

Promoting career exploration during a pandemic: medical students make the case for wearable technology

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Abstract

In March 2020, cities across Canada locked down in an effort to control the rapid spread of the novel coronavirus (SARS-CoV-2). The containment measures forced many disruptive societal changes, with the virtual delivery of medical education being one example. Many of the resulting educational changes will persist for the foreseeable future. As students at the Temerty Faculty of Medicine at the University of Toronto, we have observed first-hand the transition to a virtual curriculum. Preclerkship medical students have been unable to participate in clinical observerships as part of early career exploration throughout the duration of the pandemic. These clinical experiences offer more than just opportunities to narrow career options, they also serve as a critical part of our development as future physicians. Given the continued need to preserve personal protective equipment and comply with physical distancing guidelines, we believe innovative solutions are needed to restore this critical component of our medical education. Our student-led research group has described a novel use of a point-of-view livestreaming technology that allows physicians to demonstrate physical exams while teaching clinical skills to medical students as one possible solution. As the pandemic continues to threaten global health, a clear need exists to identify and implement creative innovations to prepare future physicians.

In March 2020, cities across Canada locked down in order to control the rapid spread of the novel coronavirus (SARS-CoV-2). The containment measures forced disruptive societal changes, including the virtual delivery of medical education. Many resulting educational changes will persist for the foreseeable future. As students at the Temerty Faculty of Medicine at the University of Toronto, we have observed first-hand the transition to a virtual curriculum. Like others, we have written about the rapid curricular reconfiguration and emphasized the need to develop innovations to deliver clinical skills in a virtual environment.^{1,2} Ideally, these innovations should take advantage of previously existing technology and evidence, expediting development and implementation processes. Redevelopment of the undergraduate medical curriculum has been a key focus of ongoing discussion.^{3,4} Notable work by Dhillon et al. outlines many changes that have transpired in both preclerkship and clerkship Canadian medical training.⁵ However, limited discussion has occurred regarding pandemic impacts on medical student career exploration.^{6,7}

At our medical school, the second and third waves of the pandemic resulted in an administrative decision to continue delivery of the preclerkship curriculum in a virtual environment for the 2020-2021 academic year. Many curricular elements, including didactic lectures and small group sessions, transitioned smoothly to virtual environments. However, the mandatory in-person career exploration curriculum, or Enriching Education Experiences (EEEs), has been suspended indefinitely. Many EEEs involve clinical observerships, whereby preclerkship students organize shadowing with attending physicians to explore different career possibilities. Unfortunately, due to physical distancing protocols and efforts to preserve personal protective equipment (PPE), preclerkship students in Toronto, and most of Canada, have been removed from hospital and clinical settings. As a result, junior medical students have been unable to participate in clinical observerships as part of early career exploration.

The breadth of medical specialties is immense, and limited clerkship time exists to explore them before residency applications,

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making it imperative for students to explore career options during preclerkship. Although junior medical students are still able to attend virtual medical career events and organize career conversations with attending physicians, the ability to shadow physicians clinically remains essential for students' personal and professional development. The inability to shadow is a major stressor; the anxiety-provoking topic is routinely discussed with faculty at class-wide town halls. Not only are we unable to narrow career options, but we also miss out on crucial experience in competitive specialties. The 2020 Canadian Resident Matching Service report listed 19 specialties with more students applying than available spots.⁸ Moreover, we can no longer experience first-hand the type of interactions that occur within a given specialty. These opportunities provide us with numerous experiences through which we can begin forming our professional identity, and identify areas of practice that align with personal values.⁹ It is imperative that we start narrowing career prospects and begin career planning during our preclerkship curriculum, a process that benefits from clinical observerships.

Clinical observerships offer more than simple opportunities for medical students to narrow our career options. Effective role modeling creates an exciting multimodal learning environment whereby we learn through observation of physicians' bedside manners and the thought processes guiding patient-physician interactions, as well as how to develop new skills and reflect on our experiences with the supervising physicians.¹⁰ Moreover, we observe communication skills of medical providers, learn how to build rapport with patients, and become more prepared to effectively contribute to patient care during clerkship.^{11,12} Finally, observerships may serve as an opportunity to recruit medical students into specialties of increased need.¹³ Thus, our previous observership experiences have enabled us to begin both career planning and development of our physician identities prior to entering clerkship. Given the continued need to preserve PPE and comply with physical distancing guidelines, we believe innovative solutions are needed to restore this critical component of our medical education.

In response, our student-led research group has described a novel use of a point-of-view (POV) livestreaming technology that allows physicians to demonstrate physical exams while teaching clinical skills to medical students.¹⁴ A wearable chest-strap with a mounted smartphone allows real-time POV streaming of clinicians' interactions. This same technology can be readily applied to career exploration, in particular clinical observerships. Using this readily available technology, an attending physician can don the chest-mounted livestreaming technology and carry out their clinical duties while integrating teaching of medical students as active, virtual participants. We are currently investigating the feasibility of this technology for virtual observerships in real-world clinical settings, and gathering feedback from physicians, patients, and medical students. Previous literature using pre-recorded POV videos suggests that learners enjoy the first-person perspective and find it useful for their learning.¹⁵ We are unaware of literature investigating patients' perceptions of such innovations. We recognize that our novel use of this technology will not replace in-person clinical experiences; however, it offers many exciting possibilities that otherwise would be unsafe, impractical, and resource intensive.

