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Can avoidance of complications lead to biased healthcare decisions?

Jennifer Amsterlaw[3,5], Brian J. Zikmund-Fisher[1,2,3], Angela Fagerlin[1,2,3], and Peter A. Ubel[*1,2,3,4]

[1]VA Health Services Research & Development Center of Excellence, VA Ann Arbor Healthcare System, Ann Arbor, MI
[2]Division of General Internal Medicine, University of Michigan, Ann Arbor, MI
[3]Center for Behavioral and Decision Sciences in Medicine, Ann Arbor, MI
[4]Department of Psychology, University of Michigan, Ann Arbor, MI
[5]Institute for Learning & Brain Sciences, University of Washington, Seattle WA

Abstract

Imagine that you have just received a colon cancer diagnosis and need to choose between two different surgical treatments. One surgery, the "complicated surgery," has a lower mortality rate (16% vs. 20%) but compared to the other surgery, the "uncomplicated surgery," also carries an additional 1% risk of each of four serious complications: colostomy, chronic diarrhea, wound infection, or an intermittent bowel obstruction. The complicated surgery dominates the uncomplicated surgery as long as life with complications is preferred over death.

In our first survey, 51% of a sample (recruited from the cafeteria of a university medical center) selected the dominated alternative, the uncomplicated surgery, justifying this choice by saying that the death risks for the two surgeries were essentially the same and that the uncomplicated surgery avoided the risk of complications. In follow-up surveys, preference for the uncomplicated surgery remained relatively consistent (39%–51%) despite (a) presenting the risks in frequencies rather than percents, (b) grouping the 4 complications into a single category, or (c) giving the uncomplicated surgery a small chance of complications as well. Even when a pre-decision "focusing exercise" required people to state directly their preferences between life with each complication versus death, 49% still chose the uncomplicated surgery.

People's fear of complications leads them to ignore important differences between treatments. This tendency appears remarkably resistant to debiasing approaches and likely leads patients to make healthcare decisions that are inconsistent with their own preferences.

Keywords: risk communication, medical decisions, cognitive biases

1 Introduction

Over the past several decades, there has been a revolution in healthcare decision making, with much more recognition among healthcare practitioners that patients deserve a role in their healthcare decisions. A few decades ago, oncologists frequently withheld cancer diagnoses from patients out of fear that patients could not handle this information (Novack et al., 1979). It was not uncommon around this time for a woman to wake up from a breast biopsy procedure to learn not only that she had breast cancer, but that the surgeon had already taken the liberty of performing a mastectomy (Lerner, 2001). These practices are unheard of today. Patients with cancer diagnoses are told about their diagnoses and are often involved in important treatment decisions: deciding for example, whether to opt for surgical therapies versus radiation. Healthcare practitioners are involving patients in these decisions out of recognition that many of these decisions are not purely medical judgments but also include value judgments that only patients themselves can make (Gafni & Whelan, 1998). It is the patient who needs to consider tradeoffs between the benefits of treatment and the potential complications treatments entail. The "right choice" for any specific patient therefore often depends on that patient's preferences or attitudes about possible outcomes.

At the same time as the medical community has been moving toward greater patient involvement in healthcare decisions, decision-making research has identified a host of circumstances in which people don't seem to make the

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right choice. For example, people make different choices when their options are framed as gains or losses, preferring a surgical procedure with a 90% survival rate to one with a 10% mortality rate, even though the two procedures are identical (McNeil, Pauker, & Tversky, 1988). They prefer different healthcare providers when evaluating each possible doctor separately versus when considering the set of possible physicians all at once (Zikmund-Fisher, Fagerlin, & Ubel, 2004). Their choices are unduly influenced by uninformative anecdotes (Ubel, Jepson, & Baron, 2001). A recurrent theme in this line of research is that people's preferences are often inconsistent or easily overridden by subtle cognitive processes (Fischhoff, 1991).

On one side, then, is a push to give patients more information so they can make decisions that are consistent with their personal preferences, while on the other side is a growing psychological literature revealing people's tendency to make choices that are in fact *inconsistent* with their own preferences (Ubel, 2002). These two worlds are in the process of colliding, as clinicians and researchers become aware of the likelihood that patients, even when given comprehensible information about important healthcare tradeoffs, will make irrational or inconsistent choices because of the way they process the information they are given.

Take, for example, a common rule of thumb about the kind of information healthcare providers are expected to give patients before enrolling them in research trials or before consenting them for invasive surgical procedures. Clinicians are expected to inform patients about any treatment complication that is reasonably likely to occur. Although there is no absolute cutoff for how likely a complication must be for clinicians to tell patients about it, most experts feel that clinicians should tell patients about any moderately severe complication that occurs at least 1% of the time, and should inform them about serious complications that occur even less often than that. This approach to risk communication is reflected in the Food and Drug Administration's Guidance for Industry regarding the content and format of prescription drug labels ("Guidance for industry: adverse reactions section of labeling for human prescription drug and biological products — content and format," 2006).

