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The culture of doubt: Do medical students really experience clinical uncertainty when they should?

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6 Personal View

Medical Teacher

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10 **The culture of doubt: Why medical students do not experience clinical uncertainty when**
11 **they should?**
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3 Personal View

Medical Teacher

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8 **The culture of doubt: Do medical students really experience clinical uncertainty when**
9 **they should?**

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12 Bullet points:

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- 15 • The factors that contribute to perceiving a stimulus as a source of uncertainty remain to be
16 further explored
 - 17 • Students understanding of uncertainty aligns closely with that of experienced physicians
 - 18 • Uncertainty stems from complex and dynamic interactions between contexts, clinical tasks,
19 and individuals
 - 20 • The influence of the situation, conceived as an 'enviroming experienced world,' on
21 uncertainty perception, remains to be further explored.
 - 22 • Future approaches should explore uncertainty perception through observational
23 ethnographic studies in real-world settings.
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Abstract

Uncertainty is a fundamental aspect of medical practice, necessitating incorporation into undergraduate medical training. The integrative model of uncertainty tolerance (UT) developed by Hillen and Han serves as a comprehensive framework for exploring clinical uncertainty. While studies have extensively examined UT dimensions, including sources, responses, and moderators, the factors influencing the perception of uncertainty stimuli remain underexplored.

However, students' ability to perceive uncertainty and their approach to uncertain stimuli play a crucial role in enabling them to develop adaptive responses to uncertainty, necessary for their comfort in these situations. Defining uncertainty as a metacognitive state suggests significant variability in its perception among individuals and within an individual over time. Moreover, several studies have demonstrated the substantial influence of various individual and contextual factors on how individuals perceive and respond to uncertainty.

In this paper, the authors present multiple hypotheses to address the question of whether students genuinely perceive uncertainty stimuli when they should. The authors argue that students' personal relationship with their knowledge is essential in their ability to identify clinical uncertainty, particularly concerning the limits of medical knowledge. Therefore, they propose that an academic culture fostering doubt, through exposing students to a variety of perspectives, would enhance their ability to identify uncertainty zones in a clinical situation at an early stage.

Drawing on Dewey's situational theory, the authors emphasize the importance of better understanding, in a work setting, the influence of contextual and situational characteristics on individual perceptions of uncertainty. In line with this idea, ethnographic studies would offer valuable insights into identifying the relationship between the students, their work environment, and their perception of clinical uncertainty.

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3 Uncertainty, being inherent in medical practice, is an essential training objective for
4 undergraduate students. Hillen and Han have developed an integrative model of uncertainty
5 tolerance (UT).¹ Considering its comprehensive conceptualization of UT, this model now serves
6 as a reference for studies exploring clinical uncertainty. Drawing on this framework, previous
7 research highlighted how uncertainty perception shapes subsequent responses by individuals,²
8 thus playing a pivotal role in the construct of UT. While numerous studies have delved into the
9 various dimensions of UT, including sources,³ responses, and moderators, the factors that
10 contribute to perceiving a stimulus as a source of uncertainty remain to be further explored.

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12 According to Han, uncertainty is defined as “the conscious metacognitive awareness of
13 ignorance—a self-awareness of incomplete knowledge”.¹ The strong correlation between
14 metacognition, one's understanding of their own knowledge, and uncertainty suggests
15 considerable variation in the ability to perceive uncertainty, both among students and within an
16 individual over time. This hypothesis is in line with a growing body of evidence supporting the
17 idea that uncertainty tolerance is a subjective state that evolves through the medical curriculum
18 and the accumulation of professional experience, rather than being a static personality trait.

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20 Besides, prior research has underscored the impact of diverse factors, termed moderators, on
21 uncertainty tolerance. These factors encompass various individual, contextual, or situational
22 characteristics that have the potential to directly shape how individuals appraise and respond to
23 uncertainty. Nevertheless, the documentation regarding the extent to which these factors may
24 interact to influence the initial perception of clinical uncertainty stimuli, especially in the
25 clinical situations encountered by trainees during their placements, remains limited. Making the
26 development of uncertainty tolerance a training objective requires educators to ensure that the
27 learning conditions and work situations provided effectively enable students to perceive a
28 dimension of uncertainty. Therefore, investigating the determinants of uncertainty perception
29 in students becomes a major research challenge. Framing uncertainty perception as a situated,
30 dynamic, and evolving state prompts the question: do medical students really experience
31 clinical uncertainty when they should? To that extent, we can put forth various working
32 hypotheses to enhance our understanding of the factors that prompt students to identify a
33 stimulus of uncertainty in a work situation.

