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# Restructuring the inpatient advanced pharmacy practice experience to reduce the risk of contracting coronavirus disease 2019: Lessons from Saudi Arabia

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[Correction added on 05 May 2020 after first online publication: Yousef Alaqeel was added as co-author.]

## Abstract

**Introduction:** On March 11, 2020, the World Health Organization announced the rapidly spreading epidemic of the coronavirus disease 2019 (COVID-19) pandemic. Almost all countries started to take proactive precautionary measures to reduce the risk of contracting the virus. The education sector, including pharmacy education, has been drastically impacted by this pandemic. During the outbreak, many hospitals instructed the health profession's schools to restrict or prevent the presence of their students and interns in their hospitals in an effort to limit the spread of the virus.

**Objectives:** Constraining the presence of interns in the affiliated hospital has impacted the integrity of delivering the learning outcomes of each clinical rotation. In this paper, we present the experience of four faculty preceptors in restructuring the advanced pharmacy practice experience in different clinical settings, including critical care, infectious diseases, cardiology, and internal medicine, in order to reduce the risk of contracting COVID-19 at a large academic medical institution in Saudi Arabia.

**Conclusion:** We believe that this experience could provide guidance and insights for other pharmacy schools dealing with this issue during this global pandemic.

KEYWORDS

coronavirus, COVID-19, pharmacy, Saudi Arabia

## 1 | INTRODUCTION

On March 11, 2020, the World Health Organization (WHO) called the rapidly spreading outbreak of coronavirus a pandemic.[1] Coronavirus disease 2019 (COVID-19) caused by SARS-COV2 was able to spread from one country to the other, leaving catastrophic consequences, including many fatalities. The first confirmed COVID-19 case was reported in late December 2019 in Wuhan, Hubei Province, China.[2] On March 23, 2020, more than 390 000 confirmed cases tested positive for COVID-19 worldwide, according to the WHO.[3] Countries started to take proactive precautionary measures to reduce the risk of contracting the virus. Saudi Arabia (SA) is located in the Middle East Gulf Region. In 2019, SA's population was reported to be more than 34 million. The first confirmed COVID-19 case in SA was reported on the March 2, 2020 for a Saudi citizen returning from Bahrain.[4] Soon after, restrictions in gatherings of religious activities, sporting events, and transportation were instituted by the government. On the March 8, 2020, the Ministry of Education announced that public and private schools, as well as universities, would be closed. All educational institutions started to rely on online resources to deliver their coursework. All didactic coursework was transitioned to be delivered by using online platforms via video streaming technology solutions.[4,5]

  

Generally speaking, pharmacy education has been evolving in SA, and the majority of pharmacy schools in SA are offering the Doctor of Pharmacy (Pharm.D.) Degree in which their curriculum is structured in a similar way to the one offered in the United States.[5] Pharm.D. training consists of a rigorous didactic curriculum followed by clinical rotations. During the last year of their Pharm.D. program, students spend their time fulfilling their advanced pharmacy practice experience (APPE) requirements in which they rotate every 4 to 5 weeks through different sites and clinical settings.[5] During the outbreak, many hospitals instructed the health professional schools to restrict or prevent the presence of their students and interns in their hospitals in order to prevent exposure to potentially infected cases. The College of Pharmacy at King Saud bin Abdulaziz University for Health Sciences is located in Riyadh City, the capital of SA. It is affiliated with a large academic medical institution that has a bed capacity of more than 1800 beds. Our curriculum is adopted and modified from an Accreditation Council for Pharmacy Education (ACPE) accredited pharmacy school from the United States.[6]

Restricting the presence of interns in our affiliated hospital has impacted the integrity of delivering the learning outcomes of each clinical rotation. In this paper, we present the experience of four clinical faculty preceptors in our pharmacy school in restructuring the APPE in different clinical settings, including critical care, infectious diseases, cardiology, and internal medicine in order to reduce the risk of

