

Pandemics Past and Present: A Guided Inquiry Approach

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ABSTRACT

BACKGROUND: COVID-19 exposed undergraduate medical education curricular gaps in exploring historical pandemics, how to critically consume scientific literature and square it with the lay press, and how to grapple with emerging ethical issues. In addition, as medical students were dismissed from clinical environments, their capacity to build community and promote professional identity formation was compromised.

METHODS: A synchronous, online course entitled *Life Cycle of a Pandemic* was developed using a modified guided inquiry approach. Students met daily for 2 weeks in groups of 15 to 18 with a process facilitator. During the first week, students reported on lessons learned from past pandemics; in the second week, students discussed ethical concerns surrounding COVID-19 clinical trials, heard from physicians who provided patient care in the HIV and COVID-19 pandemics, and concluded with an opportunity for reflection. Following the course, students were asked to complete an anonymous, voluntary survey to assess their perceptions of the course.

RESULTS: With a response rate of 69%, an overwhelming majority of students agreed or strongly agreed that learning about historical pandemics helped them understand COVID-19 (72, 99%). The course successfully helped students understand current and potential COVID-19 management strategies as 66 (90%) agreed or strongly agreed they developed a better understanding of nonpharmacological interventions and new pharmacological treatments. Students also gained insight into the experiences of healthcare providers who cared for patients with HIV and COVID-19. Qualitative analysis of the open-ended comments yielded 5 main themes: critical appraisal of resources, responsibility of the physician, humanism, knowledge related to pandemics, and learning from history.

CONCLUSIONS: The onset of the COVID-19 crisis illustrated curricular gaps that could be remedied by introducing the history and biology of pandemics earlier in the curriculum. It was also apparent that learners need more practice in critically reviewing literature and comparing scientific literature with lay press. The flexible format of the course promotes the development of future iterations that could cover evolving topics related to COVID-19. The course could also be repurposed for a graduate or continuing medical education audience.

KEYWORDS: Pandemic, guided inquiry, COVID-19 curriculum

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Introduction

Covid-19 uniquely disrupted the education of medical students. Starting in mid-March 2020, medical students across the US were dismissed from clinical settings and transitioned to online instruction. Students had the added burden of knowing that the return to clinical learning might expose them to patients who were severely ill with a disease whose clinical manifestations and therapeutic interventions were evolving daily. At the same time, the biomedical community was being inundated with new literature (much of which was not yet peer reviewed) that was also being reported in the lay press with varying degrees of accuracy. These confusing and dynamic events left medical educators with a curricular gap to fill. At the Donald and Barbara Zucker School of Medicine (ZSOM), we had failed to meaningfully incorporate historical pandemics and lessons learned into our curricula, and had not equipped our learners with the ability to organize

and interpret scientific literature so it could be reconciled with reports in the lay press.¹ Additionally, as the pandemic unfolded, all members of the healthcare community began to grapple with a myriad of ethical issues that seemed to grow alongside the pandemic. Our learners were removed from the medical school community and the daily structure of their lives had seemingly evaporated. This loss of social learning may have also interrupted learners' progress in developing their professional identities. Never before had medical educators faced a similar set of challenges to be confronted in real time.

Methods

Setting and participants

All ZSOM students completing their second year of medical school (N = 106) participated in the course. The course was



delivered remotely via ZOOM. At the time, these students had just completed the last course of their second year and were entering their USMLE Step 1 independent study time. Students had been scheduled to sit for the USMLE Step 1 in May, but most of these exams had to be rescheduled to a later, unspecified date. By offering this course, students received credit for an elective. In this way, the course helped students stay on track to graduate without delay.

Curricular design

We developed a synchronous online course, *Life Cycle of a Pandemic*, to explore pandemic origins and resolutions, and to discuss current ethical and biomedical challenges. Course design followed a constructivist approach, using modified guided inquiry.² The intent of guided inquiry is to help students create and integrate meaning from multiple reference sources. Key steps include defining an area of inquiry for learners, supporting them as they explore and synthesize information and ideas, and having learners present findings, thoughts, and viewpoints. To accomplish this level of complex learning, guided inquiry calls for the use of interdisciplinary faculty teams to design the curriculum.

