Asthma and the Public School Teacher: A Two State Study

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Background: Asthma is one of the most common chronic health problems experienced by school-age children. As a result, school professionals need to be well informed about this chronic illness so that they can adequately support the needs of students with asthma.

Methods: This study examines data collected from a sample of teachers ($n=593$) in 2 large southeastern states regarding their familiarity with asthma self-carry and self-administration laws and policies and training received related to general chronic health conditions including asthma.

Results: Teachers, on average, reported little training received at either undergraduate or graduate levels. Although teachers noted knowledge about asthma, acquired through in-service training or to a lesser degree formal education, a high percentage of teachers reported receiving no asthma-related training through such approaches.

Conclusions: Data in this study are consistent with data collected in a similar study in 2001 suggesting that while asthma prevalence has increased, education about the condition has not. Implications for school teachers, school administrators, school nurses, teacher educators, and asthma education personnel are provided.

Keywords: asthma, school, comprehensive health education

Introduction

THE HIGH NUMBERS of children enrolled in American schools with suspected or diagnosed asthma continues to present challenges to teachers, school nurses, and other school personnel who assist children in managing their conditions throughout the school day. Asthma is one the most common chronic illnesses among school-aged children.¹ The Centers for Disease Control and Prevention (CDC) estimates that 8.4% of children less than the age of 18 are diagnosed with asthma in the United States with 51.6% of these children having reported 1 or more asthma exacerbations in the past year.² Furthermore, 50.3% of children were reported to have uncontrolled asthma.¹ Relatedly, in 2013, 13.8 million school days were reportedly lost because of asthma exacerbations in US schools.³ Despite greater access to medical intervention, the mortality rate for asthma remains 2.8 per million for the general population of children at the age of 18 years.²

Asthma disproportionately impacts children who are African American with risk for mortality close to 3 times the rates for European American children.^{4,5} High prevalence rates are also found in LatinX communities. For example, the CDC report a 12.1% prevalence rate in Puerto Rico.²

Estimates from the National Asthma Control Program indicate asthma costs the United States 56 billion dollars per year.⁵ Furthermore, an asthma diagnosis is more likely in children from low-income environments.^{6,7} Given that children spend an extensive amount of their waking hours in school settings, it is imperative for school personnel to work together to manage the illness. In a previous study, Neuharth-Pritchett and Getch noted teachers lacked training and preparation needed to assist children with asthma management.⁸ This study examines the state of affairs 15 years later with particular focus on implications for future practice.

Review of the Literature

Asthma is one of the most common illnesses in US schools.¹ In a classroom of 30 students, teachers can expect to have 3 students with asthma in their class.^{1,9} Given the impact asthma has on children's health and access to education, it is vital that teachers understand asthma and its management in the classroom environment. Asthma trend studies indicate that the prevalence rate of asthma has leveled off but disparities among low-income and children from underrepresented populations still exist. Thirteen percent of African American children and 11% of children from

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low-income families have asthma.⁶ These data highlight the importance of organized, concerted efforts to manage asthma among all children, but particular strategies need to be put in place to improve the management of asthma in populations most at risk for poor health treatment and resulting outcomes. Schools are the logical place to intervene as ~90% of US children attend public schools and spend most of their day in school and school-related activities.¹⁰

In the United States, several positive trends have occurred in recent years including laws supporting children self-carrying asthma inhalers and self-administering asthma medication.¹¹ In 2004, 38 US states had laws allowing children to carry and self-administer their emergency asthma inhalers.¹² Today, all 50 US states and the District of Columbia have asthma self-carry and medication self-administration laws.¹² Unfortunately, >55% of children continue to lack permission to use their asthma medication in school,¹³ indicating that many children are not benefitting from recent self-carry and self-administration laws. In addition, a study of school nurses found that high school students were less likely to have permission to carry inhalers than elementary students. When probed further school nurses reported many secondary students self-carried inhalers without notifying the school nurse. These nurses stated that more secondary students have access to their asthma inhalers than the permission to carry data indicate.¹³

The National Heart, Lung, and Blood Institute (NHLBI) National Asthma Education and Prevention Program (NAEPP) School Asthma Education Committee¹⁴ provides a comprehensive checklist that can assist school nurses in determining the asthma friendliness of schools. The checklist can assist nurses in identifying barriers, training needs, and environmental triggers that may adversely impact managing children's asthma at school. The NAEPP's Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma provides comprehensive guidelines on asthma management,¹⁵ which has likely been instrumental in guiding physician, nurse, emergency room, and other medical care providers in asthma management.

