

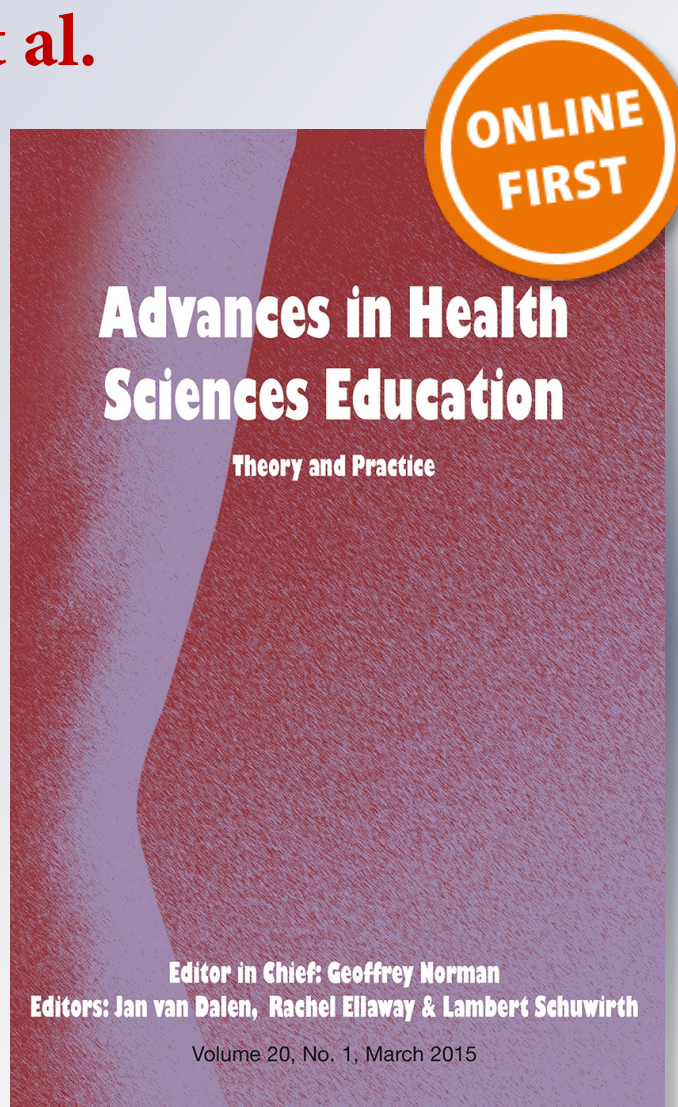
Consequences of contextual factors on clinical reasoning in resident physicians

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Consequences of contextual factors on clinical reasoning in resident physicians

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Abstract Context specificity and the impact that contextual factors have on the complex process of clinical reasoning is poorly understood. Using situated cognition as the theoretical framework, our aim was to evaluate the verbalized clinical reasoning processes of resident physicians in order to describe what impact the presence of contextual factors have on their clinical reasoning. Participants viewed three video recorded clinical encounters portraying straightforward diagnoses in internal medicine with select patient contextual factors modified. After watching each video recording, participants completed a think-aloud protocol. Transcripts from the think-aloud protocols were analyzed using a constant

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comparative approach. After iterative coding, utterances were analyzed for emergent themes with utterances grouped into categories, themes and subthemes. Ten residents participated in the study with saturation reached during analysis. Participants universally acknowledged the presence of contextual factors in the video recordings. Four categories emerged as a consequence of the contextual factors: (1) emotional reactions (2) behavioral inferences (3) optimizing the doctor patient relationship and (4) difficulty with closure of the clinical encounter. The presence of contextual factors may impact clinical reasoning performance in resident physicians. When confronted with the presence of contextual factors in a clinical scenario, residents experienced difficulty with closure of the encounter, exhibited as diagnostic uncertainty. This finding raises important questions about the relationship between contextual factors and clinical reasoning activities and how this relationship might influence the cost effectiveness of care. This study also provides insight into how the phenomena of context specificity may be explained using situated cognition theory.

