

**Health-system implementation of a collaborative core curriculum for advanced pharmacy
experiential education during the COVID-19 pandemic**

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Purpose. A collaborative advanced pharmacy practice experience (APPE) education model established within a healthcare institution during the coronavirus disease 2019 (COVID-19) pandemic is described.

Summary. The COVID-19 pandemic caused a nationwide disruption of APPE pharmacy education. Healthcare institutions faced the challenge of educating APPE students while attempting to simultaneously de-densify work areas and reduce transmission risk for employees and patients. A pharmacist coordinator and pharmacist academic partners at a large teaching hospital created a collaborative common core curriculum model for resourceful implementation of APPE education. Healthcare network pharmacists, clinical pharmacist academic partners, and pharmacy residents delivered the curriculum to 35 pharmacy students over a 9-week time period. Main components of the curriculum included patient case discussions, topic discussions, journal club presentations, live continuing education (CE) webinars, and development of pharmacy technician CE programs. A majority of students reported positive experiences working with a variety of preceptors from different specialties (81%) and collaborating with students from other universities (62%).

Conclusion. A health system can leverage institutional, network-wide, and academic partner resources to implement a collaborative APPE curriculum during challenging times such as those experienced during the COVID-19 pandemic.

Keywords: APPE, COVID-19 pandemic, curriculum, experiential education, health system, remote learning

The spread of the coronavirus disease 2019 (COVID-19) pandemic has posed a serious national and global health threat. The Centers for Disease Control and Prevention (CDC) has offered guidance to help slow the spread of COVID-19 in US healthcare facilities. Recommended steps to help protect US healthcare workers and patients include limiting personnel and use of technologies such as telephone and telemedicine technologies.¹ Additionally, CDC has provided limited guidance to institutions of higher education, such as minimizing in-person classes and activities and delivering hybrid or fully remote learning experiences.²

While these recommendations are practical for individual locations and settings, there is a paucity of resources available to guide experiential education during advanced pharmacy practice experiences (APPEs). Various healthcare institutions implemented limits on numbers of personnel and students within their facilities during times of intensified COVID-19 community spread; however, the Accreditation Council for Pharmacy Education (ACPE) requires that 1,440 APPE hours be performed prior to issuance of a doctor of pharmacy degree by an accredited college or school of pharmacy.³ Of note, these APPE hours must include patient care activities to satisfy the intent of this educational standard for application of knowledge. Failure to meet these requirements in a timely manner could result in postponement of student graduation.

Due to nationwide APPE rotation cancellations resulting from COVID-19 spread, many pharmacy students in their fourth professional year experienced unprecedented learning experience disruptions. A coordinated response from healthcare institutions and experiential education offices within colleges or schools of pharmacy was needed to plan alternative teaching methods that met APPE educational standards. Use of remote communication and learning strategies based on patient health record information has been proposed as a means to achieve learning during the COVID-19 pandemic.⁴ In this article we describe the use of one such method to facilitate a remote, multifaceted collaborative APPE rotation at a large health system.

Practice setting and methods

Health-system environment. The APPE experience occurred at a large, integrated 9-hospital health system that serves western Pennsylvania and surrounding areas. Pharmacy services include 9 inpatient pharmacies with supporting clinical and investigational drug services, 7 retail pharmacy sites with patient discharge medication delivery services, infusion centers, home infusion services, and hospital-based and embedded ambulatory pharmacy services.

The health network is active in pharmacy education for students, residents, pharmacists, and pharmacy technicians. The manager of education and residency programs of the health system coordinates the educational efforts of the pharmacy department at the tertiary care academic medical center. The health network has affiliation agreements with 13 pharmacy schools and generally accepts over 130 students for approximately 175 APPE rotations each year. An academic partnership with 2 colleges of pharmacy exists, with the health network providing practice sites for 5 clinical faculty. Four hospitals sponsor pharmacy residency programs and 26 pharmacy residents: 17 in their postgraduate year 1 (PGY1) residency and 9 among a variety of postgraduate year 2 (PGY2) programs. Required activities within these residency programs include the provision of small-group educational sessions for APPE students. The health system is also an ACPE continuing pharmacy education provider. Continuing education (CE) programs for pharmacists (and pharmacy technicians, as applicable) are provided as live and recorded seminars and webinars.

