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Twelve tips for thriving in the face of clinical uncertainty

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ABSTRACT

Background: Effectively managing clinical uncertainty is increasingly recognized as a goal of medical education. Stress from uncertainty has been associated with depression and burnout in trainees and may also impact patient care. Despite its importance, however, strategies to embrace uncertainty in clinical practice are lacking.
Aims: The literature on uncertainty in medicine was reviewed. Incorporating insights from faculty and students, 12 tips for healthcare educators to help themselves and others thrive in the face of clinical uncertainty were developed.
Results: Educators will find the tips practical and easy to implement in their day-to-day interactions as clinicians and teachers. Tips are divided into tips for oneself; for implementing with students and trainees; and for implementing with patients and in healthcare systems.
Conclusions: These tips can enhance healthcare professionals' and students' ability to thrive in the face of uncertainty. Strategies to embrace uncertainty are critical for ourselves, our trainees, our patients, and our healthcare systems.

Introduction

Clinical uncertainty is inherent in medicine. It manifests in the processes of diagnosis, prognosis, and therapeutics, and in the complexities of healthcare coordination (Han et al. 2011; Bhise et al. 2018a). It makes most of us – physicians and patients – deeply uncomfortable. Uncertainty in medicine dates back to Hippocrates, yet there exists a deeply rooted cultural unwillingness to acknowledge it (Logan and Scott 1996). Strong defenses against, and denial of, uncertainties are consistent observations made by sociologists studying the process of medical training (Bucher and Stelling 1977).

Studies link intolerance of uncertainty (as defined by heightened anxiety and feeling "stumped" or "helpless") to burnout, ineffective communication strategies, cognitive biases, and inappropriate resource use (Kruglanski and Webster 1996; Cooke et al. 2013; Bhise et al. 2018b). Indecision and anxiety related to uncertainty can lead to depression or other mental health problems that undermine physician wellness and resilience (Simpkin et al. 2018). Despite the alluring call of certainty suggested by terms like "precision medicine" and "molecular genomics", and the promise of ever-more targeted therapies, the ironic reality is that with more information at our fingertips, uncertainty is only going to continue to rise (Hunter 2016).

Recently, the medical profession has begun to recognize the need to identify and address clinical uncertainty, acknowledging its impact on patient safety and wellness among working physicians and trainees. The UK's General Medical Council (GMC) highlighted coping with uncertainty as a core professional competency in its latest annual report, *Outcomes for Graduates 2018* (General Medical Council 2018). Likewise, the Accreditation Council of Graduate Medical Education (ACGME) in the US has included the ability to tolerate uncertainty among the important competencies for physician trainees (ACGME 2015). Medical education at both undergraduate and graduate levels is struggling to keep pace with these recommendations, with few strategies existing to embrace uncertainty in clinical practice.

Ever-increasing data, informatics, and improving – yet fallible – algorithms will continue to aid decision-making in the clinical setting. Future physicians will, therefore, need to tolerate, learn in, and practice in a "new frontier" of ever-expanding uncertainty, all the while guiding patients in trusting and meaningful relationships essential for authentic patient-centered care and shared decision-making (Simpkin and Schwartzstein 2016; Armstrong 2018). How then, does one not only survive, but *thrive,* in the face of clinical uncertainty?

In this article, current literature on the tolerance of uncertainty, cognitive biases, decision-making, and distress tolerance are synthesized alongside the authors' self-experience and that of colleagues and students to identify strategies to help the 21st-century healthcare professional thrive in the face of rising clinical uncertainty. The tips are divided into three sections: tips for oneself; tips to help guide students and trainees; and tips to implement with patients and in healthcare systems.