Keywords Clinical reasoning · Internship and residency · Medical education · Situated cognition · Quantitative methods

Introduction

Clinical reasoning has been described as the process “that enables practitioners to take wise action, meaning to take the best justified action in a specific context” (Higgs and Jones 2008). Diagnostic reasoning reflects the processes that clinicians use to establish or arrive at a diagnosis and therapeutic reasoning reflects the process that clinicians use to decide upon a plan of action tailored to each patient’s unique circumstances (Bissessur et al. 2009; Durning et al. 2012a, b).

Contemporary understanding of clinical reasoning has emerged from multiple, diverse fields. Some of the frameworks utilized to explore clinical reasoning, such as dual processing theory (e.g. non-analytic and analytic reasoning, a form of information processing theory), emphasize the role of the individual physician (Eva 2004; Hogarth 2005; Schwartz and Elstein 2008) and their knowledge; they do not explicitly account for the social context of care. Such frameworks, while useful for understanding reasoning, can minimize the potential impact of the patient, the environment, and the interactions between the patient, the physician and the environment. Previous research by Brooks et al. (2000) has demonstrated that “contextual factors,” such as a diagnostic suggestion, can alter diagnostic accuracy. In previous work, it was found that patient-related contextual factors (low proficiency in English and challenging of a physician’s credentials) in combination with encounter-related contextual factors (incorrect diagnostic/therapeutic suggestion and atypical disease presentation) appear to be negatively associated with diagnostic reasoning in board-certified physicians when viewing a set of recorded clinical scenarios (Durning et al. 2012a, b). In addition, it has been demonstrated that contextual factors are linked, in important ways, to the clinical reasoning processes of expert physicians, findings that are consistent with theories of situated cognition, ecological psychology and cognitive load (Durning et al. 2011). However, it is not known if or how such contextual factors relate to clinical reasoning in physicians in training. Given this, it is important to consider these

relationships in this subgroup and whether the associations can be explained by current theoretical frameworks of clinical reasoning.

Over the last two decades, observations of variation in performance across cases and between cases have introduced the concepts of content and context specificity. Studies have demonstrated that in simulated cases, low correlations exist between cases with the same diagnosis when factors outside of content have been modified, indicating that something other than content is responsible for these differences (Durning et al. 2012a, b; Elstein et al. 1990; Norman et al. 1985). Situated cognition is a theory that may help to explain the concept of context specificity by accounting for the dynamic interactions that occur between the physician, patient and environment during a clinical encounter (Fig. 1).

Situated cognition theory contends that reasoning and learning are situated within the physical environment and social context of an experience (Durning et al. 2011; Durning and Artino 2011; Schunk 2008). As such, knowledge and reasoning are thought to be intrinsically linked to a specific context and are shaped by the interactions that occur within this context, whether these interactions are physical, cultural or social. This framework contrasts with other theories, such as dual processing theory, which focus on the individual thereby minimizing the role that the environment and social interactions may have in the encounter. Situated cognition promotes the idea that learning and knowledge are dynamic and can change based upon the interactions present and how information becomes available within each specific context. As such, when applied to clinical reasoning, situated cognition theory would assert that the outcome of a clinical encounter is not solely the product of the physician's knowledge (Durning and Artino 2011).

The aim of this study was to evaluate the verbalized clinical reasoning process of resident physicians in an Internal Medicine training program in order to describe the relationship between contextual factors and clinical reasoning and whether these relations are adequately explained by situated cognition.

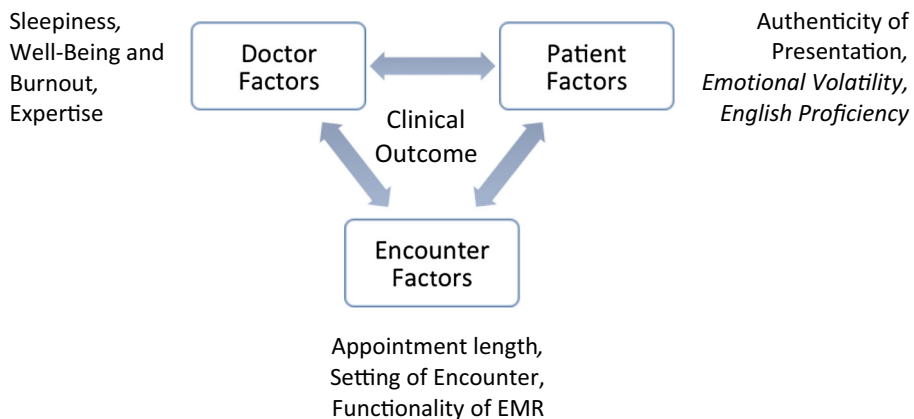


Fig. 1 Situated cognition as a framework for context within a clinical encounter. The clinical outcome is dependent upon the complex interactions of all components; the physician, the patient, and the encounter. The types of factors evaluated in this study are show in *italics*

