RESEARCH ARTICLE

Do Patient Preferences Influence Surgeon Recommendations for Treatment?

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Abstract

Background: When the best treatment option is uncertain, a patient's preference based on personal values should be the source of most variation in diagnostic and therapeutic interventions. Unexplained surgeon-to-surgeon variation in treatment for hand and upper extremity conditions suggests that surgeon preferences have more influence than patient preferences.

Methods: A total of 184 surgeons reviewed 18 fictional scenarios of upper extremity conditions for which operative treatment is discretionary and preference sensitive, and recommended either operative or non-operative treatment. To test the influence of six specific patient preferences the preference was randomly assigned to each scenario in an affirmative or negative manner. Surgeon characteristics were collected for each participant.

Results: Of the six preferences studied, four influenced surgeon recommendations. Surgeons were more likely to recommend non-operative treatment when patients; preferred the least expensive treatment (adjusted OR, 0.82; 95% CI, 0.71 – 0.94; *P=0.005*), preferred non-operative treatment (adjusted OR, 0.82; 95% CI, 0.72 – 0.95; *P=0.006*), were not concerned about aesthetics (adjusted OR, 1.15; 95% CI, 1.0 – 1.3; *P=0.046*), and when patients only preferred operative treatment if there is consensus among surgeons that operative treatment is a useful option (adjusted OR, 0.78; 95% CI, 0.68 – 0.89; *P<0.001*).

Conclusion: Patient preferences were found to have a measurable influence on surgeon treatment recommendations though not as much as we expected-and surgeons on average interpreted surgery as more aesthetic. This emphasizes the importance of strategies to help patients reflect on their values and ensure their preferences are consistent with those values (e.g. use of decision-aids).

Level of evidence: III

Keywords: Conservative treatment, Decision making, Patient preference, Surgery

Introduction

There is an increasing emphasis on engaging patients in medical decision-making. The majority of patients prefer to be involved in the decision-making process, even after trauma where some might think that capacity to participate in decision making is diminished (1–3).

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In the shared decision-making model, decisions are based on participation of both the person seeking and the person providing care, in the process of sharing information, expressing values and preferences, and coming to agreement on final choices (1, 4, 5). There is some evidence that shared decision-making improves patient satisfaction (5, 6). Shared decision-making should also increase patient autonomy for preference-sensitive conditions (5, 7). When the best treatment option is uncertain, patient preferences based on their values are important.

There is substantial and unexplained surgeon-to-surgeon variation in treatment options for upper extremity conditions (8–14). It has been demonstrated that when evidence is inconclusive, surgeons make recommendations based on their comfort and familiarity, not on the preferences of the patient, but additional studies are needed (1, 4).

This study assessed whether specific patient preferences influence surgeons' recommendations for operative or non-operative treatment for preference-sensitive upper extremity conditions for which surgery is discretionary. We tested the null hypothesis that there are no specific patient preferences associated with variation in surgeon treatment recommendations accounting for other factors. We examined the secondary question whether there are surgeon-related factors that are associated with the choice of operative or non-operative treatment.

Materials and Methods

Study design

This study was reviewed and approved by our Institutional Review Board. Using online software (SurveyMonkey; http://www.surveymonkey.com) a survey presented 18 scenarios of patients with upper extremity conditions for which operative treatment and non-operative treatment may both be effective and are preference-sensitive. For each scenario, patient preferences were presented in a random fashion in six categories. Surgeons were asked if they would recommend operative or non-operative treatment to each fictional patient.

All surgeons with an email address on file with the Science of Variation Group (SOVG) (n = 840) were invited to participate. The SOVG consists of orthopedic, trauma and plastic surgeons with an interest in treating upper extremity conditions from all over the world. It aims to study variation in definitions, interpretations, recommendations and treatment of human illness without financial incentives. SOVG surveys are available to surgeons who commonly treat upper extremity conditions after joining the group online. A total of 203 (24%) surgeon-members responded. This does not represent a response rate because we do not check if email addresses are active, we do not remove email addresses of non-participants, and some members may not treat fractures or upper limb conditions and therefore may not have responded because they did not consider the survey relevant to their practice. In any case, with the randomization process, the characteristics of the participants affect the external validity of the findings, but not the hypothesis per se. Of the 203 respondents 192 surgeons completed the survey. Respondents who did not complete the survey were excluded from the analyses. Furthermore, we excluded physicians in training for orthopaedic surgery (n=8), resulting in a total of 184 responses available for analyses. Surgeon characteristics were collected for each participant (e.g. country of residency and specialization), so associations between surgeon characteristics and treatment recommendations could be studied [Table 1].

