Artificial intelligence in oral health care: Friend or foe?

Salme E Lavigne*, PhD, RDH


Salme E Lavigne

As we ring in 2025, it's hard to believe that we are already at the quarter century mark! So much has happened in the past 25 years, with one of the more notable ones being an overwhelming growth of artificial intelligence (AI) technologies. It seems that AI has become ubiquitous, from advances in smartphones, chatbots, GPS, generative AI tools such as ChatGPT, Bard, and Bing, to robotic cars no longer requiring drivers. For those of you who are old enough to remember, it is reminiscent of the old television cartoon series *The Jetsons*! In fact, AI is moving along at such rapid speeds that it is penetrating all aspects of our lives whether we recognize it or not. Thus, it is important, regardless of our roles in health care, whether as clinicians, educators, researchers, or community health or health policy leaders, that we acknowledge the impact of AI and embrace these new innovations while also recognizing their shortcomings.

In November 2023, the Harvard School of Dental Medicine in Boston held a two-day Global Symposium on Artificial Intelligence and Dentistry, with over 400 attendees from 30 countries, including AI scientists, ethicists, policy makers, practitioners, researchers, and students.[1] Some of the more established AI innovations were highlighted, including technological advances that can help identify dental decay up to 5 years earlier; public health applications that leverage machine learning to identify patients whose social determinants of health put them at higher risk for dental disease; and the analysis of satellite data and atmospheric chemistry models to determine which communities are most affected by extreme heat exposure (wildfires) and extreme storms, both of which impact oral health by increasing the risks of dry mouth, caries, and psychological stress resulting in bruxism.[1]

Other uses of AI technologies that are becoming commonplace in dental and dental hygiene practices are the automation of patient engagement, scheduling, and other time-consuming office tasks. The advent of mobile phone apps to enhance patient motivation with toothbrushing and monitoring plaque control may be of particular interest to dental hygienists. A recent study showed that use of a mobile app offering real-time coaching through Bluetooth connectivity on brushing all tooth surfaces resulted in a 94% average coverage of all tooth surfaces by users as well as longer brushing time leading to better oral health.[2]

In the medical field, utilization of AI has been increasing for many years, consistent with the growth of personalized and precision medicine. For example, polygenic risk screening using gene sequencing now plays a major role in cancer therapeutics.[1] Another use of AI involves the design of new therapeutic approaches based on each patient's unique circumstances. Researchers at Harvard have recently developed a knowledge graph model, TxGNN,[3] that describes 17,000 diseases using available clinical and biomedical data. This interdisciplinary model could eventually be used to predict how a specific therapeutic might work in individual patients and to identify new uses for medications approved for other purposes. These revolutionary algorithms will allow clinicians, including dental hygienists, to look across the world at all medications and determine which ones would work best for a particular disease.[3]

Interventional and diagnostic radiology are other areas that are benefitting tremendously from AI-assisted tools. One such tool—the CyberKnife—has revolutionized cancer treatment by using AI-driven robotics to improve radiotherapy accuracy and reduce the amount of radiation to healthy tissues (www.cyberknife.com). The most important feature of the CyberKnife is real-time motion synchronization that adjusts to patient movements such as breathing, coughing, and other slight shifts. The device verifies the exact tumour position, then adjusts the robot to target the tumour with submillimetre precision.

Additionally, more sophisticated AI technology in the field of diagnostic imaging is enabling the interpretation and analysis of data from cellphone and computer images for patients living in remote areas with minimal access to health care practitioners. These products should always be used as helpers, however, rather than decision makers when it comes to diagnosis and treatment planning.[1] AI

*Scientific editor, *Canadian Journal of Dental Hygiene*

Correspondence: Dr. Salme E Lavigne; scientificeditor@cdha.ca

tools, despite incredible advances, simply do not have the comprehensive understanding of a patient's medical and oral health history that a human practitioner does to ensure personalized care.

Concerns over the potential use of AI for diagnostic purposes are necessarily leading to calls from health care professionals for better guidance. A 2024 survey of more than 700 Canadian physicians[4] regarding the use of AI revealed overwhelming agreement (77%) on the need for some type of AI governance either from government or medical associations. A further 81% believed a legal framework for AI in medicine should be created.[4] I would argue that such guidelines are necessary in dentistry and dental hygiene as well.

