Original Article

Cognitive disposition to respond in postgraduate trainees of general surgery at Rawalpindi Medical University

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Abstract

Introduction: Cognitive biases leading to diagnostic errors are associate with adverse outcomes and compromise patient safety and contribute to morbidity and mortality. Exploration and identification of cognitive biases have been a difficult task for the clinicians and medical educators. The literature is deficient in the identification of cognitive biases in surgical trainees. The objective of the study was to identify various cognitive biases that may negatively impact clinical reasoning skills and lead to diagnostic errors in trainees of general surgery.

Materials and Methods: A quantitative study was conducted involving 48 trainees of general surgery to explore the various cognitive biases. The questionnaire was devised and consisted of ten items devised to explore five biases. .Descriptive statistical analysis was done on SPSS 20 and the respondents with score >25 were categorized as predisposed to error scores of 20-25 were taken as a borderline and overall score of <25 was insignificant for the presence of cognitive bias.

Results: Premature closure was the most frequent cognitive bias found significant in 34 (70%) of trainees followed by anchoring bias in 14 (58, 3%) trainees. The relative frequencies of different biases are shown in Table 2. The mean score of the questionnaire was 22.7 (range 10 to 38) SD 7.2. Ten out of forty-eight (21%) trainees with a mean score of >25 showed a clear inclination toward cognitive errors whereas 11 (22%) with a score in the range of 21 to 25 were categorized as having an equivocal tendency towards committing an error, Whereas 27 (56%) with a score of less than 20 were less prone to cognitive errors.

Conclusion: The two most common errors seen in the study were anchoring bias and premature closure and both are related to information gathering. A larger study is required to explore the association of cognitive bias with different specialties and experience of clinicians.

Keywords: Cognitive bias, diagnostic errors, Postgraduate trainees, General surgery Clinical reasoning skills.

Introduction

Diagnostic error is a subtype of medical error is associated with almost 10% of deaths and 17% of adverse events. The number of patients suffering as a result of diagnostic errors in various surgical procedures has been estimated to be more than 80000/year in the United States alone.[1] The consequences of diagnostic error put a lot of burden on the health care system apart from the financial and psychological burden on the patients. Various internal factors related to failure in perception failed heuristics and biases and flaws in conceptual understanding (related to faulty knowledge and knowledge perception) are also referred to as cognitive disposition to respond.[2] The true prevalence of these CDRs is not exactly known also, Which CDRs are more important? Whether these CDRs are present when no diagnostic errors have been made is also a matter of debate.[3] As supported by the literature cognitive biases and heuristic are definitively associated with diagnostic errors that compromise patient safety.[4] Clinicians and surgeons should be aware of these cognitive errors and should know which cognitive error they are more prone to commit.[5,6] Trainees and residents in surgery who are a novice in their specialty are particularly prone to errors.[6] One reason i.e. faulty knowledge and lack of experience is quite obvious but cognitive dispositions to respond may also be associated with an increased risk of errors and are generally ignored.[7] The extent to which these biases contribute to error is not fully established.[7] Strategies focused on the recognition of these biases are not associated with a reduction in error whereas, strategies directed towards knowledge deficit have a little but consistent effect.[8] Most of the researches has focused on the cognitive biases in clinicians and trainees of specialties other than general surgery and none of the studies has explored cognitive biases in trainees of general surgery. The study was conducted to answer the research question "What are the different Cognitive biases associated with diagnostic errors and poor clinical reasoning in Trainees of general surgery? "The purpose of the study was to explore various cognitive biases and heuristics in trainees of general surgery.

Materials and Methods

This quantitative cross-sectional survey was conducted at Benazir Bhutto Hospital and District headquarter Hospital Rawalpindi from June 2019 to December 2019. Convenience sampling was done. A total of 50 Third-year and fourth-year postgraduate trainees of FCPS and MS general surgery were included in the study whereas trainees of first and second-year trainees were excluded as they were usually not allowed to make independent decisions about patient's diagnosis and were quite a novice in the specialty. A self-administered questionnaire specifically designed to explore the cognitive biases was completed by the respondents. The Questionnaire was carefully designed after identifying cognitive biases from literature and two Focus group discussions with the experts who were consultant surgeons and medical teachers with at least ten years standing. The questionnaire consisted of ten items devised to explore five biases.

