MAEDICA – a Journal of Clinical Medicine
2023; 18(2): 317-322
https://doi.org/10.26574/maedica.2023.18.2.317

MÆDICA - a Journal of Clinical Medicine

ORIGINAL PAPER

Exploring Knowledge of Cognitive Disposition to Respond in Clinical Decision-Making among Early Clinical Learners

N. VINAYKUMAR[a], T. S. GUGAPRIYA[b], S. KALAISELVI[c]

[a]Department of Anatomy, Government Medical College, Palakkad 678013, Kerala, India

[b]Department of Anatomy, All India Institute of Medical Sciences, Nagpur, Maharashtra, India

[c]Department of Community Medicine, All India Institute of Medical Sciences, Nagpur, Maharashtra, India

ABSTRACT

Introduction: *Background: Errors in clinical medicine are a constant occurrence leading to litigations. Cognitive disposition to respond (CDR) was considered the underlying cause of errors in the decision-making process. The rapid thinking system used by early clinical learners leads to cognitive errors. The scenario gets compounded by a limited awareness and lack of exposure to cognitive dispositions to respond (CDRs) in the formal medical graduate curriculum. Variation in the frequency of occurrence in a real-life context, contradictory claims over the influence of clinical expertise, specialty, and methods of teaching about cognitive biases led to this exploratory study among early clinical learners.*

Methods: *In the present research, subjects' recruitment was based on voluntary participation of medical graduates, interns, and residents, who were assigned to equal groups of 30. All study groups were first exposed to six commonly occurring CDRs as role-play-based videos, followed by a case scenario-based exposure to 13 uncommon CDRs in the clinical setting. Participants were then asked to reflect on the experience. Data was analyzed by descriptive and thematic analysis.*

Results: *Among the 19 tested biases, 75.6% of participants identified Hindsight bias. The sunk cost was found out by 34.4% of participants only. Information processing bias was identified more frequently than psychological processing bias. Intergroup variability showed that residents were not identifying biases as frequently as medical graduates and interns. The role play video with reflective writing was voiced as the suitable training method for cognitive bias.*

Conclusion: *The study concludes that medical graduates must be sensitized to CDRs using role-play-based reflection methods.*

Keywords: cognitive bias, diagnostic error, decision making, role-play.

Address for correspondence:
Dr. T. S. Gugapriya, Additional Professor
Department of Anatomy, All India Institute of Medical Sciences, Plot No. 2, Sector 20, MIHAN, Nagpur, Pin 441108, Maharashtra, India
Tel.: +919444163451, +919943451490; email: guga.tarun@gmail.com

Article received on the 16th of May 2023 and accepted for publication on the 9th of June 2023

INTRODUCTION

Diagnostic cognitive errors are becoming a common occurrence in health care establishments. Diagnostic errors in clinical diagnosis account for 6-17% of all medico-legal claims (1-4). The cognitive diagnostic errors are ascribed to occur due to a multitude of factors. A substantial subset was claimed to be associated with perception failures, failed heuristics and cognitive biases, which were collectively termed as cognitive dispositions to respond (CDRs) (5, 6). These errors in the thinking process have been considered the primary contributory factor of morbidity and mortality in clinical practice, with legal and medical impact (4, 7).

The term "cognitive bias" denotes all unconscious influences, behaviors and easy ways that profoundly impact our decision-making process (1, 8). Nineteen different types of CDRs were the most commonly reported in a clinical setting and were categorized into information or psychological processing bias, depending on the operant process occurring in them (1). A rapid intuitive judgment system and a slow reasoned judgment system have been proposed as two paradigms of clinical decision-making (9, 10). Among them, the rapid system is predisposed to cognitive bias, heuristics and perception failures due to its inherent lack of restriction (9). Interestingly, early clinical learners were reported to rely on a rapid system during the clinical decision-making process (10).

The literature shows that the occurrence of CDRs increases with the experience of patient encounters (11). On the contrary, practicing physicians were less susceptible to cognitive bias in their clinical decision-making (12). Irrespective of the level of patient encounters or the hierarchy of clinical learners, creating awareness about these CDRs represents the first step towards resolving such clinical decision-making errors among health professionals (13). Greater understanding and awareness about CDRs might cultivate reflective clinical practice leading to improved patient outcomes (14). Formal curricular exposure to knowledge about CDRs among medical undergraduates in the Indian context is lacking. Medical graduates equipped with a formal curriculum to identify and handle these biases during patient encounters were less likely to be biased (15).

