How to Incorporate the Experiential Student Pharmacist Into the Pediatric Practice Setting

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Experiential education conducted in the pediatric practice setting provides student pharmacists the opportunity to learn about a unique patient population. For many students, experiential rotations may be the only form of pediatric education they receive in pharmacy school. Providing quality pediatric experiences is essential to stimulate students' interest in this practice area and train those with goals to become pediatric pharmacists. It is also important to ensure graduating pharmacists have exposure to fundamental pediatric pharmacy concepts. Although pediatric practice areas and institutions differ in patient populations and services, a well-rounded rotation experience should be provided for the pharmacy student. Preceptors must decide what concepts to teach and what activities students should be incorporated into during this experiential period. This article provides goals and activities for student pharmacists that can be included in newly designed introductory pharmacy practice experiences and advanced pharmacy practice experiences within various pediatric settings.

ABBREVIATIONS ACPE, Accreditation of Council for Pharmacy Education; ADE, adverse drug event; APPE, advanced pharmacy practice experience; ASHP, American Society of Health-System Pharmacists; HIPAA, Health Insurance Portability & Accountability Act; IPPE, introductory pharmacy practice experience; IRB, institutional review board; IV, intravenous; KIDs List, Key Potentially Inappropriate Drugs in Pediatrics List; LLPM, layered learning practice model; PGY1, postgraduate year 1; PGY2, postgraduate year 2; PO, oral; SOAP, subjective, objective, assessment, and plan

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Introduction

Providing training to student pharmacists regarding pharmacotherapy for pediatric patients (i.e., special populations) is recommended by the American Council for Pharmacy Education (ACPE).¹ Education in pediatric pharmacotherapy may be achieved through didactic required courses that are integrated into the curriculum, supplemental didactic pediatric electives, or via clinical simulation that focuses on the pediatric patient. It may also be achieved during an introductory pharmacy practice experience (IPPE) or advanced pharmacy practice experience (APPE). Experiential education (i.e., “rotations”) in the pediatric setting provides student pharmacists the opportunity to apply didactic information to the patient care process. It also enables the student to learn and further refine the communication skills appropriate for pediatric patients and their caregivers. Quality pediatric experiential education should stimulate students' interest in pediatric practice and ensure graduating pharmacists have exposure to fundamental concepts important to the care of pediatric patients. The experience may also inspire students to pursue postdoctoral training to become pediatric pharmacists. Unfortunately, for many students, experiential

rotations may be the only form of pediatric education they receive in pharmacy school. A 2014 survey of Doctor of Pharmacy (PharmD) programs in the United States revealed that only 41 programs offered an IPPE in pediatrics with 1 program requiring it.² Seventy-four programs offered an APPE in pediatrics with 3 programs requiring it. However, less than 20% of graduating students participated in a pediatric APPE.²

Pediatric pharmacy practitioners are encouraged to serve as preceptors to offer students opportunities to learn about this patient population. The IPPEs and APPEs are arranged by the school or college in various structures through a block time, longitudinally, or during times when students are not in classes. Preceptors may be challenged in determining what concepts should be taught and which activities are appropriate or best suited for student learning during the IPPE and APPE experiential periods. Schools or colleges may provide preceptors and students with a list of required or recommended ability-based activities or outcomes that must be completed during the experience. However, daily tasks and activities that accomplish these requirements are at the discretion of the preceptor and are dependent on the practice setting, patient population and

diseases, and the goals of the rotation. While practice environments vary by setting and type of institution, all pediatric experiential rotations should incorporate concepts of pharmacotherapy and the medication use process that is specific to pediatric patients to provide a more comprehensive rotation experience for the student pharmacist. To ensure a broad experience within the institution, the preceptor can also arrange for the student to see various pediatric populations (e.g., age, disease based, acuity level) and not spend the entire rotation within 1 practice area. Exposing students to practice outside the traditional rotation times, such as evenings or weekends, or through telehealth opportunities, can provide a more well-rounded experience.

The purpose of this article is to provide preceptors, who are newly developing rotations, with ideas for educational goals and corresponding activities for student pharmacists on their required community and institutional health-system setting IPPEs and the required community pharmacy, hospital/health-system pharmacy, inpatient general medicine patient care, and ambulatory patient care or elective APPEs within a variety of environments. Examples of tasks and activities that can be incorporated into IPPEs or APPEs are described within this article and listed in the Table.²⁻⁶ Not all tasks and activities can be used on every type of rotation; thus, consider the table as a list of options and select those that best fit the rotation. Clinical education models and situational circumstances and recommendations of experiential experiences are also discussed.

