;5(1):129. [PubMed: 20490348]
4. Rubin G, Orbach H, Rinott M, Rozen N. The effectiveness of splinting and surgery on sleep disturbance in carpal tunnel syndrome. J Hand Surg Eur Vol. 2017;43(3):286–289. doi:10.1177/1753193417729110 [PubMed: 28872412]
5. Barry MJ, Edgman-Levitan S. Shared Decision Making — The Pinnacle of Patient-Centered Care. N Engl J Med. 2012;366(9):780–781. doi:10.1056/NEJMp1109283 [PubMed: 22375967]
6. Nam KP, Gong HS, Bae KJ, Rhee SH, Lee HJ, Baek GH. The Effect of Patient Involvement in Surgical Decision Making for Carpal Tunnel Release on Patient-Reported Outcome. J Hand Surg. 2014;39(3):493–498. doi:10.1016/j.jhsa.2013.12.025
7. Oshima Lee E, Emanuel EJ. Shared Decision Making to Improve Care and Reduce Costs. N Engl J Med. 2013;368(1):6–8. doi:10.1056/NEJMp1209500 [PubMed: 23281971]
8. Johnson EJ, Shu SB, Dellaert BGC, et al. Beyond nudges: Tools of a choice architecture. Market Lett. 2012;23(2):487–504. doi:10.1007/s11002-012-9186-1
9. Peters E, Klein W, Kaufman A, Meilleur L, Dixon A. More Is Not Always Better: Intuitions About Effective Public Policy Can Lead to Unintended Consequences. Soc Iss Policy Rev. 2013;7(1):114–148. doi:10.1111/j.1751-2409.2012.01045.x
10. Newhouse JP, Manning WG, Morris CN, et al. Some Interim Results from a Controlled Trial of Cost Sharing in Health Insurance. N Engl J Med. 1981;305(25):1501–1507. doi:10.1056/NEJM198112173052504 [PubMed: 6795505]
11. Howe R, Hassett MJ, Wheelock A, O'Donoghue C, Kaplan C, Ozanne EM. Costs matter: The impact of disclosing treatment costs and provider profit on patients' decisions. J Cancer Policy. 2017;11:42–47. doi:10.1016/j.jcpo.2016.09.002

