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Boundedly rational patients? Part 1: Health and patient mistakes in a behavioral framework

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Abstract

During medical visits, the stakes are high for many patients, who are put in a position to make, or to begin to make, important health-related decisions. But in such visits, patients often make cognitive errors. Traditionally, those errors are thought to result from poor communication with physicians; complicated subject matter; and patient anxiety. To date, measures to improve patient understanding and recall have had only modest effects. This paper reviews the current literature on behavioral insights in the patient experience and argues that an understanding of those cognitive errors can be improved by reference to a behavioral science framework, which distinguishes between a "System 1" mindset, in which patients are reliant on intuition and vulnerable to biases and imperfectly reliable heuristics, and a "System 2" mindset, which is reflective, slow, deliberative, and detailed-oriented.

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Keywords

System 1 and System 2 — cognitive errors — patient-reported outcomes measures — heuristics

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Cognitive challenges in health care

The relationship between patient and physician has much changed in the last century, with a shift from paternalistic to shared decision-making, loss of longitudinal relationships, increase in volumes and shorter visit times. Understanding the factors that govern this relationship is crucial in improving the experience of patients –and clinical outcomes. As patient-centered decision-making has become closer to a science, many evidence-based improvements in the communication methods of providers have been made. To date, however, the frame of mind of patients and methods to enhance both the quality and quantity of their involvement in their own care has not been the target of interventions.

In their landmark report "To Err is Human: Building a Safer Health System", the Institute of Medicine estimated that preventable medical errors are responsible for more deaths annually than motor vehicle accidents, breast cancer, and AIDS (Kohn, Corrigan, Donaldson, 2000). An important cause of those errors is lapses in patient-provider communication, which can lead to errors in diagnosis, testing, and treatment strategy. In addition to the quality of the communication from patient to physician and vice-versa, the patients' understanding of new medical information and recall of relevant information, during and after the visit, present cognitive challenges during which mistakes are commonly made. There are several distinct problems, all of which can be connected with continuing work in behavioral science.

First, errors in understanding of statistics lead to misdirection and poor decision-making by patients. Patients have been documented to overestimate their chance of survival and underestimate their personal risk of complications, even when accurately estimating the risk of others (Weeks, Cook, O'Day, et al., 1998). Patients have difficulty understanding their likelihood of cancer when given the real-life results of a test and false positive rate –strikingly, so do their doctors (Gigerenzer Edwards, 2003). Framing of the benefits versus risks avoided by preventative health measures can have a large impact (Sarfati, Howden-Chapman, Woodward, Salmond, 1998). Even seemingly crucial and very personal decisions such as end-of-life decisions[1] and organ donation registration[2] can be influenced by the way the question is framed[3]. Cognitive errors on the part of patients are frequent and seen in both inpatient and outpatient sessions, across socioeconomic classes and education levels, although with greater magnitude in less educated and older patients.

These errors in understanding medical information have been blamed on the inherently complicated subject matter;

[1] See Kressel Chapman, 2007; Kressel, Chapman, Leventhal, 2007; Halpern et al., 2013

[2] Ways in which patients are influenced when making those decisions reviewed in Thaler Sunstein, 2009

[3] An argument can be made that on both these topics, patients are generally very poorly informed, and do not like thinking about the choices they can make and their implications; they tend to choose quickly and are particularly easy to influence, in clinical experience and in studies, by defaults or outside advice.

low rates of medical literacy; poor communication from the physicians; and pressure from lack of time and high emotional burden. In response, studies have been done to correct those externalities, sometimes with positive results. Tools to help understanding of statistics, such as simpler and more descriptive language ("Out of 100 people with your disease, 3 will have a stroke or die in the next year if they don't take their blood thinning medication", instead of "The risk of stroke or death is 3%/year") have been shown to improve understanding (Kahneman, 2013), especially if accompanied by simple graphical representations (Spertus et al., 2015). Use of written materials and decisions aids has increased short-term patient recall of information, satisfaction, and participation in decision-making[4], although not anxiety related to consent for a procedure (Kinnersley et al., 2013).

Second, patients have poor recall of information prior to, during, and after a medical interaction. The most "savvy" of patients –even physicians, when they are themselves patients– often remember the one thing they meant to ask their doctor only at the end of the visit –"the doorknob question", in medical jargon– or, worse, on the way home. Recall by patients of timing of health-related events, especially those with emotional salience, is poor (L. M. Hess et al. 2012). Recall of information given during a medical visit is generally estimated to be less than half of what was discussed, even in healthy volunteers asked to recall a set number of instructions to be followed after hospital discharge (Langewitz et al., 2015). Studies have shown a poor correlation between what patients and healthcare professionals remember from one visit. In one study, 45% of pairs remembered different goals as having been set during the visit, and 21% did not think the same decisions were reached (Parkin Skinner, 2003). Similarly to the challenges in understanding medical information, efforts to simplify information and improve the communication have been studied, with some improvement in recall. Use of written or pictorial end-of-visit summaries has been proposed as a way to increase recall of instructions, with especially promising results in one study, improving recall of healthy volunteers from 14% to 85% of a list of strategies to manage two cancer symptoms (Houts et al., 1998).

