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Cognition in the Clinic: The Case for Cognitive Ethnography in Family Medicine

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ABSTRACT

In family medicine, clinical reasoning often requires family physicians to provide patient care across a heterogeneity of clinical problems and a wide range of clinical contexts. The relationship between clinical reasoning and context has long been implicated in the medical education literature; however, traditional conceptualizations of clinical reasoning have focused on individual cognition and have positioned context as external to the process itself. More recently, clinical reasoning has been defined through the integration of knowledge and context. This emerging conceptualization requires research methodologies that place a greater emphasis on how this integration takes place in real-world practice settings. Despite this need, such methodologies remain underutilized and underexplained in the medical education literature. This article provides an overview of cognitive ethnography, a methodology that can explore the integration of knowledge and context in real-world settings. Using a case study of cognitive ethnography exploring adaptive expertise in family medicine, this article further shares an example of how to design and implement cognitive ethnography in family medicine research. A greater understanding of the realities of clinical reasoning in the family medicine context is crucial to support the ongoing research, training, and academic conversations in family medicine.

INTRODUCTION

In medical education, clinical reasoning traditionally has been explored within a cognitivist research paradigm.[1] This paradigm positions clinical reasoning as being synonymous with the cognitive processes that enable an individual to respond to a clinical problem.[2-5] Meanwhile, *context*—a concept implicitly acknowledged but often poorly defined through isolated patient, physician, or environmental characteristics[6]—has been viewed as influential to clinical reasoning but external to the process itself, positioned as 'noise' complicating our ability to understand cognitive processes. Research following this paradigm has tended to utilize tightly controlled experiments in laboratory settings to explore how contextual factors impact performance on diagnostic tasks.[2-5,7]

Recently, an emerging area of literature has conceptualized clinical reasoning as a contextually-situated activity.[1] Rather than noise, context is viewed as the "weaving together" of physician, patient, and medical encounter.[6] Cognition is not omitted from this paradigm of clinical reasoning; instead, cognition is inseparable from context, and expert performance is defined through the integration of knowledge and context.[9,10] This conceptualization allows for explorations of context in clinical reasoning research in real-world settings beyond isolated features which are easily observable in tightly controlled experiments.[1,11,12]

This emphasis on real-world settings is especially important in family medicine research. Grierson and Vanstone noted the value of the clinical context of family medicine practice for education research based on its "heterogeneity."[13] The variabilities in practice resulting from this heterogeneity can be observed across different areas of context identified by

Bates and Ellaway[11] in their review of medical education literature:

- The *physical location* of practice across urban and rural settings and practice models (hospital-based practices, family health teams, independent community practices, etc.) can differ with respect to patient population and access to other health professionals and available resources.[14,15]
- The broad scope of practice performed and *experienced* within family medicine requires physicians to respond to routine and nonroutine clinical problems, including ambiguous undifferentiated symptoms that might lack straightforward diagnosis, management, or treatment strategies as well as requires physicians to experience uncertainty, complexity, and novelty in their daily practice.[16-18]
- In addition to scope of practice, family medicine's prioritization of continuity of care means that both *physicians and patients bring* their entire long-standing relationship within a clinical encounter: clinical decision-making must incorporate the patient's medical history, personal relationship, and broader social circumstances.[17,19-23]
- This scope of practice and continuity of care represent a *broader cultural influence* that aligns work with generalist practice and prioritizes generalism as a philosophy of care; however, family physicians also can work with more focused practice within specialized areas of care.[24-29]

To understand how we can better account for these differences in clinical context, research methods must aim to explore the integration of knowledge and context across real-world settings.[9,30,31] Despite the acknowledgment of the need for such research, methodologies aligned with this purpose remain underutilized and underexplained in medical education literature. This article presents one research methodology—cognitive ethnography—that can help elucidate how clinical reasoning occurs in real-world settings. The following sections offer an overview of cognitive ethnography, concluding with an example for implementing it in family medicine research.

WHAT IS COGNITIVE ETHNOGRAPHY?