12. Sadigh G, Carlos RC, Krupinski EA, Meltzer CC, Duszak R. Health Care Price Transparency and Communication: Implications for Radiologists and Patients in an Era of Expanding Shared Decision Making. Am J Roentgenol. 2017;209(5):959–964. doi:10.2214/AJR.17.18360 [PubMed: 28742372]
13. Ubel PA, Abernethy AP, Zafar SY. Full Disclosure — Out-of-Pocket Costs as Side Effects. N Engl J Med. 2013;369(16):1484–1486. doi:10.1056/NEJMp1306826 [PubMed: 24131175]
14. Hartman M, Martin AB, Espinosa N, Catlin A, The National Health Expenditure Accounts Team. National Health Care Spending In 2016: Spending And Enrollment Growth Slow After Initial Coverage Expansions. Health Affairs. 2017;37(1):150–160. doi:10.1377/hlthaff.2017.1299 [PubMed: 29211503]
15. Porter ME. A Strategy for Health Care Reform — Toward a Value-Based System. N Engl J Med. 2009;361(2):109–112. doi:10.1056/NEJMp0904131 [PubMed: 19494209]
16. Reuben DB, Cassel CK. Physician stewardship of health care in an era of finite resources. JAMA. 2011;306(4):430–431. doi:10.1001/jama.2011.999 [PubMed: 21791692]
17. Tilburt JC, Wynia MK, Sheeler RD, et al. Views of us physicians about controlling health care costs. JAMA. 2013;310(4):380–389. doi:10.1001/jama.2013.8278 [PubMed: 23917288]
18. Reuben DB. Miracles, choices, and justice: Tragedy of the future commons. JAMA. 2010;304(4):467–468. doi:10.1001/jama.2010.1048 [PubMed: 20664050]
19. Swensen SJ, Kaplan GS, Meyer GS, et al. Controlling healthcare costs by removing waste: what American doctors can do now. BMJ Qual Saf. 2011;20(6):534. doi:10.1136/bmjqs.2010.049213
20. Sommers R, Goold SD, McGlynn EA, Pearson SD, Danis M. Focus Groups Highlight That Many Patients Object To Clinicians' Focusing On Costs. Health Affairs. 2013;32(2):338–346. doi:10.1377/hlthaff.2012.0686 [PubMed: 23381527]
21. Riggs KR, Ubel PA, Saloner B. Can Appealing to Patient Altruism Reduce Overuse of Health Care Services? An Experimental Survey. J Gen Intern Med. 2017;32(7):732–738. doi:10.1007/s11606-017-4002-5 [PubMed: 28155043]
22. Kwon R, Allen LA, Scherer LD, et al. The Effect of Total Cost Information on Consumer Treatment Decisions: An Experimental Survey. Med Decis Making. 2018;38(5):584–592. doi:10.1177/0272989X18773718 [PubMed: 29847252]
23. Milone MT, Karim A, Klifto CS, Capo JT. Analysis of Expected Costs of Carpal Tunnel Syndrome Treatment Strategies. Hand (New York, N,Y). November 2017:1558944717743597. doi:10.1177/1558944717743597
24. Mason W, Suri S. Conducting behavioral research on Amazon's Mechanical Turk. Behav Res Methods. 2012;44(1):1–23. doi:10.3758/s13428-011-0124-6 [PubMed: 21717266]
25. Paolacci G, Chandler J, Ipeirotis PG. Running experiments on amazon mechanical turk. Judgm Decis Mak. 2010;5(5):411–419.
26. Paolacci G, Chandler J. Inside the Turk: Understanding Mechanical Turk as a Participant Pool. Curr Dir Psychol Sci. 2014;23(3):184–188. doi:10.1177/0963721414531598
27. Peer E, Vosgerau J, Acquisti A. Reputation as a sufficient condition for data quality on Amazon Mechanical Turk. Behav Res Methods. 2014;46(4):1023–1031. doi:10.3758/s13428-013-0434-y [PubMed: 24356996]
28. Shammas RL, Mela N, Wallace S, Tong BC, Huber J, Mithani SK. Conjoint Analysis of Treatment Preferences for Nondisplaced Scaphoid Fractures. J Hand Surg. 2018;43(7):678.e1–678.e9. doi:10.1016/j.jhsa.2017.12.021
29. Zhang S, Vora M, Harris AHS, Baker L, Curtin C, Kamal RN. Cost-Minimization Analysis of Open and Endoscopic Carpal Tunnel Release. JBJS. 2016;98(23). https://journals.lww.com/jbjsjournal/subjects/HandandWrist/Fulltext/2016/12070/Cost_Minimization_Analysis_of_Open_and_Endoscopic.5.aspx.
30. Mehrotra A, Chernew ME, Sinaiko AD. Promise and Reality of Price Transparency. N Engl J Med. 2018;378(14):1348–1354. doi:10.1056/NEJMhpr1715229 [PubMed: 29617580]
31. Sinaiko AD, Rosenthal MB. Increased Price Transparency in Health Care — Challenges and Potential Effects. N Engl J Med. 2011;364(10):891–894. doi:10.1056/NEJMp1100041 [PubMed: 21388306]