Rotation design and identified challenges. Designing an APPE rotation during a pandemic presented several challenges from the perspective of a health system. These challenges included preceptors navigating new COVID-19 responsibilities, accommodating the varied needs of several pharmacy schools and different types of rotations, transitioning learners to a remote format without traditional access to onsite experiences, and providing opportunities for students to impact the health system in a meaningful way.

Responding to the COVID-19 pandemic created new, additional practice responsibilities for preceptors. To support preceptors, a collaborative common core curriculum was developed to optimize resources and combine educational experiences. The common core curriculum ensured students progressed toward key rotation outcomes. During the spring of 2020, the health system had students from 4 schools of pharmacy on different schedules assigned to acute care, ambulatory care, hospital pharmacy, and diverse elective rotation experiences. The manager of education and residency programs reviewed preceptor submissions of APPE rotation syllabi and office of experiential education materials from each school of pharmacy to ensure the schedule would meet the required learning experiences. Broad learning objectives were kept consistent across student rotations to ensure they were covered throughout the learning experience. All students in attendance were expected to participate and produce deliverables at an activity, even if it was not a required activity for their rotation type. For example, a student initially scheduled for an infectious diseases rotation was expected to also prepare for learning activities and assignments relevant to other specialties, such as cardiology, critical care, and ambulatory care. Accordingly, many students gained learning experiences they would not have otherwise had in their originally assigned rotation. Preceptors could add additional learning activities for their students or opt out of a day's activities as they felt appropriate. Each student's individually assigned preceptor remained responsible for his or her own student's learning and evaluations but was assisted by the manager of education and residency programs, who coordinated the communication, expectations, and schedule related to the shared experiences.

This common core curriculum included synchronous topic discussions, patient case discussions, and journal club presentations for students to attend together in a remote format (Table 1). Students completed projects, reviewed preparatory materials such as primary literature and clinical practice guidelines on an assigned topic, and viewed recorded CE presentations remotely as well. In association with these CE sessions, students were provided follow-up assignments, often consisting of drug information (DI) questions, which were discussed during a synchronous group

session later in the week. Preceptors from across the health system alternated in providing oversight of these learning activities. As appropriate for the CE content, an ambulatory care or pharmacy administration preceptor rather than an acute care preceptor led a learning activity to allow more time for inpatient COVID-19–related planning and patient care activities. The preceptors for that learning activity were responsible for sending students invitations for Zoom (Zoom Video Communications, San Jose, CA) meetings, providing a brief description of the session activities, and sending any pre-session materials at least 48 to 72 hours prior to the meeting. Students were given feedback from the preceptors leading these common core curriculum learning activities and from an individually assigned preceptor who reviewed and evaluated completed assignments while tracking overall progress.

While the common core curriculum provided a consistent general structure, efforts were made to customize the learning experience for each student. The manager of education and residency programs employed several strategies to emphasize and prioritize learning activities according to the assigned rotation type. During large-group synchronous sessions, many preceptors used the breakout room feature in Zoom to maximize active participation for all students, but when the large group reconvened, a smaller preselected group of students were expected to lead discussions and generate recommendations. These students were assigned according to alignment of the topic area with their rotation type to allow for deeper learning and accountability in their assigned rotation type. For instance, students assigned to an outpatient rotation led patient case presentations and discussions of care plans focused on ambulatory care disease states. Similarly, when CE topics and DI questions were delineated, topics were designated by rotation type. Students on hospital rotations were assigned more general pharmacy or patient safety topics and questions, while students on clinical rotations were assigned either acute care or ambulatory care pharmacy topics based on their rotation type. As an example, a student originally scheduled for a 5-week inpatient general cardiology rotation was assigned to lead cardiology-focused activities as much as possible. This student, while participating in all scheduled common core curriculum activities, led a

topic discussion about investigational drug services during week 1, led acute care cardiology patient cases during weeks 2 and 5, led student groups in a resident-run session about guidelines for ventricular arrhythmias in week 3, led a topic discussion about heparin-induced thrombocytopenia in week 4, and was assigned to create a CE presentation about hyperlipidemia management for pharmacy technicians.