Scenarios

Each of the 18 scenarios involved a fictional patient with no comorbidities and no soft tissue or neurovascular damage. An age typical of the condition was used and gender was randomized for each observer in each scenario. The following upper extremity conditions that can be treated both operatively and non-operatively were investigated: diaphyseal clavicle fracture, proximal humerus fracture, distal radius fracture, greater tuberosity fracture, scaphoid waist fracture, small rotator cuff defect, ganglion cyst, triangular fibrocartilage defect, trapeziometacarpal arthrosis, scapho-lunate ligament insufficiency, distal biceps rupture, proximal biceps rupture, lateral clavicle fracture, mucous cyst, wrist arthritis, Kienbock disease, De Quervain tendinopathy, and a diagnosis of carpal tunnel syndrome in spite of normal electrophysiological testing [Table 2] [Appendix 1].

In each scenario, a patient was randomly assigned an affirmative or negative opinion for the six types of preferences: preference for the least expensive treatment, avoidance of immobilization, avoidance of major complications, preference for non-operative treatment, preference for surgery only if there is consensus among surgeons that it is a useful option, and a preference that aesthetics are important to the patient [Table 3]. Appendix 2 provides an example of a scenario.

Statistical analysis

An a priori power analysis determined that a minimal sample size of 138 participants would provide 80% statistical power (beta 0.20; alpha 0.05) to detect a difference in proportion of recommended treatment of 0.2 (assuming the proportion for recommended treatment is 0.1 in one group and 0.3 in the other group).

Demographic and clinical characteristics of surgeon-members were evaluated using descriptive statistics. Categorical data were presented as frequencies with percentages. Two-sided Fisher exact tests were performed to assess associations between patient preferences and treatment recommendations. In addition, two-sided Fisher exact tests and Chi-squared tests were used to investigate associations between surgeon characteristics and treatment recommendations.

Table 1. Surgeon characteristics

			Mean decision per scenario*			Total number of choices (%)	
	n = 184	%	Recommend Non-operative Treatment	Recommend Operative Treatment	*P* value	Recommend Non-operative Treatment	Recommend Operative Treatment
Years in practice					0.019		
0 – 5	57	31	34	23		618 (60)	408 (40)
6 – 10	42	23	24**	19**		423 (56)	333 (44)
11 – 20	58	32	34	24		617 (59)	427 (41)
21 – 30	27	15	14	13		255 (52)	231 (48)
Geography					<0.001		
Asia and Australia	17	9.2	8	9		151 (49)	155 (51)
United States and Canada	95	52	58	37		1037 (61)	673 (39)
Europe	63	34	36	27		641 (57)	493 (43)
South America	9	4.9	5	4		84 (52)	78 (48)
Specialization					0.54		
General Orthopaedics	16	8.7	9	7		167 (58)	121 (42)
Orthopaedic Trauma	67	36	39	28		702 (59)	500 (41)
Shoulder and Elbow	27	15	15	12		275 (57)	211 (43)
Hand and Wrist	74	40	43**	32**		765 (57)	567 (43)
Supervise Trainees					0.005		
No	20	11	13	7		233 (65)	127 (35)
Yes	164	89	93	71		1680 (57)	1272 (43)

* Total number of choices divided by number of cases, to provide an overview that is easier to interpret. Numbers are rounded.
** Both numbers are rounded, real numbers were 23.5 and 18.5 for 6 – 10 of years in practice, 42.5 and 31.5 for hand and wrist.

After performing bivariate analyses, all patient preferences, patient gender, and all surgeon characteristics were entered into a generalized estimating equations (GEE) analysis, to correct for dependency of observations. Outcomes of this analysis are reported by odds ratios (ORs) with 95% confidence intervals (CIs) and *P*values. *P*values of < 0.05 were considered statistically significant.

Results

Patient preferences

Bivariate analyses demonstrated a significant association between recommendation for non-operative treatment and the following: preference for least expensive treatment (*P=0.017*), preference for non-operative treatment (*P=0.007*), preference to have surgery only if there is consensus that surgery is useful (*P=0.001*), and absence of a preference for the most aesthetic result (*P=0.045*) [Appendix 3]. After correction for dependency of observations and other possible confounders using GEE analysis, we found that surgeons were more likely to recommend non-operative treatment when patients preferred the least expensive treatment (adjusted OR, 0.82; 95% CI, 0.71 – 0.94; *P=0.005*), when patients preferred non-operative treatment (adjusted OR, 0.82; 95% CI, 0.72 – 0.95; *P=0.006*), when patients only preferred operative treatment if there is consensus among surgeons that operative treatment is a useful option (adjusted OR, 0.78; 95% CI, 0.68 – 0.89; *P<0.001*), and when patients were not concerned about aesthetics (adjusted OR, 1.15; 95% CI, 1.0 – 1.3; *P=0.046*) [Table 4].