**TABLE 1** Examples of advanced pharmacy practice experience restructuring modalities and activities

| Domain | Modality before COVID-19 | Modality following COVID-19 | Example of activities used for assessing the domain |
|---|---|---|---|
| Knowledge skills | Direct daily face-to-face interaction | Direct online videoconference interaction | • Topic discussion and presentation<br>• Journal club presentation<br>• De-identified or made-up patient case presentation<br>• Answering drug-information questions<br>• Drafting and reviewing therapeutic protocols<br>• Reflection on COVID-19 updates<br>• Preparing medication administration guides |
| Cognitive skills | Direct daily face-to-face interaction | Direct daily online videoconference interaction | • Topic discussion and presentation<br>• Journal club presentation<br>• De-identified or made-up patient case presentation<br>• Answering drug-information questions<br>• Drafting and reviewing therapeutic protocols<br>• Reflection on COVID-19 updates<br>• Designing and evaluating therapeutic plans<br>• Documenting therapeutic interventions<br>• Evaluating and appraising primary, secondary, and tertiary literature<br>• Evaluating medication related problems and safety outcomes |
| Interprofessional skills | Direct daily face-to-face interaction | Direct daily online videoconference interaction | • Rotating role-playing<br>• Answering drug-information questions from health care providers<br>• Incorporating simulated collaborative patient-care decision-making with members of an interprofessional health care team<br>• Communicating therapeutic plans with the health care team members |
| Communication skills | Direct daily face-to-face interaction | Direct daily online videoconference interaction | • Rotating role-playing<br>• Answering drug-information questions from health care providers<br>• Incorporating simulated collaborative patient-care decision-making with members of an interprofessional health care team<br>• Recording education materials<br>• Debating with other students and faculty preceptor<br>• Simulated patient counseling<br>• Topic discussion<br>• Communicating with family members, insurance, and outpatient pharmacy |

contracting COVID-19 at a large academic medical institution in SA. We believe that this paper will provide guidance and insights for other pharmacy schools dealing with this global pandemic on how to restructure their clinical rotations while maintaining the integrity of the delivered learning outcomes.

## 1.1 | Restructuring the APPEs

The ACPE provides guidance for pharmacy schools regarding certain suggested activities that could be conducted during the APPE.[7] The majority of these activities fall under one of four domains or skill sets, including knowledge skills, cognitive skills, interprofessional skills, and communication skills. Certain rotations may add the psychomotor skill set as a component of the evaluated domains. Table 1 highlights sample activities for each domain.

Under normal circumstances, faculty preceptors usually spend their time in daily clinical activities, in-campus academic research and administrative duties, and direct interaction with APPE students. Before COVID-19, the majority of the APPE learning outcomes had been assessed during the daily face-to-face interaction between the faculty preceptor, other health care providers, patients, and the APPE students. However, during the COVID-19 pandemic, we have begun to brainstorm on how to ensure assessing these learning outcomes without having the APPE students on-site. We have come to the conclusion that we have to strike a balance by using remote virtual platforms, in order to ensure that these learning outcomes are assessed. These platforms were used as communication and collaboration platforms that combined persistent workplace chatting, video meetings, and file sharing and storage. We also had to take into consideration the overwhelming tasks that we, as faculty preceptors, had to fulfill during the pandemic, such as live streaming, recording enormous amounts of lectures, and ensuring being at the bedside as much as possible (Table 2).

During the COVID-19 pandemic, APPE students were assessed daily via videoconference sessions. On average, the session went for 5 hours. At the end of each session, APPE students had approximately 3 hours of assigned readings, assignments, and activities to complete before the next videoconference session the following day. At the end of each week, students had approximately 10 hours of assigned additional readings, assignments, and other activities to complete over the weekend. Therefore, on average, APPE students had a total of 50 hours of learning experience either by videoconference sessions with their faculty preceptor or fulfilling other rotation requirements, such as assigned readings, assignments, and other activities. All of the activities, mid-point and final evaluation were held via videoconference with the faculty preceptor.