Due to state and health-system requirements, learners were not able to attend rotation responsibilities onsite, which removed their ability to directly access the electronic health record. While unable to replicate the onsite experience fully, preceptors facilitated patient case discussions in the common core curriculum, which allowed students to participate in patient care activities by determining treatment plans and incorporating evidence-based clinical decision-making. Many case discussions addressed successive stages of patient care by following patients over time, such as day-to-day care during a hospital stay or visit-to-visit care in a clinic setting. Individualized changes to subjective and objective patient information, such as new data (vital signs, laboratory results, imaging reports, etc), additional information obtained at a follow-up visit, or additional diagnoses were added to the case as the patient's care progressed. Within this continuum of patient care, updated case information often altered diagnosis and treatment considerations, leading students to consult references and primary literature within a time-restricted environment typical of a clinical setting. Students were required to evaluate patient characteristics and present a pharmacotherapy assessment and plan in detail equivalent to that required during an onsite rounding experience, including being able to defend their recommendations in response to typical follow-up questions. In the ambulatory care discussions, preceptors provided information that would be readily found in the patient record but required students to generate questions to ask of patients and collect additional information that would inform their plans.

Another goal was to incorporate projects that could provide added value to the health system while offering additional authentic learning experiences offsite. For example, students were able to support pharmacy operations in addressing the medication administration needs of patients

with COVID-19. Students created an information sheet for nurses regarding use of extended intravenous infusion lines to allow placement of infusion pumps outside of hospital rooms to decrease nursing staff use of personal protective equipment and virus exposure. Furthermore, a pharmacy departmental goal was to develop more educational programs for pharmacy technicians, so students organized in groups were assigned to design and record a CE presentation (with preceptor oversight) that would become an accredited program for pharmacy technicians. Lastly, the rotation added valuable teaching experiences for pharmacy residents in a clinical setting by giving them the opportunity to lead focused topic discussions and journal club presentations and engage in clinical debates with students.

Assessment of rotation delivery. In order to assess the effectiveness of the new remote rotation design, a 15-question electronic survey approved by the institutional review board was sent to students at the end of their rotation block. This survey included 3 open-ended questions to elicit feedback to help identify aspects of the rotation most beneficial during a remote rotation (and potentially during a traditional rotation) as well as areas for improvement. Closed-ended questions further elicited student perspectives on the effectiveness of specific rotation activities and the impact of the rotation's design, including collaboration opportunities, instruction by a diverse set of preceptors, communication, and time commitment.

Results

The postrotation survey (appendix) had a response rate of 60% (21 of 35 students completed the survey). The majority of those students (81%) indicated that compared to past rotations, working with a variety of preceptors from different specialties and practice settings positively affected their learning experience. The majority (62%) also felt collaborating with students from other universities on the rotation assignments improved their learning experience. The activities the students found to be the most helpful in preparing them for future practice were the patient case discussions led by clinical faculty, topic discussions led by preceptors and pharmacy

residents, and the DI questions. About 86% of respondents indicated rotation time/workload demands equivalent to or greater than in previous onsite APPE clinical rotations.

A qualitative analysis was performed to evaluate responses to the 3 open-ended survey questions (What aspects of the rotation were the most effective for student learning? What aspects of the rotation could be improved? Which activities would be beneficial to include during a traditional rotation experience?). Over half of the students (67%) indicated that case presentations and associated topic discussions constituted the most significant aspect of the rotation. Specifically, students appreciated that case presentations were based on real patient care experiences and provided an overview of multiple disease states, which they felt allowed for effective simulated patient care opportunities in a remote setting. The survey responses also indicated that students believed that having access to preceptors from different practice specialties during one rotation increased their learning opportunities and allowed them to prepare comprehensive care plans spanning various disease states. Thirty-three percent of students felt that case presentations should continue to be offered remotely, with involvement by a variety of students and preceptors from different rotations. A recommendation for program improvement was to implement a standardized method of communication when sending out Zoom information for the activities on the rotation calendar. Due to rotation involvement by numerous preceptors from both the health system and academic partner institutions, different mechanisms were used (both email and calendar invitations).

