

Comfort with uncertainty in medical professionals

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Scientific Impact

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This section briefly describes the rationale and objectives of this thesis, discusses key results and conclusions, and elaborates several potential implications of these findings to the scientific community, society, and health professions educators.

Project Rationale, Objectives, and Findings

Uncertainty is fundamental to the practice of medicine, and clinicians' abilities to effectively manage these experiences is viewed as a marker of expertise. Clinicians can respond constructively to experiences of uncertainty in many ways, from strategies to elaborate the root causes of a patient's symptoms, to signposting risks that may surface as a clinical problem evolves, to considering the resources they may need to safely manage a problem. This thesis sought to understand clinicians' in-the-moment experiences with uncertainty, elaborating the notion of 'comfort' as means to better understand how they notice, make sense of, and respond to complex situations in practice.

In the initial qualitative study of practicing emergency physicians, experiences of comfort were described as a dynamic spectrum of in-the-moment appraisals. On one end of this spectrum, clinicians felt sufficiently comfortable to continue managing problems when they were able to project forward and imagine how situations might evolve, concurrently identifying boundary conditions to signal when they were reaching the borders of their expertise. Comfort was reinforced when—in the process of monitoring their patients, their own metacognitions, and their environment—they felt that a problem was proceeding as expected. On the other end of this spectrum, clinicians described discomfort when cues alerted them to problems that were evolving in unexpected ways or when they identified aspects of problems that were beyond their abilities. This discomfort served as a trigger for clinicians to monitor a situation with greater attention, proceed more intentionally, and think deliberately about the types of human and material resources they might call upon strategically to manage these situations. Taken together, the real-time balancing act between appraisals of comfort and discomfort gave clinicians the sense for how they could proceed safely through evolving experiences of uncertainty in their workplace.

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An ensuing qualitative study of emergency medicine clinicians-in-training demonstrated similar manifestations of this spectrum of comfort with uncertainty, yet these novice clinicians' experiences were substantially colored by their own skepticism in their abilities to accurately appraise these situations. To cope with this uncertainty about themselves, trainees set themselves up for success by rehearsing the steps they intended to cover with their patients, then checked their interpretations of these experiences explicitly or implicitly against the appraisals of other members of their healthcare team. In discussing their unique experiences of uncertainty, trainees also elaborated several means that they used to forge effective partnerships with their supervisors, such as broadcasting their thinking or engaging in deliberately performative actions to garner their supervisors' attention. These studies suggest important lessons for how trainees learn to manage uncertainty in practice and suggest ways that supervisors can simultaneously support this growth and maintain patient safety.

Impact on Science and Healthcare

These findings have broad potential implications to science and healthcare. A wide variety of fields such as philosophy, mathematics, psychology, and engineering have explored ways to conceptualize, understand, and address uncertainty. While contextually, methodologically, and conceptually diverse, most of these approaches are oriented towards a reductionistic construction to uncertainty, aiming to name and sort factors that contribute the uncertainties of a prototypical problem. These factors are then used to generate statistical or probabilistic predictions about how a problem is likely to play out or how individuals are likely to act when confronted with a similar situation. This type of work provides helpful background for the ways in which individuals' knowledge, past experiences, and personality traits might interact with a wide variety of influences in an environment to shape their uncertainty. Yet such work has several important assumptions, all of which begin with a fairly positivist and reductionistic orientation to uncertainty: 1) that individuals will identify and interpret contextual factors or cues in the same ways; 2) that the probabilistic influences of these cues or data can be assigned and used in real time by individuals; and 3) that problems have mutually agreed-upon and

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verifiable solutions. Lacking these conditions in a given moment of uncertainty, however, it is likely that the conceptual, statistical, and philosophical approaches that have been used historically to *understand* uncertainty are quite different from what individuals experience and do when they *are uncertain*.

