Research Article

Shared Decision Making, Fast and Slow: Implications for Informed Consent, Resource Utilization, and Patient Satisfaction in Orthopaedic Surgery

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Abstract

Introduction: Through shared decision making, the physician and patient exchange information to arrive at an agreement about the patient's preferred treatment. This process is predicated on the assumption that there is a single preferred treatment, and the goal of the dialog is to discover it. In contrast, psychology theory (ie, prospect theory) suggests that people can make decisions both analytically and intuitively through parallel decision-making processes, and depending on how the choice is framed, the two processes may not agree. Thus, patients may not have a single preferred treatment, but rather separate intuitive and analytic preferences. The research question addressed here is whether subjects might reveal different therapeutic preferences based on how a decision is framed.

Methods: Five clinical scenarios on the management of tibial plateau fractures were constructed. Healthy volunteers were asked to select among treatments offered. Four weeks later, the scenarios were presented again; the facts of the scenario were unchanged, but the description was altered to test the null hypothesis that minor changes in wording would not lead the subjects to change their decision about treatment. For example, incomplete improvement after surgery was described first as a gain from the preoperative state and then as a loss from the preinjury state.

Results: In all five cases, the variation predicted by psychology theory was detected. Respondents were affected by whether choices were framed as avoided losses versus potential gains; by emotional cues; by choices reported by others (ie, bandwagon effect); by the answers proposed to them in the question (ie, anchors); and by seemingly irrelevant options (ie, decoys).

Discussion: The influence of presentation on preferences can be highly significant in orthopaedic surgery. The presence of parallel decision-making processes implies that the standard methods of obtaining informed consent may require further refinement. Furthermore, if the way that information is portrayed makes surgery more or less appealing, the use of services may be subject to unwanted influence. If surgery were accepted preoperatively by the patient's intuitive process but evaluated after the fact by the analytic process (or vice versa), well-indicated and well-performed surgery may still fail to provide patient satisfaction.

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Shared decision making[1] has been defined as a process in which the physician and patient exchange information as a means to arrive at a decision about the patient's preferred treatment. When engaged in shared decision making, the clinician is expected to make a diagnosis and "[identify] treatment options according to clinical priorities; the patients' role is to identify and communicate their informed values and personal priorities, as shaped by their social circumstances."[2]

The shared decision-making process is predicated on the assumption that there is a preferred treatment and that dialogue between physician and patient is the correct route to its discovery. In that vein, Slover et al[3] lament doctors who "underestimate patients' desires for information" and accordingly assert that providing more "information about the treatment outcomes, costs, risks, and benefits of each option….is important in helping the patient decide on the best treatment choice for them." Yet it may be the case that there is no singular preference, and giving more information at some point only sways patients from one genuine preference to another.

There is good reason to believe that patients may in fact not have a single preference. According to the prospect theory psychological model described by Tversky and Kahneman,[4] people making choices do not necessarily make purely analytical decisions. Rather, people employ two parallel decision-making processes; one that is fast and instinctive and one that is slower and more deliberate.[5] These two processes, presented with similar input, might yield different outputs: one reflecting an emotional response and another reflecting analytical calculus. Accordingly, because physicians' choices in terms of how to portray the relevant medical information may in turn selectively stimulate one process or another, the framing of the clinical scenario may ultimately govern patients' choices.

This inconsistency of patient preferences could have great significance within orthopaedic surgery in at least three areas. First, because orthopaedic indications are dictated to a considerable degree by subjective perceptions, the use of orthopaedic services[6] may be influenced by modulation of how information is portrayed in the shared decision-making process. Second, if surgery were accepted by one of the patient's cognitive processes but evaluated after the fact by another process, well-indicated and well-performed surgery may still fail to provide the desired level of postoperative satisfaction and "fulfillment of expectations."[7] Finally, the presence of parallel decision-making processes suggests that the process of informed consent must be refined to account for this duality.

Accordingly, the research question addressed here is whether patients selecting among orthopaedic therapeutic options have more than one distinct preference; that is, in an almost literal sense, whether patients facing decisions can be of two minds. To assess this hypothesis, paired scenarios were presented to subjects who were then asked to select a treatment. Each paired scenario portrayed an identical situation, but the presentation was altered to evaluate whether or not it would evoke inconsistencies as suggested by psychology theory.