During each educational session, we started with national and international COVID-19 updates, focusing mainly on the pharmacotherapy aspects and the role of pharmacist during outbreaks. Then, the session was broken into three main themes. During the first theme, we ensured infusing activities to assess the knowledge skills domain for each APPE student, such as topic discussions. During the second theme, we introduced several activities to assess the cognitive skills domain, such as evaluating or designing therapeutic plans for real patient cases or made-up cases. During the third theme, we performed several activities to assess the communication skills domain, such as debating with other APPE students on clinical topics with controversies. Nevertheless, we had some challenges in the assessment of the interprofessional skills domain, given the nature of the clinical practice, which requires on-site interaction with other health care providers. In order to overcome this obstacle, students were requested to prepare a several presentations using videoconferencing for the nurses and other health care providers. Moreover, depending on the urgency, students were requested to provide evidence-based formal answers for any drug-related questions that came up during daily bedside rounds that had to be communicated verbally or in writing. Role-playing was used to assess the communication domain, in which the students and the faculty preceptor took on different roles, such as acting to be the patient or other health care providers. Students were also requested to workup de-identified real patients. Different modality was used than the one used in normal circumstances. On a daily basis, students were provided with de-identified relevant patient information from their faculty preceptor that was extracted from the electronic medical record. Students were requested to address patients' problems and draft their assessment and plan, including any

**TABLE 2** Example of advanced pharmacy practice experience students weekly schedule prior and during COVID-19

| | Prior to COVID-19 weekdays | During COVID-19 weekdays | Prior to and during COVID-19 weekend |
|---|---|---|---|
| 0800-0900 | Knowledge, cognitive, communication, and interprofessional skills assessment during daily bedside rounds | Knowledge, cognitive, communication, and interprofessional skills assessment using de-identified patients information sent to students, drug-information questions, and reading assignments (until 11) | Knowledge and cognitive skills assessment using home assignments using activities in Table 1 |
| 0900-1000 | | | |
| 1000-1100 | | | |
| 1100-1200 | Recap and preparation for afternoon meeting with faculty preceptor | | |
| 1200-1300 | Break | Knowledge, cognitive, communication, and interprofessional skills assessment using activities in Tables 1 and 3 | |
| 1300-1400 | Knowledge, cognitive, communication, and interprofessional skills assessment using activities in Table 1 | | |
| 1400-1500 | | | |
| 1500-1600 | | | |
| 1600-1700 | | | |

