



The inseparability of context and clinical reasoning

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Abstract

Early descriptions of clinical reasoning have described a dual process model that relies on analytical or nonanalytical approaches to develop a working diagnosis. In this classic research, clinical reasoning is portrayed as an individual-driven cognitive process based on gathering information from the patient encounter, forming mental representations that rely on previous experience and engaging developed patterns to drive working diagnoses and management plans. Indeed, approaches to patient safety, as well as teaching and assessing clinical reasoning focus on the individual clinician, often ignoring the complexity of the system surrounding the diagnostic process. More recent theories and evidence portray clinical reasoning as a dynamic collection of processes that takes place among and between persons across clinical settings. Yet, clinical reasoning, taken as both an individual and a system process, is insufficiently supported by theories of cognition based on individual clinicals and lacks the specificity needed to describe the phenomenology of clinical reasoning. In this review, we reinforce that the modern healthcare ecosystem – with its people, processes and technology – is the context in which health care encounters and clinical reasoning take place.

KEYWORDS

clinical guidelines, diagnostic reasoning, system dynamics

1 | INTRODUCTION

Clinical reasoning (CR) can be considered as the process that operates with the purpose of arriving at a diagnosis, treatment and/or management plan, as well as striving for improved patient outcomes and well-being.¹ Curricula and instruction regarding clinical reasoning in health professions education programs (particularly physician education) have largely focused on an individual making a clinical decision or series of decisions.² Similarly, the research surrounding clinical reasoning has drawn heavily upon basic tenets and methods of cognitive psychology's modelling of

concept formation, categorization and decision-making as well as various sources of fallibility of individual cognition.³ Important early descriptions of CR have described a process during which an individual uses either analytical or nonanalytical approaches to develop a working diagnosis,⁴ weigh and make treatment decisions, and prognosticate (forecast) about a given situation. Clinical reasoning traditionally has been seen as an individual-driven cognitive process based on gathering information from the patient encounter, forming mental representations that rely on previous experience and engaging developed patterns to drive working diagnoses and management plans.²

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A recent review by Koufidis et al.⁵ described the epistemological underpinnings of clinical reasoning through three contrasting lenses, describing it as a categorization task (i.e. a mental representation of the external world), a process that emerges from interactions within a system, or as a primarily social practice in which language and culture shape reasoning and decision-making. Over the years, multiple theories have been forwarded to explain the mental processes that may underlie decision-making generally and clinical reasoning more specifically. Similarly, there are several descriptions of what 'good' clinical reasoning should look like, often with varied (often low) levels of engagement with theory and the published literature. What often seems like a reasonable or even good idea (improving critical thinking, e.g.) is seldom borne out in the results of empirical research.⁶

Yet, important work has described models that make sense of the phenomena observed in clinical practice and experienced by clinicians. One of the leading theories of CR today is script theory. This theory states that interaction with new information activates acquired networks of previous knowledge and experiences stored as 'scripts' (mental representations) which enable the interpretation and classification of new information.^{7,8} Another paradigm is the dual-process theory^{9,10} where two cognitive systems operate in a complementary and interrelated fashion. The first is an intuitive and reflexive rapid system (System 1, nonanalytic decision-making) based on recognition of patterns and cues with a second system that is more deliberate, analytical and time-consuming^{6,11,12} (analytic decision-making, System 2). While dual-process theory provides a helpful framework for understanding decision-making, many overly simplistic explanations have vilified System 1 and encouraged a shift to System 2. Such efforts are not supported by the evidence¹³ despite their pop-culture appeal (and broad uptake in clinical reasoning education programs).

Likewise, research on the failures of clinical reasoning and diagnostic errors has emphasized the role of the individual diagnostician, including the biases to which diagnosticians may fall prey. These include the pitfalls of overconfidence¹⁴ in their diagnoses. While there may be some value in this work – often performed in controlled laboratory settings – it is quite difficult to attribute most diagnostic errors to the faulty cognitive process of one clinician alone; systems factors as well as interactions with other individuals almost certainly play a role.³ Furthermore, expertise plays a role in diagnostic excellence and experts often use nonanalytical decision making. Thus, it is cognitively incongruent to dismiss nonanalytical decision-making as problematic when, in fact, it is often part of the solution.

