

Agentic artificial intelligence in dentistry: an autonomous future for education and management

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Dear Editor:

Agentic artificial intelligence (AAI) represents a significant advance in the field of artificial intelligence, characterized by its ability to operate autonomously, make decisions, and execute complex actions with minimal human intervention. In contrast to generative artificial intelligence (GAI), which relies on detailed prompts, AAI emphasizes agency, acting independently to achieve specific objectives (1,2).

The term “agentic” derives from the concept of agency in AI, closely associated with areas such as reinforcement learning, automated planning, and multi-agent systems. This type of AI can independently execute complex workflows. Unlike traditional machine learning models that require human intervention, AAI operates with genuine autonomy. These sophisticated systems are designed not only to suggest actions but also to autonomously initiate and complete complex tasks, such as generating comprehensive study protocols, simulating multiple clinical trial arms, drafting detailed regulatory submissions, and triggering necessary adjustments in supply chains, all without direct human involvement. Although its use is still in the process of consolidation within scientific literature, AAI has begun to attract attention due to its potential to transform processes in different areas, including higher education and institutional management (3).

AAI has multiple applications in the academic context. In education, for example, it can function as a personalized tutor, adapting content and methodologies according to each student’s individual performance. It also enables the generation of virtual clinical simulations that replicate real-world scenarios for practice in controlled environments. In research, AAI facilitates the analysis of large datasets, the development of systematic reviews, and the automated generation of hypotheses, optimizing both the design and execution of scientific projects. From an administrative perspective, it can automate tasks such as academic scheduling, resource management, and inventory control, thus promoting greater efficiency in institutional operations (2,4).

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The primary beneficiaries of AAI implementation would be students, who would gain access to more personalized and effective learning processes, as well as faculty members and researchers, whose repetitive workload could be substantially reduced. In addition, both public and private institutions could enhance the quality of their educational services through the strategic use of this technology (1,4,5).

Despite its advantages, its adoption poses significant challenges. Among these is the need to ensure the accuracy and security of automated decisions, particularly in clinical diagnosis, where errors can have serious consequences. Risks arising from biases in training data and the ethical treatment of sensitive information related to students and patients must also be considered (5). On the other hand, in Peru, limited technological infrastructure in many public universities constitutes an additional barrier to its effective implementation (6).

Despite this, AAI could optimize the allocation of human and material resources, provide adaptive tutoring in public institutions, and position private universities as benchmarks for educational innovation. Its strategic implementation could help reduce gaps in dental education, aligning graduate competencies with the demands of an increasingly digitalized and complex professional environment (7,8).

If implemented strategically, AAI may generate greater operational efficiency, personalized education, and strengthened research. However, inappropriate adoption could lead to excessive technological dependence, resistance to change, and workforce displacement in administrative areas. In addition, issues related to bias and data privacy must be addressed to prevent negative impacts on trust in these systems. Therefore, a balanced approach that combines innovation with planning tailored to the Peruvian context is essential (8,9).

In conclusion, AAI has the potential to transform education, research, and administration in Peruvian dental schools, provided that technical, ethical, and contextual challenges are adequately addressed. Nevertheless, the success of its implementation will depend on the ability of the academic community to integrate this technology responsibly, with critical insight and ethical commitment.

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MASR: conceptualization, writing of the original draft.

WTC: writing of the original draft.

ARCF: visualization, writing - review & editing.

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