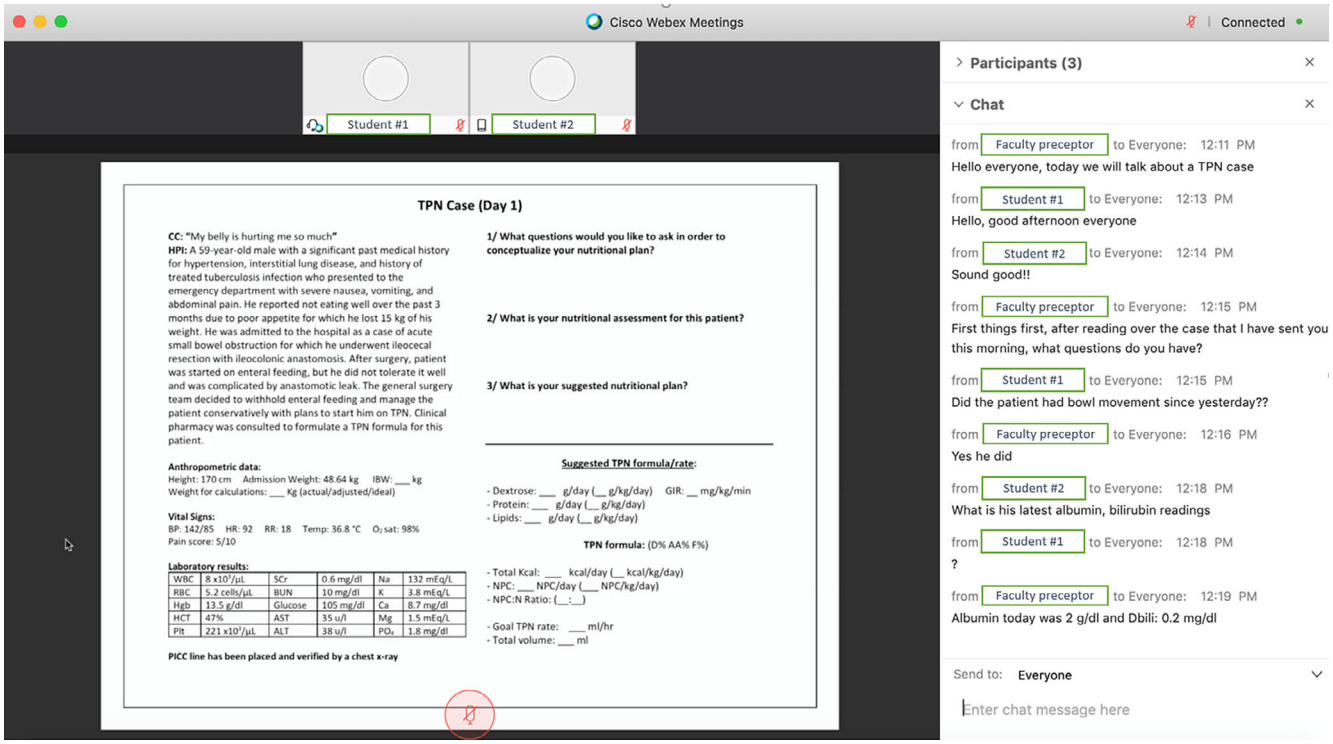


**FIGURE 1** Sample screenshot example from Cisco Webex videoconferencing for a de-identified patient requiring total parenteral nutrition plan during the internal medicine rotation

therapeutic drug monitoring interventions. For their therapeutic drug monitoring plans, students were requested to forward their final signed plan to their faculty preceptor through email after discussing their rationale with their faculty preceptors. Then, faculty preceptors would cosign and incorporate their plan in the electronic medical record. Moreover, there was an interactive videoconference session among all faculty preceptors and APPE students from the different rotations to share their insights and to summarize what they have learned at the end of each week. Table 1 highlights the major activities that were used successfully during the APPE restructuring process. Blackboard was used to submit all rotation-related assignments. Students will be invited to complete an online survey at the end of the rotation to evaluate their experiences on their rotation structure and the learning outcomes before and after the rotation, and offer inputs on their experience and the ways to improve the future rotations. Figure 1 shows example screenshot from Cisco Webex videoconferencing application highlighting where the APPE students were involved in solving clinical questions in de-identified or made-up patient cases. As shown in the examples, APPE students were requested to ask pertinent questions to their faculty preceptor before conceptualizing their assessment and plan.

### 1.2 | APPE-specific restructuring modalities

In addition to all of the previously highlighted activities in Table 1 that were conducted using videoconferencing, APPE students were asked to undertake several rotation-specific activities to ensure the assessment of the four skill domains. For example, in the internal medicine rotation, APPE students were requested to involve in fall-risk assessment task force meetings and to formulate total parenteral nutrition regimens for ongoing patients. In the critical care rotation, APPE students were asked to conduct an online simulation for acute cardiac life support and resuscitation strategies and create a "do not crush list" and "medication precaution" for potential medications that could be used for patients with COVID-19. In the cardiology rotation, APPE students were requested to create a warfarin counseling video recording for patients and nurses and help in drafting cardiovascular therapeutic protocols for patients with COVID-19. In the infectious disease rotation, APPE students were requested to such as participating in drafting protocols for COVID-19 screening and management, creating short video about the proper precautions to avoid contracting COVID-19 and participating in the antimicrobial stewardship program. Further details and examples of rotation-specific activities are shown in Table 3.

## 2 | DISCUSSION

In this study, we present the experience of four faculty preceptors in restructuring the APPE in order to reduce the students' risk of contracting COVID-19 in SA. To the best of our knowledge, this is the first experience that shed light on this crucial global crisis from the clinical pharmacy education perspective. Globally, many pharmacy schools

