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Getting the job done: Educational robustness of community-engaged medical education during the COVID-19 pandemic

Jenna Darani, MD, MMS; Erin Cameron, PhD; Brian Ross,PhD, MEd

Abstract

Background. The COVID-19 pandemic profoundly impacted medical education worldwide, leading to challenges and adaptations of both in-class and clinical education models. The Longitudinal Integrated Clerkship (LIC) emphasizes community engagement and integration in rural and remote communities making it a unique model to evaluate adaptability during the pandemic. This study examines how the pandemic affected the in-class and clinical experiences of third-year medical students engaged in an LIC situated in Northern Ontario.

Methods. The study employed an anonymous survey completed by 32 LIC students and 18 program administrators. Data collection focused on non-clinical and clinical learning activities, COVID-19 experiences, and the implementation of virtual care.

Results. Despite pandemic challenges, 72% of program administrators reported the overall quality of education remained consistent with previous years. All students successfully met required clinical learning objectives and other promotion requirements, although 56% reported restricted clinical access and limited experience with specialists. Virtual care became a primary adaptation, with 97% of students participating. Student safety was supported by the availability of adequate personal protective equipment availability, and the program maintained continuity throughout the disruption.

Conclusions. While the COVID-19 pandemic caused significant changes to medical education, particularly in clinical settings, our study found that the LIC model proved remarkably robust. Despite challenges, the LIC was able to adapt and maintain educational continuity, ensuring that students continued to meet their learning objectives. These findings highlight the resilience of the LIC model in times of crisis and suggest its potential as a flexible educational approach that is capable of withstanding future disruptions.

Keywords: Rural, distributed, pandemic, longitudinal integrated clerkship.

Introduction

The COVID-19 pandemic changed the world as we knew it[1]. Seemingly overnight, individuals had to change how they worked, socialized, and interacted with one another. Medical schools and students were not immune to these changes, and the way medicine was taught and practiced had to change as well[2]. To better understand how distributed medical education was impacted, this paper focuses specifically on how the pandemic affected academic programming and outcomes at a multi-campus medical program during the 3rd year Longitudinal Integrated Clerkship (LIC) of the Doctor of Medicine (MD) degree.

The LIC is part of the MD program at the Northern Ontario School of Medicine University (NOSM U). NOSM U was founded in 2002 and has its primary campuses located in Thunder Bay and Sudbury, two small cities located in the north of the Canadian province of Ontario[3]. Clinical learning experiences

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occur at the two regional hospitals, Thunder Bay Regional Health Sciences Centre, and Health Sciences North, and in over 90 communities throughout the region[4]. Northern Ontario is the largest sub-region within Ontario, Canada's most populous province. Although the region is large (approximately 800,000 km^2) it is also sparsely populated and contributes only approximately 800,000 people to Ontario's total population of 14.5 million[5]. While approximately 300,000 people in the region live in small cities, the remainder reside in smaller rural and remote communities, many of which are home to Indigenous and Francophone persons[3]. Decades of physician shortages and other healthcare professionals have contributed to worse health outcomes for those living in Northern Ontario compared to those in other parts of the province[6,7], and NOSM U was established with an explicit social accountability mandate to improve the supply of physicians to the region[3].

To achieve this aim NOSM U students engage with multiple northern Ontario communities throughout their training using place- and sociocultural-based educational approaches, helping them better understand the specific challenges and needs of these communities as well as the desire to meet them[7-9]. The NOSM U undergraduate medical education (UME) program lasts four years and is split into 3 phases. Phase 1, which encompasses years one and two, comprises both classroom and community-based educational experiences. This Phase is roughly equivalent to what would be called the 'pre-clerkship' in most other UME programs, and is organized around eleven case-based modules, each of which covers a major body system[4].

In Phase 2, year 3, students embark on what is called the Comprehensive Community Clerkship (CCC), a compulsory 8-month LIC. An LIC refers to a clerkship model in which the student learns about clinical practice in a predominantly primary care or small hospital setting where the various medical disciplines are taught in a concurrent and integrated manner[10]. Students are assigned to live and learn in large rural or small urban communities in Northern Ontario, excluding Sudbury and Thunder Bay, ranging in size from Sioux Lookout with a population of around 5000 to Sault Ste. Marie which is home to approximately 80,000 people[11]. In the LIC model students increase their knowledge of medical care through clinical encounters and through the socio-cultural context in which the patients and their families live and work[12]. This is different from traditional rotation-based clerkships[13] as the LIC allows for the student to follow patients over a longer period, allowing for stronger relationships to be built with patients, peers and preceptors, over multiple clinical encounters, and the ability to better advocate for their patient populations[13,14]. Additionally, traditional block clerkships are challenging to complete in rural settings, as students often cannot be guaranteed sufficient exposure to a specialty due to insufficient patient flow over a 4-to-8-week block[15].