Methods

Participants

All resident physicians in the Internal Medicine training program at the San Antonio Uniformed Services Health Education Consortium were invited to take part in this mixed methods study from 2013 to 2014. Subjects were contacted by email by a research assistant and invited to participate. There were no exclusion criteria. Informed consent was obtained prior to participation. The study was approved by the IRB at the Uniformed Services University of the Health Sciences and acknowledged and approved by the Brooke Army Medical Center IRB. Residents were not compensated for participation in this study.

Design

The study design has been used previously and is part of a program of research, the methods of which have been previously published (Durning et al. 2011, 2012a, b). Participants viewed a series of three video recordings. Each case was followed by completion of a computerized free-text post encounter form and then a think aloud protocol while viewing the video recordings a second time. These video recordings displayed one of three diagnoses: HIV, colorectal cancer, or symptomatic type 2 diabetes mellitus with specific patient contextual factors modified related to (1) a patient with low English proficiency, (2) emotional volatility displayed as challenging of the physician's credentials or (3) a combination of both of these contextual factors respectively. Specific contextual factors were altered to allow for exploration of the influence of these factors on clinical reasoning performance. The portrayed cases were designed to represent straightforward disease presentations and were reviewed by an independent group of physicians, not involved in the study, for authentic portrayal (Durning et al. 2012a, b). The video recordings were selected in a random order for viewing with each participant watching all three recordings.

After watching a video recorded clinical encounter, the participants completed a previously validated post encounter form (Durning et al. 2012a, b) which asked what additional history or physical exam information the participants would seek, what his/her differential diagnosis would be, what his/her diagnosis is and the data that support this, and what treatment plan he/she would institute for the patient. Following this, the participant then re-watched the videotape while engaging in a think-aloud protocol facilitated by a research assistant (Ericsson and Simon 1980). Consistent with published guidelines, all participants were first trained in the think aloud methodology by going through a series of examples and the particular think aloud task in this investigation (arriving at the diagnosis and therapy for the patient in the video). The actual protocol involved having participants state whatever came to mind while re-watching the videotape; if no utterances were vocalized after a period of time (10 s) the research assistant asked the participant to "think aloud." The think aloud sessions were all audio recorded.

Data analysis

The spoken data from each think aloud session was transcribed verbatim into a written transcript. These transcripts were then analyzed using a constant comparative approach. Coding of transcripts for emergent themes was performed while being mindful of the theoretical framework of situated cognition. Two investigators (EM, TR) independently

coded utterances (single words, phrases, or sentence(s) corresponding to a theme) and then grouped these utterances into general categories, themes and subthemes (see results below). Following initial coding (approximately 30 % of the transcripts), the two investigators (EM, TR) met to discuss the themes and resolve disparities. Several themes emerged and the process was continued until saturation was reached. Both investigators met for a final time following coding of all of the transcripts to review categories, themes and subthemes and to resolve differences (100 % agreement was met with this process). Accuracy of diagnosis, coded as either correct or incorrect, and the presence of diagnostic uncertainty, defined as the inability of the resident to commit to a final diagnosis, was coded by two investigators (EM, TR) with differences resolved by discussion.

Descriptive statistics, including means, standard deviations, ranges and proportions were calculated for demographic data, accuracy of diagnosis, presence of diagnostic uncertainty, word count and the average number of differential diagnoses generated using SPSS 22.0.

Results

A total of 10 residents (4 males, 6 females of 74 possible participants) enrolled in the study. Three residents were in post-graduate year 1 (PGY-1), 3 residents PGY-2, and 4 residents PGY-3 of training. The average year of medical school graduation was 2009 (range 2006–2012). All participants completed a think-aloud protocol for each of the three video recordings. Two authors coded these transcripts (EM, TR) with differences resolved through discussions, accomplishing 100 % agreement. No new themes emerged after data analysis for seven participants.