32. Iacobucci G. NHS proposes to stop funding 17 “unnecessary” procedures. BMJ. 2018;362. doi:10.1136/bmj.k2903
33. Buhrmester M, Kwang T, Gosling SD. Amazon’s Mechanical Turk: A New Source of Inexpensive, Yet High-Quality, Data? Perspect Psychol Sci. 2011;6(1):3–5. doi:10.1177/1745691610393980 [PubMed: 26162106]
34. Casler K, Bickel L, Hackett E. Separate but equal? A comparison of participants and data gathered via Amazon’s MTurk, social media, and face-to-face behavioral testing. Comput Hum Behav. 2013;29(6):2156–2160. doi:10.1016/j.chb.2013.05.009
35. Mortensen K, Hughes TL. Comparing Amazon’s Mechanical Turk Platform to Conventional Data Collection Methods in the Health and Medical Research Literature. J Gen Intern Med. 2018;33(4):533–538. doi:10.1007/s11606-017-4246-0 [PubMed: 29302882]
36. Hauser DJ, Schwarz N. Attentive Turkers: MTurk participants perform better on online attention checks than do subject pool participants. Behav Res Methods. 2016;48(1):400–407. doi:10.3758/s13428-015-0578-z [PubMed: 25761395]
37. Keith MG, Tay L, Harms PD. Systems Perspective of Amazon Mechanical Turk for Organizational Research: Review and Recommendations. Front Psychol. 2017;8:1359. doi:10.3389/fpsyg.2017.01359 [PubMed: 28848474]
38. Whaley C, Schneider Chafen J, Pinkard S, et al. Association between availability of health service prices and payments for these services. JAMA. 2014;312(16):1670–1676. doi:10.1001/jama.2014.13373 [PubMed: 25335149]
39. Zafar SY, Chino F, Ubel PA, et al. The utility of cost discussions between patients with cancer and oncologists. Am J Manag Care. 2015;21(9):607–615. [PubMed: 26618364]
40. Alexander G, Casalino LP, Meltzer DO. Patient-physician communication about out-of-pocket costs. JAMA. 2003;290(7):953–958. doi:10.1001/jama.290.7.953 [PubMed: 12928475]
41. Bestvina CM, Zullig LL, Rushing C, et al. Patient-Oncologist Cost Communication, Financial Distress, and Medication Adherence. JOP. 2014;10(3):162–167. doi:10.1200/JOP.2014.001406 [PubMed: 24839274]
42. Reinhardt UE. The disruptive innovation of price transparency in health care. JAMA. 2013;310(18):1927–1928. doi:10.1001/jama.2013.281854 [PubMed: 24219941]
43. Shih T, Dimick JB. Is reference pricing the next big thing in payment reform? JAMA Surgery. 2014;149(12):1219–1220. doi:10.1001/jamasurg.2014.392 [PubMed: 25321603]
44. Robinson JC, Brown T, Whaley C. Reference-Based Benefit Design Changes Consumers’ Choices And Employers’ Payments For Ambulatory Surgery. Health Affairs. 2015;34(3):415–422. doi:10.1377/hlthaff.2014.1198 [PubMed: 25732491]
45. Robinson JC, Brown TT. Increases In Consumer Cost Sharing Redirect Patient Volumes And Reduce Hospital Prices For Orthopedic Surgery. Health Affairs. 2013;32(8):1392–1397. doi:10.1377/hlthaff.2013.0188 [PubMed: 23918483]
46. Robinson JC, Brown TT, Whaley C, Bozic KJ. Consumer Choice Between Hospital-Based and Freestanding Facilities for Arthroscopy: Impact on Prices, Spending, and Surgical Complications. JBJS. 2015;97(18). https://journals.lww.com/jbjsjournal/Fulltext/2015/09160/Consumer_Choice_Between_Hospital_Based_and.1.aspx.