This program of research begins with a much more constructivist and contextually-embedded notion of uncertainty. In contrast to fields such as mathematics or psychology where well-defined solutions can be identified and measured with relative precision, health professionals tackle problems that are vastly more ambiguous, negotiated, and idiosyncratic. For example, patients manifest a wide variety of symptoms and exam findings for a given disease, respond to treatments differently, and have disease states that are in constant evolution. In making sense of what might be going on with their patients and what they might do to help them, clinicians draw from their own idiosyncratic training and past experiences to gather information from their patients, diagnostic tests, and others in their work environment while concurrently enacting management strategies that harness the resources they have at their disposal. The ways that health professionals tackle uncertainty in their unique work contexts thus aligns well with the construct of ‘ill-defined problems’ where, as defined by Karen Kitchener elaborates, “there are conflicting assumptions, evidence, and opinion that may lead to different solutions.” The findings from this program of research—namely the ways that clinicians make holistic predictions about how a problem might play out, how they intentionally monitor themselves and a situation, and how they use appraisals of comfort to be agentic in managing these experiences—may thus prove useful to other fields seeking to understand how individuals grapple with ill-defined problems in other contexts.

The constructions of ‘comfort with uncertainty’ elaborated by these research findings also offer several important implications for healthcare institutions. First and foremost, these results emphasize the dynamic and idiosyncratic ways that experienced clinicians make sense of the problems they are negotiating within their unique work contexts. This calls into question the notion that there is a stable construct of what it means to be an expert. Instead, expertise

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seems to manifest through clinicians' abilities to effectively self-regulate when they feel uncertain, recognizing the emergent risks and the limits of their abilities, reflecting upon the alignment between their skills and the problem at hand, monitoring their patients and other team members intentionally, and drawing upon the resources that are available to them. This highlights the complex fabric of healthcare work environments, the ways in which clinicians rely on other health professionals (e.g., 'borrow comfort') to help bridge the gaps between their abilities and the demands of a problem, and the ways in which systems can effectively support collaborative ways of delivering care. This program of research has not elaborated the other side of these conversations—namely the vantage points of colleagues who have been called upon for help—and these perspectives are needed in future work to gain a deeper understanding of how systems can support these collaborations when they are needed most. That said, the implication from this research is that managing uncertainty is often a shared endeavor between health professionals, best fostered within systems where expressing vulnerability, asking others for help, and collaborative work are expected attributes of high-functioning interprofessional and interdisciplinary teams.

Impact on Society

From a societal perspective, these findings provide nuance around the ways that patients understand the work of clinicians caring for them. Expertise in medicine is typically characterized in the lay media as tantamount to 'solving a case,' akin to detectives sleuthing for answers to unsolved problems. The American television drama "House" encapsulated this construction of medical expertise, chronicling the fictional character Dr. Gregory House as he pieced together pieces of clinical puzzles to arrive at diagnoses that had befuddled those before him. This inevitably led to statements such as "I solved the case, my work is done" (pilot episode), reinforcing the presumption that effective medical management is conditional upon diagnostic precision, and that expert clinicians guide their care teams by arriving at these diagnostic epiphanies in isolation. Yet this construction of medical expertise diverges greatly from the narratives shared by participants in these studies. Clinicians instead described tentative, negotiated, and dynamic constructions of problem-solving in moments of

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uncertainty. To work through these experiences, they used cues from their patients, themselves, and their environment to 'feel' their way towards the next management steps even though they were not entirely sure what was going on or what types of interventions might help.

There thus seems to be a disconnect between how patients conceptualize the work of clinicians and the actual ways that clinicians work through problems in practice. Providing patients with a better understanding of how these processes play out in real time may, for example, may help them to understand why one clinician manages their problem(s) differently than another, why second opinions often result in different constructions of diagnostic and treatment plans, and why care *feels* so different in different contexts (e.g., the clinic, the emergency department, or the hospital wards).

This implies that greater effort is needed to reach patient audiences to animate the ways that clinicians manage uncertainty in practice. This discourse could be stimulated by capturing clinicians' narrative descriptions of how they experienced and managed dynamic scenarios that were rife with uncertainty, including the ways that they communicated these experiences to their patients. Podcasts, radio or television interviews, or live case-based discussions would all offer new ways for clinicians to elaborate these experiences with vulnerability and nuance. Multi-disciplinary and interprofessional conferences where clinicians, patients, policy makers, and patient advocates interact are also a ripe venue to engage in discussions about how best to support both patients and clinicians as they negotiate these experiences. The American and European 'Diagnostic Errors in Medicine' conferences offered by the Society to Improve Diagnosis in Medicine, for example, are venues where the patient-, provider-, and system-based influences on these uncertainty experiences could be unpacked from a variety of perspectives.

