




## Article

# Accelerating the Appropriate Adoption of Artificial Intelligence in Health Care: Prioritizing IDEA to Champion a Collaborative Educational Approach in a Stressed System

Bemnet Teferi <sup>1</sup>, Maram Omar <sup>1</sup>, Tharshini Jeyakumar <sup>1,2,3</sup>, Rebecca Charow <sup>1,2,3</sup> , Caitlin Gillan <sup>1</sup>, Jessica Jardine <sup>1</sup>, Jane Mattson <sup>4</sup> , Azra Dhalla <sup>5</sup>, Sedef Akinli Kocak <sup>5</sup>, Mohammad Salhia <sup>6</sup>, Bryn Davies <sup>1</sup> , Megan Clare <sup>1</sup>, Sarah Younus <sup>1</sup> and David Wiljer <sup>1,2,\*</sup>

<sup>1</sup> University Health Network, Toronto, ON M5G 2C4, Canada

<sup>2</sup> Institute of Health Policy, Management and Evaluation, University of Toronto, Toronto, ON M5S 1A1, Canada

<sup>3</sup> Department of Medicine, University of Toronto, Toronto, ON M5S 1A1, Canada

<sup>4</sup> Michener Institute of Education, University Health Network, Toronto, ON M5T 1V4, Canada

<sup>5</sup> Vector Institute, Toronto, ON M5G 0C6, Canada

<sup>6</sup> Rotman School of Management, University of Toronto, Toronto, ON M5S 1A1, Canada

\* Correspondence: david.wiljer@uhn.ca

**Abstract:** In a dynamic healthcare landscape, healthcare professionals (HCPs) must be proficient in artificial intelligence (AI). The Clinician Champions Program was created to address these AI education gaps. Over six weeks, three cohorts participated in this interprofessional program, featuring weekly assignments and a capstone project. This study employs a qualitative descriptive approach to assess the program's effectiveness in enhancing knowledge, confidence, and skills in AI integration. With a 78% completion rate among 158 clinicians, the program utilized engaging methods, including case studies, capstone projects, and reflective learning to meet diverse learning needs. It also emphasized ethical considerations (e.g., IDEA framework) and the importance of extending educational opportunities to various healthcare professionals. The findings highlight the necessity of a diverse, equitable, and inclusive learning environment to bridge AI education gaps in healthcare. The program's success supports the idea that enhancing AI knowledge and fostering confidence can lead to meaningful AI discussions in healthcare practice. This research offers insights for educators and institutions aiming to address the evolving healthcare needs through innovative interprofessional educational approaches.

**Keywords:** AI in healthcare; collaborative learning; interprofessional education; healthcare professional education; inclusive learning; program evaluation



**Citation:** Teferi, B.; Omar, M.; Jeyakumar, T.; Charow, R.; Gillan, C.; Jardine, J.; Mattson, J.; Dhalla, A.; Kocak, S.A.; Salhia, M.; et al. Accelerating the Appropriate Adoption of Artificial Intelligence in Health Care: Prioritizing IDEA to Champion a Collaborative Educational Approach in a Stressed System. *Educ. Sci.* **2024**, *14*, 39. <https://doi.org/10.3390/educsci14010039>

Academic Editor: James Albright

Received: 3 November 2023

Revised: 13 December 2023

Accepted: 15 December 2023

Published: 29 December 2023



**Copyright:** © 2023 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

## 1. Introduction

In the rapidly evolving landscape of healthcare, where technological advancements such as Artificial Intelligence (AI) are reshaping clinical practices and patient care, the need for comprehensive education among clinicians and healthcare professionals has become paramount. A knowledge gap exists concerning the implementation of AI in healthcare practice and the varying levels of acceptance of this technology among healthcare professionals (HCPs) and patients [1]. The lack of AI literacy among HCPs and the continuous onset of emerging technologies merits the immediate need for AI education programs [2]. HCPs must be able to adapt to the use of these technologies and tools while providing compassionate, patient-centered care. Lomis et al. (2021) suggest the need for interprofessional planning and the delivery of AI education among policymakers, educators, and leaders [3]. The authors further assert that understanding AI as a tool to enhance HCP's clinical work, instead of replacing it entirely, could address some of the hesitancy towards AI adoption and implementation in practice.

Although promising transformative benefits, the adoption of AI into healthcare settings presents a multitude of challenges that need to be addressed. Barriers to the successful adoption of AI technologies include concerns about data security and privacy, resistance to change, technical complexities, and a need for standardized guidelines for AI implementation in clinical practice [1]. Recognizing these challenges, educational programs have emerged as a strategic solution to equip HCPs with the necessary skills and insights to navigate this evolving landscape [4,5]. These programs are designed to bridge the gap between current clinical practices and the demands of AI integration and foster a deep understanding of the potential benefits and ethical considerations associated with AI in healthcare [2,6]. In essence, these educational initiatives play a pivotal role in enhancing HCPs' readiness to harness the potential of AI while effectively addressing the obstacles that impede its seamless adoption in the clinical environment.

