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Pediatric nurse practitioners effective in teaching providers the Asthma Action Plan using simulation[1]

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ABSTRACT

Despite traditional education regarding the Asthma Action Plan (AAP), providers in the inpatient setting of a pediatric hospital reported lack of knowledge regarding the AAP and lack of confidence in teaching the AAP to patients and families. The purpose of this study was to assess the effect of a pediatric nurse practitioner (PNP)-led class incorporating simulation on resident physician knowledge of the AAP and confidence in teaching families the AAP. The study setting was a 250 bed Midwest academic pediatric hospital. The 26 participants were second year residents completing a four-week pediatric pulmonary rotation. The class consisted of a brief didactic component regarding the AAP, simulation to teach a patient/parent actor the AAP based on PNP-developed scenarios, and debriefing of the experience. The average composite score on the pre- and post-simulation knowledge assessment showed improvement from 44.8% to 80.4% ($p < 0.001$). All participants answered favorably on questions regarding perceived benefit of the class and 80.8% strongly agreed that they felt more confident teaching the AAP after the class. This study demonstrates that resident physician knowledge of the AAP and confidence in teaching the AAP improved after a PNP-led simulation class.

Asthma is one of the top admitting diagnoses for hospitalized children (Pfuntner, Wier, & Stocks, 2013). Pediatric nurse practitioners (PNPs) have been shown to have a key role in the clinical care of children hospitalized with asthma including educating children and families regarding asthma self-management, and supporting and educating other multidisciplinary members of the inpatient team to also provide asthma care and education (Borgmeyer, Gyr, Jamerson, & Henry, 2008; McCarty & Rogers, 2012; Tolomeo, 2009; Wall et al., 2014). The National Asthma Education and Prevention Program's Guidelines for the Diagnosis and Management of Asthma (2007) recommend that health care professionals provide an Asthma Action Plan (AAP) for all children and adults with asthma. The AAP is a written plan to guide self-management of asthma. The Joint Commission Children's Asthma Care (CAC) metrics include the AAP as part of the Home Management Plan that is recommended for all children who are hospitalized for asthma (Joint Commission, 2014). The critical importance of the AAP is recognized as an essential component of effective asthma care.

At this pediatric hospital, it is expected that each patient/family receives an AAP and education regarding the AAP prior to discharge. Despite the use of traditional teaching strategies to educate providers about the AAP, providers continued to express concerns about lack of knowledge regarding the AAP and lack of confidence in their ability to educate patients and families. Simulation-based education has been shown to improve provider knowledge and skill in many health care settings with technical procedures as well as patient/family communication (Nicksa, Anderson, Fidler, & Stewart, 2015; Rosenthal et al., 2006; Schroedl et al., 2012; Singer et al., 2013). To improve the care of children hospitalized with asthma, PNPs at the hospital developed a class using simulation with standardized parent actors to teach staff nurses how to educate families about asthma management and the use of an AAP. Although the PNP-led simulation classes at the study hospital have been successful in improving nurse knowledge regarding the AAP and their confidence in teaching the AAP, evidence is lacking in the literature about the effectiveness of simulation training to improve provider knowledge of the AAP or skill in teaching it to patients and families.

Study Purpose

Similar to nurses, resident physicians at the hospital also voiced lack of knowledge regarding the AAP and lack of experience and confidence in teaching the plan despite traditional education strategies. The purpose of this study was to assess the impact of an AAP simulation class

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led by PNPs on resident physician knowledge of the AAP and confidence in teaching families the AAP.

Design and Methods

Institutional Review Board exempt status was obtained prior to the start of this quasi-experimental pretest-posttest study. The setting was a 250 bed urban tertiary children's hospital in the Midwest affiliated with a university medical school. A convenience sample consisted of 26 participants, 24 resident physicians and 2 fourth-year medical students, who were completing a four-week inpatient rotation on the pulmonary unit between July 2015 and June 2016. As part of their rotation, these participants were all expected to learn about the care of children hospitalized with asthma and the use of an AAP. PNPs specializing in the inpatient management of children hospitalized with asthma and certified as asthma educators developed didactic content, simulation scenarios for the study, a knowledge test, and a simulation evaluation. Knowledge tests and scenarios were based on current asthma care guidelines and had been reviewed by pulmonologists and expert asthma educators. The knowledge test, scenarios, and simulation evaluation were previously used in AAP simulation classes with >100 nurses over a six year period.