Methods

Five clinical scenarios concerning the management of tibial plateau fractures were constructed. Subjects were asked to select among the treatments offered. Four weeks later, the scenarios were presented again, with slight modifications in presentation but without change to the substance of the scenario (Table 1). All data were collected using a web-based interface and stored without demographic or personal identifiers.

Volunteers were recruited via an email sent to the medical students at our university. They were offered a $15 gift card to participate. A target sample size of 67 was calculated, based on an effect size one half as great as that demonstrated in the original description of the framing bias.[4] One hundred and thirty-one volunteers completed the study. The study was approved by the Institutional Review Board. To preserve anonymity, no identifying information was collected from the respondents during the study. University rules required subjects to complete a W-9 form to collect the gift card, but this information was not seen by the investigators.

Case 1

To test for a framing bias,[4] whereby people react to a choice differently based on whether changes are presented as gains or as losses, respondents were asked twice to choose between surgery and therapy to ameliorate postfracture arthrofibrosis. Subjects were told that they had sustained a fracture and, despite appropriate treatment, 40° of motion had been lost. They were informed that there were two treatments available, one with a certain outcome (ie, physical

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Table 1

Description of the Scenarios and Potential Triggers

Bias	Scenario	Possible Irrationality Trigger
Framing	Subjects asked to choose between surgery or therapy for postoperative arthrofibrosis. First iteration: surgery presented as a means to achieve a gain compared with current state Second iteration: surgery framed as a means of preventing loss compared with preinjury state.	Participants will be more risk seeking for the same prospective gain when the scenario is framed as a means for avoiding loss.
Affect	Participants asked if they would undergo prophylactic fasciotomy at the time of the index procedure to prevent compartment syndrome. First iteration: potential complication and its odds described verbally Second iteration: identical verbal description supplemented with photographs of an unsuccessfully treated compartment syndrome	Subjects' answers may be skewed by emotional response to visual information.
Anchoring	Subjects asked to state the maximal tolerable rate of surgical complications to select fracture surgery over casting. First iteration: no suggestions offered. Second iteration: a high rate of complications was suggested before asking what rate subjects would accept.	Participants really do not know what complication rate is acceptable. Hence responses can be influenced by a rate suggested to them.
Bandwagon	Participants asked to choose between arthroscopic and open surgical treatment. First iteration: arthroscopy was favored Second iteration: subjects were (mis)informed that most people in the first iteration chose open surgery before subjects were asked for their preferences	Subjects' answers will be skewed by those of others.
Decoy	Subjects first asked to select between SA or WA to prevent DVT.[a,b,c] First iteration: subjects asked to make this head-to-head choice. Second iteration: a third and obviously inferior choice was added (ISA). It was no better at preventing DVT than SA, but it had a higher risk of complications.	ISA was less appealing than SA, and it would be expected to be chosen by no one. If pure logic were applied, the inclusion of ISA should have no effect on the appeal of SA and WA. On the other hand, the "triumph" of SA over ISA might give SA an irrational boost (ie, a halo effect) in its comparison to WA, as well.

DVT = deep vein thrombosis, ISA= inferior strong anticoagulant, SA = strong anticoagulant, WA = weak anticoagulant
[a] SA was said to markedly decrease the risk of clots but increase the risk of hemorrhage.
[b] WA had less power to prevent clots but had a smaller risk of hemorrhage.
[c] Neither anticoagulant was necessarily better; respondents would simply be indicating a preference for either high risk/high reward or low risk/low reward option.

therapy) and one whose outcome was uncertain (ie, surgery). In the first presentation, they were told that therapy offered a certain gain of 10° of motion, whereas surgery offered a 25% chance at a (complete) 40° gain and a 75% chance of no gain at all. In the second presentation, the subjects were told that therapy offered a guaranteed net loss of 30° of motion relative to the preinjury state, whereas surgery offered a 75% chance of a 40° loss, but a 25% chance of preventing any loss of motion. In both scenarios, the expected change of both treatments was 10°, with therapy offering a certain change of 10° and surgery offering a 25% chance of 40° and 75% chance of 0°. The difference was that the certainty associated with surgery was framed in the first presentation as a conduit to possible gain, whereas in the second presentation, it was framed as a means of avoiding loss of motion compared with the preinjury state.