Several surgeon characteristics were associated with a recommendation for operative treatment: more than 20 years in practice (adjusted OR, 1.44; 95% CI, 1.1 – 1.9; *P=0.015*), supervision of trainees (adjusted OR,

Table 2. Treatment recommendation per scenario

	Non-operative	Operative
	n=1913 (58%)	n=1399 (42%)
	n (%)	n (%)
Diaphyseal Clavicle Fracture	105 (57)	79 (43)
Proximal Humerus Fracture	81 (44)	103 (56)
Distal Radius Fracture	98 (53)	86 (47)
Greater Tuberosity Fracture	179 (97)	5 (2.7)
Scaphoid Fracture	52 (28)	132 (72)
Small Rotator Cuff Defect	145 (79)	39 (21)
Ganglion Cyst	129 (70)	55 (30)
Triangular Fibrocartilage Defect	140 (76)	44 (24)
TMC Arthrosis	163 (89)	21 (11)
Scapho-lunate Ligament Insufficiency	57 (31)	127 (69)
Distal Biceps Rupture	70 (38)	114 (62)
Proximal Biceps Rupture	153 (83)	31 (17)
Lateral Clavicle Fracture	45 (24)	139 (76)
Mucous Cyst	107 (58)	77 (42)
Wrist Arthritis	93 (51)	91 (49)
Kienbock Disease	114 (62)	70 (38)
De Quervain Tendinopathy	61 (33)	123 (67)
Carpal Tunnel Syndrome Normal Electrophysiological Testing	121 (66)	63 (34)

Table 3. Patient preferences assigned to the scenarios

Preference 1:	The patient would prefer the least expensive treatment. The patient is not concerned about costs.
Preference 2:	The patient would prefer the treatment with the shortest immobilization time. The patient is not concerned about immobilization time.
Preference 3:	The patient would prefer the treatment with the lowest chance of major complications. The patient is not concerned about the chance of major complications.
Preference 4:	The patient would prefer non-operative treatment. The patient is comfortable with either non-operative or operative treatment.
Preference 5:	The patient would prefer operative treatment only if there is consensus among surgeons that operative treatment is a useful option. The patient is comfortable with operative treatment even if it's a bit experimental.
Preference 6:	The patient is concerned with aesthetics. The patient is not concerned about aesthetics.

Table 4. Generalized estimating equation analysis of factors influencing surgeon recommendation for operative treatment

	OR	CI 95%	*P* value
Patient Characteristics			
Patient Gender Male	1.08	1.2 – 0.94	0.30
Preferences			
Least Expensive Treatment	0.82	0.71 - 0.94	0.005
Avoid Immobilization	1.03	0.89 – 1.2	0.71
Avoid Major Complications	0.92	0.80 – 1.1	0.23
Preference for Non-operative Treatment	0.82	0.72 – 0.95	0.006
Consensus that Surgery is Useful	0.78	0.68 – 0.89	<0.001
Aesthetics are Important	1.15	1.0 – 1.3	0.046
Surgeon Characteristics			
Gender Surgeon Male	0.95	0.62 – 1.4	0.80
Years in Practice (Reference: 0 – 5 years)			
6 – 10	1.20	0.92 – 1.6	0.17
11 – 20	1.14	0.89 – 1.4	0.30
21 – 30	1.44	1.1 – 1.9	0.015
Supervise Trainees	1.37	1.0 – 1.8	0.038
Geography (Reference: USA and Canada)			
Asia and Australia	1.77	1.3 – 2.5	0.001
Europe	1.27	1.0 – 1.6	0.036
South America	1.42	0.94 – 2.2	0.094
Specialization (Reference: Hand and Wrist)			
General Orthopaedics	0.88	0.60 – 1.3	0.48
Orthopaedic Trauma	0.78	0.62 – 0.98	0.035
Shoulder and Elbow	0.88	0.67 – 1.2	0.39

OR = odds ratio; CI = confidence interval

1.37; 95% CI, 1.0 – 1.8; *P=0.038*), and the geographic areas Australia/Asia (adjusted OR, 1.77; 95% CI, 1.3 – 2.5; *P=0.001*), and Europe (adjusted OR, 1.27; 95% CI, 1.0 – 1.6; *P=0.036*). When orthopedic trauma surgeons assessed the scenario (adjusted OR, 0.78; 95% CI, 0.62 – 0.98; *P=0.035*) operative treatment was recommended less often [Table 4].

Discussion

The aim of this study was to investigate whether specific patient preferences influence recommendations for surgery for preference-sensitive conditions. We found that four of the six studied preferences influenced surgeon recommendations. The pattern of preferences that did and did not influence surgeon recommendations, as well as the direction of those influences, informs us about characteristics of surgeon bias.