Tips for oneself

Tip 1

Understand your gut reaction to uncertainty

The human brain is hardwired to perceive reward from certainty and discomfort from increasing levels of uncertainty (Hsu et al. 2005; Berker et al. 2016). Unfortunately, the healthcare environment is a breeding ground for uncertainty, arising from hard-to-predict disease processes,

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ambiguous laboratory and imaging findings, and from healthcare outcomes that are far from binary (Simpkin and Schwartzstein 2016). Our own reaction to uncertainty is important to be aware of and is highly variable (Mlodinow 2009) – though often unpleasant. It depends, in part, on nuances of the present clinical situation, previous experiences, knowledge, the culture of practice, and societal pressures (Strout et al. 2018). Acknowledging our own implicit responses to uncertainty enables us to gain insight into our reactions – both emotional and behavioral.

Recall an instance where you were uncertain. How did you feel? What emotions arose? What thoughts came to mind? By reflecting on the emotions and thoughts uncertainty triggers within us, we can begin to gain more control over our automatic behaviors and actions. This allows us to respond mindfully and choose more functional rather than dysfunctional ways to deal with uncertainty (Danczak and Lea 2014). Indeed, evidence suggests modifying our reaction to uncertainty is possible with practice (Geller 2013).

Another strategy is to identify *a priori* areas where you anticipate feeling uncertain. Ask yourself, in your specific clinical practice, are there diagnoses or situations that make you feel uncomfortable? A particular type of patient, a challenging procedure, or when a colleague asks you a question? Prepare yourself to face these situations, rather than being blindsided by them (John 2018). As an example, one colleague reported feeling uncertain when caring for immunosuppressed post-transplant patients. She developed a practice of involving infectious disease colleagues sooner rather than later for such cases. In this way, she set up a deliberate practice of managing her reaction and dealing with the anticipated uncertainty.

Tip 2

"Diagnose" the type of uncertainty

Merriam-Webster (2004) defines uncertainty as a subjective awareness of one's lack of knowledge – a form of metacognition, or self-awareness and self-knowledge of one's own thought process. Whilst clinical uncertainty lacks a unified definition and conceptual model, different taxonomies of uncertainty in healthcare have been proposed (Beresford 1991; Alam et al. 2017).

Han et al. (2011) proposed a 3-dimensional taxonomy that characterizes uncertainty according to its fundamental sources (including probability, ambiguity, and complexity), issues (scientific, practical, and personal), and locus (which accounts for whether the uncertainty is primarily situated in the patient or the clinician). A pragmatic classification system emerged in focus groups with general practitioners, identifying uncertainty related to analyzing, negotiating, networking, and team-working (Danczak and Lea 2014).

Distinguishing and acknowledging the multiple meanings and varieties of uncertainty in healthcare may be important as each is likely to have unique effects or warrant different courses of action (Han et al. 2011). "Diagnosing" the type and sources of uncertainty you are facing can be helpful in clarifying the path forward and suggesting appropriate management strategies (Hamui-Sutton et al. 2015). A classification scheme may also identify skills physicians in training and practice need to develop, guiding educational interventions to help manage uncertainty (Danczak and Lea 2014).

What may be most relevant and practical for the everyday practitioner is making the dichotomous distinction between "knowable" and "unknowable" forms of knowledge underlying uncertainty. Identifying, articulating, and prioritizing the minimization of such "unnecessary uncertainties" (i.e. the knowable unknowns) is a first step and specific action we can take to better manage clinical uncertainty. Each type of uncertainty demands a different response: for instance, a knowledge gap can be addressed through reference materials while a situation of conceptual or personal uncertainty may require a more individualized and nuanced approach.

Tip 3

Identify cognitive biases

Our desire for certainty leaves us open to the influence of cognitive biases. To prosper in the face of increasing knowledge and a busy workplace, well-versed experts learn to recognize patterns that allow them to think and act quickly. Such quick-thinking heuristics, first identified by Tversky and Kahneman (1974), serve a useful purpose – for example, recognizing the cardinal signs of an acute stroke or myocardial infarction and initiating appropriate therapy and organizing the appropriate personnel – yet they leave clinicians vulnerable to cognitive bias, and in turn, false assumptions, misdiagnosis, and errors (Trowbridge 2008). Becoming aware of the common cognitive pitfalls and biases is important:

- Availability heuristic: when physicians make a diagnosis based on what is easily accessible in their minds, rather than what is actually most probable.
- Anchoring heuristic: when physicians settle on a diagnosis early in the diagnostic process and subsequently become "anchored" to that diagnosis, despite evidence to the contrary.
- Confirmation bias: as a result of anchoring, physicians may discount clinical information discordant with the original provisional diagnosis and accept only that which supports their original diagnosis.
- Representativeness heuristic: physicians depend greatly on this cognitive short-cut in which a patient's presentation is compared to a "typical" case of specific diagnoses but leaves off the "atypical" presentations.