The collaborative common core rotation design was able to support pharmacy preceptors and meet APPE educational outcomes for 35 students over a 9-week period in the spring of 2020. Fifty-five educational activities were provided to APPE students as part of the curriculum: 28 topic discussions, the majority of which contained follow-up assignments reviewed later in the week or related patient case examples; 14 patient care case discussions; 8 journal clubs; and attendance at 5 live CE webinars delivered by pharmacy residents. Twelve health network pharmacists, 4 clinical

faculty, and 13 pharmacy residents supported by residency preceptors facilitated the educational activities.

Pharmacy preceptors, including 14 health network pharmacists, 1 clinical faculty member, and 4 pharmacy residents, mentored APPE students to design CE programs to be offered to hospital network pharmacy technicians. Sixteen ACPE-accredited CE programs were delivered and recorded by the APPE students, accounting for 8 credit hours of pharmacy technician home study programming for the health network.

Discussion

Experiential education requires a different application of competencies and style of learning than what can be achieved in a classroom setting. In an ideal patient care rotation, students would be interacting with patients and team members in hospital patient care units, clinics, and pharmacies. While onsite direct patient care was not possible during the time of the described APPE experiences, the rotation assignments and activities were intentionally designed to incorporate interactive elements common to the experiential setting and challenge learners in an APPE experience rather than a classroom environment.

Requiring students to consider adjustments to therapy with new patient updates, research necessary information in the moment, and collaborate with a group in Zoom breakout rooms to develop patient-centered, evidence-based recommendations reproduces rounding services and ambulatory care models in a remote setting. Real-time clinical reasoning and decision-making closely models most onsite patient care APPE experiences. Assigning students to perform a patient case “workup” in advance of a group discussion—and then adding new patient information at initial and successive time points—allowed students to see how a case evolves during daily provision of clinical services in acute and ambulatory care settings. The patient case discussions provided students with objective data found in the patient record but required them to consider additional information they would need to collect from a patient, just as they would in an onsite patient care experience. The

results of the student survey indicated that nearly all (20 of 21, or 95.2%) of the students felt the patient case discussions were very helpful to their learning for future practice, and many students felt these discussions should be continued. Since the students were nearing the end of their fourth professional year, these participants had previous APPE experiences to consider when reflecting on this rotation. Their perspectives indicated that participation in these discussions was a strong step towards providing an effective APPE experience in a remote environment within the limitations necessitated by the pandemic.

This rotation structure afforded additional benefits for students, preceptors, and the health system. Drawing on a wide variety of preceptors throughout the health system minimized individual workload for the preceptors and time away from patient care while maximizing student access to experts and diverse patient care experiences beyond what most individual preceptors at a single rotation site can provide. Students noted the benefits of this diversity in patient care experiences and preceptors in their survey responses. While deploying pharmacy residents in various ways for health system–specific activities during the COVID-19 pandemic has been previously described,⁵ this report discusses an additional role for layered learning and collaborative education of APPE students. The residents gained valuable teaching experience, while the workload was shared among a larger group of preceptors.

Practical limitations of a remote APPE rotation include the absence of face-to-face interactions, which are vital for establishing relationships with medical professionals and patients. Potential integration of telemedicine with interprofessional participation would represent a challenging but welcome addition to enhance these educational objectives in a remote learning environment. Furthermore, although direct electronic health record access was unavailable to students, some patient information from patient cases may have been more readily accessible than if they would have had to navigate the records to find that information themselves. While students appreciated the diverse precepting staff, some of the qualitative survey responses reflected the variation in communication styles that is common with a large group of collaborators. Proactive

communication and planning are essential to maintain clear expectations regarding rotation assignments and to provide access to preceptors for students with concerns and questions. A lead educational staff member is beneficial for organizing these collaborative efforts between multiple health systems, practice settings, and pharmacy schools. With one individual at the health system coordinating the schedule and combined rotation efforts, students had a point person and there were likely fewer instances of miscommunication, particularly during a time of uncertainty and sudden changes. The quantitative survey responses indicated that students understood the rotation expectations and felt preceptors were available to address questions or concerns.