Introductory Pharmacy Practice Experiences –

Community Setting. The ACPE mandates time in the community setting during IPPEs.¹ Pediatric prescription processing occurs at all community practice sites. Students should become familiar with the verification and dispensing processes associated with medications for children and demonstrate competency in calculating pediatric doses. Differences in prescription requirements, volume/dose calculations based on concentrations, dosage form administration and measuring devices, and pediatric drug information resources available for community practice are important concepts to cover during the community setting IPPE rotations.

Students have many opportunities to practice their communication skills in the community practice setting with children and caregivers. During the community setting IPPEs, preceptors should review the goals of counseling and the different approaches for communicating with caregivers and pediatric patients as compared with adults. An important concept to address is communicating to children by using appropriate age-based approaches. Additionally, students may have not been exposed to different counseling points regarding best practices for oral liquid administration to children, communicating concerns with cough and cold products, or pediatric-specific counseling points regarding com-

mon childhood diseases such as diabetes or asthma. During the community setting IPPE rotation, students should observe counseling activities and counsel with preceptor oversight.

To foster more community outreach in this practice setting, community setting IPPE students can organize or assist with health fairs, addressing commonly asked questions from families on prevalent conditions or therapies in pediatric patients. IPPE students may require close oversight from the preceptor. Depending on state law and organization policy, students may also be able to immunize patients. Student involvement has been shown to increase student confidence in immunizing and preceptor satisfaction.⁷ Although most states do not allow pharmacists to administer routine childhood vaccines, some states allow pharmacists to administer adolescent vaccines. IPPE students can observe and counsel patients regarding vaccinations, while some students may be able to administer a vaccine with preceptor oversight, depending on the state laws and license.

Institutional Health-System Setting. The requirement of student pharmacists to gain experience in an institutional health-system setting during IPPE is mandated by the ACPE and should be balanced with time in the community setting.¹ Care for acutely ill pediatric patients may be provided in freestanding children's hospitals, children's hospitals that are contained within adult hospitals, or pediatric units/wings located within a hospital. Furthermore, children may be cared for in a long-term care facility where pharmacy services are provided. Each of these health systems will have its own practice model for how the care of pediatric patients is delivered. Any of these settings would fulfill the institutional requirement set forth by the ACPE for the institutional health-system IPPEs. Goals for the rotation include understanding characteristics of health-system pharmacy practice and developing fundamental skills necessary to practice effectively in the institutional setting.

The institutional health-system setting IPPE rotation may be the student's first exposure to both a health system and to the pediatric population. Basic shadowing experiences of pharmacy technicians and pharmacists should be scheduled to help students understand the roles and workflow of the pharmacy. Focus should be placed on medication verification, compounding, and dispensing activities that highlight the differences in pediatric pharmacotherapy. The emphasized concepts and skills will include an introduction to weight-based and age-based dosing for neonatal and pediatric patients and the use of pediatric drug information resources, such as the *Pediatric and Neonatal Dosing Handbook* (Lexi-Comp, Hudson, OH), *Neofax* (IBM Micromedex, Greenwood Village, CO), and *Pediatric Injectable Drugs (The Teddy Bear Book)* (American Society of Health-System Pharmacists [ASHP], Bethesda, MD).

Table. Student Activities for IPPE and APPE Experiences²⁻⁶**Pharmacists' patient care process**

- Recognize and apply the differences between pediatric patients and adults (e.g., classification and definitions of age, vital signs, pharmacokinetics and pharmacodynamics, developmental pharmacology, laboratory test values) when providing patient care
- Assess a pediatric patient's growth by using the growth curves
- Review order entry and verification with preceptor
- Assess prescriptions for accuracy and appropriateness (drug, dose, route, frequency, duration) and order verification for each respective patient by using information from the medical record
- Identify medications on the KIDs List when reviewing medication profiles
- Recognize and mitigate drug-drug, drug-food, drug-allergy, and/or drug-disease interactions
- Review patient care reports. Pharmacy reports, such as antimicrobial stewardship report, hemoglobin with erythropoiesis-stimulating agents, renal dosing adjustments, platelet monitoring with heparin
- Create a patient care plan (e.g., may use or develop a patient workup/monitoring form)
- Develop SOAP note
- Make interventions to optimize patient care to the health care team and document appropriately per institutional policy
- Participate in the following activities: patient care rounds, interprofessional clinical rounds (e.g., patient care rounds, nutrition rounds, radiology rounds, antimicrobial and transplant rounds), and comprehensive care team discussions
- Respond to pharmacokinetic consults
- Participate in patient emergencies with preceptor

