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Ontario Medical Students Association
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POSITION PAPER

A Proposal for an Artificial Intelligence Curriculum in Medical Education

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SUMMARY

Background

Artificial intelligence (AI) has several definitions and use cases, but at its core is defined as the simulation of human intelligence by a system or a machine. Healthcare in Canada and around the world is rapidly being reshaped by the integration of AI-powered scribes, predictive analytics, and other digital health applications. As these technologies become more widespread, it is critical for medical students to develop the capabilities to navigate this evolving landscape in the interest of high-quality patient care and medical competency. A deeper understanding of AI will facilitate students' abilities to critically appraise these tools, including their limitations, biases, and appropriate clinical applications, while minimizing inappropriate implementation. Despite this need, formal AI education remains limited in Ontario medical schools. The Ontario Medical Students Association (OMSA) is uniquely positioned to address this gap, leveraging its role as an advocate to ensure that all medical students in the province are equally equipped to effectively engage with AI, digital health, and health informatics.

Recommendations

The Ontario Medical Students Association recommends the following:

1. That digital health and health informatics leadership are consulted to understand their recommendations for the creation of an artificial intelligence in medicine curriculum.
2. That the authors and OMSA leadership develop standardized criteria for a medical education curriculum to ensure that Ontario medical students receive equitable training, and advocate with leadership at Ontario medical schools to integrate the above recommendations and resources into the curriculum at each school.
3. That all Ontario medical students be given access to a training workshop, published by the OMA in collaboration with OMSA, with all students who complete it receiving a certificate of completion.

INTRODUCTION

Artificial intelligence (AI) has several definitions and use cases, but at its core is defined as the simulation of human intelligence by a system or a machine (Xu et al., 2021). Today, from AI scribes to predictive analytic models and beyond, AI and digital health applications are rapidly reshaping healthcare on both domestic and global scales. AI-powered tools such as automated clinical decision support systems, machine learning-based diagnostics, and virtual patient simulations are becoming more prevalent in medical practice (Paranjape et al., 2019; Civaner et al., 2022; Seth et al., 2023). As AI continues to reshape the medical field, medical students and future physicians must develop a strong foundation in AI literacy to engage with these technologies critically and responsibly.

A recent review on the use of AI in medical education highlighted its diverse applications, including AI-based standardized patients, virtual reality, clinical simulations, and emergency response skills assessments (Narayanan et al., 2023). Despite these advancements, there is currently no standardized AI curriculum across Ontario medical schools, even as AI adoption in healthcare accelerates. An inaugural Canadian paper on AI in medical education underscored the urgent need for competency development in undergraduate curricula (Bilimoria et al., 2019). While it identified major gaps, such as the absence of formal curricular opportunities and ethical training, it did not anticipate the rapid expansion of generative AI (GenAI), regulatory frameworks, and AI-driven medical tools (Xie et al., 2025). In fact, the 2024 OMSA educational survey found that over 60% of Ontario medical students felt unprepared or neutral in their understanding and application of health informatics (OMSA, 2024). This further highlights a clear gap in medical education that must be addressed, to ensure medical students and future physicians are equipped with essential digital health competencies.

In response, institutions such as NOSM University have since initiated preliminary structured AI policies, including the Guidelines for the Use of Generative AI in Teaching and Learning, to navigate GenAI's role in medical education and evaluation, clinical applications, and administrative workflows (NOSMU, 2025). Additionally, Health Canada's evolving stance on AI in medical devices and the proposed Artificial Intelligence and Data Act (AIDA) emphasize the growing need for regulatory literacy among future physicians (CMPA, 2024). However, despite these developments, the majority of Ontario medical schools still lack standardized AI curricula, leading to fragmented knowledge across institutions (UGME Survey Data, 2025).