Our assessment of the rotation had various limitations. Although our survey collected unique perspectives from students at 4 different schools of pharmacy, a very small sample size was obtained during a short period of onsite learning restrictions during the COVID-19 pandemic, which limits the generalizability of conclusions. Our descriptive survey was collaboratively designed by health system and academic partners but was not a validated or standardized survey tool. Since the survey was focused specifically on the student perspective and of limited scope, it did not fully capture educational perspectives from pharmacy residents and/or clinical pharmacy specialists. Furthermore, the potential impact of changes in the student learning environment due to the pandemic (eg, living situations, access to resources) on survey results is unknown.

As the COVID-19 pandemic continues to affect the region, the health system has retained elements developed in the spring of 2020 to address the evolving challenges related to conducting APPE experiences. The benefits of a common core curriculum merit continued evaluation, and the health system has maintained this structure, albeit with a reduction in the number of shared activities per week, as preceptors' patient care schedules become more established and consistent again. Individual preceptors can continue to opt in or out of a common core activity for a given day. This format balances the benefits of the shared learning experiences, such as a diverse precepting staff and reduced preceptor burden, with more opportunity for onsite participation.

Conclusion

Periods of uncertainty can generate new ideas that may result in improvements on the status quo. Drawing upon established relationships with academic partners and considering network-wide resources, a health system can create a remote, collaborative learning experience for APPE students encompassing multiple institutions and schools of pharmacy. While a fully remote rotation is not preferred for this health system or its academic partners, there are several components that benefited the students, the preceptors, and the health system that merit continual evaluation and can serve as a foundation for the ongoing adaptability required during the COVID-19 pandemic.

Disclosures

The authors have declared no potential conflicts of interest.

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Key Points

- Health-system resources, key stakeholders, and departmental goals should all be considered when formulating a plan for times of significant challenge and change.
- A common core curriculum can lead to a streamlined advanced pharmacy practice experience (APPE) program for students and preceptors while providing an opportunity to customize APPE rotations.
- Collaboration with a diverse preceptor network can broaden student experiences and learning while allowing for a practical balance of precepting and overall workload demands.

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Table 1. Example of Remote Rotation Schedule

	Monday	Tuesday	Wednesday	Thursday	Friday
Morning activities	<p>New student orientation (as applicable)</p> <p>Review pre-session materials</p> <p>Recorded CE or synchronous topic discussion with assignment</p>	<p>Patient care case review</p> <p>Prepare final patient care plans</p>	<p>Assignment review from recorded CE or topic discussion</p> <p>Review Friday patient case materials</p>	<p>Review pre-session materials</p> <p>Work on post-session assignments</p> <p>Meet with CE group or preceptor</p>	<p>Patient care case review</p> <p>Prepare final patient care plans</p>
Afternoon activities	<p>Journal club or topic discussion</p> <p>Review pre-session materials</p> <p>Work on post-session assignments</p> <p>Meet with CE group or preceptor</p>	<p>Review pre-session materials</p> <p>Work on post-session assignments</p> <p>Meet with CE group or preceptor</p>	<p>Journal club or topic discussion</p> <p>Review pre-session materials</p> <p>Work on post-session assignments</p> <p>Meet with CE group or preceptor</p>	<p>Resident-run topic discussion, journal club, or debate</p> <p>Live CE webinar</p>	<p>Weekly rotation overview</p> <p>Review Tuesday patient case materials</p> <p>Review pre-session materials for next week</p> <p>Meet with CE group or preceptor</p>

Abbreviation: CE, continuing education.