Resident physicians began the sessions by completing a pre-simulation assessment of knowledge regarding the AAP. Following this step, the PNP gave a brief didactic overview of the AAP, medication administration techniques, and strategies for effective patient/parent education. The concept of "teach back" was stressed as an essential strategy for education. The PNP then introduced the simulation activity by distributing two scenarios and discussing the goals for teaching each zone of the AAP. Each resident selected a scenario. Based on the scenario selected, one participant taught a parent of a 2-year-old toddler about the AAP and one taught an adolescent. As an example, the scenario regarding teaching the parent of a toddler is displayed in the Appendix. A standardized patient/parent actor trained in simulation and oriented to asthma and the role of family member, portrayed the parent and the adolescent in the scenarios. Following each scenario the participants, the PNP leader, and the patient/parent actor debriefed the experience by discussing both positive and negative aspects of the simulated education session. During the debriefing, the PNP clarified any misinformation or misconceptions. After the session, the participants completed a post-simulation assessment of knowledge, an evaluation of the simulation experience that included 4 Likert-scale items and space for free-text comments, and an online evaluation of the patient/parent actor. The entire session took approximately 45 min and anonymity was maintained for all tests and evaluations. The pre- and post-knowledge assessments responses were recoded as binary variables to indicate *Correct* or *Incorrect* scores. A composite assessment score was calculated as the percentage of overall *Correct* responses at each time period. Univariate summary statistics were created for assessment scores. A series of McNemar tests were conducted to determine changes in individual assessment item responses. A non-parametric Wilcoxon signed rank sum test was used to determine changes in the composite score over time. Alpha was preset at 5% for all testing of significance. All analyses were performed using IBM SPSS Statistics for Windows version 23.0 (IBM Corporation, Somers, NY, USA). Qualitative comments on the evaluation surveys were recorded and grouped by topic.

Results

All 26 participants completed the pre- and post-tests. A summary of participant responses to the instrument items at Pre- and Post-Simulation Assessment is reported in Table 1. The table indicates *Correct* responses and the relative improvement across time periods. Five items received mostly *Correct* responses in the Pre-Simulation Assessment Period: Items 1 (100%), 3 (92.3%), 5 (80.6%), 6a (69.2%), and 6b (76.9%). There was significant improvement from the Pre- to Post-assessment in 6 items: Items 2a (+61.6%, $p < 0.001$), 2b (+46.1%, $p = 0.008$), 2c (+76.9%, $p < 0.001$), 4a (+69.2%. $p < 0.001$), 4b (+65.4%, $p < 0.001$), and 7 (+53.8%, $p < 0.001$). The average percentage of correct composite assessment scores significantly increased from 44.8% (standard deviation = 10.9%) at Pre-Simulation to 80.4% (standard deviation = 15.4, $p < 0.001$) at Post-Simulation as shown in Fig. 1.

A summary of participant responses to the Simulation Evaluation is visualized in Fig. 2. Between 73.1% and 80.8% of participants indicated *Strongly Agree* on each item. The evaluation favored only positive responses as there were no participants who indicated *Strongly Disagree, Disagree, or Neutral* responses.

The Simulation Evaluation also asked participants to identify the most important knowledge gained in the AAP simulation session. Free-text comments were documented by 22 participants. Several of the participants gave more than one free-text comment. Medication administration was identified by 16 participants as the most important knowledge gained. Teaching families was mentioned by eight participants. Comments by six participants referred to learning about the peak flow meter and its use.

Discussion

Simulation has become an integral part of the education provided for physician residents at the study hospital. However, simulation has been

Table 1
Pre- and post-knowledge assessment and correct item responses ($N = 26$).

	Item Question and Response Options	Pre		Post		Improvement	
		n	%	n	%	%	p-value
1	According to the Asthma Action Plan, which zone is the child in if they begin to cough and have a runny nose? [Yellow Zone]	26	100.0	26	100.0	0.0	N/A
2a	What are the 3 reasons for the parent to call the PCP (primary care provider) in the Yellow Zone? [not better (Green Zone) after first hour (3 treatments)]	1	3.8	17	65.4	61.6	<0.001*
2b	What are the 3 reasons for the parent to call the PCP (primary care provider) in the Yellow Zone? [needs albuterol more frequently than every 4 h]	6	23.1	18	69.2	46.1	0.008*
2c	What are the 3 reasons for the parent to call the PCP (primary care provider) in the Yellow Zone? [needs albuterol every 4 h for >24 h]	2	7.7	22	84.6	76.9	<0.001*
3	What is the most important teaching point regarding medicine in the Green Zone? [everyday control medicine or medicine correctly given]	24	92.3	23	88.5	−3.8	0.999
4a	Name the first and second actions to be taken in the Red Zone. [give albuterol]	4	15.4	22	84.6	69.2	<0.001*
4b	Name the first and second actions to be taken in the Red Zone. [call provider]	4	15.4	21	80.8	65.4	<0.001*
5	What part of the Action Plan tells parents signs that their child's asthma is well-controlled? [Green Zone]	21	80.6	19	73.1	−7.5	0.625
6a	Name 2 uses of the peak flow meter [2 of 3: assess response to albuterol; identify zone; identify best]	18	69.2	21	80.8	11.6	0.453
6b	Name 2 uses of the peak flow meter [2 of 3: assess response to albuterol; identify zone; identify best]	20	76.9	25	96.2	19.3	0.125
7	Identify the green, yellow and red zones of a child whose personal best peak flow is 300. [above 240; between 150 and 240; below 150]	2	7.7	16	61.5	53.8	<0.001*

* $p < 0.05$.

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