

JRMC | Journal of Regional Medical Campuses

Creating a Healthcare Entrepreneurship Teaching Program for Medical Students

Aida Ahrari, MSc; Pawandeep Sandhu, HBSc; Dante Morra, MD, MBA; Sarah McClennan, MHSc, MD;
Alison Freeland, MD

DOI: <https://doi.org/10.24926/jrnc.v4i1.3564>

Journal of Regional Medical Campuses, Vol. 4, Issue 1 (2021)

z.umn.edu/JRMC

All work in JRMC is licensed under CC BY-NC



Creating a Healthcare Entrepreneurship Teaching Program for Medical Students

Aida Ahrari (MSc), Pawandeep Sandhu (HBS), Dante Morra (MD, MBA), Sarah McClennan (MHSc, MD), Alison Freeland (MD)

Abstract

Introduction: The future of healthcare hinges on effective adoption of innovative solutions. Arguably, physicians are ideally positioned to propel clinical innovation given their firsthand experience with healthcare challenges; however, physicians often lack the necessary skills in innovation development and implementation methodology as it related entrepreneurship. The gap is partly a result of the paucity of exposure to entrepreneurship concepts within medical education and postgraduate training. To address this gap, the University of Toronto's distributed medical education campus in Mississauga created a novel teaching initiative designed to impart themes of healthcare entrepreneurship to early stage medical learners.

Methods: To inform the design of the program, the authors conducted a series of semi-structured interviews with key stakeholders, including physician entrepreneurs, innovation leaders, curriculum specialists, and medical students. Using thematic analysis, key recommendations were extracted regarding learning objectives, approach to program delivery, and anticipated outcomes. A well-established entrepreneurial teaching model, the MaRS Entrepreneurship Framework, was adapted to frame the curricular content to the needs of medical learners. The resulting educational product consisted of 6 sessions, taught by subject matter experts, which outlined a methodological approach to the development of a medical start-up as a means of launching an innovation.

Results: From November 2019 to May 2020, six sessions were held with a total of 37 unique attendees. The authors found that the series generated interest in entrepreneurship among medical students while fostering an appreciation for the basic principles of entrepreneurship.

Conclusion: The next stage involves further program evaluation to guide the next iteration of the program. Potential avenues for growth include delivering the series virtually to support greater student accessibility. Future considerations include incorporating entrepreneurship into core undergraduate medical curricula and creating a dual degree program in medicine and entrepreneurship that cater to students with a deep interest in the field of healthcare entrepreneurship. **Disclosure:** The authors have no conflict of interest to declare. As all data were completely anonymized and no patients were involved, this was not reviewed by an ethics board

INTRODUCTION

Background

The future of healthcare involves leveraging innovation to solve healthcare challenges. While other industries are applying technology to improve operations, healthcare has traditionally proven more resistant to change.¹ To address the pressing challenges facing our healthcare system, we need individuals who are able to design and implement patient-centered solutions to complex problems.² To this end, physicians who experience health systems challenges are ideally positioned to create innovative solutions. Equally important is the ability of innovators to operationalize novel

ideas, which requires skills grounded in the field of entrepreneurship. Not surprisingly, a study investigating patent application patterns for medical devices found that major incumbent medical device firms were more likely to incorporate information from physician-founded start-ups than non-physician-founded start-ups, as physicians can often provide important insight to ensure that products address real healthcare challenges and are intuitive for the end-users.^{3,4} Yet, few medical schools in Canada actively encourage students to pursue innovation and entrepreneurship during their formative years of training, and as a result, the number of physician entrepreneurs in Canada

Aida Ahrari is a medical student at the University of Toronto and a graduate of the master's degree in Systems Leadership and Innovation at the Institute of Health Policy, Management, and Evaluation, University of Toronto, Toronto, Ontario.

Pawandeep Sandhu is a medical student at the University of Toronto, Toronto, Ontario.

Dante Morra is the Chief of Staff at Trillium Health Partners Hospital and Head of the CanHealth Network, Mississauga, Ontario. He is an Associate Professor in the Temerty Faculty of Medicine and an Adjunct Professor at the Rotman School of Management, University of Toronto, Toronto, Ontario.

