

The uncertainty is killing me: Self-triage decision making and information availability

Andrew A. Cooper

Department of Psychology, Neuroscience & Behaviour
McMaster University, Hamilton, Canada

Karin R. Humphreys

Department of Psychology, Neuroscience & Behaviour
McMaster University, Hamilton, Canada

Abstract

Accurate self-triage is important for both the individual's health, and the efficacy and efficiency of the health care system. Ambiguity and partial information from sources of questionable fidelity may contribute to the difficulties laypersons experience in making care-seeking decisions. The role of certainty in diagnostic information was investigated using hypothetical health threat scenarios. Sixty healthy undergraduates were asked to indicate how urgently they would seek care under the circumstances depicted in these scenarios. Information relating to certainty interacted with threat severity in a logical pattern, such that increased certainty of high severity threat prompted more urgent care-seeking response, while reduced certainty of lower severity threats increases urgency. Minor reductions in certainty reduced urgency of response for high severity threats. Implications of these results on health information resources and public services are discussed.

Keywords: *Decision-making; Uncertainty; Health care; Behaviour and behaviour mechanisms; Psychology, Applied; Patients.*

Self-triage is the process by which an individual evaluates his or her own health to determine if and when to seek medical attention. This task is of vital importance to both patient health and health care system functionality, yet is largely neglected in the medical literature. Pandemics and other mass casualty situations (e.g., as a result of bioterrorism or natural disaster) further increase the system's reliance on self-triage (Centers for Disease Control and Prevention, 2007), and an understanding of patients' decision making is critical to strategic planning. Furthermore, this facet of health care is undergoing tremendous change in terms of the emergent field of consumer health informatics (Eysenbach, 2000). Medical information is now readily available to the layperson on the internet in the form of searchable databases and pseudo-diagnostic websites, which in spite of efforts towards organization and regulation, remain of widely varying reliability (Diaz et al., 2002). Anecdotally, more patients

than ever before are presenting at their doctors' offices volunteering potential diagnoses gleaned from the internet. These sources are likely highly influential in self-triage – at least among a subset of individuals – and the impact of the availability of suggested diagnostic information requires further examination.

Appropriate care-seeking behaviour can have a critical impact on the progression and ultimate outcome of a state of compromised health. Delayed presentation to medical professionals can result in a worse prognosis than if treatment were sought promptly (Richards, Westcombe, Love, Littlejohns & Ramirez, 1999). Decisions to seek care are predicted by a number of demographic factors, including age, gender, socioeconomic status, health insurance coverage and disease pattern (Hulka & Wheat, 1985). However, there remains considerable variability in rates of health care use that is unaccounted for by these variables (Wolinsky, 1978).

Evidence from medical literature suggests that individuals often adopt ineffective care-seeking strategies (Cameron, Leventhal & Leventhal, 1995). Some individuals employ a potentially dangerous “wait and see” approach (Safer, Tharps, Jackson & Leventhal, 1979), while at the same time a disproportionately high percentage of physician visits (40-65%) occur for complaints that do not result in the detection of a specific disease or disorder (Barsky, Wychak & Klerman, 1986). However, such outcomes may of course result from either a missed diagnosis or a correct reassurance by the doctor that there is no health threat. Both methods are inefficient, and typical of the difficulties people experience when making judgments about threats to their own health. Understanding the factors that contribute to accurate and appropriate care-seeking behaviours is critical to the development of procedures to help refine individuals' and public health strategies towards a system that is more effective than the current hit-or-miss method.

This study investigates the decision to seek medical care in the context of hypothetical situations involving health threats of differing severity and diagnostic certainty. In a naturalistic setting, this self-triage process occurs with

incomplete and ambiguous information, from a limited knowledge base, in advance of any formal input from medical professionals. As such, these decisions are fundamentally different than those made by individuals who have received a diagnosis. It is not surprising, therefore, that people are not particularly good at developing effective care-seeking strategies. The fundamental decision that individuals are faced with is whether they require medical care, and with what urgency. Several factors contribute to this decision, including an evaluation of the potential severity of the health threat, what specific condition might be implicated, and with what subjective certainty alternative explanations can be ruled out. These are complicated decisions, and the factors involved tend to be non-orthogonal.

