Journal of the Postgraduate Institute of Medicine 2017; 4 (2): E59 1-5
http://doi.org/10.4038/jpgim.8174

Medical Education

Clinical Reasoning: Implications and strategies for postgraduate medical education

Asela Olupeliyawa[1]

[1] Department of Medical Education, Faculty of Medicine, University of Colombo, Sri Lanka

Keywords: medical education, reforms

Corresponding Author: Asela Olupeliyawa, E-mail asela@medarc.cmb.ac.lk https://orcid.org/0000-0002-7665-6458

Competing Interests: Author has declared that no competing interests exist

Introduction

The myriad clinical decisions made by medical professionals every day are crucial in determining healthcare outcomes. Capability in clinical reasoning is, therefore, a key learning outcome trainees are expected to achieve (albeit at different levels) during undergraduate, postgraduate and continuing medical education. The clinical decision-making process includes the cognitive reasoning that results in a diagnostic or therapeutic judgement (clinical reasoning) and the cognition that influences the judgement being implemented. The purpose of this paper is to discuss some key concepts of this decision-making process and how they have been applied to support the development of clinical decision-making skills in postgraduate medical education.

Development of clinical reasoning and educational implications

Recognising how clinical reasoning skills develop from novice to expert has important implications for postgraduate training. Traditionally, the cognitive process underlying clinical reasoning has been divided along the lines of intuitive decisions involving pattern recognition and analytical decisions involving a hypothetico-deductive approach. A review of the medical literature suggests that the cognitive process of diagnostic decision making by experienced clinicians mostly involves a pattern recognition model, with limited use of the hypothetico-deductive model in complex situations [1].

Humans use simplified rules for making intuitive probability estimates under uncertainty termed as 'heuristics' [2]. clinical decisions, biases while forming heuristics may result in errors [1]. Experts have a broader repertoire of options than novices to choose from and are able to choose better in a short time than novices. This successful intuition can be attributed to experts' exposure to environments that provide valid cues and opportunities to practice and receive feedback on their decision-making skills [3]. On the other hand, sources of clinicians' overconfidence in their (incorrect) decisions can be broadly categorised as failure to recognise some heuristic biases and lack of stimulus e.g. limitations in feedback [4]. In the Sri Lankan context, with its ample opportunities to practice, encouraging trainees to take a more analytical approach, initially, while learning to recognise the appropriate cues and supporting them with feedback, would promote decision making ability.

The development of clinical reasoning, in particular diagnostic reasoning, has been more recently explained through 'script theory' [5]. According to this theory, learners form cognitive networks of clinical and pathophysiological information and their relationships (called 'scripts'), through ongoing clinical experience. When subsequently encountering a new patient presentation, clinicians frame their preliminary expectations of the patient's condition by activating one or more of these scripts. New patient information is then processed through complementary analytical and intuitive decision-making processes to evaluate the fit with their expectations. Increasing medical expertise and subsequent better developed scripts may prompt a more intuitive 'pattern recognition' process. Complex cases may however prompt a more analytical 'hypothetico-deductive' process, even in experienced clinicians.

The discussion on the role and processes of intuitive and analytical decision-making has recently shifted to a more inclusive 'dual process theory' and its use in the training of clinicians. Proponents of this theory discuss functional, adaptive approaches that reduce decision errors in both intuitive (system 1) and analytical (system 2) decision-making processes, which are termed 'de-biasing strategies [6, 7]. De-biasing strategies for intuitive processes include avoiding stereotypes in pattern recognition and engaging in reflection supported by feedback. For analytical processes these strategies include deliberation (intentionally using analytical approaches in complex scenarios) and metacognition/justification (questioning and justifying the reasons for making a decision) in a given situation [6, 7, 8]. Such analytical de-biasing strategies will be particularly useful for postgraduate trainees.

Tools for learning clinical decision making

Educational strategies should support the development of illness scripts. Early clinical exposure and highlighting the clinical relevance of pathophysiological information, for instance by the use of clinical case scenarios, will support the initial development of such scripts among medical students. As postgraduates practicing in the clinical environment, educational tools should help trainees recognise issues such as multi-morbidity and activate multiple scripts while recognising their interrelationships, thus encouraging an analytical process. One such tool trialled among Sri Lankan postgraduate medical trainees is the 'Clinical Reasoning Map', where a complex clinical scenario is visualized as a non-hierachical network diagram with causal interconnections [9]. Postgraduates have found the tool to be useful to understand the pathogenesis of a multifaceted condition and subsequently generate differential diagnosis and select appropriate investigations.

The application of dual-process theory suggests that educational interventions should employ simple strategies with explicit instructions, encouraging the use of de-biasing in both processes, and should occur during an actual course of reasoning where clinicians can interact with specific knowledge in memory [8]. One such tool trialled among Australian General Practice trainees is the 'Guideline Enhancement Tool' [10]. This tool initially guides trainees to identify the decisions that need to be made in a given scenario. It then requires them to refer to clinical practice guidelines and rate their usefulness in making those decisions. Next, the trainees are provided with details on the patient context and asked to make decisions and justify them considering the patient context.