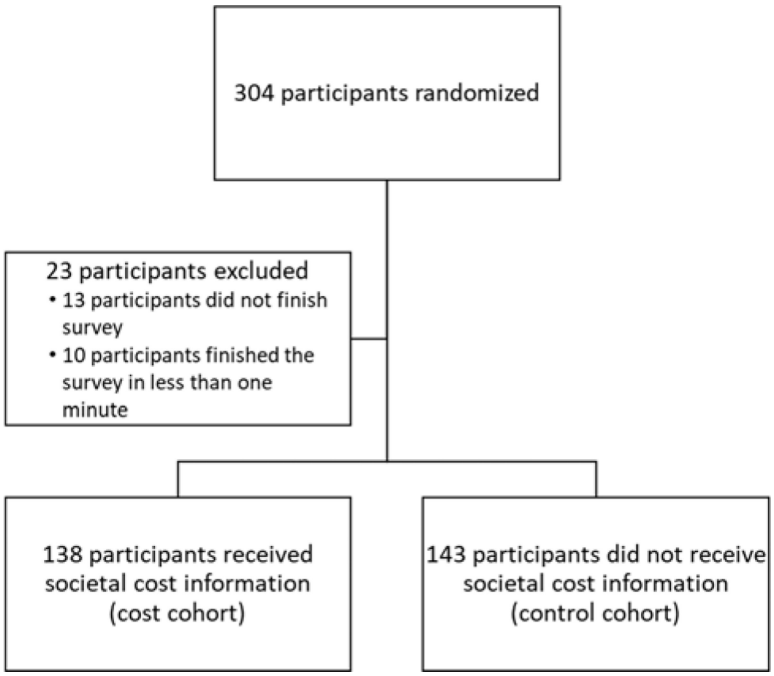

Figure 1.
Randomization scheme.

