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COVID-19 Impact on Regional Medical Campus Education: Student Perspectives

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Abstract

Due to social distancing precautions and the desire to protect clinical learners, the COVID-19 pandemic forced medical schools everywhere to implement more distanced and virtualized learning in their educational curriculums. More specifically, at the University of Kansas School of Medicine-Salina, a regional medical campus, the impact of some of these changes were also seen and felt. The purpose of this study was to investigate the downstream effects of these curriculum changes from the perspectives and opinions of medical students attending a regional medical campus. To explore the study purpose, a mixed-methods, cross-sectional study that used an online survey with closed and open-ended questions was used. Additionally, because of unique curriculum characteristics depending on the year of the student, first and second year students (Phase I) were asked slightly different questions than students in their third and fourth years (Phase II). Closed-ended questions asked students about lecture experience, clinical learning development and time, study time, exam performance, collaborative learning experiences, and socialization/interactions with colleagues. Students answered in range of -3 to +3, negative numbers meaning a detrimental impact (or decrease in study time), and positive numbers being beneficial impact (or increase in study time). Open-ended questions asked students about improvements that could be made, unique class circumstances during the pandemic and any other relevant impact not covered in closed-ended questions. For Phase I students, lecture experience, study time, and exam performance resulted in no impact. However, collaborative learning and socialization with colleagues did result in a detrimental impact that was significant. For Phase II learners, clinical skills development, time spent in clinical skills development, and socialization with colleagues were detrimentally impacted. However, the amount of time spent on studying increased and exam performance benefited. These findings suggest that pandemic-related curriculum changes impact learners differently depending on the phase of medical they are in.

Introduction

The COVID-19 pandemic affected the experiences of medical students across the world. At a regional campus like University of Kansas School of Medicine-Salina (KUSM-Salina), the effects of the pandemic varied among students, and varied from the school's other 2 campuses. We approached this study from the perspective that the standard medical school curriculum should be constantly evaluated, much like the continuous quality improvement cycle used commonly throughout healthcare. When curricula are under constant constructive scrutiny, educators may also be able to better understand how crises – like pandemics – may impact them. We agree with previous work that take this same perspective and asserts that the experiences of the medical students should be incorporated in this process as well.¹

A majority of US medical schools follow a 4-year model consisting of 2 initial preclinical years (Phase I) and the last 2 years focusing on clinical medicine (Phase II).² Students in the preclinical years watch lectures, participate in anatomy labs, attend collaborative learning sessions with their fellow students, and take exams over the material from those lectures and group sessions. Over the years at KUSM there has been a transition to more group, case-based, collaborative, and flipped-classroom learning, in contrast to more traditional lecture-based learning.^{3,4} Phase I students tend to be at school more often, and clinical experiences are kept to a minimum. On the other hand, Phase II students are focused on their clinical skills acquisition and total knowledge of medicine. Students in Phase II spend most of their time in the clinic and hospital learning alongside physicians, residents, and other health care

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professionals. They also attend clinical learning activities at their respective institutions for supplemental clinical experience and formative and summative feedback. Because of the differences in clinical experiences between the 2 phases, the COVID-19 pandemic may affect students in each phase differently.

During the Severe Acute Respiratory Syndrome (SARS) outbreak in 2003, medical schools in Hong Kong and Canada were forced to cease in-person learning, leading to medical schools transitioning to videotaped vignettes, audiotaped recordings or online chat rooms and webcasting in place of clinical experiences.⁵ Similarly, in the COVID-19 pandemic, there has been a cessation of in-person lectures and an increase of recorded lectures and/or livestreams across the country.⁶ Collaborative learning sessions have also been transitioned to webinars or teleconferences; as a result, these changes have led to less real-time feedback and have made back and forth discussion difficult.⁶ Furthermore, second year medical students at the end of Phase I were preparing for the United States Medical Licensing Exam (USLME) Step 1 when these curriculum changes were first implemented, creating an unprecedented circumstance for second year students. First-year students were finishing up their last modules for the academic year while third-year students completed their clerkships.