Despite the increasing integration of AI into clinical practice, AI education remains a glaring gap in medical curricula worldwide. A cross-sectional study assessing medical students' AI literacy found that most students had limited exposure to AI and lacked a fundamental understanding of its applications in medicine (Bisdas et al., 2022). In a recent pan-Canadian survey, 85% of students reported having no formal educational opportunities related to AI, while only 4.8% indicated receiving formal exposure as part of their curriculum (Pucchio et al., 2021).

This deficit places future physicians at risk of misinterpreting AI-generated outputs, failing to identify biases, and relying on AI tools without understanding their limitations (Goh et al., 2021). Biases in AI can exacerbate pre-existing disparities related to socioeconomic status, race, ethnicity, religion, gender, disability, and sexual orientation (Mittermaier et al., 2023). AI algorithms are often trained on data from specific population groups, which may limit their generalizability to broader or more diverse populations. For instance, an algorithm trained exclusively on European datasets may demonstrate limited generalizability when applied to Canada's genetically diverse population. Bias can exist at any stage, from data collection to model implementation. These examples represent just a fraction of the broader issue of bias in AI models, highlighting the need for medical students to critically understand the limitations and implications of such technologies in clinical practice.

Given AI's growing impact, the Ontario Medical Students Association (OMSA) recognizes the urgent need to implement a structured AI curriculum in medical education. To standardize AI education in medical training, competency frameworks must outline essential AI knowledge, skills, and attitudes for medical students (Maddox et al., 2019). A scoping review of AI curricula for medical education suggested a multi-tiered approach, incorporating foundational AI knowledge, applied skills, and ethical considerations (Giansanti, 2023). Competencies should include technical proficiency in AI tools, data literacy, patient confidentiality, data privacy, understanding AI's clinical applications, and the ability to critique AI outputs critically (Civaner et al., 2022). Regarding presumed patient confidentiality, one study demonstrated that patient data can be re-identified from datasets that were previously de-identified, further highlighting the need for scrutiny and appropriate application of PHIPA (Personal Health Information Protection Act) guidelines (Janmey et al., 2018). Establishing a standardized competency framework thus ensures that all medical students acquire a consistent level of AI education, regardless of their institution.

It has also been suggested that traditional passive learning methods are insufficient for teaching AI in medicine. Active learning strategies, such as flipped classrooms and case-based learning, have been displayed to be effective in medical education (Goh et al., 2021). A recent study demonstrated the benefits of a flipped classroom approach for AI literacy training, particularly when applied to medical imaging (Chan et al., 2021). Integrating case studies from radiology, pathology, and pharmacology allows students to see AI in action, fostering a deeper understanding of how AI can enhance diagnostic accuracy and efficiency (Giansanti, 2023). Additionally, incorporating real-world AI applications in electronic health records (EHRs) and predictive analytics will provide students with hands-on experience in utilizing AI for patient care (Seth et al., 2023).

Medical education in jurisdictions beyond Ontario are reacting to this changing landscape through implementing tools involving simulated and virtual learning with AI. For instance, AI-powered virtual patient simulations implemented in American educational institutions offer medical students opportunities to refine diagnostic reasoning, clinical decision-making, and communication skills in a controlled environment (Paranjape et al., 2019). These simulated interactions have been shown to enhance medical interview skills and improve students' ability to manage complex cases (Giansanti, 2023). By utilizing AI-based chatbots or language models, students can engage in dynamic patient interactions and receive automated feedback on their performance (Bisdas et al., 2022). These technologies provide a safe space for students to practice and refine their clinical skills while reducing cognitive load and improving retention (Chan et al., 2021).

Beyond theoretical understanding, medical students should actively engage with AI as both users and developers. One innovative approach involves placing students in the role of AI designers, requiring them to evaluate algorithmic performance and consider real-world implementation challenges (Goh et al., 2021). A study exploring AI-based clinical decision support system (CDSS) training demonstrated that students who engaged in AI development activities exhibited greater critical thinking and problem-solving skills in digital health (Chan et al., 2021). These exercises allow students to recognize AI's limitations, appreciate its decision-making processes, and develop a balanced perspective on AI-assisted clinical practice.