Sarah McClennan is the Director of the Mississauga Academy of Medicine at the University of Toronto, Mississauga, Ontario. She is an Assistant Professor in the Department of Medicine, Division of Emergency Medicine, University of Toronto, Toronto, Ontario.

Alison Freeland is the Regional Associate Dean of Education at the University of Toronto, Temerty Faculty of Medicine's Mississauga Campus and Vice President of Education, Academic Affairs, and Patient Experience at Trillium Health Partners, Mississauga, Ontario. She is an Associate Professor in the Department of Psychiatry, University of Toronto, Toronto, Ontario.

Corresponding author: Dr. Alison Freeland, Office of the Regional Vice Dean, University of Toronto, Trillium Health Partners, Clinical Administrative Building, 15 Bronte College Court, 4th floor, Mississauga, ON, L5B 0E7; telephone: (905) 848-7580 Ext. 2209; email: alison.freeland@thp.ca; twitter: @drafreeland.

has been limited.⁵ Given the recent increased interest and productivity of physicians in developing new devices, software, and services to improve patient outcomes, training future physicians to innovate healthcare is a logical next step.

Medical schools across the country continue to expand education of students beyond the traditional clinical expertise to include other important areas of development such as leadership, advocacy, and quality improvement. Broader expertise in the aforementioned areas is an important aspect of ensuring optimal human health at both the individual and population level.⁶ Innovation and entrepreneurship are key domains in which clinicians can generate solutions with a broad impact on patient outcomes. Currently, the lack of formal education on entrepreneurship in medical school means that aspiring physician entrepreneurs are often left to learn important skills, establish networks, and acquire resources on their own.⁷ We believe that medical schools should do more to supplement medical education with entrepreneurial exposure in order to inspire medical trainees to consider entrepreneurship as a viable avenue for developing healthcare solutions.

Innovation and entrepreneurship are central to many of the clinical and educational activities of the Mississauga region, both at the University of Toronto's distributed medical education campus in Mississauga, as well its community hospital partner, Trillium Health Partners (THP). As the clinical teaching site of the Mississauga distributed medical campus, THP is a leader in the Canadian innovation and entrepreneurship landscape. THP leads an acclaimed pan-Canadian initiative, the Coordinated Accessible National (CAN) Health Network, which coordinates an integrated and receptive marketplace for Canadian health technology start-ups. Given the Mississauga Academy of Medicine's culture of innovation and entrepreneurship, students and faculty alike were driven to leverage their regional strength and offer healthcare entrepreneurship teaching to medical students. Herein, the regional medical education campus of Mississauga led the creation of the Entrepreneurship in Healthcare Seminar Series.

Environmental scan and needs assessment

We conducted an environmental scan and needs assessment to gather information about existing entrepreneurship teaching programs within the medical education space in Canada and the United States. Our initial needs assessment revealed a gap in opportunities for training medical learners in entrepreneurial skills, particularly in Canada. A brief review of the literature highlighted the sparsity of publications in this area, emphasizing that, despite a growing culture of entrepreneurship, medical education has failed to adapt and offer students training in this important field. This is slowly changing, with a number of training programs in innovation and entrepreneurship beginning to emerge. One such

initiative is a certificate degree program for medical students in Healthcare Delivery Science, Management and Policy Distinction by Carver College of Medicine at the University of Iowa. Established in 2016, the program offers students a dedicated block on the topics of innovation and entrepreneurship, and involves the completion of 9 education blocks over 3.5 years.⁸ Similarly, a landscape review from 2016 found 13 schools with innovation and entrepreneurship teaching streams catered to medical students, all of which were based out of the United States (Table 1).² Of those, 9 programs spanned all 4 years of medical school and 10 programs required a capstone project.² Programs were led by faculty from diverse professional backgrounds, and all awarded formal recognition to graduates. These programs accepted a median of 13 new medical students per year, which compromised of approximately 7% of the student body.² Prominent educational themes included entrepreneurship, innovation, and technology.

