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History information management strategy for minimising biases and noise for improved medical diagnosis

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ABSTRACT

Despite measures for physicians' excellence in diagnosis, the need for improvement of medical history techniques has been pointed out as one of the critical elements for improving diagnosis. Specific and proactive frameworks related to methods of effective history acquisition are needed to minimise bias and optimise decision-making. Therefore, this paper uses Linear Sequential Unmasking-Expanded to develop and propose a structured medical history acquisition strategy. The strength of this lies in its reliance on cognitive psychological processes. Breaking information gatherings and decisions into smaller tasks and ordering them correctly reduces cognitive load as well as minimises noise and bias cascade. Additionally, this approach can help physicians develop diagnostic expertise regardless of specialty.

INTRODUCTION

History information significantly contributes to accurate diagnosis.[1] Nevertheless, it can also create bias, and therefore it is critical to consider bias reduction[2] when gathering clinical data to achieve diagnostic excellence. It is important to explore and consider such bias reduction proactive frameworks for history acquisition, which are insufficiently explored. To address bias, an information-gathering strategy must consider how contextual and historical information can create bias in medical diagnosis, and how to minimise it. Incorporating multidisciplinary knowledge, including sociological and psychological knowledge related to medicine, is crucial to enhance medical decision-making.

Biases can emerge from eight different sources[3] and be categorised into three categories (see figure 1). Category A includes essential items required for medical diagnosis, such as 'data', 'contextual information' and 'reference materials'. Regarding patient history, this can break down to five components: demographics, risks, exposure, description and context.

Demographics

Age, gender and ethnicity influence disease susceptibilities. While this information is often considered in relation to risk, its significance in validating differential diagnoses warrants particular attention. When a 25-year-old man presents with a 10% weight loss and recurrent abdominal pain over 6 months, avoiding bias toward the prominent weight loss symptom is essential. Neglecting to consider the age factor adequately may result in unnecessary investigations for malignancies or gastrointestinal disorders. However, it is possible to reach the correct diagnosis of coeliac artery compression syndrome by prioritising age and focusing on factors such as alternative causes[4] and detailed onset patterns in the patient's medical history.

Risks

Encompasses endogenous patient factors such as medical history and family history. For example, a middle-aged woman with colonic diverticulosis and worsening left lower quadrant pain over 2 days may indicate diverticulitis, while recurrent bloody stools following abdominal aortic surgery in an older man could suggest an aorto-enteric fistula. Although past and family histories are routinely addressed, emphasising this risk assessment highlights the importance of structured questioning to elicit relevant risk factors, enabling a precise diagnosis.

Exposure

Includes exogenous factors like medication, occupation, residency, travel, allergies, living things and sexual contact. They aid in enhancing differential diagnoses based on other data. As they can impact the diagnosis, less seemingly significant details should also be inquired about, but in the right way and the right time. Alternatively, in cases where the diagnosis proves challenging, paying attention to these aspects can potentially lead to the correct diagnosis. For instance, in the case of a 42-year-old man experiencing unexplained fever and generalised pain, a history of consuming bear meat during a vacation revealed the diagnosis of trichinosis.

