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HEURISTICS, LANGUAGE AND MEDICAL ERRORS

M.A. Graber

University of Iowa Carver College of Medicine, Iowa City, USA

The use of heuristics, cognitive "rules of thumb" or "shortcuts", are a common part of medical decision making. While using heuristics lessens the cognitive burden of decision making and often comes up with the correct answer, reliance on heuristics can also lead to medical errors. In this introduction we will define heuristics and discuss some of the more common heuristics/biases that may lead to biased decision making and patient harm. We will also look at the use of language in medicine and how that can lead us to make diagnostic errors.

Keywords: errors; diagnostic; heuristics; semantics.

ЭВРИСТИКИ, ЯЗЫК И МЕДИЦИНСКИЕ ОШИБКИ

М.А. Грабер

Медицинский колледж Карвера Университета Айовы, Айова, США

Эвристики (ярлыки для принятия решений), когнитивные «правила большого пальца», или «короткие пути», используют в клинической практике для принятия решений по тактике ведения пациента как в диагностическом процессе, так и при выборе терапии. Этот метод уменьшает когнитивное бремя процесса принятия решений и часто позволяет получить правильный ответ, но при этом его выбор чреват и врачебными ошибками. В данной статье на примере клинических случаев, в том числе тех, которые закончились неблагоприятным исходом для пациента, рассмотрено, чем грозит такой подход к принятию решений в медицинской практике, Кроме того, в статье проанализированы ситуации, при которых причиной диагностической ошибки могло стать неправильное использование медицинских терминов.

Ключевые слова: ошибки; диагностика; эвристики; семантика.

Introduction

Heuristics are cognitive shortcuts that allow us to make decisions rapidly and often with incomplete information [1–7].

Using a heuristic requires little cognitive effort. For example, we may be in the midst of an influenza outbreak and see a patient with symptoms suggestive of influenza. We briefly interview and examine the patient and decide that it is influenza. Of course, it could be SARS or MERS. However, even though we used an intuitive approach, a cognitive shortcut, and didn't consciously direct our workup to rule out everything else, it would be ludicrous to do a full evaluation for MERS on every patient with influenza symptoms. Our mental shortcut (heuristic) is probably right. We are using the "availability heuristic" to make our decision; influenza is in the news and seemingly every patient we see has influenza. It is in the top of our mind and is the most "available" (and in this case the most likely) diagnosis [8].

Most of the time heuristics work fine, and in some situations, may be more accurate than conscious deliberation [9]. In fact, about 95% of our decisions are based on intuition/heuristics [10]. However, the use of heuristics can also lead us to make wrong decisions. Take, for example, the "availability heuristic." We are more likely to think of a pulmonary embolism in our next patient with shortness of breath if we recently misdiagnosed a patient with a pulmonary embolism. Or, when we see a patient with an uncommon illness, we suddenly "see" that same illness in patients with similar symptoms even though the disease itself may be uncommon. The illness is top in our mind (most available) and so we "see it" everywhere.

Heuristics are an evolutionary adaptation and are hard wired in our brains. For example, a heuristic may suggest that we run away from a charging lion without consciously balancing the pros and cons of various options for 10 minutes (at which time we likely will be dinner with a side of fries). If we are wrong and it is a Russian Blue

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Cat, we haven't wasted a lot of mental effort making our decision and we have survived [12]. Functional MRI (fMRI) has identified separate neural pathways for heuristic-based decisions and those made by contemplation – a distinction now referred to as "the dual process model" [13–16].

Being general rules, heuristics can cause us to make mistakes in an individual case if that case deviates from the general rule. The problem is not just theoretical. In one study, up to 74% of medical errors were determined to be the result of cognitive errors. 30% of emergency physicians self-identified cognitive errors as a source of mistakes while cognitive errors were operant by self-report in 42% internal medicine errors [17–19]. There are many cognitive and affective errors that are well recognized as sources of errors in medical decision making. A partial compilation of 50 of these by Pat Croskerry MD, PhD, FRCP from Dalhousie University in Nova Scotia can be found here: http://sjrhem.ca/wp-content/uploads/2015/11/CriticaThinking-Listof50-biases.pdf [5]. It would be impossible to address all, or even a significant portion of these, in a short paper. However, with this background, let's consider some examples.

Case 1

NHK is a 64-year-old male with a history of hypertension who presents to the emergency department with abdominal pain, described as a burning in the midepigastric region after he eats a large meal. The pain usually resolves with an H2 blocker or an antacid. The patient turns out to be a retired physician as well as a major benefactor of the hospital. The Chief-of-Staff and head of surgery show up. The clinical evaluation reveals diffuse mild, tenderness, especially midepigastric. An appropriate workup, including an EKG, is normal.