In addition, the 2017 National Association of School Nurses (NASN) Position Statement for Students with Chronic Health Conditions: The Role of the School Nurse emphasizes the importance of school nurses as vital members of the educational team who take the lead in coordinating, planning, implementing, and monitoring the health and health care plans for students with chronic illness.¹⁶ Furthermore, the Global Initiative for Asthma (GINA) has recommended contemporary strategies for asthma management.¹⁷ Generally, it appears that the attention given to asthma has made an impact on the management of children's asthma as the number of school days missed have decreased from 14.7 million in 2005¹⁸ to 13.8 million in more recent estimates.⁴ However, these numbers indicate that there is still much work to be carried out in the area of asthma management.

Concerted efforts still seem to fall short when providing comprehensive asthma management in schools. The 2012 NAEPP Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma provided explicit management guidelines for the home and specifically stated to include children and adolescents in the education and development of their asthma care plans.¹⁵ In addition, specific attention was placed on asthma education by incorporating asthma education into all points of contact by medical personnel

and all settings, including schools. Unfortunately, the report did not specifically address the process of managing asthma at school.¹⁵ Much of the responsibility implied for the management of asthma fell on children and adolescents, parents at home, and medical personnel. One recommendation was to "encourage students to take a copy of their plan to school, after school programs, and camps" (p. 7).¹⁵

Although school nurses can and likely do refer to and follow these guidelines, it must be noted that the numbers of school nurses are often below the recommended student-to-nurse ratio of 750 students to 1 school nurse for the generally healthy student population. The NASN's 2017 policy statement acknowledges that determining student-to-nurse ratio is a complex process and should take into account each school's student health care needs to determine the appropriate number of nurses. Schools with higher number of students with chronic health conditions and those with complex health care needs should have much lower student-to-nurse ratios.¹⁶ Given the shortage of school nurses, it is unlikely that every US student's asthma management plan, inhaler use, permission to self-carry and administer asthma medications, and asthma condition are being monitored by a school nurse. This is particularly true in US states where the student-to-nurse ratio is much higher than the NASN's 2017 recommendation.

According to the NASN (2008),¹⁸ the number of American student-to-school nurse ratio ranges from 275 to 1 in Vermont to 4,893 to 1 in Utah. In the 2 states where this study took place, the ratio was 1,734 to 1 in Georgia (34th of 50 states and Washington, DC) and 1,877 to 1 in Kentucky (38th of 50 states and Washington, DC). Asthma management at school is an important factor in limiting exposure to asthma triggers, identification of early warning signs, and proper use of emergency asthma inhalers.¹⁹ Given the overall high student-to-nurse ratios,¹⁶ a continued focus on coordinated team efforts for the management of children's asthma during school and school-related activities is needed. US school nurses simply cannot monitor and manage each child's asthma because their student-to-nurse ratios are too high.

Although student-to-nurse ratios are not ideal, school nurses are often the most logical and qualified school personnel to provide education, care, and management of asthma. As such, school nurses must stay current on national and international guidelines, understand how to implement asthma management programs based on these guidelines, and advocate for programs and their own need for continuing education to utilize best practices in asthma care and management within the school.^{20,21} Unfortunately, school nurses may lack confidence in their ability to conduct asthma education.²² This might be the result of a lack of asthma education school nurses receive to keep them up to date on guidelines for best practice in treatment and management of asthma.

