



Short communication

Impact on student knowledge following implementation of a pediatric core curriculum during a pediatric APPE: Pilot data

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Abstract

Objective: The objective of this study was to assess the impact of a core curriculum on student knowledge of pediatric pharmacotherapy during a pediatric advanced pharmacy practice experience (APPE).

Methods: An exam was developed to assess student knowledge of five core topics. Students took a pre-test at the beginning of the rotation, core topics were covered through lectures and topic discussions, and students retook the exam at the end of the rotation (post-test). A comparison of student performance on the pre- and post-tests was evaluated using a paired *t*-test, with a significance level set at $p \leq 0.05$.

Results: Students performed significantly better on the post-test compared to the pre-test (mean improvement 13.6%, $p < 0.001$). Significant improvements were also noted in all but one of the individual topics.

Conclusions: A core curriculum of pediatric-specific topics improved student knowledge of pediatric pharmacotherapy when administered during the course of a pediatric APPE.

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Introduction

Education pertaining to the care of special populations, including pediatrics, is a requirement of the Accreditation Council for Pharmacy Education (ACPE) within the Doctorate of Pharmacy (PharmD) curriculum.¹ Neither the

specific content nor the extent to which pediatric pharmacotherapy should be addressed within curricula is well-defined; however, foundational skills recommended by ACPE include dosage calculations and medication adjustments, as well as medication monitoring in special populations. Similarly, the Center for the Advancement of Pharmacy Education (CAPE) also requires that pharmacists are educated to be able to contribute to the health and wellness for a diverse patient population.² Consensus from the American College of Clinical Pharmacy (ACCP) Pediatrics Practice and Research Network (PRN) noted in 2005 that all pharmacists are expected to have a baseline and working knowledge of pediatric patients. It is emphasized that colleges of pharmacy should develop curricula

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that foster this by including topics such as selection of appropriate drug, dose, dosage form and route of administration, critical appraisal of the pediatric literature, as well as more specific topics such as physical assessment, fluids, electrolytes and nutrition, and safety issues, within doctorate of pharmacy programs.³ In 2009, ACCP published a toolkit to guide didactic curricula.⁴ The toolkit included recommendations that were tiered, wherein tier I recommendations listed topics that should be covered by all colleges of pharmacy. Within the toolkit, coverage of pediatric topics is noted as tier I recommendations. Specifically, tier IA (extensive instruction) recommended pediatric topics included pediatric immunizations and appropriate dosage forms, whereas tier IB (exposure to topic) recommendations included more specific pediatric topics, such as pediatric disease states, pediatric dose calculation and therapeutic drug monitoring, developmental pharmacokinetics/pharmacodynamics and changes in drug absorption, distribution, metabolism, and elimination. Similarly, in 2013, in an effort to improve access to pediatric clinical pharmacy services, the Pediatric PRN of ACCP and Pediatric Pharmacy Advocacy Group made several strategic recommendations that included standardization of pediatric pharmacy education, particularly noting the importance of reinforcing pediatric topics during experiential education.⁵ While most United States colleges of pharmacy address pediatric pharmacotherapy within PharmD programs, integration is variable, and continued expansion of pediatric education, both in the classroom and the experiential settings, has been recommended.⁶

Pediatric pharmacotherapy concepts are broadly covered in the required PharmD curriculum at the University of Michigan. In addition to otitis media and immunizations, topics covered elsewhere in the required curriculum, all students also receive a one-week pediatrics module during the therapeutics sequence in the second didactic year. Topics covered during this module include the basic concepts of pediatric pharmacotherapy, principles of medication dosing and administration, pediatric reference materials, and an introduction to the interpretation of pediatric literature. Students with an interest in pediatrics may then choose to take a semester-long pediatrics elective course in the third didactic year, which covers specific pediatric disease states and concepts in line with those recommended in the 2009 ACCP Toolkit and the ACCP Pediatrics PRN.^{3,4} While opportunities certainly exist for students to gain basic knowledge of pediatric pharmacotherapy during the didactic education at our institution, students may lack the depth of understanding necessary to enter specialized pediatric practice.⁵

Fourth year PharmD students are required to complete eight, five-week advanced pharmacy practice experience (APPE) rotations, out of nine rotation blocks. Students must complete one rotation in each of the following areas: ambulatory care, community pharmacy, drug information, health-system/hospital pharmacy, inpatient care, and non-

traditional pharmacy practice. In order to address the gap in pediatric pharmacotherapy knowledge, students have the opportunity to take APPEs in specialized pediatric settings, precepted by a pediatric clinical specialist, as their required inpatient care rotation and/or as an elective rotation. Specialized APPEs include cardiology, gastroenterology, hematology/oncology, infectious diseases, nephrology, pulmonology, and surgery; or critical care experiences in a medical/surgical intensive care unit (ICU), cardiothoracic ICU, or neonatal ICU. These specialty experiences are frequently chosen by students with a strong interest in pursuing a career in pediatric pharmacy; however, students less interested in a career in pediatric pharmacy still require an education in pediatric principles in order to be effective pharmacists in any practice setting.

In order to fill this gap, APPEs in less sub-specialized pediatric practice settings are offered by the generalist pharmacists. At our institution, generalist pharmacists have both traditional dispensing and clinical responsibilities. Generalist pharmacists commonly have post-graduate year one training and/or several advanced pharmacy practice experiences (APPE) within the inpatient and specialty environments. The generalist pharmacist rotates between various practice sites (e.g., general medicine, cardiology, emergency medicine, intensive care, or hematology/oncology, and staffing positions). In contrast, clinical specialist pharmacists maintain a specialized clinical practice and perform clinical responsibilities individualized to specific specialty areas, having little to no operational/dispensing responsibilities. The clinical specialist additionally develops clinical practice guidelines, protocols, and order sets; as well as engages in didactic teaching at the college of pharmacy, performs clinical research and scholarly work, and serves on numerous committees both at the hospital, as well as within the college environment. Clinical specialists have completed post-graduate year two training. The unique and overlapping responsibilities of generalist and specialist pharmacists are described in the [Figure](#). Fourth year students are required to complete a generalist APPE rotation, either in the adult or pediatric setting. The primary goal of the pediatric generalist APPE is to provide students with broad, hands-on pediatric experiences that can translate to any pharmacy practice setting, and will reinforce concepts necessary for entry level, less specialized practice.

In concert with the standard rotational experiences provided during the pediatric generalist APPE rotation (described later in the article), we also developed and integrated a pediatric core curriculum. The core curriculum is incorporated into the generalist APPE rotation as a means of addressing curricular gaps, providing a strong foundational knowledge of general pediatric pharmacotherapy, and covering specific inpatient-related pediatric topics. This knowledge of pediatrics can be used upon graduation to meet the needs of children, as recommended.⁵ This approach of incorporating a core curriculum into the APPE setting uses a method of teaching pediatric

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