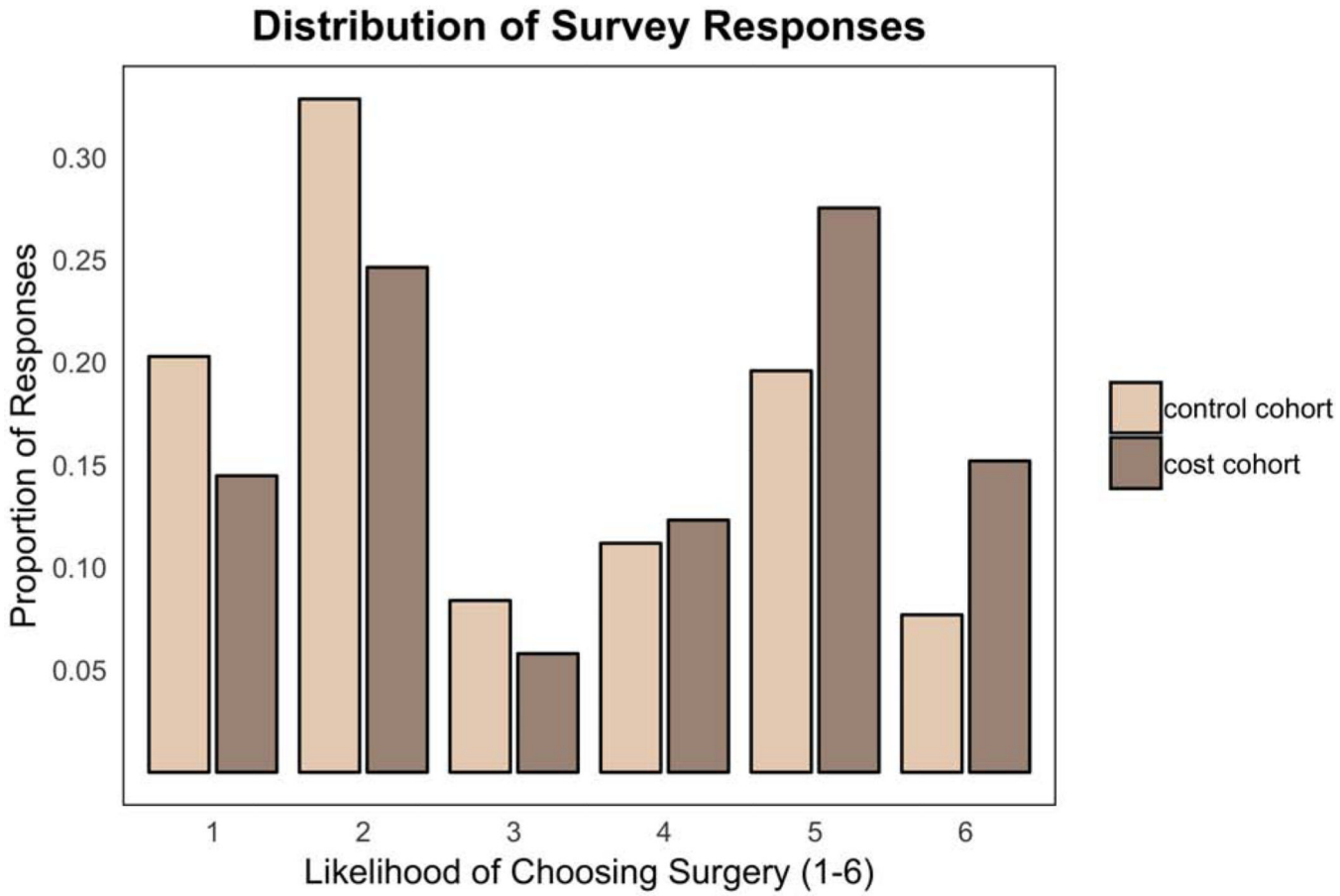

Figure 2.
Distribution of Survey Responses by Cohort. The outcome measured was the decision to have surgery, measured on a 6-point ordinal scale (1 = Definitely not, 6 = Definitely).