When COVID-19 first significantly affected the US in March 2020, the AAMC released guidelines recommending at least a 2-week suspension of any student clinical activities involving patient contact in order to mitigate virus spread and protect learners (AAMC, 2020). Guidelines in April 2020 suggested a lengthened suspension in accordance with local, state, and national guidelines and that medical students not be involved in any direct patient care activities (AAMC, 2020).⁵ At a regional medical campus like KUSM-Salina, greater hands-on clinical experience and an emphasis on rural medicine are often reasons students choose to attend. However, the pandemic presented a significant obstacle to those foci. At the start of the COVID-19 pandemic, KUSM-Salina cancelled and/or moved some large-group interactive sessions and small-group collaborative learning sessions to an online, synchronous format, while lectures and supplemental clinical activities were transitioned to an asynchronous online format.

Synchronous sessions were held online using Blackboard Collaborate or Zoom, and exams were taken online at home. Phase II students were pulled from clinical rotations at hospitals and clinics as well as in-person, school-sponsored clinical learning sessions; these experiences were replaced by online clinical simulations and other asynchronous learning activities. Because students were forced to be at home, they were not able to interact in-person with their fellow classmates, colleagues, faculty, and attending physicians.

These pandemic-induced curriculum changes affected students, administrative personnel, and instructors. This study focuses on the students at our regional medical campus KUSM-Salina, seeking to understand their perspectives on the effects of the COVID-19 pandemic on their medical education experience. With this knowledge, educators at our schools and schools similar to ours may be able to make improvements to their curricula and to their contingency plans for future crises.

Methods

To understand the impact of the pandemic on medical students attending a regional campus, this mixed-methods, cross-sectional study utilized an online survey with open- and closed-ended questions asking about major components of the curriculum and effects on their academic experience. Students were eligible to participate if they attended KUSM-Salina during the spring semester of 2020 (January-May). A link to the REDCap survey was emailed to all eligible students. The first question asked what phase the student was in during spring 2020, and then respondents were directed to the set of questions relevant to their phase: I or II. We asked a few phase-specific questions to better understand the effects experienced.

For a list of the closed-ended questions used for the survey to help answer the research question see Table 1 below.

Phase I Questions: COVID affected...	Mean (median, range), Phase I Students:	Mean (median, range), Phase II Students
Lecture experience	-0.46 (0, -2 to +1)	n/a
Collaborative learning experiences	-1.38 (-2, -3 to +3)	n/a
Total study time	-0.44 (-1, -3 to +3)	3.0 (+3, +3)
Exam performance	-0.46 (-2, -3 to +3)	1.4 (+1, +1 to +2)
Socialization/interaction	-2.3 (-2, -3 to -1)	-1.4 (-3, -3 to +2)
Clinical skills	n/a	-2.6 (-3, -3 to -2)
Clinical skill labs	n/a	-2.2 (-2, -3 to -1)

Table 1. Closed-ended Questions and Mean, Median, and Range Responses

Closed-ended survey items used a -3 to +3 scale, with negative numbers representing a detrimental or harmful impact, zero indicating no impact, and positive numbers representing a beneficial or positive impact on the experience in question. For study time, the positive numbers indicated increases in study time, and negative numbers indicated decreases. These quantitative data were analyzed using Stata SE/15. We calculated summary, descriptive statistics, including frequencies, proportions, means, and ranges. Because of the small sampling frame and number of respondents, more advanced statistical analysis was not used. The resulting qualitative data from these open-ended questions were summarized inductively.

We also asked open-ended questions about factors impacting the medical training experience. For the list of open-ended questions used on the survey for both Phase I and II students see Table 2.

What aspects of COVID-related curriculum changes need improvement? If any please explain.
Do you have any reason to believe that your class's experience has been unique from other classes? Why or why not? Please explain.
Have COVID-related curriculum changes affected your medical school experience in ways not represented by the survey?
Do you have any additional comments you feel are relevant?

Table 2. Open-ended Questions:

Results

Quantitative Findings

Out of 32 students (8 in each class), 18 (56%) students responded. There were 13 (72.2%) from Phase I and 5 from Phase II (27.8%).