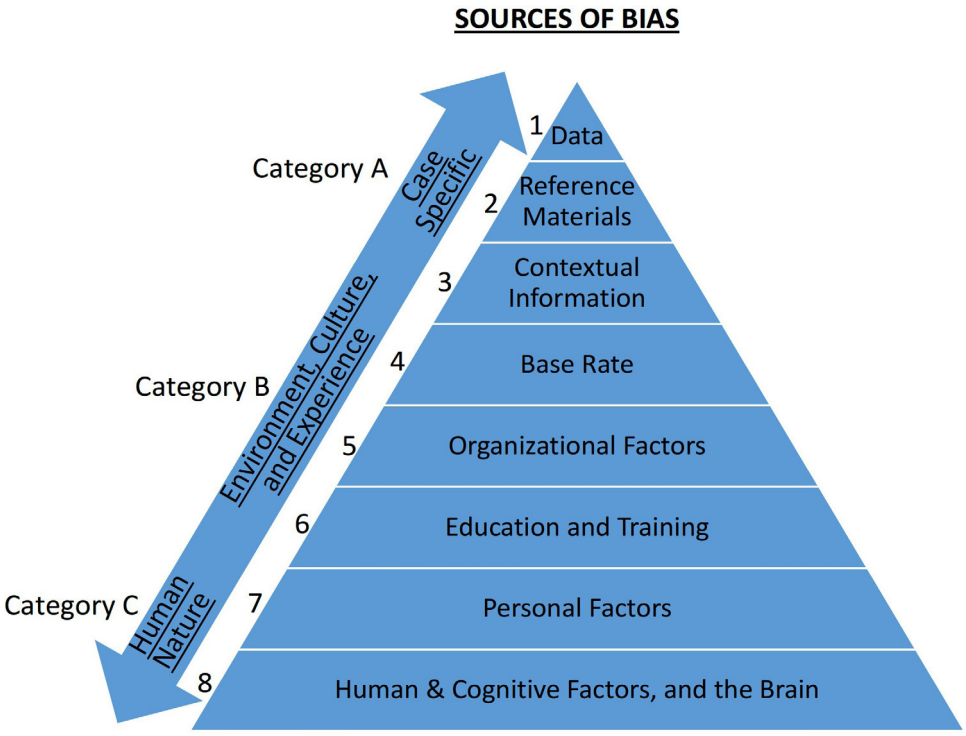

Figure 1 The eight sources of bias that may cognitively contaminate sampling, observations, testing strategies, analysis and diagnosis. They are organised in a taxonomy within three categories: starting off at the top with sources relating to the specific case, the person *being* diagnosed (category A), moving down to sources that relate to the person *doing* the diagnosis (category B), and at the very bottom sources that relate to human nature that impact all of us regardless of who is being diagnosed and who is doing the diagnosis (category C). Source: Dror.[10]

Similarly, in the case of a 55-year-old individual with long-standing dizziness and peripheral neuropathy, an occupational history of exposure to organic solvents in a factory setting unveiled the cause. These examples highlight how inquiring about such information can elucidate the diagnosis and provide valuable insights.

Description

Focus on obtaining detailed information, to the extent of being 'visualised', regarding self-reported symptoms, including their onset, clinical course, and associated factors and assessing the clinical course as linear, recurrent, or unchanged aids in forming differential diagnoses. Additionally, gathering information on factors that may affect the course (aggravating or alleviating) and patients' anxiety or specific concerns related to the symptoms is essential. When symptoms involve pain or sensory disturbances, detailed structured information regarding anatomical location and nature of the symptoms is necessary.

Context

The proximal (eg, economic status, family structure) and distal (eg, cultural background, access to local healthcare system) contexts interacts with patients' problems. Capturing context is crucial for differential diagnosis. Enriching and capturing each context during patient-physician engagement ensures continuity of care. Limited access to healthcare necessitates considering a range of untreated health issues, including diabetes, asthma, smoking-related conditions and tuberculosis. These confounding factors raise concerns about complex pathologies like immunodeficiency, autoimmune diseases and neoplastic diseases. This underscores that contextual information that can create bias can also be important in the diagnostic process—therefore the need to find strategies that enable use of such context, but yet minimise bias.

DISCUSSION

Correctly structured information gathering reduces bias, enabling optimal diagnostic decisions based on patient attributes. Understanding bias is crucial for prioritising diagnoses. 'DRED-C' items in history acquisition provide a comprehensive patient view, enhancing diagnostic quality.[5]

Information on various aspects of the problem is processed simultaneously, compromising overall accuracy due to 'over-consistency'.[6] Breaking down the judgement into smaller tasks with the least cognitive load and biasing cascade between the different components[7] prevents 'contamination' by different types of information and reduces over-consistency. Since all patients are considered for a diagnosis based on their attributes, it can help many physicians, regardless of specialty.

Using information gathering by incorporating the Linear Sequential Unmasking-Expanded (LSU-E)

process—which has been advocated in forensic science in recent years[8]—which may improve medical diagnosis. LSU-E is a linear information integration approach that sequentially incorporates information disclosure in decision-making, considering biasing power, objectivity and relevance to the decision. From the perspective of sequence information in the decision hygiene concept, it is expected to reduce bias and noise effectively. It promotes that decisions are mainly driven by the more relevant, and objective information, and minimise biases due to circular reasoning, backward reasoning and other weaknesses in human decision-making. Despite its comprehensiveness and meticulousness, this strategy can be a bit time-consuming. However, proper training can enable efficient and selective implementation.

Furthermore, to mitigate potential bias when contextual information is misleading (eg, patients inaccurately recall or provide their medical history and exposure details), sharing and verifying detailed information (medical history and the working diagnosis), aiming for story consistency and coherence, with the patient in light of patient collaboration and patient centredness should enhance the accuracy of this information.[9]

Diagnosis requires comprehensive assessments, incorporating medical history, physical examination and diagnostic test results at the right time. Further research is warranted to support the findings of this article that bias should be minimised using cognitively informed strategies, such as LSU-E.

CONCLUSION

Effective techniques for history acquisition reduce bias and noise, enhancing medical diagnosis by considering cognitive aspects of decision-making and information bias.

Correction notice This article has been corrected since it was first published. Reference 3 has been corrected.

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