Table 1: Common Cognitive bias leading to diagnostic errors

	Cognitive bias	Definition
1	Anchoring bias[4]	The tendency of the human mind to give more importance to things that come readily to mind. A person is prone to make a diagnosis or make a decision based on what is readily available to mind or that comes immediately after encountering a clinical situation
2	Availability bias[4]	Based on recent exposure to a certain disease or clinical condition the tendency of the human mind to inflate that particular diagnosis instead of looking for other possible causes/reasons. The same is the case of thinking about more common and frequently-occurring diseases
3	Commission bias[5]	This bias is more commonly seen in expert and overconfident clinicians. A concept that more is better and an obligation to beneficence results in an intervention that is not required. A tendency towards action rather than inaction.
4	Omission bias[5]	Opposite of commission bias, tendency to inaction instead of action. A concept originating from non-maleficence. It is more common than commission bias
5	Premature closure[6]	A tendency to accept a diagnosis before its full verification or limiting answers or selecting a diagnosis early

Five response options were carefully selected that matched the items in an ordinal manner in a Likert–type response scale i.e. from always having 0 score to 5 scores for never option with a maximum score of 50 to a minimum score of 10. Each bias was assessed by two questions and the maximum score for each bias was 10 and a minimum of 2. Descriptive statistical analysis was done on SPSS 20 and the respondents with score >25 were categorized as predisposed to error scores of 20-25 were taken as a borderline and overall score of <25 was insignificant for the presence of cognitive bias.

Results

The total number of participants was forty-eight. Males were 28 (58.3%) and females were 20 (41.7%). The mean age was 29 years (range 24 to 44 years) SD 4.2. The overall mean score was 22.7(range 10 to 38) SD 7.41. Premature closure was the most frequent cognitive bias found significant in 34 (70%) of trainees followed by anchoring bias in 14 (58.3%) trainees. The relative frequencies of different biases are shown in Table 2.

Table 2: Frequency of cognitive bias in trainees of general surgery

	Cognitive bias	Frequency		
		Significant	Insignificant	Equivocal
1	Anchoring bias	14 (53.8%)	8 (33.3)	2 (8.2%)
2	Availability bias	7 (29.2%)	14 (58.3%)	3 (12.3%)
3	Omission bias	7 (29.2)	12 (50%)	5 (20.2)
4	Premature closure	17 (70.9%)	7 (29.2%)	0
5	Commission bias	5 (20.8%)	15 (62.5%)	4 (16.7%)

The mean score of the questionnaire was 22.7 (range 10 to 38) SD 7.2. Ten out of forty-eight (21%) trainees with a mean score of >25 showed a clear inclination toward cognitive errors whereas 11 (22%) with a score in the range of 21 to 25 were categorized as having an equivocal tendency towards committing an error, Whereas 27 (56%) with a score of less than 20 were less prone to cognitive errors.

Discussion

The results suggest a tendency towards various cognitive errors that may affect their clinical reasoning leading to diagnostic errors. Premature closure was the most frequent bias observed in the study. A premature closure suggests a tendency to reach a working diagnosis before its full verification. It may be related to certain environmental factors especially while working in a busy outdoor or emergency department stress, fatigue, and being overworked also predisposes to premature closure. Various researchers have linked premature closure to anchoring bias. Anchoring bias was the second most common error detected in the study with 54% of participants committing the error. An Anchoring bias results when the person relies too much on readily available information or the first information they get while decision making. Another important observation was that trainees who were prone to premature closure were also inclined towards anchoring bias. Surrey et al in their mixed-method study detected cognitive errors in 59% of participants with availability bias being most commonly seen in 23.8% of items followed by anchoring bias in 10.2% premature closure in 9.5% and omission bias in 3.5%. Flaws in perceptual understanding faulty knowledge and lack of experience were the reasons for committing an error in 43% of cases.[4,5,6] The results of our study which involved trainees of general surgery were very much consistent with the study conducted by surrey et al who explored cognitive bias in trainees of internal medicine possibly representing the same mental processes that are involved in clinical reasoning to reach a diagnosis irrespective of the specialty.[7] Many researchers have questioned the very existence of these errors and their relationship to diagnostic errors and suggest that most of the errors are related to faulty knowledge.[7] We believe that faulty knowledge or perceptual flaws do affect clinical reasoning but if this was the sole reason for diagnostic errors than experienced clinicians and trainees at the end of a structured training program would not be committing diagnostic errors, a fact that has not been supported by our study various and cross-sectional surveys.[8,9]

