Guided by Data, Grounded in Values: Dentistry in the Age of NHI and AI

Why This Moment Matters

At no time in our profession's history has the ground shifted so decisively beneath us. The National Health Insurance Act of 2023 ushers in a new era in South African healthcare: one where access becomes a universal promise rather than a privilege. It positions dentistry, long sidelined in public health discourse, at the centre of a collective reimagining of care delivery.

Simultaneously, artificial intelligence (AI) is emerging from the realm of speculative fiction and into the dental operatory. AI promises precision diagnostics, streamlined workflows, and predictive insights. Deep learning systems now rival human experts in interpreting panoramic radiographs and caries detection, doing it in seconds what once took minutes. Yet in this dawning age of algorithms, human judgment still reigns supreme, if we know how to wield both tool and wisdom.

South African oral health is wrestling with a legacy stained by systemic neglect, inequity, and structural fractures while simultaneously being invited to leap into universal coverage and digital advancement. It is a rare convergence: policy, technology, ethics, and equity intersect in our profession's most visible moment.

But here's the catch: these forces can either converge into synergy or collide into dissonance. NHI's universal promise may feel like liberation, but without thoughtful calibration, standardised benefit designs could narrow clinical discretion. AI's interpretive warp may feel like a shortcut but without transparency, it risks protocolizing nuance and masking bias.

The golden thread then, is this: in the tension between systems and judgment, equity and efficiency, we must be deliberate. We ask whether we can architect a future where policy supports clinical conscience and technology enhances, rather than erodes, patient humanity?

This is the moment to define how dentistry will behave clinically, ethically, pedagogically, and professionally, in the age of the act and the algorithm.

The Promise and Peril of the Algorithm

Artificial intelligence in dentistry is no longer a futuristic curiosity. It is in our clinics, our radiographic suites, and even in our patients' pockets. From automated charting and AI-assisted caries detection to predictive analytics for periodontal disease progression, the technology promises an intoxicating combination of speed, accuracy, and efficiency. A 2023 systematic review found that deep convolutional neural networks could detect dental caries on bitewing radiographs with accuracy rates comparable to or exceeding experienced clinicians.[1]

For the overstretched practitioner in a high-volume public clinic, the benefits seem irresistible. AI could flag pathologies in seconds, standardise treatment planning, and even suggest cost-effective care options. In theory, this frees clinicians to focus on the human aspects of care like communication, trust-building, and shared decision-making.

But algorithms are not neutral. They inherit the biases embedded in their training data, and in dentistry, this data often comes from well-resourced clinical settings in the Global North. Such models may not account for the oral disease patterns, socio-economic realities, or resource constraints common in South African practice. The result? A diagnostic output that is statistically sophisticated but contextually naive.

The more insidious risk is over-reliance. As protocols increasingly integrate AI outputs into mandatory treatment pathways, particularly under the cost-containment pressures of a universal health insurance model, there is a danger that the clinician becomes a validator rather than a thinker. The "human in the loop" risks becoming "the human rubber stamp."

If the algorithm is the scalpel, we must still be the surgeon. Clinical judgment, cultural sensitivity, and ethical reasoning cannot be delegated to lines of code. The challenge and opportunity before us is to ensure that AI amplifies our judgment rather than replaces it, and that the datasets we train on reflect the realities of our patients, not just those of patients thousands of kilometers away.

The NHI Act and the Shaping of Clinical Autonomy

The National Health Insurance (NHI) framework in South Africa aspires to create an equitable, universal healthcare system that closes the gap between the privileged few and the underserved majority. Its vision is undeniably noble. Yet for dental professionals, the NHI's operational realities will shape not only the economics of practice, but also the very boundaries of clinical decision-making.

Under the NHI, standardised treatment protocols will likely become the default, with the dual aim of containing costs and ensuring uniformity of care across diverse settings. These protocols, while valuable for promoting consistency, can also narrow the clinician's scope for tailoring treatment to individual needs. The inclusion of AI-driven decision support in such systems may further embed this standardization, locking practitioners into algorithmically guided pathways.

For the public sector dentist, this could mean reduced variability in care quality between urban and rural clinics. However, it could also mean that treatment plans are increasingly dictated by cost-effectiveness algorithms rather than nuanced clinical judgment. In private practice, particularly for practitioners contracted to the NHI, reimbursement models and case authorisation processes may subtly encourage the selection of cheaper interventions over those that are clinically superior but financially less viable within the scheme's constraints.

Clinical autonomy is not an abstract privilege. It is the safeguard that ensures a dentist can recommend the treatment that best serves the patient's health, even if it is not the least expensive or most convenient. The integration of AI within NHI frameworks will demand that dental professionals become advocates for the preservation of that autonomy, articulating the difference between efficiency and quality, between standardisation and stagnation.