An AI educational program was introduced to address the need to transform practicing HCPs' skillset. The program delves into the essentiality of AI education within the healthcare sector, addressing the imperative to facilitate constructive dialogues and foster knowledge exchange among practitioners. With an emphasis on ensuring HCPs' competence and proficiency, this paper underlines the significance of AI education to enable clinicians to remain relevant in a dynamic healthcare environment. Beyond individual relevance, the broader importance of education lies in its potential to drive transformative change in healthcare systems, marked by principles of equity, inclusion, diversity, and accessibility. Through this initiative, we aim to investigate the development and implementation of AI education, designed to enhance the competencies of healthcare professionals, and instill values of health equity, diversity, and inclusivity. The goal is to improve health outcomes and comprehensive healthcare systems with the appropriate and responsible use of AI.

The primary objective of this evaluation is to assess the effectiveness and impact of the AI for the Clinician Champions Certificate Program as a foundational AI course to accelerate the adoption and implementation of AI in healthcare. Additionally, by using a health equity lens, the evaluation specifically aims to investigate the program's ability to foster equitable learning environments, promote inclusion, and empower clinicians to implement AI technologies in a manner that ensures equitable healthcare outcomes for all populations. By employing qualitative research methods, this evaluation examines how the program addresses gaps in AI knowledge and skills among clinicians from diverse backgrounds.

## **2. Materials and Methods**

### *2.1. Overall Study Design*

As part of a larger multi-methods project, the study design follows a knowledge creation cycle grounded in the Knowledge-to-Action (KTA) framework. This framework takes an integrative knowledge translation approach into action, encompassing key stages of knowledge creation, synthesis, and application [7]. The knowledge funnel approach is employed to refine the knowledge base, guiding the development of evidence-based AI education interventions.

### *2.2. Evaluation Approach*

This study employs a qualitative descriptive approach to investigate the effectiveness of AI for an interprofessional Clinician Champions Certificate Program. The evaluation approach integrates the Health Equity and Inclusion theoretical framework designed by the Centre of Addictions and Mental Health, ensuring a focus on equitable access and outcomes. The ADDIE (Analysis, Design, Development, Implementation, and Evaluation) instructional design model provides a structured framework for developing and refining the AI educational program [8]. This study received the Research Ethics Board approval of the ethics boards at the University Health Network (REB #20-6148.7).

### 2.3. AI Education Intervention

By employing the knowledge funnel approach, integrating theoretical frameworks, and leveraging the ADDIE model, this study aims to drive transformational change in the healthcare system. The AI for Clinician Champions Certificate Program is designed to address the identified needs of learners and provide comprehensive education on AI in healthcare. The curriculum covers AI fundamentals, AI in healthcare, ethics, data science, and the challenges and opportunities associated with AI. The program incorporates both synchronous and asynchronous elements to facilitate interactive learning experiences. Learners engage in activities such as reflection exercises, participant-led discussions, and sharing of course materials. The program design and delivery include input from subject matter experts and stakeholders. The educational program is implemented in three cohorts, allowing iterative improvements based on participant feedback and evaluation findings.

### 2.4. Interdisciplinary Study Team

An interdisciplinary study team comprising experts from healthcare, education, AI, and evaluation collaboratively contributed to the research project. This team brought together diverse backgrounds and expertise to facilitate a comprehensive and rigorous approach to integrating and evaluating AI education interventions.

### 2.5. Participants

A maximum purposive sampling strategy was employed for participant recruitment to ensure a comprehensive representation. This involved selecting 10–50 individuals who had completed the Clinician Champions Program. Written consent was obtained from each participant prior to their involvement, including participation in interviews and pre/post survey data for research purposes. These participants were invited to take part in interviews. This approach facilitated the inclusion of a diverse and relevant range of perspectives from participants who completed the program.

### 2.6. Data Collection

Semi-structured interviews were conducted with both learners and instructors at the end of the program. These one-on-one interviews were conducted and recorded virtually using Microsoft Teams by research analysts (RA) and program leads. The interview was between 30 and 60 min with questions guided by the Reach, Effectiveness, Adoption, Implementation, and Maintenance framework (RE-AIM) to assess learners' and instructors' thoughts and perceptions of the program and its potential impact (See Appendix A for Interview Guide) [9].

### 2.7. Data Analysis

The semi-structured interviews were transcribed using Otter.ai and were cleaned by the RA for any identifying information, then inputted into QSR NVivo for analysis. Data were coded by two RAs deductively using the RE-AIM framework. Once all data were coded, the RAs used Braun and Clarke's process for thematic analysis to inductively analyze data to generate themes relating to the coded data on learner's thoughts and perceptions of the program and its impacts [10].

## 3. Results

### 3.1. Demographics

For the Clinician Champions Program, approximately 158 clinicians were registered for the course and about 116 of them completed the course in full (73% completion rate; see Table 1). The majority of learners were women between the ages of 36 and 45 years old. Participating clinicians' education levels ranged from master's to PhD and professional degrees, with the majority of clinicians identifying as physicians, nurses, or therapists. While the majority of participants were located in Ontario, a few clinicians were based in

provinces such as Alberta, British Columbia, Quebec, Manitoba, Nova Scotia, and Prince Edward Island.

