

# The Beguiling Pursuit of More Information

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**Background.** The authors tested whether clinicians make different decisions if they pursue information than if they receive the same information from the start. **Methods.** Three groups of clinicians participated (N = 1206): dialysis nurses (n = 171), practicing urologists (n = 461), and academic physicians (n = 574). Surveys were sent to each group containing medical scenarios formulated in 1 of 2 versions. The simple version of each scenario presented a choice between 2 options. The search version presented the same choice but only after some information had been missing and subsequently obtained. The 2 versions otherwise contained identical data and were randomly assigned. **Results.** In one scenario involving a personal choice about kidney donation, more dialysis

nurses were willing to donate when they first decided to be tested for compatibility and were found suitable than when they knew they were suitable from the start (65% vs. 44%, P = 0.007). Similar discrepancies were found in decisions made by practicing urologists concerning surgery for a patient with prostate cancer and in decisions of academic physicians considering emergency management for a patient with acute chest pain. **Conclusions.** The pursuit of information can increase its salience and cause clinicians to assign more importance to the information than if the same information was immediately available. An awareness of this cognitive bias may lead to improved decision making in difficult medical situations. **Key words:** uncertainty, reasoning, judgment, rationality. (*Med Decis Making* 2001;21:376-381)

Medical schools have traditionally trained physicians to follow an exhaustive approach when collecting data. A common recommendation, for example, is to “conduct a complete history and a thorough physical examination.”<sup>1</sup> This adage implies that more information—particularly if available at little cost—is always good. This adage is further reinforced by professional standards that recommend knowing all that you can, especially if it is easily knowable.<sup>2</sup> The strategy of collecting large amounts of information is often appropriate because of the complexity of medical disorders, the possibility that a patient may have multiple concur-

rent diseases, and the reality that a single neglected disorder could lead to irreparable harm.<sup>3</sup>

Two common arguments justify a more conservative approach to collecting information. The 1st concerns the economic pressure to limit procedures that are not cost-effective.<sup>4</sup> For example, guidelines recommend against performing a cerebral angiogram on otherwise healthy adults with headaches because the high costs of testing greatly exceed the small chances of finding a treatable disorder.<sup>5</sup> The 2nd argument for a conservative approach is respect for patient autonomy.<sup>6</sup> For example, patients may refuse a cerebral angiogram because of the invasiveness of the procedure.<sup>7</sup> Neither of these 2 arguments is compelling for information that is available from history, examination, or simple test.

Other arguments call for restraint even toward data that are easy to obtain. The data occasionally represent false-positive or false-negative results and mandate some insight about baseline probabilities.<sup>8</sup> Obtaining the data can be associated with significant opportunity costs for patients; for example, an ultrasound of the abdomen is an inappropriate test for a patient with an acute gastrointestinal bleed because time spent in radiology represents time unavailable for monitoring vital signs, securing blood transfusions, or receiving other

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treatments.<sup>9</sup> Finally, data can sometimes disengage the doctor-patient relationship so that clinicians (and sometimes patients) focus primarily on numbers and neglect other profound aspects of the situation.<sup>10,11</sup>

We propose that the preceding arguments overlook other adverse effects that arise from weaknesses in human reasoning. In particular, psychological research has discovered systematic inconsistencies that stem from individuals' imperfect ability to distinguish relevant from redundant information.<sup>12-15</sup> One weakness is the tendency to pursue noninstrumental information—information that may be relevant but ought not to alter the decision.<sup>16,17</sup> In this vein, people sometimes pursue more information than necessary and, once they receive it, tend to see it as crucial for the decision.<sup>18</sup> In this study, we investigate whether clinicians also show a tendency to pursue and potentially misapply noninstrumental medical information.

## METHODS

We adapted methods developed by psychologists for evaluating how decisions are prone to systematic errors.<sup>18</sup> In one experiment, university students ( $n = 539$ ) were given a scenario involving applications to their university. By random assignment, one-half received the following simple version, which provided the information directly:

Imagine that you are on the admissions committee. You are reviewing the file of an applicant who plays varsity soccer, has supportive letters of recommendation, and is editor of the school newspaper. The applicant has a combined SAT score of 1250 and a high school average grade of B. Do you decide to accept or to reject the applicant?