Evidence-based medicine and off-label use of medicine

- Recommend eligible routine vaccinations or catch-up vaccinations based on age in accordance to the practice guidelines for immunizations
- Identify and apply available clinical practice guidelines most appropriate for the pediatric population
- Evaluate primary literature to use a medication or guide care for a pediatric patient
- Assist in developing institution-specific standards of practice consistent with the clinical practice guidelines
- Assist in creating/reviewing policies for off-label drug use

Calculations and dosage formulations

- Perform dosing based on weight, body surface area, and fixed dosages, including dosage adjustments (e.g., based on drug interactions, renal function, lab values, therapeutic drug monitoring)
- Calculate estimated glomerular filtration rate by using different equations (e.g., Schwartz and Bedside Schwartz equations)
- Calculate and assess urine output
- Provide recommendations regarding maintenance IV fluids, specifically with the fluid rate and fluid type
- Select concentrations appropriate for the individual patient (including IV continuous infusions, IV fluids, and liquid enteral medications)
- Assess nutritional needs of patients and calculations related to enteral and parenteral nutrition: calculate glucose infusion rate; parenteral nutrition; or IV additive calculations
- Perform formulation conversions, such as IV-to-PO and PO-to-IV
- Perform opioid conversion
- Discuss palatability; conduct a suspension taste testing (antibiotics, anticonvulsant medications, steroids, etc.)
- Recommend specific product formulations appropriate for pediatric patients
- Discuss when to switch from oral liquids (solutions or suspensions) to solid dosage forms (tablets, capsules), and vice versa
- Evaluate commercial availability of a medication versus the need for extemporaneous compounding
- Create/review policies for extemporaneous compounding

Therapeutic drug monitoring

- Perform TDM
- Review specific parameters that influence TDM
- Participate in creating collaborative practice agreement for TDM

SBAR, situation, background, assessment, recommendation; SOAP, subjective, objective, assessment, and plan; TDM, therapeutic drug monitoring; USP, United States Pharmacopeia

Table. Student Activities for IPPE and APPE Experiences²⁻⁶ (cont.)**Drug therapy problems**

- Retrieve, evaluate, and respond to drug information questions from preceptor or other health care professionals
- Review IV orders for compatibility
- Participate in drug shortages meeting/develop drug shortage plans

Formulary and compliance

- Review and apply requirements for HIPAA
- Discuss regulatory agencies and how they relate to aspects of patient care
- Demonstrate knowledge of current standards of institutional pharmacy practice
- Describe the role of The Joint Commission, patient safety standards, and National Patient Safety Goals
- Understand policies and procedures related to controlled substances at the state and federal level. This should include ordering, procurement, distribution, inventory, safety, storage, disposal, destruction, and the various agencies involved
- Create a drug monograph
- Perform a medication use evaluation
- Participate in a Pharmacy and Therapeutics Committee meeting
- Participate in Continuous Quality Improvement meetings

Medication safety/quality improvement

- Discuss and/or perform root cause analysis
- Discuss medication safety-related events with preceptor or medication safety officer
- Complete medication safety/quality improvement project
- Develop or update order sets
- Develop or update institutional policies, procedures, and/or guidelines
- Participate in institutional meetings such as the following: adverse drug events surveillance; infection prevention and control; quality improvement; transitions of care; stewardships (e.g., antimicrobial, opioid); and drug informatics

Interpersonal and communication skills

- Perform a medication reconciliation interview at admission, transfer, and discharge when appropriate
- Perform SBAR presentation
- Provide medication/medication administration device counseling
- Provide discharge counseling
- Provide medication therapy management
- Discuss ethical issues in pharmacy practice and patient care

Operational duties

- Describe the following: roles and responsibilities of pharmacy personnel, pharmacy services (distributive, non-distributive, clinical, administration); role of institutional committees; workflow of pharmacy; medication order cycle; pharmacy dispensing and practice models (decentralized, centralized, tiered, unit-based, etc.)
- Participate in dispensing medications through medication deliveries, automated dispensing cabinet fills, cart exchange, cart fills, restocking trays, kits, bags, etc.
- Verify and label medications and fluids properly
- Participate in drug distribution and storage, prepackaging, inventory process, etc.
- Familiarize with USP guidelines for sterile preparation and compounding and compliance with USP <797>, hazardous medication procurement, storage, and preparation (USP <800>), and non-sterile compounding and preparation (USP <795>)
- Describe process, benefits, and barriers of e-prescribing, computerized prescriber order entry, faxed prescriptions, bar-coded administration of medication, etc.