Thus, participants to the present study were early clinical learners comprising final MBBS, interns and residents with different levels of patient encounters to acquire the general knowledge about CDRs and the suitable method for teaching them in the formal curriculum. ❑

MATERIALS AND METHODS

This was a mixed-method cross-sectional study. Early clinical learners with differing degrees of clinical experience, including 100 final years MBBS (Group I), 80 interns (Group II), and 45 junior residents (Group III), of a tertiary care rural teaching hospital, were invited to voluntarily participate in the study. Considering the Central limit theorem, a sample size of 30 *per* group was decided, and participants were recruited by voluntary purposive sampling method (16) The study was initiated after obtaining institutional ethical clearance (CMCH&RC/IEC No.71) and written informed consent from each participant. Two methods were used to provide participants with CDRs, including case scenario-based and role-play video-based questions. The study investigators developed case scenario-based questions and an external expert validation for

TABLE 1. Categorization of cognitive disposition to respond (CDRs)

Category	CDRs	What operates here
Information processing bias	Anchoring bias* Diagnostic momentum* Confirmation bias*	Belief preservation Focalism
	Hindsight*	Outcome influences
Psychological processing bias	Commission bias Omission bias Gambler's fallacy	Biases of action-inaction
	Availability Bias* Posterior probability Base rate neglect Playing the odds Overconfidence	Bias in judgments
	Ascertainment bias	Stereotyping and gender bias
	Sunk cost*	Ego
	Search satisfying Representative constraint Premature closure	Early giving up tendency
	Fundamental attrition error	Pointing fingers
	Feedback sanction	Reinforcement error

*Commonly occurring bias in clinical setup

content was done for 13 uncommon CDRs. A set of six common CDRs in clinical settings was made into role play and video graphed. Based on the operational process, the 19 CDRs were further categorized into either information or psychological processing bias (Table 1). The study participants were sequentially exposed to CDRs from common to uncommon. Reflective feedback on the study methodology and Kirkpatrick's level I participating experience was obtained. The identification of CDRs by each study group was compared and descriptive statistics were used for analysis. Reflective writing was subjected to thematic analysis. ❑

RESULTS

Hindsight bias (75.6%) and sunk cost (34.4%) were found at the two ends of the CDRs spectrum identification percentage (Table 2). Information processing CDRs were more frequently identified by participants than psychological processing CDRs (Table 2).

Less than 50% of the final-year medical graduates and interns only identified psychological processing biases like omission bias, availability bias, sunk cost, representative constraint, commission bias and search satisfaction (Table 2). Also, the residents did not identify the posterior probability or base rate neglect (Table 2).

The inter-group variability in determining CDRs differed significantly for certain CDRs. By comparing the study groups, we observed that residents could not locate the CDRs as frequently as the final-year medical graduates and interns (Table 2).

Feedback analysis revealed that the role-play-based identification of CDRs was more straightforward than the case scenario-based identification of CDRs. Evaluation limited to Kirkpatrick's Level 1 showed a positive reaction towards the introduction to CDRs equally among the study groups (Figure 1). ❑

DISCUSSION

Clinical decision-making is the cornerstone of effective patient care. This clinical decision-making at times gets influenced by biases operating at physicians' cognitive levels (4, 8, 17-20). However, in the literature there is a definitive lack of evidence of a systematic assessment of each CDRs occurring in clinical decision making.

A systematic review on cognitive biases found that only three studies evaluated five or more CDRs, while the remaining ones focused on a single bias (4, 21-23). Variability in the explored CDRs and their reported prevalence limits the comparability of observations of the present study with the existing literature (Figure 2). Anchoring and confirmation bias were information processing CDRs most consistently found to be described in studies with differing frequencies. Psychological processing CDRs were reported to depend on the clinical specialty of each study participant (21-23). Along with the specialty of practice, the affective trait of physicians was also shown to have an impact upon identification of CDRs (15, 21).