The core faculty team, consisting of an internal medicine clinician (JMB) and a microbiologist (JMW) developed learning objectives (LOs) for each meeting (Table 1). An extended team of course planners, including a bioethicist and an educationalist, developed ethics and reflection sessions, respectively. All second-year medical students were placed in groups of 15 to 18. Within each group, students in pre-assigned subgroups of 2 to 3 were tasked with researching specific LOs and reporting to the entire group in an interactive fashion. Suggested biomedical and lay press resources to be used as a springboard for research were provided, including review and primary research papers, newspaper articles, podcasts, video interviews,³ a documentary,⁴ and other media.^{5,6} Students were encouraged to further explore all types of media in preparing for their presentations. During each 75-minute session, students in 2 to 3 subgroups presented their findings and analysis and led discussion. By placing students in the center of learning activities, facilitators functioned as process rather than content experts. Assessment of students was based on the quality of student presentations and overall participation. The course was pass/fail.

The course met via a Zoom platform daily for 2 weeks; in order to accommodate all students in small groups, 2 to 4 groups ran at a time over 6 weeks. In an effort to introduce structure to students at home, each group met at the same time each day. During week one, students investigated the biology of zoonotic RNA viruses, how the 1918 influenza and HIV pandemics began and were managed, and their societal impacts. Resources included (but were not limited to) articles reviewing the biology of RNA viruses, a WHO open-access course on pandemic and epidemic-prone diseases, and a documentary recounting public

health responses and patient experiences during the 1918 influenza pandemic.⁴ Students contrasted these historical events with the unfolding situation of COVID-19.

Week 2 focused entirely on COVID-19 starting with ethical concerns as identified by students who were tasked with finding articles in the lay press and aligning them with the bioethical pillars of autonomy, beneficence, non-maleficence, social justice, and utilitarianism. The next 2 days were spent on the current state of drug and vaccine clinical trials as well as the state of diagnostic and antibody testing. Students were directed to the clinicaltrials.gov and bioRxiv.org websites to evaluate the status of current clinical trials and consider papers not yet peer reviewed, respectively. For many students, this was their first exposure to translational medicine in action. Students experienced a more intimate connection to healthcare during the last 2 days of the course when first, events that defined the early outbreak of the HIV and COVID-19 pandemics were shared by faculty who were on the front-line caring for these patients. The course concluded with an opportunity for student reflection, supported by a published perspective about empathy in the time of COVID-19 and by writing personal narratives in response to a prompt concerning balancing self-care with that of patients.

Data collection

An online survey with 14 questions based on the goals of the course was distributed to all enrolled students (N = 106) at the end of the course. Participation was voluntary and anonymous. Seventy-three students (69%) completed the survey. Responses were based on a 5-point Likert scale, with the following choices: 1 (strongly disagree), 2 (disagree), 3 (neither agree nor disagree), 4 (agree) and 5 (strongly agree). There was also an optional, open-ended question asking students to “Describe something you learned from this course that you will take forward into your life as a physician.”

Data Analysis

Descriptive statistics were determined and are presented as the number and percent of participant responses to the individual questions on the 5-point Likert survey (Figure 1). Fifty of the 73 students (68%) who completed the survey also provided open-ended comments. Qualitative analysis of the 50 student comments was performed manually. Microsoft Excel® (Microsoft Corporation, Redmond, WA, USA) was used to manage the open-ended comments. Student comments were 30 words on average (units of analysis). Two raters (DMO and JBB) reviewed the written responses independently using a thematic analysis approach to inductively generate themes.⁷ The raters met once to compare their coded segments of data. Coding disagreements were discussed by all authors until a consensus was reached. The 2 raters reviewed and approved all codes applied to the comments.

Table 1. Life cycle of a pandemic Sessions. Suggestions for updating learning objectives are italicized.