In a typical week NOSM U LIC students will attend taught non-clinical academic sessions such as academic lectures, rounds, and tutorials, which are predominantly delivered online, and work on longitudinal assignments related to scholarship focussed on local healthcare problems such as the Northern and Rural Health Research Proposal. They engage in clinical training in primary care or small hospital sessions where students must participate in a range of required clinical learning experiences (RCLE), and from time-to-time work with specialists who are present in the community through Specialty Enhancement Sessions (SES). Within each LIC community site, students are taught by a range of faculty which include physicians and other health professionals and, occasionally, non-clinical teachers. There are two key program administrators (PAs) at each site. The lead faculty member is a community-based physician called the Site Liaison Clinician (SLC). The SLC is responsible for the student's learning and assessment even if they are not the one directly observing the student daily. In addition to the SLC, the other key PA is the Site Administrative Coordinator (SAC) who organizes the student's learning schedule, classroom teaching, assessment, and assists the SLC in their role as a learning guide and learner assessor. Each SLC participates in a monthly clerkship committee led by the LIC Director which provides curriculum governance to the LIC. The SACs also meet regularly as a group to discuss administrative issues, and both SLC and SACs meet as required with the LIC Director to manage student progress, curriculum compliance, and organisational issues as they occur at each site. Once the LIC is completed

students enter Phase 3, the final year of the four-year program. In Phase 3, students return to either Thunder Bay or Sudbury and complete their specialty rotations/blocks in Emergency Medicine, Internal Medicine, Obstetrics and Gynecology, Pediatrics, Psychiatry, and Surgery. They also can complete electives in specialties which interest them and can normally do these across Canada at different universities if they so choose.

Due to the COVID-19 pandemic, medical schools across Canada were forced to switch over to distance learning, prevent students engaging in electives at other universities, or to pause clinical education entirely[16]. Clerkship students had more limited bedside teaching opportunities as many were asked not to take care of COVID-19 positive patients, given there were fears that medical students may contract the virus and transmit it in their communities[17]. Although the change to online learning has been investigated in many countries across the world[18,19], and their potential effects on student career choices[20], data surrounding this change in a LIC model has not been investigated in depth. While the LIC model has been proposed to be adaptable and resilient within and out-with the pandemic[21,22], the NOSM U LIC provided a unique opportunity to investigate the educational impact of pandemic stressors on student's educational experiences. Students entering the LIC were finishing their Phase 1 pre-clerkship when the pandemic began in March 2020, and started the LIC in September of that year. This gave the UME program some time to modify the LIC considering the pandemic including implementing a COVID-19 exposure tracking system that required students to alert the program of suspected exposures, or changes to their COVID-19 infection status. In this paper, we explore the impact of the COVID-19 pandemic on clinical and non-clinical teaching and learning within the NOSM U LIC framework. We also examined how students experienced the COVID-19 as an actual or potential infectious agent present in the learning environment to help us better understand the level of resilience and adaptability of the LIC during the crisis.

Methods

Design

A descriptive case study design with a mixed methods approach was chosen to better understand how students and programs were impacted during the COVID-19 pandemic.

Participants

Data was collected from both students and PAs (SACs and SLCS) for a more holistic understanding of the LIC. While students can answer based on their personal experiences, PAs could comment on the overall program impacts of the pandemic, as well as how teaching was conducted at their LIC site.

Potential participants were recruited by convenience sampling. All students who completed their LIC during the 2020/2021 academic year were invited to participate in this study, as well as all PAss who were a part of the 2020/2021 academic year at LIC sites. All participants gave informed consent before taking part in the study according to a protocol approved by both Lakehead and Laurentian University Ethics Boards (Lakehead REB file # 1468441, Laurentian REB # 6020972).

Participant details are provided in Table 1. Of the 64 potential LIC student participants, 32 consented to participate, yielding a response rate of 50%. Out of the 30 SACs and SLCs at LIC community sites, we recruited 18 PAs comprising 9 SACs and 9 SLCs (a 60% response rate). Surveys were completed between March 2021 and April 2021 during the LIC academic year which lasted from September 2020 to April 2021.