As an extension, it is clear that clinical reasoning in practice is not an individual exercise (or even a series of individual exercises) that exists as a stand-alone and preserved process across clinical situations. Clinical reasoning is instead a dynamic collection of processes that takes place among and between persons across clinical settings. Clinical reasoning, taken as both an individual and a system process, is insufficiently supported by theories of cognition based on individual clinicals and lacks the specificity needed to describe the phenomenology of clinical reasoning. More recently, situated cognition theory has proposed an interplay of factors including the physician, the patient and the

environment.^{15,16} This is a welcome addition to the literature as it acknowledges and validates the experience of clinicians when different decisions and outcomes correctly and appropriately occur with similar scenarios in different contexts. We believe these hypotheses represent a turning point of sorts within clinical reasoning research. As these new perspectives have been added, there has been emerging evidence on the role of contextual factors in clinical reasoning and clinician performance.^{17–19}

These contextual factors affect (or even define) a multitude of processes and outcomes in healthcare such as medical errors, patient safety approaches and resource-specific medical care (e.g. resource-rich vs poor environments). Attendance to these contextual – sometimes cultural – factors also may avoid using a lens of epistemological arrogance when evaluating differences across practice settings.^{20,21} Clinical reasoning processes are also influenced by clinical contextual factors. Context can be viewed as a substrate that holds together different parts of the clinical encounter²² yet these also serve to define the encounter as unique and distinct. Context influences the way different clinicians view the same encounter and their clinical reasoning processes.²³ It has been argued that context itself is the epistemology of clinical reasoning.²⁴ Summarizing these most recent findings, we argue 'context is everything'. This paper aims to explore the shortcomings of the aforementioned current approaches to research on CR and proposes that the systematic inclusion of clinical context, although more complicated and nuanced, represents a better model for thinking about clinical reasoning.

2 | APPROACHES TO CLINICAL REASONING AND HOW CONTEXT IS ADDRESSED

The literature surrounding the science of clinical reasoning has followed an arc over the last many decades from descriptions of clinical reasoning as an individual analytical, hypothetico-deductive process to a much more nuanced, subtle understanding of clinical reasoning as a series of interconnected and interdependent, knowledge-based, dynamic processes. The varying approach to addressing and understanding context in clinical reasoning has been an important part of this arc, and the way that context has been framed, addressed or ignored in theoretical and empirical work helps make sense of where the field finds itself in modern times.

Many prominent and early descriptions of clinical reasoning have described the processes that clinicians use to make diagnostic decisions as hypothetico-deductive. Certainly, the concepts of Bayesian reasoning and other clearly individual analytic processes have value in the interpretation of clinical information and diagnostic accuracy. However, these models do not fully describe or explain why clinical practice, decisions, experiences and outcomes differ across contexts. Said differently, clinical reasoning in practice is much more than the sum of individual processes. These individual processes exist within a morass of both measurable and unmeasurable system factors in which they take place – referred to as context.



A tension arises when assigning so much importance to context while simultaneously acknowledging the difficulty in its measurement. Fortunately, the literature surrounding context in clinical reasoning continues to emerge and develop, allowing for both a richer and more nuanced understanding. Interestingly, it has become clear that methods used to understand context and the impact on clinical reasoning must draw heavily from social sciences, taking a much more anthropological approach to describe the phenomena that take place in the clinical environment.^{22,25}

We reinforce that the modern healthcare ecosystem – with its people, processes and technology – is the context in which health care encounters and clinical reasoning take place. Previous work has described context as a 'dynamic and ever-changing system that emerges from underlying patterns of patients, locations, practice, education and society, and from the unpredictable interactions between these patterns'.²⁶ This description is apt when considering the modern healthcare system that is situated within a broader society and often typified by chaos, inequity, injustice, stress, discontinuity and external pressures.

This definition and wider sociological understanding of context contrasts with previous, often experimentally defined, narrower descriptions of context. For example, well-done empirical studies on clinical reasoning have used context to define how clinical cases relate to one another in addition to an individual clinician's experience with similar conditions, seeking to understand the effect that this previous experience has on clinical reasoning. Mamede et al.^{27,28} et al describe the effects of this context and potential strategies to mitigate its effect on clinical reasoning. Similarly, other work has defined context as the interaction of doctor, patient and encounter factors, although this description may be still rather limited.¹⁹ Other works have aimed to give dimensions and better definitions to context by describing both the environment in which care occurs while also identifying the effects it produces on learning and commitment (including motivation and responsibility).²⁹ This can be summarized nicely by the Bates and Ellaway's statement that 'Few of the papers [...] defined context directly, tending instead to focus on describing specific elements of context, such as clinical disciplines, physical settings and political pressures' (p. 810). When reviewing the medical education literature they identified four concepts of context: context (1) 'as a physical location or container' (including the tasks performed in that space), (2) 'as that which is done or experienced in a particular location', (3) 'as that which participants bring to bear there' and (4) 'as the broader cultural influences that flow from the interactions of location, participation, and identity' (p. 810). This broader and more fulsome characterization of context helps move context from something that is best removed to create 'pure' research or something that interferes with decision-making and instead something that is fundamental for clinical reasoning to occur. This perspective on context is more aligned with the reality of how and why decisions are made in healthcare settings. It is also a call to further characterize these domains through study which is likely to lead to a deeper understanding of clinical decision making.

