INSTRUCTIONAL DESIGN AND ASSESSMENT

Implementing a Pediatric Pharmacy Educational Program for Health-System Pharmacists

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Objective. To implement an educational program to improve pediatric content knowledge and confidence in providing pediatric care among health-system pharmacists.

Design. Pharmacists were asked to voluntarily participate in this prospective, observational education program. A demographic assessment, pre- and post-intervention confidence assessments, and pre- and post-lecture competency assessments were conducted to evaluate the program.

Assessment. Five of the 6 confidence scores improved from the preintervention to the postintervention stage. Test scores for 2 of the 8 postlecture tests improved significantly, and the average test scores for all postlecture tests combined were significantly higher than those for the prelecture tests.

Conclusion. This study demonstrated significant improvements in both confidence and competence in pediatric pharmacotherapy among health-system pharmacists following implementation of a pediatric pharmacy education program.

Keywords: pediatric pharmacy, pharmacy, confidence, competence, health system, postgraduate education

INTRODUCTION

Numerous studies have demonstrated the value of having a trained pediatric clinical pharmacist as part of the medical team. Pediatric clinical pharmacists decrease medication errors, improve patient outcomes, and decrease costs.¹⁻⁴ While important to the pharmacy department and the medical team, the majority of pediatric clinical pharmacists do not verify medication orders or dispense medications to the pediatric areas. This function is performed primarily by pharmacists who are rotated to pediatric areas and are not specially trained in pediatrics. Our healthcare system reflects this practice and currently does not include a comprehensive pediatric training program that educates staff pharmacists who are rotated to pediatric areas.

In nonfreestanding children's hospitals, pharmacists who rotate to pediatric areas are generally self-taught from on-the-job learning, which leads to variability in content knowledge among pharmacists. In the past, many pharmacy college and school curricula offered only 1 to 3 lectures on pediatric pharmacotherapy. Today, many doctor

of pharmacy (PharmD) degree programs offer an elective course in pediatric pharmacotherapy but still may not cover it thoroughly in the core curriculum. A review of the literature also supports that there is a growing need for more pediatric pharmacotherapy education in the 6-year pharmacy curriculum.⁵ In clinical practice, few institutions have implemented a training program for pharmacists with a focus in pediatrics. Only 1 study was identified in which a pediatric training program targeting pharmacists was implemented.⁶ This program trained pharmacists in pediatric pharmacotherapy for emergencies; the pharmacists confidence and knowledge were then assessed and found to have increased. There is a need for pediatric pharmacotherapy education programs to be implemented in pharmacy departments that rotate pharmacists to pediatric areas.

DESIGN

Institutional Review Board approval was obtained for implementation of this prospective, observational education program, and pharmacist participation was voluntary. To deidentify participants, pharmacists were assigned individual program numbers that they used for completion of all paperwork affiliated with the program.

To evaluate the program, participants were assessed before and after the educational intervention by means of pre-intervention and postintervention confidence assessments,

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and prelecture and postlecture competency assessments. The expected outcomes of the program were improvement in participants' pediatric pharmacotherapy knowledge base and confidence in making pediatric therapy recommendations to the healthcare team.

The education program was conducted at Saint Barnabas Medical Center in Livingston, NJ. Saint Barnabas Medical Center is a community-based teaching hospital that is licensed for 601 beds. Within this primarily adult institution, there is a 10-bed combined pediatric intensive care unit and pediatric step-down unit, a 33-bed pediatric general floor, and a 56-bed, level III neonatal intensive care unit. The training program was open to all 27 part- and full-time employed pharmacists of the hospital's pharmacy department. Two pediatric clinical specialist pharmacists collaborated and presented 1-hour lectures to the pharmacists participating in the pediatric education program. The lectures were presented live in the pharmacy conference room and contained a variety of educational material ranging from case-based scenarios to evidence-based guidelines and current journal articles.

A demographic assessment completed by participating pharmacists prior to the education program solicited the following information: type of pharmacy degree, years in practice, whether participants currently provided pediatric pharmacotherapy and to what extent, and how much time their pharmacy degree program spent on pediatric pharmacotherapy.

