Teamwork in clinical reasoning – cooperative or parallel play?

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Abstract: Teamwork is fundamental for high-quality clinical reasoning and diagnosis, and many different individuals are involved in the diagnostic process. However, there are substantial gaps in how these individuals work as members of teams and, often, work is done in parallel, rather than in an integrated, collaborative fashion. In order to understand how individuals work together to create knowledge in the clinical context, it is important to consider social cognitive theories, including situated cognition and distributed cognition. In this article, the authors describe existing gaps and then describe these theories as well as common structures of teams in health care and then provide ideas for future study and improvement.

Keywords: clinical reasoning; diagnosis; education; medical education.

Introduction

Effective diagnostic reasoning – arriving at an explanation for a patient’s health care problem and communicating that to the patient [1] – cannot occur without teamwork. On the surface, it appears that health care is a paragon of teamwork. Diverse health care professionals interact day and night, contributing their unique abilities, experiences and expertise to improve patients’ health. Even the most seemingly straightforward of clinical encounters – such as diagnosis and management of hypertension in the primary care clinic – requires the effective choreography of multiple members of the health care team.

Although multiple health professionals may participate in an individual patient’s care, much of their work is actually done in parallel, yet alone [2]. This observation is often true in the one of the most important tasks in health care: diagnosis. Arriving at a diagnosis requires that a wealth of information be gathered and then integrated into a plausible explanation for a patient’s health problem. The diagnosis also informs future prognostic and management decisions. Diagnosis is often incredibly complex - individual experiences of conditions are myriad, atypicality is expected, and uncertainty abounds [3–5]. As a result, the diagnostic label is often not good enough – diagnostic errors are prevalent and costly [6–9].

As with other challenging processes, enhancing teamwork has been suggested as a means to improve clinical reasoning and diagnostic performance. The National Academy of Medicine highlighted improving teamwork in health care as one of their key recommendations in their report on diagnostic error [1], and recently described consensus competencies for improving diagnosis also explicitly describe the need for health professions education programs to train individuals to work as members of teams [10, 11].

The outcome of true team-based clinical reasoning is not simply achieved by adding or averaging individual knowledge or decisions made by people interacting together in a given case [2]. Instead, true teamwork in clinical reasoning just like in other fields – requires that individuals interact in a way that allows for emergence to occur. While emergence has multiple definitions, it may most simply be defined as when the outcomes of a process may be different than those predicted by the inputs alone; in other words, the outcome is more than the sum of the parts. Conversations between diverse health care professionals in a safe, empowering, non-hierarchical environment can lead to co-construction of knowledge. This collaborative decision-making leads to deeper, more insightful shared mental models and better clinical
reasoning outcomes. The teamwork literature has used the term sense making for such processes but we prefer co-construction because it emphasizes that knowledge is actually being produced and can also be applied to decision making. An example of emergence or co-construction of a mental model for a clinical situation would be when subtle interpersonal dynamics noticed by a nurse led to a new diagnostic hypothesis of domestic violence that was not previously considered. This resulted in the co-construction of a new, deeper understanding of the situation based on synergistic interactions of their respective experiences, knowledge, and abilities.

For true emergence and co-construction of mental models or diagnostic decisions to be possible, however, substantive interaction (teamwork) must occur. It is striking, then, to consider the lack of real interaction and collaboration that often occurs between health professionals as well as between health professionals and patients in the modern clinical environment. One of the most common ways that health professionals interact is through reading others’ notes in the electronic health record (EHR) without any verbal or face-to-face communication. This is an asynchronous, static manner of sharing data and information with limited potential for co-construction. While certainly more complex and advanced, this process has certain parallels to toddlers together on a play date – they play in parallel and may trade toys occasionally back and forth and the outcome of their play is completely predictable based on the toys and toddlers present. However, when older children play together, the outcome of their play is typically truly emergent – one cannot predict that a block will become a space ship on an epic journey when children begin playing with blocks.