3 | PRACTICE-VARIABILITY: MOVING AWAY FROM THE KNOWLEDGE DEFICIT PARADIGM

The variability of practice patterns between clinicians within a similar field is often raised as a failure of clinical reasoning. Building on the effects of contexts, it is equally probable that contextual factors lead to at least part of the clinical variability. Clinical guidelines have often been used to reduce clinical reasoning variability within clinician group yet deviation from these guidelines may not be random. Physicians may, in many contexts, explicitly and even wisely choose to diverge away from recommended practice based on contextual factors.³⁰ In other words, practice variation does not imply that it is unintentional nor unwarranted. The medical literature has made a call to identify the causes of said 'unwarranted' practice variation to disambiguate its many causes.³¹ Could it be that meaningful variation from practice guidelines, in some cases, represents a better understanding of these guidelines and the contexts in which they work? Does the lack of a prescription of an expensive medication to a patient from a more vulnerable socioeconomic stratum in lieu of a more affordable nonevidence-based alternative represent a failure of care or a pragmatic and empathetic evaluation of circumstances?³²

This context-dependency is observed throughout health system science. Sciences such as Quality Improvement (QI) and Knowledge Translation (KT) have an explicit consideration of the local context within their system change approaches.³³⁻³⁵ They openly acknowledge the peculiarities of the audience to which the change is applied, the reason for change, the institutional readiness for change and the 'burning platforms' which exist as cultural enablers. This broad acknowledgement of context-dependency within the system is at odds with our traditional view of individual clinical reasoning. The call made to acknowledge context in clinical reasoning brings the studies of health system sciences and clinical reasoning closer together, towards a more unified approach of 'clinical reasoning within a health system'.

These examples of system-based context-dependency are also available in more operational or business literature. It is well established that human behaviour is situational and that the emotions that drive individual reactivity (and thus decision-making) play a large role in a broader work systems.³⁶ Business literature has also acknowledged that emotions play a key role in the quality of decision-making within specific contexts.³⁷ This is further support for contexts effect on decision-making quality. This same literature has even suggested that practitioners should be selected not only for their skills but for the similarity of the context in which they have previously demonstrated these skills to their future work environment.³⁸ These paradigms have not yet been applied in medicine. It seems we have yet to acknowledge that context affects decision-making or that physicians should be selected for competence within context. Instead, context is often shirked entirely as a means of understanding or selecting appropriate situational clinical attributes and is explicitly avoided as a determinant of decision-making in medicine. In fact, many of our forms of assessment try to remove context rather than embrace it.³⁹

The quality improvement and patient safety literature has been at the forefront of highlighting the importance of context. Critical incidents, for example, saw a paradigm shift from blaming the individual decision-making or perceived lapses to better understanding the context or system in which the decisions and events took place.^{40,41} Systems themselves emerged as being complex adaptive entities with diverse interacting and components that change over time.⁴² Considering contextual factors in patient safety work was essential to the systems approach beyond the individual clinician.⁴³ A transformation took place from admonishing clinicians to 'think better' or 'work harder' and instead to design better systems that support their decision making and work. While the consideration of context has made great strides in the QI and patient safety education,⁴⁴ there are still large gaps in medical education focused on clinical reasoning in context.

Context has also permeated the medico-legal structures as an important factor in the consideration of clinical reasoning. The legal and professional standard to which North American physicians are held is that of a reasonable medical practitioner considering all the circumstances.⁴⁵ In other words, when a physician's actions or reasoning are called into question, they are compared to the objective standard of what a reasonable physician of similar training would have been expected to do in the same setting. Although the circumstances considered are generally limited to facilities, equipment and locality, this determination is, by definition, dependent on context. Despite this, it is a determination made in retrospect and is thus reliant on the presence of sufficient evidence to accurately recreate the context for an adjudicator. Here, context is seen as a defining characteristic of the clinical decision which is being deliberated. Interestingly, inquiries of this nature acknowledge that a deeper understanding of content could only contribute to a better, more nuanced, understanding of the incident in question as well as the reasons that certain decisions were made. Can we use this medico-legal lens to better understand context? The paradigm shift of systems analyses in healthcare settings, whereby systems are designed for increased resiliency that factor in the possibility of lapses in clinical reasoning, is likely to lead to a new regulatory and legal perspective on contextualized clinical reasoning.