Table 1 displays the proportion of residents able to make a correct diagnosis and the proportion of residents verbalizing diagnostic uncertainty for each case. Diagnostic accuracy was lowest for Case 1 and highest for Case 3 while diagnostic uncertainty was highest for Case 1 and lowest for Case 3. The average number of differential diagnoses generated for Case 1 was 4 ($SD \pm 2.0$), Case 2 was 6 ($SD \pm 3.2$), and Case 3 was 6 ($SD \pm 3.0$).

Table 1 Proportion of residents identifying the correct diagnosis and proportion residents demonstrating diagnostic uncertainty by case

Case	Proportion of residents ^a % (n)
Case 1: HIV	
Identified correct diagnosis	30 % (3)
Verbalized diagnostic uncertainty	90 % (9)
Case 2: Colorectal cancer	
Identified correct diagnosis	60 % (6)
Verbalized diagnostic uncertainty	50 % (5)
Case 3: Diabetes mellitus	
Identified correct diagnosis	80 % (8)
Verbalized diagnostic uncertainty	40 % (4)

^a Column numbers represent the percentage (%) and number (n) of the total sample of ten residents who participated in each case

Contextual factors

Participants viewed a series of videotapes in which contextual factors (per methods section) were modified. There was universal verbalized acknowledgement of the presence of contextual factors in every think-aloud transcript. Statements ranged from a passive acknowledgement to more elaborate appraisal of the impact the contextual factor might have on the clinical encounter.

“She has a heavy accent so they probably may have some trouble communicating...” (Case 1 HIV, low proficiency English)

“...seems very upset about the administrative system that goes into scheduling an appointment, so generally she’s very agitated.” (Case 2 colorectal cancer, emotional volatility)

Several constructs emerged from the data that appeared to be the consequence of contextual factors being present during the clinical encounter. They were grouped into four categories with associated themes and subthemes. The four categories identified were: (1) emotional reactions to the contextual factors (2) behavioral inferences (3) optimizing the doctor patient relationship and (4) difficulty with closure (see Table 2).

Emotional reactions

There was demonstration of emotional reactions in response to the presence of the contextual factors during the encounter. These manifested themselves as verbalized reactions to a patient’s behavior or implied a general judgment about the patient. The emotional reaction to the contextual factor most often appeared to create some form of tension within the participant. This was observed in 17 out of 30 transcripts (57 %). For example, several participants noted the following:

Table 2 Categories, themes and subthemes identified from think-aloud transcripts of resident physicians

Categories	Themes	Subthemes
Emotional reactions	Emotional reactions to contextual factors	
Behavioral inferences	Behavioral inferences made in response to contextual factors	
Optimizing the doctor patient relationship	Mechanism to cope with the presence of the contextual factor	
Difficulty with closure	Need for additional history and physical exam information Need for broad diagnostic investigation Presence of diagnostic uncertainty	Unable to decide upon a lead diagnosis Being unsure of how to utilize presented information

Multiple constructs emerged from the data that appeared to be the consequence of contextual factors during the clinical encounter. These were grouped into four categories with associated themes and subthemes

“Everyone wants to know how long we have been doctors for!” (Case 3 diabetes mellitus, emotional volatility and low proficiency in English)

“That is a little rude.” (Case 2 colorectal cancer, emotional volatility)

“Okay, so a little awkward. She’s very defensive... This is usually frustrating to me, talking to a patient when it’s hard to communicate.” (Case 3 diabetes mellitus, emotional volatility and low proficiency in English)

Behavioral inferences

The second category identified was the presence of behavioral inferences that participants would make about the patient in response to the contextual factor. This was exhibited when the resident would make inferences about lifestyle behaviors of the patient without the patient actually verbalizing participation in these behaviors to the physician. This was demonstrated by 8 participants in 11 out of 30 transcripts (37 %). Although not demonstrated by every participant, when it did occur there was usually an underlying negative connotation to the inference being made. This was often coupled with emotional reactions to the contextual factor.