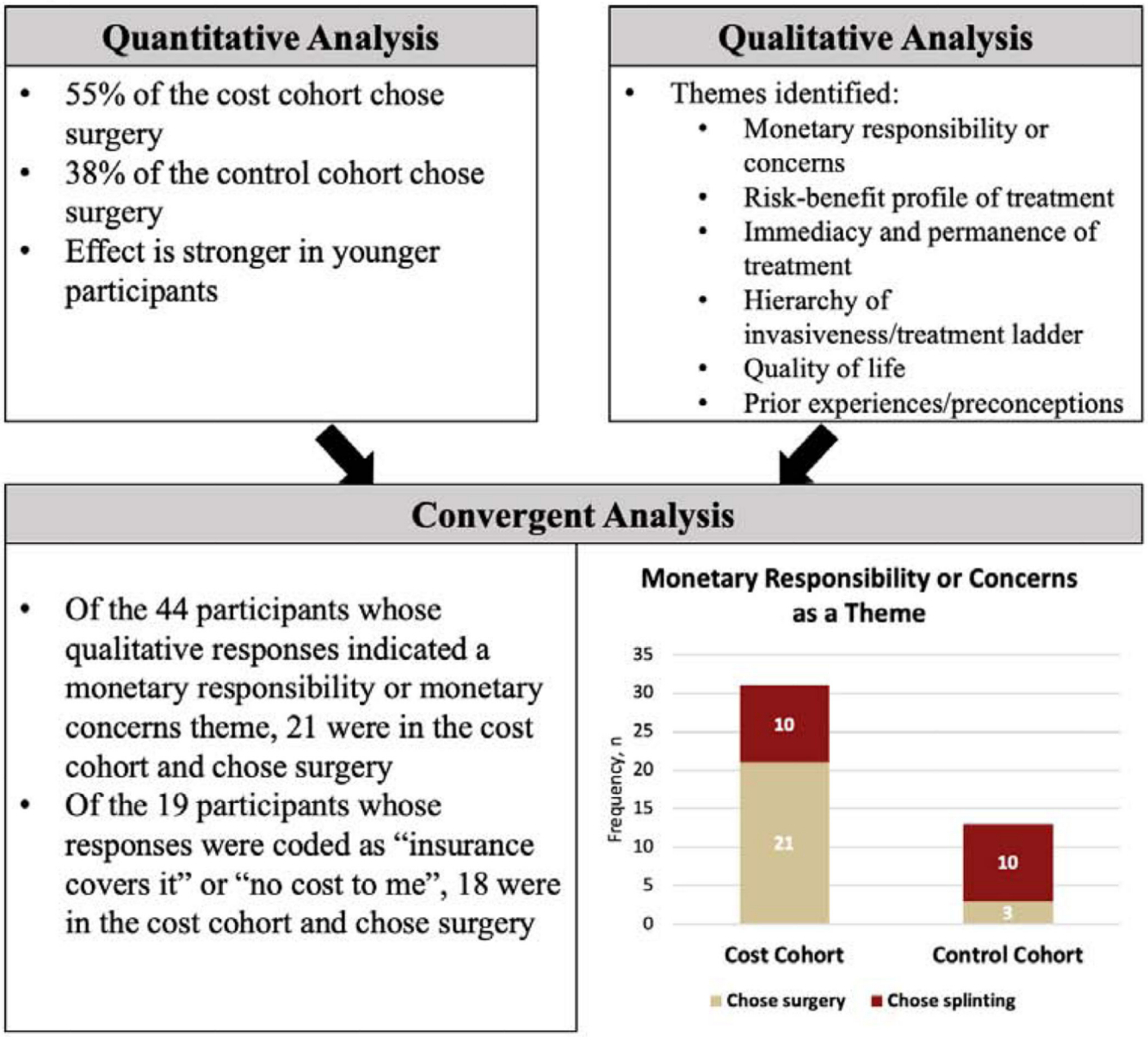

Figure 3.
Convergent Analysis.

Table 1.

Participant Demographics.

Demographic	Cost Cohort (n = 138)	Control Cohort (n = 143)
Age (SD)	43.5 (13.7)	40.7 (12.1)
Sex, n (%)		
Female	76 (55.1)	85 (59.4)
Male	60 (43.5)	57 (39.9)
Other	1 (0.7)	0 (0)
Race, n (%)	101 (73.2)	108 (75.5)
White	11 (8.0)	10 (7.0)
Black Asian	11 (8.0)	8 (5.6)
Hispanic	3 (2.2)	3 (2.1)
Other	11 (8.0)	13 (9.1)
Income, n (%)		
Less than $50,000	59 (42.8)	68 (47.6)
$50,000 to $99,999	63 (45.7)	59 (41.3)
$100,000 to $149,999	14 (10.1)	12 (8.4)
More than $150,000	2 (1.4)	4 (2.8)
Employment, n (%)		
Full-time	91 (65.9)	101 (70.6)
Part-time	27 (19.6)	21 (14.7)
Retired	7 (5.1)	6 (4.2)
Unemployed	3 (2.2)	5 (3.5)
Other	9 (6.5)	10 (7.0)
Education, n (%)		
Less than high school	2 (1.4)	1 (0.7)
High school graduate	25 (18.1)	31 (21.7)
2-year college degree	21 (15.2)	26 (18.2)
4-year college degree	63 (45.7)	59 (41.3)
Post-graduate degree	26 (18.8)	25 (17.5)
Relationship status, n (%)		
Married	54 (39.1)	74 (51.7)
Domestic partnership	5 (3.6)	7 (4.9)
Single, never married	48 (34.8)	50 (35.0)
Single, divorced or separated	23 (16.7)	7 (4.9)
Single, widowed	8 (5.8)	4 (2.8)
Insurance, n (%)		
Medicaid	16 (11.6)	16 (11.2)
Medicare	21 (15.2)	18 (12.6)
Commercial	86 (62.3)	90 (62.9)
Workers' Compensation	3 (2.2)	4 (2.8)
Uninsured	12 (8.7)	15 (10.5)
Previous carpal tunnel syndrome diagnosis, n (%)		
Yes	19 (13.8)	25 (17.5)
No	117 (84.8)	115 (80.4)
Do not know	2 (1.4)	3 (2.1)
Previous carpal tunnel release, n (%)		
Yes	5 (3.6)	4 (2.8)
No	14 (10.1)	19 (13.3)

Percentages may not sum to 100% because some participants declined to answer some items.

Table 2.

CTS Treatment Choice by Cohort.