4 | HOW DO WE RESEARCH CLINICAL REASONING IN CONTEXT?

Given that context defines and shapes clinical reasoning and that the health system in which we practice is inseparable from the decisions made within it, we advocate that a shift in our research and education programs is necessary. We advocate that, to accommodate for the context specificity (and contextual basis) of clinical reasoning, more and different empirical studies are needed that allow for capturing the relationship between context and reasoning *in situ*. This means that studies must no longer try to remove individuals from context to seek 'truth' – instead, we must seek to observe and understand what happens in the often 'messy' place where it happens; that is, 'reality'. For this, methods such as focused ethnography, mixed-methods field

studies and qualitative analytic approaches seem most promising.⁴⁶ Of course, humility and open-mindedness are fundamental as we look ahead, seeking to incorporate previously marginalized or discounted epistemological views.

Focused ethnography is a qualitative approach where observations are made of specific episodes in social fields such as handovers or morning rounds. Ethnographic methods are well-suited for medical education research and have gained popularity over the last decades^{25,47} although they have formed the basis in other fields for many years. They allow for the identification of complex relationships that are of practical relevance. For example, Chopra⁴⁸ revealed by means of a focused ethnography of teaching teams at two academic medical centres how fragmented and interrupted data delivery, retrieval and processing were, thus impeding diagnostic quality.⁴⁹ Such conclusions likely would not arise in traditional, acontextual experimental studies.

Large-scale field studies, ideally using mixed methods and being conducted as prospective randomized studies, may also provide insights into the context dependency of clinical reasoning if being coupled with analytical methods that account for nonlinearity and other factors in explaining variance. Take, for example, a prospective observational field study on patient, physician and context factors predicting diagnostic errors in an emergency room setting.⁵⁰ Using generalized linear mixed-effects models to account for the nested structure of the data, the study found that physicians' subjective rating of patients to present atypically for the diagnosis assigned predicted diagnostic error best.⁵⁰ This approach to studying diagnosis *in situ* allows context to continue its fundamental, forming role while seeking important, measurable sources of variance in performance and strategies to prevent diagnostic errors.

There is still likely some value in less contextual, often simulation-based studies that seek to understand parts of the context that shape decision-making. As discussed above, Durning and colleagues used an alternative, more controlled possibility of studying context specificity.^{15,18,19} They presented physicians with videotapes of clinical encounters with varying context factors (e.g. language proficiency of the patient, typicality of the presentation) and recorded think-aloud protocols of their thought processes as well as free-text opinions on reflection. Analyzing these qualitative data revealed how specific patient and encounter factors influence physicians' reasoning process. However, we must be continually vigilant that fulsome context is more than a sum of its not completely definable parts – thus, such experimental approaches may lend insights but are not a substitute for studies that embrace and occur in context.

5 | HOW DOES THIS AFFECT OUR EDUCATIONAL PROGRAMS?

If context defines and is fundamental for decision-making, then our educational programs must also take this into account. This means, at its core, that health systems science must be fully integrated with basic and clinical science and that learners must learn about and



within context as much as possible. Said differently, clinical reasoning is not a set of skills that can be divorced from the context in which it occurs, and thus programs entrusted to teach it should, in general, aim to take place in context as well. Certainly, a core foundation of knowledge is necessary to begin to engage in clinical reasoning,⁵¹ and a certain degree of learning and practice must concur for a learner to appropriately engage in the clinical reasoning process – that is, it has previously been described as a ‘threshold skill’.⁵² As soon as is feasible, however, learning should take place in the health system and community with other members of the healthcare team. Furthermore, medical learners should be provided with practice data between their individual settings that demonstrate this contextual variability, allow for its acknowledgement and for a design of experimentation that supports a context-centric view of clinical reasoning. Engaging with the attributes of that rich context as part of the clinical learning environment will ensure a more complete, dynamic and cocreative healthcare team in the future.

6 | CONCLUSION

In clinical reasoning, context is everything; the modern healthcare system (or nonsystem) and communities in which care is delivered (and learned, for the most part) inform and define how clinical decisions are made. Rather than trying to eliminate context from research on and teaching of clinical reasoning, we need to take the role of context into account to be able to equip practitioners for delivering safer health care.

AUTHOR CONTRIBUTIONS

All authors contributed equally to the conceptualization, writing and edits of the paper.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

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