SBAR, situation, background, assessment, recommendation; SOAP, subjective, objective, assessment, and plan; TDM, therapeutic drug monitoring; USP, United States Pharmacopeia

Students on an institutional health-system IPPE rotation should learn about the lack of commercially available pediatric-friendly dosage formulations, including IV or oral concentrations that are inadequate for pediatric patients, and how it increases workload in the pharmacy.³ IPPE activities to enforce compounding

skills include having the student measure ingredients for a compound and assist a technician or pharmacist in compounding various products. During the IPPE experience, exposure to IV medication preparation is also essential for the student to understand the rationale for different pediatric IV concentrations compared

Table. Student Activities for IPPE and APPE Experiences²⁻⁶ (cont.)**Education: teaching and learning**

- Describe pharmacy role in medical training and education
- Lead topic discussions
- Lead journal clubs
- Participate in various interprofessional educational events, including grand rounds, pediatric continuing education sessions, webinars, and journal clubs
- Provide in-service to pharmacists and pharmacy staff, nursing, physicians, social workers, dietitians, or other members of the interprofessional health care team
- Provide patient case or seminar presentations
- Present new primary literature
- Develop a flyer or handout for staff or patients

Research

- Discuss the methodology, value, and types of clinical research
- Discuss study designs and biostatistics
- Develop a research question
- Identify special precautions with conducting research in vulnerable patients (neonates and children)
- Participate in conducting research with preceptor. This may include data collection, completing IRB protocol forms, or interpreting data
- Participate in IRB meetings and understand the role of the IRB in research

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with those for adult patients. Students can learn from pharmacists and technicians during IV preparation and practice calculations necessary to create dilutions. The unique aspects of medications in the crash cart for pediatric patients compared with those for adults can be discussed. Rotating students through a pediatric satellite pharmacy within an adult hospital as well as satellite pharmacies within a pediatric hospital during an IPPE is one way to increase exposure to pharmaceutical care for the pediatric patient.

The importance of covering key practices and differences in the operations aspects of the pharmacy workflow should be covered during all institutional health-system IPPEs rotations. Activities that foster learning from an administrative standpoint include an introduction to the concept of pediatric-only formularies and the possibility of a separate pediatric Pharmacy and Therapeutics Committee in hospitals that care for both adult and pediatric patients. Attendance at these meetings for the IPPE student may be beneficial to see the differences in the important functions of these committees. Additional activities that can enhance exposure to pediatric medication usage include having the IPPE student shadow a pharmacist performing medication reconciliation or discharge counseling to the pediatric patient and their caregiver. Health-system rotations should also expose the student to the concepts of medication use evaluation and adverse drug event (ADE) monitoring. Institutional health-system IPPE students can assist with collecting this type of information. These activities would increase the student's knowledge and use of medications in the pediatric population.

Advanced Pharmacy Practice Experiences —

Community Pharmacy. Community pharmacy is 1 of the 4 ACPE-mandated APPE rotations.¹ Students who were not exposed to all the pediatric concepts and skills listed for the community setting IPPE can focus on learning these during their community pharmacy APPE. However, APPE community pharmacy rotation students who did learn the foundational concepts during IPPEs can build upon their knowledge and skills during this rotation. Students should be able to identify appropriate opportunities to practice, refine, and strengthen pediatric and caregiver counseling skills in preparation for practicing independently as a pharmacist. They should expand their knowledge of the appropriate use of non-prescription medications in the pediatric population, including medication administration devices. APPE students may be able to lead and conduct health fairs with greater independence than an IPPE student.

Dosage form differences in medications dispensed to pediatric patients should be covered. Often, these medications require pharmacist manipulation prior to dispensing such as compounding liquid medications from powders or dialing and locking the dose of medications according to a prescription. Some liquid products may come in kits that require the pharmacist to compound the product prior to dispensing. In community pharmacies, extemporaneous compounding may also occur and requires the same exposure and skills identified in the institutional health-system setting. In this case, students should learn to recognize situations that may require compounding of a product compared with using a commercially available product.

The selection of non-prescription products for a pediatric patient is a core concept to learn on a community pharmacy APPE. Pharmacy students should learn what medications and treatment options to recommend and which to avoid when selecting products for infants, children, and adolescents and counseling patients and caregivers. Many non-prescription products have an administration device within the packaging and pharmacists must be capable of educating how to correctly administer the product to the patient or caregiver. Students also should learn about appropriate and inappropriate temperature measurement devices, based on the age of the patient, as well as the proper medications to recommend for a fever in pediatric patients.

Common pediatric diseases, such as diaper rash, constipation, and lice that are more community based in origin, should be discussed as patients and caregivers will seek self-care recommendations. Medications used for cough and colds should be discussed with emphasis on how to communicate with caregivers the concerns of these products in younger ages. Non-prescription and prescription medications on the Key Potentially Inappropriate Drugs in Pediatrics (KIDs) List should be reviewed with APPE students.⁶ Students should also learn to identify and how to refer pediatric patients to the pediatrician when self-care is not indicated. Students should understand accurate information related to topics that may be controversial such as autism and immunizations as well as aspirin use in children.

