RCDSO | Royal College of Dental Surgeons of Ontario

GUIDANCE

Artificial Intelligence in Dentistry

CONTENTS

INTRODUCTION

The use of artificial intelligence (AI) in dentistry can significantly impact professional practice and patient care. Dentists can use AI for various purposes, such as improving efficiency, supporting practice management and assisting with creating documentation, diagnosis and detection of conditions and diseases, developing treatment plans, predicting outcomes, patient monitoring, and patient education. Though the use of AI is growing, there is currently no clear body of research or established best practices to guide dentists' ethical and professional conduct.

Due to the rapidly evolving nature of AI, the Royal College of Dental Surgeons of Ontario (RCDSO) has created this guidance to support registrants exploring and using AI for professional purposes. This document further supports patients and the public in understanding what to expect from their dentist if they are using AI in their clinical practices.

This document does not set out new professional requirements, but instead highlights existing responsibilities that may be relevant to the use of AI in dentistry. It also makes recommendations to support dentists in exercising their professional judgement and making decisions in patients' best interests when using AI for professional purposes.

DEFINITIONS

Artificial intelligence (AI) refers to computer systems that can perform tasks commonly associated with human intelligence, such as finding patterns in data, problem solving, learning, and making predictions, recommendations, and decisions.[1]

Generative AI (GenAI) refers to AI models that use machine learning techniques to create new content (e.g., text, images, audio, video) based on patterns learned from large data sets. These can include large language models which can understand context and generate human-like text.

Machine Learning is a branch of AI where computer systems can learn from data, recognize patterns, and make predictions or decisions without being explicitly programmed. They can improve their performance over time as they are exposed to more data.

PRINCIPLES

The following principles form the foundation for the guidance set out in this document:

1. The responsible and ethical adoption and use of AI in dentistry is guided, first and foremost, by the patients' best interests.

2. AI in dentistry has the potential to benefit dentists and patients when implemented in a manner that is safe, transparent, unbiased and non-discriminatory, and safeguards patient privacy and confidentiality.

3. AI is not a substitute for dentists' clinical skills, knowledge, and professional judgement, and is not to be used to provide care that a dentist is not otherwise competent to provide. Dentists remain responsible and accountable for their clinical care, decision-making, and documentation.

EXISTING PROFESSIONAL REQUIREMENTS

Dentists are reminded that adopting AI for professional purposes does not change their fundamental duties and responsibilities, which can be found in RCDSO's Foundations of Professionalism, RCDSO Standards of Practice and resources, and law. These include, but are not limited to:

- principles and duties in RCDSO's *Foundations of Professionalism*;

- professional requirements articulated in RCDSO's Standards of Practice, Guidelines, and Practice Advisories, including, but not limited to those relating to consent to treatment, conflicts of interest, professional advertising, and dental recordkeeping;

- legal and regulatory requirements, including, but not limited to those under the *Professional Misconduct regulation* under the *Dentistry Act, 1991*; Ontario's Personal Health Information Protection Act, 2004 *(PHIPA)* with respect to consent for the use, collection, and disclosure of personal health information;[2] and Ontario's *Accessibility for Ontarians with Disabilities Act, 2005*.

GUIDANCE FOR THE ADOPTION AND USE OF AI IN DENTISTRY

This guidance is grounded in existing professional and ethical duties and is intended to assist dentists in interpreting how these can be applied when using AI in practice. Dentists who are exploring and adopting AI in their practices are advised to adopt this guidance to help ensure AI is used responsibly and ethically. Further information can also be found in the companion FAQs.

[1] For definitions of related terms, visit the University of Saskatchewan's Glossary of AI Related Terms.

[2] Dentists must be aware of whether they have obligations under the federal *Personal Information Protection and Electronic Documents Act*, SC 2000, c 5, which applies to commercial activities relating to the exchange of personal health information between provinces and territories and to information transfers outside of Canada.

Risk-Based Approach

Generally, the greater the risk posed by an AI tool to patients, the greater the need for caution and oversight by dentists using the tool.