This is not a patient that you would evaluate further given the history and exam. It sounds like simple esophageal reflux. However, the Chief-of-Staff wonders out loud (and just within hearing range of the patient) if a computerized tomography scan of the abdomen should be done. Since the patient is a friend yours, you really don't want to miss anything and order a CT scan. The CT scan shows an adrenal incidentaloma which prompts the surgeon to recommend an open biopsy "just to be sure." Usually these are followed every 6 months, but the surgeon doesn't want to miss anything either. The patient dies on the table from uncontrolled bleeding, the result of an unneeded test. (This process of following up one unneeded test with others is called "The Ulysses Syndrome". It often results in an adverse patient event [20].)

Affect Heuristic/Visceral Bias

Having a friend (or disagreeable individual or anyone, really) as a patient may lead to decisions invoked by the "affect heuristic" also known as "visceral bias" [11]. The affect heuristic is operative when we have positive or negative feelings about our patient. This is at least part of the reason behind the admonition to not care for close family members and why many of don't like taking care of colleagues and other "important" people such as major donors to the hospital.

These feelings can skew our decision-making in two ways. The first is "omission bias," which might lead us to avoid an indicated but painful procedure on a friend or family member. For example, we might be more hesitant to perform a lumbar puncture on our own child or significant other than we would be on a patient who is otherwise a stranger. This omission could lead to a missed or delayed diagnosis of meningitis or sub-arachnoid hemorrhage. A second potential outcome of the affect heuristic is "commission bias" whereby we are more likely to perform tests on a patient in an attempt to not miss anything. Commission bias is what led to a bad outcome in the case above. It isn't unusual to find an "incidentaloma", an unexpected finding on a CT scan [21]. There are guidelines to manage these findings, but we feel pressured by our friendship with our colleague in the case above to "do more" to rule out any significant illness. This may lead to a bad outcome (bleeding from a procedure, etc.).

Case 2

SM is a 41-year-old complaining of the sudden onset of a severe headache. He states he never gets headaches and that this is the worst headache of his life. The nurse tells you he is a "drug seeker" and had an addiction to narcotics in the past (although she hasn't seen him for 12 years). His physical examination is intact except the clothing he is wearing are old and a bit shabby. The patient is discharged with a diagnosis of a severe migraine and returns by ambulance to the hospital comatose later that day. The CT scan shows a large subarachnoid hemorrhage.

Attribution Error

If the individual was a businessperson dressed in a suit and tie, and the nurse hadn't told us that he had a history of drug seeking in the past, we may have done the CT scan at the first visit. The symptoms are suggestive of a subarachnoid hemorrhage; sudden onset of a severe headache in patient without a history of headache. This is an example of "attribution error". An "attribution error" occurs when we make decisions based on irrelevant information based on a patient's race,

age, or other "attribute" that doesn't change the probability of disease. For example, both a 41-year-old well-dressed banker and a 41-year-old homeless individual can have a subarachnoid. Yet we treat the banker differently than the homeless individual. In our case, we have no idea if this patient currently has a drug problem. The last history we have of this is from 12 years ago. Even if he does, it is still irrelevant to the chief complaint given that the mortality from each subarachnoid hemorrhage approaches 50%: It isn't something we can afford to miss.

Think about how you feel if the nurse tells you that your next patient "is looking for narcotics" or is a "drug seeker" or "is crazy"? Do you look forward to seeing this patient? When we are told a patient is a "drug seeker", we subconsciously assign other characteristics to the patient. Perhaps you are expecting an angry, aggressive and demanding patient. If we are told that a patient is depressed, we are less likely to believe their symptoms (for example a subarachnoid headache symptoms) are real [22]. The way people dress, their race and even their gender, effect how we react to the patient. We may assume that a homeless person is uneducated, and an alcoholic or addict. The truth may be that the patient has a PhD in physics but has been unable to find a job and therefore can't afford a flat. But we "attribute" certain characteristics to the patient solely based on the fact that he is homeless, poorly dressed, or has a past history of drug addiction. The same is true if we are seeing a minority or a woman. We tend to minimize the symptoms if our patient is female, perhaps thinking "she is just emotional". We are less likely to do an invasive cardiac workup if our patient is female [23, 24]. This is the same reason that female doctors get called "nurse" or a recent medical school graduate is told "you are too young to be a doctor". The patient is associating (attributing) female = nurse and a young-looking = can't possibility be a doctor.

Once you hear something negative about a patient, it is hard to put it out of your mind. So, if you find for some reason you are angry or frustrated or don't like the patient, take a step back before you make a medical decision and ask yourself why you are having this reaction to the patient and whether or not this is clouding your decision making process. Is this affective bias? Could it be attribution bias? Simply recognizing the role these are playing in your decision-making process can help you avoid errors.