“She never answers the question, how much does she drink? What other behaviors does she do if she’s concerned about this, she probably does have heavy alcohol use.” (Case 3 diabetes mellitus, emotional volatility and low proficiency in English)

“She sounds very defensive. What you usually see is these people have alcohol problems.” (Case 2 colorectal cancer, emotional volatility)

Optimizing the doctor patient relationship

The third category identified from the data was optimizing the doctor patient relationship. Participants would recognize the presence of a contextual factor and attribute its effect to a poor doctor patient relationship. Consequently, multiple remarks on how or what type of physician behavior would establish better rapport with the patient were made. The participants appeared to try and optimize the doctor patient relationship as a way to cope with the presence of the contextual factors. This was commented on in 60 % (18 out of 30) of the think-aloud transcripts.

“I think I would do a little bit more to try to establish a relationship and put her at ease.” (Case 1 HIV, low proficiency English)

“With a patient like this, if I were the physician in the room I would go through all of her concerns and verbalize them to let her know that her concerns are very much valid.” (Case 2 colorectal cancer, emotional volatility)

Difficulty with closure

The final category identified as a consequence of contextual factors was difficulty with closure. This category was associated with three themes: (1) the need for additional history and physical exam information, (2) the need for broad diagnostic investigation and (3) the presence of diagnostic uncertainty.

The first theme, the need for additional history and physical exam information was present repeatedly in 90 % of think-aloud transcripts (27 out of 30) and manifest as a

request for additional history of presenting illness, past medical history, family medical history, and physical exam. The participants demonstrated repeated need for this information in order to more definitively establish a diagnosis.

“I wonder what the urine looks like, is it clear? You would wonder if she has nausea or belly pain...” (Case 3 diabetes mellitus, emotional volatility and low proficiency in English)

“Everything she has said, I would like her to explain a little bit more...” (Case 2 colorectal cancer, emotional volatility)

The second theme that emerged related to difficulty with closure was the need for broad diagnostic investigation. Participants stated a desire to utilize multiple laboratory interventions to rule out other potential diagnoses after previously stating what they thought the most likely diagnosis was in 6 out of 30 transcripts (20 %). These interventions were beyond the scope of what would normally be expected for a straightforward disease presentation.

“...I would consider doing a CBC and TSH for an anemia workup and to evaluate further gastrointestinal causes for her weight loss and fatigue.” (Case 2 colorectal cancer, emotional volatility)

“I would get a thyroid (study) just to make sure that she’s not undertaking her levothyroxine...I would also look at the sodium to consider central etiologies...like pituitary adenoma or hypopituitarism.” (Case 3 diabetes mellitus, emotional volatility and low proficiency in English)

The third theme under the category difficulty with closure was diagnostic uncertainty, which occurred in 90 % (9/10) of Case 1, 50 % (5/10) of Case 2 and 40 % (4/10) of Case 3 transcripts. This included two subthemes: (1) participants being unable able to definitively decide upon a lead diagnosis and (2) being unsure of how to utilize presented information. For the first subtheme, there was repeated evidence of reluctance to choose a single lead diagnosis, even when prompted.

“Diagnosis? Possible viral syndrome, acute seroconversion HIV, something along those lines.” (Case 1 HIV, low proficiency English)

“I don’t know how to diagnose that. Well, you could do symptoms as a diagnosis...” (Case 2 colorectal cancer, emotional volatility)

The second subtheme associated with diagnostic uncertainty demonstrated that participants in 5 out of 30 transcripts (20 %) were unsure of how to utilize information that was provided in the encounter:

“I don’t know what the lesion was on her leg, looked like some kind of bulla, hemorrhagic lesion I haven’t seen before, not sure what exactly that was...something infectious?” (Case 1 HIV, low proficiency English)

Discussion

In this study, the participants acknowledged the presence of contextual factors in all transcripts. The presence of the contextual factors appears to have evoked a cycle of interactions in participants. First, residents displayed emotional reactions to the contextual

factors that also contributed to the development of behavioral inferences. After acknowledging the contextual factor, 60 % of residents then offered ways to optimize the doctor patient relationship as a means to cope with the presence of the contextual factor. Ultimately, the residents then experienced difficulty with closure of the clinical encounter, which manifest as a desire for large amounts of additional information and then culminated in demonstration of diagnostic uncertainty. When taken in aggregate, these findings suggest that in the presence of contextual factors residents experienced something, potentially an increase in cognitive load, that interfered with their clinical reasoning processes. This potential increase in cognitive load was not necessarily an anticipated finding and, as such, the direct measurement of cognitive load was not incorporated into the study design.