Within Canada, similar programs were exceedingly rare, with our review of the Canadian medical schools' official websites finding just 2 such programs: University of Alberta's Faculty of Medicine and Dentistry offering a health entrepreneurship stream for their MD/MBA and MD/PhD students, and McMaster University delivering a Healthcare Innovation, Commercialization, and Entrepreneurship program for select MD and PhD graduates.^{7,9} Given that interest in healthcare entrepreneurship is rapidly expanding, we anticipate a growing number of similar programs will emerge from the medical education space in the near future.

Table 1. Innovation and entrepreneurship programs at US medical schools, as identified by a 2016 structured internet search reported by Niccum et al.²

Medical School	Innovation and Entrepreneurship Program Name
Brown University Warren Alpert Medical School (BROWN)	Concentration in medical technology, innovation and entrepreneurship
George Washington School of Medicine and Health Sciences (GW)	Clinical practice innovation and entrepreneurship track
New York University School of Medicine (NYU)	Health systems innovation and policy concentration
Northwestern University Feinberg School of Medicine (NU)	NUvention: Medical
Thomas Jefferson University Sidney Kimmel Medical College (TJU)	College within the college design track
University of Arizona College of Medicine (UA)	Leadership and innovation in healthcare distinction track
University of Illinois College of Medicine at Chicago (UIC)	Innovation medicine program
University of Michigan Medical School (UM)	Innovation and entrepreneurship path of excellence
University of Pennsylvania Perelman School of Medicine (UPENN)	Certificate in healthcare management, entrepreneurship, and technology
University of Southern California Keck School of Medicine (USC)	Health, technology and engineering program
University of South Florida Morsani College of Medicine (USF)	Innovation, entrepreneurship and business in medicine scholarly concentration
University of Texas at Austin Dell Medical School (UT)	Health care innovation & design distinction
University of Virginia School of Medicine (UVA)	Human-centered design and medical innovation program

METHODS

Stakeholder consultations

In the first phase of program development, we engaged key stakeholders to obtain expert perspective regarding the program feasibility, curriculum design, and best practices for delivering this training. We consulted with 6 renowned physician entrepreneurs in the forefront of Canadian healthcare innovation and 4 experts in the field of entrepreneurship education design and delivery. We also consulted with 9 key University of Toronto faculty thought leaders with tremendous experience in curriculum design. Furthermore, we sought out the user perspective by consulting with 8 medical students at the University of Toronto. All consultations were conducted in the form of semi-structured interviews and written consent was obtained.

Interview data was assessed by 2 reviewers (A.A., P.S.) who coded the transcripts; disagreements were discussed with other members of the group (S.M., A.F., D.M.) and consensus was reached. We adopted Braun and Clarke's validated model of thematic analysis with a 6-phase approach to generate, review, and define themes within the interview transcripts. Recurrent themes were extracted and subsequently informed the design of the program regarding the structure, mode of delivery, and synthesis of the series' learning objectives.

Program design

The Entrepreneurship in Healthcare seminar series was designed as an extracurricular program to introduce medical students to the fundamental principles of entrepreneurship in healthcare. The seminar series was established at the University of Toronto's distributed medical education campus in Mississauga, home to the Mississauga Academy of Medicine, where 216 students per year complete their medical training. The program committee developed the initiative between May 2019 to September 2019 and the series was rolled out in the 2019-2020 academic year.

The seminar series consisted of 6 sessions, each approximately 2 hours in duration, delivered from November 2019 to May 2020. Five out of 6 sessions were held in person at the distributed medical education campus in Mississauga and all students from both campuses, St. George (Toronto) and Mississauga, were invited to attend. One session was delivered virtually due to social distancing restrictions of the current pandemic. A panel of renowned physician entrepreneurs and innovation experts taught the sessions. Six out of 7 speakers were physicians, of which 4 were physician entrepreneurs and 2 of which held leadership roles within healthcare innovation and entrepreneurial ventures. One of the speakers was an expert in healthcare innovation and not a physician. The style of teaching involved didactic lectures

followed by a rich discussion among students and subject experts (Table 2).