Unfortunately, it seems that much of our teamwork in clinical reasoning is arrested at the “parallel play” stage of development. While there may be value in this parallel play, [12] it appears that cooperative “play” has significant (and often untapped) potential [13].

**Theoretical perspective: situated cognition, distributed cognition, embodied cognition and ecological psychology**

One of the core processes underlying diagnosis is clinical reasoning. Clinical reasoning entails the steps up to and including arriving at a diagnosis and management plan [14]. While the science of clinical reasoning is increasingly robust, it has focused primarily on the cognitive performance of the individual clinician [15, 16]. However, some researchers have emphasized the need to understand clinical reasoning performance as situated within the context of a complex health care ecosystem – including other people (e.g., team members, patients and families), physical space, workflows, artifacts like the electronic health record, and other factors – on human performance [17, 18]. This work emphasizes the importance of social cognitive theories in understanding clinical reasoning and diagnostic error. These theories suggest that interactions between people and their environment are fundamental in diagnostic reasoning; thus, diagnostic reasoning requires interaction between people and is therefore emergent. All of the theories described in this special edition – situated cognition, distributed cognition, embodied cognition, and ecological psychology- embrace the centrality of emergence in clinical reasoning. We will briefly describe these theories, as they have been described elsewhere in more detail [17].

A family of social cognitive theories can provide particularly valuable insights on the social nature of thinking, which can inform the understanding of teamwork and the reader is encouraged to review the paper by Merkebu et al. [17]. Briefly, embodied cognition emphasizes that thinking cannot be readily separated from the body – for example, effective auscultation requires both the mind and the body. Ecological psychology emphasizes the interactions between people and people and objects. Situated cognition theory emphasizes that diagnostic reasoning, and thinking in general, emerges from complex, non-linear interactions between health care professionals and patients, colleagues, and the environment [19]. Situated cognition argues that arriving at a diagnosis or management plan is not only the result of what is inside of the physician’s head but rather is the result of a myriad of environmental, social, and cultural inputs, including dialogue and negotiation (e.g., co operative play) [20, 21].

Another valuable social cognitive theory in the family of situativity is distributed cognition, which stresses that cognition is not limited to an individual’s mind but rather is spread across individuals, teams, and the physical environment in multimodal representations (e.g., speech, written documents, body gestures, and/or images) [22]. This theory can be particularly helpful when dealing with larger teams (e.g., more than 4–5 individuals), multi-team systems (e.g., primary medical team with multiple consulting teams), [23] or when the teamwork being analyzed is separated by geographic location or time. Imagine a health professional team who admits a new patient. The patient may distribute the facts of her or his
condition differently to the attending, resident, intern, student, and nurse. Each health care professional brings unique knowledge to the patient’s condition which they distribute among one another through conversation which leads to a shared mental model of a given situation. This co-constructed knowledge is placed in the medical record, a repository of knowledge, or artifact, which is further distributed to other physicians and nurses who care for the patient during the hospitalization.

The example highlights several key aspects of both situated and distributed cognition: 1) information is co-constructed through interactions between the patient, team members, and artifacts; 2) exploring different perspectives and/or representations of knowledge can lead to a richer and deeper understanding of information, and 3) a richer and deeper understanding of the information can lead to shared mental models of contexts, goals, and plans of action. This helps explain the very real phenomenon of different information arising when different members of the health care team interact with a patient – this new and different information comes to light not because it was being withheld earlier but instead because knowledge is co-constructed between people and their context and is thus different when different people are involved. Of course, the interactions between people that these theories capture may take many forms beyond face-to-face conversations; the key is that mutual interaction occurs. If people interact only in parallel and do not influence one another through perspective-sharing and exchange of information, then emergence cannot occur. This can happen through written correspondence or phone conversations as well as other emerging types of communication.