The other respondents evaluated the same applicant but in a different version that involved a possible search for one piece of missing information:

Imagine that you are on the admissions committee. You are reviewing the file of an applicant who plays varsity soccer, has supportive letters of recommendation, and is editor of the school newspaper. The applicant has a combined SAT score of 1250 but 2 differing reports about high school average grade. The guidance counselor's report indicates a B, whereas the school office report indicates an A. The school has notified you that the records are being checked, and that you will be informed within a few days which grade is correct. Do you decide to accept the applicant, to reject the applicant, or to wait for further clarification from the applicant's school before deciding?

If you chose to wait for further clarification, answer the following:

The school informs you that the applicant's high school average is a B. Do you decide to accept or to reject the applicant?

Results in the simple version showed that most respondents accepted the applicant when they knew the grade was a B. Naturally, most would also have accepted the applicant had the grade been A. Thus, the uncertainty between an A and a B was noninstrumental for this decision for most respondents. Nonetheless, in the 2nd version the respondents faced uncertainty about the grade being A or B, and most chose to pursue that information. These respondents then received the same information as in the simple version; namely, a grade of B. However, the pursuit of the information altered subsequent choices. Once they found that the grade was a B and not an A, most rejected the applicant. As a result, fewer respondents overall accepted the applicant in the search version compared to the simple version (46% vs. 57%,  $P = 0.020$ ).

In the present study, we investigated whether clinicians are also prone to make different decisions when they pursue information than when they are given the information all at once. To do so, we asked clinicians to consider a hypothetical written scenario that described a medical situation. The scenario was formulated in 1 of 2 versions. The simple version of the scenario had the information immediately available. The search version presented the same medical situation but left a piece of information missing and available through a plausible search (such as simply waiting or conducting a test). Those who chose to search in this version then obtained the same information that was available in the simple version, thus rendering the 2 versions comparable.<sup>19</sup>

The basic design of each survey was a randomized comparison trial in which clinicians' management decisions were compared across the 2 versions of the same scenario. By random assignment, one-half of the clinicians received the simple version and one-half received the search version. Participants remained blinded to the intervention (and, indeed, unaware of the possibility of an alternative version). Our main hypothesis was that having pursued a piece of information, clinicians tend to focus on the obtained information, thereby leading to different decisions than if the same information had been available from the start. The study was approved by the Research Ethics Board of Sunnybrook and Women's College Health Sciences Centre.

**Table 1** Summary of Results

Group	Option	Search Version							
		Simple Version			Search Forgone		Search Pursued		
		Accept	Reject	(% accept)	Accept	Reject	Accept	Reject	(% accept) <sup>a</sup>
Dialysis nurses	Donate kidney	38	48	44	0	26	55	4	65
Practicing urologists	Recommend surgery	97	136	42	49	46	10	123	26
Academic physicians	Continue flight	32	268	11	6	208	51	9	21

a. Percentage who accept combining both search forgone and search pursued responses.

## RESULTS

### Dialysis Nurses

The 1st survey involved nurses affiliated with kidney dialysis centers in Toronto. All individuals ( $n = 211$ ) were sent a 1-page survey and offered a lucky draw of \$50 for participation. In total, 171 surveys were returned, representing a response rate of 81%. By random assignment, one-half received the following simple version of the scenario:

Suppose that a 68-year-old relative of yours needed a kidney as a result of renal failure. Suppose that you were a suitable match. Would you donate?

The other nurses received the search version of the scenario, which contained the same data but involved a possible search for information:

Suppose that a 68-year-old relative of yours needed a kidney as a result of renal failure. Suppose that it was not known whether you were a suitable match. You could be tested to determine whether you are suitable. Would you choose to be tested?

If you indicated a willingness to be tested, please answer the following:

Suppose that you had undergone the test and that the test showed that you were a suitable match. Would you donate?

A minority of nurses in the simple version chose to donate a kidney (44%). This notwithstanding, a majority of nurses in the search version were willing to be tested for compatibility (69%). A willingness to be tested presumably arises because the donation decision is not trivial for anyone, is tempting to postpone, and can be avoided by a negative test result. However, once they underwent testing and were found (as in the simple version) to be compatible, most nurses who

searched were willing to donate (93%). As a consequence, more overall were willing to donate in the search version than in the simple version (65% vs. 44%,  $P = 0.007$ ). The discrepancy was found for both those who replied early and those who replied late (before and after median reply time).