Emotional reactions to the presence of contextual factors were common, as was the coping strategy to offer suggestions on how to optimize the doctor physician relationship. If a physician is focused on the presence of a contextual factor and develops an emotional reaction, the repercussion is that this could increase cognitive load and negatively impact other clinical reasoning processes needed to establish a diagnosis or therapeutic plan. Given the significant presence of diagnostic uncertainty, this study suggests that this may have been what occurred when faced with unexpected contextual factors. In addition, if an emotional reaction to a contextual factor results in a behavioral inference being made about the patient that is harmful or incorrect, this has potentially negative consequences on patient care. These findings have implications for understanding how to best teach clinical reasoning skills to students. Learning how to manage the multiple interactions that occur between the physician, patient and encounter becomes key in developing these types of skills.

Despite being straightforward cases that provided enough information on which to base a sound diagnosis, the tendency of the resident was to recurrently ask for additional information. Script theory provides a potential lens for viewing this finding. Script theory contends that all physicians deploy use of prior gained, relevant knowledge during clinical encounters. This entails recognition of important details, generation of hypotheses, and creation of actionable plans (Charlin et al. 2007). The need for additional data to support their diagnosis was demonstrated repeatedly and suggests that in the presence of patient contextual factors the residents' specific illness scripts were unable to account for variations in the interactions of the encounter. This may indicate an immaturity of the residents' current illness scripts contributing to their difficulty with closure of the encounter and supports the presence of context specificity. To confirm this effect, residents would need to demonstrate similar struggles when viewing the same case multiple times but with manipulation of different contextual factors.

The presence of diagnostic uncertainty was pronounced for all three of the video cases which were developed and vetted by experts to be of roughly equal difficulty and designed to represent straightforward disease presentations. As such, the diagnostic uncertainty displayed by the participants was more pronounced than warranted for these forthright cases and may suggest underlying cognitive load. Even when the correct diagnosis was clearly verbalized in the clinical reasoning of the participant, he/she was still hesitant to commit to a lead diagnosis demonstrating a lack of confidence in making the correct assessment. This ultimately could have implications for patient outcomes and cost of care.

When challenged with the presence of patient contextual factors, the residents developed diagnostic uncertainty. One method employed to mitigate the uncertainty was to order more laboratory interventions in order to confirm a diagnosis that should have been self-evident. If carried out in practice, this would lead to a decrease in the cost

effectiveness of care and also potentially lead to increased healthcare utilization due to unneeded specialist referrals.

It is notable that, as a group, the residents verbalized very little about development of a therapeutic plan. This was consistent across all cases. Given the difficulty with closure that was prominently displayed, it is perhaps not unsurprising that this occurred because, traditionally, it is thought that diagnostic reasoning precedes therapeutic reasoning or development of an actionable plan.

Theoretical implications

In aggregate, the findings of this study suggest that the presence of contextual factors in the clinical encounter may have led to an increase in cognitive load, which ultimately interfered with clinical reasoning. Cognitive load theory integrates three components including memory systems, learning processes, and types of cognitive load that impact memory (Sweller 1988; Young et al. 2014). Within memory, there are thought to be three components to include sensory memory, working memory and long-term memory. Unlike sensory memory and long-term memory, which are thought to be infinite, the capacity of working memory is limited. Working memory is used to “chunk” or package information for storage in long-term memory and can only process, compare or contrast two to four elements of information at any one given time (Kirschner et al. 2006; Young et al. 2014). If a contextual factor is recognized by the clinician and, as such, occupies space within working memory, this leaves less capacity for the physician to process other pertinent elements of the clinical encounter. If residents, when presented with a contextual factor, were required to utilize significant amounts of working memory in order to cope with the presence of the contextual factor, this would leave considerably less capacity for the clinical reasoning process. Thus, cognitive load theory offers a potential explanation for why residents struggled with diagnostic reasoning in the face of universal acknowledgment of contextual factors.

