Metacognition and Medicine

Modern medical practice has shown remarkable improvements, resulting in both increased life expectancy and quality of life for many people. Paradoxically, it is also true that medical errors in diagnosis, wrong site surgery, incorrect prescription, and similar events result in significant morbidity and mortality. Various safety protocols and checklists have been advised to prevent such errors. A completely different set of mistakes in diagnosis and management planning can result from various cognitive biases. Cognitive biases are systematic errors in thinking due to human processing limitations or inappropriate mental models.[1,2] It has been reported that "intuitive" or "fast thinking" is responsible for cognitive biases.[1] Reflective practice/metacognition/mindfulness is the opposite of intuitive or fast thinking and is a useful debiasing strategy.[3,4] Metacognition or "thinking about thinking" involves critical analysis of a thought that may direct an action while actually performing the act. For example, while advising a cyclodestructive procedure for an eye with absolute secondary glaucoma, can one critically question the advice and rule out an intraocular malignancy as a cause of secondary glaucoma and undertake the appropriate management?

This editorial looks at some of these biases and ways to mitigate them by certain debiasing strategies. While close to 100 different biases have been considered, the common ones addressed here include anchoring bias, confirmation bias/diagnostic momentum, search satisfaction, hope and expectation biases, and multitasking.[1,2,5] The proposed debiasing strategies include actively practicing reflective practice/metacognition[3,4] by specifically invoking the null hypothesis and 3D approach.[6] Furthermore, being empathetic, mindful of the impact of the disease on the patient's personal and socioeconomic factors, and addressing these to the extent possible will ensure safe and patient-centric care.

Anchoring bias: The clinician "anchors" to some of the initial clinical signs or investigation results and gets biased to focus only on additional corroborating findings while failing to gather or utilize the opposing clues leading to misdiagnosis. For example, retinal nerve fiber layer (RNFL) loss on optical coherence tomography (OCT) can potentially indicate early or pre-perimetric glaucoma. Before confirming that this is the case, one needs to see (accepting a good-quality scan) if the RNFL loss is limited to only one of either the superior or inferior hemisphere (as early glaucoma involves only one hemisphere) and is correlating with at least one of the following: corresponding ganglion cell inner plexiform layer loss, clinical optic nerve head neuroretinal rim, or RNFL loss, and finally the visual field defect in the corresponding hemifield in established glaucoma.[7] In the absence of this correlation, the OCT finding is likely a false positive. Therefore, being mindful of such anchoring effects can be helpful in situations demanding critical decision-making.

Confirmation bias/diagnostic momentum: In a patient "labeled" with a given diagnosis for a significant amount of time, there is a tendency to accept that diagnosis and not evaluate the patient in detail for other probable differential diagnoses. For example, an eye with a diagnostic label of traumatic secondary glaucoma in a child might be treated symptomatically as the visual prognosis is poor. A diligent clinician would question if the injury is causal or incidental, a deviating eye might indicate a longer duration pathology than indicated by the time of trauma, and finally an ultrasound B-scan might reveal a retinoblastoma. It is useful to ask the question "What is the worst-case scenario?" and cover the same in the investigations and management plan. It is prudent to ask yourself why you hold a particular view and consider alternative explanations and possibilities and guard against "diagnostic momentum."

Search satisfaction: It is possible that once a significant or "interesting" finding is picked up, the diligence needed to look for other associated signs and symptoms might be missing. Glaucoma can coexist with other ocular ailments such as venous occlusions, macular degeneration, and retinal detachment. All of these can affect both the vision and the visual fields. A patient with glaucoma at presentation or on follow-up can develop any of these diseases. Furthermore, primary open-angle glaucoma (POAG) can develop an element of angle closure as the lens volume increases over the years. One needs to be vigilant of these and not be satisfied with just the diagnosis of POAG. Similar is the need to look for pseudo exfoliation or corneal guttata in a case of POAG that has been advised cataract surgery. Essentially, one needs to be mindful and ask "what else is there" before committing to a diagnosis and plan of management.

Hope bias and expectation bias: The assessment of certain findings may be influenced by our expectations derived from the ongoing clinical situation, our optimism rooted in past interventions, or our emotional connection to the patient. For example, an intraocular pressure (IOP) that actually is 19 or 20 mmHg could be recorded as 18 mmHg as a trabeculectomy was performed, and there is "hope" for the IOP to be lower. Similarly, the same IOP of 19 or 20 mmHg could turn out to be 21 mmHg in a high-risk glaucoma suspect as one "expects" the IOP to be higher.