	DAY TOPIC/QUESTION	LEARNING OBJECTIVES	SUGGESTED DISCUSSION POINTS
Week 1	Day 1	Discuss course format	
		Identify areas of interest amongst learners	
	Day 2: What features do viruses with the potential to cause a pandemic share?	Describe some of the fundamental biological features of viruses capable of causing pandemics	Compare and contrast features of SARS-CoV-2 that has made it a successful pandemic causing virus with other viruses known to cause pandemics and epidemics
		Describe the infectious agents, clinical presentation, and treatment of viruses that cause some of the most epidemic/pandemic-prone diseases as defined by the WHO	
		Explain the pillars of prevention and response to outbreaks to some of the most epidemic/pandemic-prone diseases as defined by the WHO	
	Day 3: What is required to adequately prepare for a pandemic? What are the necessary public health measures needed to respond to a pandemic?	Summarize approaches for advanced preparation for a pandemic at the national, state, and health system level.	Discuss reasons the US was so vulnerable to the COVID-19 pandemic
		Evaluate the effectiveness of public health responses to past pandemics (eg, influenza and HIV) and compare with the current COVID-19 pandemic	
	Day 4: What are the lasting impacts of pandemics?	Assess the lessons learned from the influenza and HIV pandemics and discuss their relevance to the current situation.	Describe the major lessons the US has learned so far in the COVID-19 pandemic
	Describe the lasting societal impact of the HIV pandemic and predict how the COVID-19 pandemic will influence societal norms.	Predict the future societal impacts of the COVID-19 pandemic	
Week 2	Day 5: What are the major ethical concerns we are facing as we navigate the COVID-19 pandemic?	Discuss the contemporary clinical and population health ethical concerns that have presented in the face of the COVID-19 pandemic.	Discuss the ethical issues that concern you most and the implications of these concerns in the short- and long term
		Apply the bioethical pillars (Autonomy, Beneficence, Non-Maleficence, and Social Justice) to the current clinical and population health issues in a pandemic.	
		Discuss the ethical theory of <i>utilitarianism</i> and how it applies to healthcare during a pandemic.	
	Day 6: Clinical Trials-1: Potential therapeutics that target the replication cycle of SARS-CoV-2	Discuss the mechanism by which (hydroxy) chloroquine is thought to block viral infection and describe the current state of clinical trials in its use in the treatment of COVID-19	Assess the potential for current trials to enable the speedy evaluation of these drugs to serve as effective therapeutic options in the treatment of COVID-19
		Describe the development of and MOA of remdesivir and describe the current state of clinical trials in its use in the treatment of COVID-19	
		<i>These objectives can be changed to focus on new antiviral therapeutics</i>	
	Day 7: Clinical Trials-2: Potential therapeutics that promote an effective host response	Explain the use of anti-IL-6 Mabs in the treatment of COVID-19 and describe the current state of clinical trials in its use in the treatment of COVID-19	Assess the potential for current trials to enable the speedy evaluation of these treatments to serve as effective therapeutic options in the treatment/prevention of COVID-19

(Continued)

Table 1. (Continued)

DAY TOPIC/QUESTION	LEARNING OBJECTIVES	SUGGESTED DISCUSSION POINTS
	Discuss the development of diagnostic tests for anti-SARS-CoV2 antibodies and clinical trials that assess the use of convalescent serum to improve Covid-19 outcomes and place this in an historical context	
	Explain the development of vaccine candidates, their composition and how they are thought to be immunogenic, and the current state of clinical trials in its use in the treatment of COVID-19	
	<i>This can be expanded to eliminate anti-IL6 therapeutics and include anti-SARS-CoV-2 Mabs, convalescent serum, and/or additional vaccine candidates</i>	
Day 8: Report from the front lines of HIV and Covid-19	Describe the clinical presentation of COVID-19	Compare and contrast the HIV and COVID-19 pandemic in terms of clinical care and their toll on healthcare providers
	Discuss the progression of COVID-19 in hospitalized patients	
	Identify biomarkers predictive of poor outcome and explain their significance.	
Day 9: Reflections on the pandemic	Practice written reflection as a sustainable method to promote personal and professional development to support professional identity formation as clinicians	Discuss the issues that most concern you now that you have gained deeper insights in pandemics in general and the COVID-19 in particular
	Build resilience through shared storytelling and reflection with peers and faculty	

Course goal: To provide learners with an overview of how a pandemic starts, progresses, and finally resolves. To accomplish this, the history of pandemics, viruses that have the potential to spark pandemics, the clinical and public health features of pandemics, and the ethical concerns that arise were explored.