Many clinicians recognize the potential problems created by this rule of thumb. A long list of potential complications may scare patients away from what otherwise appears to be their best treatment option. Imagine a patient with colon cancer who faces a choice between the following two hypothetical surgical procedures: one surgery (the "complicated surgery") cures 80% of patients without complications, cures 4% of patients with one of four complications (leaving them with either chronic diarrhea, a slow healing wound infection, an intermittent bowel obstruction, or a colostomy), and is unable to cure 16% of patients, who therefore die of the cancer. Another surgery (the "uncomplicated surgery") cures 80% of patients without complications and is unable to cure 20% of patients, who therefore die of the cancer. In a pilot study, we determined that the vast majority of people believe that living with each of the four surgical complications is better than being dead. For those people, the complicated surgery is the choice that best fits these preferences. Yet the sheer number and graphicness of these four complications might nevertheless be enough to compel these people to choose the uncomplicated surgery.

Our current research has two goals. In Study 1, we tested how people respond in a decision-making situation where their 'best' treatment option carries a risk of several unpleasant complications. Using the colon cancer case just described, we asked people which treatment they would choose. We found that many people prefer the uncomplicated surgery — that is, they opt for the treatment with a higher risk of death just to avoid the possibility of complications. In Studies 2 through 4, we varied how we presented the scenario information to investigate the stability of this choice and to investigate underlying processes. Our results confirmed that for most people, choice of the uncomplicated surgery was actually inconsistent with their stated preferences and values. Nevertheless, even when we made people's own preferences transparent, many continued to make inconsistent choices. We conclude that avoidance of treatments carrying small risks of unpleasant complications leads to inconsistencies between stated preferences and people's decisions, and that these inconsistencies are pervasive and difficult to eliminate.

2 Study 1

In Study 1, we presented participants with the colon cancer scenario described above (see Appendix for full text). Accompanying the scenario was a simple table summarizing the treatments (Table 1).

It should be noted: in none of our studies did we refer to the treatment options as "the complicated surgery" or "the uncomplicated surgery," but instead referred to them throughout as Surgery 1 and Surgery 2. However, for purposes of presentation, we will refer to them throughout this manuscript as the complicated and the uncomplicated surgery.

The choice set up a tradeoff between mortality risk and risk of serious surgical complications: the complicated surgery had a lower mortality rate (16% vs. 20%) but by the same margin of difference carried an additional 1% risk of each of four complications: colostomy, chronic diarrhea, wound infection, or intermittent bowel obstruc-

Table 1: Treatment summary table presented with scenario in Study 1.

Possible outcome	Surgery 1 (complicated)	Surgery 2 (uncomplicated)
Cure without complication	80%	80%
Cure with colostomy	1%	
Cure with chronic diarrhea	1%	
Cure with intermittent bowel obstruction	1%	
Cure with wound infection	1%	
No cure (death)	16%	20%

tion. (Note that the scenario did not explicitly describe the outcomes as mutually exclusive, and in this respect the information is consistent with how side effects and complications often occur.) In pilot testing, we determined that the vast majority of people (>90%) thought that each of the four surgical complications was preferable to dying of colon cancer. Thus, for most people, the complicated surgery should be preferred to the uncomplicated surgery. However, we expected that the desire to avoid the complications associated with the complicated surgery might lead some of these people to prefer the uncomplicated surgery.

2.1 Methods

2.1.1 Participants

Participants were volunteers recruited from a university office building and the cafeteria of a university medical center. A total of 87 participants completed the questionnaire. The sample was 91% Caucasian and 65% female. The mean age of participants was 39.2 years ($SD = 12.9$) and 43% of participants had completed at least a college degree.

2.1.2 Procedure

Participants received the scenario as part of a written questionnaire that also contained other questions about unrelated medical decision-making topics. Demographic questions about participants' age, race, education, profession, and personal experience with colon cancer were also included. Participants completed the questionnaire at their own pace.

2.2 Results

Out of 87 participants, 44 (about 51%) selected the uncomplicated surgery, the dominated alternative. Analyses showed no significant effects of gender, race, or education level on surgery choice. 42% of our sample reported being affiliated with the medical/health profession; these individuals did not make significantly different surgery choices (39% vs. 58%, $\chi^2(1) = 3.06$, n.s.). There were also no differences as a function of prior experience with colon cancer. While 44% of participants reported that they or a close friend or family member had had colon cancer, these individuals chose the uncomplicated surgery at the same rate as other participants (54% vs. 48%, $\chi^2(1) = .315$, n.s.). Respondents who choose the uncomplicated surgery tended to be older than respondents who chose the complicated surgery (M age = 43.3 vs. 35.1 years, $t(84) = 3.10$, $p < .01$).