Hospital/Health-System Pharmacy. The requirement of student pharmacists to gain experience in hospital/health-system pharmacy is mandated by the ACPE and is 1 of 4 required APPEs.¹ Again, care may be provided in freestanding children's hospitals, children's hospitals that are contained within adult hospitals, or pediatric units/wings located within a hospital. Any of these settings would fulfill the ACPE requirement for hospital/health-system pharmacy APPEs. The APPE rotation should consist of organized activities specifically focused on achieving competencies in practice on medication dispensing, distribution, administration, and systems management.¹ Concepts and activities that resonate across various pediatric practice settings include a basic understanding of pharmaceutical formulations designed for the pediatric population; extemporaneous compounding and differences in pediatric standard oral concentrations and dilutions; and IV preparation including the addition of preservatives, and pharmaceutical calculations that are weight based.

During the hospital/health-system pharmacy APPE rotation, the student should build on the basics of institutional health-system practice learned during the IPPE experience. Students should become comfortable recognizing and verifying orders for pediatric patients and dispensing appropriate doses and products. If the APPE student was not exposed to the pediatric population and related pharmacy concepts in their

IPPE, teach those at this time. APPE students should be expected to communicate interventions with ordering providers to improve communication skills. Hospital/health-system pharmacy APPE students should be able to retrieve compounding formulas by using appropriate resources for extemporaneous preparations and stability information while independently compounding products with pharmacist verification. A focus of the hospital/health-system pharmacy APPE rotation should be on the student's ability to prepare IV medications for pediatric patients, including selecting the appropriate concentration, performing calculations, and completing the preparation. Experience at satellite pharmacies within the hospital or health system will broaden the students' exposure to a wide array of pharmaceutical care for pediatric patients.

Hospital/health-system pharmacy APPE students should be able to conduct medication histories and reconciliation, perform electronic health record reviews for ADEs, and develop medication use evaluations for medications used in pediatric patients with general direction from the preceptor. They should be able to conduct discharge counseling to the pediatric patient and their caregiver independently after training and approval from the preceptor. Studies have shown that students with training can effectively conduct medication histories in pediatric patients in order to avoid medication errors.⁸ With coaching and facilitating from the preceptor, an APPE student may be able to compile and present a drug monograph or protocol to the Pharmacy and Therapeutics Committee. This offers the student opportunities to learn more from an administrative standpoint, improve interprofessional skills, and increase understanding of medication use in children. These activities provide a valuable experience to the student, improve patient care, and benefit the preceptor and health care system. Upon completion of the APPE rotation, the student should be competent and prepared for a role in hospital/health-system pharmacy practice.

Inpatient General Medicine Patient Care, Ambulatory Patient Care, or Electives. The ACPE requires a robust APPE curriculum with the goal of applying and reinforcing the pre-APPE curriculum and preparing students to be practice-ready practitioners.¹ Inpatient general medicine patient care and ambulatory patient care are 2 of the 4 required APPEs by ACPE.¹ Most APPEs must be focused on direct patient care and incorporate required as well as elective experiences to develop well-rounded practitioners. The goals, outcomes, and content for the pediatric learning experience will vary depending on the specific practice setting, which could potentially include general medicine (acute care), ambulatory care, academia, research, or administration aspects. In general, direct patient care rotations should fulfill the goals set forth in the ACPE standards.¹ When caring for pediatric patients, it is important that the

content be linked to specific key elements of care that support safety, efficacy, innovation, and cost-savings.³ Discussion of the KIDs List should be included in all pediatric APPEs.⁶

The general medicine patient care APPEs should include the opportunity to participate in the pharmacists' patient care process as a member of a multidisciplinary rounding team interacting with other health care practitioners and learners. These team and patient interactions will allow students to strengthen their drug information, communication, and critical thinking skills. By reviewing pediatric patient profiles, students will gain an understanding of the management of pediatric diseases, calculations, dosage forms, and unique aspects of therapeutic drug monitoring. Students should also participate in and lead topic discussions and journal clubs, which will assist in their ability to make evidence-based recommendations and strengthen their ability to analyze and apply literature to their specific patient population. If possible, the general medicine patient care APPE student should have a role in medication reconciliation as well as discharge counseling to learn how to communicate with children and their caregivers. Understanding the medication distribution process for pediatric patients, learned in an institutional health-system IPPE or hospital/health-system pharmacy APPE, will strengthen the student's understanding and application of pediatric medication management in the direct patient care environment. Allowing the student to work with other members of the pediatric health care team (e.g., pediatricians, nurses, social workers) can reinforce the principles of interprofessional collaboration.