Results

Overall, the course was perceived very positively. The vast majority of students agreed or strongly agreed that learning about the history of pandemics helped them understand COVID-19 (72, 99%; Figure 1). Despite ever-present public service announcements about the role of nonpharmacologic interventions, 66 (90%) of students agreed or strongly agreed that the course increased their understanding of such measures. Most students also agreed or strongly agreed that the course helped them understand new pharmacological treatments for COVID-19 (66, 90%), clinical trials (55; 75%), and the timeline for vaccine development (62; 85%). Quantitative data demonstrated the impact of hearing from clinicians, as 71 (97%) and 68 (93%) agreed or strongly agreed that presentations by clinicians caring for HIV positive or COVID-19 patients, respectively, offered insight into what healthcare providers experienced while caring for these patients. While not an explicit goal of the course, 61 (84%) of students agreed or strongly agreed the course increased their confidence in addressing questions about COVID-19 their future patient might ask.

Qualitative analysis of the open-ended comments yielded 5 main themes: critical appraisal of resources, responsibility of the physician, humanism, knowledge related to pandemics, and

learning from history. Below we describe the interpretation of each theme and provide representative quotes for each.

Students commented that they learned how to critically evaluate resources to determine which ones provided them with factual data related to the pandemic. "People rely on you to be a reliable source of information so it's important to keep informed with credible resources," and "It's important to use peer-reviewed, well-performed and thorough studies to stay informed."

They described that, as physicians, they shoulder certain responsibilities for educating their patients. "There is far too much misleading information and sadly, greed by certain individuals out there, so now it is more important than ever to be able to find accurate and trustworthy resources and provide this for patients," and "The duty to my patients and community involve more than diagnosing and treating disease; it involves being a conduit for reliable, understandable, and well-articulated medical and scientific information."

Another common theme was the expression of humanism in the form of empathy for patients, appreciation for frontline workers, and recognition of self-care to maintain wellness. "The most important thing you can do is show compassion and support to your patients," and "I will take with me the idea that we need to be strong for our patients, but that if our own mental



Figure 1. Student perceptions of the course *Life Cycle of a Pandemic*.

state suffers, we need to be equally proactive about taking care of that as well. Doctors are human too, and even when we are called to action at the frontlines, it is okay to have doubts, fears, and reservations of our own.”

Students described very tangible outcomes from the course that were related to knowledge gained about pandemics. “I learned about R values as well as very interesting epidemiology surrounding plagues and virology,” and “Knowledge of clinical trial phases

for developing treatments.” In some cases these knowledge-based outcomes were expressed as a deeper understanding of the facts, such as 1 student who noted, “The impact of pandemics differs for people with different socioeconomic situations.”

Finally, students recognized the importance of taking what we learned about past pandemics to better inform us how to approach the current one. “I learned about the importance of looking back at history to draw parallels to the present day

when considering the behavior of people in response to public health crises,” and “Something I will take forward is that we can learn from our past medical mistakes or successes in order to better prepare for the future. For example, the same social distancing measures and wearing facemasks in 1918 are applicable to today. The lessons learned on how to care for patients with HIV and their families is also applicable to today’s medicine. We can learn how to be better for tomorrow by taking a look at previous measures.” One student put it simply, “History repeats itself.”

Limitations

As a course that was quickly developed and delivered, *The Life Cycle of a Pandemic* was not without its limitations. It was taken by students at a single medical school in the New York metropolitan area during the chaotic events of the developing surge in cases in the spring of 2020. The fact that peers and family members and in some cases, the students themselves, were suffering from COVID-19 while they were enrolled in the course set a tone of urgency. Although the course could be easily adapted to meet the needs of any group of learners, the impact of delivering the course in the New York Metropolitan area at the apex of the first wave of the epidemic is likely to have had some influence on student perception.