A preintervention confidence assessment was administered to each pharmacist before the education program commenced (Table 1). The pharmacists' confidence was assessed using a 5-point Likert scale on which 1 = low confidence, 2 = low-moderate confidence, 3 = moderate confidence, 4 = moderate-high confidence, and 5 = high confidence. Three weeks after the program was completed, a postintervention confidence assessment containing the same questions as the preintervention assessment was administered to the participants. The Wilcoxon rank sum test was used to compare results. The a priori level of significance was 0.05.

Each of the 8 lectures was presented twice in 1 day for optimum pharmacist participation. Topics covered in the education program are presented in Table 2. All lectures were accredited for continuing education from the New Jersey Board of Pharmacy, ensuring that pharmacists who attended the education program would receive credit for their participation.

Competency was assessed with a 5-question test based on the objectives of each lecture. Before each lecture began, the 5-question test was completed and collected by the educator. At the end of each lecture, the educator reviewed

Figure 1. Pre- to posttest changes in pediatric pharmacotherapy confidence among health-system pharmacists who participated in the pediatric pharmacy education program, by assessment question.

the pretest competency questions and answers with the participants. Three weeks after the program was completed and all lectures had been given, all pharmacists were administered the same competency tests (ie, posttests) for the lectures they had attended in the program. The investigators chose to wait 3 weeks before administering the posttest to ensure validation of the program and that content knowledge was maintained. Each participant served as his or her own control. All results were evaluated using a chi-square test. The a priori level of significance was 0.05.

EVALUATION AND ASSESSMENT

A total of 8 lectures were presented to 24 of the 27 eligible pharmacists, for a participation rate of 88.8%. Not all pharmacists attended each lecture. Forty-seven percent of pharmacists held a bachelor of science degree in

Figure 2. Average pre- and posttest scores for pediatric pharmacotherapy competency among health-system pharmacists who participated in the pediatric pharmacy education program (PALS = Pediatric Advanced Life Support; PICU = Pediatric Intensive Care Unit).

Table 1. Confidence Assessment Questions Administered to Health-System Pharmacists Before and After the Implementation of a Pediatric Pharmacology Education Program

Question 1	You are receiving a drug information question regarding medication dosing from a nurse/physician for a pediatric/neonatal patient. How confident are you in answering this medication dosing question?
Question 2	You are receiving a drug information question regarding route of administration from a nurse/physician for a pediatric/neonatal patient. How confident are you in answering this route of administration question?
Question 3	What is your overall confidence with verifying orders for pediatric patients?
Question 4	How confident are you in knowing where to look for appropriate medication information in order to answer a pediatric/neonatal drug information questions?
Question 5	Do you feel you have adequate pediatrics/neonatal education to answer pediatric medication questions? Please rate your confidence level to this question.
Question 6	Do you feel you have adequate pediatrics/neonatal education to verify medication orders for pediatric/neonatal patients? Please rate your confidence level to this question.

pharmacy and 53% held a PharmD degree. Fifty-three percent of pharmacists had been in practice for 10 years or less. Sixty-nine percent of the pharmacists surveyed reported receiving ≤ 2 lectures in their core curriculum in pharmacy college or school (Table 3). The majority of pharmacists (90%) who participated in this study practiced in pediatric areas for at least 1 shift a week (Table 4).

Scores for the majority of confidence-assessment questions increased by the end of the program. Results for the confidence questionnaire are displayed in Figure 1. Responses to questions 1 ($p = 0.001$) and 5 ($p = 0.049$) demonstrated significant improvements.

Average competence test scores increased in all areas after the education program was implemented, and there was a significant difference between pretest and posttest scores for 2 of the lectures (Figure 2). The 2 topics for which pharmacists' test scores increased were Pharmacology I ($p = 0.035$) and Asthma and Kawasaki Syndrome ($p = 0.044$).

DISCUSSION

The comfort that pharmacists feel in handling pediatric medication orders and answering drug information

questions is important for their job satisfaction. Many of the pharmacists at our institution had previously informed us that they disliked covering pediatric units because they were not comfortable with medication orders for this population. Improving their confidence in this area was one of the main goals of our program and the primary reason the program was initiated. Our program demonstrates that providing targeted pediatric pharmacology education to pharmacists increases their confidence in providing pharmaceutical care to pediatric patients. Following implementation of the program, there was significant improvement in confidence for some but not all areas, which could be attributed to the low sample size in our program.