**TABLE 3** Examples of advanced pharmacy practice experience (APPE) rotation-specific activities during COVID-19

| Rotation | Examples of proposed activities |
|---|---|
| Internal medicine | • Participation in fall-risk assessment task force activities:<br>○ APPE students were requested to identify patients at high fall risk (ie, through reviewing daily medications lists sent by faculty preceptors) and looking for appropriate alternatives for admitted patients.<br>• Formulating total parenteral nutrition (TPN) regimens:<br>○ Faculty preceptors sent the APPE student pertinent information for de-identified patients on TPN, and they were requested to formulate their nutritional plan.<br>• Performing simulated patient inhalers education sessions:<br>○ APPE students were requested to perform inhalers education to their peers who were playing the role of a patient with asthma, chronic obstructive pulmonary disease. |
| Critical care | • Performing interprofessional education for enteral feeding—drug interactions:<br>○ APPE students were requested to record a five-minute short video counseling nurses on drug-nutrition interactions.<br>• Assessing hemodynamics and resuscitation modalities:<br>○ Faculty preceptor provided the APPE student with a made-up or a de-identified patient case with the relevant information to be evaluated during sessions.<br>• Assessing acute cardiac life support simulation:<br>○ Faculty preceptor provided the APPE student with a web-based simulated case with cardiac arrest and assessed students' performance based on their feedback.<br>• Performing therapeutic drug monitoring (TDM) for patients on phenytoin and valproic acid:<br>○ Faculty preceptor provided the APPE student with a made-up or a de-identified patient case with the relevant information needed to write a TDM note.<br>• Creating "Do Not Crush" list:<br>○ APPE students were requested to develop a 'Do Not Crush' for nurses for medications that could be used inpatients with COVID-19. |
| Cardiology | • Monitoring of blood pressure techniques:<br>○ APPE students were requested to record a 5-minute short video counseling patients on the proper method to check their blood pressure.<br>• Performing simulated patient anticoagulation education sessions with peers:<br>○ APPE students were requested to perform anticoagulation to their peers who are playing the role of a patient with venous thromboembolism or atrial fibrillation.<br>• Creating warfarin counseling video recording for patients and nurses:<br>○ APPE students were requested to create a five-minute video counseling patients on their anticoagulation therapy.<br>• Drafting cardiovascular therapeutic protocols for patients with COVID-19:<br>○ APPE students were requested to participate in developing therapeutic protocols for patients with ST-segment elevation myocardial infarction. |
| Infectious diseases | • Participating in drafting COVID-19 screening and management protocol:<br>○ APPE students evaluated the literature and had multiple discussions with the faculty preceptor. Also, they evaluated the hospital's formulary for the agents with the proposed activity against COVID-19. Eventually, the final version of the protocol was sent to the infectious disease team for review.<br>• Creating COVID-19 short educational videos:<br>○ APPE students were required to make a short video about the proper precautions to avoid contracting COVID-19. Examples of the videos created were about how COVID-19 can spread and the steps to protect yourself and others.<br>• Participating in the antimicrobial stewardship program:<br>○ De-identified patient information from the antimicrobial restriction list was sent to APPE students for recommendations. During the discussion, APPE students were able to get more information about the patient from the preceptor. The final recommendations were discussed with APPE students and documented by the faculty preceptor in the electronic medical record.<br>• Performing a therapeutic drug monitoring for vancomycin and aminoglycoside:<br>○ APPE students were provided with de-identified patient information who are on vancomycin or aminoglycosides. APPE students were able to get more details on the patients during the discussion with the faculty preceptor. The final plan and monitoring parameters were discussed with APPE students and documented by the faculty preceptor. |

are struggling with this issue right now. We firmly believe that this study could provide some insights and guidance on the modality of how other schools could restructure their clinical rotations while maintaining the integrity of the delivered learning experience.

During this global pandemic, we as faculty preceptors had to react urgently in order to maintain the integrity of our curriculum and its mission to graduate competent pharmacists. Still, we will continue to have to improvise. Following a thorough literature search, we came to conclude that the use of videoconferencing would be the best modality to deal with this issue without compromising our standards. Previous evidence showed that the use of videoconferencing could be a useful educational tool in clinical and biomedical sciences, especially in underserved areas.[8-11] Other evidence showed that the use of videoconferencing could be cost-effective.[12] In pharmacy education,