Physically-experienced symptoms are the obvious initial motivation to seek care, but extracting information about cause or severity of the underlying condition from symptoms alone is not straightforward, especially to the layperson. Several related yet separable factors must be taken into account in understanding this process. First, a particular physical symptom can be an indicator of a number of different health threats of varying severities (e.g., abdominal pain due to food poisoning, or as a sign of appendicitis), and symptoms may be poor predictors of later physical manifestations of a disorder. In addition, the subjective experience of pain or discomfort associated with symptoms is unreliable as a predictor of threat severity; compare, for instance, the experience of muscle cramps (physically intolerable but likely not serious) and right sided weakness (tolerable symptom, but indicative of stroke). Next, causal attributions may guide the interpretation of a potential health threat. If extensive bruising can be attributed to a recent fall, it will likely be viewed as much less serious than if there were no such precipitating event. The progression and timeline of symptom manifestation also play a role, where persistence or acuteness of onset tend to be viewed with greater suspicion. Past experience and personal knowledge are also useful albeit inconclusive sources of information for a patient. A swollen leg may be more alarming to an individual with a past history of deep vein thrombosis than to another with no such experience. It is also well documented that people are not necessarily always rational actors when making decisions in the face of uncertainty, and instead use heuristics and biases that while generally effective and efficient, can also lead to errors. (see Tversky & Kahneman, 1974). Finally, other individual differences may also contribute, including gender, age and personality factors (Hulka & Wheat, 1985).

The paradox facing patients is that this incomplete and ambiguous state of affairs might be clarified by an evaluation by a medical professional, yet the initial decision to seek care is by necessity performed without the benefit of this expertise. To date, much of the research into the larger issue of patients' evaluations of health threats bypasses the issue of self-triage, by looking at patients who have been

hospitalized or are receiving treatment for a specific disorder, investigating issues such as adherence to treatment regimens, illness perceptions and coping behaviour (Steed, Newman & Hardman, 1999). An important model of health threat evaluation in this context is the Self-Regulation Model (SRM), proposed by Leventhal and colleagues (Leventhal, Meyer & Nerenz, 1980). The SRM posits that cognitive representations of health threats contribute to evaluation of self-health. These cognitive representations are comprised of the attributes of threat identity, causality, timeline and consequences, and may be influenced by multiple sources of information including experience, media and social knowledge, and physical symptoms (Baumann, Cameron, Zimmerman & Leventhal, 1989). However, studies that evaluate health threat appraisal post-diagnosis effectively reverse the real-world course of decision making. In these cases, individuals make judgments with complete information about a specific condition, rather than in a highly uncertain situation, when the particulars and identity of the health threat are unknown. The lack of certainty that is the hallmark of self-triage may thus complicate the process of constructing a cognitive representation of the threat in question as it is described by the SRM. An investigation of the process of self-triage must consider the role of this uncertainty if it is to appropriately approximate the real-world conditions under which such decisions are made.

This study explored the process of health threat analysis in the context of self-triage, where individuals are compelled to evaluate a threat of some level of severity with the additional complication of uncertainty of diagnosis. To this end, we utilized hypothetical health threat scenarios to evaluate self-triage strategies of healthy individuals. Previous studies have shown the utility of similar imagined self-relevant hypothetical scenarios to effectively elicit behavioural responses (Gregory, Cialdini & Carpenter, 1982). In these scenarios, we presented a set of symptoms, which varied in the severity of the health threat that they corresponded to (high, medium, or low threat). The issue of uncertainty in self-triage was then addressed by varying the degree of certainty of the cause of the symptoms presented (based on the provision of a possible diagnosis, a definitive diagnosis, or no diagnostic information). Participants then rated the urgency with which they would seek care, given each hypothetical scenario.