Craving a sense of certainty exacerbates the likelihood of cognitive biases, and risks the diagnostic reasoning process being curtailed too soon. Indeed, premature closure is the leading cause of misdiagnosis (Graber et al. 2005). We would do well to pause when making medical decisions and ask ourselves if there is any uncertainty that we are avoiding: Do we feel confident in our reasoning? What else have we left out? "Holding uncertainty" can allow more possibilities to remain "in play" (Danczak et al. 2016), while questioning one's cognitive biases helps individuals and teams define the assumptions they are making and avoid common pitfalls.

Tip 4

Plan for uncertainty: Use safety-netting and follow-up

While we have a strong desire to reduce uncertainty in clinical decision-making, to find the correct diagnosis and initiate treatment in a timely fashion, sometimes uncertainty lingers beyond the immediate clinic visit or hospital stay – and we can plan for it. It is wise to proactively include a role for uncertainty in management plans. By creating safety nets and following-up, we can reduce the potential harms of uncertainty and catch outcomes that run the risk of veering off course sooner.

Safety-netting is well described in the primary care practice literature (Almond et al. 2009). It provides contingency planning in the face of diagnostic or management uncertainty and is particularly useful in high-risk clinical populations. Safety netting can provide relief for providers facing uncertainty and a path forward. Ask yourself: If I'm right what do I expect to happen? How will I know if I'm wrong? What would I do then?

With changing patterns of medical practice to include more shift work, shorter encounters, and more episodic care, trainees and physicians alike are often challenged to follow the full course of patients' care. This undermines the feedback loop critical for improving diagnostic reasoning and learning about the expected clinical course of common conditions (Simpkin et al. 2017). Clinicians can make a practice of following up with patients, whether by phoning a patient following discharge, following them as an outpatient, communicating with continuity providers (e.g. phoning or messaging primary care doctors), or tracking a patient's course virtually through the electronic medical record. Additionally, communicating the level of patient "instability" or uncertainty onto the next team of healthcare providers can promote safety in care transitions (e.g. see IPASS system in Starmer et al. 2014). Building a default mechanism of "follow-up" into clinical practice gives the clinician an opportunity to course correct as the illness evolves if a "wrong decision" was made when only limited information was available; it is also essential to building a broader repertoire of "illness scripts" (Eva et al. 2007).

Tip 5

"Don't worry alone" – lean on your colleagues

Early stages of medical training – with a predominance of multiple-choice questions with "right" answers – inculcate a notion that there is one absolute truth or single best answer in medicine. This suggests an element of certainty that often does not translate from the textbook and classroom to the real-world bedside. An unintended consequence of this educational approach is that not knowing the best answer becomes a fear-inducing mark of incompetence for physicians-in-training and even attendings. With clinical experience and over time, physicians evolve to recognize that clinical problems most often have poorly defined borders, evolving characteristics, and multiple legitimate treatment approaches rather than a single correct one (Benbassat 2014). In this way, dealing with uncertainty in a mature manner requires accepting one's own fallibility. This is challenging, however, and we must do what we can to support each other in this process. It can be very reassuring to hear from peers and senior colleagues that uncertainty is not only appropriate, but also an expected component of medical practice, and nothing to be ashamed about. By talking about it, asking for help, and leaning on colleagues when overwhelmed we can help build a culture that accepts and embraces uncertainty.