Students who attended 4 out of the 6 sessions were awarded a certificate of completion, granted by the leadership team at the Mississauga Academy of Medicine. The value of offering this certificate was twofold. First, it presumably increased student interest in the initiative, as there was a tangible recognition associated with participation. This was particularly important as this was the first iteration of the series and many students had not been previously exposed to healthcare entrepreneurship. Second, the certificate served to encourage longitudinal participation in the program, which would allow us to obtain constructive feedback and informed program evaluations.

In refining the series' learning objectives, we looked to MaRS Institute, a North American leader in entrepreneurship. The series' learning objectives were modelled after the MaRS Entrepreneurship 101 Framework, a validated approach to teaching entrepreneurial concepts, and adapted to the needs of medical students.¹⁰ MaRS Entrepreneurship 101 course developers granted us written permission to utilize their course outline to inform the development of our seminar series' learning objectives.

Students began by learning about the types of innovation in healthcare and subsequently covered topics pertaining to the development of a start-up, from ideation to implementation (Table 2). Each speaker curated a lecture based on the outlined learning objectives and included anecdotes from their personal entrepreneurial journey.

As an addition to the series, we developed an optional self-paced longitudinal project to help guide students engage in what they were learning in a practical way. The longitudinal project prompted students to identify a healthcare challenge, develop a solution, and subsequently bring the solution to market. The primary goal of the longitudinal project was to evaluate student interest and uptake for such an exercise. The secondary goal was to provide an additional avenue for students to engage in the material, while maintaining flexibility. The decision to offer the longitudinal project as an optional component of the series was based on student feedback shared in focus groups. The rationale was that: 1) this was an extracurricular program for students with significant academic responsibilities, and 2) a successful first iteration of the series would require reducing barriers to participations in order to encourage more students to engage in the program.

Table 2. The Entrepreneurship in Healthcare Seminar Series Syllabus, Outlining Sessions 1-6, Corresponding Topic, and Learning Objectives, from November 2019 to May 2020.

Session Number	Topic	Learning Objectives	Speaker(s)
One	Introduction to innovation and entrepreneurship	<ul style="list-style-type: none"> Understand what health innovation is Differentiate between innovation, quality improvement, and invention Describe different types of health innovation Identify entrepreneurship as one avenue for innovating healthcare delivery Recognize the role of entrepreneurship in healthcare Identify different forms of entrepreneurship in healthcare (i.e., scalable start-up, owning a small business, entrepreneurship) 	<ul style="list-style-type: none"> Speaker 1: Physician, Chief of Clinical Staff at HealthOne Speaker 2: Healthcare innovation expert, Innovations Manager at Trillium Health Partners
Two	Identifying a problem	<ul style="list-style-type: none"> Identify a problem within the healthcare system Identify the customer and their needs Develop a start-up idea Develop a vision and mission statement for the start-up 	<ul style="list-style-type: none"> Physician entrepreneur, Co-Founder and CEO of Homecare Hub Chief Medical Officer at TD Bank Canada
Three	Developing your idea	<ul style="list-style-type: none"> Understand the role of customer interviews to 1) explore the problem users want to solve 2) obtain feedback regarding the proposed solution Determine the value proposition of a product/service and articulate it in a value proposition statement Design and test a minimum viable product (MVP) with customers and iteratively improve it 	<ul style="list-style-type: none"> Physician entrepreneur, Co-Founder and CEO of <i>SeamlessMD</i> Chair of the Canadian Medical Association's Joule Innovation Council
Four	Thinking about your customer	<ul style="list-style-type: none"> Develop the customer persona for a product/service Perform the basics of market research (market size, market segmentation, target market) Design a business model canvas for a new product/service 	<ul style="list-style-type: none"> Physician entrepreneur, Co-Founder and CEO of Maple
Five	Funding your start-up	<ul style="list-style-type: none"> Explain the different healthcare funding models in Canada Recognize the following items: balance sheet, income statement, cash flow statement Identify key financial metrics: users, revenue, acquisition cost, business model Determine how to obtain buy in from investors (strategies in the articulation of the company mission, information to provide, etc.) 	<ul style="list-style-type: none"> Physician innovation expert, Lead for Virtual Care at the Women's College Hospital Chief Medical Informatics Officer, Unity Health Toronto
Six	Entrepreneurial traits and building your team	<ul style="list-style-type: none"> Identify ways in which healthcare entrepreneurship is different from entrepreneurship in other fields Recognize the attributes and personal qualities of a successful entrepreneur Outline strategies for assembling an effective team Recognize common pitfalls when building a team 	<ul style="list-style-type: none"> Physician entrepreneur, President and Founder of Think Research

RESULTS

Stakeholder consultations

The major emerging messages of the stakeholder consultations are summarized below.