Data collection

Two surveys were developed to understand student and administrator's experiences of the clinical and non-clinical components of the LIC curriculum during the pandemic. The questions were discussed and agreed upon within the research group (JD, BR, EC). Demographic quantitative questions included age, gender, site, and type of participant i.e. student, SAC, SLC. Additional questions were asked regarding COVID-19 related patient care, and non-clinical and clinical experiences during LIC. Students and PAs were asked about the size of their LIC community to determine if there were significant differences in the student experience between a smaller vs larger

community size. Some questions used yes/no responses and others answered using Likert type scales[23]. The survey was implemented through Qualtrics, an online survey tool which allowed participants to access the survey using a web browser. The survey was anonymous as it did not collect the participants IP address nor track them in any way.

Data analysis

Summary statistics in the form of percentages for the possible answers to each semi-quantitative question were used. Due to the small sample sizes of SACs and SLCs data from these two groups were combined prior to analysis. PA and student responses, as well as student responses between those whose LIC community had a population or more or less than 10,000, were compared using Fisher Exact Test (FET) analysis when appropriate[24].

Results

Overall, the study found the overall quality of education remained consistent with previous years: 72% of PAs reported that the learning experience was about the same in the COVID-19 pandemic year compared to previous years, 28% thought it was worse, and none viewed it as better.

Student Safety and COVID-19 Exposure

Student experience with the COVID-19 virus

For students, 28% said they had contact with a COVID-19 positive patient, about 25% had symptoms of the illness but tested negative, and only one responded that they had tested positive (Table 2). In contrast, PAs (the SACs and SLCs) reported much higher percentages of students having contact (72%) or having symptoms (56%) though only 1 said they had a student test positive for COVID-19, though it is important to note that PAs are describing *all* the students at their LIC site rather than about an individual student. All students who had symptoms or tested positive isolated, with most doing so for two weeks, although one responded they isolated for only 3 days. In contrast, two PAs but no students, stated isolation was until they had 2 negative COVID-19 tests, while three other PAs didn't know. Around half of students saying they had contact with a positive patient stated they isolated, this being lower than the 85% of PAs who reported students isolated in such a scenario (FET; $p < 0.05$). Most (78%) students who had contact with a positive patient did not report this to the UME program on the main campuses, while half did so if they had symptoms. The one student who stated they had been COVID-19 positive did report.

Student safety

There was a large difference between PAs and students with respect to whether students felt safe in the clinic, with over 90% of students said they did compared to only 28% of PAs (FET; $p < 0.001$). All of the PAs and almost all students said they had access to the personal protective equipment (PPE) required to work in the clinic during the pandemic. Moreover, 81% students and PAs understood if they could or could not see COVID-19 positive patients. In addition, 78% of students stated that NOSM U provided adequate information about pandemic-related impacts on the LIC, and 94% of PAs felt the same.

Academic program learning outcomes and adaptation

Non-clinical learning

Students and PAs answered questions about non-clinical learning during their LIC. Only a small minority of students and PAs reported that their ability to participate in non-clinical sessions was impacted, although more PAs than students replied that longitudinal learning experiences were affected (FET; $p < 0.05$). About half stated that participation in exams was changed, with 25% of students replying that their exam performance had been affected, this being more than PAs who mostly replied that they did not know (FET; $p < 0.05$). Just over half of students reported that the pandemic changed their use of technology e.g., network use, video conferencing, with around one in five students requiring technology support.

Clinical learning

Students and staff were also asked about the clinical learning environment (Table 4). In terms of clinical learning, 56% of students and a higher 83% of PAs (FET; $p < 0.05$) responded that access to the clinical environment was restricted due to the pandemic, and 53% of students and 50% of PAs stated that the pandemic affected students' abilities to meet the RCLEs. Those who responded that students were affected by the pandemic to meet the RCLE were then asked if NOSM U provided alternate ways to meet

these RCLEs, such as simulations, with only 11% of PAs and 13% of students saying alternatives were available.

Virtual care was also a topic explored in the study (Table 4), with 97% of students and 94% of PAs responding that students at their site participated in virtual care. How virtual care was organised appeared to differ between sites with 50% of students responding that they had to be physically present at the clinical site when performing virtual care, which was significantly lower (FET; $p < 0.05$) than the 81% of PAs answering yes when asked the same question. PAs and students were both asked about how they believed virtual care compared to in-person care for clinical learning on a 5-point Likert scale, with 50% of students and 39% of PAs stating that virtual care was less effective than in person care for clinical learning, while 44% of students and 50% of PAs stating it was about the same.

Thirty one percent of students and 44% of PAs stated that the pandemic negatively affected students' ability to interact with specialists in the SES (Table 3). Additionally, 63% of students and 39% of PAs responded that the pandemic affected students' ability to interact with allied health professionals and/or community organizations. Notably, 33% of PAs were unsure if students were impacted. Finally, there was no difference in answers between those in small (less than 10,000 population) and larger communities (FET; $p > 0.05$).