In 2011, only 11.9% of certified asthma educators (AE-Cs) reported practicing in schools.²³ Whereas there are ~95,800 full time equivalent school nurses in the United States,²⁴ only 2.6% (2,453) of these school nurses are AE-Cs²⁵ and only 4% (3,867) of school nurses currently hold the National Board Certified School Nurse designation.²⁶ The low numbers of nurses with certifications are concerning because there is no assurance that school nurses have received appropriate, current education in the treatment and management of asthma in school-age children (Table 1).

TABLE 1. NUMBER OF CERTIFIED PRACTITIONERS
BY AREA AND SCHOOL NURSE-STUDENT RATIOS
BY STATE

<i>State</i>	<i>Nurse AE-Cs^a</i>	<i>Health educator AE-Cs^a</i>	<i>National Board Certified School Nurses^b</i>	<i>Student- to-nurse ratios^c</i>
Alaska	5	0	84	530
Alabama	21	0	14	936
Arkansas	17	0	26	1,084
Arizona	30	0	30	1,217
California	170	3	74	2,240
Colorado	145	1	128	2,101
Connecticut	50	0	78	460
DC	2	0	3	652
Delaware	3	0	113	519
Florida	58	0	82	2,605
Georgia	33	1	24	1,734
Hawaii	12	0	11	0
Iowa	7	0	31	889
Idaho	4	0	22	2,368
Illinois	97	0	141	2,893
Indiana	49	0	21	1,022
Kansas	10	0	18	552
Kentucky	36	1	5	1,877
Louisiana	12	1	9	1,868
Massachusetts	133	0	856	419
Maryland	32	2	88	913
Maine	23	0	27	602
Michigan	109	0	21	4,204
Minnesota	132	0	66	1,803
Missouri	66	1	97	748
Mississippi	7	2	58	1,394
Montana	25	0	7	3,137
North Carolina	78	0	1,058	1,320
North Dakota	4	0	3	2,828
Nebraska	58	0	6	1,407
New Hampshire	39	0	43	347
New Jersey	45	0	62	674
New Mexico	19	0	53	780
Nevada	6	0	36	1,814
New York	269	6	56	1,007
Ohio	61	2	123	2,377
Oklahoma	20	0	5	3,110
Oregon	25	1	37	3,142
Pennsylvania	75	0	68	832
Rhode Island	30	0	36	632
South Carolina	22	0	50	901
South Dakota	6	0	5	1,195
Tennessee	33	0	20	1,415
Texas	96	2	176	841
Utah	1	2	17	4,893
Virginia	112	1	129	873
Vermont	16	0	23	275
Washington	48	3	142	1,060
Wisconsin	98	0	45	2,359
West Virginia	1	0	94	1,159
Wyoming	3	0	39	595

^aData compiled from the National Asthma Educator Certification Board.

^bData compiled from the National Board for Certification of School Nurses.

^cData compiled from the National Education Association. AE-Cs, certified asthma educators.

Consistent with the 2019 Global Strategy for Asthma Management and Prevention and national asthma treatment guidelines, individuals with asthma should have an asthma action plan.^{17,27} Students with asthma are often served best within the school setting when provided with action plans developed by their physicians and implemented by teachers and school nurses.²⁷ According to results from the most recent National Health Interview Survey, the percentage of children with asthma who had ever received an asthma action plan increased to 50.7% from 41.7% in 2002.²⁸ Although the number of asthma action plans have increased, the percentage of students with permission to carry and administer their asthma medication has consistently remained <45%.¹³

Asthma action plans are an important tool and should include whether permission to self-carry and self-administer asthma medications was obtained. Given that asthma action plans are part of a comprehensive monitoring and communication system for children with asthma, it is imperative that members of this comprehensive team, including teachers, have the requisite knowledge and skills to be able to put asthma plans into action. Research has been conducted measuring levels of teacher training in this realm.

