

Use of wearable point-of-view live streaming technology for virtual physical exam skills training

Technologie portable de diffusion en direct pour l'enseignement virtuel des techniques d'examen physique

Daniel Teitelbaum,¹ Mary Xie,¹ Mariam Issa,¹ Matthew Nelms,¹ Lauren Wintraub,¹ Fok-Han Leung,^{2,3} Joyce Nyhof-Young,^{2,4} Mirek Otremba,⁵ Giovanna Sirianni,^{2,6} Karina Prucnal^{2,7}

¹Temerty Faculty of Medicine, University of Toronto, Ontario, Canada; ²Department of Family and Community Medicine, University of Toronto, Ontario, Canada; ³St. Michael's Hospital, Ontario, Canada; ⁴Office of Assessment and Evaluation, MD Program, University of Toronto, Ontario, Canada; ⁵Department of General Internal Medicine, Royal Jubilee Hospital, British Columbia, Canada; ⁶Sunnybrook Health Sciences Centre, Ontario, Canada, ⁷North York General Hospital, Ontario, Canada

Correspondence to: Dr. Karina Prucnal, Karina.prucnal@mail.utoronto.ca

Published ahead of issue: March 24, 2022; published on July 6, 2022. CMEJ 2022, 13(3). Available at <https://doi.org/10.36834/cmej.73076>

© 2022 Teitelbaum, Xie, Issa, Nelms, Wintraub, Leung, Nyhof-Young, Otremba, Sirianni, Prucnal; licensee Synergies Partners. This is an Open Journal Systems article distributed under the terms of the Creative Commons Attribution License. (<https://creativecommons.org/licenses/by-nc-nd/4.0>) which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is cited.

Implication Statement

We piloted a virtual teaching tool comprised of a chest-mounted smartphone streaming point-of-view footage over videoconferencing software to deliver a physical exam skills session. Compared to medical students taught via third person view through pre-recorded video followed by preceptor-led discussion, a higher proportion of students taught via point-of-view wearable technology reported improved knowledge of demonstrated skills and feeling engaged, comfortable interacting with their tutor, and better able to visualize demonstrated exam maneuvers. This accessible, affordable, and easily replicable innovation can potentially enhance virtual clinical skills teaching and enable novel distant clinical learning opportunities for healthcare professions students and educators.

Énoncé des implications de la recherche

Nous avons mis à l'essai un outil d'enseignement virtuel, notamment pour les cours de techniques d'examen physique, qui consiste dans le fait de porter un téléphone intelligent fixé sur la poitrine pour diffuser en direct, par le biais d'un logiciel de vidéoconférence, pour réaliser un examen physique plutôt que subjectif. Comparativement aux étudiants en médecine qui pour le cours ont visionné une vidéo préenregistrée prise par caméra objective, suivie d'une discussion dirigée par un précepteur, un plus grand nombre d'étudiants ayant suivi le cours par le biais d'une technologie portable avec par le biais d'un dispositif technologique portable déclarent avoir amélioré leurs connaissances sur les techniques présentées, se sentir engagés et à l'aise pour interagir avec l'enseignant, et avoir été en mesure de bien voir les gestes d'examen montrés. Cette innovation accessible, abordable et facilement reproductible pourrait permettre d'améliorer l'enseignement virtuel des habiletés cliniques et d'offrir de nouvelles possibilités d'enseignement

Introduction

The COVID-19 pandemic heavily impacted global undergraduate medical education delivery.¹ At the Temerty Faculty of Medicine, University of Toronto, the pre-clerkship curriculum was held either partially or entirely online since March 2020. This has impacted teaching sessions that are difficult to replicate virtually, particularly clinical skills education and observerships.^{2,3,4}

Point-of-view (POV), livestreamed video has successfully facilitated learning for medical trainees.⁵ POV live video can more clearly visualize hands-on maneuvers and aid facilitator interactions. Few studies have evaluated live POV filming with wearable devices for medical education. The purpose of this study was to evaluate student perceptions of a wearable, POV, livestream camera tool to facilitate virtual physical exam skills workshops. This study

received approval from the University of Toronto Health Sciences REB: Protocol #00039550.

Description of the innovation

Our medical student-led initiative piloted a novel modality for delivery of virtual physical exam skills education. As our commentary proposed,⁶ a smartphone mounted on a wearable chest strap (\$59 USD) streamed POV video to medical students over videoconferencing software during a physical exam skills session. Three groups of approximately 29 students (89 total) were taught by a tutor donning the chest strap and performing the liver exam on a standardized patient while streaming their first-person view. The tutor narrated exam maneuvers step-by-step while students were able to ask questions in real-time. The remaining students (six groups of approximately 29 students, 180 total, of which three had the intervention tutor) were taught the liver exam using a pre-recorded patient exam video using a fixed-camera third-person perspective, followed by group discussion.