previous evidence showed that the use of videoconferencing in academia APPE elective was effective and successful.[13] As shown in our restructuring modality, there was a significant emphasis on the COVID-19 in each rotation to avoid detaching APPE students from reality and to highlight the integral role pharmacists can play during this outbreak. Moreover, the provided timeline for the restructured modality is more an estimate, and meeting sessions were adjusted according to the day-to-day COVID-19 situation. We urge other Pharmacy schools to adopt and customize their APPE rotations to ensure that the integrity of the learning outcomes is being delivered as per the requirements. We also urge the clinical pharmacy educational and professional bodies to release recommendations on the available modalities and best practices that could be used to ensure the delivery of the Pharmacy curriculum during this pandemic, which could then also be used in other urgent circumstances in the future. Countries that take into consideration the number of hours APPE students spend in each rotation should contact their Pharmacy Board for specific details.

There are several free and paid online videoconferencing platforms that could be used to share content, documents, and other learning materials with APPE students. Our institution is able to provide free access to resources, such as Blackboard Collaborate Ultra and Webex, by the Cisco, Zoom, and Microsoft Teams. We have conducted all of our learning modalities smoothly, and there have been minimal technical issues. In our experience, we used Cisco Webex Meeting predominantly, as it was able to offer everything we were looking for, such as creating polls, breakout rooms, white boarding, and screen and file sharing. Blackboard was mainly used for assignments submission. We believe that the differences between these virtual platforms are minimal and they all serve the same purpose sufficiently. The advanced features that were made available by these platforms have maximized and enriched the learning experience of APPE students. Given the high demand for these resources during crisis times like this pandemic, internet connectivity and technical issues may limit the continuous daily use of these resources. Therefore, ensuring the availability of more than one resource to APPE students is crucial to maintaining an uninterrupted learning experience.

Our experience had certain limitations that are worth highlighting. First, despite the benefit of implementing a specialist model for a clinical pharmacy that allows more educational time at our institution, it was challenging to maintain optimal educational experience for our APPE students in addition to the academic, clinical, administration, and research duties during this outbreak. However, implementing more online videoconference discussions allowed for increased flexibility in the given timeframe. Second, our affiliated hospital, King Abdulaziz Medical City, is part of the National Guard Health Affairs system, which does not grant any remote access to electronic medical records for all health care providers, except in certain circumstances. [Correction added on 05 May 2020 after first online publication: the preceding sentence has been modified to improve clarity.] Although this could have a major effect on real-case scenario exposure for students, maximizing the number of de-identified or made-up patient cases provided by the faculty and optimizing the use of online-based simulated cases could maintain the learning experience. Moreover, the number of real patients cared for by the APPE students was lower than normal during COVID-19. Also, one major limitation of the current circumstance with COVID-19 is the limited face-to-face interaction with other health care providers, which hinders the interprofessional learning experience. That being said, this modality does not violate the ACPE standards as they suggest using multiple modalities including, face-to-face, tele-health, or videoconferencing technology to conduct the interprofessional educational activities.[7] Our restructuring strategy may fill a temporary gap but is not a sustainable model. Using video-communication interaction may offer a decent compromise that could be optimized via implementing strict strategies to ensure patient safety and privacy. Unfortunately, our pharmacy students did not have a chance to interact with other health care students, given the fact that other health care schools were using different modality than ours. However, integrating our experience with other health care students could improve the learning experience. Lastly, we have to acknowledge that we were not able to assess the APPE students' psychomotor skills due to the lack of face-to-face interaction between the APPE students and faculty preceptors.

An important determination of the effect of the COVID-19 pandemic on pharmacy education should be performed through an appropriate academic assessment based on program learning outcomes. We intend to perform a before-and-after assessment of students' experience and perception with the adaptation of maximized online learning for APPE students. In addition, program learning outcomes will be carefully assessed for the current APPE class, as they are compared with previous APPE students over the past 3 years.

## 3 | CONCLUSION

In this paper, we present the experience of four faculty preceptors in restructuring the APPE in different clinical settings in order to reduce the students' risk of contracting COVID-19 at a large academic medical institution in SA. Mainly, videoconferencing modality was used to conduct and assess clinical rotation learning outcomes. This paper could provide guidance and insights for other pharmacy schools struggling with this issue during this global pandemic.

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### CONFLICT OF INTEREST

The authors declare no potential conflict of interest.

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