The "one word one meaning" fallacy

The next case is one that we have all experienced (and many of us on frequent basis). Recall when you were a junior student or resident and went into a patient's room. You walk out of the room and go talk to the senior physician to present the case. The senior doctor goes into the patient's room and gets an entirely different history. Raise your hand if this has happened to you...more than once! So why does this happen? Part of the reason is the "one word one meaning" fallacy [25]. For example, the patient may deny chest pain when asked. But if you ask, "any pain, pressure, sharp feeling, heaviness, tightness, or discomfort in your chest?" the patient may answer yes. To the patient, "chest pain" may mean one thing (for example sharp). To us, "chest pain" means any cardiac discomfort including pressure, heaviness, a tearing sensation, pain with breathing, etc. So, start with an open-ended questions such as, "What kind of symptoms are you having today?" If you do need to prompt the patient, give them several options to help them describe their symptoms (pressure, tightness, sharp, stabbing, etc.).

Another example of the "one-word-one-meaning-fallacy": JC is a 32-year-old patient who was in the hospital for "shortness of breath". He had an extensive workup including a left heart catheterization, a right heart catheterization, pulmonary function tests, a bronchoscopy, a chest CT, etc. He was discharged and promptly walked from his inpatient room to the emergency department. It was very puzzling. Why did he get discharged and come right to emergency department? His response, "I am still short of breath". Here is this guy who looks like he could be the striker on the Russian National Football team complaining he is short of breath. So, I asked him, "what do you mean by shortness of breath?" As doctors and other care providers we expect him to say something like, "I can't walk 20 feet without having to stop to catch my breath." His response? "I can't breathe through my nose". This happens a lot: Don't assume you and the patient are speaking the same language even if you are speaking the same language. To those of us in medicine, "shortness of breath" usually means dyspnea. But, as in this case, the patient may use words differently. So always ask the patient to describe their symptoms. For example, what does the patient mean when she complains of a "migraine headache" or "the flu?" To the patient, a migraine is any bad headache. To us it is a specific kind of headache (unilateral, pulsating, nausea, photophobia). To us, "flu" means "influenza". To the patient it may be nausea and vomiting. In the case of JC we could have avoided 2 weeks in the hospital and tens of thousands of dollars of tests simply by asking, "What do you mean by shortness of breath?" So any time the patient tells you their diagnosis ("I am dizzy', "I have a migraine", "I have a slipped disc"), ask

them to describe their symptoms. It is our job to figure out what is going on and not just to put down in the chart what the patient believes that they have. We may need to take the time to educate the patient, especially in the age of the World Wide Web, where patients often think they already know the answer. But that is part of what it means to be a doctor in the 2020s.

Case 3

The last case is also case that everyone has seen. BFL is a 22-year-old female who presents complaining of "twelve out of ten" pain; this is the worst pain she can imagine. Of course, she is smiling and eating a bag of potato chips. You are scratching your head wondering if she is making this up. How can she really be in such bad pain while eating potato chips? She looks fine. Is she just looking for narcotics?

Frame of Reference

It is possible she is looking for narcotics. But it also may be that her frame of reference is different than ours. What is the worst pain a patient can imagine or has seen? Maybe an ingrown toenail, a sprained ankle or falling and hitting her head. What is the worst pain you can imagine? Probably 30% second degree burns, a kidney stone or maybe an open femur fracture. So, for the patient, this may be the worst pain imaginable. The point is that we should not dismiss this complaint and assume it is fake or embellished. Her idea of what constitutes "worst pain" is going to be different than ours.

Discussion and Conclusion

Language and heuristics both have a roll in diagnostic errors. Teaching about the way we make decisions may help to reduce medical errors [26, 27]. In this paper we discussed the affective heuristic (AKA "visceral bias"), attribution error, availability bias and "the one word on meaning fallacy". In the follow-up paper we will discuss dealing with uncertainty in medicine, "representiveness", diagnosis momentum as well as other common sources of medical error.

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Information about the author

Mark A. Graber — MD MSHCE FACEP, Emeritus Professor of Emergency and Family Medicine. University of Iowa Roy J. and Lucille A. Carver College of Medicine, Iowa City, USA. E-mail: mark-graber@uiowa.edu.

Информация об авторе

Марк А. Грабер — доктор медицины, магистр здравоохранения и этики, член Американского колледжа врачей экстренной помощи, почетный профессор кафедры экстренной помощи и семейной медицины. Медицинский колледж Карвера Университета Айовы, США. E-mail: mark-graber@uiowa.edu.