Another major concern highlighted in the 2024 physicians' survey was that, with the availability of generative AI models such as ChatGPT, Bard, and Bing, 89% of physicians believed their patients were likely to encounter misinformation when searching for medical answers.[4] A related worry expressed by the majority of respondents was that patients are trying to diagnose themselves and are more likely to take AI responses more seriously than their physicians' own expertise.[4] It will be important for medical and oral health professionals to assist patients in understanding the plethora of misinformation. Although some information generated by large language models is valid, it must always be reviewed critically and considered in conjunction with evidence from other credible sources. Dental hygienists should remind their patients of the need to be critical thinkers when seeking oral health information at home.

One final area of concern that requires serious discussion is the use of generative AI tools in research and writing. Since the advent of these tools, there has been an explosion of publications in the scientific literature as researchers use these tools to speed up the scientific process, from study design to peer review (frowned upon by most reputable journals). AI is a wonderful tool for both practitioners and researchers to identify clinical trials that are current and meaningful. However, there is also a real concern about accuracy or relevance of the data to a particular patient or diagnosis.[5] ChatGPT and other such tools do not always generate accurate or unbiased results. They have been known to provide incorrect links or references to studies that do not even exist or that have no relevance to the topic at hand.[5] This shortcoming is particularly serious for academics given the risks not only of propagating such inaccuracies, thereby compromising the scientific body of knowledge, but also of reporting non-existent or falsified data. Other concerns pertain to intellectual property rights, confidentiality of personal and financial data, and use of the most recently published research, which would depend on when the "bot" was last trained.[5] Thus, there is a serious need for ethical guidelines from both academic institutions and scholarly journals to ensure that researchers have reviewed and edited all content generated by AI, checking citations and references for accuracy.

In response to this 21st century reality, the editorial board of the *Canadian Journal of Dental Hygiene* developed and approved a policy on the responsible use of generative AI in January 2024. Details of the policy and disclosure requirements have been added to the journal's *Guidelines for Authors*; the policy is also available in full at cjdh.ca/authorguidelines. I would encourage everyone to read it.

CONCLUSION

There is no question that AI is here to stay and will be increasing exponentially in its abilities to simplify and transform our practices and improve the delivery of health care along with other aspects of our lives. Should all health professional schools offer AI education for their students? Absolutely, particularly in the areas of disease prevention, new technologies, research and writing support. What we should not forget is that AI will never be 100% accurate and will not replace human expertise, so we need to continue to monitor all the new discoveries, create and follow ethical boundaries, learn from these new tools and, in the process, become better thinkers!

> *"The proliferation of AI tools in science risks introducing a phase of scientific enquiry in which we produce more but understand less."*[6]
>
> *—Lisa Messeri (anthropologist) & MJ Crockett (neuroscientist)*

REFERENCES

1. McAlpine KJ. From Climate Change to Dental Cavities, AI is Changing Oral Health [Internet]. *Harvard School of Dental Medicine News*, November 27, 2023. Available from: http://hsdm.harvard.edu/news/climate-change-cavities-ai-changing-oral-health
2. Thurnay S, Adam R, Meyners M. A global, in-market evaluation of toothbrushing behaviour and self-assessed gingival bleeding with use of app data from an interactive electric toothbrush. *Oral Health Prev Dent*. 2022;20:1–10.
3. Huang K, Chandak P, Wang Q, Havaldar S, Vaid A, Leskovic J, et al. A foundational model for clinician-centered drug repurposing. *Nat Med*. 2024;30(12):3601–3613. https://doi.org/10.1038/s41591-024-03233-x
4. Crist C. *Canada: Physicians and AI Report 2024*. Medscape. Available from: medscape.com/doctors_and_ai_ca_2024
5. Yaroshenko TO, Iaroshenko OI. Artificial intelligence (AI) for research lifecycle: Challenges and opportunities. *University Library at a New Stage of Social Communications Development. Conference Proceedings*. 2023;8. https://doi.org/10.15802/unilib/2023_294639
6. Messeri L, Crockett MJ. Artificial intelligence and illusions of understanding in scientific research. *Nature*. 2024;627(8002):49–58. https://doi.org/10.1038/s41586-024-07146-0