It is important to consider the ethical implications of deploying this type of technology for medical education in real-world settings. Several important considerations must be made similar to those in in-person interactions, including appropriately obtaining patient consent to participate, as well as introducing the students who are participating, how the video is being streamed, and the platform. Addressing patient questions about the technology is an important element of informed consent. Lastly, inherent risks regarding patient privacy must be discussed. As many patients have already participated in some form of virtual care during the pandemic, many will have increased understanding of these risks. Nonetheless, the video conferencing platform of choice should meet healthcare standards regarding security features.

Finally, implementation of POV technology has other novel implications. For example, many remote and rural communities are challenging for trainees to access due to distance and financial concerns, potentially resulting in lower physician recruitment to such areas.¹⁶ Our innovation would allow us as medical learners to learn in real time about the first-person perspectives and challenges faced by patients, physicians, and other healthcare professionals in these communities. Similar opportunities may exist to use this technology for global education, thereby improving equitable access to such unique educational experiences (e.g. trainees from lower income countries could experience the Canadian healthcare system and vice versa). Clearly, it is important to consider the ethical implications in these contexts. Establishing a detailed consent process to ensure that patient privacy is upheld is critical, especially with vulnerable populations.

As the pandemic continues to threaten global health, a clear need exists to identify and implement creative innovations to prepare future physicians. As medical students, we feel uniquely situated to provide meaningful insights and solutions to this educational challenge. We invite other health professions learners like ourselves and their associated faculty to build upon our idea in the realm of wearable technology. Indeed, we hope this commentary ignites a larger call to action for medical trainees, staff, and faculty to develop pragmatic technological solutions to improve accessibility to career exploration for preclerkship medical students during this pandemic and beyond.

References

1. Jeyakumar Y, Sharma D, Sirianni G, et al. Limitations in virtual clinical skills education for medical students during COVID-19. *Can Med Educ J*. 2020 Dec 7;11(6):e165-e166. doi: 10.36834/cmej.70240
2. Mehta N, Sayed C, Sharma R, et al. Medical education advances and innovations: a silver lining during the COVID-19 pandemic. *Can Med Educ J*. 2020 Dec 7;11(6):e141-e144. doi: 10.36834/cmej.70926
3. Daniel M, Gordon M, Patricio M, et al. An update on developments in medical education in response to the COVID-19 pandemic: A BEME scoping review: BEME Guide No. 64. *Med Teach*. 2021 Mar;43(3):253-271. doi: 10.1080/0142159X.2020.1864310
4. Rose S. Medical student education in the time of COVID-19. *JAMA*. 2020 Jun 2;323(21):2131-2132. doi: 10.1001/jama.2020.5227
5. Dhillon J, Salimi A, ElHawary H. Impact of COVID-19 on Canadian medical education: pre-clerkship and clerkship students affected differently. *J Med Educ Curric Dev*. 2020 Oct 14;7:2382120520965247. doi: 10.1177/2382120520965247
6. Li M, Pieris D, Xu G, et al. In the shadows: medical student clinical observerships and career exploration in the face of COVID-19. *Can Med Educ J*. 2021 Mar. doi: org/10.36834/cmej.71523
7. Byrnes YM, Civantos AM, Go BC, et al. Effect of the COVID-19 pandemic on medical student career perceptions: a national survey study. *Med Educ Online*. 2020 Dec;25(1):1798088. doi: 10.1080/10872981.2020.1798088

8. 2020 CaRMS Forum [Internet]. The Canadian Resident Matching Service; 2020 Apr 17. Available from: <https://www.carms.ca/pdfs/2020-carms-forum.pdf>
9. Gharahbaghian L, Hindiyeh R, Langdorf MI, et al. The effect of emergency department observational experience on medical student interest in emergency medicine. *J Emerg Med*. 2011 Apr 1;40(4):458-62. doi.org/10.1016/j.jemermed.2010.02.020
10. Horsburgh J, Ippolito K. A skill to be worked at: using social learning theory to explore the process of learning from role models in clinical settings. *BMC Med Educ*. 2018 Jul 3;18(1):156. doi.org/10.1186/s12909-018-1251-x
11. Bing-You RG, Hayes VM, Skolfield JL. Physician shadowing by college students: what do patients think? *BMC Res Notes*. 2014 Mar 14;7:146. doi.org/10.1186/1756-0500-7-146
12. Elfassy MD, Duncan L, Green A, et al. Patients as teachers: Evaluating the experiences of volunteer inpatients during medical student clinical skills training. *Can Med Educ J*. 2020 Dec 7;11(6):e8-e16. doi: 10.36834/cmej.70158
13. Stroh DA, Ray-Mazumder N, Norman JA, et al. Influencing medical student education via a voluntary shadowing program for trauma and acute care surgery. *JAMA Surg*. 2013 Oct;148(10):968-70. doi: 10.1001/jamasurg.2013.363
14. Wintraub L, Xie M, Issa M, et al. Wearable technology and live video conferencing: the development of an affordable virtual teaching platform to enhance clinical skills education during the COVID-19 pandemic. *Can Med Educ J*. 2020 Sep 23;11(5):e121-e125. doi: 10.36834/cmej.70554
15. Thomson FC, Morrison I, Watson WA. 'Going Professional': using point-of-view filming to facilitate preparation for practice in final year medical students. *BMJ Simul Technol Enhanc Learn*. 2018 Jul;4(3):148-149. doi.org/10.1136/bmjstel-2017-000224
16. Waslowski J, Paton M, Brownrigg T, et al. Evaluation of a new rural mentorship program for preclinical medical students. *Can J Rural Med*. Forthcoming 2021