### Practicing Urologists

The 2nd survey involved practicing urologists affiliated with the American Urologic Association. A sample of English-speaking individuals ( $n = 1076$ ) were surveyed and offered a lucky draw of \$5000 for participation. In total, 461 completed surveys were returned, representing a response rate of 43%. By random assignment, one-half received the following simple version of the scenario:

N.F. is a 69-year-old man with stage T1C prostate cancer. His prostate-specific antigen level is marginally elevated at 7.0 ng/ml, and biopsy reveals Gleason 6 cancer. Review of systems is otherwise remarkable only for shortness of breath on exertion (2 flights of stairs). Otherwise, he is in good health. A medical consultation documents chronic emphysema with moderate obstruction (FEV1 of 1000 ml, equivalent to 40% predicted). In this situation, would you recommend surgery or radiation therapy?

The other urologists received the search version of the scenario, which contained the same data but involved a possible search for a piece of missing information:

N.F. is a 69-year-old man with stage T1C prostate cancer. His prostate-specific antigen level is marginally elevated at 7.0 ng/ml, and biopsy reveals Gleason 6 cancer. Review of systems is otherwise remarkable only for shortness of breath on exertion (2 flights of stairs). Otherwise, he is in good health. In this situation, would you recommend surgery, recommend radiation therapy, or obtain a medical consultation before deciding?

If you decided to obtain a medical consultation, consider the following:

A medical consultation documents chronic emphysema with moderate obstruction (FEV1 of 1000 ml, equivalent to 40% predicted). In this situation, would you recommend surgery or radiation therapy?

In the simple version, many of the urologists (42%) chose to operate. Yet, in the search version, somewhat more (58%) chose to obtain a medical consultation, presumably because the data might help in patient care. However, having obtained the consultation and learned the extent of emphysema (identical to that in the simple version), most who obtained the consultation recommended against surgery (92%). As a consequence, fewer urologists were willing to operate in the search version than in the simple version (26% vs. 42%,  $P = 0.001$ ). The discrepancy was found for both those who replied early and those who replied late (before and after median reply time). Note that unlike the nurse scenario, medical consultation is not mandatory before surgery.

### Academic Physicians

The 3rd survey involved academic physicians whose addresses were obtained from the Internet. A sample of physicians in the United States and Canada ( $n = 1596$ ) were surveyed by e-mail and given no incentive for participation. In total, 574 completed surveys were returned, representing a response rate of 36%. By random assignment, one-half received the following simple version of the scenario:

You are traveling on an airplane and respond to the appeal "Is there a doctor on board?" Apparently, a 60-year-old male passenger experienced 15 to 20 minutes of "crushing" chest pain during takeoff (now resolved). Past medical history is unremarkable. The patient looks sick. The heart rate is about 80. The first-aid kit has a blood pressure cuff. You obtain a systolic pressure of 120 (cabin too noisy for auscultation). In this situation, would you recommend that the pilot land the airplane for medical reasons or would you recommend that the pilot continue the flight as scheduled?

The other physicians received the search version of the scenario, which contained the same data but involved a possible search for information:

You are traveling on an airplane and respond to the appeal "Is there a doctor on board?" Apparently, a 60-year-old male passenger experienced 15 to 20 minutes

of "crushing" chest pain during takeoff (now resolved). Past medical history is unremarkable. The patient looks sick. The heart rate is about 80. The first-aid kit does not have a blood pressure cuff, but the flight attendant knows there is one in a second kit elsewhere in the plane. Would you recommend that the pilot land the airplane for medical reasons, recommend that the pilot continue the flight as scheduled, or ask for the blood pressure cuff before making a decision?

If you chose to have the blood pressure cuff, answer the following:

You obtain a systolic pressure of 120 (cabin too noisy for auscultation). In this situation, would you recommend that the pilot land the airplane for medical reasons or would you recommend that the pilot continue the flight as scheduled?

Few physicians in the simple version recommended continuing the flight (11%). In contrast, a substantial number in the search version asked for the blood pressure cuff (22%), presumably because baseline data could be valuable if the patient's condition changed. Once having obtained the relatively favorable blood pressure results (which were the same as in the simple version), most of the physicians who asked for the blood pressure cuff recommended continuing the flight (85%). Consequently, more physicians recommended continuing the flight in the search version than in the simple version (21% vs. 11%,  $P = 0.001$ ). The discrepancy was found for both those who replied early and those who replied late to the survey (before and after median reply time). Note again that measuring blood pressure is not mandatory for the decision.