**Table 1.** Overview of Clinician Champion’s Program Learners.

Number of Learners	Cohort 1	Cohort 2
Registered	48	55
Completed	38	40

3.2. Program Evaluation

The Clinician Champions Program built a strong mindset and a foundational skillset for HCPs. The Clinician Champions Program had three distinct iterations in which it aimed to enhance their understanding of AI and begin to prepare them for adopting AI into healthcare. The program successfully (1) created an engaging curriculum using case-studies, hands-on learning, capstone projects, and reflective learning, which appropriately met their learning needs; (2) reinforced the importance of prioritizing ethical considerations (e.g., IDEA); and (3) underscored the significance of extending educational opportunities to a dynamic range of health professionals in order to encourage sustained change in their practice (i.e., improving their knowledge of AI and confidence to join conversations on AI in their workplace).

From those who completed the program, 18 clinicians consented to be interviewed and 12 interviews were conducted post-program for evaluation. Learners highlighted several motivations for participating in this program, including, but not limited to, the introduction to technical aspects of AI (e.g., reading datasets, machine learning, etc.), how to implement AI in clinical practice and its potential and impact, as well as the ethical implications of AI in healthcare.

A number of themes were generated from the deductive analysis using the RE-AIM framework followed by inductive thematic analysis; in particular, the following three themes were generated from learners’ perspectives following the evaluation of the program: (1) enhancing learner competency in AI through accessible course design for continuing professional development (CPD); (2) promoting diversity in perspectives for AI education; and (3) guiding all learners towards future directions in AI implementation (refer to Table 2 for a summary of themes).

**Table 2.** Summary of Program Evaluation Themes and Quote References.

The Clinician Champions Program Evaluation Themes	Subthemes	Learners’ ID
Enhancing Learner Competency in AI through Accessible Course Design for Continuing Professional Development	<ul style="list-style-type: none"><li>• Tailoring course delivery methods to reach a diverse audience and facilitate effective learning</li><li>• Providing relevant and appropriate content to meet learners’ needs</li></ul>	[C15], [C22]
Promoting Diversity in Perspectives for AI Education	<ul style="list-style-type: none"><li>• Engaged in collaborative curriculum for multidisciplinary learning</li><li>• Cultivated opportunities to engage with multidisciplinary teams using learning tools</li></ul>	[C45], [C06], [C36]
Guiding All Learners towards Future Directions in AI Implementation	<ul style="list-style-type: none"><li>• Selecting relevant course content that supports AI preparedness</li><li>• Facilitating effective communication for interprofessional collaboration</li></ul>	[C36], [C06], [C36]

**Theme 1:** *Enhancing Learner Competency in AI through Accessible Course Design for Continuing Professional Development (CPD).*

The Clinician Champions Program aimed to provide inclusive and effective learning opportunities for a diverse audience. The program had an accommodating course delivery allowing it to effectively reach audiences from various specialties; the course material was disseminated through multiple methods to ensure accessibility. For instance, the content was made available on an online platform, and the synchronous online lectures were scheduled in the evenings to accommodate the busy work schedules of the participants.

“...because it was presented in both written and there was a video content for the assignments, and you could choose to access additional videos or resources, I thought that that was helpful for different learning styles. I don’t know if people were made aware of the features of Zoom... of turning on things like transcription or that kind of thing”. [C15]

In addition to the use of multiple platforms for asynchronous learning and Zoom for synchronous learning, they incorporated multiple delivery modes, including written materials and video content, catering to different learning styles. This approach was highlighted by a participant who appreciated the availability of additional resources and the option to access features like transcription on virtual platforms (e.g., Zoom). Moreover, participants emphasized the benefits of this course’s virtual format and delivery as it eliminated travel times and allowed them to participate and incorporate it into their demanding clinical work schedules. The use of virtual and multiple delivery modes allowed for flexibility with the deadlines and access to recordings after the synchronous online lectures for clinicians who were not able to attend due to their work commitments.

To meet learners’ needs accurately, it was important to provide relevant and appropriate content; the course was designed to address varying levels of AI knowledge among participants with interprofessional considerations. In addition to the synchronous lectures delivered by experts in the field, participants were also able to network, share progress on their projects, and discuss course material from their experiences and perspectives in breakout rooms.

“I consider my knowledge in AI going into the course probably very basic, like very below basic, like very rudimentary. And I find coming out, I feel my knowledge base is much higher”. [C22]

Along with the interdisciplinary perspectives involved in the synchronous discussion, the course provided both teaching assistant (TA) office hours and online module tutorials where TAs offered tailored support to learners with different technical skills, assisting them in making informed decisions within their projects. The provision of constructive feedback from the TAs not only improved learners’ confidence but also enhanced their knowledge base in AI.

**Theme 2:** *Promoting Diversity in Perspectives for AI Education.*

The program was developed to provide foundational AI skillsets and competencies for all learners in healthcare regardless of previous knowledge. Therefore, a strong focus on promoting diversity in perspectives and collaboration among participants was recognized while developing and implementing the program. An interdisciplinary education team was recognized for the importance of diversity in the delivery of AI education and course content. Participants emphasized that the presence of an instructor, course director, expert speakers, and multiple tutorial assistants ranging in healthcare experience allowed for better support and guidance throughout the course, ensuring questions and concerns were addressed.