Postgraduates have found the tool to be useful in promoting de-biasing by deliberation and metacognition/justification.

Tools for assessing clinical decision making

As clinical reasoning has been recognised as an important outcome in medical education it is important that it is assessed holistically. Workplace-based assessments, such as 'Case-based Discussions', assess clinical reasoning together with several other domains and provide trainees with specific feedback [11]. On the other hand, in early training it is also important to assess decision making separately from other domains. A key criterion for specifically assessing clinical decision-making skills is framing the question so as to evaluate a clinical decision or action rather than underlying knowledge. This approach is taken in 'Key Features Problems', where the examinee is presented with only the critical features useful for the resolution of the clinical problem and questioned on decisions to be taken [12].

The script theory has also resulted in the development of assessment tools for clinical reasoning. The most widely used tool is the Script Concordance Test (SCT). The SCT is designed to assess how trainees process new clinical information, through complementary analytical and intuitive decision-making processes, in comparison to experts by evaluating fit with pre-formed illness scripts [13]. The written test is based on clinical scenarios with adequate information to activate the scripts. The test items are either diagnostic, investigative or treatment decisions and the decision to be made is provided to examinees. Then new clinical information is introduced and examinees are required to rate their likelihood of making the initial decision. The test is scored on the concordance of the examinee's response with the response of a panel of experts to whom the test has been administered earlier. The SCT is well established in medical education literature as a tool with good psychometric properties and good construct validity for assessment of clinical decision-making competence [14, 15]. Evidence suggest that engagement with the SCT process itself may help participants develop decision making skills [16], an assessment that promotes learning.

From decision to action: contextual influences

It is important to acknowledge that a spectrum of individual factors and environmental influences interact when clinical decisions are actually implemented. Decisions can be strongly influenced by others involved in or impacted by the decision. A review of interventions that aimed to reduce diagnostic error suggested that controlled settings and study methods often neglect contextual influences on clinical decisions [17]. Different care providers may have different thresholds for action which may result in decisional conflict. Such decisional conflicts have been identified in doctors and nurses in intensive care settings [18] and among patients and doctors [19]. The importance a clinician places on others, for instance the need for social desirability, may influence clinical decisions. Such influences include consideration of peer norms over peer knowledge [20] and interactions with colleagues, opinion leaders, pharmaceutical representatives, and patients [21]. Studies also identify practitioner workload, resource demand and team communication as influencing clinical decisions, particularly in critical care settings. The sequence and nature of decisions can even be influenced by factors

such as the physical layout of the unit and the availability of other team members [22, 23]. Trainers also need to be aware that the supervisor-trainee relationship impacts on clinical decisions. Training should promote meaningful engagement with these influences through strategies such as reflective practice.

Summary

Clinical decision making is a complex outcome that is vital for healthcare quality and safety. The development of clinical decision making, particularly in postgraduate trainees, can be explained through several theories including the script theory and the dual process theory. These theories can be practically applied in formulating strategies for teaching/learning and assessment of clinical decision making. Actual clinical experience is the foundation of such strategies but that exposure should be supported by methods to a) systematically engage trainees in increasingly complex clinical scenarios, b) encourage trainees to deliberate and reason their clinical decisions, and c) promote feedback and reflection of these decisions in actual practice. Postgraduate trainers should practice these strategies as appropriate to their own clinical context.