For the ambulatory patient care APPEs, it is important to schedule students concurrently with the preceptor in clinic to interact directly with patients and other health care providers. This environment should provide the opportunity to participate in patient care visits as well as comprehensive care team discussions. Similar to the general medicine patient care APPE student, the ambulatory patient care APPE student should be solving drug information requests, performing therapeutic drug monitoring and medication reconciliation, and providing disease and medication counseling to patients and caregivers. Students should be competent to educate on devices and technology such as inhalers, continuous glucose monitoring devices, and glucometers. Evaluating immunization histories and recommending vaccinations is a core activity of the ambulatory care patient workup. Students may also be exposed to the process of storing and distributing medication samples. Depending on the type of clinic, students may also facilitate the resolution of prior authorization and refill requests, complete medication assistance program applications, and problem-solve medication issues as they arise.

Both the inpatient general medicine patient care

and ambulatory patient care APPE student should participate in transitions-of-care activities and practice appropriate documentation in the electronic health record. Documentation can involve detailed pharmacokinetic recommendations, education or medication reconciliation interactions, and other pharmacy-related interventions. In addition, both types of rotations should have an opportunity to attend various meetings such as quality improvement, drug shortages, and ADE surveillance. By attending and participating in these types of meetings, students will be able to connect patient care experiences to decision making that will affect future medication therapy and monitoring. Allowing students to engage in available clinical research and scholarship opportunities will ensure students receive a well-rounded experience.

Clinical Education Models

Layered Learning Practice Model. The layered learning practice model (LLPM) is beneficial in situations when precepting multiple learners of various levels of education. This model is designed with residents and students learning under the leadership of an "attending" pharmacist.⁹ In the LLPM, the "attending" preceptor remains responsible for the care of patients and education of all learners; however, residents and students can assist in teaching, modeling, and coaching each other. For example, once trained as a preceptor, a postgraduate year 2 (PGY2) pediatric resident could assist with co-precepting a postgraduate year 1 (PGY1) resident and/or precepting an APPE or IPPE student. The PGY1 resident could precept or co-precept the APPE or IPPE student. Many pediatric PGY2 residency programs, as well as PGY1 programs, require a resident to precept or co-precept a student as part of the residency program requirements. In addition, the APPE student could co-precept the IPPE student once a certain level of skill is demonstrated.

With the LLPM, residents can assist co-precepting IPPE and APPE students with daily activities such as patient care rounds or clinic visits, IV-to-PO (IV-to-oral) medication changes, medication histories and reconciliations, or drug information questions, even during their staffing requirements. The LLPM in institutional rotations can extend pharmacy services where pharmacist and technician resources may be limited and tied to the distribution process.

Preceptors and learners benefit from a layered learning model. Layered learning can maximize the preceptor's time spent in clinical practice and other responsibilities while ensuring all learners gain the required knowledge or skills. This type of learning allows trainees to learn various feedback methods and then practice and develop these skills. Students and residents also have more independence in this type of educational model. Outcomes from an LLPM in an acute care oncology pharmacy practice experiential

setting involving pharmacy students and residents demonstrated a perceived increase in oncology pharmacy knowledge, developed clinical and self-management skills, and improved clinical time management skills.¹⁰ Students also stated having a resident as a co-preceptor was less intimidating than having the primary preceptor as the sole preceptor. An LLPM involving APPE and IPPE students in a Veterans Affairs ambulatory care setting found that near-peer teaching prepared the IPPE students for APPEs.¹¹ It also increased the practice readiness of the APPE students. The preceptor was able to accommodate multiple IPPE and APPE students simultaneously at the pharmacy practice site with adequate supervision. LLPMs engage pharmacy learners through direct patient care experiences and use active learning to enhance the learning process.¹² They have also allowed a health system to advance patient services and improve practice site efficiency and effectiveness.¹²

The LLPM does have challenges. The preparation and planning of an LLPM can be time intensive. Activities and roles may require shifting if the preceptor has a varying number of learners during each rotation. For example, to help decrease the burden of learners shadowing pharmacists for IPPE and APPE institutional rotations, IPPE students could shadow technicians and learn the basics of pharmacy workflow, while APPE students can work directly with pharmacists. In addition, it is important to be flexible in the model to accommodate differences in a learner's capabilities.¹² Physical space may also be a challenge with the increased number of learners needing to attend rounds or be in clinic.

Near-Peer Learning Model. The near-peer learning model is defined as "senior trainees (1 or more years senior in training on the same level of the medical education spectrum) teach more junior trainees."¹³ Thus, pharmacy students are taught by other students who are at least 1 year ahead of them in the pharmacy curriculum. In settings where there are only APPE and IPPE students, this educational model is appropriate to incorporate.