“The way [the instructor] presented the course was based on his personal journey through AI. And I don’t think you can ask for more, you know, it was his hard

learned lessons on how to build a successful, not AI program, but how to develop a successful attitude towards AI. [Instructor] described [their] challenges. And was open to every single thing that we were talking about". [C45]

Most importantly, the interdisciplinary background of the educational team was highly valued, as it provided a range of perspectives and expertise from various healthcare professions, enriching the learning experience.

"The support from the TAs, also the labs were interesting. I did really enjoy that one class where they had guests come over, and kind of explain their AI business plan and or like kind of what they do, and how it's currently being run or used and why it's helpful. So I think it just gave a little bit more of a practicality in regards to what we're learning". [C06]

To facilitate discussions and engagement, the program employed various course delivery modes, including a discussion board for assignment responses and breakout groups for case studies and reflections. This approach facilitated the sharing of knowledge and experiences among HCPs from different backgrounds, enabling them to enhance their understanding of AI and its practical use in healthcare from various perspectives.

The importance of collaboration in the delivery of the Clinician Champions Program and adjustments were made to foster collaboration among participants. These platforms allowed participants to interact, share their insights, and learn from each other's perspectives. Collaborative learning activities, such as group discussions and case-study exercises, were employed to facilitate multidisciplinary learning. Features such as the chat and forums on the platforms were used to facilitate the discussion amongst learners and with the educators (e.g., TAs and experts). The robust chat discussions during synchronous sessions with TAs, instructors, and learners were indeed a valuable aspect of the program. They facilitated active engagement with practical examples and case studies, enhancing participants' understanding and the application of AI technical skills. A few first- and second-cohort participants identified opportunities to better facilitate learning based on the course content. For instance, participants noted that a more streamlined approach to content delivery could enhance the overall program.

"the structure of delivery of content from week to week to week, could probably be a bit more simplified, easier to digest and gradually increasing and maybe decrease the total amount of content. I think this course would be stellar". [C36]

Hence, the program length was extended from 6 to 8 weeks for the third cohort, providing additional time for in-depth discussions, collaborative activities, and knowledge exchange. This extension allowed participants to delve deeper into the subject matter and engage in more comprehensive learning experiences. Furthermore, collaboration was promoted through the continued use of the increased service of an online discussion board for assignment feedback and breakout groups for case studies and reflections. These platforms facilitated ongoing interaction and collaboration among participants, encouraging them to share insights, discuss challenges, and collaborate on problem-solving.

### **Theme 3:** *Guiding All Learners towards Future Directions in AI Implementation.*

The selection of relevant course content plays a vital role in supporting AI preparedness among learners. The inclusion of a capstone assignment that emphasizes experiential learning through practical assignments allows learners to apply their knowledge in real-world scenarios. Additionally, facilitating conversations with key stakeholders such as clinicians, policymakers, and industry experts provides learners with valuable insights into the challenges and opportunities in AI implementation.

"I think the capstone project was great. I think the assignments are very meaningful. I think each of the projects presented by the lecturer was great, like, it's giving us an insight of what things are done, and how they got done. And being



able to discuss it as a group be like, oh, we had questions, people had worries. And we're able to exchange. I think all that was quite valuable, in terms of like, learning approach and learning content. And that's where I think I got most of my understanding of my peers of how they think about projects and like the value . . . what they're afraid of and so on". [C36]

The capstone project aims to promote collaboration with the organization's stakeholders and partners, enhancing participants' communication skills and interdisciplinary collaboration. This aligns with the broader goal of AI educational programs to support CPD and effective communication for successful AI adoption in healthcare. By providing opportunities for mentorship and coaching, learners can enhance their communication skills and develop a deeper understanding of interdisciplinary collaboration.

"Yeah, and the capstone project was also a great way for. . . me to think a little bit more about it. I wasn't sure about my idea. And so I think, guess the idea of just creating a[n] AI, project out of the blue is a bit daunting, but in the end, it worked out and the TAs helped me quite a bit". [C06]

The participants emphasized the importance of TAs and instructors in providing coaching and mentorship within AI educational programs. According to participants, these individuals play a crucial role in assisting learners with the challenges of AI implementation in healthcare. Participants reflected that leveraging the expertise of TAs and instructors helps learners establish a solid foundation in interprofessional collaboration, contributing to a further understanding of AI and responsible adoption in healthcare.

"Yeah, I think the capstone project was great. I think the assignments are very meaningful. I think each of the projects presented by the lecturer was great, like, it's giving us an insight of what things are done, and how they got done. And being able to discuss it as a group be like, oh, we had questions, people had worries. And we're able to exchange. I think all that was quite valuable, in terms of like, learning approach and learning content. And that's where I think I got most of my understanding of my peers of how they think about projects and like the value . . . what they're afraid of and so on". [C36]

Participant feedback emphasized the potential of these programs to empower learners in driving positive change within the healthcare industry through AI technologies. They highlighted the importance of selecting relevant course content, fostering effective communication channels, and offering mentorship opportunities.

#### 4. Discussion

The evaluation of an AI certificate program for clinicians provided valuable insights into the importance of foundational courses to accelerate the adoption and implementation of AI in healthcare. The Clinician Champions Program aimed to enhance learners' competency in AI through accessible course design for CPD, promoting diversity in perspectives for AI education, and guiding all learners towards future directions in AI implementation.