Phase I students were asked about the impact of the pandemic on their lecture experiences using the -3 to

+3 scale described in Methods. The mean rating was -0.46 (range -2 to +1). With respect to study time, Phase I student responses had more variability. The mean was -0.44 (range -3 to +3). For COVID-19 impact on exam performance among Phase I students, the mean was -0.46 (range -2 to +1). With respect to collaborative learning experiences during Phase I, the mean was -1.38 (range -3 to +3).

Finally, we asked about the impact of the pandemic on socialization with classmates and colleagues as it pertained to their medical education experience. For Phase I students, the mean response was -2.3 (range -3 to -1). All who responded felt there was a negative impact on socialization and interactions with classmates during pandemic-related curriculum changes. The means of all responses for phase I questions are found in Table 1.

Phase II students were asked about unique aspects of their curriculum that were impacted by the COVID-19 pandemic, either positively or negatively, similar to the Phase I students. However, Phase II students numbered only 5.

We asked Phase II students about the pandemic's impact on clinical skills development. The mean response was -2.6 (range -3 to -2), indicating all who responded felt a negative impact. Regarding study time, conversely to Phase I students, all 5 Phase II students answered +3, indicating an increase in study time.

Regarding impact on exam performance, the Phase II mean was 1.4 (range +1 to +2). Overall, Phase II students experienced an increase in study time and a beneficial impact on exam performance. Phase II students were also asked about the impact of the pandemic on time for clinical skill learning activities and events. Similar to clinical skills development, the impact on clinical skill activities and events had a mean of -2.2 (range -3 to -1).

The social aspect of medical school was also explored with Phase II students. The mean was -1.4 (range -3 to +2). The means of all responses for Phase II questions are found in Table 1.

Qualitative Findings

In the qualitative data, many different perspectives were brought to light about COVID-related curriculum changes at our regional medical campus. We present the questions with summaries of the responses to each and select representative quotations. Due to our small sample size, we are not presenting all

qualitative responses in their entirety to protect student confidentiality.

Question: What aspects of COVID-related curriculum changes need improvement?

For Phase I students, online, prerecorded lectures were difficult for some who preferred that *“more lectures could be live-streamed”* because *“lectures could be improved to be more interactive.”* Students often brought up the fact that online webinars for collaborative and problem-based learning sessions did not compare in quality to the interactions and discussions experienced in their previous, in-person versions. In addition, one student felt *“some recorded lectures seem slightly outdated”*.

On a smaller regional campus like KUSM-Salina, where there are only 8 students per class, many students felt that social distancing along with appropriate face masks and personal hygiene should have been reasonable measures that would have allowed for the continuation of in-person sessions. The students expressed that KUSM-Salina’s unique campus circumstance perhaps should have been allowed different guidelines from the other, larger campuses where 30 to 100+ students would have been asked to congregate. For example, one student said:

“I feel that with the proper safety precautions implemented we would be able to do some in-person learning activities. Personally, I learn best with in-person interactions and hands-on learning and when those aspects of the curriculum were taken away during COVID modifications I definitely missed them!”

For Phase II students, many wished they could have stayed in clinics and hospitals to acquire clinical medical knowledge and physical exam techniques.

For example, a student stated:

“There is no substitute for real experience. I missed out on surgeries and physical exam maneuvers that I likely will not have repeat exposure to but will be expected to know in residency.”

The students reported understanding this was a difficult situation to predict and prepare for, and they understood alternative simulated activities were an appropriate response.

Question: Do you have any reason to believe that your class’s experience has been unique from other classes? Why or why not?

As mentioned previously, first-year medical students were finishing their last 2 modules of their academic

year whereas second year medical students were reviewing for the USLME Step 1 to complete Phase I; therefore, these differences must be taken into consideration when reviewing student perspectives. First-year students reported the biggest impact on their medical educational experience was not getting to directly collaborate, learn, and socially interact with their colleagues. Some even stated concerns about how the pandemic would *“affect [their] bonding”*. Many second-year students expressed concerns about experiencing Step 1 test date delays while also having to deal with being forced to study at their homes, not having as much interaction, and coping with the stress of preparing for a high-stakes exam. One student stated:

“[T]here had been significant anxiety around the issue which, more likely than not, affected peoples’ focus on studying.”