Before implementing recommendations, understanding medical students' perceptions of AI is critical for designing an effective curriculum. One study examining medical students' perceptions of AI found that many held unrealistic expectations regarding its capabilities. (Bisdas et al., 2022). Both negative and positive attitudes towards AI were demonstrated, as indicated by their lack of education, exposure, and technical understanding (Bisdas et al., 2022). Addressing these misconceptions through structured AI education can help shape a balanced and evidence-based perspective, ensuring that students neither over-rely on AI nor dismiss its utility in clinical practice (Paranjape et al., 2019).

To ensure the sustainability of AI education in medical curricula, continuous evaluation and adaptation are necessary. A two-year study on web-based AI education for medical students emphasized the importance of iterative curriculum updates based on student feedback (Paranjape et al., 2019). By integrating feedback mechanisms, medical educators can refine AI curricula over time, ensuring relevance and effectiveness in an ever-evolving digital healthcare landscape.

As AI becomes increasingly embedded in clinical decision-making, an updated position paper is therefore necessary to address emerging ethical, regulatory, and pedagogical challenges, ensuring medical students are equitably equipped to critically engage with AI in both educational and clinical contexts. A deeper understanding of AI will ultimately facilitate students' abilities to critically appraise these tools, including their limitations, biases, and appropriate clinical applications, while minimizing inappropriate implementation.

This proposal outlines a comprehensive AI education framework, integrating curriculum design, ethical considerations, interactive learning, competency frameworks, and innovative AI-assisted teaching methods to equip future medical professionals with the necessary knowledge and skills.

PRINCIPLES

The Ontario Medical Students Association makes its recommendations using the following guiding principles:

1. Ethical accountability: promoting responsible, patient-centred use of AI in healthcare.
2. Equity: ensuring all medical students in Ontario have equitable access to this education.
3. Advocacy: empowering medical students to engage with AI in healthcare.
4. Leadership: empowering medical students to be future clinical champions in this space.

RECOMMENDATIONS

The Ontario Medical Students Association recommends the following:

1. **That digital health and health informatics leadership are consulted to understand their recommendations for the creation of an artificial intelligence in medicine curriculum.**

Through consulting with leading experts in health informatics and AI, we can understand necessary elements of an effective, evidence-based, and relevant AI curriculum within a medical education setting. In a Canada-based study, Singla et al. consulted a panel of 18 experts in health and AI from diverse regions and educational backgrounds to determine essential AI learning competencies in medicine. Key curricular components were identified as ethics, law, theory, application, communication, collaboration, and quality improvement (Singla et al., 2024). Another qualitative study interviewed 38 participants, including 6 AI experts, and identified similarities and differences in what was deemed important in developing a medical AI curriculum (Moldt et al., 2024). These studies illustrate the importance and practicality of engaging with a diverse panel of experts, students, and educational specialists in the process of developing a well-rounded AI in medicine curriculum.

2. **That the authors and OMSA leadership develop standardized criteria for a medical education curriculum to ensure that Ontario medical students receive equitable training, and advocate with leadership at Ontario medical schools to integrate the above recommendations and resources into the curriculum at each school.**

Medical curricula in Ontario have been developed according to Medical Council of Canada (MCC) guidelines and are informed by CanMEDS competencies (Medical Council of Canada, 2024; “CanMEDS Framework,” n.d.). Standardization of curricula is crucial to ensuring consistent competency across medical graduates and equitable educational opportunities for all medical students in Ontario. Currently, there is significant variability in AI education in medical schools globally, ranging from none or basic introductory sessions to structured longitudinal programs (Ng et al., 2023). In Singla et al.’s framework for an AI in medicine curriculum, informed by the panel’s perspective on the most important components, elements such as ethics, law, theory, application, communication, collaboration, and quality improvement were identified. Each element was then mapped to the Association of Faculties of Medicine of Canada (AFMC) Entrustable Professional Activities (EPAs), which are a set of nationally standardized clinical tasks that medical students in Canada must be able to perform independently before entering residency. Furthermore, curricular elements were overlapped with CanMEDS roles to illustrate the alignment of an AI curriculum with standardized medical education guidelines (Singla et al., 2024). Similarly in Ontario, an AI in medicine curriculum should be developed to actively align with CanMEDS and MCC core competencies in order to ensure a uniform understanding of and equitable access to the educational material.

