

Five things AI cannot replace in dentistry—and why clinicians still matter

Artificial intelligence (AI) has seen a rapid surge in popularity and accessibility in dentistry, and more broadly in healthcare. Publicly available AI tools, particularly large language models, have become increasingly integrated into professional and clinical workflows. As of 2024, more than half of healthcare organisations globally reported integrating some form of AI, and both its applications in dentistry and the scale of its adoption therein continue to expand rapidly.[1,2]

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As an international speaker who is regularly invited to address dental education organisations and universities, I have observed first hand the growing interest and uncertainty surrounding AI among professionals and students alike. Many of the questions I receive during and after presentations reveal not only excitement about AI's potential but also widespread misconceptions about its limitations.

This article stems from those conversations. Based on both professional dialogue and current developments in dental technology, I have identified five essential things that AI cannot do in dentistry—areas where human expertise, intuition and care remain irreplaceable. These points are not exhaustive, but they represent critical themes that concern all members of the dental team, including general practitioners, specialists and educators.

AI cannot make nuanced real-time decisions

While AI systems, particularly those based on large-scale data analysis, are advancing rapidly and can perform impressive tasks, it is crucial to recognise that AI lacks the human nuance, contextual awareness and the ability to interpret complex or incomplete scenarios that are essential in clinical settings.

AI excels at supporting tasks such as data analysis and pattern recognition. However, machine learning systems are unable to make real-time decisions, especially when those decisions depend on patient communication, emotional cues or multifaceted medical and psychosocial factors. As noted in a letter published by the *British Dental Journal*, while AI demonstrates technical prowess, it lacks the ethical judgement and concern needed for comprehensive patient care, making it unfit to replace dentists entirely.[3]

Furthermore, the quality of AI output is heavily dependent on the quality of input data.[4] In clinical practice, it may be challenging to convey all the subtleties of a patient's condition through data alone. This limitation underscores the indispensable role of human clinicians, who can interpret and act upon complex, context-dependent information that AI might overlook.

AI cannot perform hands-on procedures

As a specialised dental practitioner, I often see first hand how patients respond to the idea of complex treatments. Many arrive with a degree of fear or anxiety, especially when it is their first visit or the procedure is more involved. What I have noticed time and again is that trust plays a central role—and that trust is built not only on knowledge but on human interaction, empathy and reassurance.

When I ask patients if they would trust a robot for treatment, the answer is always a firm no. Their reaction—often incredulous—underscores the irreplaceable value of human presence and intra-operative judgement.

Regardless of AI's advancements, it cannot replicate the fine motor skills, adaptability or emotional awareness required in clinical dentistry. Even the idea of a large robotic arm performing dental procedures—regardless of its technical precision—is unsettling, not just for patients but even for us as professionals.

While robotics has been explored in some areas of dental implantology, current systems are strictly assistive, requiring human oversight and intervention at every step. The idea of autonomous robotic treatment in dentistry remains a distant possibility—and one that raises more ethical and practical concerns than it resolves.[5]

Ultimately, dentistry is a tactile profession. We rely not only on visual data but also on touch, sound, judgement and experience—factors that cannot simply be outsourced to machines.

AI cannot build patient relationships

One of the most irreplaceable aspects of dentistry is the relationship between clinician and patient. People do not just come for treatment; they come for reassurance, understanding and empathy. They want to look their clinician in the eye, read the clinician's body language and feel heard.

I have not seen any AI system capable of interpreting emotion, cultural context or psychological state in real time—unlike a human clinician. For example, when a patient is eligible for two treatment options—one more invasive, one more conservative—a human dentist might sense the patient's emotional unease and tailor his or her recommendation accordingly. AI, however, processes data not emotions. It might generate a technically optimal plan but not one that aligns with the patient's lived experience or personal values.

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When I use AI in my practice—to generate ideas or analyse information, for example—I always remind myself that a single missing detail can easily lead to an incorrect or misleading result. In a clinical setting, such errors are not just technical; they are personal.

This is precisely the issue. A patient can sense whether you are confident, present and genuinely engaged. If the patient believes that his or her care is being directed by something impersonal or beyond his or her control, that bond begins to weaken. No matter how intelligent the software, AI cannot build the kind of trust that develops from consistent, honest human interaction.