Discussion

In this study, we explored the educational impact of the COVID-19 pandemic on a LIC occurring in communities across Northern Ontario. Our major finding was that the clerkship adapted effectively to the pandemic. Indeed, most NOSM U LIC PAs thought that the quality of learning was like that during non-pandemic years. Indeed, the LIC continued throughout the pandemic with no shutdowns or closures occurring at any learning site (BRoss, unpublished data). This differed from other universities in Canada, where many clerkships and all visiting electives were suspended at some point during the pandemic[25].

Student Safety and COVID-19 Exposure

The COVID-19 pandemic presented a significant challenge to medical education programs across Canada, particularly in healthcare settings where access to PPE and safety protocols were uncertain. We were interested to understand more about what occurred during the LIC including physical risks related to exposure and the psychological impacts stemming from safety concerns during students' clinical education.

Student safety

Across Canada in all healthcare settings, there were serious issues accessing PPE during the pandemic due to limited stockpiles from previous pandemics such as SARS and H1N1, supply chain issues and competition around the world to obtain limited PPE stock. There was also limited access to COVID-19 testing and a long period of time between the start of the pandemic and the development of vaccines[27,28]. It was therefore a surprising yet welcome finding that almost all student respondents had access to appropriate PPE, and perhaps as a result a similar high proportion of students felt safe in their clinical environments. This feeling of safety may also have been due to a decision to not let LIC students participate in the care of COVID-19 positive patients, with most students reporting that they were aware of this restriction. In contrast, however, a much lower proportion of PAs reported student's felt safe (28% vs 91%) suggesting that how students and PAs viewed safety differed. It is therefore notable that clerkship students across Canada seemed to be less concerned about contracting COVID-19 or contaminating others than they were about how the adaptive changes occurring during the pandemic could impact their learning and affect their future careers[25]. More than half of student respondents in our survey reported that their access to the clinical environment was restricted due to the pandemic, leading to the cancellation of many routine appointments and surgeries [28]. As such PAs may have noticed and reported increased student anxiety regarding their education in general as feeling unsafe, rather than to matters pertaining to clinical safety *per se*.

Student viral exposure and reporting

Students also had to take time away from training due to COVID-19 symptoms or testing positive for COVID-19 with a quarter of student respondents

having to isolate during LIC due to COVID-like symptoms. There was variability in terms of the length of the isolation period which was reported as being between 3-14 days which is consistent with the NOSM U UME decision to leave such details up to each LIC site (B. Ross, unpublished data). Surprisingly, when PA respondents were asked about how long students at their site had to isolate if exposed to COVID, almost a third of PAs left the response blank indicating that they either did not specifically know how many days their students isolated, or alternatively local site requirements may have varied during the clerkship and a single answer was not possible.

Student participants reported quite low rates of COVID-19 patient exposure or having symptoms. The COVID-19 infection rate in Northern Ontario was less than southern Ontario[29]. This is thought to be due to increased social distancing due to geography, and maybe a higher degree of immunity in the region[30]. That being said, our PA participants reported much higher rates of student exposure or having symptoms. While this may be due to PAs working with multiple students, given the high student response rate to the survey this explanation is arithmetically unlikely. A more likely explanation is suggested by our finding that only about 1 in 5 students opted to communicate COVID symptoms or infection to the UME program administration, something they were required to do (BR, unpublished data), and which would have resulted in potential disruptions to their education. Even though this was an anonymous survey, students may have been hesitant to reveal exposure or having symptoms to the researchers, even though they had revealed such to their site PAs. While such evidence is circumstantial, our data does suggest that students may have experienced a tension between COVID-19 isolation requirements and their desire to complete their clerkship under circumstances that were both uncertain and rapidly changing.

Academic program learning outcomes and adaptation
While ensuring student safety during clinical placements was paramount, the pandemic also raised significant questions about the continuity of non-clinical learning. This next section explores how the academic program maintained its educational objectives through non-clinical activities, despite the disruptions caused by the pandemic.

Non-Clinical Learning
During the LIC, student's in-clinic education is augmented by a range of academic sessions, longitudinal assignments and assessments. A large majority of students and, to a lesser extent, PAs reported that their participation in these activities was unaffected. The switchover to online education likely underpinned student's reports of changed technology use[26], though the existing extensive use of videoconferencing in the highly distributed LIC may have minimised such an impact and explain why only around half of our student participants reported technology had changed. Moreover, while many students viewed their exam performance as having been impacted, all LIC students successfully completed their coursework and were promoted to their final year (BRoss, unpublished observations).