One of the limitations of this study is that data were obtained using fictional scenarios. There could be a difference between hypothetical recommendations and recommendations made to an actual patient. To overcome this, we designed straightforward scenarios applicable to a typical hand and upper extremity clinic. Second, only one in four surgeons who were emailed to participate in this study completed the survey. A previous study performed by the SOVG group tried to estimate the number of active users. According to that study the SOVG has 57% active members who responded to at least 20% of surveys

to which they were invited (15). The participation bias might affect the generalizability of the results, but the randomization process improves the internal validity. An advantage over traditional reliability studies might be the large number of fully trained, practicing surgeons used in this study rather than residents or fellows. Third, the majority of surgeons participating in the SOVG work in academic medicine (89% supervise trainees); therefore, it might be possible that treatment recommended by these surgeons differs from recommendations of surgeons in other types of practices. Lastly, the influence of preferences may be less for scenarios where treatment recommendations are more uniform across practices. For instance, in the scenario of a greater tuberosity fracture, only 5 (2.7%) participants recommended operative treatment and in the scenario of a lateral clavicle fracture, 139 (76%) surgeons recommended operative treatment [Table 2]. However, since all surgeons made recommendations for the same scenarios and the scenarios were entered into the GEE analysis; we do not feel that this had a large influence on our outcomes. Future studies might be limited to the scenarios with recommendations for surgery between 35 and 65% such as diaphyseal clavicle fractures, proximal humerus fractures, distal radius fractures, distal biceps ruptures, mucous cysts, wrist arthritis, Kienbock disease, and a diagnosis of carpal tunnel syndrome in spite of normal electrophysiological testing.

Specific patient preferences influenced surgeon recommendations for treatment. It has been demonstrated that sex, race and socioeconomic status affect patient preferences. Consistent with our findings, subjective characteristics such as patient's wishes and preferences influence clinical decision making (16–20). The direction of influence of most of the preferences, based on the odds ratios, was logical and as expected. Preference for the least expensive treatment, preference for non-operative treatment, and preference for operative treatment only if there is consensus among surgeons that this option is useful, were all associated with recommendation of non-operative treatment.

But the finding that patients who value aesthetics were recommended operative treatment more often is contrary to what we assumed beforehand and might reflect surgeon biases. This could also reflect limitations of our description of the clinical scenario. Surgery may not result in a better contour given that added implants and scar might add to the perceived deformity. It is not clear that surgery leads to better aesthetics (e.g. scar and plate prominence vs. fracture deformity with a displaced diaphyseal clavicle fracture), but the surgeons in our study--on average--believe that it does. We were also surprised to find that preferences regarding immobilization and avoidance of complications had no measureable influence. These are common rationales for either operative or non-operative treatment. For instance, the treatment of a patient with a non-displaced fracture of the scaphoid is thought to be decided based on these preferences.

With regard to characteristics of surgeons, we found multiple associations between certain characteristics and treatment recommendations. First, we found that surgeons practicing in Europe, Asia and Australia were more likely to recommend operative treatment compared to surgeons in the US and Canada. These findings are in conflict with a previous study that demonstrated that surgeons in the US have higher rates of surgical interventions (21). However, as this study suggests, there might be a regional variation in the extent of incorporation of patient preferences into physicians' treatment decisions. Another discrepancy in treatment recommendations may lie in the experience of surgeons. In this study the most experienced surgeons (21 – 30 years of independent practice) recommended operative treatment more often compared to the group of surgeons that started independent practice more recently (0 – 5 years of independent practice). A possible explanation for this observation may be that experienced surgeons of the SOVG are more confident about their treatment recommendations and therefore recommend operative treatment earlier in the process compared to less experienced surgeons (22, 23). Another explanation is that older surgeons trained in an era where non-operative treatment was more common have a greater understanding of the results of non-operative management. Lastly, our data showed that orthopaedic trauma surgeons recommended operative treatment less frequently than hand and wrist surgeons. This variability in recommendations of surgeons has been observed in specific conditions and could be due to clinical knowledge of the presented scenarios, the severity of the condition and the way these conditions normally present to their daily clinic (13, 24).

We found that based on the odds ratios, patient preferences had a measurable influence on surgeon treatment recommendations, although not as much as we expected. In addition, surgeons on average interpreted aesthetic preferences in a way that some patients might not. This emphasizes the importance of helping patients reflect on their values and ensure their preferences are consistent with those values and not based on misconceptions. Supportive approaches such as the use of decision-aids might help patients identify their true preferences. Decision-aids also ensure that surgeon bias (e.g. surgery improves aesthetics) does not have a disproportionate influence on decision making (25). For instance, patients could be shown photos of various types of scars and deformities to refine their decision making. Additional study is merited to determine if treatment consistent with a patient's values might optimize adherence, facilitate recovery, increase satisfaction with care, and potentially improve patient reported outcomes.