In 1995, Edwin Hutchins published *Cognition in the Wild*,[32] documenting his experiences aboard a navy ship to explore navigation in action. In the book, Hutchins took a novel approach to the relationship between culture and cognition, arguing that cultural activity systems have their own cognitive properties which differ from the cognitive properties of the individuals who participate in these systems: "human cognition is not just influenced by society and culture, but . . . is in a very fundamental sense a cultural and social process."[32] He identified the framework of distributed cognition, which posits that cognition is embedded within a larger physical and social environment: it is the interaction between individual and environment, which allows an individual to 'distribute' their cognition to achieve a goal.[33,34] For example, in describing ship navigation, Hutchins noted the complex interplay between social actors and artifacts—social and physical objects intended to aid, enhance, or improve cognition,[35] such as human-made navigational tools and charts on the ship[32,36]—which support the goals of the navigation team. To explore distributed cognition, Hutchins immersed himself in the world of naval ship navigation. He described this immersion through three journeys: "a movement through physical space from the 'street' to the ship, a movement through social space from civilian to military life, and a movement through conceptual space from everyday notions of wayfinding to the technical domain of navigation."[32]

Hutchins' research on distributed cognition was made possible through the development and use of ethnographical research methods in combination with cognitive theory to explore cognition in real-world settings. Cognitive ethnography is a form of ethnography specifically developed to explore distributed cognition.[37-39] Cognitive activity is defined through the interaction between individual and environment.[33,35,36] This deliberate focus on cognition differentiates cognitive ethnography. As explained by Mylopoulos and Farhat in their cognitive ethnography, "...distributed cognition is a valuable framework in that it does not deny individual knowledge or agency, and thus allows exploration of expertise in context without losing the expert in the analysis."[38] Thus, the goal of cognitive ethnography is to reveal how cognition is enacted in real-world settings, which can help researchers understand how clinical reasoning occurs in daily work.

Significantly, as cognitive ethnography is a type of ethnography, elements of ethnographic methodology remain important. Medical education has a long history of 'traditional' ethnographic research to explore topics such as socialization and medical culture.[40,41] More contemporary approaches—such as digital ethnography and focused ethnography—attempt to adapt ethnographic methods in response to the evolving medical education research landscape.[40,42-46] These contemporary approaches are not in contrast with traditional ethnography,[42,47] but require careful and deliberate consideration to ensure that "the underlying ethnographic methodology . . . remain guiding principles of enquiry."[48] Recent articles have focused on this underlying methodology when conducting a focused ethnography or digital ethnography in medical education.[42-44] The following section offers similar attention to conducting cognitive ethnography research in medical education.

CONDUCTING COGNITIVE ETHNOGRAPHY

In a medical education context, Reeves et al provided five interrelated "activities" (or phases) that are "actioned" in conducting ethnographic work: planning, sampling, data

collection, data analysis, and writing up.[49] This section provides an overview of these activities when conducting cognitive ethnography research in a family medicine context, with Table 1 highlighting key features of cognitive ethnography and traditional ethnography.

First, in *planning* cognitive ethnography, the research team must gain access to a clinical space for observations. Parallel with Hutchins' three journeys,[32] this access can be considered with respect to the physical, social, and conceptual space. First, physical access involves the practical and bureaucratic challenges of gaining access to a clinical space. Second, social access involves potential issues in gaining access to family physicians and patients. For family physicians, being observed on cognitive activities might evoke feelings of being evaluated on diagnostic accuracy—a traditional outcome of interest in the cognitivist paradigm of clinical reasoning. For patients, the presence of an observer during a clinical encounter might seem awkward or complicate the primacy of the doctor-patient relationship in family medicine. Third, conceptual access requires the research team to gain insight and familiarity with the research setting. For example, the research team might need to reconcile their theoretical knowledge of distributed cognition with the lived experience of being within their research setting (while not disrupting day-to-day activities in the space). A key informant—or an insider from the research setting—can play an important role in gaining access to these spaces.[50] Furthermore, access is an ongoing process: the researcher's immersion with participants requires constant participation and renegotiation over time.

Second, *sampling* is concerned with the focus of data collection. Within family medicine, sampling can be tenuous given the heterogeneity of the practice context and can differentiate across different areas of context identified by Bates and Ellaway.[11] For example, decisions regarding location, scope, participants, and practice can all greatly impact the day-to-day operations of a clinic observed in a study. These decisions, or *purposive sampling,* should result from the overarching research question guiding the study protocol.[41] In cognitive ethnography, this research question derives from the application of an established theoretical framework—distributed cognition—onto activities in practice, allowing the research team to observe the framework in action. As such, data collection is typically more focused than in traditional ethnography, with Ball and Ormerod highlighting this observational specificity as a key feature of cognitive ethnography.[37] They noted, however, that this specificity also can be seen as contrary to the implication of 'full' immersion implicit in ethnography methodology, because the research team may observe only a subset of activities without full participation, whereas traditional ethnographies are defined through the length and intensity of data acquisition.[37]

Third, *data collection* can involve several data sources. The breadth and depth of data collection might be dependent on access to the study site (eg, gaining access to patient health records poses ethical challenges), but it also requires consideration of the level of participation of the researcher. Following the observational specificity highlighted in the previous section, the researcher typically does not fully immerse or fully participate in the research setting. Regardless, researcher reflexivity remains important to consider how their presence in the clinical space might influence data collection, the activities of participants, and the entire research process.[47,51] Moreover, following aforementioned tensions between the purely cognitivist and contextually-situated paradigms of clinical reasoning, the researcher must remain aware of how their framework of cognition shapes their understanding of clinical activities. For example, acknowledging clinical reasoning as a contextually-situated activity, data collection should have an equal emphasis on both human and contextual factors.