Required Clinical Learning Experiences
Students' hesitance to act in a way which could have resulted in mandatory isolation, may be partly explained by many isolating students reporting that they did not engage in any non-clinical learning during this time. Secondly, participants responded that their ability to complete their RCLEs was negatively impacted and that being provided with alternative ways to do so was only reported by by a small minority of students and PAs. Nevertheless, all students successfully completed these requirements and promotion rates into the final year of study were unaffected by the pandemic (BRoss, unpublished data) indicating that students and their preceptors adapted in a manner which ensured student completion despite the difficulties imposed by the pandemic environment.

Virtual Clinical Education
The completion of RCLEs was likely reliant on the use of virtual patient care based clinical learning. Indeed, almost all LIC PA respondents noted that students participated in virtual clinical care, a change which undoubtedly allowed the clerkship to continue rather than being suspended. The University of Ottawa undergraduate medical program defines virtual care as a "series of tools to facilitate and support the safe delivery of care", providing a framework for

developing skills earlier in training and supporting the use of digital technology in the healthcare system[31]. PA and student respondents to the survey were both asked how virtual care compared to in-person care for clinical learning, and a large portion of both noted that the two experiences were about the same. This contrasts with most Canadian medical students feeling that their quality of education was reduced due to the pandemic[32]. Interestingly in the survey results, there was a statistically different response between PAs and students regarding if students had to be present in the clinical site when performing virtual care, indicating some degree of confusion regarding site policies during the rapid switch to this form of clinical teaching. The successful switch to virtual care for student training may have been enabled by mandatory virtual care training using standardized patients that the student had to complete prior to beginning their LIC.

Access to specialists

Our results suggest that student's ability to interact with specialists in the SES was reduced due to the pandemic. The primary care focus of the LIC can result in student's not feeling their exposure to medical specialties is sufficient even in non-pandemic years[12.13], but it is likely that the pandemic made these interactions even more challenging as specialists were unable to travel to Northern Ontario. The impact of this lack of access appears to have been limited, however. For example, in applications to post-graduate programs (the Canadian Residency Matching Service (CaRMS) match) the following year this LIC cohort had a 100% placement rate, with 56% of students matching into family medicine programs and 44% matching into specialty programs across Canada[34]. Additionally, 45% of students matched into a NOSM U residency training program which was similar to that in other years[33]. The NOSM U results were about the same as the 2021 match for all of Canada, with a 94.9% match rate in 2020 compared to a 94.2% match rate in 2021[33]. This strong performance in the match, in both family medicine and specialty medicine, suggests that any dip in specialist access due to the pandemic did not play out into actual career trajectory variation. This may be because this cohort had the opportunity to engage in specialty electives in their fourth year. In general our data does not support that participation in a LIC, even when specialty exposure is lower than usual, limits career choices, although the uniqueness of the pandemic situation makes such a conclusion tentative.

Conclusions

Taken together, our data indicate the robustness of the LIC program in terms of both clinical and non-clinical teaching, as well as in student learning and career outcomes. While infection rates were lower in the region, the limited number of healthcare workers at many sites makes it likely that significant stressors existed as indicated by responses showing restricted access to clinical teachers during the pandemic. Indeed, the lack of differences reported between both larger and smaller communities, with differing resources available to them, suggests an adaptability and resiliency of LIC sites who were placed under marked clinical and educational stress by the pandemic. While it is unclear from our results what the underlying mechanism is which resulted in LIC continuance during the pandemic, the governance structures which gave sites the autonomy to adapt within the boundaries for program completion set by NOSM U may have played an important role. Indeed, it has been argued that LICs are highly adaptable and resilient due to the social capital developed at each site which results in the cooperation and tenacity to achieve desired clinical and educational aims whether during or out-with a pandemic[21,22,35]. The experiences of the NOSM U LIC provides further empirical evidence supporting such conclusions.

References

1. Zhai P, Ding Y, Wu X, Long J, Zhong Y, Li Y. The epidemiology, diagnosis and treatment of COVID-19. *Int J Antimicrob Agents.* 2020;55(5):105955.
2. Sahu P. Closure of universities due to coronavirus disease 2019 (COVID-19): impact on education and mental health of students and academic staff. *Cureus.* 2020;12(4):e7541.
3. Strasser R, Lanphear JH. The Northern Ontario School of Medicine: responding to the needs of the people and communities in Northern Ontario. *Educ Health (Abingdon).* 2008;21(3):212.