The degree of risk depends on the nature and intended use of an AI tool. While AI can encompass a broad range of tools, GenAI tools can present distinct or heightened risks due to their potential to produce inaccurate, misleading, or biased outputs.

Risk to patients also increases when use of an AI tool:

- **directly influences clinical decision-making (e.g., helps formulate a diagnosis or treatment plan for a patient);**
- **affects patient health and/or safety (e.g., informs the diagnosis and treatment of an oral disease or condition); and/or**
- **uses the patient's personal health information.**

1. ACCOUNTABILITY AND RESPONSIBILITY

Assessing the Appropriateness of AI

Dentists have a professional responsibility to prioritize the wellbeing of patients.[3] This responsibility applies when providing care with the support of AI. The following guidance can help dentists fulfill their obligations while assessing whether it is appropriate to use AI within their practice:

1. Prioritize patients' best interests when making decisions to adopt and use AI in dentistry.

2. Understand whether an AI tool is appropriate for its intended uses. When there is insufficient information to form a clear understanding of the tool's appropriateness, avoid using the AI tool.

3. Understand the risks (including the nature of the risk, severity, and likelihood of harm) and limitations associated with the AI tool, including, for example, the potential for inaccuracies, errors, and biased outputs and whether it impacts patient care directly or indirectly.

4. Take steps to prevent and mitigate the potential risks associated with the AI tool.

Assessing AI Tools

To make informed decisions about whether to adopt a particular AI tool for professional purposes, it is important for dentists to understand the following details about the AI tool, where applicable:

- **Whether the tool complies with relevant laws and regulations, including privacy laws (e.g., PHIPA);**
- **Data protection, security, use, storage (including what data is stored and where), and retention policies and procedures;**
- **If used for clinical purposes, how the AI tool performs, including its clinical validity (how well it predicts or aids diagnoses), accuracy (correct results versus false positives/negatives), reliability, safety, effectiveness, and consistency across different population groups;**
- **The data sets used to train the AI tool and any limitations (e.g., underrepresented patient demographics, such as by race, ethnicity, age, gender, or socioeconomic status);**
- **How end users (e.g., health care practitioners) and impacted populations (e.g., patients) may have been involved in the design, development, and testing of the AI tool;**
- **What the tool is meant to be used for (intended uses);**
- **Limitations and risks of the AI tool, and steps taken to mitigate risks, including risk of bias, errors, and data breaches;**
- **How the tool's performance is monitored, feedback can be provided, improvements are made, and updates are communicated.**

Dentists may seek information about the AI tool from the AI manufacturer and developer, as well as external sources (e.g., independent expert or peer reviews).

[3] Royal College of Dental Surgeons of Ontario, *Foundations of Professionalism*.

Using AI

It is important for dentists to be aware that AI can produce outputs which contain inaccuracies, errors, and misleading information, or which may be incomplete or outdated. For instance, AI scribes can generate documentation that includes information that was not discussed, or AI diagnostic tools can suggest treatment that is not necessary. AI may also unintentionally perpetuate biases, for example, if the data used to train the tool is not representative of the patient population being served, or if there are biases in the way the tool was developed and designed.

Dentists play a critical role in actively overseeing the use of AI and exercising their clinical judgement to prevent adverse impacts on patients. The following guidance can help dentists using AI to provide care that mitigates risks and is appropriate to the patient and their circumstances:

5. Complete relevant and ongoing training and education, as needed, in order to use AI competently, safely, and effectively, and to stay up to date with developments in the technology.

6. Ensure any staff who will be involved in using any AI tools are competent to use the tool and trained on appropriate uses, limitations, risks, and steps to mitigate risks.

7. Critically review and evaluate all AI-generated outputs for accuracy, completeness, and biases and/or stereotypical associations before including them in the patient record, or proceeding with a clinical decision (e.g., diagnosis, treatment recommendation, or plan).

8. Take into consideration the patient's unique characteristics, circumstances, and clinical presentation when making and implementing decisions with the support of AI tools.