The real measure of the NHI's success will not be in how much it can save, but in whether it can deliver equitable, evidence-based care without eroding the professional discretion that lies at the heart of ethical dentistry.

The Convergence of AI and NHI: Efficiency or Ethical Erosion?
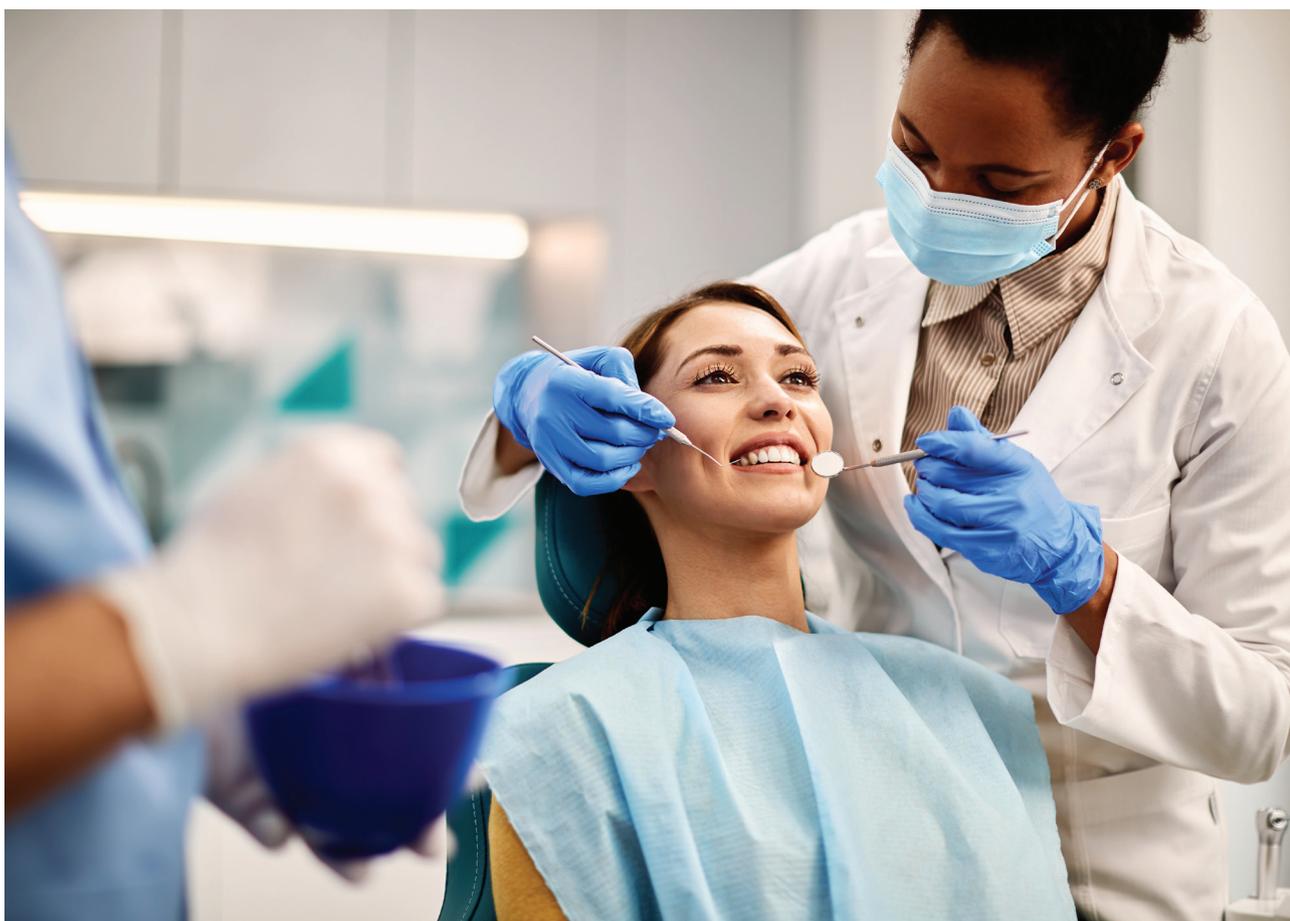
When the forces of AI-driven decision-making and the structural framework of the NHI converge, dentistry stands at the intersection of two powerful currents. On the one hand, artificial intelligence promises to streamline workflows, reduce diagnostic errors, and extend specialist-level decision support to even the most resource-constrained clinics. On the other, the NHI system introduces financial and operational guardrails that could narrow the spectrum of acceptable treatment options.