4. Ross BM, Cervin C. Northern Ontario School of Medicine. *Acad Med.* 2020;95(9S):S588-S591.
5. Statistics Canada. *Census Profile, 2021 Census of Population.* Accessed [date]. https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/prof/index.cfm?Lang=E
6. Strasser R, Hogenbirk JC, Minore B, Marsh DC, Berry S, McCready WG, Graves L. Transforming health professional education through social accountability: Canada's Northern Ontario School of Medicine. *Med Teach.* 2013;35(6):490–496.
7. Strasser R, Hogenbirk J, Jacklin K, Maar M, Hudson G, Warry W, Cheu H, Dubé T, Carson D. Community engagement: A central feature of NOSM's socially accountable distributed medical education. *Can Med Educ J.* 2018;9(1):e33–e43.
8. Ross BM, Daynard K, Greenwood D. Medicine for somewhere: the emergence of place in medical education. *Educ Res Rev.* 2014;9(22):1250-1265.
9. Ross BM, Taylor K, Button B, Kilbertus F, Cameron E. How early clinical experiences in rural communities influence student learning about rural generalism considered through the lens of educational theory. *Can Med Educ J.* 2024;15(2):6-13.
10. Hudson JN, Poncelet AN, Weston KM, Bushnell JA, Farmer EA. Longitudinal integrated clerkships. *Med Teach.* 2016;39(1):7–13.
11. NOSM University. *Community profiles.* NOSM University, Sudbury, Canada. Accessed March 12 2025. https://www.nosm.ca/our-community/wider-campus-of-the-northern-ontario-school-of-medicine/community-profiles/
12. Worley P, Couper I, Strasser R, Graves L, Cummings BA, Woodman R, Stagg P, Hirsh D, Consortium of Longitudinal Integrated Clerkships (CLIC) Research Collaborative, Banh KV, Barnard A. A typology of longitudinal integrated clerkships. *Med Educ.* 2016;50(9):922-932.
13. Teherani A, Irby DM, Loeser H. Outcomes of different clerkship models: longitudinal integrated, hybrid, and block. *Acad Med.* 2013;88(1):35-43.
14. Dodsworth A, Munro K, Alberti H, Hirsh DA, Paes P, Illing J. Patient outcomes in a longitudinal integrated clerkship: a systematic literature review. *Med Educ.* 2023;57(9):820-832.
15. Couper I, Worley P, Strasser R. Rural longitudinal integrated clerkships: lessons from two programs on different continents. *Rural Remote Health.* 2011;11(1):1665.
16. Dedeilia A, Sotiropoulos MG, Hanrahan JG, Janga D, Dedeilias P, Sideris M. Medical and surgical education challenges and innovations in the COVID-19 era: a systematic review. *In Vivo.* 2020;34(3 Suppl):1603-1611.
17. Alsoufi A, Alsuyihili A, Msherghi A, et al. Impact of the COVID-19 pandemic on medical education: medical students' knowledge, attitudes, and practices regarding electronic learning. *PLoS One.* 2020;15(11):e0242905.
18. Khalil R, Mansour AE, Fadda WA, et al. The sudden transition to synchronized online learning during the COVID-19 pandemic in Saudi Arabia: a qualitative study exploring medical students' perspectives. *BMC Med Educ.* 2020;20(1):285.
19. Al-Balas M, Al-Balas HI, Jaber HM, et al. Distance learning in clinical medical education amid COVID-19 pandemic in Jordan: current situation, challenges, and perspectives. *BMC Med Educ.* 2020;20(1):341.
20. Bughrara MS, Swanberg SM, Lucia VC, Schmitz K, Jung D, Wunderlich-Barillas T. Beyond COVID-19: the impact of recent pandemics on medical students and their education: a scoping review. *Med Educ Online.* 2023;28(1):2139657.
21. Geiger K, Bowman J, DeWitt D. Reflecting on the advantages of longitudinal integrated clerkships and COVID-19. *J Reg Med Campuses.* 2021;4(2).
22. Webb K, Fish S, Williams F, Goodfellow R, Riley S, Gerrard F. COVID and LIC-the importance of educational continuity in a global pandemic. *Educ Prim Care.* 2021;32(6):372-373.
23. Hasson D, Bengt BA. Validation and findings comparing VAS vs. Likert scales for psychosocial measurements. *Int Electron J Health Educ.* 2005;8:178–192.