34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 **Students' definition of clinical uncertainty**

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57 Our initial hypothesis revolves around the notion that students may lack a precise understanding
58 of what uncertainty entails, or their definition of uncertainty may differ from that of experienced
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3 practitioners. However, a significant body of qualitative research contradicts this hypothesis, as
4 medical students have provided rich and nuanced descriptions of uncertainty experience in the
5 past.³ Such results suggest that their understanding of uncertainty aligns closely with that of
6 experienced physicians.
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10 11 12 13 **Reducible uncertainty: identifying the “knowns unknowns”**

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15 A second hypothesis would involve how students identify the dimension of uncertainty within
16 a clinical scenario. On one hand, in line with Han’s definition of uncertainty, we could
17 hypothesize that students' difficulties in perceiving uncertainty may result from insufficient
18 content knowledge, leading them to fail to generate the relevant hypotheses and/or to prioritize
19 them inadequately. Such difficulty in identifying the "known unknowns" within a clinical
20 situation could lead students to inadvertently neglect the ambiguous dimension of the problem
21 they are confronting. By limiting their ability to perceive uncertainty, these challenges for
22 students in identifying the boundaries of their knowledge would thus hinder them from
23 implementing adaptive responses to the uncertain situation, impacting their overall tolerance
24 for uncertainty. Accordingly, if the development of knowledge throughout the curriculum helps
25 reduce the significance of "reducible" uncertainties associated with a lack of knowledge, it
26 could also play a role in students' ability to consider multiple hypotheses when facing a clinical
27 problem. This, in turn, may enhance their perception of the uncertain dimension of the situation
28 at hand.
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43 **Clinical uncertainty: exposing students to the limitations of medical knowledge**

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45 Past research has shown that clinical uncertainty mostly arises from the "unknown unknowns"
46 embedded in the situation.³ Here, students described the lack of evidence, the indeterminacy of
47 future outcomes, and the inherent complexity in patient care as major sources of uncertainty.
48 Hence, the majority of clinical uncertainty is associated with the limitations in the body of
49 medical knowledge, characterized by Renée Fox as type 2 uncertainty. While some qualitative
50 studies have provided rich descriptions of this ontological uncertainty, the ability of students to
51 identify such uncertainty in real world settings is still to be determined. Perceiving a dimension
52 of ontological uncertainty, rooted in the very limits of scientific knowledge rather than one's
53 own knowledge, requires students to fully engage in solving the problem. Aligned with the
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3 concept of motivation, such engagement necessitates assigning students a high-value task in an
4 authentic environment, all with a level of guidance tailored to the student's autonomy. Lastly,
5 providing students with the opportunity to perceive uncertainty involves exposing them to
6 complex and ill-defined problems. Guiding students towards a patient-centered approach and
7 engaging them in interprofessional reflective processes has the potential to enrich their
8 perception of uncertainty. This exposure would bring forth diverse perspectives on the situation,
9 thereby unveiling the myriad challenges inherent in the issue at hand. Clinical supervision
10 should thus focus not only on ensuring that the proposed learning situations expose students to
11 sufficiently explicit sources of uncertainty but also on ensuring their perception of the uncertain
12 dimensions of the issues at hand.
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23 **The “culture of doubt”: the influence of the academic environment on uncertainty** 24 **perception**

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27 The culture of doubt instilled in several academic environments, based on the exposure of
28 students to the incomplete and unstable nature of scientific knowledge, and on evaluation
29 methods that foster reasoning rather than obtaining a black or white answer, is crucial in
30 students' ability to identify sources of uncertainty. Some studies suggest that initiatives aimed
31 at fostering “epistemic maturity” in students - which could be seen as a source of “humility”
32 that acknowledges the inherent limitations of scientific and personal knowledge - may foster
33 their ability to handle uncertainty.⁴ Such a stance will facilitate identification of potential
34 sources of uncertainty involved in ill-defined clinical situations.
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44 **The situated nature of uncertainty: deciphering the interrelations between the task, the** 45 **context, and uncertainty perception**