Advocacy to medical school leadership around developing AI in medicine curricula at Ontario medical schools is crucial for gaining buy-in and ensuring the longevity of programs. The importance of institutional investment was highlighted by the Association of American Medical Colleges (AAMC) in their mission statement, declaring that medical schools have a responsibility to cultivate interdisciplinary collaborations to develop diverse, robust, and current AI curricula aligned with the needs of their students (AAMC, n.d.). In Ontario, OMSA can undertake an active role in liaising with medical schools to highlight the importance of AI in medicine education and the demand of medical students, as well as the healthcare system, for this unique skill set. OMSA and the authors can also actively collaborate with schools to establish partnerships with leading experts across Canada from diverse fields including, but not limited to, AI, data science, ethics, medical education, and clinical practice.

3. **That all Ontario medical students be given access to a training workshop, published by the OMA in collaboration with OMSA, with all students who complete it receiving a certificate of completion.**

All Ontario medical students should have access to a standardized training workshop, developed and published by OMSA, to enhance their abilities to critically appraise AI tools. The AI training workshop can provide evidence-based education on key topics relevant to AI, such as theory, application, and ethics of AI use in medicine. Upon successful completion, participants will receive an official certificate that can be used in various settings to demonstrate competency in this topic. This is an innovative mode of delivering AI in medicine education. Adjacent examples to this concept include Harvard Medical School’s "Leading AI Innovation in Health Care" postgraduate certificate program and University of Illinois Urbana-Champaign "AI in Medicine Certificate" program, both of which were designed with healthcare professionals, and not medical students, as the primary audience (Paulus & Ravi, 2024).

Implementation Strategy

Recommendation 1: That digital health and health informatics leadership are consulted to understand their recommendations for the creation of an artificial intelligence in medicine curriculum.

This objective is in support of MCCQE objective 126, to manage health information while

recognizing and adapting to the limitations of current digital technology systems. Although this objective is focused on clinical informatics, there is little focus on AI. Therefore, consultation with leadership can serve two objectives: (1) to support the addition of AI to this objective, and (2) to establish partnerships with existing experts and organizations to support Recommendation 2 and 3 outlined in this document. This involves a several stage process.

1. Identifying key stakeholders: there are several organizations that specialize in AI and/or digital health in Ontario. Selected organizations are specified below. Snowball sampling can be used to further connect with relevant stakeholders.
    a. Institute of Health Policy, Management, and Evaluation, University of Toronto
    b. Vector Institute, University of Toronto
    c. McMaster Health Innovation Hub, McMaster University
    d. Ontario Health, Ontario Health
    e. Clinician practitioners in Ontario who have expertise in both AI and medical education may serve as a further resource.
    f. Additional key stakeholders who may be identified at a later date.
2. Consultation: in order to synthesize information effectively, OMSA and the authors should generate a series of consultative questions for stakeholders identified above. These will help identify key competencies in AI that are most relevant to incorporate into the medical curriculum:
    a. What competencies should medical students develop in AI literacy?
    b. How should medical students be taught about ethics in the context of AI?
    c. How can we ensure that AI education adapts against a rapidly evolving landscape of integration into healthcare?
    d. How would schools go about assessing competence in AI literacy?
3. Curriculum feedback and iteration: regular engagement with particular stakeholders will ensure continuous alignment with this rapidly changing field. Annual consultative meetings or surveys can be used as tools to gather feedback.

Recommendation 2: That the authors and OMSA leadership develop standardized criteria for a medical education curriculum to ensure that Ontario medical students receive equitable training, and advocate with leadership at Ontario medical schools to integrate the above recommendations and resources into the curriculum at each school.