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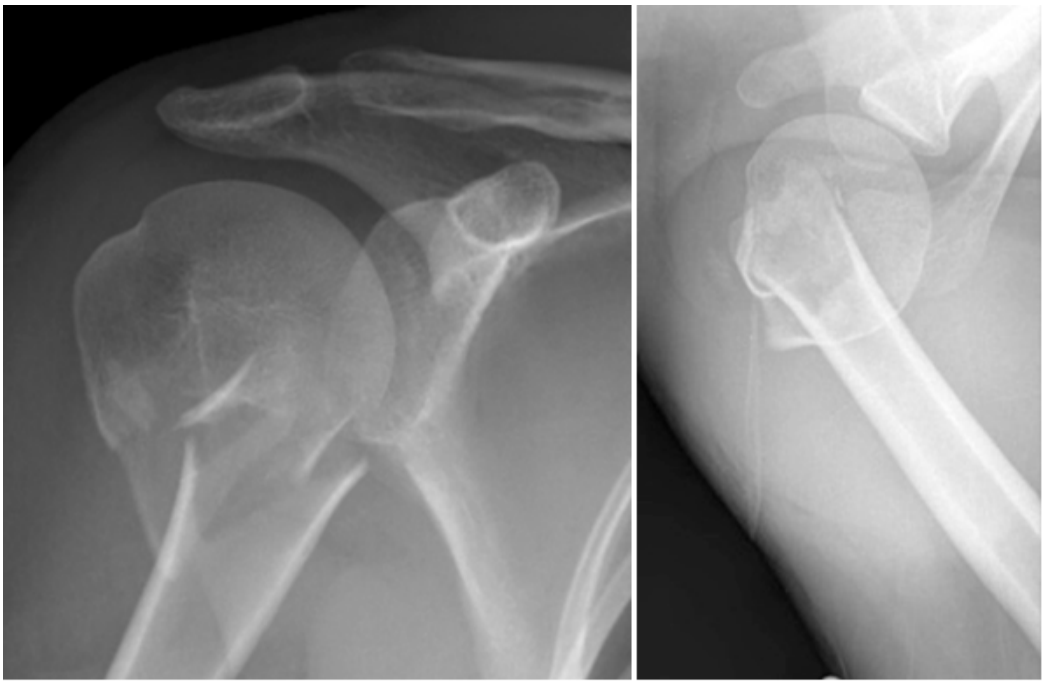
Appendix 1 case examples.
Case 1 Diaphyseal clavicle fracture:

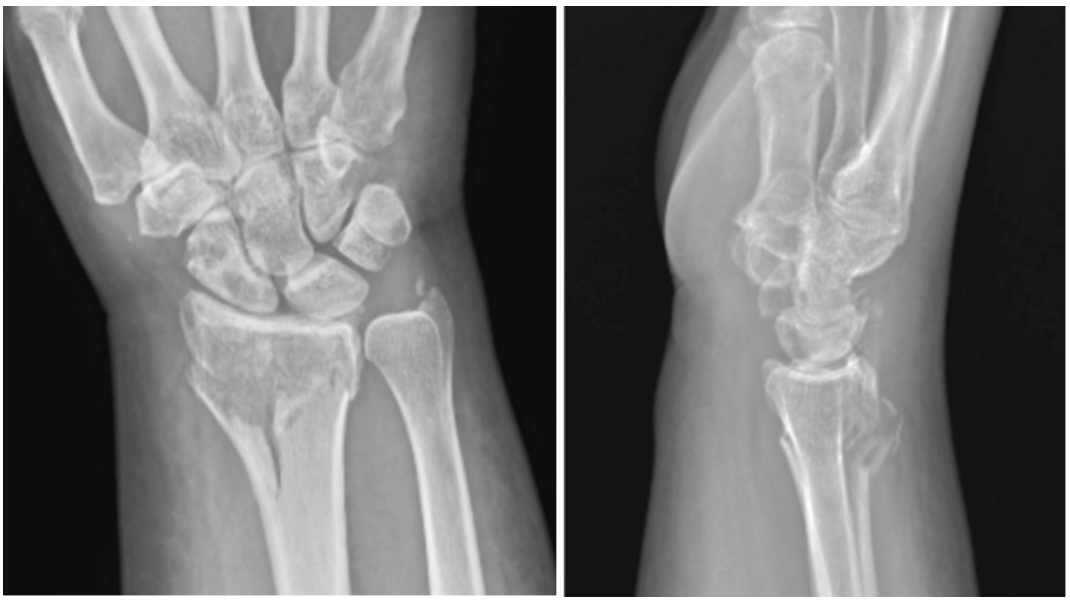
A 33 year old (woman/man) with no comorbidities, has this mid-shaft clavicle fracture. There are no signs of neurovascular damage. He/she has the following preferences. What treatment would you recommend: operative or non-operative?

Case 2 Proximal humerus fracture:



A 65 year old (female/male) with no comorbidities, has this proximal humerus fracture. There are no signs of neurovascular damage. He/she has the following preferences. What treatment would you recommend: operative or non-operative?

Case 3 Distal radius fracture:



A 55 year old (female/male) with no comorbidities, has this radius fracture. There are no signs of neurovascular damage. He/she has the following preferences. What treatment would you recommend: operative or non-operative?