Program structure

Reducing barriers to participation for both students and speakers was deemed important for ensuring the operation of the program. Furthermore, providing a broad overview of entrepreneurship in healthcare was considered more appropriate than covering advanced topics less practical for medical students. The ideal number of sessions was determined to be 6-8. Finally, recommendations were made to encourage speakers to address learning objectives within the context of their own entrepreneurial journey.

Program content

Emphasis was placed on using a well-established entrepreneurial framework to inform the development of the series' learning objectives. Consultants recommended providing opportunities for students to engage in entrepreneurial activities by developing healthcare solution ideas in the context of a longitudinal project.

Student engagement

Generating student interest was considered to be crucial to the ultimate success of the program, therefore, developing an effective promotional strategy was central to ensuring student engagement. Additionally, incorporating the student

perspective in the development of the series was noted as key to ensuring that the program catered to the needs of medical students.

Entrepreneurial community

Emphasis was placed on creating a multidisciplinary entrepreneurial community at the regional medical campus of Mississauga by forging mutually beneficial relationships with local start-ups and providing students with invaluable opportunities to network with physician entrepreneurs.

Initiative offerings

The program was deemed valuable in broadening the perspectives of medical learners by promoting critical analysis of current healthcare problems and considering ways to tackle issues with innovative solutions. The program was recognized as a vehicle for allowing students to explore novel career avenues in healthcare entrepreneurship.

Future directions

Recommended future directions included creating strategic partnerships with local champions in healthcare innovation and entrepreneurship. Furthermore, evaluating the program and making iterative improvements were deemed central to the success and longevity of the initiative.

Program outcomes

The series captured a total of 57 attendances by 37 unique attendees as shown in Figure 1. The demographic of attendees comprised mostly of pre-clerkship medical students from the distributed medical education campus of Mississauga (Figure 1). The virtual session was the second most highly attended of the series. It was also the only session that featured attendees from the St. George campus, located in central Toronto, as well as clerkship students. This data seems to suggest that holding sessions virtually would increase student participation in the program, likely by minimizing barriers to participation, such as commuting.

Given that this was the pilot year of the program, there was a limited number of program evaluations completed by student participants. A post-session survey, consisting of 6 questions graded on a 5-point Likert scale, was used to measure student satisfaction. Table 3 outlines percentage of respondents who answered agree to strongly agree on the 5-point Likert scale with regards to each of the 6 survey questions. The survey showed that greater than 85% of attendees deemed the sessions excellent to very good. The feedback survey also captured free text comments which were overwhelmingly positive. Additionally, a significant majority of students indicated that they gained knowledge from the sessions which would be valuable in a real-world setting (Table 3). Although this feedback does not tell us exactly how participants plan to use the knowledge and skills learned in the program, it does help illustrate the perceived

value and utility of the material, as there is a general consensus that enough useful information was extracted from the series to apply these principles to a practical scenario.

The timing of sessions 5 and 6 did align with examination period, which may explain their drop-in attendance. Furthermore, session 5 covered the financial aspect of startups, with a focus on financial metrics and funding models. While an important topic for entrepreneurship, we anticipate that the technical nature of this talk was less appealing to medical students, which was also supported by student feedback. Following iterations of the program should consider ways to cater this material to medical students in an engaging and tangible manner. Finally, sessions 5 and 6 had a drop in promotional efforts, which likely also contributed to the decline of participants. This finding points to the importance of effective promotion for student engagement. The following program iterations should develop and execute a comprehensive and multimodal promotional strategy to capture student interest and participation. Additionally, student uptake of the longitudinal project was found to be low, likely given the time commitment required to engage with the material. The next iteration of the program should seek student feedback to modify the project in order to increase its appeal and utility for users.

