

## The Price of Certainty – Diagnostic Uncertainty, Expectations, and Algorithms in Modern Dermatopathology

In dermatopathologic practice, tissue specimens are interpreted and diagnostic reports are generated that substantially inform clinical decision making. The evaluation of morphological patterns is performed in the context of clinical information and established criteria. While diagnostic accuracy is a core expectation in this process, it is important to acknowledge that not all cases allow for unequivocal conclusions. Many findings must be interpreted within a spectrum of diagnostic probability, rather than as binary outcomes. In clinical practice, however, uncertainty is often perceived as problematic. Patients, healthcare systems, and even clinicians themselves increasingly expect precision and definitive answers. Yet in many areas of medicine, including dermatopathology, a proportion of cases inherently involve interpretive judgement.

- **The limits of objectivity:** Dermatopathology and pathology are frequently regarded as one of the more objective medical specialties. The process appears straightforward: a biopsy, a slide, a report. But diagnostic variability is well documented, even among experienced practitioners. A melanocytic lesion that one dermatopathologist considers benign may be classified differently by another. These differences arise not from incompetence, but from the interpretive nature of the work – influenced by morphology, clinical context, and cognitive factors such as decision fatigue.<sup>1,2</sup> Beyond cognitive,

defensive, and interindividual factors, diagnostic variability may also be influenced by technical and procedural aspects, such as non-representative or superficial biopsies, unassessed portions of a lesion, and artifacts related to tissue acquisition and processing, including oblique, tangential, or incomplete sectioning.

- **Defensive medicine as a systemic response:** To mitigate perceived risk, clinicians may adopt defensive diagnostic behaviors. Increasingly, additional immunohistochemical stains are employed and expanded differential diagnoses are formulated, not solely based on clinical indication but also as a means of safeguarding against potential criticism or medico-legal consequences. Such defensive strategies are understandable within current medico-legal frameworks, but they consume resources and may inadvertently contribute to overdiagnosis and overtreatment.<sup>3</sup> Against this backdrop, technological solutions are often embraced as a promise of certainty.
- **Technology and the quest for certainty:** Advances in technology – from immunohistochemistry to molecular diagnostics and artificial intelligence – offer valuable tools. Yet they are not infallible. These modalities provide probabilistic data, not absolute answers. There is a risk that reliance on technological outputs may displace clinical reasoning. This reflects the concept of mechanical objectivity, in which technically generated information

is implicitly perceived as more reliable and objective than individual clinical judgement. Objective measures are seductive precisely because they appear definitive, even when they are not. As clinicians, we must remain critically engaged with such data.<sup>1,2,5</sup>

- **Managing expectations:** Expectations of certainty extend beyond the clinical team. Patients increasingly seek clear diagnoses, prognoses, and treatment plans. Expressions of diagnostic uncertainty can be met with disappointment or mistrust. Simultaneously, regulatory frameworks and reimbursement models often incentivize categorical decisions over nuanced communication. In this environment, acknowledging the inherent limitations of medical knowledge is professionally challenging, yet ethically necessary.<sup>3</sup> These dynamics are not confined to pathology. In everyday dermatologic practice, clinicians similarly navigate diagnostic uncertainty – for example in inflammatory dermatoses, pigmented lesions, clinically, or treatment response prediction. The increasing reliance on algorithms, scoring systems, and guideline-driven thresholds affects decision making across dermatology, reinforcing the expectation that complex biological processes can be reduced to definitive categories.
- **Decision fatigue and its impact:** Each diagnostic decision carries cognitive load. In pathology, this may involve dozens or even hun-

dreds of decisions per day. Over time, cognitive fatigue can subtly influence judgement – particularly in complex or borderline cases. While decision fatigue is rarely discussed in medical contexts, it warrants greater attention. Recognizing its impact may help clinicians implement strategies to mitigate its effects.<sup>6</sup>

- **Towards a more sustainable diagnostic culture:** Modern medicine places considerable emphasis on precision and standardization – aspirations that have delivered substantial benefits. However, a parallel culture of intolerance for uncertainty has emerged. These risks fostering defensive practice and undermining professional judgement. A more sustainable diagnostic culture would acknowledge that uncertainty is an intrinsic aspect of clinical work. Rather than equating it with failure, systems should support clinicians in managing uncertainty transparently and responsibly.<sup>3,4</sup> Professional integrity also extends to transparent and responsible communication beyond the diagnostic report itself, including the careful and data-protection com-

pliant presentation of clinical uncertainty in dermatologic case reporting.<sup>7</sup>

For readers of JDDG, these considerations are relevant across the full spectrum of dermatologic practice, wherever diagnostic decisions are made under uncertainty and increasing technological and systemic pressure. Certainty cannot always be achieved. But intellectual honesty, reflective practice, and clear communication remain within our control – and they are essential to maintaining trust in clinical care. Recognizing uncertainty not as a weakness, but as a shared condition of modern medicine, may be a first step towards restoring trust on both sides of the microscope.

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