Oldie et al in their qualitative content analysis on reflective and narrative writing found anchoring and availability bias in 88% and 76% of narrative respectively.[8] They concluded that Contextual factors at the level of the patient, the clinical environment, and the health care team influence the likelihood of cognitive error. They developed a list of core biases

more frequently seen in trainees of internal medicine and recommended that different specialties may be prone to different biases and errors. In our study we only included trainees of general surgery and trainees of other specialties were not included, a larger comparative study would be required to compare the cognitive bias in other specialties with surgical trainees to identify the association between different cognitive biases and specialties. Melanie Rylander and Jeannette Guerrasio in their study found 49 different error types reported by physicians.[9] The perceived response rate for medical student errors was 25% and 22% in residents of internal medicine. They found anchoring bias and availability bias to be more frequent and both were related to the error of information gathering.[10,11] The least common error was overconfidence and ascertain bias both related to oneself and determined by personality traits as well. They inferred that heuristics errors are observed at various levels of training with students committing a diagnostic error is usually related to poor knowledge. Singh et al found that over 50% of diagnostic errors in a primary care setting is related to information gathering (Anchoring and premature closure) during interaction with patient and most medical errors involved multiple factors including cognitive bias, system failure, and faulty knowledge.[10] Information gathering seems to be one of the most important factors leading to cognitive bias such as anchoring bias and premature closure. In our observations, one of the reasons for poor information gathering is excessive workload and poor working conditions found in most public sector hospitals.

Msaouel et al in their multi-institutional cross-sectional survey concluded that 60% of medical students and trainees were prone to cognitive errors especially gambler's Fallacy and this was a unique finding not supported in other studies, we did not explore gambler's fallacy in our study and focused primarily on five cognitive biases associated with clinical reasoning as identified in the literature. Most of the physicians are also prone to cognitive biases, although the type of bias varies at different stages of their career[11]. Norman et al found diagnostic errors are a result of multiple factors including cognitive biases and failed heuristics. Errors may be associated with both system 1 and system 2. Strategies aimed at reducing the errors by addressing the dual-process model of thinking have a small but consistent improvement in results.[12] The questionnaire developed for our study was designed to identify the various common cognitive bias and did not explore the dual-process model of thinking. Megan et al devised an instrument to isolate and quantify bias produced by the availability and representativeness heuristics and illustrated the utility of their instrument by demonstrating decreased heuristic bias within medical contexts at higher training levels.[13] Sponski et al in a systemic review concluded that overconfidence, the anchoring effect, information and availability bias, and tolerance to risk may be associated with diagnostic inaccuracies or suboptimal management, which is consistent with our results.[12]

The results of most of the studies conclude that cognitive biases and heuristics are associated with diagnostic errors.[14] The most common type of diagnostic error found in our study was premature closure (70%) followed by anchoring bias both related to inadequate information gathering.[15] As the participants in our study belonged to a public sector Hospital with busy outpatient and inpatient departments. The higher rate of these findings may be related to unfavorable working conditions rather than purely due to cognitive biases.[16] We attempted to explore common cognitive errors as identified by literature and certain other biases e.g. gambler's fallacy and ascertain bias found in other studies were not explored. The finding that premature closure and anchoring bias are more common as compared to other cognitive biases is also supported by other studies.[16,17,18] The respondents with a score of >25 indicted that they have a predisposition towards committing an error due to cognitive biases and with a score <20 had a less predisposition. The borderline score needs to be further evaluated. It was also interesting to note that trainees who were prone to premature closure were also prone to anchoring bias.

Our study has multiple limitations, the sample size was small and the questionnaire was designed to explore only five cognitive biases and requires further improvements and modifications. The study was based on a self-administered cross-sectional survey and further exploration can be done using qualitative methods and narratives of trainees to analyses the association of cognitive biases with diagnostic errors. A cutoff score of 25/50 was also a crude estimate and requires further improvement using standard methods.

Conclusion

Our study suggests in trainees of general surgery are predisposed to cognitive bias leading to diagnostic errors. The two most common errors seen in the study i.e. premature closure and availability bias are related

to information gathering. A more robust study involving qualitative methodology and reflective or narrative accounts of the errors and cognitive biases is required to further explore the association of cognitive bias with specialties and level of experience of the clinician.

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