Figure 1. Number of Attendees per Session at the Entrepreneurship in Healthcare Seminar Series, University of Toronto, 2019-2020. The number of students from the distributed medical education campus of Mississauga and from the central Toronto St. George campus are indicated.

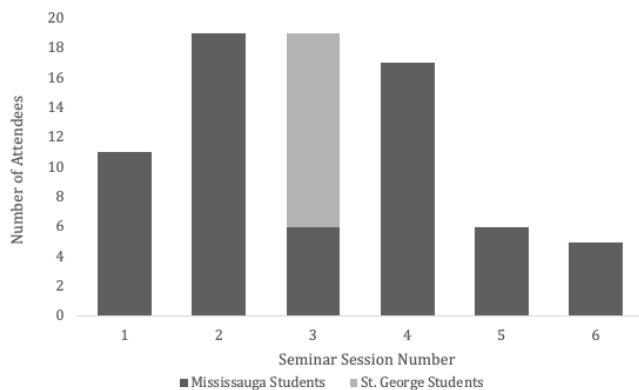


Table 3. Summary of Post-Session Surveys of the Entrepreneurship in Healthcare Seminar Series, including Session Number, Number of Respondents, Survey Question, and Percent Respondents who Rated Agree to Strongly Agree on the Given 5-Point Likert Scale, from November 2019 to May 2020.

Survey Question	Session Number					
	One (n=3)	Two (n=7)	Three (n=3)	Four (n=12)	Five (n=4)	Six (n=1)
	Percent (%) Respondents who Agree or Strongly Agree ²					
<i>I was able to relate each of learning objectives to the teaching I received</i>	3/3	5/7	3/3	12/12	4/4	1/1
<i>I gained knowledge from this session which will be valuable in a real-world setting</i>	2/3	4/7	3/3	12/12	3/4	1/1
<i>I was well engaged during the session</i>	3/3	5/7	3/3	12/12	4/4	1/1
<i>My learning was enhanced by the knowledge and experiences shared by the facilitator</i>	3/3	5/7	3/3	12/12	4/4	1/1
<i>I found the session to be well-organized</i>	3/3	6/7	3/3	11/12	4/4	1/1
<i>I enjoyed learning about the topics covered in the session</i>	3/3	3/7	3/3	12/12	4/4	1/1

¹Note that n refers to the number of survey respondents per session.

²The percentage shown is an amalgamation of percent respondents who marked agree or strongly agree according to the 5-point Likert scale for each respective survey question.

DISCUSSION

The Entrepreneurship in Healthcare Seminar Series was developed to promote entrepreneurship amongst the next generation of physicians by training medical students to generate problem solving designs, services, and products that respond to healthcare challenges. The program aimed to teach a systematic approach to creating a start-up company as a means to launch innovative solutions to healthcare challenges. Developing an appreciation for healthcare innovation and entrepreneurship is central to training a new generation of physicians who are not limited by the status quo; instead, they are attuned to recognizing gaps in the system and seeking novel solutions to address them. Delivering this important message early on in the training of future physicians is crucial for shifting perceptions around medical innovation and entrepreneurship.

The program achieved a number of short-term outcomes. First, the series generated interest in the field of entrepreneurship among students who participated. Second, the series trained participants in the entrepreneurial approach to problem solving and scaling an innovation. While the degree of competency gained is difficult to quantify at

this time, we can infer that participants developed a basic understanding of the entrepreneurial framework as outlined in the learning objectives. Third, the series served as an avenue for fostering mentee-mentor relationships between medical students and physician entrepreneurs.

The long-term outcomes of the initiative were twofold. First, the program provided an opportunity to consider how best to position entrepreneurship and innovation within a medical school curriculum, whether as an elective opportunity, a core curricular requirement, or a more advanced learning opportunity in the form of a joint degree program in Medicine and Masters of Innovation and Entrepreneurship. Second, we anticipate that with greater development of the initiative and multiple iterations of the program, we can see an increased number of successful physician-led medical start-ups which contribute to solving major healthcare challenges in Canada.