ISSUE AT A GLANCE

We are pleased to feature 4 original research articles in this issue. **Katherine Yerex, Juyoung Lee, Robert Schroth**, and colleagues evaluate data from the Children's Oral Health Initiative to determine its impact on the oral health of First Nations and Inuit children (pp. 9–17). **Kornchanok Wayakanon, Suwimon Jettanacheawchankit, Tuksaporn Pongpradit**, and colleagues investigate the effects of 3 remineralizing agents on initial carious lesions (pp. 18–28). **Ava Chow, Reid Friesen, and Nazlee Sharmin** examine student perceptions of integrating foundational sciences into their clinical dental hygiene program (pp. 29–35). **Denyse Blanco, Jacquie Ripat, Laura MacDonald**, and colleagues study the use of storytelling and reflection to advance understanding of client-centred care among prelicensure health care students (pp. 36–44). In addition, you'll find 2 literature reviews: **Dhandayuthapani Sasikala, Parisa Baghkomeh, Jamaluddin Mohammad Farzan**, and colleagues explore social media use by parents seeking information on how to improve the oral health of their children (pp. 45–58); **Cristine Miron Stefani, Adriano de Almeida de Lima, Fabiane Miron Stefani**, and colleagues report on the evidence of the effectiveness of orofacial myofunctional therapy in treating orofacial myofunctional disorders (pp. 59–72). Finally, this issue includes a short communication by **Nazlee Sharmin, Alia Wazir, and Ava Chow**, who describe students' experiences with an online quiz game in their third-year dental hygiene course at the University of Alberta (pp. 73–78).

PLAIN LANGUAGE SUMMARIES

Yerex K, Lee J, Schroth RJ, Kim J, Edwards JM, Hai-Santiago K, Bertone M, Hayes A, Lavoie J, Martin HD, Dufour L, White P, McNally M. Children's Oral Health Initiative program's impact on First Nations and Inuit children. *Can J Dent Hyg.* **2025;59(1):9–17.**

This study looked at data from Canada's Children's Oral Health Initiative (COHI) to see how the program affected the oral health of First Nations and Inuit children in Atlantic Canada, Saskatchewan, and Ontario between 2006 and 2016. The authors analyzed data for children aged 0 to 7 years, identifying the number of children who had their first dental screening and at what age, received fluoride varnish, sealants, and atraumatic restorative therapy. They also calculated the scores for decayed, extracted, and filled primary teeth (deft). From 2006 to 2016, 80,574 children (average age of 3.8 years) participated in COHI in Saskatchewan, Ontario, and Atlantic Canada. The proportion of children receiving oral screenings, fluoride varnish, and sealants stayed consistent over time. From 2006 to 2012, more children in Saskatchewan and Atlantic Canada received atraumatic restorative therapy, and deft scores remained mostly stable with a slight increase. As children got older, deft scores increased in Ontario and Saskatchewan but decreased in Atlantic Canada. While there were no significant decreases in deft scores, the findings suggest that children in COHI are receiving needed preventive services such as fluoride varnish and atraumatic restorative therapy.

Jettanacheawchankit S, Pongpradit T, Euapokai A, Eiamsakul A, Wongmoon K, Wayakanon K. Evaluating the effects of remineralizing agents on initial carious lesions. *Can J Dent Hyg.* **2025;59(1):18–28.**

Fluoride-containing products have been shown to reverse initial carious lesions by promoting enamel remineralization. Other products that don't contain fluoride because of toxicity concerns have been developed for the same purpose. This study examined the effects of 3 products—fluoride varnish (Duraphat®), casein phosphopeptide–amorphous calcium phosphate paste (CPP-ACP, Tooth Mousse®), and casein phosphopeptide–amorphous calcium phosphate fluoride paste (CPP-ACPF, Tooth Mousse Plus®)—on initial carious lesions. Forty upper premolar teeth were divided into 4 groups: distilled water, fluoride varnish, CPP-ACP, and CPP-ACPF. Each tooth was cut in half. One half was tested for hardness, and the other half was tested for colour and roughness. These tests were done before treatment, after demineralization, and after remineralization. The authors found that weakening the enamel made it much softer and rougher. After treatment, all 3 products made the enamel harder and lighter in colour. They also made the enamel less rough, but that change wasn't significant. There were no significant differences in effectiveness between the 3 products.