The clinical hierarchy was observed to influence the identification of CDRs, with residents identifying them less frequently in the present study, which was in contradiction to reports of either physician identifying CDRs quickly or total lack of influence of clinical hierarchy (11, 15). Rushing into a diagnosis and stressful working environment experienced by clinicians in day-to-day emergencies was claimed to activate the ingrained cognitive biases to get expressed in the clinical decision-making process (24).

The evolution of cognitive biases to diagnostic errors is the crucial phase where intervention might help to mitigate the occurrence of CDRs. The interconnected operant that provides enough clinical insight and faith, thereby minimizing the commission of CDRs, was the ability to understand and think about one's thought process and be aware of the possibility that biases can occur during this process (14, 20). To hone such clinical decision-making among health care providers, education and training form the appropriate strategy (9, 15, 25, 26). Nevertheless, to equip early clinical learners with the necessary tools for handling biases, introducing knowledge about these common cognitive biases in the medical graduate curriculum stands as a possible solution that would help them achieve clinical maturity (14, 27).

Experiential quizzing exercises and game-based exposure to cognitive bias were reported to successfully teach students about cognitive bias (28, 29). In addition to these reports, the video role-play method favoured by medical graduates in our analysis needs to be considered while preparing the lesson plan for teaching cog-

Type of bias	Frequency (%) identified the specific type of bias) Over all (N=90)	Final year medical graduates (n=30)	Interns (n=30)	Residents (n=30)	P value
Bias of action-inaction					
Commission bias	34 (37.8)	18 (60)	12 (40)	4 (13.3)	0.0009*
Omission bias	31 (34.4)	12 (40)	9 (30)	10 (33.3)	0.71
Gambler's Fallacy	52 (57.8)	16 (53.3)	17 (56.7)	19 (63.3)	0.73
Bias of judgment					
Posterior probability	50 (55.6)	19 (63.3)	18 (60)	13 (43.3)	0.25
Availability	34 (37.8)	11 (36.7)	13 (43.3)	10 (33.3)	0.72
Base rate neglect	49 (54.4)	18 (60)	20 (66.7)	11 (36.7)	0.049*
Playing the odds	61 (67.8)	25 (83.3)	21 (70)	15 (50)	0.02
Overconfidence	62 (68.9)	26 (86.7)	21 (70)	15 (50)	0.009*
Stereotyping					
Ascertainment bias	63 (70)	23 (76.7)	22 (73.3)	18 (60)	0.33
Ego					
Sunk cost	31 (34.4)	6 (20)	16 (53.3)	9 (30)	0.02*
Early giving up tendency					
Search satisfying	36 (40)	16 (53.3)	9 (30)	11 (36.7)	0.16
Representative constraint	42 (46.7)	12 (40)	15 (50)	15 (30)	0.67
Premature closure	60 (66.7)	23 (76.7)	21 (70)	16 (53.3)	0.14
Pointing fingers					
Fundamental attribution error	61 (67.8)	29 (96.7)	17 (56.7)	15 (50)	0.0002*
Reinforcement error					
Feedback sanction	65 (72.2)	24 (80)	17 (56.7)	24 (80)	0.07
Focalism					
Anchoring	59 (65.6)	19 (63.3)	20 (66.7)	20 (66.7)	0.95
Diagnostic momentum	57 (63.3)	24 (80)	15 (50)	18 (60)	0.049*
Confirmation bias	62 (68.9)	26 (86.7)	21 (70)	15 (50)	0.0089*
Outcome influence					
Hindsight bias	68 (75.6)	25 (83.3)	20 (66.7)	23 (76.7)	0.32

