FDI POLICY STATEMENT

Artificial intelligence in dentistry

To be adopted by the FDI General Assembly: September 2024, Istanbul, Türkiye

CONTEXT

The English Oxford Living Dictionary defines Artificial Intelligence (AI) as “the theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages”.

Most AI applications utilize machine learning which repeatedly analyses a training dataset to identify and learn inherent patterns to solve a certain task such as detecting objects on images (e.g. a caries lesion on a radiograph) or predicting events from numerical data (e.g. future loss of a tooth from historical and clinical patient data). The performance of AI applications is typically evaluated on unseen test datasets.

Currently, AI applications cover a wide range of domains including computer vision (image or video analysis), natural language processing (speech analysis), robotics, virtual reality and simulation. In healthcare and health sciences, an increasing number of applications involving AI have reached clinical maturity, i.e. regarding usefulness and regulatory approval. FDI World Dental Federation (FDI) presents a comprehensive White Paper on Artificial Intelligence (AI) in dentistry, outlining the unprecedented capabilities of AI driven by advancements in digital data, hardware, and software, and emphasizing its potential to revolutionize oral healthcare, education and research while aligning with FDI's Vision 2030 strategy for optimal oral health for all.

SCOPE

This policy statement aims to provide a basic understanding of AI, and to call the profession, including dental professionals, educators, researchers, manufacturers and policy makers, to take action to leverage the benefits of AI while recognizing and addressing its inherent risks and challenges.

DEFINITIONS

Artificial intelligence (AI): Capability of a technical system to acquire, process and apply knowledge (ISO/IEC 22989)

Machine learning: The process in which computer technologies are used so systems can learn from data or experience (ISO/IEC 23053).

PRINCIPLES

It is critically important to take healthcare systems and societal factors into account when ensuring that dental AI systems are used for the benefit of patients.

Dental AI promises benefits on several levels:

- For patients; better diagnostics and treatment planning, active and supportive therapy, and higher accessibility of care by lowering physical and economical access barriers;
- For dental professionals; efficiency gains, higher diagnostic and treatment quality and better streamlining of processes;
- For healthcare services; cost reduction, objectification of treatment needs and an increase of fairness.

Notably, dental AI needs to be useful and true, i.e. to be built on data of high quality as, otherwise, bias, performance attrition due to limited generalizability and eventually harm may emanate from its use. To access high-quality data, data protection and accessibility need to be balanced, and harmonization and exchangeability of data strengthened. Ethical and social aspects, including human autonomy, fairness and transparency of AI, will need more focus in the future. Ensuring that AI does not increase but, instead, reduces inequity is closely linked to the underlying training data reflecting under-represented populations as well as the accessibility of such AI to all population groups. Moreover, the risk of automation bias (i.e., over-reliance of practitioners using AI) needs to be addressed, and options to measure an AI's performance on standardized datasets using comparable metrics are currently lacking.

POLICY

FDI recommends that dental professionals:

- acquire a basic literacy of AI. The decision either to use or not to use an AI application should be taken on an informed basis along the principles of evidence-based dentistry;
- critically appraise the evidence supporting an AI application for oral and dental care, including evaluation of the true usefulness and applicability in specific target settings (high generalizability and low risk of bias), as well as the costs generated and burdened on patients and on payers;
- employ AI applications as assistance systems and safeguard themselves against automation bias. The responsibility for any diagnoses or treatment deduced from any AI assistance remains with human users (human autonomy).

FDI encourages dental educators, researchers, developers, policy makers and payers to:

- use the core curriculum of AI for dental professionals to inform the development of undergraduate or postgraduate training programmes;
- engage in the widespread activities around standardization and regulatory oversight of AI, such as developing relevant ISO standards to ensure high quality of AI applications for the benefit of patients;
- support the assessment and certification of dental AI along the principles of evidence-based care and against agreed criteria, and engage in the development of benchmarking approaches, ensuring that dental AI comes with robust and soundly measured performance across populations and settings;
- develop a balanced approach of data protection concerns and the ethical use of healthcare data for the benefit of patients and society. Access to heterogeneous data will ensure generalizability of dental AI applications and prevent discrimination of underrepresented groups, fostering equity of care;
- promote and incentivize AI applications with demonstrated benefit for patients, providers, the healthcare system or society;
- consider the practical challenges of integrating AI into dental practices and work to reduce the related implementation barriers, for example, due to limited standardization and interoperability of data and software systems.

KEYWORDS

artificial Intelligence, data, learning systems, machine learning

DISCLAIMER

The information in this policy was based on the best available scientific evidence at the time. It may be interpreted to reflect prevailing cultural sensitivities and socio-economic factors.

REFERENCES

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