Chow AK, Friesen R, Sharmin N. Why do we need this? Perception and integration of basic and clinical sciences by dental hygiene students. *Can J Dent Hyg.* **2025;59(1):29–35.**

Health professional students with a good understanding of basic science are better at diagnosing and understanding clinical cases. Yet traditional health professional programs separate basic science and clinical courses, making it hard for students to see how the science applies later. This study looked at how students felt about mixing science with their clinical training and measured how well this integration worked. Dental hygiene students in their second to fourth years at the University of Alberta, Canada, were asked to

Continued...

take an anonymous survey about their views on integrating science into their courses. Third- and fourth-year students were also asked to complete a test measuring how well they integrated basic science with clinical knowledge. There were significant differences in how students from different years felt about integrating science into their clinical training, but many of their comments described it as beneficial. There were no significant differences between third- and fourth-year students in how well they integrated this knowledge. More research is needed to understand faculty views and find ways to better integrate science into the curriculum at the faculty level.

Blanco D, Ripat J, MacDonald L, Ateah C, Wener P. Development of client-centredness: Perceptions of interprofessional health care. *Can J Dent Hyg.* **2025;59(1):36–44**

High-quality health care involves professionals working together. To do this well, educators need to ensure students develop strong client-centred knowledge, skills, values, and attitudes. This study aimed to use storytelling and reflection to understand how health care students develop a client-centred approach. Six students from different health disciplines participated in 3 focus group sessions over 5 months to talk about their client-centred experiences. Digital stories were used to spark discussion. When the focus group data were analyzed, 4 themes emerged: 1) building on existing professional knowledge; 2) seeing client-centredness as an evolving process; 3) sharing stories; and 4) reflecting as a critical process. Using storytelling and reflection in an interprofessional education setting helped students explore and understand client-centredness better. Health care students benefit from storytelling and open discussions, which help them learn from each other and develop a client-centred approach beyond just knowledge and skills.

Sasikala D, Baghkomeh PN, Farzan JM, Nuvvala S, Arockiam S. Use of social media by parents as a resource for knowledge on children's oral health: a systematic review. *Can J Dent Hyg.* **2025;59(1):45–58.**

This review looked at how parents use social media to educate themselves on their children's oral health and examined the quality of the content shared on these platforms. Researchers searched the PubMed, Google Scholar, Scopus, Web of Science, and Embase databases for relevant studies published from 1998 to 2023. Of the 26 studies that met the inclusion criteria, 5 studies (19%) found that parents who actively use social media for educational purposes can improve their children's oral health habits. Nineteen studies (73%) recommended that oral health professionals create informative and standardized videos for social media. Two studies (8%) suggested that social media helps parents promote oral health in an accessible and engaging way. The review shows that social media plays an important role in informing, educating, and motivating parents to improve their children's oral health, but the information needs to be standardized.

Stefani CM, de Almeida de Lima A, Stefani FM, Kung JY, Flores-Mir C, Compton SM. Effectiveness of orofacial myofunctional therapy in improving orofacial function and oral habits: a scoping review. *Can J Dent Hyg***. 2025;59(1):59–72**.

This review aimed to find out what evidence exists to support the use of orofacial myofunctional therapy (OMT) in treating orofacial myofunctional disorders (OMDs) that affect the function of facial structures and oral habits. Six databases and grey literature were searched for relevant studies. Two independent reviewers screened the records in two phases, and one extracted the data. The evidence level of each article was assessed using the Oxford CEBM Levels of Evidence. Of 11,518 records screened, 58 were included (50 primary studies and 8 reviews). The OMDs considered in those studies were ankyloglossia, atypical swallowing, lip incompetence, mouth breathing, non-nutritive sucking habit, and low tongue position at rest. Only 11 studies (19%) were randomized controlled trials. Most did not have a proper randomization process or describe allocation concealment, and half were open-label studies. Although 86% of primary studies reported positive results using OMT, only 9 of 12 comparisons were considered plausible (6 with level 3 evidence, 2 with level 2, and 1 with level 1). None confirmed the effectiveness of OMT. More well-designed clinical trials with larger samples and longer follow-ups are needed to provide the high-level evidence required to confirm OMT's effectiveness in treating OMDs.