It was also critical to create a compassionate and safe learning environment to support learners to feel comfortable exploring and discussing new concepts, such as those in the rapidly evolving field of AI [11]. The program's focus on promoting diversity in perspectives and collaboration among learners and experts highlights the importance of an equity lens in AI education and, ultimately, implementation. The program was guided by the Health Equity and Inclusion framework for education and training [8] in an effort to ensure the accessibility, diversity, and inclusivity of program delivery and content. The framework was used in tailoring the course content as it prioritized discussions on ethical considerations, healthcare disparities, and the integration of diverse perspectives. Additionally, the program further demonstrated its commitment to accessibility, inclusivity, and equitability by presenting course content in plain language, making it accessible online, and providing it at no-cost or fee to reach a broader audience. Moreover, the program had

an evaluation and feedback process after each cohort to enable continuous improvement and ensure the program evolves to meet the needs of the diverse clinicians.

Utilizing an interprofessional and multidisciplinary approach, the Clinician Champions Program successfully supported clinicians from various backgrounds and disciplines to gain foundational AI knowledge and skills. In addition to the program participants' diverse backgrounds, clinicians had different levels of AI knowledge, which created a rich learning environment, fostering collaboration and knowledge exchange facilitated by the course design (e.g., breakout rooms and group discussions/problem-solving exercises). Incorporating collaborative learning activities promotes interprofessional education and builds on diverse perspectives [12]. By engaging with one another and working together, learners explored AI concepts and applications, analyzed real-world healthcare scenarios, and developed solutions that integrate the knowledge and skills from multiple disciplines. The use of technology to facilitate interprofessional education in healthcare education is an evidence-based solution to the demanding workload of clinicians [13]. Furthermore, studies support the notion of technology-supported education to increase learners' knowledge and promote knowledge and skill-building while utilizing interprofessional education and collaborative learning activities [14].

Further highlighting the importance of an interprofessional and multidisciplinary approach to AI education, the program incorporated diverse types of knowledge requisites for thorough AI integration. Some of those included expert guest speakers and instructors to support interprofessional education and transform clinical practice. The multidisciplinary nature of the program is highlighted in the inclusivity of the content (e.g., foundational content with flexible assignments) and delivery (e.g., online delivery of content and online discussion forums) to match the diverse clinical disciplines and skill levels. By drawing from a diverse pool of expert guest speakers and instructors, the program facilitates interprofessional education, enriching learners' perspectives and reinforcing the interdependency between the educational and professional systems in clinical settings. This approach finds support in a systematic review conducted by Reeves and colleagues in 2016 [15]. Their study emphasizes the profoundly positive influence of interprofessional education on both clinical practice and the attitudes of clinicians. The review underscores the pivotal role of interprofessional education in equipping clinicians with the requisite knowledge, attitudes, and reflective skills needed for effective collaborative practice [15]. In the landscape of nurturing new clinical skills in AI, this structure is pivotal due to the multifaceted nature encompassing ethical, social, and clinical dimensions [3].

Experiential learning catalyzes dynamic dialogue and the cultivation of diverse perspectives within the Clinician Champions Program. By incorporating a capstone assignment and grounding the learning experience in real-world clinical problems, participating clinicians could practically apply their newfound AI knowledge, reinforcing their understanding and promoting collaborative problem-solving with diverse perspectives. This experiential approach not only engaged learners but also facilitated knowledge exchange and interdisciplinary collaboration, mirroring the dynamic nature of healthcare settings. Such conversations and cross-professional dialogues foster holistic problem-solving and underscore the program's emphasis on collaborative efficacy. The culmination of this learning journey, marked by the capstone project, encapsulates the practical application of AI solutions [16]. The hands-on experience allowed clinicians to develop the necessary competencies for AI integration, fostering a culture of innovation and empowering them to advocate for AI implementation in their respective areas of expertise. Moreover, this approach was facilitated through strategic tools like breakout rooms, online chats, expert engagements, and real-world case studies. Studies have shown that technology-supported experiential education can significantly enhance learners' knowledge and skill-building while addressing the increased workload of clinicians [17].

Educational programs' impact on promoting AI equity principles aligns with the National Academy of Medicine's (NAM) Quintuple Aim framework, emphasizing equity and inclusion [3]. These initiatives address disparities and cultivate a diverse, knowledgeable



workforce in AI healthcare by prioritizing training and education. Equitable learning is fostered by creating a safe and compassionate space for learning through diverse materials and engaging methods [18]. This convergence underscores the strategic role of education in shaping equitable AI practices. Integrating NAM's Quintuple Equity and Inclusion goals within education advances AI equity principles, ensuring advancements that benefit healthcare access, quality, and outcomes for all. However, the literature indicates that there needs to be more consistency in addressing concerns about bias, equity, diversity, and inclusion in AI projects [19]. Challenges include the lack of practical tools for implementing principles and ambiguity about responsibility for diversity and inclusion in the AI development process. This further emphasizes the critical role of educational programs in instilling these principles and practices to mitigate these challenges effectively. The interprofessional approach can catalyze richer conversations around equity and inclusion.