TABLE 2. Distribution of cognitive bias across early clinical learners

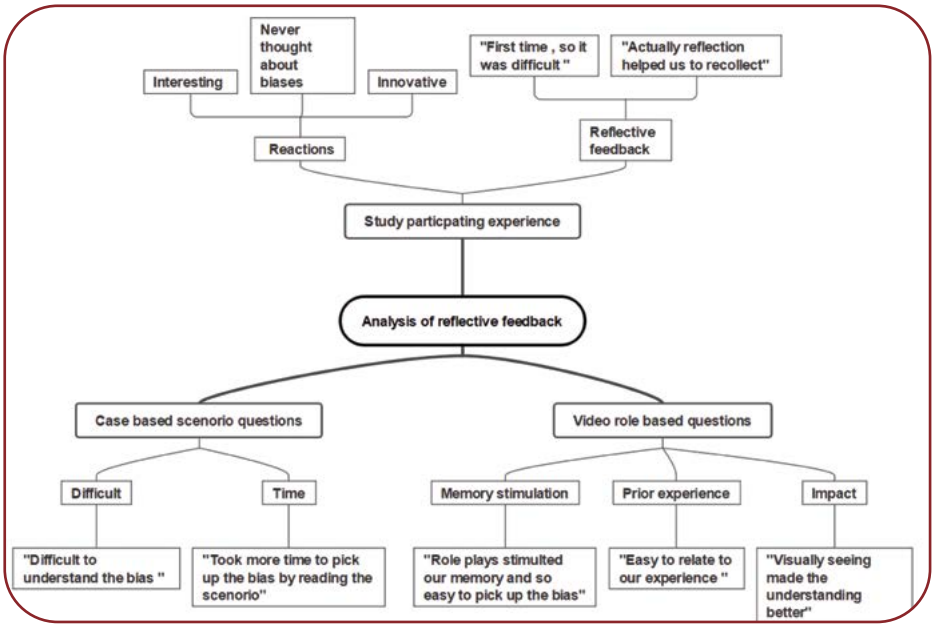

FIGURE 1. Thematic analysis of the reflective feedback

nitive biases (Figure 1). Role-play is a specialized teaching methodology that develops critical thinking, better perception of what is being shown and remembering experiences by seeing others, and self-comprehension in comparison to the conventional inventory of cognitive biases in medicine (ICBM) case scenario questionnaire as evidenced by the themes obtained from the study (15, 30) (Figure 1). In addition, using reflective reasoning helps neutralize the effect of operant cognitive biases by promoting metacognition (31). Such sensitizing teaching modules of

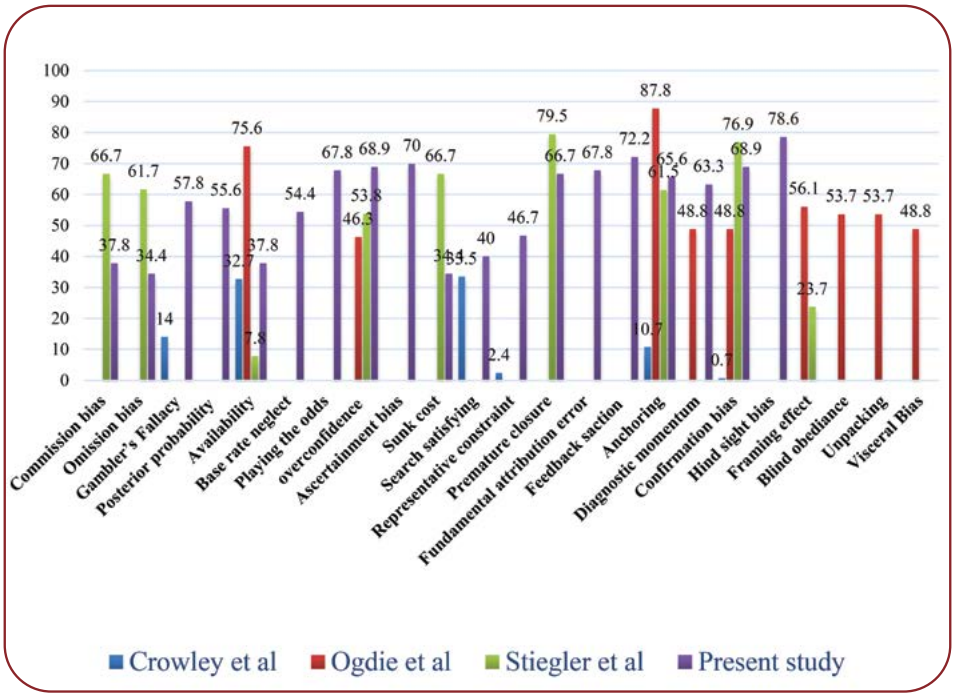

FIGURE 2.
Prelevance of CDRs across studies

CDRs with suitable teaching methodology ideally need to be started in a definite curricular setting for medical graduates, preferably before clinical exposure (32).

