FROM THE EDITORS' DESK

Exercises in Clinical Reasoning: A Retrospective

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The term *clinical reasoning* describes the process of gathering information as well as generating and testing hypotheses to develop a diagnosis and treatment plan. Physicians often do this subconsciously, but self-improvement and education benefit from a more deliberate and transparent process. Excellence of the medical craft requires clinical reasoning mastery.

Traditionally, residents and students learn clinical reasoning from each other, their patients, and teachers. Whether in a busy outpatient clinic or a hospital setting, the teaching of clinical reasoning is an integral part of clinical encounters and attending rounds. Clinicians apply these concepts without labeling them, but for the sake of our learners, we ought to know them and label them out loud.

The field of cognitive psychology has advanced our understanding of decision-making. To bridge the gap from implicit clinical reasoning learning to explicit teaching of its principles, in 2010 *JGIM* launched a new series, Exercises in Clinical Reasoning (ECR). Articles in this series provide a running commentary of a clinician's thought process as the clinician discusses an unknown patient case. The addition of diagnostic reasoning commentary written by another clinician provides an iterative meta-cognitive approach (thinking about thinking) by which to peer into the clinician's mind. The commentator highlights and explains theoretical concepts as well as errors, heuristics, and biases presented by the discussant. The discussion focuses on the clinical reasoning process and ends with brief clinical teaching points. The series aims to strengthen clinicians' own clinical reasoning and to improve their teaching of it. The *JGIM* ECR clinical reasoning topics range from basic to advanced, and all cases attempt to illustrate some of the nuances of the diagnostic reasoning process. As of the time of this writing, *JGIM* has published 31 such ECR manuscripts (see Online Appendix).

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Clinical reasoning integrates both statistical (probabilistic) and pathophysiological thinking into the patient's context. At times, we must move from fast, instinctive thinking (system 1) to slow, deliberate thinking (system 2) when confronting diagnostic complexity. An early *JGIM* ECR case describes this change in thinking when a middle-aged patient presented with sudden chest pain.[1] The clinician deliberately works through the different causes of chest pain when certain pieces of information don't fit his initial diagnosis illness script.

Case-based discussions have been integrated into the programs of professional societies. For example, the Society of General Internal Medicine (SGIM) has incorporated into its meetings the presentation of a *mystery case* to a master educator. The master educator 'works the case' in front of an audience, followed by a clinical review of the patient's diagnosis. Some case discussions presented at the meetings have served as material for the *JGIM* ECR series.

Some institutions have adopted this format for large group conferences. A faculty member sequentially presents clinical information to an experienced clinician, who is unaware of the case. The teacher selects cases to achieve a particular educational goal and serves as a coach during the discussion. At times, specific clinical reasoning concepts are discussed to make the 'invisible, visible.' The conference increases the transparency of the attending thought process and in turn teaches clinical reasoning. The organized and deliberate approach used in these sessions illustrates the many nuances of clinical reasoning, cognitive errors, system errors, and other aspects of clinical reasoning.

Though the *JGIM* ECR series has been successful, Denise Connor and Jeff Kohlwes saw a need for additional tools to help educators teach clinical reasoning. To support the printed version of the ECR series, they led a team in adding online educational tools. The web version (https://www.sgim.org/web-only/clinical-reasoning-exercises) provides ready-to-use tools for faculty and trainees to learn and teach clinical reasoning core concepts. The first three modules include all educational material necessary to teach key concepts of clinical reasoning.

The first module uses a case from the *JGIM* ECR series to discuss *problem representation* and *premature closure*.[2] A 43-year-old woman with right upper quadrant abdominal pain, fever, and headaches was initially diagnosed with gallstone disease. As the case evolves, it is revealed that she visited rural Mexico, and she is eventually diagnosed with brucellosis causing granulomatous hepatitis. The case highlights how slight refinements of a problem representation can change one's differential.

The second module brings a literary perspective from Sir Arthur Conan Doyle's detective to discuss *illness scripts*.[3] Sherlock Holmes compares the brain to an attic: one must decide what information stored in the brain to use and when to use it. A 22-year-old woman with multiple abdominal surgeries was hospitalized after another episode of severe abdominal pain. Concerned about the severity, the resident sees her again a few hours later and notes reddish-brown urine in the urine collection bag. The case progresses with discussion of prioritizing differential diagnoses based on illness scripts that adapt to changing information. She is later diagnosed with acute intermittent porphyria.

The last module discusses the *recognition-primed decision making* conceptual model, describing how experts solve problems under uncertainty and stress.[1] A 59-year-old man with cardiovascular disease presented with sudden-onset chest pain. The diagnosis of acute coronary syndrome quickly changed to aortic dissection after the resident noted that the blood pressure was different between the arms. The deliberate decision to slow down and consider all of the information led to the correct diagnosis and treatment. The conceptual model described uses concepts from the *dual process* theory of cognition.

The *JGIM* ECR published cases and online tools can support the implementation of clinical reasoning conferences by institutions with little such experience. *JGIM* cases can be presented in small chunks to an experienced clinician during a resident conference. The clinician can then share their ongoing thought process, while the facilitator points out clinical reasoning core concepts. Once they are comfortable with the format, we hope that clinician-educators in general internal medicine will recognize cases within their own institutions that fit this format and may be suitable for the ECR published series.

We invite *JGIM* readers to try out these resources at their home institutions. The Society to Improve Diagnosis in Medicine (SIDM) provides additional useful resources.[4] Self-improvement and education benefit from a more deliberate and transparent thinking process. As educators, understanding clinical reasoning terms is as essential as understanding renal physiology in a patient with hyperkalemia.

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