The Clinician Champions Program's interprofessional learning approach encompassed collaborative and experiential learning, and ultimately promoted diverse clinical perspectives within the AI sphere. Through the accessible course design that facilitated discussion and support between instructors and learners, clinician learners gained knowledge and confidence to engage within the AI ecosystem in their healthcare work settings.

## 5. Limitations

This study has several limitations. Firstly, the participants in the course were self-selected, meaning they voluntarily chose to enroll. This inherent nature of participant self-selection introduces the potential for selection bias, as those who choose to participate may have the inherent motivation for change and to adopt concepts from the program as opposed to those who did not choose to enroll. This sample therefore may not be representative of the wider pool of potential learners. Secondly, not all course participants participated in the research, potentially causing incomplete data. Thirdly, the absence of a team-based course approach in this program presents another limitation. Participants came from diverse contexts and backgrounds, complicating the assessment of the program's impact. In team-based learning environments, participants collaborate and learn from each other, potentially influencing outcomes differently.

Additionally, some members of the evaluation team were involved in program development. This dual involvement should be carefully considered to ensure the evaluation maintains objectivity and impartiality. Furthermore, the program's content and delivery approach evolved across different cohorts, introducing variability into the educational model under study. Finally, the rapidly changing technology and healthcare context during course delivery may have influenced participant experiences and outcomes. These limitations should be considered when interpreting results and applying them to future AI education initiatives.

## 6. Conclusions

By bridging the gap between healthcare and AI, the program empowers participants to navigate complex AI technologies and fosters a deep understanding of ethical considerations and stakeholder engagement. The outcomes of this evaluation underscore the significance of tailored, interprofessional, educational initiatives in building a diverse and proficient workforce capable of harnessing AI's potential for transformative healthcare. The research explored these objectives by investigating the perspectives, needs, and challenges of HCPs learning and adopting AI in healthcare to transform the skillset to enhance equity and overall health outcomes. The program's focus on imparting practical expertise and fostering a culture of responsible AI implementation exemplifies its contribution to shaping a more inclusive, knowledgeable, and innovative landscape across all health professions. Future work should focus on the ongoing education of HCPs to ensure the appropriate adoption of AI while also maintaining robust mentoring and coaching initiatives to support the successful implementation of AI technologies in clinical practice.

**Author Contributions:** Conceptualization, M.S., M.C. and D.W.; Methodology, R.C., C.G., J.M., S.A.K. and D.W.; Validation, B.T., T.J., R.C., S.Y. and D.W.; Formal analysis, B.T., M.O., T.J., M.C. and S.Y.; Investigation, B.T., T.J., M.C. and S.Y.; Resources, B.T., T.J. and R.C.; Data curation, B.T., M.O., T.J., R.C. and M.C.; Writing—original draft, B.T. and M.O.; Writing—review & editing, B.T., M.O., T.J., B.D. and D.W.; Visualization, B.T., M.O., T.J., R.C., S.Y. and D.W.; Supervision, D.W.; Project administration, B.T., C.G., J.J., J.M., A.D., S.A.K., M.S., M.C. and S.Y.; Funding acquisition, M.S. and D.W. All authors have read and agreed to the published version of the manuscript.

**Funding:** Accelerating the appropriate adoption of AI in health care by building new knowledge, skills, and capacities in the Canadian health care professions is funded by the Government of Canada's Future Skills Centre. Accélérer l'adoption appropriée de l'intelligence artificielle dans la santé en développant de nouvelles connaissances, compétences et capacités pour les professionnels desanté canadiennes» est financé par le Centre des Compétences futures du gouvernement du Canada.

**Institutional Review Board Statement:** This study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Review Board (or Ethics Committee) of the University Health Network (protocol code 20-6148.3 and 14 April 2021).

**Informed Consent Statement:** Informed consent was obtained from all subjects involved in this study.

**Data Availability Statement:** Data supporting this study are not publicly available due to ethical consideration and privacy of our participants. Please contact our research team to request access to data.

**Acknowledgments:** The authors of this study would like to acknowledge the support from the University Health Network, the Michener Institute of Education, and the Vector Institute, as well as Shingai Mangjengwa, a former Vector Institute member, for her contribution to the program. In addition, we thank the clinicians and health professionals for their time in contributing to the study.

**Conflicts of Interest:** The authors declare no conflicts of interest.

## Appendix A

### Accelerating the Adoption of AI in Health Care Learner Interview Guide

#### Practice Context:

Please describe your current professional setting?

Prompt: Where you work?

Prompt: Length of time in current role?

Effectiveness/Efficacy Part 1

Tell us about your overall learning experience with the AI for Clinical Champions certificate program and to what extent it met or didn't meet your expectations or needs?

Prompt: Which of the course concepts or sessions stood out the most to you?

Prompt: What did you love about the course?

Prompt: What would you have changed about the course?

Do you feel as though your participation in this program contributed to your confidence in joining conversations about AI in professional situations?

Prompt: Which modules or knowledge and skills helped you the most?

Prompt: Which modules or knowledge and skills helped you the least?

Do you feel as though your participation in this program contributed to your professional development and your ability to prepare for the implementation of AI in your practice?