In addition, multiple second-year students reported 1- to 2-week delays in taking Step 1 and at the time feared it would result in a delay starting Phase II.

The Phase II students similarly brought up concerns about not only having shortened in-person clinical experiences, but also the fact that they would not be able to travel for externships and clinical rotations at potential residency locations. For instance, a student stated:

“[W]e do not get to travel for interviews fourth [year], meet our future colleagues, or see the towns/cities we will spend the next 3-5 years in. We also do not get to participate in externships which greatly influence the likelihood of getting an interview and residency spot.”

Question: Have COVID-related curriculum changes affected your medical school experience in ways not represented by the survey?

Many of the Phase I students explained that having to learn to study at home instead of their usually study space at school was an environmental change, rather than a curriculum change, and it had in fact affected their medical education experience and performance. For example, one student stated:

“Studying at home was more of a challenge for me. I did well enough but I wasn’t as productive as I would have been at school.”

Other students mentioned feeling *“disconnected”* from their colleagues. Phase I students mentioned missing exposure to supplemental clinical knowledge that they believed they would have gained from either enrichment activities or hands-on cadaver anatomy

activities that help build on theoretical knowledge learned from lectures and text books.

Phase II student responses varied, with some feeling isolated from colleagues and patients and others being happy to have a chance to step away from the rigorous schedule of medical school and focus on other aspects of life, with one student stating:

"Yes, I was able to get a very nice breath of fresh air and spend a great deal of quality time with my immediate family. Overall, this was a great benefit to my physical and mental health, despite the deficits in my education."

Question: Do you have any additional comments you feel are relevant?

Phase I students had no additional input. Phase II students mentioned that implementing a standard telehealth clerkship would be beneficial, with one student stating:

"Honestly, I think they should make a telehealth rotation. . . This would give us experience with the 'new age of medicine' tech."

Lecture experience, study time, and exam performance were either not impacted or slightly negatively impacted for Phase I students, while collaborative learning sessions and socialization were. Clinical knowledge, skill development, and socialization with colleagues and attendings were negatively impacted for Phase II students. Positive impacts for Phase II students included study time and exam performance. There were some differential effects of curriculum changes based on phase of medical school, which were detailed in the qualitative data as well.

Discussion

Natural disasters and worldwide pandemics have affected medical institutions and their students. The lessons from these events do not come from the disasters themselves but from the responses and corresponding changes medical institutions had to make to mitigate the impacts on the educational experiences of their students. Due to Hurricane Katrina in 2005, Tulane University School of Medicine in New Orleans relocated its education programs to Houston, Texas, and used Baylor University facilities. Along with partnering with other schools, this school cited having key back-up technology infrastructure as a major reason for why the school was able to be functional again after only a month.⁷

Like the current COVID-19 situation, the SARS outbreak of 2003 in Hong Kong led to the closure of medical schools and universities located there. Those institutions responded by implementing information technology systems so that students could maintain social distancing and prevent the spread of the virus.⁸ In looking at the COVID-19 pandemic and its impact on US undergraduate medical education, medical schools have acted in accordance with AAMC recommendations and in similar ways to their Katrina and SARS responses, integrating more remote learning through technology.⁵ The responses to these disasters and pandemics were able to keep medical education afloat, but better understanding the ramifications of these responses for students is the value of this study.

Regional medical campuses differ from larger, urban campuses in that there are fewer students. KUSM-Salina uses a significant amount of real-time telecommunication technology, such as lecture streaming.⁹ Students at Salina perceive – in contrast to more metropolitan campuses – they have more opportunities for immersive, hands-on clinical experiences due to the more intimate educational setting.¹ Another factor to consider is interpersonal dynamics. Because of the smaller class size, students often know each other more personally and have ample opportunities to socialize through school-sponsored specialty interest groups.¹

The largest proportion of Phase I students felt that their lecture experience was not impacted; however, the average showed a slight detrimental impact because the next-largest proportion did not report a negative impact. This finding is supported by our analysis of free-text responses. Students mentioned that pre-recorded lectures diminished the quality of the original live-streamed interaction and discussion with faculty and fellow classmates, possibly supporting why we see the slight detrimental impact. Nevertheless, Phase I students felt no impact overall, but if there was one it was only a slight detrimental impact.