Fourth, Reeves et al broke down *data analysis* into three aspects: description, analysis, and interpretation.[49] Within cognitive ethnography, description entails recounting and detailing factors involved in a clinical encounter, such as physicians, patients, practice setting, and broader practice context. During analysis, the research team explores the interactions between individual and environment. Durning and Artino described "the unit of analysis [in distributed cognition] is individuals engaged in cognitive activities within social and material contexts";[52] as such, the analysis aims to examine interactions between human and contextual factors. Finally, interpretation "builds an understanding or explanation of the data beyond the data points and analysis."[49] The goal of ethnography is not necessarily generalizability, but rather to gain deeper understanding of the phenomenon of interest;[53] thus, in family medicine, this interpretation can help reveal clinical reasoning in real-world settings and hypothesize implications for practice and education. Following the primacy of triangulation in ethnographic methods, data analysis should involve constant comparative analysis of different data sources, both inductively to uncover emergent themes and deductively with respect to the overarching framework of distributed cognition.

Fifth, when *writing up* an ethnography study, the research team continues to elucidate the relationship between researcher and study setting.[49] Again, due to the lack of full immersion and participation, the researcher may view the setting as distinct from the self. Where writing decisions can manifest, however, is through how the research team views the relationship between theory and practice. For example, the presentation of the cognitive ethnography could aim to extend or refine broader theoretical understandings of the relationship between cognition and context, or it could remain localized to the specific site and population of the study. While generalizability is not a goal of ethnographic research, Ball and Ormerod noted that the verifiability of a cognitive ethnography study—or the understanding that the cognitive

TABLE 1. Similarities and Differences Between Cognitive Ethnography and Traditional Ethnography

	Cognitive ethnography	Traditional ethnography
Purpose	To explore cognitive processes as enacted in real-world settings	To explore social interactions in real-world settings
Theoretical lens	Psychology and cognitive science (ie, distributed cognition)	Social sciences (ie, anthropology and sociology)
Role of the researcher	Primarily an observer who is not fully immersed and participating in the research setting	Participant-observer fully immersed and participating in the research setting
Observational specificity	High specificity and focused data collection based on more narrow research question	Low specificity and broad observation of social and cultural practices
Duration	Higher intensity due to more focused data collection and lack of immersion	Lower intensity due to broad data collection and immersion in research setting
Data collection	Observation, interviews, field notes, artifact analysis	Observation, interviews, field notes, artifact analysis
Data analysis	Triangulation of data sources through constant comparison to gain a greater understanding of phenomenon of interest	Triangulation of data sources through constant comparison to gain a greater understanding of phenomenon of interest
Writing process	Increased emphasis on verifiability	Increased emphasis on personalization and storytelling

Note: Based on key features highlighted by Ball and Ormerod[37]

framework guiding the study offers empirical reassurance—contrasts traditional ethnography methodology.[37]

COGNITIVE ETHNOGRAPHY OF ADAPTIVE EXPERTISE: A CASE STUDY

This section presents a case study of an ongoing cognitive ethnography in family medicine, providing an explicit example of the decision points involved in designing and implementing cognitive ethnography in a real-world setting.

Adaptive expertise[54-59] is a model of expert development and performance that has been aligned with family medicine to support the practice and training of the "specialist generalist"—"to balance both the routine and the nonroutine, providing exceptional care for the simple and the complex, and remaining capable in the face of uncertainty and ambiguity."[26] Adaptive expertise acknowledges how knowledge is generated and transformed during the activity of patient care, recognizing the contributions of different health care workers and environmental factors,[10,60,61] thus reflecting a contextually-situated conceptualization of clinical reasoning.[57,62] Despite this theoretical alignment between adaptive expertise and family medicine, how the context of family medicine practice supports the enactment of adaptive expertise in real-world clinical settings remains unclear. Therefore, cognitive ethnography allowed us to explore how family physicians interact with their context to provide exceptional patient care.