Further, increasing sub-specialization has led to disparate groups within medicine – we should break down traditional silos to embrace uncertainty together. Sticking to subspecialty "tribes" has the risk of narrowing one's diagnostic vision, fostering belief in the superior effectiveness of treatment in one's own sub-specialty over others, camouflaging and avoiding uncertainty, and missing opportunities for sharing learning and the perceived burden of uncertainty among clinicians. Fragmented healthcare is a leading cause of medical errors, while effective teamwork and open communication can promote improved outcomes in the face of clinical complexity, acuity, and uncertainty (Rosen et al. 2018).

Tips to help guide students and trainees

Tip 6

Set the culture: Role model embracing the inherent uncertainty of clinical medicine

Talking openly about uncertainty in the clinical environment helps normalize the experience of uncertainty not only for colleagues but also for learners, modeling that it is "safe" and necessary to express uncertainty and setting a new culture that embraces uncertainty.

Role modeling uncertainty includes *thinking out loud* and being explicit about *probabilistic (or Bayesian) thinking*; it may also include searching for answers in real-time. Rencic (2011) writes: "Doing quick, highly focused literature searches with internet-based resources or compiled evidence reviews while seeing a patient in clinic demonstrates to learners that rapidly accessing relevant medical literature is both feasible and valuable" (p. 890). Likewise, asking consulting teams or colleagues for help or to educate you and your team is an effective means of recognizing the limits of one's knowledge and practicing life-long learning.

Never be afraid to say, "I don't know." These simple words welcome input and curiosity, helping learners gain confidence in recognizing where clinical uncertainty exists, and understand that communicating and sharing uncertainty is what the healthcare culture ought to expect.

Tip 7

Promote curiosity over certainty

Curiosity is a basic element of our cognition and a fundamental motivator for learning. Appreciate when trainees' express curiosity and make time for discussion to answer their questions (Fitzgerald 1999). This is pivotal to the development of sound clinical reasoning. According to Wenzel (2017), "whereas throughout their previous schooling [medical students] were judged by their answers, in their medical education and their careers they will often be judged predominantly by their questions. We should applaud students for curiosity … " (p. 608).

Prioritize learners' open-ended thinking by asking "How" and "Why" questions rather than "What" and "When" (Simpkin and Schwartzstein 2016; Schwartzstein and Roberts 2017). Questions such as "How are you thinking about this?" encourage the trainee to connect pathophysiological knowledge to the clinical presentation, identifying gaps in their knowledge, and promoting higher-order skills, such as synthesis and evaluation (Bowen 2006; Kassirer et al. 2009; Rencic 2011; Adams 2015).

To improve teaching skills, faculty may choose to adopt an evidence-based teaching tool such as One-Minute Preceptor (Neher et al. 1992; Furney et al. 2001). On the other hand, teaching learners presentation models like SNAPPs (Wolpaw et al. 2003), which explicitly calls on students to ask questions and identify areas of uncertainty, can equip trainees with a tool to infuse curiosity, questioning, and discussion of uncertainty among their clinical teams even if this is not brought up by the supervising physician (Pascoe et al. 2015).

Finally, be aware of how language choices can influence our perceptions and reinforce our values. Using the word "hypothesis" instead of "diagnosis" conjures a very different expectation of certainty (Simpkin and Schwartzstein 2016).

Tip 8

Be explicit about the level of uncertainty

Clinical educators should be explicit about their thought processes and level of uncertainty in a clinical situation, engaging the team in navigating uncertainty in real-time. They can do this by describing the ambiguity, asking questions, and offering contingencies:

- Discuss how much and what types of uncertainty are being faced at the moment. How does it make everyone feel?
- Consider which biases your team is at risk for. Ask trainees to name a cognitive bias and how it might apply in this situation.
- Perform a "prospective hindsight" analysis with your team (Klein 2007). This involves temporarily assuming the working diagnosis or decision is wrong. Ask your trainees: What if we are wrong? What might we have missed? What else could it be?
- Explicitly identify the evidence, or absence of evidence, for the clinical management you are pursuing. Expose blindspots and demonstrate to trainees the synergy of evidence-based medicine and clinical intuition.
- Articulate the level of uncertainty you are willing to tolerate in this particular case, and why. Just as team members may ask one another "Would this test change your management?" we can start to ask: "How would this test or a patient's response 'change your uncertainty'?"
- Increase trainees' mastery of probability-based logic by explicitly discussing thresholds to test and treat and how such thresholds may change from patient to patient (i.e. Bayesian reasoning).
- Consider adding an explicit discussion about the level of uncertainty during handoffs and transitions in care.