We anticipated that severity would have an effect on urgency, but that certainty should modulate the effects of severity. That is, we predicted that greater certainty for a more severe diagnosis should result in greater urgency. Conversely, greater certainty for a low severity diagnosis should result in lower urgency. Of particular interest is how intermediate degrees of certainty impact the decision making process – how urgent is an uncertain threat compared to a certain one, and how does this interact with severity?

Method

This study tested 63 undergraduate students (42 females, with an age range of approximately 18-24) enrolled in introductory psychology at McMaster University.

Table 1: Example Scenarios

| Threat Severity | | Diagnostic Certainty | | |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------------------------------------|----------------------------|
| | | No Information | Suggested Identity | Definitive Diagnosis |
| High | You are walking to school when you're suddenly overwhelmed by a severe headache. A wave of nausea hits you, and you begin to have difficulty seeing... | (no further info) | These symptoms may indicate a brain aneurysm. | You have a brain aneurysm. |
| Medium | After a few days of mild fever and coughing, you notice a general reddish rash developing all over your body... | (no further info) | These symptoms may indicate the measles. | You have the measles. |
| Low | You wake up one morning with a sore throat. You are coughing and sneezing, and your nose is running... | (no further info) | These symptoms may indicate a cold. | You have a cold. |

Students received course credit for participating. This study received approval from the McMaster Research Ethics Board.

Twenty-seven hypothetical medical scenarios were constructed (see Table 1 for examples). Participants were instructed to read through the scenarios, imagining themselves in the situations described, and asked to respond to the question: “*When would you seek medical attention for this situation?*” Responses were indicated on a 7-point scale, with a low boundary identified as “Never” (qualified on the instruction page as “at the next scheduled appointment, if at all”), and a high boundary outlined as “Immediately” (“within the hour”). This yielded the dependent measure of response urgency.

Each scenario was constructed with input from a physician around a specific disease or injury-based health threat, with three levels of the factor *threat severity* -- low (e.g., common cold); medium (e.g., measles); or high (e.g., brain aneurysm). Severity ratings were verified by nine independent raters. The inclusion of non-disease stimuli (e.g., sprained ankle) was considered important in terms of ecological validity, as judgments of care-seeking urgency are necessary for other states of compromised health. Most scenarios were described on the basis of three or four core symptomatic or diagnostic features; in some cases, necessary contextual information was included, (e.g., the precipitating event in the case of non-disease scenarios). No

threat descriptions had identical symptom clusters, but some shared common symptoms.

Each scenario was presented at three levels of the factor of *diagnostic certainty*. For a single scenario, the core description of symptoms remained constant, but the information about a potential diagnosis varied. In the “No Information” (NI) condition, participants were only provided information about symptoms. In the “Suggested Identity” (SI) condition, participants also saw an additional sentence identifying a possible diagnosis (e.g., “These symptoms are consistent with the measles”). Critically, while this diagnosis was always appropriate, statements were never definitive and were intended to present a plausible threat candidate without ruling out alternatives. Finally, the “Definitive Diagnosis” (DD) condition included an unambiguous diagnosis of the health threat (e.g., “You have the measles”).