The structure of teams in health care

In order to better understand teamwork in health care, a shared understanding of different types of teams is helpful. For the purposes of this paper, we will define three types of teams: fixed teams, template teams, and knotwork teams [24].

Fixed teams are teams that have the same persons in the same roles from day to day. Relationships between individuals form over time and roles can be defined a priori or evolve over time as a team develops its routines and understands the strengths and weaknesses of its members. Fixed teams are relatively uncommon in health care, although certain outpatient settings may come relatively close. For example, a primary care clinic may have the same physician, nurse, medical assistant, and reception staff every day; as individuals develop relationships, work roles may evolve substantially. When a team member departs and is replaced by another, she or he may be surprised by their job roles.

Template teams, in contrast, are much more common in health care. In template teams, different persons may fill each role from day to day. Thus, the basis of interaction between members of the team is often not personal relationships alone but instead well-defined roles and responsibilities. Examples of template teams in health care include inpatient medical teams, operating room teams, and acute decompensation response teams. Each of these has specific roles that are fulfilled by different people over time in different combinations. However, in contrast to fields in which template teams are well supported by robust definitions of roles and responsibilities – such as aviation – roles among members of the health care team are sometimes not well defined. In these situations, conflict, confusion, and miscommunication are all too common. Examples of these situations include code blue teams and day-to-day rounding teams, in contrast to situations in which roles are well defined such as operating room teams [25–28].

Knotwork teams are also common in health care. Knotwork teams are ad hoc teams that interact in a specific instance for a specific reason around a single point of focus. In health care, this may be the team formed when a primary team obtains multiple subspecialty consultations in the context of a challenging diagnosis. The persons involved in a knotwork team may interact with the focal point of the team (a patient and/or the primary care provider) but often do not interact directly with one another. There is a risk that this work could be done in parallel – yet alone. It is important to consider when a knotwork team exists when a template team may be more effective: a code blue, team, for example, functions much better as a template team with clear roles, responsibilities, and prescribed interactions that it does as a knotwork team without these formal descriptions. Certainly, there is value in individuals working asynchronously and even in parallel, [12] although the potential for deep and meaningful collaboration may be limited.

Each of these types of teams has value in certain contexts, but it is fundamental to define what type of team is expected in a given context and then support the development and functioning of that team. For example, a fixed team, with stable team membership over time and a strong sense of team identity, may be comfortable with sharing responsibility for patient outcomes. However, a team member who disagrees with the rest of the team may suppress their thoughts to avoid social alienation, and toxic leadership could inhibit communication. Alternatively, the members of a knotwork or template team do not have the benefit of the longitudinal team relationship
and are not inhibited by this team identity, but may have to rely on stereotypical, hierarchical roles and communication styles when interacting. Since the idea of a diagnostic team is relatively new, [29] there is are substantial knowledge gaps – and research opportunities – with respect to how best define and design these teams to optimize the diagnostic process and clinical reasoning outcomes. While there is much known about the assessment of individuals [30] and teams [31], we must develop and gather validity evidence for better tools that allow more meaningful measurement of diagnostic performance. With respect to team assessment, teamwork alone should not be the dependent variable of these assessments – instead, teamwork should be treated as an independent variable that leads to a clinically important outcome.

**Improving teamwork and supporting teams in diagnosis**

To create effective diagnostic teams, all members of the health care team, especially patients, should be empowered to co-construct diagnostic reasoning. Clearly, roles and responsibilities will differ based on the unique abilities and perspectives of the health care professionals and patients involved in the team and these should be defined as clearly as possible. Graber et al. present a vision for this type of “the new diagnostic team” [29]. There are several domains that are important to consider in enhancing teamwork in diagnosis, including structure, process, and culture.

**Structure**

To transform the vision of a new diagnostic team into reality, key structures are needed to enhance opportunities for meaningful participation. When feasible, institutions should consider implementing interprofessional, patient-centered bedside team rounding [22]. If not feasible, case management rounds should include all relevant health professional team members and allow some time and space for co-construction so that a holistic view of the patient’s illness experience is captured.