The creation of a standardized curriculum structure, with a suggested timeline of completion of 1 year, will help promote equitable access to AI education for Ontario medical students irrespective of home school. The following is a proposed structure that can be revised as required upon consultation with stakeholders (see Recommendation 1). Additionally, consultation with Ontario medical school leadership may both strengthen and provide insight into the feasibility of proposed objectives. This will be done in collaboration with the Curriculum and Innovation Development Committee (CIDC).

1. Learning outcomes: A core set of learning outcomes for AI education includes foundational topics in AI such as machine learning, neural networks, and natural language processing, as well as their applications in diagnostics, treatment planning, and patient management. An emphasis on the ethical implications of AI is also critical. This includes bias, data privacy, and the transparency of AI algorithms in clinical settings. It is also relevant for students to learn about the responsibilities of healthcare providers in using AI tools safely and effectively.
2. Curriculum structure: The AI curriculum can be structured into modules, adapted to the existing curriculum at each medical school. AI education can be embedded into existing medical school courses, such as clinical decision-making, bioethics, and patient communication. A broad proposal of modules includes:

    a. Introduction to AI: History, key concepts, and types of AI used in healthcare.
    b. Clinical Applications of AI: AI-powered diagnostic tools, predictive analytics in patient care, and machine learning applications in medical imaging.
    c. AI and Ethical Practice: Exploring AI's potential biases, ethical frameworks for AI decision-making, and the impact of AI on healthcare equity.
3. Review and adaptation: As per recommendation 1, it is critical for AI curriculum to remain relevant. As such, this curriculum should be annually reviewed by an OMSA committee or representative in consultation with experts in the field.

A critical responsibility will be for OMSA to advocate for the integration of AI education across the curricula of all Ontario medical schools. This advocacy will aim to ensure that AI is equally integrated into all medical schools and that all students have equal access to high-quality, standardized training in this area, regardless of home school. OMSA or representatives of Ontario medical students will engage with medical school leadership, including deans and curriculum planners, to present an AI curriculum proposal and advocate for the implementation of proposed objectives within the curricula of Ontario medical schools.

Short-term plan for implementation: to present this paper at the Council of Ontario Faculties of Medicine (COFM) meeting to initiate cross-institutional dialogue around AI in medical education. This will help raise awareness about AI in medicine and highlight existing curricular gaps, with the goal of sparking discussion around the importance of AI in medical training.

Long-term plan for implementation: Work with COFM to develop a recurring agenda item focused on AI in medical education, allowing for progress to be tracked across schools and encouraging the adoption of standardized AI learning objectives across medical schools.

Recommendation 3: That all Ontario medical students be given access to a training workshop, published by the OMA in collaboration with OMSA, with all students who complete it receiving a certificate of completion.

To ensure that all students have rapid access to basic AI teaching regardless of their level of training and/or home school's capacity to implement formal AI teaching, OMSA should publish a one-hour AI training workshop.

1. Content: This workshop will be developed in collaboration with experts (see recommendation 1) and follow standardized learning objectives (see recommendation 2). It should have both a lecture and interactive component, such as a quiz or case study. The content of the workshop will be finalized following a needs analysis conducted in collaboration with experts (see recommendation 1). Sample topics may include, but are not limited to: AI in clinical practice, AI in administrative tasks, AI in medical education, and so forth.
2. Delivery: The workshop will be available online, making it accessible to all Ontario medical students, regardless of their location.
3. Certification: Students who successfully complete the workshop will receive an OMSA-issued certificate. This certificate will serve as proof of basic AI competency and can be included in students' professional portfolios.
4. Feedback: Data will be collected on student perception of what is beneficial and what is not beneficial. The workshop can be revised based on both student feedback as well as important changes in content (see recommendation 1 and recommendation 2). Specific outcomes related to the workshop will also be collected, including surveys pre/post workshop to identify comfort levels as well as student knowledge and confidence using AI.

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