There is also the matter of accountability. A dentist can articulate his or her reasoning, adjust based on patient feedback and share in the responsibility of outcomes. AI cannot. As a result, it cannot form the kind of therapeutic alliance that underpins all successful dental care. In short, while AI may assist communication—through translation, scheduling or information delivery—it cannot replicate the emotional intelligence and nuanced interpersonal connections fundamental to clinical care.

AI cannot make ethical decisions

Every patient is different—not just clinically but personally. Patients bring their values, preferences, fears and expectations to every appointment. As a dental professional, you begin to perceive these cues the moment a patient enters the room. You notice whether he or she is hesitant about a procedure, curious about alternatives or perhaps more concerned about aesthetics than longevity. These subtle cues inform how we frame options, provide guidance and respect patient autonomy. AI cannot do this.

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Furthermore, ethical decision-making often involves more than clinical judgement; it involves negotiation, compromise and compassion. We are trained not only to do no harm but to do what is right for that individual within the context of his or her life. To me, AI cannot substitute that sense of professional responsibility. It lacks moral reasoning and cannot be held accountable for the outcomes of its suggestions. Ethics in dentistry are dynamic and context-dependent, requiring discretion and sensitivity that only human experience can provide.

AI cannot ensure equity or critical oversight

The perhaps most overlooked limitation is AI's inability to ensure fairness and accountability without human oversight. In dentistry, as in all areas of healthcare, fairness matters. It is not just about applying the same procedure to everyone; it is about recognising difference, context and need. As professionals, we often make decisions based on a blend of clinical data, visual cues, body language, tone of voice and prior knowledge of the patient. Our ability to interpret these complex inputs helps ensure that care is both appropriate and equitable.

While AI systems can process large volumes of data and even flag inconsistencies, they lack the situational awareness that humans apply instinctively. A camera might capture an image, but it will not detect hesitation in a patient's voice. An algorithm may suggest a procedure, but it will not notice the anxiety in a patient's posture or pick up on the silent signals that a clinician observes intuitively.

This is where the risk lies. AI can only work with what it is given. If the data is incomplete, is biased or lacks essential human nuance, the results may inadvertently perpetuate inequality. In fact, many AI systems have been shown to reflect the limitations of their training data—leading to recommendations that disadvantage certain patient groups, particularly those under-represented in clinical datasets.

That is why human oversight is not optional; it is essential. AI can be a powerful assistant, but it cannot assume the ethical and professional responsibilities that come with patient care. Equity in dentistry requires judgement, awareness and a conscious commitment to fairness. These are a human's role to consider, not the functions of a machine.

Human expertise at the heart of a digital future

The concerns addressed in this article are genuine and reflect the growing uncertainty many dental professionals feel about the future. As AI continues to evolve, it is natural to wonder how our roles may shift or whether aspects of our work might be replaced. Yet the points raised here reaffirm a vital truth: AI is a tool—not a replacement.

Yes, robotics and intelligent systems will become more capable over time. They may assist with increasing sophistication, speed and precision. However, they will always lack the very qualities that define our profession: clinical judgement, human connection, ethical awareness and the ability to adapt in real time. The future of dentistry will be shaped not by machines alone but by clinicians who lead with both skill and empathy—supported, not replaced, by AI.

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References



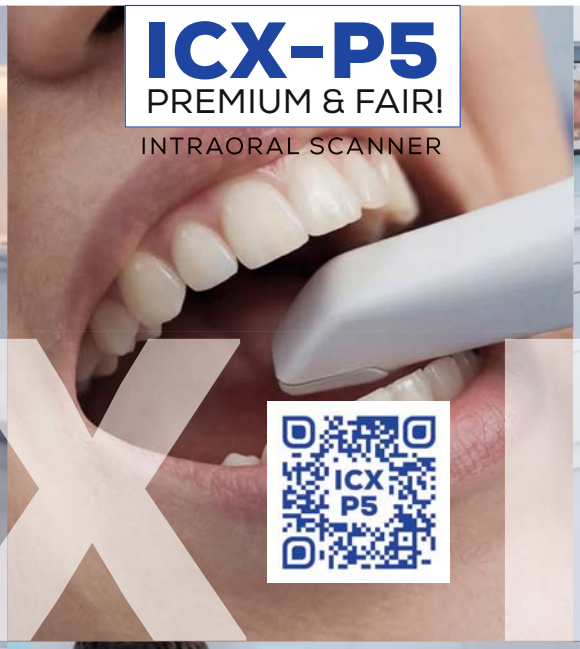
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