This marriage of technology and policy could redefine dentistry in South Africa. Imagine a rural community dental clinic where AI-powered diagnostics flag carious lesions, assess periodontal status, and even suggest the optimal restorative material. The clinician, under the NHI's reimbursement constraints, might then face a silent tension: proceed with the AI-recommended cost-efficient option, or advocate for a more durable, albeit more expensive, alternative that the system might not cover. In theory, AI could elevate the baseline standard of care nationwide. In practice, it risks institutionalising a lowest-common-denominator approach if the algorithms are tuned more for cost control than for clinical excellence.

Ethically, this convergence forces us to confront the question: who holds the final authority in patient care? If AI algorithms are trained on datasets that reflect historic inequities or exclude certain population profiles, their guidance may unwittingly perpetuate disparities. Under the NHI, where these algorithms could be embedded as decision-support defaults, such biases risk becoming codified into national healthcare delivery.

There is also the matter of trust. Patients may assume that every recommendation, whether human or algorithmic, is grounded in their best interest. Dentists will need to develop the skill and courage to explain, and if necessary, challenge algorithmic recommendations when they do not align with the patient's unique context. This is not simply a clinical responsibility; it is an ethical imperative.

The efficiency promised by AI and the accessibility promised by the NHI are both worth striving for. But efficiency that

compromises judgment, and accessibility that trades away quality, could leave us with a system that meets targets yet fails patients. The task for the profession will be to harness these forces in a way that expands, rather than contracts, the scope of ethical and patient-centred dentistry.

Navigating the Future: Preparing Dentists for a New Clinical Reality

Dentistry is entering a new era in which neither clinical skill nor business acumen alone will be enough. The next generation of dentists will need to navigate an environment where patient needs, technological capabilities, and systemic constraints are in constant negotiation. Preparing for this reality requires more than updating clinical syllabi; it demands a reimagining of what it means to be a competent and ethical practitioner in the 21st century.

Undergraduate and postgraduate education must adapt to this shifting landscape. Students must be trained not only to use AI-driven diagnostic tools, but to critically appraise their outputs. They must understand how reimbursement systems like the NHI influence treatment planning, and how to advocate for patient-centred care within these structures. This is not about producing graduates who can follow a flowchart; it is about producing clinicians who can recognise when the flowchart serves the patient and when it doesn't.

Beyond technical competence, there is a need to cultivate ethical resilience. This means giving future dentists the frameworks and language to challenge cost-driven care when it undermines patient welfare, to articulate the long-term value of preventive interventions, and to resist the quiet erosion of professional autonomy. It also means preparing them to engage in interdisciplinary conversations, where dental priorities are sometimes overshadowed by broader health system demands.

The profession has faced crossroads before in times when new technologies or policy changes threatened to narrow our role to technicians rather than healthcare leaders. Each time, our survival and relevance have depended on our ability to adapt without surrendering the core values of care, integrity, and patient advocacy. This new intersection of AI and NHI is no different. If we can prepare our current and future practitioners to navigate this complexity, we can ensure that dentistry in South Africa does not merely endure the coming transformation, but actively shapes it. The goal is not just to survive within the system, but to lead within it, confidently, ethically, and with an unwavering commitment to the people behind the policies and algorithms.

Choosing Our Compass in an Era of Change

The convergence of algorithms and acts will redefine dentistry's landscape, but it will not decide its soul. That choice remains ours. AI will continue to sharpen its predictions, and national health policies will continue to shape access and funding. Yet no software, no statute, can replicate the deeply human act of sitting across from a patient, hearing their concerns, and tailoring a plan that honours both their needs and their dignity.

In this moment, the profession stands at a threshold. We can allow ourselves to be guided solely by cost-effectiveness scores and efficiency metrics, or we can choose to see these tools as just one part of a richer clinical dialogue, one where professional judgment, ethical reflection, and patient trust

remain central. The danger lies not in adopting new systems, but in surrendering the responsibility to question them.

Dentistry has always been about more than teeth; it is about the health, confidence, and quality of life of those we serve. The market may dictate costs, algorithms may suggest pathways, but it is the clinician's voice anchored in evidence, ethics, and empathy, that should chart the course. The future will remember not only how we adapted to these changes, but how steadfastly we held to the values that make dentistry a profession and not just a service.

The compass is still in our hands. The question is: will we let others set our direction, or will we navigate with purpose?

Further reading:
Schwendicke F, Rossi JG, Göstemeyer G, Elhennawy K, Cantu-Aguilar GP, Gaudin R, Chaurasia A, Gehrung S, Krois J. Cost-effectiveness of artificial intelligence for proximal caries detection. Journal of Dental Research. 2021;100(4):369–376.

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CPD questionnaire on page 336

The Continuing Professional Development (CPD) section provides for twenty general questions and five ethics questions. The section provides members with a valuable source of CPD points whilst also achieving the objective of CPD, to assure continuing education. The importance of continuing professional development should not be underestimated, it is a career-long obligation for practicing professionals.