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48 Acknowledging the “situated” nature of uncertainty involves addressing uncertainty as a state,
49 stemming from the complex and dynamic interactions between the context, the clinical task,
50 and the individual, rather than an objective, independent domain within a specific problem.
51 Previous works suggested that the nature of the task shapes the experience of uncertainty.
52 Cristancho et al showed that in surgical settings, surgeon’s recognition of uncertainty was
53 directly influenced by external factors, including time pressure, or having to deal with multiple
54 tasks concomitantly -such as being on call while operating.⁵ They also identified how surgeons
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3 used contextual features including patient-related characteristics -such as problematic anatomy,
4 medical history, or social situation- and of information incompleteness, pertaining to
5 ambiguous, unanticipated or conflicting sources of information, as cues to recognize
6 uncertainty. The critical significance of contextual factors in practitioners' recognition of the
7 uncertain nature of a problem aligns with Dewey's perspective, viewing a situation as the result
8 of interactions among individuals, their environment, and the problem to be solved. Hence, the
9 influence of the situation as a whole depicted by Dewey as an 'environing experienced world,'
10 on uncertainty perception, remains to be elucidated.
11 These efforts would help better identify the contextual factors contributing to the emergence of
12 uncertainty in real clinical settings, alternately fostering an earlier perception of uncertainty in
13 trainees.
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23 **Implications for research**

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25 Several studies have investigated professionals' UT through psychometric measures. However,
26 these instruments tend to conceptualize UT more as a personality trait than as a state emerging
27 from a specific problem, neglecting the influence of the situation on uncertainty perception.
28 Furthermore, UT measures do not incorporate identification of uncertainty as a distinct
29 assessment domain, hindering the quantification and measurement of the impact of the
30 perception process on overall tolerance. As a result, we propose that future approaches could
31 delve into students' perception of uncertainty through observational ethnographic studies in
32 real-world settings. Longitudinal studies exploring the development of students' ability to
33 identify uncertainty stimuli in clinical setting throughout curricula could complement such an
34 ethnographic approach. Notably, comparing diverse student cohorts across countries and
35 educational stages in medical education could provide valuable insights into the curricular
36 specificities shaping students' posture in clinical uncertainty.
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49 **Conclusion**

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51 Preparing future healthcare professionals to navigate clinical uncertainty is now widely
52 acknowledged as a fundamental training goal. Fostering uncertainty tolerance in students
53 entails immersing them in a state of uncertainty. However, the capacity of students to discern
54 uncertain aspects in the situations they encounter remains insufficiently documented. Thus,
55 there is a need to investigate the factors influencing their identification of uncertainty stimuli
56 within clinical situations. Consequently, upcoming ethnographic studies could focus on
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3 exploring, within professional contexts, the individual, contextual, and situational elements that
4 contribute to students' perception of uncertainty. Such endeavors are essential for identifying
5 the features of the learning environment that enhance students' uncertainty perception,
6 ultimately aiming to bolster their comfort in complex situations or when confronted with ill-
7 defined problems.
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15 REFERENCES

- 16
17 1. Hillen MA, Gutheil CM, Strout TD, Smets EMA, Han PKJ. Tolerance of uncertainty:
18 Conceptual analysis, integrative model, and implications for healthcare. *Social Science &*
19 *Medicine*. 2017;180:62–75.
20
21
- 22
23 2. Anderson EC, Carleton RN, Diefenbach M, Han PKJ. The Relationship Between
24 Uncertainty and Affect. *Front Psychol*. 2019;10:2504.
25
26
- 27
28 3. Stephens GC, Sarkar M, Lazarus MD. “A whole lot of uncertainty”: A qualitative study
29 exploring clinical medical students’ experiences of uncertainty stimuli. *Med Educ*.
30 2022;56(7):736–46.
31
32
- 33
34 4. Patel P, Hancock J, Rogers M, Pollard SR. Improving uncertainty tolerance in medical
35 students: A scoping review. *Med Educ*. 2022;1-11.
36
37
- 38
39 5. Cristancho SM, Apramian T, Vanstone M, Lingard L, Ott M, Novick RJ. Understanding
40 clinical uncertainty: what is going on when experienced surgeons are not sure what to do?. *Acad*
41 *Med*. 2013;88:1516-1521.
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