Discussion

Overall, the need for *The Life Cycle of a Pandemic* course was itself a lesson learned that is likely not specific to our institution. Our second-year students had completed coursework and assessments in microbiology, infectious disease, scientific discovery, and population health. However, the COVID-19 crisis illustrated that our learners were unprepared to translate relevant knowledge and skills without structure and guidance. We believe our experience could likewise inform other institutions about curricular changes that may be needed earlier in the medical education program. For example, students need to learn about the historical context of pandemics and basic concepts that define transmissibility (eg, R values) when learning about other infectious diseases. Additional practice in critically reviewing literature and making comparisons with lay press should also be introduced earlier in the curriculum.

With regard to the course itself, like the COVID-19 epidemic, it will continue to evolve. The course’s flexible format facilitates its adaptation to accommodate our growing understanding of disease pathophysiology and its treatments. In this context, we found that updating suggested references was important with each iteration of the course, even though the references were provided only to spur further investigation. For example, when the course was first offered, hydroxychloroquine had just been introduced as a potential therapy. Over the 6-weeks of instruction, the drug went from promising to politicized and then to potentially dangerous. Future versions of the course may introduce new LOs that prompt students to explore clinical trial protocols, how clinical data should be shared, the role of the media, and issues of scientific literacy.

The clinicaltrials.gov and bioRxiv.org websites can be mined for the most recent advances in potential therapeutics and vaccines. The use of popular media such as documentaries and podcasts can be extended to further highlight the importance of medical humanities. On the other hand, the course can also be adjusted to include more pathophysiology and treatment as the science advances. Importantly, the course design can also be adapted to other topic areas, including other societal crises. Because the faculty facilitators in this course were not content experts, but rather functioned as process experts, topic areas are not constrained by faculty expertise.

Conclusion

As the COVID-19 pandemic continues to define the nature by which we deliver medical education, be that in-person, remotely, or a hybrid, it is important that our learners are afforded the opportunity to gain perspective on what we have learned from past pandemics and what COVID-19 has to teach us. To be confronted with a once-in-a-century pandemic as an early learner can be impactful in a myriad of positive and negative ways. We believe the flexible design of our course can equip medical students, or other, more advanced learners, with some of the knowledge, skills, and attitudes needed to face this challenging time.

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Ethical approval

This study was deemed exempt by the Hofstra University Internal Review Board (reference # 20200514-SOM-WIL-1)

Author Contributions

JMW, DMO, JBB, and JMB equally contributed in concept of the work; drafting and revising the article; and for the approval of the version to be published.

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REFERENCES

1. Rosen K. The COVID-19 curriculum. *Acad Med.* 2020;95:1311.
2. Kahlthau CC, Moniotes LK. Guided inquiry teams for the 21st century learners. *Sch Lib Mon.* 2010;26:18-21.
3. JAMA Livestream. Coronavirus Q&A with Anthony Fauci, MD. April 9, 2020. Accessed April 10, 2020 https://www.youtube.com/watch?v=c0cYneu-hlc&feature=youtu.be%3Futm_source%3Dsilverchair&utm_medium=email&utm_campaign=article_alert-jama&utm_content=ol&utm_term=040820
4. Public Broadcasting System. American experience: influenza 1918. Accessed March 30, 2020 <https://www.pbs.org/video/american-experience-influenza-1918/>
5. TED-like talk. How did the 1918 flu pandemic start and could we have another one?/Ockham’s Razor. April 8, 2018. Accessed March 30, 2020. <https://www.youtube.com/watch?v=WlafYHjx04U>
6. Vox news. How wildlife trade is linked to coronavirus. March 6, 2020. Accessed March 30, 2020. <https://www.youtube.com/watch?v=TPp0jGYIW54>
7. Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol.* 2006;3:77-101.