Study time for Phase I students had no uniformity in the responses. This differed markedly from the experiences of their Phase II counterparts, which were relatively positive. The impact on study time for Phase I students may vary per student due to personal characteristics such as study habits, personal stressors, anxiety, individual motivation, and

other external factors, as suggested by Looyeh et al.¹⁰ Furthermore, research has shown that study time alone has no direct relationship with performance; it is the interaction of motivation and ability along with study time that influences academic performance.¹¹ Personal factors like study habits have a definite role in time spent studying,¹² which may influence these findings. With our data, we cannot separate these individual-level factors from the effects of COVID-19-related curriculum changes.

Students largely reported no pandemic impact on exam performance, but a few reported a minor detrimental impact. This could mean that curriculum changes may not have had as detrimental an impact as educators may have originally feared.¹³ Although one study supports that students learning in the classroom is associated with better performance on essay-style exams, this same study showed no difference in multiple choice (medical school exams) exam performance between online and classroom learners.¹⁴ In fact, in a study that explored whether online learning platforms contributed to higher exam performance, researchers found that the use of web-based platforms had a positive correlation with the percentage of correct answers in medical exams.¹⁵ Another study suggests that online learners may achieve more than classroom counterparts,¹⁶ further supporting that the virtualization of the curriculum due to COVID had less of a negative impact than expected. However, reasons why some students may have felt a harmful impact to their exam performance may be related to reasons given in open-ended responses: receiving less feedback and interaction with faculty and colleagues and having to transition to less productive learning environments.¹⁷

Most students indicated that collaborative learning activities in small group sessions were negatively impacted by the pandemic. Because curriculum changes were transitioned to more individual-oriented online settings and did not involve as much direct communication with and visualization of colleagues, these difficulties were predictable. In previous research, collaborative learning activities have been proven to stimulate learning.³ However, with COVID associated distance learning, transitioning medical school to the home setting may disrupt home-work boundaries, isolate students, and increase the use of email,¹⁹ possible reasons why students indicated negative effects related to small-

group learning in our survey. One study that explored graduate student perceptions of online learning found that technical issues, a perceived lack of belonging to a group, difficulty in understanding objectives without other students, and time constraints are impediments to the online classroom,²⁰ also consistent with sentiments expressed by KUSM-Salina students.

With the transition to more online learning experiences, Phase II students at KUSM-Salina felt the pandemic negatively impacted their clinical experiences. Conversely, previous research has shown virtual patient learning may not have a detrimental impact on the quality of education. In a study investigating the use of a "low-fidelity simulator", virtual patients were deemed a valuable and useful tool for the development of clinical reasoning and history taking skills.²¹ Therefore, even though students may perceive that their educational experience has suffered, their actual learning and acquisition of skills may not have been compromised with the use of virtual alternatives. In a virtual radiology clerkship, researchers found that final exam scores were similar in the virtual version compared to the in-person version, but students revealed that didactic lecture content felt more advanced and opportunities to build professional connections with faculty physicians were more limited.²² Lack of rapport with teaching physicians and a decrease in patient contact are prominent features in how students perceived the impact on the clinical portion of their education.

The social aspect was important to investigate because peer and classmate interactions may affect one's medical education.¹⁷ In our study, the majority of students felt socialization with peers as it related to their medical school experience suffered because of COVID-related changes. For our Phase II students, the ability to socialize with colleagues, faculty, and attending physicians was also negatively affected, a result seen in other studies as well. In a study looking at student satisfaction and learning outcomes, withdrawal rates and exam scores were similar between in-person and online instruction. However, online students tended to be less satisfied with instructor rapport, course excellence, peer interaction, and self-perceived knowledge gains.²³ In addition to learning and student satisfaction implications, social interactions with colleagues also

matters to mental health. It is well known that social isolation is linked to behavioral health disorders in healthy individuals but especially those with existing mental health conditions.²⁴ Therefore, the social aspect should be considered in any holistic discussion of medical education.