Most participants (87%) provided a written explanation for their surgery choice. Of these, 94% of participants selecting the uncomplicated surgery cited a desire to avoid complications as the reason for their choice, with 60% simply reporting that they did not want complications and 34% also explicitly mentioning the tradeoff with mortality risk. Two additional people mistakenly believed the uncomplicated surgery improved their chances of survival. In contrast, 100% of participants selecting the complicated surgery cited its higher survival rate as the reason for their choice, with 68% simply mentioning its better survival rate and 32% also describing the tradeoff between death and complications.

2.3 Discussion

Results from Study 1 showed that regardless of background factors such as gender, race, education, medical affiliation, or previous experience with colon cancer, many people preferred the uncomplicated surgery to the complicated surgery. Written responses indicated that this preference stemmed from a desire to avoid complications. Most participants appeared to have understood the information presented, with well over half the sample explicitly acknowledging the tradeoff between mortality risk and risk of complications. However, those who chose the uncomplicated surgery were unwilling to risk the possibility of serious complications to improve their overall

Table 2: Treatment summary table presented with Study 2 "Complications Added" version.

Possible outcome	Surgery 1 (complicated)	Surgery 2 (uncomplicated)
Cure without complication	80%	80%
Cure with colostomy	1%	0.25%
Cure with chronic diarrhea	1%	0.25%
Cure with intermittent bowel obstruction	1%	0.25%
Cure with wound infection	1%	0.25%
No cure (death)	16%	19%

chance of survival. Why would this be the case? Barring the possibility that people actually would prefer to die than live with complications (a possibility we examine in Study 4), selecting the treatment with the higher mortality risk seems irrational. We next explored reasons for this apparent inconsistency.

3 Study 2

Study 2 investigated the possibility that choice was affected by the number of possible outcomes listed for each treatment option. One possibility was that people were attracted to the uncomplicated surgery because it had only two outcomes associated with it — total cure and death — while the complicated surgery had six possible outcomes, four of which were ambiguous "cured with complications" outcomes. People may simply have been averse to this kind of uncertainty, leading them to choose the surgery with fewer and less ambiguous possible outcomes.

People are notoriously averse to uncertainty. For example, in the 1980s, back when HIV infection was a death sentence, studies showed that men were happier after they received HIV test results than while they were waiting for the results *no matter what their test results revealed!* The uncertainty of not knowing their HIV status was harder to cope with than the certainty of a rapid demise (Sieff, Dawes, & Loewenstein, 1999). The same phenomenon was demonstrated among people undergoing genetic testing for Huntington's Disease, a devastating, hereditary neurologic illness that causes uncontrolled spasms, dementia and death (Wiggins et al., 1992). Rationally speaking, it should be easier to live with a 50% chance of Huntington's Disease than a 100% chance. But it is difficult for people to cope with the uncertainty of a 50% chance of illness. Uncertainty is so stressful that it can create paradoxical situations. For example, during World War II, people living in London were deluged by nightly bombing raids, while those living in the suburbs were raided sporadically. Objectively speaking, it should feel worse to be bombed nightly than to be bombed less often. However, people in the suburbs were significantly *more* likely to develop stomach ulcers than city dwellers, because they were so stressed out by the uncertainty of when they would be exposed to bombing raids (Frederick & Loewenstein, 1999).

We hypothesized that the uncomplicated surgery, despite having a higher death rate than the complicated surgery, would feel less uncertain to subjects, and therefore more desirable. To test this, we developed a new version of the scenario in which the uncomplicated surgery was now described as carrying a small risk of complications (Table 2). In this "Complications Added" version, the uncomplicated surgery now carried a 0.25% risk of each of the four complications described for the complicated surgery. To compensate for this change while preserving the same basic probability information, we reduced the death rate for the uncomplicated surgery from 20% to 19%. If people simply preferred the uncomplicated surgery because it had less ambiguous outcomes, they should now prefer it less (even though the decrease in the death rate actually makes this option more attractive). With both treatments now carrying the potential for the same set of unpleasant outcomes, people should be more inclined to choose the option that maximizes their survival.

The "Complications Added" version also tests an explanation for choosing the uncomplicated surgery grounded in the non-linear probability weighting function of Kahneman and Tversky's Prospect Theory (Kahneman & Tversky, 1979). Prospect Theory holds that very small probability events are overweighted in decisions. As a result, the change in the probability of a complication (e.g., colostomy) from 0% to 1% may influence choice far more than the equivalent 1% reduction in the death rate from 20% to 19%. However, the very small (0.25%) risks of each complication added to the uncomplicated surgery in the "Complications Added" version should be similarly overweighted, and thus Prospect Theory would predict that people should shift their preferences towards the

Table 3: Treatment summary table presented with Study 2 "Grouped Complications" version.