One of the first studies to examine teacher knowledge and training was conducted by Neuhaarh-Pritchett and Getch.⁸ This study revealed few teachers had exposure to coursework, in-service professional development, or other training on chronic health conditions or illness, coursework on asthma management, or training in dealing with medical emergencies. When examining courses associated with chronic health conditions during undergraduate education, the percentage of teachers who had such coursework ranged from 12.4% to 26.8%. At the graduate level, percentages of teachers who had completed coursework associated with chronic health conditions ranged from 1.4% to 5.8%. The percentage of teachers who experienced training related to chronic illness through in-service professional development opportunities ranged from 9.6% to 28.5%.⁸

Furthermore, the Neuhaarh-Pritchett and Getch study⁸ indicated when asked specifically about past training experiences related to asthma, the percentage of teachers who reported receiving this information across undergraduate coursework, graduate coursework, and in-service professional development experiences was 4.1%, 0.7%, and 14.1%, respectively. Finally, the study polled teachers about their training experiences surrounding intervention with medical emergencies and first aid/cardiopulmonary resuscitation (CPR) training. Only 17.2% of teachers had training on medical emergencies but that number rose slightly to 25.1% for first aid/CPR. At the graduate level, only 3.8% had training in medical emergencies and 2.1 had first aid/CPR training. These percentages rose dramatically during in-service training with 53.3% reporting training in addressing medical emergencies and 54.0% reporting training in first aid/CPR.

Given concerning data regarding teacher knowledge of and training for managing chronic conditions and asthma in the classroom, this previous 2001 study was replicated in 2015. The purpose of the 2015 data collection was to expand the reach of the survey to include responses from teachers from one additional Southeastern state. The follow-up study also aimed to assess whether progress had been made in increasing the percentages of teachers who had received training on chronic medical conditions and asthma management.

Finally, given a number of advances in asthma management including updates to asthma-related laws, this study predicted more teachers would have been able to access training and resources on asthma management.

Materials and Methods

Procedure

Participants completed the Asthma and Other Chronic Diseases in School survey in Fall 2015, which was an update of the Georgia Public School Teachers' Asthma Knowledge and Perception Survey.⁸ The survey contained questions about the enrollment of children with asthma or other chronic conditions in teachers' classrooms along with questions about teachers' training and preparedness for assisting a child with asthma, teachers' comfort and efficacy in supporting children with asthma in their classrooms, teacher knowledge of asthma, and school policy and access information. Teachers also completed a series of questions on their personal demographics.

The survey and the study were approved by the Institutional Review Boards at the authors' affiliated universities. Participants were either contacted through mail to complete a paper survey or through e-mail to complete a survey through a web-based interface. Data from the survey were collected anonymously from a random sample of 3,223 teachers in Georgia and Kentucky. This study examines teacher responses to questions regarding the training they had received regarding chronic illness, and asthma in particular, and knowledge regarding managing medical emergencies in the classroom. The response rate to the survey was 22.1% with a cooperation rate of 82.9%. Cooperation rate is operationalized as the proportion of all surveys completed of those that were begun. Of the 712 respondents, cooperation data yielded 593 usable responses.

Participants

Participants in the study included 593 teachers from Georgia and Kentucky with teaching experience ranging from 1 to 44 years, with a mean of 16.39 years taught ($SD = 8.54$). Teachers taught across the elementary grades and included teachers from kindergarten (15.7%), first grade (12.3%), second grade (12.0%), third grade (13.8%), fourth grade (12.3%), fifth grade (11.5%), special education (6.2%), and Other (12.9%). Teachers who were coded as Other taught subjects such as English as a second language, were academic interventionists, were specialty area teachers in music or art, or were teachers who taught multiple grades. Nineteen teachers (3.2%) did not indicate their grade taught.

Teachers supplied information regarding the highest level of education completed, which could include a bachelor's degree (17.4%), master's degree (53.0%), education specialist degree (19.2%), and doctorate (2.2%). Twenty-one teachers (3.5%) noted some additional coursework completed above obtained degrees but gave incomplete information as to what that additional work entailed. In addition, 28 teachers (4.7%) did not provide information related to their highest level of education attained. All teachers in the sample, however, reported having a minimum of a bachelor's degree to be credentialed as a certified teacher in either Georgia or Kentucky.