References

1. Elstein AS, Schwarz A. Clinical problem solving and diagnostic decision making: selective review of the cognitive literature. BMJ. 2002;324:729-732. https://doi.org/10.1136/bmj.324.7339.729
2. Tversky A, Kahneman D. Judgment under Uncertainty: Heuristics and Biases. Science. 1974;185:1124-1131. https://doi.org/10.1126/science.185.4157.1124 PMid:17835457
3. Kahneman D, Klein G. Conditions for intuitive expertise: a failure to disagree. Am Psychol. 2009;64:515-526. https://doi.org/10.1037/a0016755 PMid:19739881
4. Croskerry P, Norman G. Overconfidence in Clinical Decision Making. Am J Med. 2008:121;S24-S29. https://doi.org/10.1016/j.amjmed.2008.02.001 PMid:18440351
5. Charlin B, Tardif J, Boshuizen HP. Scripts and medical diagnostic knowledge: theory and applications for clinical reasoning instruction and research. Acad Med. 2000;75:182-190. https://doi.org/10.1097/00001888-200002000-00020 PMid:10693854
6. Croskerry P, Singhal G, Mamede S. Cognitive debiasing 1: origins of bias and theory of debiasing. BMJ Qual Saf. 2013;22(Suppl 2):ii58-ii64. https://doi.org/10.1136/bmjqs-2012-001712 PMid:23882089 PMCid:PMC3786658
7. Croskerry P, Singhal G, Mamede S. Cognitive debiasing 2: impediments to and strategies for change. BMJ Qual Saf. 2013;22(suppl 2):ii65-ii72. https://doi.org/10.1136/bmjqs-2012-001713 PMid:23996094 PMCid:PMC3786644
8. Norman GR, Eva KW. Diagnostic error and clinical reasoning. Med Educ. 2010;44;94-100. https://doi.org/10.1111/j.1365-2923.2009.03507.x PMid:20078760
9. Jayasinghe S. Describing complex clinical scenarios at the bed-side: Is a systems science approach useful? Exploring a novel diagrammatic approach to facilitate clinical reasoning. BMC Med Educ. 2016;16:264. https://doi.org/10.1186/s12909-016-0787-x PMid:27724852 PMCid:PMC5057485
10. Balasooriya C, Rhee J, Shulruf B, Canalese R, Zwar N. Evaluating the Guideline Enhancement Tool (GET): an innovative clinical training tool to enhance the use of hypertension guidelines in general practice. BMC Med Educ. 2014;14:1046. https://doi.org/10.1186/s12909-014-0273-2 PMid:25547621 PMCid:PMC4318171
11. Norcini J, Burch V. Workplace-based assessment as an educational tool: AMEE Guide No. 31. Med Teach. 2007;29:855-71. https://doi.org/10.1080/01421590701775453 PMid:18158655

12. Page G, Bordage G. The Medical Council of Canada's key features project: a more valid written examination of clinical decision-making skills. Acad Med. 1995;70:104–10. https://doi.org/10.1097/00001888-199503000-00009 https://doi.org/10.1097/00001888-199502000-00012 PMid:7865034
13. Charlin B, Roy L, Brailovsky C, Goulet F, van der Vleuten C. The Script Concordance test: a tool to assess the reflective clinician. Teach Learn Med. 2000;12:189-195. https://doi.org/10.1207/S15328015TLM1204_5 PMid:11273368
14. Lubarsky S, Charlin B, Cook DA, Chalk C, van der Vleuten CP. Script concordance testing: a review of published validity evidence. Med Educ. 2011;45:329-338. https://doi.org/10.1111/j.1365-2923.2010.03863.x PMid:21401680
15. 15. Dory V, Gagnon R, Vanpee D, Charlin B. How to construct and implement script concordance tests: insights from a systematic review. Med Educ. 2012;46:552-563. https://doi.org/10.1111/j.1365-2923.2011.04211.x PMid:22626047
16. Ross PT, Uijtdehaage S, Lypson ML. Reflections on culture: Views on script concordance testing. Med Educ. 2010;44;505-506. https://doi.org/10.1111/j.1365-2923.2010.03638.x PMid:20345693
17. Singh H, Graber ML, Kissam SM, Sorensen AV, Lenfestey NF, Tant EM, Henriksen K, LaBresh KA. System-related interventions to reduce diagnostic errors: a narrative review. BMJ Qual Saf. 2012;21(2):160-70. https://doi.org/10.1136/bmjqs-2011-000150 PMid:22129930 PMCid:PMC3677060
18. Coombs M. Power and conflict in intensive care clinical decision making. Intensive and Critical Care Nursing, 2003;19(3):25-135. https://doi.org/10.1016/S0964-3397(03)00040-5
19. Légaré F, O'Connor AM, Graham ID, Wells GA, Tremblay S. Impact of the Ottawa Decision Support Framework on the agreement and the difference between patients' and physicians' decisional conflict. Med Decis Making. 2006;26(4):373-390. https://doi.org/10.1177/0272989X06290492 PMid:16855126
20. 20. Fattore G, Frosini F, Salvatore D, Tozzi V. Social network analysis in primary care: The impact of interactions on prescribing behaviour. Health Policy, 2009:92(2–3):141-148. https://doi.org/10.1016/j.healthpol.2009.03.005 PMid:19356822
21. Gabbay J, Le May A. Evidence based guidelines or collectively constructed "mindlines?" Ethnographic study of knowledge management in primary care. BMJ. 2004;329(7473):1013. https://doi.org/10.1136/bmj.329.7473.1013 PMid:15514347 PMCid:PMC524553
22. Urban JM, Weaver JL, Bowers CA, Rhodenizer L. Effects of workload and structure on team processes and performance: implications for complex team decision making. Hum Factors. 1996;38(2):300-310. https://doi.org/10.1518/001872096779048101 https://doi.org/10.1177/001872089606380210
23. Franklin A, Liu Y, Li Z, Nguyen V, Johnson TR, Robinson D, Okafor N, King B, Patel VL, Zhang J. Opportunistic decision making and complexity in emergency care. J Biomed Inform. 2011;44:469-476. https://doi.org/10.1016/j.jbi.2011.04.001 PMid:21511054