Possible outcome	Surgery 1 (complicated)	Surgery 2 (uncomplicated)
Cured without complications	80%	80%
Cured, but with one of the following complications: colostomy, chronic diarrhea, intermittent bowel obstruction, or wound infection	4%	
No cure (death)	16%	20%

survival maximizing outcome, the complicated surgery, when compared to the results from Study 1.

Another possible source of the inconsistency was that people were relying on a simple tallying strategy to decide on the best option, for example by counting up the treatments' "wins" and "losses" in each outcome category. In that case, the complicated surgery may have looked like a bad option because it had five "losses" to the uncomplicated surgery (for each of the four complications outcomes and the death outcome) and only one "win" (for death rate). One potential way to increase preference for the complicated surgery, then, would be to reduce its "losses" to the uncomplicated surgery by presenting the complications outcomes as a single outcome with a 4% risk, rather than as four separate outcomes each with a 1% risk. This is what we did in the "Grouped Complications" version of the scenario (Table 3). We predicted that if a tallying strategy was in use, this change would increase preference for the complicated surgery.

3.1 Methods

3.1.1 Participants

Participants were volunteers recruited from the cafeteria of a university medical center, two university office buildings, and a local shopping center. A total of 80 participants completed the Complications Added version, and 100 participants completed the Grouped Complications version. The sample was 84% Caucasian and 57% female. The mean age of participants was 40.6 years ($SD = 16.3$), and 47% of participants had completed a college degree.

3.1.2 Procedure

The procedure was identical to that used in Study 1. The only difference was that the probability information was changed, as described above.

3.1.3 Results

In the Complications Added version, 41 out of 80 participants (about 51%) selected the uncomplicated surgery, an identical result when compared to Study 1, $\chi^2(1) = 0.01$, $N = 167$, n.s.). In the Grouped Complications version, 40 out of 100 participants (40%) selected the uncomplicated surgery, which also did not differ significantly from the proportion obtained with the original scenario, $\chi^2(1) = 2.10$, $N = 187$, n.s.) Thus, preference for the uncomplicated surgery did not depend simply on the number of outcomes possible for each treatment or on whether the complications were presented as four separate outcomes or as one.

Participants' explanations for their choice of the uncomplicated surgery again reflected a desire to avoid complications. Across both versions, about 80% of participants provided explanations for their choice. Of these, 23 out of 32 participants (72%) who selected the uncomplicated surgery in the Complications Added version said they wanted to avoid complications. Two mistakenly reported that the survival rate was better for the uncomplicated surgery, while seven (22%) gave a non-specific explanation, such as "so I'll have a better chance." In the Grouped Complications version, 26 out of 30 (87%) explained their choice of the uncomplicated surgery by saying they wanted to avoid complications. Three gave non-specific "better chance" explanations and one gave an ambiguous response.

Upon closer examination, three main types of explanations that expressed a desire to avoid complications emerged. Some people simply said they wished to avoid complications; some referred to a tradeoff, saying that they realized that the uncomplicated surgery's death rate was higher but were willing to take that risk to be free of complications; and some in effect bypassed the tradeoff by stating that the difference between the surgeries' mortality rates was too small to be meaningful. Across both versions of the scenario, responses of these types constituted 24%, 21%, and 16% of all explanations for choice of the uncomplicated surgery, respectively.

3.2 Discussion

Even when significant changes in the scenario were made, a significant minority of people maintained preference for the uncomplicated surgery. This leads us re-

Table 4: Treatment summary table presented with Study 3 "Reframing" version.

Possible outcome	Surgery 1 (complicated)	Surgery 2 (uncomplicated)
Cured of colon cancer	840 800 cured without complications 40 cured with one of the following complications: • colostomy • chronic diarrhea • intermittent bowel obstruction • wound infection	800 800 cured without complications 0 cured with one of the following complications: • colostomy • chronic diarrhea • intermittent bowel obstruction • wound infection
No cure (death)	160	200

ject to two plausible hypotheses about the predominant source of the bias. In general, people did not avoid the complicated surgery simply because of the uncertainty associated with its multiple and ambiguous options, nor were they relying on a simple tallying strategy that was overwhelmed by these multiple possible side effects. Written explanations for choosing the uncomplicated surgery again indicated strong aversion to complications. A closer analysis of these explanations yielded two discernable subtypes of responses: A small number of people appeared to prefer death rather than risk life with complications, and a larger number believed the difference in mortality rates was too small to be significant, leaving complication rate as the deciding factor.