Multitasking: Multitasking is not exactly a bias but is likely to make one susceptible to different biases. It may be taken as a risk factor for cognitive biases. Although medical practice is a demanding task that requires our full mental engagement, our allocation of mental resources depends on our familiarity and comfort with the clinical or surgical situation, often leading to partial resource dedication and mental multitasking. For example, fear of complications and level of confidence with the procedure are two strong and opposing forces that act constantly on our minds while performing any surgery. When we are learning a new surgical skill such as Phaco emulsification, we are 100 percent focused on the job at hand and diligently avoid errors. As our familiarity and ease with a procedure grow, we often find ourselves multitasking during surgery, sometimes resulting in preventable complications. This can lead to a decline in confidence, prompting us to adopt a more cautious and focused approach. However, over time, as comfort levels increase once more, the tendency to

multitask re-emerges. By consciously recognizing whether we are concentrating or multitasking during different stages of surgery and redirecting our full mental resources, when necessary, we can potentially reduce the likelihood of such errors This does apply to clinical evaluation as well. The more focused and less multitasking we are while evaluating a patient, the more likely we are to gather subtle but crucial information in past records or in history. Quite often, such information (e.g., the use of steroid skin ointment in a patient whose IOP control is poor) is very crucial in the successful care of a patient. Could one make all efforts to be "only with the patient" when with the patient?

Null hypothesis: Invoking the null hypothesis in clinical evaluation is a powerful debiasing strategy. Briefly, the concept is that we accept our proposed favorite hypothesis (drug A is better than drug B) only by rejecting the null hypothesis (drug A is not better than drug B) by actively looking for evidence against our favorite hypothesis. For example, on gonioscopy, a decision is made that the angle is open. That would be the favorite hypothesis. Then, using the null hypothesis, one seeks evidence for the contrary and questions if the angle is open due to miosis of the pupil because of the illumination in the room, whether one is inadvertently indenting the angle open, or whether subtle blotchy pigments or synechiae in the angle are being ignored. If the answer to all the above is negative, then the null hypothesis that there is angle closure is rejected and the favorite hypothesis that the angle is actually open is accepted. Similar logic could be used before labeling a disc as glaucoma or glaucoma suspect (favorite hypothesis) and looking for evidence for the contrary: enlarged cup-to-disc ratio due to a large disc, pallor of the neuroretinal rim due to a tilted disc, and RNFL defect being a slit and not reaching the disc margin. In summary, one looks actively for evidence that could disprove one's clinical assertion.

3D approach: The 3D (data, diagnoses, and direction) approach is an outcome of the research work by JW Rudolf.[7] The study examined diagnostic problem-solving by 39 anesthesia residents in a medical simulation. In the simulation, the anesthesiologists were called to take over anesthesia in an operating room where a 29-year-old woman urgently needed an appendicectomy. The scenario presented was difficulty with the airway or ventilation. Only a small number of the residents identified the real cause among the multiple possibilities and averted the crisis. Based on the thought process of the residents as they handled the diagnostic challenge, they were grouped as fixated, diagnostic vagabond, stalled, and adaptive. Those who consider all the possible differential diagnoses and take each to its logical end are successful adaptive thinkers. The diagnostic vagabonds think of various possibilities but would not intervene adequately to take each of the possibilities to completion. The fixated thinkers can think of only one possible cause and those that are stalled fail to act in the presence of the crisis at hand. The possible cognitive solution suggested is the 3D approach. As the diagnosis is made and a management plan is evolving one is encouraged to actively seek if all available data is being considered, what all diagnoses are being thought of and the direction that is being taken is safe.

Empathy: The progress of science and technology in the field of medicine, coupled with increasing specialization, leads doctors to concentrate extensively on the "disease" itself, often overlooking the broader concept of the "illness" as experienced by the patient.[8] To successfully understand all the concerns of the patient about the disease, we need cognitive empathy (understanding the other person's thoughts and realities accurately) and to be able to address these we need compassionate empathy (a feeling of concern for the other person's well-being). Such an approach is the last mile run to excellence and leads to higher "uptake" of the advice.

A standard medical consultation and subsequent communication predominantly center around the biomedical aspects of the disease, emphasizing the diagnosis and prognosis. However, for truly patient-centric care, it is essential to also delve into the psychological impact of the illness on the individual. This involves understanding the patient's concerns regarding potential therapy costs, treatment duration, recovery period, the ability to maintain current livelihood, and aspirations for the future based on anticipated treatment outcomes. These would comprise the psychosocial aspects of the illness as opposed to the biomedical aspects focusing on diagnosis and prognosis.[9] During the process of assessing these components, one needs to focus on not just what is said but also on how it is said and the body language. It is worthwhile to remember here Albert Mehrabian's model of communication: what is said constitutes only 7% of communication; how it is said (38%) and body language (55%) are more important constituents. Can one focus on all these while conversing with the patients?

We also need to realize that cognitive empathy is a two-way process. The patient's cognitive empathy skills assess if the doctor is compassionate or motivated by other conflicting considerations. If we improve our cognitive empathy and genuinely demonstrate compassionate empathy, we win the patient's trust, and the famous quote of Patch Adams will come true – "You treat a disease, you win, you lose. You treat a person, I guarantee you, you'll win, no matter what the outcome."

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