Short-term next steps will include, first, rigorous evaluation of the program by obtaining student and presenter feedback and iterating the program accordingly. Second, there is a need for developing virtual streaming of future iterations of the program to allow for greater accessibility. Given the current pandemic and the University's plans to move large classes online, we have chosen to deliver the next iteration of seminar series in the 2020-2021 academic year virtually. Given our positive experience with the single online session, we anticipate that the next virtual iteration of the program will have greater student engagement, while maintaining meaningful discussion and connectivity.

Long-term next steps could include the development of practicums in healthcare start-ups, where students can gain hands-on experience and receive one-on-one mentorship, the program can be adapted and delivered to postgraduate medical residents who would also benefit from developing skills in entrepreneurship. There is also potential for the initiative to evolve into a joint degree program in Medicine and Masters of Innovation and Entrepreneurship; an intriguing opportunity that would provide both the depth of learning and the experiential scholarship necessary to prepare those with a firm interest to develop as future physician entrepreneurs. A dual degree program in medicine and entrepreneurship would reflect institutional accountability for training physician leaders who will pursue critical transformations in the healthcare system over the coming decades. Finally, there is significant opportunity for the program to expand beyond the University of Toronto to medical schools worldwide. One anticipated challenge may be the scarcity of physician-entrepreneurs who are often concentrated in innovation hubs such as Toronto. This issue can be mitigated by using virtual programs broadcasted from the University of Toronto to faculties of medicine across Canada and abroad.

CONCLUSION

The Entrepreneurship in Healthcare seminar series was a first of its kind program among Canadian medical schools, designed to promote entrepreneurship within healthcare to early stage medical learners. The project is a model for other distributed medical campuses to leverage their unique strengths in order to create innovative opportunities for their medical student community.

References

1. Safi S, Thiessen T, Schmailzl KJ. Acceptance and Resistance of New Digital Technologies in Medicine: Qualitative Study. *JMIR Research Protocols*. 2018;7(12). doi:10.2196/11072
2. Niccum BA, Sarker A, Wolf SJ, Trowbridge MJ. Innovation and entrepreneurship programs in US medical education: a landscape review and thematic analysis. *Medical Education Online*. 2017;22(1). doi:10.1080/10872981.2017.1360722
3. Smith SW, Sfekas A. How much do physician-entrepreneurs contribute to new medical devices? *Med Care*. 2013;51(5):461-7
4. Deng D, Zaric G. Physician entrepreneurship: Why it matters to all of us. *University of Western Ontario Medical Journal*. 2018;86(S1):12-13. doi:10.5206/uwomj.v86is1.2114
5. Collier R. Canadian health care lacks culture of innovation. *Canadian Medical Association Journal*. 2018;190(36):E1089-E1090. doi:10.1503/cmaj.109-5655
6. Al-Musawi S, Houbby N. Addressing the void of entrepreneurship development amongst medical students in the UK. *Advances in Medical Education and Practice*. 2019;10:677-678. doi:10.2147/amep.s207533
7. FoMD Health Entrepreneurship Program. University of Alberta Faculty of Medicine and Dentistry. <https://www.ualberta.ca/medicine/innovation/entrepreneurship-program>. Accessed May 4, 2020.
8. Healthcare Delivery Science, Management and Policy Distinction. University of Iowa Health Center Carver College of Medicine. <https://medicine.uiowa.edu/md/curriculum/distinction-on-tracks/healthcare-delivery-science-management-and-policy-distinction>. Accessed November 26, 2020.
9. Building Health Entrepreneurs. Health Innovation, Commercialization and Entrepreneurship. <https://healthinnovation.mcmaster.ca/>. Accessed May 1, 2020.
10. Entrepreneurship 101. MaRS Discovery District. https://www.marsdd.com/wp-content/uploads/2014/03/Entrepreneurship-101-Course-Syllabus_Final1.pdf. Accessed May 4, 2020.

11. Scholarly Concentrations Program. Indiana University School of Medicine.
<https://medicine.iu.edu/md/curriculum/scholarly-concentrations>. Accessed November 23, 2020.