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Clinical Reasoning and Dual Mental Processing in Diagnostic Competence

Muhammad Tariq and Syed Ahsan Ali

Diagnostic reasoning and clinical judgment are the most critical aspects of a physician's performance in medicine. It is essential in the formulation of a diagnosis and is the key to effective and safe management of patients.¹ Imparting diagnostic competence in residents and medical students is of utmost importance in order to develop them into competent healthcare providers who are competent enough to diagnose various clinical conditions with low diagnostic error. Medical errors represent an increasingly explored topic in the scientific literature. The overall diagnostic error rate is still unacceptably high.¹ A systematic review of autopsy studies found that diagnostic error is present in 23% of cases.² These errors could be related to wrong diagnosis, medication errors, surgical mistakes or skill deficiencies or ineffective communication.³ But the majority of these errors are due to information processing and not due to gaps in physicians' knowledge.² The better understanding of diagnostic errors would improve clinical reasoning in medical students and residents.³ Graber divided cognitive errors into faulty; knowledge, data gathering, information processing and verification.⁴ Premature closure after reaching a diagnosis without considering other potential possibilities was found to be the most common error.³

Knowledge expansion, as well as re-structuring and critical thinking help students and residents to develop their diagnostic competence. Repeated application of knowledge in the diagnosis and understanding of real patients, lead to the formation of illness scripts in the mind of the learner. Experienced doctors have rich collection of illness scripts in their memory and whenever a patient comes in, doctors try to match the illness scripts.⁵ Therefore, an expert doctor tends to use this rapid and pre-dominantly automatic reasoning approach based on matching illness scripts. On the other hand, in diagnosing complex or uncommon problems, physicians tend to be more analytical in their approach.⁶

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Clinical reasoning consists of dual-mental processing that has been either 'analytical' (AN) or 'non-analytical' (NA). The non-analytical is also known as system 1 or subconscious pattern or illness script recognition and analytic is called system 2 processing.² Studies have shown that medical students and novices use mostly system 2 approach as they are less experienced and have seen less cases, therefore, they have less number of illness scripts in their memory and could not match the clinical presentations effectively in making the diagnosis of a particular condition. In contrast, experienced doctors tend to use system-1 approach as they have a whole host of clinical scripts and scenarios in their mind.^{2,7} Indeed increasing use of system-1 approach in dual processing among novices decreases errors of comprehensiveness and use of analytic approach among experts reduces the risk of premature closure.⁷ Therefore, dual processing through balancing cognitive reasoning strategies in clinical approach helps both novices and experts in strengthening their diagnostic competence and limiting diagnostic errors.^{1,2} Croskerry suggests that clinicians override, re-calibrate and re-balance their decisions through dynamic oscillation between analytic system-2 and non-analytic system-1 processes.¹

Reflective practice is the ability of doctors to think critically about their own clinical reasoning and decisions in making a diagnosis.⁶ Mamede *et al.* also suggested deliberate inclination to look for alternative diagnosis and their consequences, a willingness and openness to test new data and synthesize new understanding of a problem and ability to reflect upon one's own thinking process and critically examine conclusions and assumptions about a particular problem (meta-reasoning).⁸ Reflective practice is an important instrument in improving clinical judgment and developing medical expertise particularly in situations of uncertainty and uniqueness.⁶

Mamede *et al.* studied diagnostic approach of second year internal medicine residents. The results reinforced effectiveness of automatic reasoning in solving common cases, however, reflective practice is found to be valuable in diagnosing complex or unique cases.⁶ In another study on medical students' acquisition of diagnostic competence using reflections as a strategy, Mamede *et al.* demonstrated that the performance of students in the structured reflection condition to

diagnose new cases was worse during the training phase and in immediate test, however, they outperformed those in the other groups in the delayed test.⁵ This delayed effect of reflections on learning is due to the effects of elaboration or deeper processing and due to high cognitive load during the training phase leading to some delay in learning with better long-term performance.⁹

As per Norman and Eva, non-analytic reasoning is responsible for diagnostic errors and analytic reasoning strategy is superior in decision-making, cognitive judgment and metacognition. On the contrary, the inducement of conscious reasoning results in poorer performance because analytic approach places heavy load on working memory, which has limitation in speed and size.³

There is sparse literature and further research is required on clinical reasoning strategies in diagnostic competence and the diagnostic errors in both novices and the experts. Furthermore, a potential area for future research could be to study balance and re-balance in clinical reasoning strategy through oscillation between system-1 and system-2 thinking in reducing diagnostic errors. Knowledge deficit and synthesis has a significant role to play as well in diagnostic competence.



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