Patient-reported outcomes measures (PROMs) were proposed in the last two decades as a way to increase patient involvement, improve recall, and focus care on elements that are important for quality of life[5]. PROMs consist of detailed symptom surveys given to patients prior to visits. By asking questions about specific symptoms, periods of time and quality of life spheres, they are thought to improve recall and reporting of symptoms by patients. For instance, heart failure PROMs, such as the Kansas City Cardiomyopathy Questionnaire, ask patients about their shortness of breath over the last two weeks, as noticed when walking, climbing stairs, showering, hurrying on the street (Spertus Jones, 2015). They are increasingly used and helping in focusing the discussion during the patient visit, tracking symptom changes after an intervention, and as endpoints in clinical trials. While inherently complicated medical information and poor communication have been shown to play a role in causing patient errors, and some improvements in understanding and outcomes have been seen with interventions in those domains, less attention has been given to the effects on patients of the biases and heuristics that have been shown to cause cognitive errors in other settings- buying a car, choosing insurance, saving for retirement.

Two systems and their likely effects in healthcare

In an influential essay, Stanovich and West describe two families of cognitive operations: "System 1", an intuitive, fast-thinking system, that use heuristics, and "System 2", a slow-thinking, deliberate, effortful system that is used for complex reasoning (Stanovich West, 2000). Taking the idea of two systems as a metaphor, Kahneman has elaborated their differences and interactions, describing the benefits of System 1 thought (rapid retrieval of memories and information, short reaction time) as well as its costs (such as biases, error-prone heuristics, and susceptibility to framing and anchoring). For instance, most of us have a poor intuitive understanding of statistics[6] and are influenced by framing effects and status quo bias, which can lead us to make poor choices in long-term economic decisions such as saving for retirement and choosing loan programs (Sunstein, 2013). In the healthcare field, poor adherence to medications in patients in low socioeconomic classes can be better understood in light of the fact that because of poverty, they have limited bandwidth for attention to health, in particular of long-term consequences of diseases with few symptoms or a long asymptomatic latent period, such as hypertension or diabetes (Mullainathan Shafir, 2013).

An understanding of behavioral biases is increasingly being used to set policy – not only at the level of government but also by private institutions, including in the domains of health and medicine (Thaler Sunstein, 2009). For example, lessons from behavioral economics have recently been applied in population health management[7]. The applications have generally shown benefits in short trials, although there is not yet solid evidence for lasting benefits. Interventions that influence both patients and physicians have been recently studied, such as an evidence-based risk calculator to be performed in real time

[4] See E. P. Hess et al., 2012 for choice of tests and risk of radiation vs. cardiovascular event in patients with low-risk chest pain, and Waljee, Rogers, Alderman, 2007 in choice of medical versus surgical treatment of breast cancer. See Stacey et al., 2014 for recent Cochrane review of evidence base for decision aid tools in medicine.

[5] (Wasson et al., 1999) and (Nelson et al., 2015).

[6] see Tversky and Kahneman's seminal work in Tversky Kahneman, 1974, 1981 and Kahneman Tversky, 1979

[7] See Ubel, Comerford, Johnson, 2015, for choices of health insurance; Levy, Riis, Sonnenberg, Barraclough, Thorndike, 2012; Sonnenberg et al., 2013; Thorndike, Riis, Levy, 2016; Thorndike, Riis, Sonnenberg, Levy, 2014 for interventions to improve dietary patterns; Merrick et al., 2015 to increase the rates of cancer screening; and Patel, Asch, Rosin, et al., 2016; Patel, Asch, Troxel, et al., 2016 for physical activity and weight loss

by the physician at the patient's bedside, which was shown to significantly reduce the risk of complications in coronary angiography (Spertus et al., 2015).

We would expect System 1 thinking to be especially prominent during a visit, when patients are under pressure, short of time, and obliged to make quick decisions. This claim can elegantly explain some or perhaps all of the cognitive errors faced by patients described earlier: System 1 relies on intuition for statistics, producing a high error rate (Kahneman, 2013); it is dependent on context and recent memories have more salience, which is why patients give more salience to recent symptoms rather than accurately describing their history; it is impulsive and discounts the future in favor of the present, which can lead to poor and regretted long-term medical decisions, especially in end-of-life care; it is optimistic and overconfident, as seen in patients' underestimation of their personal risk for adverse events when compared to the general population.

While the factors affecting patient decision-making have been less studied than physician decision-making, there is evidence that even highly educated patients –in a striking example, economists well versed in statistics and probability– rely on heuristics rather than the available evidence base, even when offered to them . Cognitive aging has been found to be associated with more reliance on heuristics outside of the healthcare setting. System 2, on the other hand, would be expected to be lead to more detailed thought, better understanding of complex information, and better recall of information. The shift between one system and the other usually occurs unconsciously, as a response to outside stimuli (such as tasks that present a cognitive load, such as complicated multiplications or reading difficult handwriting), or emotions (sadness, for instance)[8].

We speculate that patients are often relying on System 1, which is ill-suited for the decisions that they must make in medical setting. In a later essay, to be published in this journal, we will offer evidence that the speculation is correct.

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[8] See Kahneman, 2013. Interestingly, even invoking an emotion subconsciously can have a strong effect: in one experiment, subjects were instructed to hold a pencil in their mouth in a position that made them frown. They subsequently had higher, more "System 2" scores, on a test.

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