Prompt: Which modules or knowledge and skills helped you the most?

Prompt: Which modules or knowledge and skills helped you the least?

Thinking back to your motivation and the three questions you had when entering the program, to what extent did the program match or answer these?

Prompt: Which modules or knowledge and skills helped you the most?

Prompt: Which modules or knowledge and skills helped you the least?

What were the elements in the education program that helped to make it a meaningful learning experience for you?

Prompt: Lectures, discussions, case studies, capstone project, etc.

Prompt: Positive or negative experience

Was the format, content, and mode of delivery of the certificate program appropriate for you at this stage in your professional career? Please explain.

Prompts Your skill level did not meet/ matched/ exceeded the challenge at hand

Prompt: Was it relevant?

### **Implementation**

How did you find navigating Blackboard?

Prompt: to what extent were you able to find the information you needed?

Prompt: did you contact technical support or need to ask for assistance?

How did you find the instructor and TAs for the program?

Prompt: how knowledgeable did you find them about AI in healthcare?

Prompt: how well did they explain difficult content areas or answer questions?

Prompt: how helpful were they in helping you learn and achieve your goals?

Prompt: how professional, organized, and engaging were they?

Prompt: how well did they create a positive learning environment?

Prompt: how likely would you be to take another program taught or supported by them?

Prompt: what could they do to improve?

### **Reach/IDEA**

The next questions will focus on the inclusivity, diversity, equity, and accessibility of the program.

How inclusive did you find the program, meaning to what extent did you find the program open to all, not excluding certain groups or individuals?

Prompt: to what extent did you feel the content:

Included and represented different backgrounds and contexts?

Was unbiased, objective, and inclusive?

Used respectful, non-discriminatory, and inclusive language?

Prompt: to what extent did you feel the program:

Provided a safe and inclusive space?

Encouraged effective and open communication?

Provided opportunities to resolve conflict/have crucial conversations?

Facilitated a sense of belonging?

Provided opportunities for learners to interact?

Had instructors and TAs who were representative of the learner population?

How diverse was the program, meaning to what extent did you find the program including or involving people from a range of different backgrounds such as social, ethnic, gender, professional, etc.?

Prompt: to what extent did you feel the content:

Included diverse people and perspectives?

Included lived experiences from people who are representative of the learner population?

Considered risks, experiences, and needs of vulnerable and marginalized populations?

Prompt: to what extent did you feel the program:

Included diverse and representative Instructors and TAs?

Included diverse and representative learners?

How equitable was the program, meaning to what extent did you find the program fair and impartial?

Prompt: to what extent did you feel the content:

Provided choice in learning activities?

Provided different media or formats to review the information?

Provided enough ways to demonstrate what you learned?

Used plain language, define terminology, and provide examples?

Prompt: to what extent did you feel the program:

Accounted for different geographic locations, ability, access to technology, resources, work schedule, and other learner factors?

Provided different facilitation approaches/instructional strategies?

Provided regular check-ins?

Provided timely and useful feedback?

How accessible was the program, meaning to what extent did you find the program easily approachable and relevant to all?

Prompt: to what extent did you feel the content provided accessible options/come in multiple formats?

Prompt: to what extent did you feel the program offered accommodations to students?

### **Maintenance**

Have you experienced other AI-related programs or events before?

Prompt: Which programs or events did you attend?

Prompt: How does your experience engaging with this certificate program compare to previous AI-related education that you've been involved with?

Do you plan to seek out additional opportunities to learn more about AI?

Prompt: What knowledge or skills do you want to gain from these opportunities?

Prompt: Have you found programs you are interested in?

Prompt: What barriers have you faced in trying to gain more education?

Do you plan to continue to work on your capstone project or other AI or technology initiatives?

Prompt: Can you share with us what your plans are?

Prompt: Can you share with us how you have applied Artificial Intelligence in your clinical environment?

Prompt: Which modules or knowledge and skills have helped you the most?

Prompt: Have you found gaps in your knowledge and skills?

Prompt: What resources or supports have helped you the most?

Prompt: What barriers have you faced?

If there was a mentoring or coaching program you could join after this program, would you be interested?

Prompt: why not?

Prompt: what would you want to gain from it?

### **Closing**

Thinking about what you have shared so far, are there any other opportunities for improvement in this program that would have enhanced your learning experience?

Is there anything else you would like to share about your experience with this program?

That concludes our interview. Thank you for participating and helping us to improve the certificate program to educate health care providers about AI.

Do you have any questions?