People's tendency to equate the 16% and 20% the mortality risks is problematic. Why should people view a 4% difference in complications rates as significant, but dismiss an equally-sized difference in death rates? The asymmetry is perhaps most obvious in the Complications Added case, where both surgeries have the same set of possible outcomes. In that case, people appeared to view a 3% difference in the total complications rate as significant, but not a 3% difference in death rate, even though *both* surgery options included small risks of complications. The finding is consistent with prior research in psychology (Baron, 1997; Fetherstonhaugh, Slovic, Jonhnson, & Friedrich, 1997; Jenni & Loewenstein, 1997) and medicine (Bobbio, Demichelis, & Giustetto, 1994; Forrow, Taylor, & Arnold, 1992; Malenka, Baron, Johansen, Wahrenberger, & Ross, 1993) showing that people often think about risks in relative, rather than absolute terms. Specifically, equal sized changes in risk may be perceived as greater when they represent a larger fraction of the baseline risk level. In our scenario, people may have focused on the 1% to 4% increase in complications risk from the uncomplicated surgery to the complicated surgery because it represents a greater (relative) change in risk than the 19% to 16% decrease in mortality. Again, this underlines the point that the risk of unpleasant complications — even when small – looms inordinately large in people's decision-making in a way not captured by linear probability weighting.

4 Study 3

When people ignore important probability differences in mortality risk across options, they effectively bypass the tradeoff that is inherent in the choice. When the cure rates and death rates are both seen as equivalent across surgeries, only complication rates remain to distinguish between the two treatments, and the uncomplicated surgery is a clear winner. The goal of Study 3 was to explore ways of heightening people's sensitivity to meaningful probability differences across options and to the necessary tradeoff between mortality risk and risk of complications. We created two new versions of the scenario with this in mind.

In the first of these, the "Explicit Tradeoff" version (Table 4), we made two major changes. First, we presented the outcome information in terms of frequencies rather than percents. To emphasize the additional 4% of people whose lives could potentially be saved by the complicated surgery, we chose to present the information in terms of the likely outcomes for 1000 people undergoing each treatment. If participants could see that 40 additional people would be saved by the complicated surgery, this might reduce their tendency to dismiss the mortality rates as equivalent. Second, we divided the death outcome for the uncomplicated surgery into two separate outcomes — death from colon cancer (the same as in all previous scenarios) and death from "scar tissue inflammation," a new fatal complication of the uncomplicated surgery. The probability of death from scar tissue inflammation under the uncomplicated surgery (4%) was precisely equal to the probability of being cured with complications under the complicated surgery. With this change,

Table 5: Treatment summary table presented with Study 3 "Explicit Tradeoff" version.

Possible outcome	Surgery 1 (complicated)	Surgery 2 (uncomplicated)
Cured without complications	800	800
Cured, but with one of the following complications: colostomy, chronic diarrhea, intermittent bowel obstruction, or wound infection	40	0
No cure, death from scar tissue inflammation within 2 years	0	40
No cure, death from colon cancer within 2 years	160	160

we hoped people would now more clearly see the tradeoff they had to make — either incur the risk of surviving with complications or incur the risk of dying from one.

In the second version, the "Reframing" version (Table 5), we again presented outcome information in terms of frequencies rather than percents. In addition, we changed how the information about complications outcomes was presented. In previous versions, we had always presented "cured with complications" as an outcome distinct from being cured without complications. In the Reframing version, we now presented it as a subset of the larger group of people cured of their colon cancer, thereby giving that outcome a more positive spin. We hypothesized that this approach would increase preference for the complicated surgery by making the complications outcomes seem less negative and also by highlighting its higher cure rate.

4.1 Methods

4.1.1 Participants

Participants were recruited from the cafeteria of a university medical center, a local bus station, and the local public library. A total of 76 participants completed the Explicit Tradeoff version of the questionnaire, and 88 completed the Reframing version. The sample was 67% Caucasian and 54% female. The mean age was 35.3 years ($SD = 15.0$), and 52% had completed a college degree.

4.1.2 Procedure

The procedure was identical to earlier versions. Probability information in the scenario was changed as described above.

4.2 Results

For the Explicit Tradeoff version, 31 out of 78 participants (40%) chose the uncomplicated surgery. This difference was not significant when compared to results of Study 1, $\chi^2(1) = 1.95$, $N = 165$, n.s.). For the Reframing version, 34 out of 88 participants (39%) chose the uncomplicated surgery, again not significantly different from the original scenario, $\chi^2(1) = 2.52$, $N = 175$, n.s.).

4.3 Discussion

Although participants in both versions used in Study 3 tended to pick the uncomplicated surgery slightly less often than in the Study 1 base case, in neither version did we observe a significant difference in behavior. Neither making the tradeoff between the risks of death and life with complications explicit, nor reframing life with complications as a subset of the cured population, was effective in encouraging substantially more study participants to select the option that maximized survival. Of note: in determining the sample sizes for our studies, we set out to find large differences between versions, looking for phenomena that explained all or most of the bias. Since our manipulations of both the risk statistics and the format of their presentation yielded no dramatic behavior changes, we next considered the possibility that the observed selection of the uncomplicated surgery was actually a true reflection of people's preferences between life with complications and death.