I had intended to discuss these issues concerning uncertainty as an invited keynote speaker at the 2020 European Diagnostic Errors in Medicine (EuroDEM) conference which was

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unfortunately delayed due to the COVID-19 pandemic. I am hopeful that I can travel to Europe as a keynote speaker for the 2022 EuroDEM conference and additionally hope to translate these lessons into other media (e.g., podcasts, blog posts, magazine articles) that have a wider patient audience. Ideally, I can partner with non-clinicians in these efforts to generate lessons that are clear and pragmatic to the lay public. One goal could be to change the discourse around ‘shared decision making’ towards conversations that acknowledge the variety of ways that clinicians and patients form partnerships and communicate effectively when navigating uncertainty together.

Impact on Health Professions Educators

These research findings have the most direct impact on researchers and educators in the health professions. Since its publication in 2019, my conceptual manuscript on ‘comfort with uncertainty’ elaborated in Chapter 2 has been accessed over 1000 times on ResearchGate and cited 32 times by articles discussing topics such as clinical reasoning, diagnostic calibration, epistemologies in simulation, and the role of self-confidence. It was additionally referenced by Dr. Ray Land in his opening plenary “Threshold Concepts and Troublesome Knowledge” for the 2019 Association for Medical Educators in Europe (AMEE) annual meeting in Vienna, Austria.

I have shared these findings at local, regional, and national conferences in an effort to help others reimagine how clinical reasoning can be conceptualized and reinforced in our teaching practices. Locally, I presented these findings to the University of Washington Graduate Medical Education community on two occasions, with a total of over 180 residency leaders in attendance. These sessions emphasized the importance of attending to learners’ signals for when they were experiencing discomfort, as well as strategies for effective modeling by supervisors. Regionally, I presented findings from Chapter 5 as an oral abstract at the 2021 AAMC Group on Educational Affairs regional meeting. And nationally, the findings elaborated in Chapters 3 and 6 were accepted as papers in Academic Medicine’s competitive “Research in Medical Education” (RIME) supplement in 2020 and 2021, respectively. The findings from Chapter 6 will be presented as an oral abstract at the 2021 AAMC “Learn, Serve, Lead” virtual

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conference, and I discussed the findings from Chapter 3 in a dedicated AAMC podcast led by RIME program leaders after the 2020 AAMC conference was shifted to a virtual format. The central implications for health professions educators that have been shared in these various speaking engagements are elaborated below.

For clinician educators who directly supervise trainees, it is essential to recognize that novice clinicians are inherently skeptical of their abilities to self-regulate effectively during experiences of uncertainty. This sets the stage for educators to monitor trainees more intentionally for instances when they are seeking support, manifest when trainees ‘broadcast’ their thinking about a problem, make efforts to cross-check their thinking with others, or express worry or concern about an evolving situation. It is equally important for clinician educators to realize that trainees often use supervisors’ guidance in *implicit* ways, taking the *absence* of redirection as permission to proceed ahead or making assumptions about a supervisor’s guidance based upon their body language or affect. This would suggest that supervisors can better support trainees by more deliberately broadcasting their own thought processes about the risks they are considering as a problem evolves, vulnerably sharing their emotional and somatic reactions to a situation as a marker of their own internal appraisals, and explicitly discussing how these appraisals are shifting their approaches to a given situation. Modeling of these behaviors provides real-time lessons to trainees regarding how experts self-regulate when uncertain. These lessons for supervisors could be reinforced, for example, in faculty development workshops on feedback or bedside teaching, or within courses emphasizing how to effectively debrief simulation scenarios.

These findings also have several implications for curriculum designers charged with building experiences that mimic the types of work that trainees engage with in authentic clinical practice. Traditional medical curricula are frequently oriented towards the diagnosis and treatment of specific medical conditions, thereby deemphasizing the processes by which information is gathered, interpreted, and acted upon in real time when patients present with new or undifferentiated problems. The results from this research program would suggest that

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curriculum designers should build novel curricula that more purposefully address clinicians' experiences with uncertainty, prompting trainees to tackle clinical problems that are ambiguous, dynamic and negotiated and elaborating the risks they believe are at play in a given clinical moment. Training exercises such as these should prompt trainees to think through the kinds of help they might need from others in order to address the problem at hand, and this would provide a novel means to emphasize the value of interprofessional collaborations. Designing curricula in these ways would help trainees to practice the self-regulatory behaviors that experienced clinicians use when encountering uncertainty, help them recognize the interdependence between different health care professionals, and more deliberately signpost the system forces that influence their care of patients with ill-defined problems.