End

## References

- Petersson, L.; Larsson, I.; Nygren, J.M.; Nilsen, P.; Neher, M.; Reed, J.E.; Tyskbo, D.; Svedberg, P. Challenges to implementing artificial intelligence in healthcare: A qualitative interview study with healthcare leaders in Sweden. *BMC Health Serv. Res.* **2022**, *22*, 850. [\[CrossRef\]](#) [\[PubMed\]](#)
- Charow, R.; Jeyakumar, T.; Younus, S.; Dolatabadi, E.; Salhia, M.; Al-Mouaswas, D.; Anderson, M.; Balakumar, S.; Clare, M.; Dhalla, A.; et al. Artificial Intelligence Education Programs for Health Care Professionals: Scoping Review. *JMIR Med. Educ.* **2021**, *7*, e31043. [\[CrossRef\]](#) [\[PubMed\]](#)
- Lomis, K.; Jeffries, P.; Palatta, A.; Sage, M.; Sheikh, J.; Sheperis, C.; Whelan, A. Artificial Intelligence for Health Professions Educators. *NAM Perspect.* **2021**, *2021*. [\[CrossRef\]](#) [\[PubMed\]](#)
- Lee, J.; Wu, A.S.; Li, D.; Kulasegaram, K. Artificial Intelligence in Undergraduate Medical Education: A Scoping Review. *Acad. Med.* **2021**, *96*, S62–S70. [\[CrossRef\]](#) [\[PubMed\]](#)
- Buchanan, C.; Howitt, M.L.; Wilson, R.; Booth, R.G.; Risling, T.; Bamford, M. Predicted Influences of Artificial Intelligence on Nursing Education: Scoping Review. *JMIR Nurs.* **2021**, *4*, e23933. [\[CrossRef\]](#) [\[PubMed\]](#)
- O'Connor, S.; Yan, Y.; Thilo, F.J.S.; Felzmann, H.; Dowding, D.; Lee, J.J. Artificial intelligence in nursing and midwifery: A systematic review. *J. Clin. Nurs.* **2023**, *32*, 2951–2968. [\[CrossRef\]](#) [\[PubMed\]](#)
- Field, B.; Booth, A.; Iltott, I.; Gerrish, K. Using the Knowledge to Action Framework in practice: A citation analysis and systematic review. *Implement. Sci.* **2014**, *9*, 172. [\[CrossRef\]](#) [\[PubMed\]](#)
- Agic, B.; Fruitman, H.; Maharaj, A.; Harris, H.; Gagnon, L.; Taylor, J.; Ashraf, A.; Henderson, J.; Ronda, N.; McKenzie, K.; et al. *Health Equity and Inclusion Framework for Education and Training*; Centre for Addiction and Mental Health: Toronto, ON, Canada, 2023.
- Gaglio, B.; Shoup, J.A.; Glasgow, R.E. The RE-AIM framework: A systematic review of use over time. *Am. J. Public Health* **2013**, *103*, e38–e46. [\[CrossRef\]](#) [\[PubMed\]](#)
- Braun, V.; Clarke, V. Using thematic analysis in psychology. *Qual. Res. Psychol.* **2006**, *3*, 77–101. [\[CrossRef\]](#)
- Gray, K.; Slavotinek, J.; Dimaguila, G.L.; Choo, D. Artificial Intelligence Education for the Health Workforce: Expert Survey of Approaches and Needs. *JMIR Med. Educ.* **2022**, *8*, e35223. [\[CrossRef\]](#) [\[PubMed\]](#)
- Brault, I.; Therriault, P.-Y.; St-Denis, L.; Lebel, P. Implementation of interprofessional learning activities in a professional practicum: The emerging role of technology. *J. Interprof. Care* **2015**, *29*, 530–535. [\[CrossRef\]](#)
- Curran, V.; Reid, A.; Reis, P.; Doucet, S.; Price, S.; Alcock, L.; Fitzgerald, S. The use of information and communications technologies in the delivery of interprofessional education: A review of evaluation outcome levels. *J. Interprof. Care* **2015**, *29*, 541–550. [\[CrossRef\]](#) [\[PubMed\]](#)
- Pulman, A.; Scammell, J.; Martin, M. Enabling interprofessional education: The role of technology to enhance learning. *Nurse Educ Today* **2009**, *29*, 232–239. [\[CrossRef\]](#) [\[PubMed\]](#)
- Reeves, S.; Fletcher, S.; Barr, H.; Birch, I.; Boet, S.; Davies, N.; McFadyen, A.; Rivera, J.; Kitto, S. A BEME systematic review of the effects of interprofessional education: BEME Guide No. 39. *Med. Teach.* **2016**, *38*, 656–668. [\[CrossRef\]](#) [\[PubMed\]](#)
- Connolly, C.; Hernon, O.; Carr, P.; Worlikar, H.; McCabe, I.; Doran, J.; Walsh, J.C.; Simpkin, A.J.; O'Keeffe, D.T. Artificial Intelligence in Interprofessional Healthcare Practice Education—Insights from the Home Health Project, an Exemplar for Change. *Comput. Sch.* **2023**, *40*, 412–429. [\[CrossRef\]](#)
- Chen, M.; Decary, M. Artificial intelligence in healthcare: An essential guide for health leaders. *Healthc. Manag. Forum.* **2020**, *33*, 10–18. [\[CrossRef\]](#) [\[PubMed\]](#)
- Cohen, S.S. Interprofessional and interdisciplinary collaboration: Moving forward. *Policy Polit. Nurs. Pract.* **2013**, *14*, 115–116. [\[CrossRef\]](#) [\[PubMed\]](#)
- Zowghi, D.; Rimini, F.d. Diversity and Inclusion in Artificial Intelligence. *arXiv* **2023**, arXiv:2305.12728. [\[CrossRef\]](#)

**Disclaimer/Publisher's Note:** The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.