Case 2

To measure the potential effect of emotions[8] on decision making (what may be termed an affect bias), respondents were twice asked if, at the time of an index surgical fixation, they would prefer to undergo a prophylactic fasciotomy to prevent compartment syndrome, as opposed to having a fasciotomy performed only after signs and symptoms appeared. The latter approach was stipulated to have a slightly higher risk of failure than the prophylactic procedure but avoids unnecessary surgery. In the first instance, the potential complication and its odds were verbally described to the subject, but in the second iteration, the identical verbal description was supplemented by photographs of an unsuccessfully treated compartment syndrome (eg, necrotic muscle followed by an amputation).

Case 3

To test for an anchoring bias[9] (ie, the tendency to focus heavily on the initial information presented), the participants were first asked to state the maximal rate of surgical complications that they would tolerate to accept fracture surgery. In the second iteration, respondents, prior to stating their own opinion, were told that others had accepted a high rate.

Case 4

To test for a bandwagon bias[10] (ie, the theory that people do something because others are doing it), the respondents were asked to choose between arthroscopic and open surgical treatment. After the first iteration, it was seen that arthroscopy was favored. In the second iteration, before asking for preferences, the subjects were (mis)informed that most people had chosen open surgery in the first iteration.

Case 5

To test for a decoy bias,[11] in which respondents might change their preference between two options when presented with a third option that is not itself chosen, participants were first asked to select between strong or weak anticoagulants to prevent deep vein thrombosis (DVT)/pulmonary embolism (PE) after the fracture. The strong anticoagulant (SA) was said to markedly decrease the risk of DVT/PE but commensurately increase the risk of hemorrhagic stroke. The weak anticoagulant (WA) was said to decrease the risk of DVT/PE only marginally but increase the risk of stroke by only a small amount. This choice was constructed with neither drug necessarily being a better option. Subjects would simply be indicating a preference for either high risk/high reward or low risk/low reward. In the first round of the experiment, the respondents were asked to make this choice as a head-to-head comparison. In the second presentation, a third and obviously inferior choice was added: an inferior strong anticoagulant (ISA) that was no better at preventing DVT/PE than the SA but had a higher risk of complications. This third choice was unmistakably less appealing than the SA, and it would be expected to be chosen by no one but was included to determine whether the “triumph” of the SA over the ISA might give the SA an irrational boost in its comparison to the WA. All proportions were assessed with the chi square test; differences in means were evaluated with a two-tailed student’s t-test.

Results

A summary of the changes between the initial and second iterations of each case is provided in Table 2.

Case 1

In the test for a framing bias, participants were asked if they would prefer surgery or nonsurgical therapy for the treatment of arthrofibrosis, with the uncertainty associated with surgery framed in one of two ways. When the uncertainty associated with surgery was framed as a potential gain, 49 subjects (37%) opted for surgery. In the second iteration in which uncertainty associated with surgery was presented as a means of avoiding a potential loss of motion, 80 subjects (61%) opted for surgery ($P < 0.001$). Subjects were seen to be more risk seeking to avoid a loss but more risk averse when facing a potential gain.

Case 2

In the test for an affect (emotional) bias, participants were asked whether they were willing to undergo prophylactic fasciotomy to prevent potential compartment syndrome. In the first iteration, in which compartment syndrome was described only verbally, 56 subjects (43%) elected to undergo the procedure. During the second iteration, participants were posed with the exact same question and were shown graphic images of compartment syndrome; 92 subjects (70%) chose surgery ($P < 0.001$).

Case 3

In the test for an anchoring bias, participants were asked for the maximal acceptable rate of surgical complications for a given procedure. The mean response in the first iteration of the scenario was a 17.8% rate. When it was suggested that an artificially high rate of 78% was reasonable, the mean response to the same question was 32.2% ($P < 0.001$).

Case 4

This clinical scenario tested for a bandwagon bias among subjects. They were asked if they would prefer open surgery or minimally invasive surgery. The number of subjects who