Along with teaching about these CDRs, which was received with reactive appreciation by early clinical learners (Figure 1), it is also imperative to develop a system that continuously monitors and supports medical professionals in their efforts to fight CDRs by way of debiasing strategies and encouraging reflective thinking practices (11, 33-35).

Despite understanding the importance of teaching about biases for mitigating CDRs (1), there is a dearth of work focussing on the evolution pathway from cognitive biases to clinical decision-making errors (36). And this lacuna needs to be further explored.

Study limitations

The purposive voluntary sampling method with a limited sample size is a definitive limitation of the present study. Non-inclusion of the higher hierarchy of practicing physicians from various specialties is another limitation of this study. ❑

CONCLUSIONS

Knowledge of CDRs occurring in clinical decision-making among early clinical learners drastically varies according to their clinical encounters. The variability in identifying CDRs among medical graduates, interns and residents emphasizes the need to address these CDRs in the formal medical graduate curriculum. Also, using methods that expose the medical graduate to real-life experiences, like role-play with reflection, would be the ideal method for formally effectively introducing such CDRs. ❑

Conflicts of interest: none declared.
Financial support: ???

References

1. **Croskerry P.** The importance of cognitive errors in diagnosis and strategies to minimize them. *Acad Med* 2003;78:775-780.
2. **Saber Tehrani AS, Lee H, Mathews SC, et al.** 25-year summary of US malpractice claims for diagnostic errors 1986-2010: an analysis from the National Practitioner Data Bank. *BMJ Qual Saf* 2013;22:672-680.
3. **Esteban-Zubero E, Valdivia-Grandez MA, Alatorre-Jiménez MA, del Carmen Rizo-De La L.** Diagnosis Bias and its Relevance During the Diagnosis Process. *Arch Clin Med Case Rep* 2017;1:24-30.
4. **Saposnik G, Redelmeier D, Ruff CC, Tobler PN.** Cognitive biases associated