For near-peer teaching, APPE students can model and teach IPPE students how to gather patient information from the pediatric patient, caregiver, or chart; conduct chart reviews; and communicate with other health care practitioners. APPE students can mentor IPPE students on various projects such as drug use evaluations and help increase the IPPE students' understanding of pediatric medication management and workflow.¹⁴

Preceptors and learners benefit from a near-peer learning model. Benefits of near-peer teaching include the notion that difficult concepts can be explained at an appropriate level and often with more time dedicated to explaining concepts as compared with explanations to a faculty member.¹³ The near-peer "teacher" also can provide a comfortable environment for the learner to

ask questions and raise concerns and is likely to better understand the challenges that new learners may encounter.¹³ The preceptor may be able to focus on other responsibilities while the near-peer teaching is occurring.

Limitations exist for this type of teaching. The near-peer "teacher" must be capable of teaching their peers as well as have a desire and confidence to teach others. Near-peer "teachers" may also have little clinical experience, thus making discussion of application difficult. Despite challenges, the LLPM and the near-peer learning models can be implemented within different pediatric acute and ambulatory care experiential settings with various levels of learners.

Situational Circumstances

Situational challenges can arise during experiential learning. The assigned preceptor may not be available to the student every day on rotation owing to professional and personal responsibilities, or the varying types of pediatric pharmacy models. Furthermore, preceptors can have students on rotation with varying interests in pediatric pharmacotherapy. Some students may already know that they want to become a pediatric pharmacy specialist, while others are unsure or exploring the field further, and yet others have little to no interest in the pediatric population. This section provides guidance on how to precept students during these special circumstances.

Preceptor Availability. Preceptors may not always be available on site, whether it is due to a staffing or scheduling conflict, personal days, or attendance at a training workshop or conference. As a result, accommodations should be made to prevent delays in student learning.

Communication between preceptor and student is always beneficial, especially to inform the student of preceptor inaccessibility. The use of tools such as a rotation calendar can assist in communication and organization of the rotation for both student and preceptor. Planning allows the student to be proactive in their learning experience, as well as to identify or anticipate student needs for the time missed. If teaching a class or giving a presentation, having the student attend or even facilitate in-class or active learning activities could provide a new perspective for the student. Also, consider possible tasks for the student to complete during a preceptor absence, such as subjective, objective, assessment, plan (SOAP) notes, topic discussions with a colleague, or a journal club. A useful educational tool that may be helpful for review on days a preceptor is unavailable is the ASHP Pediatric Resource Center, which has member-accessible links to podcasts and webinars on various pediatric disease states.¹⁵ Additionally, ASHP has a preceptor toolkit available to members with numerous resources to use during the preceptor's absence.¹⁶ Other organizations, including the American Pharmacists Association Preceptor SIG¹⁷

and Therapeutic Research Center Preceptor Training and Resource network,¹⁸ have preceptor resources that can assist with student-learning options.

The student can also use the opportunity to experience various clinical services by rounding with a different pharmacy preceptor or other health care provider, spending the day with a member of the pharmacy or hospital administrative team, or spending time in a different area of the pediatric pharmacy setting. As most students will likely have their institutional APPE in an adult hospital, providing students on pediatric clinical rotations with an opportunity to spend time in a pediatric main or satellite pharmacy can be a beneficial learning experience. By gaining hands-on experiences as described in the Institutional section, students will be able to gain a greater understanding of the medication process in pediatric patients. To facilitate a smooth observational day, the primary preceptor should connect with the colleague early about any anticipated absence, as well as what is expected of him/her and the student. Students also can work on assignments or projects during downtime, which would alleviate some of the burdens on a colleague and still meet IPPE or APPE requirements.

For unanticipated absences, communication remains most vital. Connect with a colleague as soon as possible to obtain permission from him/her to precept the student for the day, if needed. Once the responsibilities have been organized, provide the student with the information needed to ensure things run smoothly in the absence. Having the student reflect and provide a review of what was experienced or discussed during the preceptor's absence will help with the learning session and encourage personal and professional growth.

The Student Who Plans to Pursue Pediatrics as a Career Path. A student who is interested in a career in pediatric pharmacy may be easiest to precept motivation-wise but may also require a significant amount of energy to feed their enthusiasm. Students are likely to consider residency as a career path (or already have) and have perhaps started the application process when on their APPEs. If they have not, preceptors can serve as an important mentor during this crucial time. Students who are passionate about pediatric patients often seek extra experiences to further their interests. Having a perpetual list of potential student projects can serve to benefit both preceptor and student, as well as the pharmacy department and patient care. Introducing students to involvement within professional organizations, such as the Pediatric Pharmacy Association, ASHP, and American College of Clinical Pharmacy, or connecting them to pediatric colleagues, is a great way for them to develop their professional network. Reviewing residency program options, the benefits and disadvantages of pursuing a PGY1 residency at a children's hospital versus a general PGY1 residency, and defining criteria for the student to consider when

researching programs can all be discussed during the student's time on rotation.