Students provided implied consent by completing a post-session survey assessing third person view pre-recorded video versus POV videoconference for utility and effectiveness. Participants responded to five Likert scale questions from “Strongly Disagree” to “Strongly Agree”; 37 POV videoconferencing students (~42% response rate) and 26 students (~14% response rate) in the pre-recorded third-person view group completed the survey.

A higher proportion of POV videoconferencing group students strongly agreed that they felt engaged and comfortable interacting with their tutor, effectively visualized the exam maneuvers, and that their clinical skills improved. Participants ranked overall session satisfaction from 1-10, with a higher average score from the POV videoconferencing group. Finally, a higher proportion of these students also felt that the session increased their confidence performing the liver exam going into clerkship (Table 1).

Table 1. Survey results

Survey Question		Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)	Average
The content of the clinical skills session was relevant and clearly linked to course objectives	A	0%	0%	0%	49%	51%	4.51
	B	0%	4%	4%	81%	12%	4.00
I felt comfortable interacting with the tutor during the session	A	0%	0%	5%	57%	38%	4.32
	B	0%	12%	23%	50%	15%	3.69
I felt engaged in the session	A	0%	0%	5%	59%	35%	4.30
	B	8%	12%	23%	50%	8%	3.38
I was able to effectively visualize the physical exam maneuvers performed in this teaching session	A	0%	0%	8%	49%	43%	4.35
	B	4%	12%	27%	58%	0%	3.38
My knowledge of the clinical skills demonstrated has improved after this session	A	0%	3%	16%	43%	38%	4.16
	B	4%	15%	23%	58%	0%	3.35
		1 or 2	3 or 4	5 or 6	7 or 8	9 or 10	
How would you rate your overall satisfaction with this session? (Scale of 1-10)	A	0%	0%	5%	54%	41%	8.24
	B	4%	4%	35%	46%	12%	6.77
		No	Unsure	Yes			
Do you think that such a virtual session has increased your confidence in performing the liver exam going into clerkship?	A	14%	22%	65%			
	B	31%	23%	46%			

A = Wearable chest strap groups (n = 37); B = pre-recorded video groups (n = 26)

Suggestions for next steps

Student feedback on wearable POV live-streaming technology for teaching physical exam skills was overwhelmingly positive. Preliminary results indicate that this interactive, cost-effective, and accessible modality can enhance virtual physical exam skills training. It can be easily replicated by other programs and be an adjunct to face-to-face physical exam skills training, thereby providing supplementary opportunities to engage students in virtual clinical skills training post-pandemic. Implementation requires a smartphone, chest strap, and videoconferencing

software, items feasible for most programs. Furthermore, this innovation will enable future, post-pandemic forms of distance learning. Limitations include small samples and potential response bias due to optional participation. Next steps include evaluating this teaching method for student observerships and continuing professional development for physicians in rural or remote communities.

Conflicts of Interest: None.

Funding: No funding was obtained for this study.

References

1. Shahrivini B, Baxter SL, Coffey CS, MacDonald BV, Lander L. Pre-clinical remote undergraduate medical education during the COVID-19 pandemic: a survey study. *BMC Med Educ.* 2021;21(1):13. <https://dx.doi.org/10.1186%2Fs12909-020-02445-2>
2. Sani I, Hamza Y, Chedid Y, Amalendran J, Hamza N. Understanding the consequence of COVID-19 on undergraduate medical education: medical students' perspective. *Ann Med Surg.* 2020;58:117-9. <https://doi.org/10.1016/j.amsu.2020.08.045>
3. 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;7:2382120520965247. <https://doi.org/10.1177%2F2382120520965247>
4. Hilburg R, Patel N, Ambruso S, Biewald MA, Farouk SS. Medical education during the coronavirus disease-2019 pandemic: learning from a distance. *Adv Chronic Kidney Dis.* 2020;27(5):412-7. <https://doi.org/10.1053/j.ackd.2020.05.017>
5. Thomson FC, Morrison I, Watson WA. 'Going professional': using point-of-view filming to facilitate preparation for practice in final year medical students. *BMJ Simu Technol Enhanc Learn.* 2018;4(3):148-9. <http://dx.doi.org/10.1136/bmistel-2017-000224>
6. 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 Ed J.* 2020;11(5):e121-e5. <https://doi.org/10.36834/cmei.70554>