with medical decisions: a systematic review.
BMC Med Inform Decis Mak 2016;16:1-4.
5. **Croskerry P.** Diagnostic Failure: A Cognitive and Affective Approach. In: Henriksen K, Battles JB, Marks ES, et al., editors. Advances in Patient Safety: From Research to Implementation (Volume 2: Concepts and Methodology). Rockville (MD): Agency for Healthcare Research and Quality (US); 2005 Feb. Available from: https://www.ncbi.nlm.nih.gov/books/NBK20487/.
6. **Kachalia A, Gandhi TK, Puopolo AL, et al.** Missed and delayed diagnoses in the emergency department: a study of closed malpractice claims from 4 liability insurers.
Ann Emerg Med 2007;49:196-205.
7. **Schiff GD, Puopolo AL, Huben-Kearney A, et al.** Primary care closed claims experience of Massachusetts malpractice insurers.
JAMA Intern Med 2013;173:2063-2068.
8. **Graber ML, Franklin N, Gordon R.** Diagnostic Error in Internal Medicine.
Arch Intern Med 2005;165:1493-1499.
9. **Ely JW, Graber ML, Croskerry P.** Checklists to reduce diagnostic errors.
Acad Med 2011;86:307-313.
10. **Tay SW, Ryan P, Ryan CA.** Systems 1 and 2 thinking processes and cognitive reflection testing in medical students.
Can Med Educ J 2016;7:97-103.
11. **O'Sullivan ED, Schofield SJ.** A cognitive forcing tool to mitigate cognitive bias–a randomised control trial.
BMC Med Educ 2019;19:1-8.
12. **Hartigan S, Brooks M, Hartley S, Miller RE, et al.** Review of the Basics of Cognitive Error in Emergency Medicine: Still No Easy Answers.
West J Emerg Med 2020;21:125-131.
13. **Norman G.** Dual processing and diagnostic errors.
Adv Health Sci Educ Theory Pract 2009;14 Suppl 1:37-49.
14. **Hunzeker A, Amin R.** Teaching cognitive bias in a hurry:single-session workshop approach for psychiatry residents and students.
MedEdPORTAL 2016;12:10451.
15. **Hershberger PJ, Markert RJ, Part HM, et al.** Understanding and addressing cognitive bias in medical education.
Adv Health Sci Educ Theory Pract 1996;1:221-226.
16. **Wayne W Lamate** (July 24, 2016) Central limit theorem. https://sphweb.bumc.bu.edu/otlt/mphmodules/bs/bs704_probability/BS704_Probability12.html (Accessed on Jan 15, 2022).
17. **Croskerry P.** The cognitive imperative: Thinking about how we think.
Acad Emerg Med 2000;7:1223-1231.
18. **Croskerry P.** Achieving quality in clinical decision making: Cognitive strategies and detection of bias.
Acad Emerg Med 2002;9:1184-1204.
19. **Croskerry P.** Cognitive forcing strategies in clinical decision making.
Ann Emerg Med 2003;41:110-120.
20. **West RF, Toplak ME, Stanovich KE.** Heuristics and biases as measures of critical thinking: associations with cognitive ability and thinking dispositions.
J Educ Psychol 2008;100:930-941.
21. **Crowley RS, Legowski E, Medvedeva O, et al.** Automated detection of heuristics and biases among pathologists in a computer-based system.
Adv Health Sci Educ Theory Pract 2013;18:343-363.
22. **Ogdie AR, Reilly JB, Pang WG, et al.** Seen through their eyes: residents' reflections on the cognitive and contextual components of diagnostic errors in medicine.
Acad Med 2012;87:1361-1367.
23. **Stiegler MP, Neelankavil JP, Canales C, Dhillon A.** Cognitive errors detected in anaesthesiology: a literature review and pilot study.
Br J Anaesth 2012;108:229-235.
24. **Hayes MM, Chatterjee S, Schwartzstein RM.** Critical Thinking in Critical Care: Five Strategies to Improve Teaching and Learning in the Intensive Care Unit.
Ann Am Thorac Soc 2017;14:569-575.
25. **Bowen JL.** Educational strategies to promote clinical diagnostic reasoning.
N Engl J Med 2006;355:2217-2225.
26. **Hernandez I, Preston JL.** Disfluency disrupts the confirmation bias.
J Exp Soc Psychol 2013;49:178-182.
27. **Bhatti A.** Cognitive bias in clinical practice – nurturing healthy skepticism among medical students.
Adv Med Educ Pract 2018;9:235-237.
28. **Kleefeld JC, Pohler D.** Internalizing cognitive bias: An experiential exercise for teaching and learning the anchoring effect.
Brock Educ J 2019;28:33-47.
29. **Halpern DF, Hakel MD.** Applying the science of learning to the university and beyond: Teaching for long-term retention and transfer.
Change: The Magazine of Higher Learning 2003;35:36-41.
30. **Lamb ME, Lerner RM.** *Handbook of child psychology and developmental science: Socioemotional processes*, Vol. 3, John Wiley & Sons, Inc., 2015.
31. **Mamede S, van Gog T, van den Berge K, et al.** Effect of availability bias and reflective reasoning on diagnostic accuracy among internal medicine residents.
JAMA 2010;304:1198-1203.
32. **Hyman DJ, Pavlik VN, Greisinger AJ, et al.** Effect of a physician uncertainty reduction intervention on blood pressure in uncontrolled hypertensives – a cluster randomized trial.
J Gen Intern Med 2012;27:413-419.
33. **Henriksen K, Brady J.** The pursuit of better diagnostic performance: a human factors perspective.
BMJ Qual Saf 2013;22:1-5.
34. **Graber ML, et al.** Cognitive interventions to reduce diagnostic error: a narrative review.
BMJ Qual Saf 2012;21:535-557.
35. **Croskerry P, Singhal G, Mamede S.** Cognitive debiasing 1: origins of bias and theory of debiasing.
BMJ Qual Saf 2013;22:58-64.
36. **Norman GR, Monteiro SD, Sherbino J, et al.** The causes of errors in clinical reasoning: cognitive biases, knowledge deficits, and dual process thinking.
Acad Med 2017;92:23-30.