Confidence scores for a small subset of pharmacists ($n = 3$) decreased after the program was implemented. To determine the reason for this phenomenon, we asked participants for feedback on the program. Some pharmacists reported feeling "overwhelmed" by the information that they were not aware of and that they had more to learn on this topic than they originally perceived. The feeling of uncertainty in this population resulted in some pharmacists feeling less confident in these areas. To address this issue, we have created and implemented a pediatric training book for the pharmacists to use and have strongly encouraged staff pharmacists to reach out to pediatric specialists for help or advice in areas of pediatric pharmacotherapy with which they are uncomfortable.

Table 2. Schedule of Topics Presented in the Pediatric Pharmacology Education Program

Week	Topic
One	Pediatric Pharmacology I
Two	Pediatric Pharmacology II
Three	Pediatric Infectious Disease
Four	Acute Otitis Media and Cough and Cold Medications
Five	Sickle Cell Disease and Diabetic Ketoacidosis
Six	Asthma and Kawasaki Syndrome
Seven	Cystic Fibrosis
Eight	Pediatric Intensive Care Unit and Pediatric Advanced Life Support

Table 3. Number of Pediatric Lectures Given in the School Core Curriculum^a

Pediatric Lectures, No.	Pharmacists, No. (%)
0	5 (26)
1	2 (11)
2	6 (32)
3	5 (26)
4	1 (5)

^a Excluded elective courses

Table 4. Time Health-System Pharmacists Spent Practicing in Pediatric Areas While Participating in the Pediatric Pharmacy Education Program

Shifts per Week, No.	Pharmacists, No. (%)
1	17 (90)
2	1 (5)
3	0
4	0
5	1 (5)

Establishing an increase in pharmacists' overall aptitude in this area is equally important. The definition of competence varies but encompasses the individual's demonstrated capacity to perform, including their knowledge and skills. Competencies are gained through a variety of methods such as formal education, apprenticeship, on-the-job experience, and training and development programs. The Joint Commission of Accreditation of Healthcare Organizations requires regular pharmacy competency assessments. Assessments can be accomplished through a variety of methods including reviewing test results with a written or oral competency, and observation of skills.

Increasing pediatric pharmacist competency will increase the knowledge base and hopefully translate to improved patient care. Our education program addressed the major pediatric diagnoses encountered in our institution, which include pediatric infectious disease, Kawasaki syndrome, sickle cell anemia, and asthma. Lectures pertaining to asthma and Kawasaki syndrome yielded a significant increase in competence of pharmacists providing care in these areas. This may be in part because these are common diagnoses encountered in our institution but also because the participants' knowledge base of these topics may have been greater than that of other newer topics introduced in the program. Approximately half of the pharmacists who participated in this program have been employed in our institution for over 10 years, whereas the other half are relatively new to the pharmacy profession. This fact may have influenced the rate at which participating pharmacists retained information presented in areas about which they were already familiar.

We plan to provide this pediatric education program to our pharmacists on a biennial basis so that it will serve not only as new material for recently hired pharmacists but also as a refresher for our existing pharmacy staff members. We have also been asked to share this program with our affiliated institutions and are considering providing a taped session of the program that pharmacists at

our hospital could review as a refresher or as new material in between scheduled live presentations of the education program. We have asked for participant feedback and will identify areas that had lower competence scores so that we can enhance lectures in the future. We also may divide the subjects into individual lectures to allow for a more in-depth review of each disease state.

SUMMARY

Pharmacists located in hospitals serving primarily adult populations frequently do not receive significant training or education in pediatric patient care. As a result, pharmacists covering pediatric units may feel they do not have the necessary skill set and knowledge base to adequately take care of pediatric patients. This is supported by previous reports from many of the pharmacists at our institution that they do not like covering pediatric units because they are not comfortable with medication orders for this population. Improving pharmacists' confidence in this area was one of the main goals of our program, and one of the reasons it was initiated. Feedback from participants in our program was positive. Many stated that they learned a great deal, and the majority said they would like to see this program continue in the future. Our program demonstrates that providing targeted education to pharmacists in pediatric pharmacotherapy increases their competence and confidence in providing pharmaceutical care to pediatric patients.

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