### DISCUSSION

In medicine, business, and other domains, people tend to assume that more information cannot hurt. Underlying this assumption is the belief that people have clear and stable preferences that can only be refined by becoming informed.<sup>20</sup> Research in psychology, on the other hand, suggests that individuals' preferences are often unclear and tend to be constructed during the process of making a decision.<sup>21-23</sup> As a result, preferences can be significantly altered by subtleties in context.<sup>24,25</sup> Like the fuzzy boundary between education and advertising, it is hard to tell when clarification ends and distortion begins. Individuals' priorities can be malleable, so that minor changes in circumstances can sometimes alter individuals' preferences and lead to discrepant decisions.

**Table 2** Summary of Recommendations

Recommendation	Violation	Example of Error
Consider whether missing information is relevant	Seek all available data from history and exam	Rectal exam in a patient who is having an acute aortic dissection
Make a plan in advance of data becoming available	Forestall planning until after data are collected	Ignoring the patient's history when acting on unexpected lab test results
Check with colleagues who can review data impartially	Disregard new views after gathering the data	Dismissing colleague's idea because you have "known the patient longer"

The present study suggests that one factor influencing clinicians' decisions is their own behavior. Using scenarios, we show how the pursuit of information can lead nurses and doctors to weigh information more heavily than if the information were available at once. The findings cannot be attributed to thoughtless or deceptive responses, which work against the observed pattern. The findings are consistent with past studies of decisions—with both hypothetical and real pay-offs— involving consumer purchases, mortgage applications, and difficult negotiations.<sup>16,26–29</sup> A number of forces may be relevant, such as the influence of cognitive dissonance or sunk costs, although we feel the most germane notion is self-perception.<sup>30–32</sup> That is, clinicians infer from the pursuit that the data are crucial. This, we argue, has medical care implications (Table 2).

First, we urge physicians to consider the relevance of missing information before it is pursued. Good physicians collect a lot of information. Yet, in some cases missing information may be irrelevant and at other times it may be worth acquiring only for reasons outside the current choice (e.g., for research).<sup>33</sup> In cases where the information is not instrumental to the decision at hand, this reality needs to be appreciated and the pursuit of data adjusted accordingly.<sup>16</sup> Determining relevance is not easy, but after a search one may shift perspective and feel obliged to act. Although a warning against pursuing noninstrumental information may sound banal, the data suggest that such predispositions can emerge when facing difficult decisions.

Second, in situations where a piece of information is noninstrumental but is hard to forgo, physicians might be well served by constraining themselves to a pre-specified course of action. That is, physicians should consider making a contingency plan for when the data become available. Doing so encourages people to think through the uncertainty and identify the features that truly ought to matter. In contrast, delaying deliberation until the information is available risks focusing undue attention on the one piece of information. In many situ-

ations, moreover, foresight and advanced planning are essential for allowing time for patients and families to contribute to the decision. Finding ways to teach people to think through uncertainty is a priority for future research.

Third, for situations in which missing information has been sought without a clear prespecified plan, the physician may want to consult with a colleague who can review the data easily without biases related to an involved search. Although it is hard to simulate how influential the pursued information would have been had it been known all along, a colleague might provide a fresh perspective that is free of the investments made during a difficult or long search. This technique is analogous to review boards who evaluate transplant candidates after each patient has been fully evaluated by his or her own physician. Colleagues who are presented with all the data at one time often see things differently than the physician who obtains the same data through gradual struggle.

A limitation of our research is the low survey response rate, yet this weakness is unlikely to explain our findings. Our research design tests for discrepancies between 2 versions of the same scenario. It avoids inferences about overall choice, and the discrepancies cannot be explained by a willingness to respond. In addition, past studies have found discrepancies regardless of whether response rates were high or low; indeed, the largest discrepancy we observed was in the sample with the highest response rate. Moreover, the observed patterns would still be statistically significant in each case even if all nonresponders were to give identical replies (either positive or negative). Finally, real-world situations may be much more intense and involved than the gentle delays induced through survey research.

One interesting feature of our scenarios is that reasonable people could disagree on which decision is correct. Yet, the discrepancies between the simple and search versions are disturbing. Although more research

is needed, we think that choices made following a search have added reasons for worry. One reason is that information can be pursued along different search paths, which may shift priorities in different directions and result in divergent decisions. The simple version, in contrast, is a single perspective that is consistent for all decision makers. In addition, undue searching has the markings of a “self-erasing error.”<sup>34</sup> That is, people might initially “err” by pursuing noninstrumental information but then proceed to make choices that endow the information with instrumental value, thereby “erasing” the error. At no point will the decision maker recognize having made a mistake.

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