24. Campbell I. Chi-squared and Fisher–Irwin tests of two-by-two tables with small sample recommendations. *Stat Med.* 2007;26(19):3661–3675.
25. Abbas M, Dhane M, Beniey M, et al. Repercussions of the COVID-19 pandemic on the well-being and training of medical clerks: a pan-Canadian survey. *BMC Med Educ.* 2020;20:385.
26. 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.
27. Mathews M, Ryan D, Hedden L, et al. Family physicians' responses to personal protective equipment shortages in four regions in Canada: a qualitative study. *BMC Prim Care.* 2023;24(1).
28. Rose S. Medical student education in the time of COVID-19. *JAMA.* 2020;323(21):2131.
29. Public Health Ontario. *Ontario COVID-19 Data Tool.* publichealthontario.ca. Published April 28, 2023. Accessed March 12, 2025. http://www.publichealthontario.ca/en/Data-and-Analysis/Infectious-Disease/Respiratory-Virus-Tool
30. White E. Why are northern Ontario's COVID-19 numbers so low? 'Part of it has to do with a little bit of luck'. cbc.ca. Published December 3, 2020. Accessed March 12, 2025. https://www.cbc.ca/news/canada/sudbury/covid-19-pandemic-northern-ontario-spread-1.5823086
31. Anawati M. Virtual care in undergraduate medical education: perspectives beyond the pandemic. How medical education can support a change of culture towards virtual care delivery in Canada. *Can Med Educ J.* 2022;13(4):92-99.
32. ElHawary H, Salimi A, Barone N, Alam P, Thibaudeau S. The effect of COVID-19 on medical students' education and wellbeing: a cross-sectional survey. *Can Med Educ J.* 2021;12(3):92-99. doi:10.36834/cmej.71261.
33. Turriff L. Applications by faculty and discipline. carms.ca. Published August 8, 2022. Accessed March 12, 2025. http://www.carms.ca/data-reports/r1-data-reports/applications-by-faculty-and-discipline
34. NOSM University. *Constellation of Shining Stars.* nosm.ca. Published May 7, 2021. Accessed March 12, 2025. http://www.nosm.ca/2021/05/07/constellation-of-shining-stars/#:~:text=Thirty%20medical%20students%20from%20the%20NOSM%20Class%20of,match%20rate%20of%2094.2%25%20%28vs%2094.9%25%20in%202020%29
35. McElhinney Z, Hoskison G, Bartlett M. LIC in the time of COVID: experiences of LIC tutors during the COVID-19 pandemic in Scotland. *Educ Prim Care.* 2023;34(2):58-63.

Tables

Table 1: Characteristics of participants completing the survey

Measure	Program Administrators	Students
Number of participants	9 SAC 9 SLC	32
Acted as an SAC/SLC previously	18 (100%)	NA
Gender (Female/Male)	8 (44%)/10 (56%)	11(34%)/21 (66%)
Age (mean ± SD) (range))	48 ± 4 (36-62)	28 ± 1 (25-34)
Community size (population < 10,000)	6 (33%)	14 (44%)

Characteristics of Program Administrators and student survey participants, including age, gender, household size and LIC location/size. SAC: Site Administrative Coordinator; SLC: Site Liaison Clinician; NA: Not Applicable.

Table 2: Student experiences of COVID-19 illness

Question	Type of experience					
	Close contact with a COVID-19 positive patient		COVID-19 symptoms but tested negative		Tested COVID-19 positive	
	PA	Student	PA	Student	PA	Student
Did you (student) or your students (PA) have each type of experience? [Yes/Don't know][1]	13(72%)/0(0%)	9(28%)/0(0%)	10(56%)/1(5%)	8(25%)/0(0%)	5(28%)/0%	1(3%)/0(0%)
If yes, did you (student) inform the medical school via COVID-19 tracking process? [Yes]	Not asked	2(22%)	Not asked	4(50%)	Not asked	1(100%)
If yes, did you (student) participate in non-clinical learning while isolating? [Yes]	Not asked	5(56%)	Not asked	7(88%)	Not asked	1(100%)
If yes, did you (student) or your students (PA) isolate? [Yes]	11(85%)	5(56%)	10(100%)	8(100%)	5 (100%)	1 (100%)
If isolating, did you (student) or your students (PA) for how long? [text answer]?						
3 days	0(0%)	0(0%)	1 (10%)	1 (12%)	0 (0%)	0 (0%)
10 days	1(8%)	2(40%)	1 (10%)	3 (38%)	0 (0%)	0 (0%)
14 days	10(76%)	3(60%)	2 (20%)	4 (50%)	3 (60%)	1 (100%)
As per protocol	1(8)%	0(0%)	1 (10%)	0 (0%)	1 (20%)	0 (0%)
Until 2 negative tests	0(0%)	0(0%)	2 (20%)	0 (0%)	0 (0%)	0 (0%)
Don't know	1(8)%	0(0%)	3 (30%)	0 (0%)	1 (20%)	0 (0%)

Program administrators (PA; n=18) and students (n=32) were asked about students having close contact with COVID-19 positive patients, students having COVID-19 symptoms, or testing positive for COVID-19. If participants answered 'Yes' to having these experiences, they were also asked if they reported this to the program, participated in non-clinical learning, and whether they isolated and for how long. The table show the number of participants who gave the answer shown in [brackets] along with the percentage in parenthesis. PA and student responses were compared using a FET with statistical significance *: $p < 0.05$. [1] No comparison was performed between PA and students as PAs supervise multiple students.