	Outcome	Cost Cohort	Control Cohort	p value†
Entire cohort	Probability of choosing surgery, n (%) Definitely not Probably not Maybe not Maybe Probably Definitely	 20 (14.5) 34 (24.6) 8 (5.8) 17 (12.3) 38 (27.5) 21 (15.2)	 29 (20.3) 47 (32.9) 12 (8.4) 16 (11.2) 28 (19.6) 11 (7.7)	< **0.05**
	Dichotomized choice, n (%) Splinting Surgery	 62 (44.9) 76 (55.1)	 88 (61.5) 55 (38.5)	< **0.05**
No prior carpal tunnel syndrome	Probability of choosing surgery, n (%) Definitely not Probably not Maybe not Maybe Probably Definitely	 17 (14.5) 25 (21.4) 7 (6.0) 14 (12.0) 33 (28.2) 21 (17.9)	 22 (19.1) 39 (33.9) 11 (9.6) 13 (11.3) 22 (19.1) 8 (7.0)	< **0.05**
	Dichotomized choice, n (%) Splinting Surgery	 49 (41.9) 68 (58.1)	 72 (62.6) 43 (37.4)	< **0.05**

† Significant p values are in bold.

Table 3.

CTS Treatment Choice by Age.

	Outcome	Cost Cohort	Control Cohort	p value[†]
Age less than or equal to 39 years[*]	Probability of choosing surgery, n (%) Definitely not Probably not Maybe not Maybe Probably Definitely	 5 (7.8) 13 (20.3) 2 (3.1) 10 (15.6) 23 (35.9) 11 (17.2)	 15 (19.2) 26 (33.3) 5 (6.4) 11 (14.1) 15 (19.2) 6 (7.7)	< **0.05**
	Dichotomized choice, n (%) Splinting Surgery	 20 (31.3) 44 (68.7)	 46 (59.0) 32 (41.0)	< **0.05**
Age greater than 39 years	Probability of choosing surgery, n (%) Definitely not Probably not Maybe not Maybe Probably Definitely	 15 (20.5) 21 (28.8) (8.2) (9.6) 14 (19.2) 10 (13.7)	 14 (21.9) 21 (32.8) 7 (10.9) 5 (7.8) 12 (18.8) 5 (7.8)	0.42
	Dichotomized choice, n (%) Splinting Surgery	 42 (57.5) 31 (42.5)	 42 (65.6) 22 (34.4)	0.38

[†]Significant p values are in bold.

[*]Mean age = 31.6. Mean age = 52.9. Note that two participants declined to provide age and were excluded.

Mean age = 31.6. Mean age = 52.9. Note that two participants declined to provide age and were excluded.

Table 4.

Attitudes Towards Healthcare Costs by CTS Treatment Choice.

Statement	Agreement, n (%)*		p value†
	Choosing surgery (n = 131)	Choosing splinting (n = 150)	
1. “Health care is a human right.”	120 (91.6%)	131 (87.3%)	0.34
2. “The cost of health care is one of the biggest problems facing this country.”	122 (93.1%)	142 (94.7%)	0.09
3. “Consumers can help lower the cost of health care.”	88 (67.2%)	97 (65.1%)	0.47
4. “Doctors should consider the country’s health care costs when they make medical decisions.”	78 (59.5%)	99 (66.0%)	0.21
5. “I consider the country’s health care costs when I make a decision about my treatment.”	71 (54.2%)	92 (61.3%)	0.08
6. “My doctor should consider my out-of-pocket costs when he or she makes a medical decision.”	110 (84.0%)	125 (83.3%)	0.62
7. “I consider my out-of-pocket costs when I make a decision about my treatment.”	123 (94.6%)	142 (94.7%)	0.92

*One participant who chose surgery did not answer item 7 above and one participant who chose splinting did not answer item 3 above. These are presented as dichotomized outcomes (agreement vs. disagreement) for simplicity.

†The p value corresponds to a Mann-Whitney U-test, which was performed using Likert scores.