In contrast to Phase I students, the topics of study time and exam performance for Phase II students were more uniform. However, there were only 5 respondents in this category. Phase II students experienced not only an increase in study time across the board, but also a slight benefit to their exam performance. A study at the University of Belgium looked at the relationship between study time investment and academic performance in higher education. For most courses, study time predicted academic performance more reliably than student characteristics;²⁵ therefore, the association between increased study time and improved exam performance is not a new concept. For COVID-related curriculum changes in this context, increased study time and exam performance may be due, in part, to the way Phase II clerkships and clinical rotations are designed. Traditionally in Phase II, more time is allocated to learning on the wards via real-world clinical encounters.² One study looking at a psychiatry clerkship's active learning activities (team-based learning and clinical simulation) and their effect on student performance on the standardized NBME subject exam in Psychiatry, concluded that increasing active learning did not improve student exam performance.²⁶ Therefore, if traditional clinical active learning may not benefit student performance on exams, removing it (during the pandemic) may not be detrimental to student performance as well. If students, however, have less time in clinic, this could potentially increase time spent studying material specifically relevant to national exams, resulting in higher exam performance. Some studies have suggested that students sometimes prefer online learning modules rather than a traditional in-person didactic due to less travel, thereby increasing attendance if one is able access online lectures from one's own home.²⁷ Additionally, Phase I students that have reduced contact with colleagues and instructors could be more susceptible to burnout because of the work load compared to Phase II students.²⁷ This potentially contributes to the differences in findings between Phases I and II seen in our survey. A

confounding factor on our results on exam performance, however, is that performance on clerkship exams typically increases as the year progresses.²⁸ With that said, the differences between Phase I and II student study time and exam performance provide evidence that the effects of COVID-related curriculum changes may affect students differently depending on their phase of medical school.

Future Implications. Past work has focused on the response of medical institutions and the reconstruction of the medical school curriculum in response to disasters. However, there is less literature on the opinions of students – particularly those on smaller campuses – about these changes. This study detailed how students perceived such impacts on their educational experience. With this knowledge, in the wake of future disasters or pandemics, educators may make changes to current approaches or choose different curriculum adaptations entirely.

Limitations. Due to our small campus size and rural location, the sample size for this study is limited and therefore cannot be generalizable to other medical campuses in the country. Additionally, many Phase II students at KUSM-Salina did not respond to the questionnaire. Because of the survey method, there is inherent selection bias that must be taken into account. However, we are confident these results are relevant to other, similarly-situated regional campuses with small class sizes located in non-metropolitan areas.

In the future, there would be value in replicating this across all campuses and across regional campuses. Future studies could potentially quantify the relationship between study habits and exam performance as well as the direct relationship between the COVID-19 pandemic and examination scores.

Conclusion

Throughout history, medical institutions have adapted their curricula in response to disasters by implementing more technology-based, distance-oriented learning infrastructures. These adaptations have achieved continuity in medical education. Curriculum changes should constantly be evaluated, though, to allow for further improvement and innovation.

When investigating COVID-19 impacts on the regional medical school experience, the 2 phases of medical school should each be considered. For Phase I students, lecture experience, study time, and exam performance were either not impacted or slightly negatively impacted. Aspects that were more clearly negatively impacted were collaborative learning sessions and socialization. For Phase II students, clinical knowledge and skill development and time/activities relevant to this component were negatively impacted, as well as socialization with colleagues and attendings. However, unlike Phase I students, Phase II students felt their study time and exam performance increased or was slightly positively impacted, respectively. This indicates study time and exam performance may suffer or thrive depending on the phase of medical school a student is in when pandemic-related curriculum changes occur. In the COVID-19 pandemic, students' perspectives on curriculum changes have not thoroughly been investigated. This study aimed to do so on a small regional campus and provide further information useful to educational system improvements.

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