It is crucial to ensure students highly interested in a career in pediatric pharmacotherapy appropriately balance workload with enthusiasm. Some students may be overly excited about their pediatric experience and want to experience as much as possible but forget to concentrate on the primary learning experience of pediatric patient care. It is not ideal for a student to take on additional tasks if his/her primary rotation responsibilities are suffering. Conversely, if a student overestimates the time or effort needed for a project, it is up to the preceptor to ensure the student does not burn out and to address any shortcomings prior to completion of the project or rotation.

The Student Who Is Not Sure About Pediatrics but "Likes Kids." For students who are unsure if pediatrics is the right field for them, the approach to their rotation should be slightly different. At the beginning of the rotation, identify the student's goals for the rotation and his/her short- and long-term career goals. Compared with students who know pediatric pharmacy is their career destination, students who are unsure can benefit from a broader exposure to pediatric pharmacy in order to identify areas of interest within pediatrics they could pursue as a career path. Additionally, students may need to recognize that "liking" children does not always equate to happiness in a pediatric career, as rarely do pediatric pharmacists have the opportunity to play with or socially interact with their patients. Have honest discussions with students about making decisions in a complex pediatric patient to provide the best patient care, which may involve separating themselves emotionally from the patient or learning to accept the parents' decision to continue with or remove life-saving measures. It is vitally important to also have unbiased discussions with students about some of the negative aspects of pediatrics, including complicated chronic multidisease management, social and family issues, terminal illnesses, and death. These discussions allow for a stronger connection between preceptor and learner and offer a chance for the preceptor to explain how she or he deals with these types of difficult situations. Providing the benefits and disadvantages of practicing in pediatrics in an objective, unbiased manner will allow students to make the most informed decision possible on whether a career in pediatrics is right for them.

The Student Who Has No Interest in Pediatrics. Students who have no interest in pediatrics may present a bit of a challenge to precept in a pediatric environment. Approaches, concepts, and discussions can be modified in the rotation to highlight how pediatric pharmacy will influence their career regardless of the practice setting. One consideration is to identify what the student's plans are after graduation and then tailor the rotation in that direction. Engaging his/her professional passion early in the rotation will also help. Students who

are planning on working in a community setting could benefit from increasing their knowledge of pediatric use and dosing of non-prescription and commonly prescribed medications for children. Having the student focus on discharge planning, including recommending appropriate pediatric doses for medication orders, selecting an appropriate dosage form for a pediatric patient, and conducting discharge counseling, can be more applicable for those focused on a community setting. A student intent on pharmacy administration can participate in more managerial and administrative activities and meetings. A student who is considering an industry or government career could review key legislative acts such as the US Food and Drug Administration Safety and Innovation Act and the Pediatric Research Equity Act. Topics such as how to satisfy the imposed federal requirements could be discussed. It is highly unlikely in the course of a career that a pharmacist will not come across a situation involving the health of a child, whether it is a relative, child of a friend, or an encounter during usual business. Conducting learning sessions with the student involving different scenarios where pediatric patients may require care will benefit the student. Pharmacists are highly sought out and trusted for their medical knowledge, and it is essential to provide the most accurate and evidence-based responses to care for pediatric patients.

When precepting multiple learners at the same time with differing pediatric interests, there are a few approaches that can be considered. Students who are completing IPPEs and APPEs with the same preceptor can benefit from the LLPM or near-peer learning models depending on the preceptor's observations of the students' knowledge and abilities. Multiple APPE students with varying interests can educate each other on how a particular case would be handled in their desired position, such as an inpatient pharmacist and independent pharmacist or ambulatory care pharmacist and specialty pharmacist. This could also enable exploration of how the care transition occurs and detect possible gaps in the respective processes. Topic discussions and scenarios can be presented to educate each student according to his/her desired career path while maintaining both students' interest and increasing the level of knowledge.

Conclusion

Pharmacy students should be exposed to the pediatric population during experiential education. Precepting students during IPPEs and/or APPEs is rewarding; however, planning activities and designing a rotation can be challenging. Despite the variety of pharmacy and patient services within an institution, a well-rounded IPPE and APPE for the pharmacy student should be offered. The concepts, content, and activity ideas for students provided in this article can be incorporated in various pediatric settings during these types of experiences.

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