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Representativeness Heuristic is a Potential Danger to the Diagnostic Process

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Abstract

Similarly to the ordinary, the diagnostic process is characterized by the formulation of initial hypotheses to which probability judgments are associated, sometimes generated through heuristics and biases. The use of mental "shortcuts" can negatively affect the patient's management.

Keywords

Heuristics; biases; diagnosis; representativeness.

How to Cite

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Dear Editor,

I read the article Role of heuristics in diagnostic reasoning in practice with interest, and I would like to propose some criticisms of the conclusions reached by the Author.

The Author claims that diagnostic reasoning is articulated in the following steps: first, the physician examines the patient and "suspects" a possible diagnostic hypothesis; next, he chooses a test to evaluate this hypothesis; and finally, he combines the prior probability of disease as estimated from its population prevalence with

the relative likelihood ratio (LR) to calculate a posterior probability of disease. He affirms that such early hypotheses, being just suspicions and not probability judgements, can be discarded if proved wrong without introducing any risk of error in the whole process.

In my opinion, to "suspect" something is to generate a personal belief about the actual cause of a patient complaint. Different diseases can usually cause a symptom, so multiple diagnostic beliefs are generated, and specific degrees of confidence, which can be formalized as probabilities, are associated with each.

In the clinical context, probability judgments are formulated based on uncertain data, precisely the context in which heuristics are used, and biases can occur. The use of mental shortcuts is further confirmed by the evidence according to which the first diagnostic hypotheses (and the respective pre-test probabilities) arise within a few seconds from the beginning of the encounter with the patient (Pelaccia et al. 2014: How and when do expert emergency physicians generate and evaluate diagnostic hypotheses? A qualitative study using head-mounted video cued-recall interviews, Annals of Emergency Medicine, 64(6):575-85, doi: 10.1016/j.annemergmed.2014.05.003). The degree of belief in these early hypotheses, which seldom relies on the knowledge of population prevalence, drives the following decisions about further testing.

It is possible that, among others, the representativeness heuristic is employed, according to which the probability that object A belongs to class B is estimated from the degree of similarity of the former to the latter. If A is highly representative of B, the probability that the former belongs to the latter is considered high. At the same time, if A has no characteristics that make it simi-

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lar to B (thus is "atypical" with respect to B), the probability of A belonging to B is considered low (Tversky and Kahnemann 1974: Judgment under Uncertainty: Heuristics and Biases, Science, 185(4157):1124-31, doi: 10.1126/science.185.4157.1124). Consequently, a clinical presentation that bears little resemblance to the description of the disease contained in the physician's mental model could be associated with such a low degree of confidence that it is not further analyzed.

Empirical evidence about the use of heuristics and bias in clinical medicine is scarce due to the intrinsic difficulties in defining both the population of possibly affected subjects and the misdiagnosis cases. Nonetheless, some accounts of the use of representativeness heuristics exist. According to Kulkarny and colleagues, victims of trauma defined with objective scales as moderate-severe but who do not present "typical" characteristics for the condition are transferred less frequently to dedicated medical centers (Kulkarny et al. 2019: Defining the representativeness heuristic in trauma triage: A retrospective observational cohort study, PLoS One, 14(2):e0212201, doi: 10.1371/journal.pone.0212201).

Contrary to what the Author of the essay claims, at least one case of death related to the representativeness heuristic has been reported in the literature. In a 70-years-old woman, the absence of characteristic features of the disease (such as hypotension, severe chest pain, and increased diameter of the mediastinal profile on chest X-rays) meant that a diagnosis of aortic dissection was not considered and led to an unfortunate outcome (Moffat et al 2022: Dual-processing theory helps to explain delay in diagnosis of Stanford type A aortic dissection, BMJ Case Reports, 22;15(4):e242036, doi: 10.1136/bcr-2021-242036).

In conclusion, there is evidence that the diagnostic pro-

cess is similar, in most cases, to ordinary reasoning. It includes an initial phase of hypothesis generation, in which the doctor may resort to biases and heuristics, including representativeness. Using the representativeness heuristic may correlate with worse outcomes for patients.

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