These discussions reinforce that what matters is not the absence of uncertainty, but rather the processes and thinking patterns one uses to manage it.

Tip 9

Formally integrate uncertainty into medical education curricula

The presence of uncertainty in the medical environment is not a new revelation, yet its absence in medical curricula is conspicuous (Luther and Crandall 2011). There is a need to refine how we define, measure, and teach clinical uncertainty in the pre-medical, pre-clinical, and clinical experiences of future physicians. In a longitudinal study over the course of medical school, Han et al. (2015) found that rather than growing comfort with clinical uncertainty, between the first and final year, there was a significant decrease in tolerance of ambiguity among students. Counterproductively, we currently train students for certainty, rather than preparing them for uncertainty.

One promising direction is that the ability to deal with uncertainty is increasingly recognized as a major goal of medical education. It is now listed by the UK's GMC as among the core professional competencies for physicians as well as one of the 21 competencies defined by the ACGME as important to foster, measure, and track in physicians over time. Specifically, trainees must demonstrate "the capacity to accept that ambiguity is part of clinical medicine and to recognize the need for, and to utilize appropriate resources in, dealing with uncertainty" (ACGME 2017, p. 23). Likewise, standardized tests in medicine (including the MCAT) are shifting away from pure basic science topics to include questions of psychology, social sciences, and system level issues (Association of American Medical Colleges 2011), while Geller (2013) has argued for assessing prospective students' tolerance for ambiguity in the selection process.

Medical schools are broadening admissions criteria to include students with diverse backgrounds and experiences and incorporating more "true to life" clinical learning, case-based approaches and training in health systems sciences (Vanderbilt et al. 2017). Formal training methods for uncertainty must be developed, disseminated, and evaluated for their effectiveness (Danczak and Lea 2018). We must advocate for and support such changes in policy and pedagogy in medical schools and healthcare systems, such that lessons learned in this generation are sustained and institutionalized for the future.

Tips to implement with patients and in healthcare systems

Tip 10

Discuss uncertainty openly with patients

Thriving in the face of uncertainty requires an ability to communicate uncertainty to our patients. The recent National Academy of Medicine report "Improving Diagnosis in Health Care" recommends that physicians share their working diagnosis with patients including the degree of uncertainty associated with each diagnosis (Balogh et al. 2016). As we strive for an era of patient-centered care and shared decision-making, we must authentically discuss all

elements of clinical uncertainty – from diagnostic decisions to therapeutic decisions, to conversations about prognosis.

Although we often worry that admitting uncertainty will lead to a loss of patient confidence, it has been suggested that appropriate expressions of uncertainty can lead to stronger physician–patient relationships (Armstrong 2018). One study found that when primary care providers used direct expressions of uncertainty, such as "I don't know" or "It's not clear," there were higher levels of positive talk, patient engagement, and patient satisfaction (Gordon et al. 2000). This must certainly be done carefully: in a study with pediatric cases, Bhise et al. (2018b) discovered parents react more favorably – in terms of perceived competence, physician confidence, and trust, and intention to adhere to recommendations – when diagnostic uncertainty is communicated with implicit rather than explicit strategies (e.g. broad differential diagnoses).

"The question is not whether to share uncertainty with our patients, but how best to share it to create trust instead of unnecessary anxiety," Armstrong concludes (p. 818). Such conversations require empathy and are more effective in the context of a partnering relationship. Assure the patient that regardless of one's uncertainty, you will be there to support them through the process (Ha and Longnecker 2010). Saying "I don't know exactly what is going on but I will be with you and will support you" goes a long way in reassuring the patient even if the clinical "answer" is unclear. Open discussion, including admitting vulnerability and acknowledging our limitations, builds trust and shared responsibility when it is grounded in mutual recognition of the inevitable uncertainty of clinical medicine (Ranjan et al. 2015).