5 Study 4

Selecting the surgery with the higher mortality risk just to avoid possible side effects seems irrational. But is it? The 18th Century philosopher, David Hume, said, "It is not contrary to reason to prefer the destruction of the whole world to the scratching of my little finger." That is, the rationality of a given choice depends on whether that choice is consistent with one's goals and values. The uncomplicated surgery is a bad choice only if people would prefer to live with complications rather than die. If people actually would rather die than live with any of the complications, we cannot call them irrational for choosing the uncomplicated surgery. On the other hand, if a person thinks that living with complications is better than being dead, then he should prefer the complicated surgery. If such a person nevertheless chooses the uncomplicated surgery,

he has made an irrational choice — a choice inconsistent with his own preferences. In Study 4, we investigated whether preference for the uncomplicated surgery is in fact an irrational choice, or whether it simply reflects people's underlying beliefs about the value of life with complications relative to death. We did so by having each subject complete a rating exercise in which they directly compared life with each of the four possible complications versus death.

A second goal of Study 4 was to examine whether having participants make such ratings would affect their surgery choices. Thus we compared the surgery choices of people who performed the rating exercise before versus after making their surgery choice. If people are choosing the uncomplicated surgery because they prefer death over life with complications, then undertaking the rating exercise before making a choice should not influence people's decisions. However, if participants do prefer to live with complications rather than die – but nonetheless make treatment choices inconsistent with these preferences — expressing a preference for life in a pre-decision rating exercise could focus their decision-making around those priorities, leading to greater preference for the complicated surgery.

5.1 Methods

5.1.1 Participants

Participants were recruited from the cafeteria of a university medical center. A total of 154 participants completed the questionnaire, with half receiving the "Rate-Before-Choice" version of the questionnaire and half receiving the "Rate-After-Choice" version. The sample was 89% Caucasian and 62% female. The mean age of participants was 42.2 years ($SD = 16.5$), and 52% of participants had completed a college degree. Participants' demographic characteristics (gender, race, age, education level) did not differ across the two versions of the questionnaire.

5.1.2 Procedure

Participants were presented with the same basic scenario used in Study 1. In addition, either before or after their choice, participants received the rating exercise. This consisted of four questions that asked "What would be better, being dead or living with ___ ?" for each of the possible complications: colostomy, chronic diarrhea, intermittent bowel obstruction, and wound infection. Participants could respond by selecting either "death would be better" or "living with ___ would be better." Descriptions of the four complications (identical to the descriptions provided in the original scenario) accompanied the rating exercise. In addition, in the Rate-After-Choice condition, the last page of the questionnaire gave participants the opportunity to change their original treatment choice if they desired.

5.2 Results

Participants' responses on the rating exercise revealed an overwhelming preference for life with complications over death. Looking just at the ratings of participants in the Rate-Before-Choice condition, 71 out of 77 participants (92%) indicated that life with complications was preferable to death for all four complications listed. On the opposite extreme, only one participant indicated a preference for death in all four cases. Five participants (7%) preferred death over life with complications in some cases but not others, with three people reporting that they would rather die than live with a colostomy bag and two reporting that they would rather die than live with intermittent bowel obstruction. Preference for life with complications was somewhat lower in the Rate-After-Choice condition, suggesting that the choice activity affected participants' rating responses. However, 61% of participants in the Rate-After-Choice condition still indicated that life with complications was preferable to death for all four complications listed. Roughly 7% believed death was preferable in all four cases, with the remaining 32% reporting a preference for complications over death only in some cases.

In many cases, participants' surgery choices were not consistent with these preferences. In the Rate-Before-Choice condition (in which 92% of participants indicated that they preferred life with complications over death in all cases), 49% of participants went on to select the uncomplicated surgery, thus selecting a surgery which did not reflect their stated beliefs. In the Rate-After-Choice condition, 45% selected the uncomplicated surgery even though 60% then indicated that they preferred complications over death in all cases. Stated another way, 49% of people who chose the uncomplicated surgery in the Rate-Before-Choice and 32% of people who chose the uncomplicated surgery in the Rate-After-Choice condition made choices *inconsistent* with their stated preferences. Further, when participants were given the chance to change their initial choice in the Rate-After-Choice condition, few did so. Only three switched from the uncomplicated surgery to the complicated surgery, and four actually switched in the opposite direction.

Thus, when people were asked directly about whether they thought it was better to be dead or to live with complications, most said that they would rather live with complications than die. However, these preferences were frequently not reflected in their surgery choices.

