Clinical Reasoning and Risk in the Intensive Care Unit

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KEYWORDS

• Clinical reasoning • Risk assessment • Bayesian analysis • Risk benefit • Intensive care

KEY POINTS

- Clinical reasoning, the process by which clinicians make diagnostic and treatment decisions in medicine, is particularly challenging in the ICU because clinicians often work with incomplete information and in an evolving physiologic context.
- Novices and experts, both of whom practice in an academic intensive care environment, think and reason differently from one another. Understanding and appreciating these differences is important for educators and learners in the ICU.
- Understanding the risk related to the disease and the medical treatment is the critical final piece to the clinical reasoning and decision-making process because risk and benefit determine the treatment threshold.
- We propose a modified bayesian reasoning approach to clinical reasoning, which is replicable, works for experts and novices, and incorporates not just diagnostic algorithms but also accounts for treatment thresholds, leading to a standard approach to risk assessment and intervention.

INTRODUCTION

"Clinical reasoning" is a commonly used phrase in medicine, although one that can be difficult to define and means different things to different people. A reasonably succinct definition of clinical reasoning is "the ability to sort through a cluster of features presented by a patient and accurately assign a diagnostic label, with the development of an appropriate treatment as the end goal."[1] This definition captures the diagnostic component of reasoning without forgetting the larger picture, namely the patient requiring treatment or intervention.

Clinical reasoning and decision-making face particular challenges in an intensive care unit (ICU) environment. ICU medicine is practiced at a fast pace. Patients are unstable from a hemodynamic or respiratory perspective, therefore decision-making occurs under greater stress, making accurate diagnostic reasoning more difficult.[2] In addition to the pressure of needing to act quickly, the reduced time to make a clinical decision also means that the information ICU physicians work with is often incomplete, leading to an increase in biased reasoning.[3] The ICU is a continuously evolving environment. The correct intervention one moment (fluids for septic shock) can become incorrect the next (when the stress of sepsis induces an acute cardiomyopathy and markedly reduced ejection fraction) meaning practitioners cannot rely on a single course of action to remain the correct course of action. Finally, in a standard academic ICU, there are decision-makers at many

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different levels of training: students, subinterns, junior and senior residents, junior and senior fellows, all the way up to attending physicians. Each of these practitioners has their own breadth of experience, which affects how they see the case in front of them.[4] Each of these practitioners brings different reasoning skills to the bedside and approaches problems with a unique style and ability.[5,6]

Thus, it is important to think about reasoning and risk in a structured manner. The use of a methodology provides structure, reliability, and reproducibility to a process that is rooted in uncertainty and dynamism. The methodology we propose is a modified bayesian reasoning method that can be adapted to the practitioner or learner. A goal of this article is to help define a method of clinical reasoning and show how it can work in an ICU environment. We also demonstrate the differences between novice and expert reasoning and shed light on how this affects the education and oversight of these practitioners. Finally, we define the term "treatment threshold" and make clear the relationship between reasoning and risk in the ICU.

ANALYSIS, INTUITION, AND METHOD

There are many methods that have been proposed to achieve the goal of correctly reasoning through a diagnostic challenge. Despite this variability, the core elements of good reasoning remain the same. The first step in any diagnostic challenge is to frame the question or identification of the chief concern (complaint, historically). The physician then gathers information about the patient including information on the historical state of the patient (past medical history, past surgical history, social history, family history, any medications they were taking when the concern started) and the current state of the patient (history of present illness, vital signs, physical examination, and any available test results). The doctor then moves through six core critical thinking skills to assess this trove of information: (1) interpretation, (2) analysis, (3) evaluation, (4) inference, (5) explanation, and (6) self-regulation; the last refers to looking back on one's performance in the first five.[7] Finally, the physician must then decide if the evidence at hand is consistent with a known diagnosis and institute therapy if the benefit is greater than the risk. Together this is the art of clinical reasoning.

Clinical reasoning has traditionally been performed via several different methodologies, each with proponents and critics, advantages and disadvantages.[8] The largest camps align themselves similar to the Five Subscale Critical Thinking Processes proposed by Facione and Facione[9] where reasoning was broken into inductive and deductive styles and analytical and intuitive thinking. Deductive reasoning starts with a firm hypothesis followed by a search for facts to support or refute that belief. Inductive reasoning values the open-minded search for clues that can, once gathered and assessed, add up to a conclusion or hypothesis. Intuitive thinking looks for key elements of the story to draw reasonable conclusions regarding already-formed hypotheses, whereas analytical thinking values facts, clues, and evidence that is used to generate a conclusion. According to their methods, the intuitive thinkers tend toward deductive reasoning and the analytical thinkers tend toward a more inductive reasoning process. Each of these approaches has its strengths and weaknesses that have to be recognized or the practitioner risks adding significant error into the reasoning process (**Table 1**).

EXPERTS AND NOVICES: NOT ALL REASONING IS DONE THE SAME WAY

Although all physicians and trainees use pieces of each of these reasoning and thinking methods in their actual practice, reliance on one versus the other changes over time. This is important to understand when using reasoning on one's own

Table 1
Relative strengths and weaknesses of intuitive and analytical reasoning

Intuitive/Deductive		Analytical/Inductive	
Strengths	**Weaknesses**	**Strengths**	**Weaknesses**
Hypothesis-based	Open to early closure, confirmation, and choice-support biases	Thorough/rigorous	Susceptible to availability, anchoring, and framing biases
Relies on prior experience	Can be "too fast"	Does not require much prior experience	Slow
Fast	Requires experience	Methodical	Laborious
			"Paralysis by analysis"