Table 3: Impact of the pandemic on required non-clinical learning activities

Question	Program Administrators	Students
Did the pandemic affect you (students) or your student's (PA) ability to participate in academic sessions e.g. lectures, clinical academic rounds? [Yes/Don't know]	1(6%)/2(11%)	3(9%)/0(0)
Did the pandemic affect student's ability to participate in longitudinal learning experiences e.g., the Northern and Rural Health Research Proposal? [Yes/Don't know]	4(22%)/3(17%)	*1(3%)/0(0%)
Did the pandemic change how you (students) or you student's (PA) participated in written assignments [Yes/Don't know]	8(44%)/2(11%)	16(50%)/0(0%)
Did the pandemic affect how you (students) or you student's (PA) performed on written or clinical assessments? [Yes/Don't know]	1(6%)/15(83%)	*8(25%)/0(0%)
Did the pandemic change your (student) use of technology e.g. network use, video conferencing? [Yes]	Not asked	18(56%)
Did you (student) require assistance with your technology e.g. Wi-Fi connection, equipment? [Yes]	Not asked	6(19%)

Program administrators (n=18) and students (n=32) were asked to comment on the pandemic's overall impact on required learning activities e.g., academic sessions, written assignments, written assessments, and their use of technology. The table show the number of participants who gave the answer shown in [brackets] along with the percentage in parenthesis. PA and student responses were compared using a FET with statistical significance *: $p < 0.05$.

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Table 4: Clinical environment

Question	Program Administrators	Students
Did you (student) or your students (PA) feel safe in the clinical environment during the LIC? (Yes/No/Don't know)	5(28%)/11(61%)/2(11%)	**29(91%)/3(9%)/0(0%)
Did students always have access to appropriate PPE? (Yes/No/Don't know)	18(100%)/0(0%)/0(0%)	31(97%)/1(3%)/0(0%)
With respect to COVID+ patients, did you (student) or your students (PA) understand which patients they could see and which they could not? (Yes/No/Don't know)	15(83%)/2(11%)/1(6%)	26(81%)/6(19%)/0%
Did NOSM U provide adequate information about to you or your students about pandemic-related impacts on the LIC? (Yes/No/Don't know)	17(94%)/1(6%)/0(0%)	25(78%)/7(22%)/0(0%)
Was access to the clinical environment by students restricted due to the pandemic? (Yes/No/Don't know)	15(83%)/3(17%)/0(0%)	*18(56%)/14(44%)/0(0%)
Did the pandemic negatively affect your (student) or your students (PA) ability to meet the RCLEs (Yes/No/Don't know)	9(50%)/9(50%)/0(0%)	15(47%)/17(53%)/0(0%)
If yes, did NOSM U provide alternate ways to meet RCLEs e.g. simulations (Yes/No/Don't know)	1(11%)/3(33%)/5(56%)	2(13%)/6(38%)/7(49%)
Did you (student) or your students (PA) participate in virtual clinical care? (Yes/No/Don't know)	17(94%)/0(0%)/1(6%)	31(97%)/0(0%)/1(3%)
Did you (student) or your students (PA) have to be physically present in the clinic site? (Yes/No/Don't know)	15(83%)/2(11%)/1(6%)	*16(50%)/13(41%)/3(9%)
How did virtual care compare to in-person care for clinical learning? (Less effective/about the same/more effective/Don't know)	7(39%)/9(50%)/0(0%)/2(11%)	16(50%)/14(44%)/1(3%)/1(3%)
Did the pandemic negatively affect student's ability to interact with specialists in SES (Yes/No/Don't know)	10(55%)/8(45%)/0%	13(41%)/19(59%)/0(0%
Did the pandemic negatively affect student's ability to interact with allied health professionals and/or community organizations (Yes/No/Don't know)	7(39%)/5(28%)/6(33%)	20(63%)/12(38%)/0(0%)

Students (n=32) and program administrators (n=18) were asked questions about virtual care, COVID-19 rules, dissemination of COVID-19 guidelines, PPE, and safety. They were also asked about the impact of COVID-19 on clinical education requirements such as RCLE, SES, and limitations to accessing in the clinical environment. The table show the number of participants who gave the answer shown in [brackets] along with the percentage in parenthesis. PA and student responses were compared using a FET with statistical significance *: $p < 0.05$, ** : $p < 0.001$.