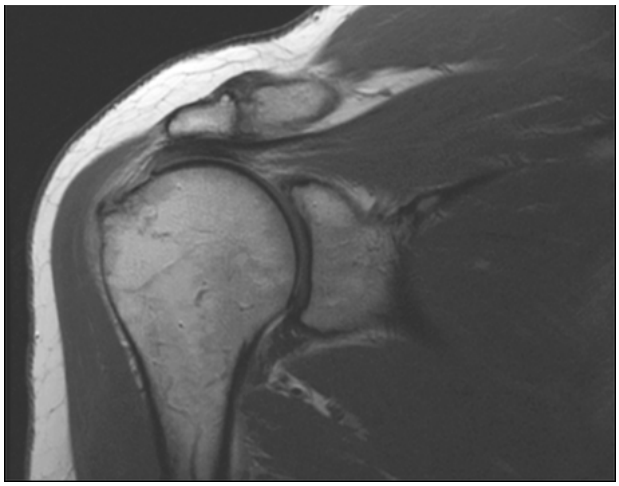
Case 4 Greater tuberosity fracture:

A 70 year old (female/male) with no comorbidities, has this greater tuberosity fracture. There are no signs of neurovascular damage. He/she has the following preferences. What treatment would you recommend: operative or non-operative?

Case 5 Scaphoid fracture:

A 25 year old (female/male) with no comorbidities, has this scaphoid fracture. There are no signs of neurovascular damage. He/she has the following preferences. What treatment would you recommend: operative or non-operative?

Case 6 Small rotator cuff defect:

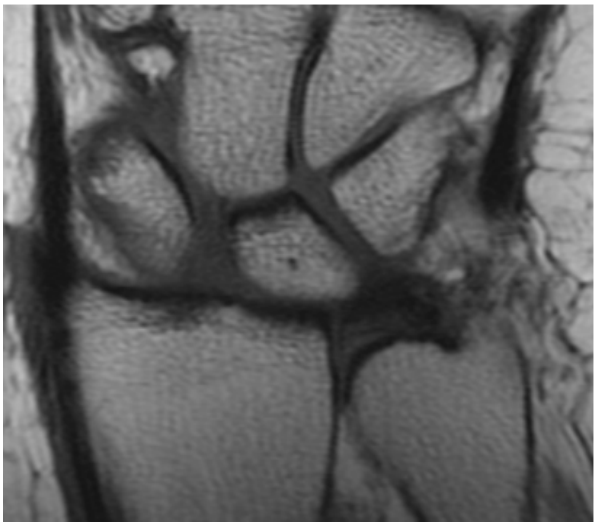


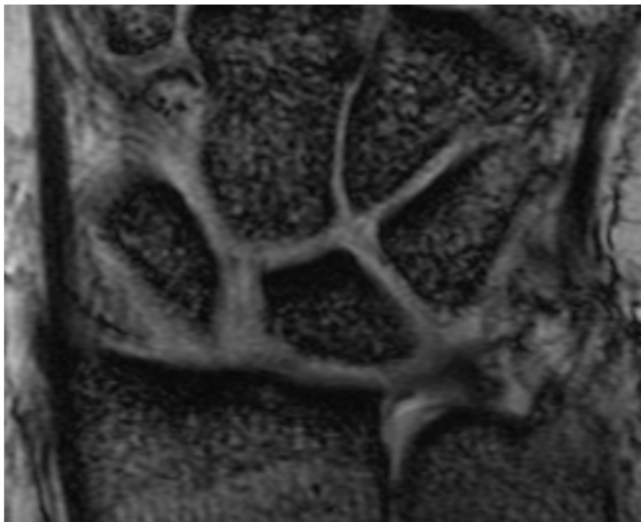
A 55 year old (female/male) with no comorbidities, has this small rotator cuff defect. He/she has the following preferences. What treatment would you recommend: operative or non-operative?

Case 7 Ganglion cyst:

A 30 year old (female/male) with no comorbidities, has this ganglion cyst. He/she has the following preferences. What treatment would you recommend: operative or Non-operative?

Case 8 Triangular fibrocartilage defect:





A 45 year old (female/male) with no comorbidities, has this TFCC defect. He/she has the following preferences. What treatment would you recommend: operative or non-operative?

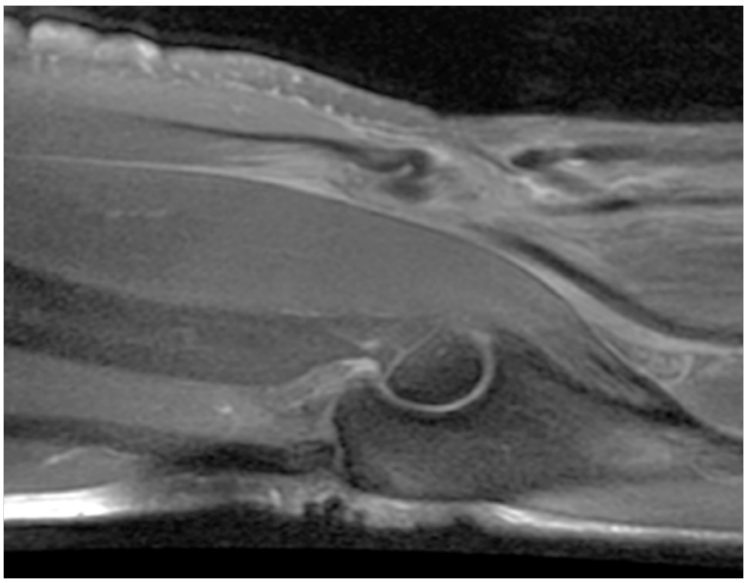
Case 9 Trapeziometacarpal arthrosis:

A 65 year old (female/male) with no comorbidities, has this trapeziometacarpal arthrosis. He/she has the following preferences. What treatment would you recommend: operative or non-operative?

Case 10 Scapholunate ligament insufficiency:

A 37 year old (female/male) with no comorbidities, has this scapholunate ligament insufficiency. He/she has the following preferences. What treatment would you recommend: operative or non-operative?

Case 11 Distal biceps rupture:

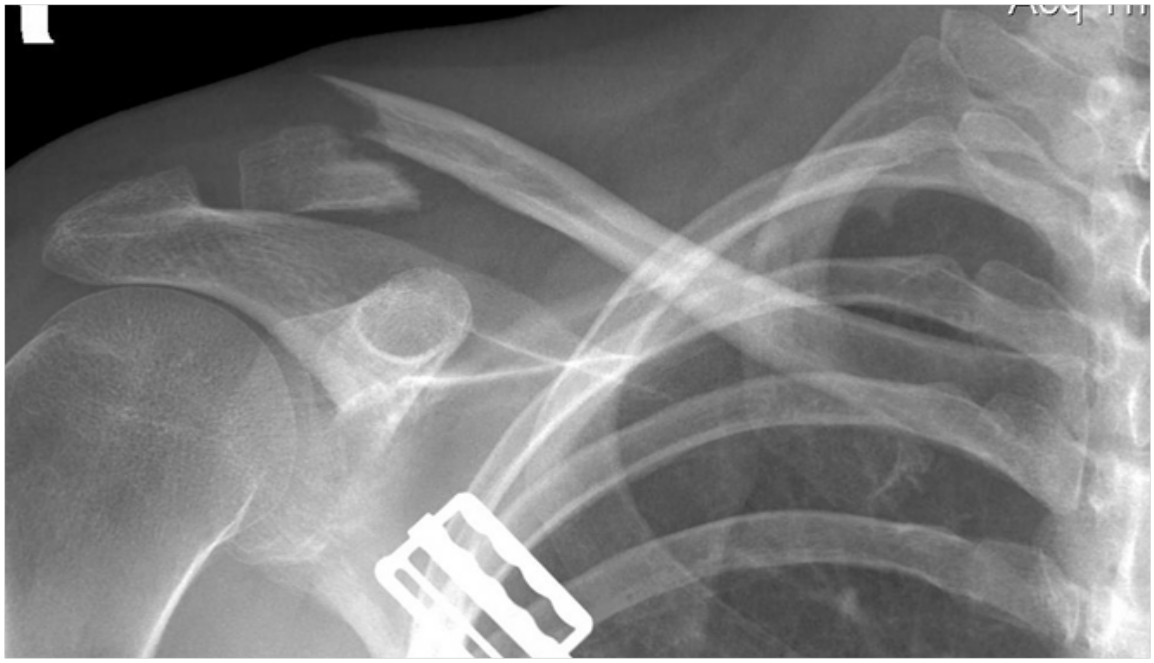


A 47 year old (female/male) with no comorbidities, has this distal biceps rupture. He has (preferences). What treatment would you recommend: operative or non-operative?

Case 12 Proximal biceps rupture:

A 51 year old (female/male) with no comorbidities, has this proximal biceps rupture. He/she has the following preferences. What treatment would you recommend: operative or non-operative?

Case 13 Lateral clavicle fracture:

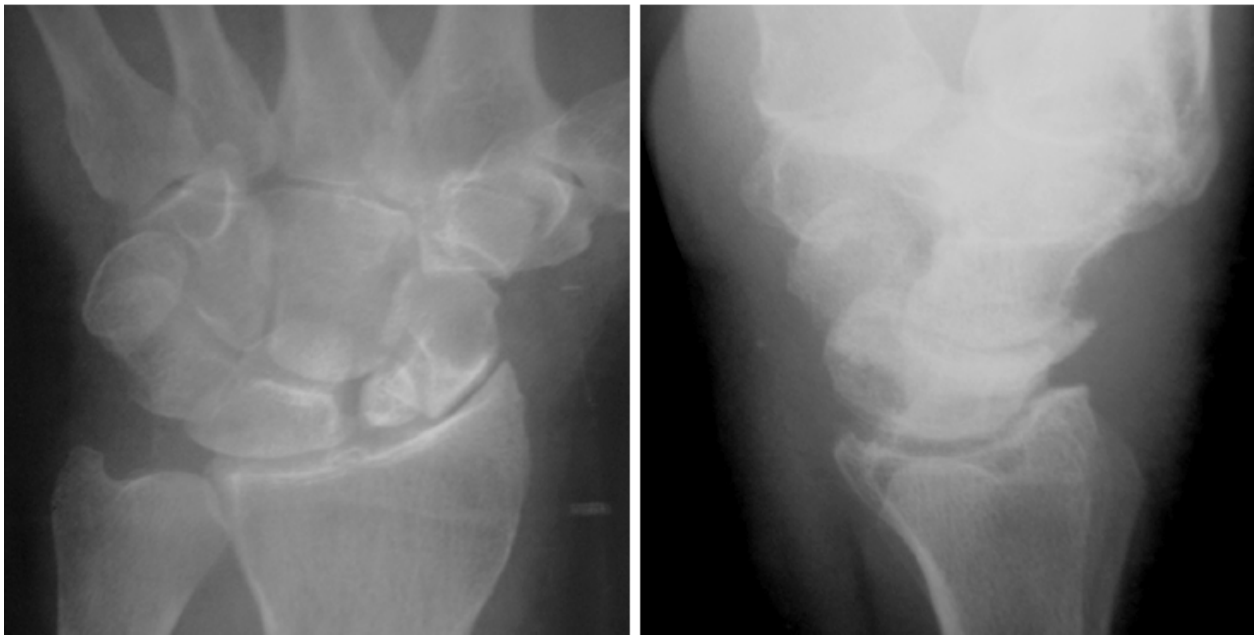


A 42 year old (female/male) with no comorbidities, has this lateral clavicle fracture. There are no signs of neurovascular damage. He/she has the following preferences. What treatment would you recommend: operative or non-operative?

Case 14 Mucous cyst:

A 38 year old (female/male) with no comorbidities, has this mucous cyst. He/she has the following preferences. What treatment would you recommend: operative or non-operative?

Case 15 Wrist arthritis:



A 50 year old (female/male) with no comorbidities, has this wrist arthritis. He/she has the following preferences. What treatment would you recommend: operative or non-operative?

Case 16 Kienböck disease:

A 42 year old (female/male) with no comorbidities, has this Kienböck disease. He/she has the following preferences. What treatment would you recommend: operative or non-operative?

Case 17 De Quervain tendinopathy:

A 44 year old (female/male) with no comorbidities, has de Quervain tendinopathy, based on the clinical picture. Clinical picture: Three months of symptoms. Corticosteroid injection did not help. He/she has the following preferences. What treatment would you recommend: operative or non-operative?

Case 18 Carpal tunnel syndrome:

A 40 year old (female/male) with no comorbidities, has radial tunnel syndrome, based on the clinical picture (EMG normal). Clinical picture: Lateral elbow pain and tenderness, distal to the epicondyle. Worse with activity. Neurological exam and electro diagnostic testing are normal. He/she has the following preferences. What treatment would you recommend: operative or non-operative?

Appendix 2 example of fictional scenario.

A 33 year old (woman/man) with no comorbidities, has this mid-shaft clavicle fracture. (radiograph) There are no signs of neurovascular damage. The patient has the following preferences.
1) The patient would prefer the least expensive treatment.
2) The patient is not concerned about immobilization time.
3) The patient would prefer the treatment with the lowest chance of major complications.
4) The patient is comfortable with either nonoperative or operative treatment.
5) The patient would prefer operative treatment only if there is consensus among surgeons that operative treatment is a useful option.
6) The patient is not concerned about aesthetics
What treatment would you recommend: non-operative or operative?

Appendix 3. Bivariate analysis of the influence of patient preferences on surgeon recommendations

	Recommend Non-operative Treatment	Recommend Operative Treatment	
	n=1913 (58%)	n=1399 (42%)	
Patient Characteristics	**n (%)**	**n (%)**	***P* value**
Gender			*0.36*
Female	957 (59)	677 (41)	
Male	956 (57)	722 (43)	
Preference	**n (%)**	**n (%)**	***P* value**
Least Expensive			0.017
Yes	999 (60)	671 (40)	
No	914 (56)	728 (44)	
Avoid Immobilization			0.57
Yes	953 (57)	711 (43)	
No	960 (58)	688 (42)	
Avoid Major Complications			0.25
Yes	980 (59)	688 (41)	
No	933 (57)	711 (43)	
Prefers Non-operative			0.007
Yes	991 (60)	658 (40)	
No	922 (55)	741 (45)	
Consensus that Surgery is Useful			0.001
Yes	1000 (61)	647 (39)	
No	913 (55)	752 (45)	
Aesthetics are Important			0.045
Yes	934 (56)	733 (44)	
No	979 (60)	666 (40)	