These factors were combined in a 3 x 3 design to produce nine conditions. Threat severity was a within-subjects, between-items variable; that is, each scenario was rated as having either low, medium, or high severity, with subjects viewing multiple scenarios of each level of severity. Diagnostic certainty was a within-subjects and within-items variable; three variants of each scenario were constructed to depict different levels of certainty, with each subject seeing only one version of a given scenario. Participants saw each of the 27 scenarios one time, with three instantiations of each severity-by-certainty condition. Three versions of the

response packet were created and assigned to participants at random so that each item appeared in each diagnostic certainty condition counterbalanced across these versions. Participant gender was also recorded. The inclusion of two

Results

Mean response urgency was calculated for each of the nine possible diagnostic certainty by threat severity conditions; results are depicted in Figure 1 below. A repeated-measures ANOVA was conducted for diagnostic certainty (3) by threat severity (3) by gender (2), with response urgency as the dependent measure. The results of the ANOVA indicated a main effect of severity [$F(2, 57) = 633.15, p < .0001$], where high, medium and low Severity conditions yielded mean response urgency ratings of 6.31, 4.09, and 1.92 respectively. There was also a main effect of diagnostic certainty [$F(2, 57) = 3.599, p = .03$], where definitive diagnoses were rated as requiring more urgent responses than the suggested identity and the no information conditions ($M=4.29, 4.09$ and 3.95 respectively). There was also a main effect of gender [$F(2, 1) = 13.07, p < .001$] such that females responded overall more urgently than males (means of 4.30 and 3.67 respectively). There were no differences between counterbalanced versions of the list.

Critically, there was a significant severity by certainty interaction [$F(2, 57) = 7.33, p < .0001$]. To explore this interaction, a series of planned paired t-tests was conducted (collapsing across gender). For threats of high severity, a significant difference was observed between DD and SI conditions [$t = -3.10, df = 59, p = .003$], between DD and NI [$t = -7.36, df = 59, p < .001$] and also between SI and NI [$t = -.402, df = 59, p < .001$].

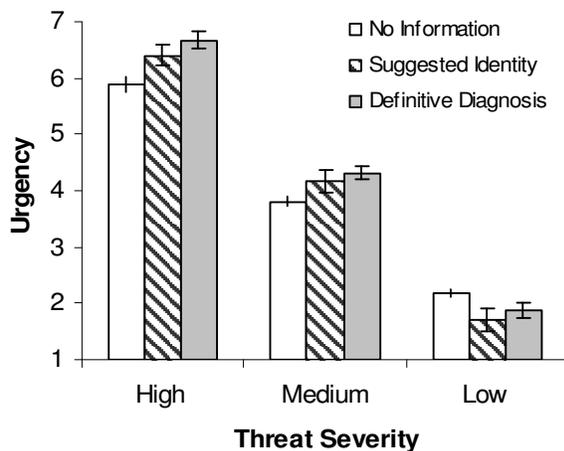


Figure 1. Mean response urgency for each pairing of threat severity by diagnostic certainty. Error bars denote standard error of the mean. A 7 represents the greatest urgency.

control questions designed to eliminate participants who were not following the instructions of the exercise resulted in the exclusion of three participants.

Definitively diagnosed items elicited most urgent responses, followed by those with a suggested identity, and those without identity information. Responses to the definitive diagnosis condition and the no information condition were the only conditions to differ significantly for medium severity threats [$t = -7.36, df = 59, p = .014$], though the response trend was similar to that seen in the high severity condition. Medium severity threats that were definitively diagnosed elicited the most urgent responses, followed by those with a suggested diagnosis and symptoms alone. For low threat severity, only the SI and NI conditions were significantly different [$t = 3.29, df = 59, p = .002$], although the difference between DD and NI conditions approached significance [$t = 1.81, df = 59, p = .075$]. Crucially, the pattern of response urgency was different at low severity than at the other levels: symptom information alone elicited more urgent responses than the definitive diagnosis condition or suggested identity condition, with latter conditions eliciting similar responses.

Discussion

As one might expect, our results indicate that higher severity health threats were responded to more urgently than those of lesser severity. However, the effects of threat severity were modulated by diagnostic certainty, such that at the highest level of severity, increased levels of certainty were accompanied by significant increases in ratings of urgency. Conversely, certainty reduced urgency judgments for threats of low severity. Females also generally responded more urgently than males.