Table 2

Responses to Modifications

Bias	First Iteration	Second Iteration	Change Between Presentations
Framing	Surgery framed as a potential gain: 49 of 131 chose surgery	Surgery framed as a means to avoid loss: 80 of 131 chose surgery	Consistent: 78 Changed: 53 (42 changed to surgery; 11 changed to therapy)
Affect	Only verbal information provided: 56 of 131 chose fasciotomy	Verbal information and complication photographs provided to subjects: 92 of 131 chose fasciotomy	Consistent: 85 Changed: 46 (41 favored fasciotomy; 5 declined fasciotomy)
Anchoring	No anchor (ie, suggested value) was provided for the maximal acceptable rate of complications. Mean response = 17.8%	When subjects told that a 78% rate of complications was reasonable, subjects had a higher mean maximal acceptable rate of complications (32.2%)	Consistent: 17 Increased: 95 Decreased: 19
Bandwagon	No information on the choice selected by peers provided to subjects: 5 of 131 chose open surgery	Subjects were told that open was chosen by 85% of their peers: open surgery was chosen by 24 of 131	Consistent: 110 Changed: 21 (20 favored open surgery; 5 changed to minimally invasive)
Decoy	33 of 131 chose SA 98 of 131 chose WA	ISA: none Original SA: 57 of 131 WA: 74 of 131	Consistent: 93 Changed: 38 (31 changed preference to original strong anticoagulant; 7 changed to weak anticoagulant)

ISA = inferior strong anticoagulant, SA = strong anticoagulant, WA = weak anticoagulant

initially requested open surgery was only five (4%). However, in the second presentation, the group was told that 85% of the participants had chosen open surgery initially (contrary to fact), and 24 (18%) now chose open surgery ($P < 0.001$).

Case 5

This scenario tested for a decoy bias by asking the subjects in the first iteration which of the following they preferred for DVT prophylaxis: a SA with a small risk of bleeding or a WA with an increased risk of DVT. When faced with a direct choice, 33 participants (25%) chose the SA. In the second iteration, the subjects were given the same two choices plus a third and obviously inferior choice (ISA). None of the subjects chose the ISA, yet 57 (44%) now chose the original SA, almost double the number of subjects who selected that option initially ($P < 0.001$).

Discussion

Rational consistency is a hallmark principle of sound decision making.[12] Surgical indications that are inconsistently applied across geographic[13] or temporal[14] boundaries may be deemed suspect, and fracture classifications that lack consistent assignment can be dismissed as inadequate.[15] Therefore, it seems reasonable that patients' decision-making processes can be considered sound only if they too demonstrate consistency.

In our study, volunteer subjects were shown to be inconsistent in their selection of treatments, despite the consistency of the facts driving the selection. Nevertheless, this phenomenon does not necessarily reflect a flaw in the subjects' decision-making process. Rather, the apparent inconsistency of articulated preferences may be the product of patients having two distinct mental processes for determining a preference, and the two processes may not always agree.

The demonstrated inconsistency of patient preferences could have significance with regard to orthopaedic shared decision making in at least three areas. First, because indications are governed to a considerable degree by subjective perceptions, the use of orthopaedic services[4] may be influenced by modulation of how information is portrayed in shared decision making. Second, if surgery were accepted by one of the patient's cognitive processes but evaluated after the fact by another, then well-indicated and well-performed surgery may still fail to provide the desired level of post-operative patient satisfaction and fulfillment of expectations.[10] Finally, parallel decision-making processes have important implications for the process of informed consent.

If patients' expressed preferences can be changed by the way that facts are presented, the overall utilization of services (ie, the total number of patients in a population who do or do not opt for surgery) can be changed, as well. It might be possible to induce[16] demand for surgery or, if desired, to retard[17] that demand. The latter may become increasingly important in healthcare systems with bundled payments.

The inconsistency of expressed preferences may also explain a commonly encountered phenomenon: namely, that even well-executed surgery may not attain the levels of patient satisfaction that the objective result would be expected to attain.[18] This dissatisfaction may be the result of a fast and instinctive decision-making process driving the initial choice to undergo the procedure, whereas a slow and deliberative process allows evaluation of the postoperative result. Thus, well-executed surgery may still fail to meet the patient's expectations—at least when those expectations are defined for a second time after surgery. Understanding the root cause of this redefinition of expectations and not dismissing it as irrational thinking may allow for the development of better tools to preempt postoperative patient dissatisfaction.

The presence of parallel decision-making processes also is germane to the issue of informed consent, especially with regard to malpractice claims that rest on the assertion that consent was not given. Patients may allege that informed consent was not truly obtained because some critical piece of information was not shared; that is, patients may say, "If only I were told that...." However, this information might be critical only in retrospect. Because the mental process providing the postoperative analysis may very well have been dormant (or overruled) at the time consent was given preoperatively, retrospective comments about the patient's prior state of mind can be wrong, even if made sincerely and with no intent to deceive.