5.3 Discussion

These results demonstrate that many people who chose the uncomplicated surgery chose it *despite a clear preference for life with complications over death*. That is, their choices contradict their own preferences. The results from the Rate-Before-Choice condition are especially striking: People's choices were inconsistent with their preferences even though they had expressed those preferences only minutes before.

6 General Discussion

The goal of informed consent discussions in healthcare practice is to help patients decide which alternatives best fit their individual preferences. A choice between two surgical operations may hinge, for example, on how particular patients weigh the relevant risks and benefits of the two procedures. The same kind of weighing, of pros and cons, helps people make all kinds of healthcare decisions, such as whether to enter clinical trials, or whether to undergo risky treatments for serious illnesses. And because people's attitudes toward risks and benefits differ, the right choice for any one person will depend on his/her values. Consequently, experts contend that patients deserve to receive comprehensible medical information and the freedom to choose among available alternatives.

Our study reveals one problem with the way informed consent is currently obtained. As our study shows, when people receive comprehensible information about their treatment alternatives, they do not always make choices that fit their own preferences. This in itself is not a new finding, as people have been shown to be susceptible to a whole host of biases when making healthcare decisions (Redelmeier, Rozin, & Kahneman, 1993). However, our study is significant for two important reasons. First, we have demonstrated a decision-making inconsistency that is particularly relevant to healthcare decisions: lists of graphic complications can drive people away from treatments, even when the same people acknowledge that these treatments are preferable to other alternatives in terms of expected outcomes. Second, we have shown just how persistent this inconsistency can be. Even when people's preferences are completely transparent — even after people have seen the inconsistencies of their own views — people still make choices that don't map onto their own preferences. It is as if many of our subjects told us "the complicated surgery is better than the uncomplicated surgery, but I prefer to receive the uncomplicated surgery."

Although none of our manipulations significantly reduced the percentage of participants selecting the uncomplicated surgery from that observed in the base case, the three versions yielding the lowest preference for the uncomplicated surgery rates (Study 2: "Grouped Complications" and the two versions of Study 3 — see Table 6) all grouped the risk of the four possible complications into a single category. This suggests that some fraction of people choosing the uncomplicated surgery were influenced by the sheer number of categories under consideration. Still, we note that our studies were powered to detect relatively large effects — that is, relatively "common" patterns of choice — and in none of these versions did the percentage of people picking the uncomplicated surgery ever drop below 39% of the sample, so the impact of this issue is moderate at best. Most likely, a variety of factors contribute to inconsistent decision-making in these cases. We hope to clarify these further in our future research, by conducting larger studies with the power to reveal subtle processes contributing to — if not completely explaining — the effect, and by conducting studies that explicitly assess the role of affect in people's decisions.

Nevertheless, it is worth speculating about potential causes of this bias. Our initial intuition was that the sheer number of complications of the complicated surgery was the source of the bias. However, in the "Complications Added" survey from Study 2, both of the surgical alternatives have the same number of complications, yet 51% of people still chose the dominated alternative. This substudy proves that it is not simply the number of complications that leads to the bias.

We also predicted that the number of complications, and the graphic way each complication was described, might make it difficult for people to perceive the dominance relationship. Perhaps people were just unaware that one surgery dominates the other. We no longer believe this explanation, however. To begin with, neither education nor measures of people's mathematical ability were significantly associated with treatment choice in any of our studies. Moreover, we presented this scenario to a random sample of 119 primary care physicians in the U.S., and asked them what they would choose for themselves. Almost 40% chose the uncomplicated surgery, suggesting that neither medical training nor relevant decision experiences prevent biased choices. Finally, in Study 4, we asked people to state whether they preferred death or any of the four surgical complications prior to asking them to choose between the two surgical alternatives. We believe that this method should have clarified the dominance relationship, and yet many study participants were still willing to choose the dominated alternative.

We are now in the process of exploring other mechanisms that could explain the source of the bias we have demonstrated in this paper. One possibility is that the bias results from processes similar to those documented in studies of *betrayal aversion*. Research shows that people are bothered by bad outcomes when the cause of those outcomes is perceived as some kind of betrayal. For ex-

Table 6: Participants' surgery choices across all scenario versions. Statistics compare proportions against those from Study 1.

	N	Percent selecting dominated alternative	χ^2	p
Study 1				
Original scenario	87	51%		
Study 2				
Complications added to uncomplicated surgery	80	51%	0.01	.931
Grouped complications for complicated surgery	100	40%	2.10	.147
Study 3				
Explicit tradeoff	78	40%	1.95	.163
Reframing	88	39%	2.52	.112
Study 4				
Focusing rating before choice	77	49%	0.00	.992

ample, people believe it is worse to be killed in an auto accident by a faulty airbag than by other malfunctions in a car, because the airbag is supposed to protect people from injury. (Koehler & Gershoff, 2003) Medical interventions are supposed to improve people's health, and so the fact that the complicated surgery might cause other (lesser) harms might be perceived as kind of betrayal, resulting in aversion to that choice. Similar tendencies may contribute to well-known omission biases. For example, people are reluctant to get vaccinated if the vaccine carries a risk of health side effects, even if the risk/benefit profile of the vaccine is better than the risk/benefit profile of remaining unvaccinated (Ritov & Baron, 1990).