These results make intuitive sense: being certain of having a severe disease should elicit a more urgent response than *potentially* having it, but simply recognizing it as a possibility may cue a more urgent response than the symptoms alone dictate. However, to look at it another way, this also demonstrates that introducing even a moderate degree of uncertainty to a possibly very serious situation reduces the urgency of response. The relationship between severity and certainty is reversed in scenarios involving threats of lower severity. In these cases, a diagnosis confirms the relatively benign nature of the health threat, while decreasing certainty allows for the possibility of more serious alternatives.

The results of this study have implications on the broader field of self-health and care-seeking behaviour. First, they suggest that this hypothetical health threat paradigm provides a useful way of evaluating care-seeking tendencies in healthy populations. We can see that the factors of severity and certainty play into the self-triage decision in an interactive fashion, and that participants' responses are generally quite rational. This suggests that when possible, making this kind of graded information available can be

helpful to making self-triage decisions. However, it also identifies a critical problem: in potentially serious situations, people will not respond as urgently as may be appropriate in cases of uncertainty, even when they have a suggested diagnosis at hand. In the Emergency Department, a potential heart attack is triaged and treated as such until proven otherwise, as the cost of a false negative far outweighs a false positive. In cases where patients' health and wellbeing demands that the threat be treated as if it were the worst-case-scenario (e.g., a heart attack or stroke), public health education will need to be tailored to overcome this uncertainty effect. Providing laypersons with appropriate heuristics for more optimal decision making may help improve the self-triage process.

These results also show that providing a label, even an uncertain one, plays heavily into decision making. The suggestion of a serious diagnosis can increase urgency, but the suggestion of a less serious diagnosis can reduce it, even when the symptom information is always provided. The obvious extension is that health resources such as websites that provide diagnostic information may not only affect how a patient presents to a physician, but in fact whether they will present at all. In a recent study on care-seeking behaviour, 11% of individuals who used internet medical resources indicated that they had used the internet instead of seeing their doctor, citing reasons such as convenience and cost (Diaz et al., 2002). If the websites being utilized were monitored to ensure provision of accurate and directive information, and were able to take into account decision making biases such as those demonstrated in this study, internet resources might be beneficial to patients making self-triage decisions. However, the American Medical Association has identified several issues with Internet-based health information resources, including considerable variation in quality of content, confidentiality issues and potential commercial interference (Winkler et al., 2000). The AMA has provided clear guidelines governing affiliated websites, but at present, unregulated online sources of health information still pose a concern. This is particularly true in light of the findings of this study, which shows the strong effects of diagnostic suggestions, and the certainty with which they are presented. An inaccurate self-diagnosis may be very difficult for a patient to overrule in their decision making process, regardless of symptomatology.

As discussed earlier, there are a multitude of further complicating variables that remain to be examined to more fully understand self-triage decisions. For example, it is unclear how people deal with the factors of certainty and severity in the face of differential diagnoses. Furthermore, in light of the suspect nature of some internet medical resources, it might also be valuable to evaluate the impact of potentially incorrect diagnostic information on care-seeking behavior. Ultimately, this approach has great potential for understanding self-triage, which might help to improve public health programs dedicated to improving care-seeking behaviours, and identify potential problems with existing

sources of information that laypersons rely upon when evaluating their own health.

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Correspondence to: Andrew A. Cooper
The Ohio State University
Department of Psychology, Clinical Program
1835 Neil Avenue, Room 185
Columbus, Ohio, USA 43210
cooper.1803@osu.edu

Research Profile

Andrew A. Cooper is currently a graduate student in the Clinical Psychology program at the Ohio State University. His research concerns the role of uncertainty in layperson decision-making in a health context and the process of change in cognitive therapy for depression.

Dr. Karin R. Humphreys is an assistant professor in the Department of Psychology, Neuroscience & Behaviour, at McMaster University, in Hamilton, Ontario, Canada. Her research focuses on the cognitive psychology of language, including the role of language in medical decision making.