This supports previous findings in expert physicians (Durning et al. 2011) that the presence of contextual factors during a clinical encounter contributes to cognitive load. In both studies, the participants appear to manifest evidence of increased cognitive load but in different ways. For residents, cognitive load may have led to emotional reactions and the need for additional information that had previously been presented in the encounter, indicating that information had been missed. This is supported by statements such as “Everything she has said, I would like her to explain a little bit more...” (Case 2 colorectal cancer, emotional volatility). In expert physicians, increased cognitive load manifest as participants initially missing pertinent information. However, when viewing the video for the second time, the expert physicians were able to recognize that information had been missed in the encounter (Durning et al. 2011). This suggests as one potential explanation that the presence of contextual factors may increase extraneous cognitive load and lead to memory errors in expert physicians but leads to interpretation errors in trainees. As such, just as trainees practice evaluating multiple cases of the same diagnosis in order to advance content knowledge, this suggests that it might be useful for physicians to also practice managing contextual factors in order to learn ways to reduce cognitive load. This has implications for how we attempt to train future physicians to cope with or mitigate the impact of contextual factors in effort to strengthen clinical reasoning processes and for potentially aiding in the reduction of medical errors.

Ultimately, situated cognition would predict that the presence of contextual factors within a clinical encounter could induce increased cognitive load (Durning et al. 2011). As

such, the observed impact of contextual factors on clinical reasoning in this study may be explained in part by context specificity and situated cognition. Context specificity argues that performance varies across problems and is not solely the consequence of variable content knowledge. Given that the cases developed for this study were designed to have roughly equal difficulty, the variation in performance across cases is consistent with context specificity. This suggests that something outside of mere content knowledge impacted clinical reasoning resulting in variations in performance. Situated cognition asserts that the outcome of a clinical encounter is not just the product of the physician's knowledge, but is instead a complex interplay of the interactions between the physician, the patient and the environment in which the encounter occurs (Durning and Artino 2011). By introducing patient contextual factors, the interactions between the physician and the patient were modified and appear to have impacted the outcome of the clinical encounter. This theory helps to explain why a physician, if given a chief complaint, may have a diverse variety of clinical reasoning processes depending on the characteristics of the participants and setting of the clinical encounter. In effect, this implies that diverse diagnostic and therapeutic decisions could be made based on the same chief complaint by simply altering the characteristics of the participants or environment.

This study has several limitations. First, a small number of participants were sampled across PGY levels. Second, because only residents from an Internal Medicine program were sampled, findings may not generalize to other specialties. Third, the nature of video recorded cases does not always allow participants to reframe the encounter easily. If residents were more readily able to do this, it may have impacted how clinical reasoning processes occurred. Going forward, this could potentially be addressed by advancing the methods used to evaluate clinical reasoning in the presence of manipulated contextual factors, such as having participants engage in an objective structured clinical examination. Fourth, because the participants watched video recorded clinical scenarios, this may not be generalizable to actual patient care settings. Fifth, the impact of contextual factors on cognitive load and performance was not necessarily an anticipated finding. Due to this, direct measurement of cognitive load was not incorporated into the study design. Going forward, incorporating measurement of cognitive load into the study design would help to further delineate the impact that contextual factors have on cognitive load and, subsequently, clinical reasoning. Finally, our own biases, in the form of prior assumptions and experience, have potential to have influenced our interpretation of the data.

There are several strengths to this study. One, there was universal acknowledgement of the presence of the manipulated contextual factors across all participants in all cases. This occurred without the participants knowing that the contextual factors had been manipulated. Second, despite the small number of participants, saturation was reached quickly and agreement between coders was 100 %. Finally, this study supports findings of previous work demonstrating that contextual factors are related, in important ways, to the process of clinical reasoning in physicians consistent with the theories of cognitive load and situated cognition (Durning et al. 2011). We believe, that taken together, these add to the trustworthiness of the findings.

This study raises important questions about the impact that contextual factors have on clinical reasoning in physicians in training. We believe our work provides insight into context specificity, as viewed through situated cognition theory, and how the presence of contextual factors may alter clinical reasoning processes. In addition, it offers up potential explanations for how contextual factors may impact cognitive load during a clinical encounter. Understanding how residents view, respond and cope with the presence of contextual factors has implications for understanding how clinical reasoning occurs, how it can

best be taught and how it can best be assessed. In education, these findings suggest that consideration needs to be given on how to best teach students and residents sound clinical reasoning skills that impart ability to account for variety in context while optimizing clinical reasoning accuracy. Additionally, placing greater focus on how to best understand the patient perspective may increase the clinician's sensitivity and ability to manage patient contextual factors.

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