We acknowledge that there are several limitations to our study. Our subjects were students, not patients. Although it can be claimed that many results in psychology were discovered using similar student subjects, the use of students may be suboptimal. Henrich et al[19] stated that "we need to be less cavalier in addressing questions of human nature on the basis of data drawn from this particularly thin, and rather unusual, slice of humanity." It also might be argued that the study was indeed strengthened, not weakened, by the choice of students as subjects.[20] Real trauma patients who are distracted by pain might be less able to think clearly. Also, one could argue that medically sophisticated subjects such as ours could be expected to make better decisions, and therefore the detection of inconsistencies as shown here in fact strengthens our conclusions.

Our decision to collect our data using a web-based interface is a limitation with regard to any claims that our methods actually replicate a typical oral discussion. Yet no such claims were made, and the use of a computer is actually a strength of the study because a computer interface offers a precise and exact means of conveying information and is not confounded by issues of body language, tone, facial expression, and other forms of nonverbal communication. Moreover, the use of a computer interface may more closely replicate the shared decision-making process in the future because a great variety of information-sharing computer systems already are in place, such as the American Academy of Orthopaedic Surgeons (AAOS) OrthoInfo portal.[21] In addition, multimedia programs have been shown to improve the informed consent process for research trials[22,23] as well as for isolated orthopaedic surgical procedures.[24]

It must also be acknowledged that our scenarios were staged and cannot be seen as evidence that irrationality is common, let alone frequent. Rather, the evidence from these staged scenarios merely indicates that the phenomenon of concern does exist.

Clinical Applications

Despite the study's limitations, its findings may inform discussions of orthopaedic surgical indications, utilization, and outcomes. If people really do have distinct preferences based on distinct but parallel decision-making processes, then decisions made based on preferences might defy reproducible definition. If the selection of treatment may be dictated by one psychological process and retrospectively evaluated by another, then it is likely that perfectly predictable outcomes might nonetheless disappoint patients.

Because parallel decision-making processes exist, dialogue may bring us no closer to discovering the patient's true preference. Indeed, shared decision making may not resolve inconsistencies in stated preferences but actually amplify them. To help resist the biases presented, we propose the use of the following practices during shared decision making: making standardized presentation of the available treatment options, avoiding mention of irrelevant choices, offering potential treatment options without mentioning the choice made by other patients (ie, bandwagon bias), asking questions without including a proposed answer, and presenting the potential outcomes directly.

A prepared general script can be used for standardized presentation of common procedures and to ensure that the same facts are presented to all. For example, patients can be referred to the AAOS OrthoInfo portal[24] to learn about knee replacement. Irrelevant treatment choices can be avoided by discussing only the available treatment options. For example, if a surgeon never uses allografts for anterior cruciate ligament reconstruction, mentioning that other surgeons might offer this option (without suggesting that the patient should visit that surgeon and consider that choice) could serve as a decoy that distracts the patient.

The surgeon who believes that a given distal radius fracture could be treated equally well with either surgery or immobilization may tip the decision inappropriately by adding "by the way, most of my patients with this type of injury choose surgery," thereby introducing bandwagon bias. The surgeon can avoid anchor bias by asking questions without including a proposed answer. If patients are asked to state a numerical answer that may drive the informed consent decision (eg, in the setting of an acromioclavicular joint separation, it may be informative to know how much strength loss the patient will tolerate), it is important to ask the question without an imbedded anchor.

Potential outcomes should be presented to the patient in a direct fashion and not as relative changes (ie, gains or losses) from the current state. Telling the patient that "a hip replacement may allow you to walk 10 blocks without assistance" may be preferable to both "a hip replacement may allow you to walk 9 blocks more than you can now" and "a hip replacement will keep you out of wheelchair for a 10-block trip."

Ultimately, discussion with the patient remains "the cornerstone of informed consent,"[23] and the principles advocated by the AAOS Information Statement on Patient-Physician Communication[25]—attention, understanding, empathy, and honesty, among others—remain paramount to effective exchange of information. Nonetheless, even adherence to those principles may not be enough. Our findings indicate that patients are susceptible to cognitive biases; therefore, great care must be taken to ensure that patients are not inadvertently swayed in their decision-making processes.

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References

Evidence-based Medicine: Levels of evidence are described in the table of contents. In this article, reference 6 is a level I study. Reference 22 is a level II study. References 4, 9, and 17 are level III studies. References 7, 14, 18, and 24 are level IV studies. References 1-3, 5, 8, 10-13, 15, 16, 19, 20, and 23 are level V expert opinion.

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