**Processes**

There is no question that diagnostic reasoning is impaired by busy, chaotic, and stressful work environments that prevent time for meaningful dialogue and collaboration. Obviously, the best way to address these issues is to optimize the work environment through reducing physician, nurse, and allied health professional workloads and reducing the frequency of task-shifting/multi-tasking [32, 33]. Unfortunately, such changes are difficult. In lieu of such changes, processes can be instituted that create the time and space needed for effective diagnostic teamwork. An example of this is the concept of a diagnostic timeout [34–36]. In this process, all team members pause to confirm that they are working from a shared mental model of the patient’s key biopsychosocial clinical findings and the particulars of the situation. Such pauses provide the time for dialogue that can lead to co-constructed new or deeper understanding or management plans.

The diagnostic timeout, and other similar processes, like team huddles, create opportunities to confirm and co-construct team situation awareness (TSA) – a shared awareness of the goals of an encounter, the strategies for achieving those goals, and the particulars of the situation. TSA is a “precursor to decision-making and performance [and]… involves the team’s perception, comprehension and projection of the current situation: encompassing the surrounding environment, the task and the team itself” [37].

In health care, it can be tempting to assume that team members’ understanding of the situation and its goals are self-evident. However, this is not always the case: even daily activities, such as inpatient hospital rounds, have different goals identified by different members of the team [25]. It should be noted, that this may have benefits in avoiding group think and highlighting diverse ideas. Further, it is important to identify and discuss when competing goals may be present, such as balancing teaching and efficiency, tolerating versus resolving uncertainty, and balancing throughput and thoroughness. Building processes that allow time for the building of TSA are likely to enhance diagnostic outcomes.

**Culture**

Health care has deep hierarchical roots that must be acknowledged and addressed in order to facilitate psychological safety (i.e., “the degree to which people view a given environment as conducive to interpersonally risky behaviors like speaking up or asking for help”). [38] Honest and open communication is one of the foundations of psychological safety, and psychological safety does not “just happen naturally” in a clinical environment that is often typified by power, bias, and judgment. Instead, key behaviors must be taught, supported, and assessed to ensure that psychological safety can occur. In order to facilitate the best environment for clinical reasoning,
teams should have open and honest communication that invites, supports, and encourages all viewpoints from team members. Furthermore, those who have traditionally been in a position of perceived power on the team will need to make a conscious and dedicated effort to encourage those who have traditionally lacked power on the team to share their ideas with the team (see Table 1).

The concept of a discourse ethic is valuable in this context, and this construct has three requirements: 1) all individuals who are competent are allowed to share information in the exchange, 2) everyone in the group is allowed to question decisions and express their attitudes and desires, and 3) participants should not be coerced to give up their rights to speak during the exchange [39]. When a diversity of thought is desired (as it usually is in diagnosis), it is important to invite and express appreciation for team members’ participation (a construct known as leader inclusiveness), be open and humble, clarify gently, validate sympathetically, and outline how the team will use the shared information [39]. It is quite possible that some team members’ suggestions in a given situation may not be helpful or even clinically wrong based on a lack of context-specific knowledge or experience. In response to such suggestions, humiliation and dismissiveness must be avoided.

Creating a culture of psychological safety in large or even smaller organizations is easier said than done. There are no short-cuts available to speed the process of cultural change. Organizations must prioritize such cultural change as part of their mission and use models, like Kotter’s 8-step change model, that provide strategies that enhance the chances for success [40].

### Conclusions

While our understanding of clinical reasoning has grown, we still have much to do in improving teamwork in diagnosis, from developing better shared understanding of what kinds of teams are needed and present to assessing these teams and establishing key teamwork-enabling cultural factors. Health care must learn from other fields in order to enhance teamwork and move our interprofessional education and practice efforts from teaching about teams to learning and practicing in teams. We must, as a field, move beyond parallel play.

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