In the planning phase, particular attention was given to the different areas of context identified by Bates and Ellaway.[11] We conducted the study at an urban-based family health team clinic, hypothesizing that this *physical location* would allow us to explore specialist generalist practice[26] due to the diversity of patient presentations and health professionals represented at this setting. This setting would allow us to observe routine and nonroutine clinical problems *experienced* in patient interactions and the *family physicians* involved in these interactions. We also explored the *broad cultural influences* associated with this context through this setting (as described later). A key informant in family medicine was crucial in gaining physical access to the clinical space as well as social access by fostering relationships between the research team and participants. All participants were made aware that the focus of the study was to observe problem-solving in action rather than to evaluate clinical performance, which further helped us gain access to the social space because it reduced potential concerns about the observation of activities. Adaptive expertise[2,54-61] provided a theoretical lens to help gain access to the conceptual space of the study, as it provided a framework through which to understand experiences in the clinical space.

In the sampling phase, we used purposive sampling to recruit family physicians with 5 to 10 years of experience at the clinic to participate in the study. We anticipated that this sampling would target participants skilled with the integration of knowledge and their practice context in patient care. The key informant helped establish observational specificity by suggesting specific clinic dates for observations. During these dates, we observed all available interactions between these participants and patients because we hoped to observe the broad scope of practice that is characteristic of specialist generalist practice.[26] We selected an observer without a clinical background to allow them to maintain limited participation and immersion in the clinical environment.

Data collection was comprised of observations, field notes, and interviews. The observer had experience researching adaptive expertise in family medicine but without a clinical background; this lack of clinical knowledge enabled the exploration of adaptive expertise during observations without focusing on clinical diagnostic accuracy. During observations, adaptive expertise provided a theoretical framework

to orient understanding of clinical activities. Context was operationalized during observations through three broad categories aligned with Bates and Ellaway's[11] area of *cultural influence*: continuity of care, comprehensiveness in practice, and collaboration with other health care professionals. This operationalization allowed the researcher to focus on specific contextual factors associated with each of these categories—and how they interact with knowledge—during observations. Following observations, participant interviews helped elucidate clinical reasoning decisions that occurred during patient interactions, as well as allowed us to gain insight into participants' practice context and broader understanding of family medicine and generalist practice. Conversations with the key informant provided further insight into observations with respect to the overarching research question. While patients were aware that observations were taking place, they were not study participants and were not interviewed. Patient data were not recorded or included in the study. This decision reflected the focus of the study on family physicians' cognitive activities during patient interactions (rather than on categorization of patient activities as routine or nonroutine).

Using a constant comparative approach, data analysis and collection occur concurrently: analysis immediately after data collection aimed to inform subsequent observations and interviews. Through data analysis—utilizing adaptive expertise as a theoretical framework—we attempted to triangulate understandings across different knowledge sources. This involved a rich description of clinical activities and analysis focused on the relationships and reflection of these clinical activities toward the integration of knowledge and context. Through the ongoing interpretation of data, we will attempt to connect this analysis with the broader adaptive expertise and family medicine research literatures, respectively. Previous work by the research team exploring adaptive expertise offered a deductive framework to help support the ongoing interpretation of data.

Lastly, writing enhanced reflexivity by making apparent the research team's own interpretations and influence on the study. This reflexivity also involved journaling by the observer to document their participation in the research setting: aligned with the journey into conceptual space, journaling helped make evident how the observer's relationship with family medicine changed over the course of the study. The research team's differing perspectives and professional backgrounds helped frame insights gained through the study in relation to adaptive expertise, education science, and family medicine. The involvement of the wider team throughout writing helped elucidate the relationship with the research setting in the presentation of the study, as most team members were not present during observations. One major consideration while writing centred around the presentation of data as localized within the study's specific context or as part of the broader adaptive expertise research literature, which might represent different audiences, journals, and writing styles.

CONCLUSIONS

Cognitive ethnography offers a powerful methodology for medical education. Bringing together cognitive theory and ethnographic methods allows for the exploration of cognitive processes in real-world settings. In family medicine, where patient care often necessitates responding to a variety of presentations across a wide range of clinical contexts, cognitive ethnography can help us understand how physicians solve problems in their daily work. Such understandings of problem-solving are necessary to support the ongoing expert performance of physicians, contributing to the deliberate structure of the workplace with the interaction between physician and environment in mind, as well as incorporating such understandings to enhance teaching and learning in training programs. Together with previous research from a purely cognitivist paradigm, the incorporation of cognitive ethnography in medical education can allow for a more fulsome understanding of how physicians diagnose, treat, and manage patient problems.

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