The bias may also result from the affective salience of the surgical complications. Intermittent diarrhea may not have much impact on people's quality of life, and may not come close to being perceived as being as bad a death. But diarrhea is icky. So is the thought of a colostomy or a wound infection. People are much more sensitive to the probability of emotionally mundane events than to more emotionally salient events, when making decisions (Rottenstreich & Hsee, 2001). As a result, because the complicated surgery includes a risk of four affectively loaded complications, people may feel strong aversion to that surgery despite the low probability of each complication, and despite the fact the complications are preferable to the alternative of being dead. By contrast, our simple description of the risk of death may lack the emotional salience of the graphically described complications. Indeed, a number of decision making theories postulate that anticipatory emotions play a large role in people's decisions, and can skew the relationship between probability, utility, and decisions (Damasio, 1994; Finucane, Alhakami, Slovic, & Johnson, 2000; Loewenstein, Weber, Hsee, & Welch, 2001). Along these lines, people may *know* that the complicated surgery is better than the uncomplicated surgery, but it might *feel* like the uncomplicated surgery is a better option. We plan a series of follow up studies, in which we will try to influence the emotional salience of the four surgical complications, as well as the emotional salience of death, to see how that influences people's choices.

Is consistency something people should strive for when making important decisions? We think so. Consistency is hardly the hobgoblin it is often made out to be. When confronted with inconsistencies, most people, in most circumstances, do not merely shrug off the inconsistency. They try to understand why they have made an inconsistent choice, or discover some consistency lying underneath the surface of their choice. The huge field of research on cognitive dissonance is a testament to the importance people place on achieving some type of internal consistency in their lives. Of course, consistency is not always desirable, nor is inconsistency always troubling. People change their minds over time, for example, and such inconsistencies, if they can be even called that, can be a sign of growth or open-mindedness.

Yet in this article we are not exploring reasonable inconsistencies occurring over the course of people's lives. Instead, across the span of two minutes, after earlier stating a preference for the complications over death, many people had no problem choosing the uncomplicated surgery over the complicated surgery. This is a dilemma. If the complicated surgery is better than the uncomplicated surgery, then people should choose it, and if it is not, then their preferences should reflect this view. We have shown that even when people receive easily comprehensible information, and when their own preferences

are made clear to them, they often still make choices that don't fit their own preferences.

A couple decades ago, medical ethicists and patient advocates faced the daunting challenge of convincing clinicians that patients deserve a role in making their healthcare decisions. This challenge is not over yet, with recent evidence showing that clinicians still do a sub-optimal job of informing patients about their treatment alternatives (Braddock, Fihn, Levinson, Jonsen, & Pearlman, 1997). Our study shows that a new and important challenge exists for anyone hoping to help patients make healthcare decisions.

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Appendix

Scenario Text accompanying Table 1 in Study 1

Imagine that you were recently diagnosed with **colon cancer**, which is cancer of the bowels. Without treatment, people with your type of colon cancer usually die within 2 years.

Fortunately, there are two different surgical procedures that can be performed to treat your cancer. Both surgeries work by removing as much of the cancer as the surgeons can see. But they differ in the likelihood of curing the cancer and in the likelihood of causing complications.

Surgery 1

Surgery 1 **cures colon cancer without any complications** in 80%, or 80 out of 100 patients. Surgery 1 **does not cure the colon cancer** in 16%, or 16 out of 100 patients, and the patients die of colon cancer within 2 years.

In addition,

- 1%, or 1 out of 100 patients are cured of their cancer, but must undergo **colostomy**, where part of the bowel is removed and patients have bowel movements into a plastic pouch attached to their belly.
- 1%, or 1 out of 100 patients are cured of their cancer but experience **chronic diarrhea**, involving 6–10 bowel movements a day, with an occasional need to wake up in the middle of the night to go to the bathroom.
- 1%, or 1 out of 100 patients are cured of their cancer but experience **intermittent bowel obstruction**, which causes crampy pain in the belly on-and-off for up to 3 hours at a time.
- 1%, or 1 out of 100 patients are cured of their cancer but experience a **wound infection**, an open area of the skin at the surgical scar, which occasionally hurts and drains thick yellow fluid once in a while. The infection can take up to 1 year to heal.

Surgery 2

Surgery 2 **cures colon cancer without any complications** in 80%, or 80 out of 100 patients. Surgery 2 **does not cure the colon cancer** in 20%, or 20 out of 100 patients, and the patients die of colon cancer within 2 years.