Tip 11

Use patients as allies in shared-decision making

Increased tolerance of uncertainty correlates with increased engagement in patient-centered care (Politi and Légaré 2010). The more ambiguous, complex, and uncertain a situation, the more likely an experienced physician is to engage in patient-centered decision-making (Dalton et al. 2015). Partnering with patients in shared decision-making has positive benefits for care received, satisfaction, and outcomes (Barry and Edgman-Levitan 2012). By discussing uncertainty with patients, whether about diagnosis, prognosis, or treatment and management options (as before in Tip 10), providers may find a reduction in their stress and anxiety through sharing decision-making responsibility. A patient's values and preferences can often guide treatment choices where otherwise the best means of the proceeding would be uncertain.

Berger (2015) has outlined a "toolbox" of bioethical, clinical, and communicative principles that offer a practical approach for addressing uncertainty in a clinical encounter; decision aids may be a useful adjunct in promoting an explicit discussion of uncertainty.

Tip 12

Advocate for systems infrastructure to support the embracing of uncertainty

In current healthcare systems, there are few incentives to encourage embracing clinical uncertainty. Certainty is valued implicitly and explicitly in our institutions, policies, and in the learning environment. In many hospitals, admission from the emergency department (ED) to in-patient ward requires a formal diagnosis to be entered in the patient's chart; Electronic Health Record (EHR) systems require laboratory testing, imaging, and prescriptions to be associated with specific diagnoses in the record (Bhise et al. 2018c); and billing for an encounter is often stratified according to the final diagnosis or the treatments offered without crediting, recognizing, or valuing the work and time required for clinical reasoning, patient education and shared decision making, as well as the consideration and communication of uncertainty. Amidst the 87,000 ICD codes, there is none for "I don't know." Many physicians eschew tasks they feel are time-consuming, including discussions of goals of care, patient education, evaluating health literacy, or discussing uncertainty. Yet these are the components of a clinical encounter that patients and providers both find valuable (Brédart et al. 2005), and such conversations may serve to reduce readmissions, improve adherence, and improve the quality of patient's health and wellness over time (Arora 2003).

Changes to support uncertainty could include more flexible diagnostic codes and treatment algorithms that build in uncertainty and room for modification over time; clinical decision support tools and electronic medical record systems that offer provisional diagnoses or better, and more flexibly, capture how diagnostic knowledge and certainty evolves over time, enabling tolerance of uncertainty rather than undermining it (Lanham et al. 2014). We do not reimburse physicians for their "thinking time," nor for the important but nuanced work of carefully and compassionately communicating uncertainty. But perhaps we should. We must advocate for better ways to measure, assess, and train the management of uncertainty.

A final means to thrive in the face of uncertainty is to see it as a natural starting point for system quality improvement in healthcare. Clinical uncertainty may unveil unnecessary variation, inconsistent practices, safety errors or near misses, or areas in which new knowledge or new processes are necessary. This is a natural precursor for improvement – health systems would do well to draw on the observations, questions, and ideas of trainees and physicians in practice to identify areas for future research, clinical practice or guideline development, or organizational process improvement (Blumenthal 2012).

Conclusions

Uncertainty is uncomfortable for most individuals, and we have elaborate cognitive and emotional drives to eliminate it from our decision-making process (Armstrong 2018). Despite the remarkable trajectory of biomedical research in recent decades, our quest for certainty has not been answered and clinical uncertainty is unlikely to disappear any time soon. Indeed, as uncertainty inherently borders the edge of our knowledge, it is only likely to increase.

Embracing uncertainty is critical for ourselves, our trainees, our patients, and our healthcare systems (Simpkin and Schwartzstein 2016). The tips described in this article will provide healthcare educators and professionals across the educational continuum (undergraduate, graduate, and

continuing medical education) with a framework of strategies to thrive in the face of clinical uncertainty.

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Disclosure statement

Notes on contributors

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