9. Where available, use the AI tool's functionality to maintain an audit trail which enables AI-generated outputs to be recorded, tracked, and monitored.

10. Review significant AI-generated errors or incidents to identify contributing factors, implement improvements, and take actions as appropriate (e.g., inform the patient, report problems to the AI manufacturer/developer, report privacy breaches to the Information and Privacy Commissioner, ensure the tool is up-to-date, discontinue use of the AI tool).

2. TRANSPARENCY AND DISCLOSURE

Transparency with patients about the use of AI means informing patients when they are interacting with AI and when the dentist is using AI directly in their care. Transparency is especially important as the use of AI in dentistry is new and evolving. Being transparent and involving patients in decision-making supports patient autonomy, informed decision-making, and patient trust. The following guidance can help dentists be transparent about their use of AI in their practice:

11. Inform individuals when they are interacting with AI rather than with a human (e.g., when using a virtual assistant chatbot that simulates human conversation).

12. Prior to using an AI tool that will directly impact a patient's care or clinical decision-making, inform patients (e.g., about how AI will be used and the benefits and limitations of the tool). The level of information provided may be tailored based on how and when AI is being used, as well as the patient's technological literacy.

13. Document discussions with patients about the use of AI in their care, and record whether AI tools have been used to develop patient records or formulate a diagnosis, treatment plan, or other clinical decisions.

14. Provide reasonable accommodation, when possible, to patients who express a desire for no or minimal involvement of AI in their care.

3. PROTECTING PATIENT HEALTH INFORMATION

In keeping with dentists' obligation to safeguard patient privacy and confidentiality in accordance with *PHIPA*, the following guidance can help dentists meet these obligations while using AI:

15. Understand the privacy and security settings and measures of the AI tool being used and be satisfied that any patient data involved is securely stored.

16. Do not permit AI-generated outputs containing personal health information to be used for other purposes (e.g., training the AI tool, sharing with third parties), unless patients have provided express and knowledgeable consent to the specific use of their information for that purpose.[4]

ADDITIONAL RESOURCES

It is important for dentists to seek continuing learning and educational opportunities on the responsible and ethical use of AI. Registrants may find the following resources helpful for understanding the various uses of AI in healthcare, learning the principles around the responsible and ethical use of AI, and evaluating and assessing AI tools.

General Information and Resources

- **American Dental Association**, Dentistry – Overview of Artificial and Augmented Intelligence Uses in Dentistry
- **Canadian Centre for Cyber Security**, Cyber security guidance
- **Centre for Effective Practice**, Artificial Intelligence (AI) Learning Centre
- **National Institute of Standards and Technology**, AI Risk Management Framework

General Principles

- **Government of Canada**, Responsible use of artificial intelligence in government
- **Government of Ontario**, Responsible use of AI principles
- **Health Canada**, Good Machine Learning Practice for Medical Device Development: Guiding Principles
- **Health Canada**, Transparency for machine learning-enabled medical devices: Guiding principles
- **World Health Organization**, Harnessing Artificial Intelligence for Health

Guidance: Evaluating and Assessing AI

- **Accessibility Standards Canada**, Accessible and Equitable Artificial Intelligence Systems – Technical Guide
- **Government of Canada**, Algorithmic Impact Assessment tool
- **Information and Privacy Commissioner of Ontario**, Privacy Impact Assessment Guidelines for the Ontario Personal Health Information Protection Act

Guidance: Using Generative AI

- **Canada Health Infoway**, How Ready is Your Practice for an AI Scribe?
- **Canadian Medical Protective Association**, AI Scribes: Answers to frequently asked questions
- **Government of Canada**, Guide on the use of generative artificial intelligence
- **Healthcare Excellence Canada**, Implementing Artificial Intelligence in Canadian Healthcare: A Kit for Getting Started
- **Office of the Privacy Commissioner of Canada**, Principles for responsible, trustworthy and privacy-protective generative AI technologies

[4] Section 18 of the Personal Health Information Protection Act, 2004, S.O. 2004, c. 3, Sched. A.