Age was reported in age bands and included 7.1% at 20 to 29 years of age, 25.8% at 30 to 39 years, 30.5 at 40 to

49 years, and 32.9% older than 50 years. Twenty teachers (3.7%) did not provide their age. Race/ethnicity information was also supplied by participants and revealed that 85.16% of teachers were White, 10.62% were African American, 0.67% were Hispanic, Native American, or Asian, and 0.51% of teachers reported a race/ethnicity of "Other." A small number of teachers did not report their racial or ethnic background (1.7%). Within the sample, 93.6% teachers were women.

Questions were also posed about the size of the schools and communities in which teachers worked. Teachers reported working in relatively large schools with student populations >500. The majority of teachers taught in communities with 25,000 residents or more. Finally, teachers were also asked to provide information about their individual health status. Eighty teachers (13.5%) indicated they had an asthma diagnosis and 363 (61.2%) indicated concerns with allergies. The survey did not ask teachers to describe the severity of their own asthma. Twelve percent of teachers also reported diagnoses of other chronic conditions such as hypertension, diabetes, gastrointestinal disorders, and metabolic disorders.

Results

Teachers in this study reported receiving limited training regarding chronic illnesses commonly occurring in students through both undergraduate and graduate coursework (Table 2). A slightly higher percentage of teachers reported receiving some information on this topic through school-based in-service training; however, a majority still indicated no exposure to information related to chronic illness even at this level. Similarly, teachers also reported limited training in relation to the more specific topic of asthma management at each of these levels. In contrast, a higher percentage of teachers reported receiving at least some level of training to date related to emergency management in the classroom and/or first aid/CPR with 68% and 49.9%, respectively, indicating that they had received some training in these areas at the in-service level.

Study participants were also asked to identify what assistance, if any, their schools provide in providing access to information from outside agencies or health care providers in the local community. Results indicated that 48.6% were provided with such assistance by school districts, whereas 51.4% did not receive these resources. Teachers were also asked how well they thought their state requirements for teacher training prepared them both to teach students with chronic health problems in general and to teach students with asthma in the classroom. A majority of teachers (65.7% and 55.5% of teachers, respectively) reported not feeling well prepared to teach either of these student groups (Table 2).

Discussion

Results of this study examining teacher preservice and in-service training regarding chronic health problems in students and, more specifically, of managing asthma in students in the classroom indicated teachers lack sufficient understanding of these important issues and most had little, if any, training or education regarding asthma and asthma management. Findings were fairly consistent with results of recent studies indicating teachers often are not as well informed about issues related to working with children with asthma.^{29–31} Furthermore, participants' responses to questions regarding previous training received regarding chronic

TABLE 2. TEACHER RESPONSES (*N*=593) TO THE TRAINING AND EDUCATION ITEMS ON THE ASTHMA AND OTHER CHRONIC DISEASES IN SCHOOL

	<i>Undergraduate</i>		<i>Graduate</i>		<i>In-service</i>	
	<i>Yes frequency, n (%)</i>	<i>No frequency, n (%)</i>	<i>Yes frequency, n (%)</i>	<i>No frequency, n (%)</i>	<i>Yes frequency, n (%)</i>	<i>No frequency, n (%)</i>
Did you take any coursework related to chronic health conditions?	112 (18.9)	481 (81.1)	23 (3.9)	570 (96.1)	205 (34.6)	388 (65.4)
Did you have a specific special education course on chronic illness?	75 (12.6)	518 (87.4)	25 (4.2)	568 (95.8)	79 (13.3)	514 (86.7)
Did you have a specific health course on chronic illness?	49 (8.3)	544 (91.7)	12 (2.0)	581 (98.0)	104 (17.5)	489 (82.5)
Did you have any specific coursework on asthma management?	20 (3.4)	573 (96.6)	2 (0.3)	591 (99.7)	114 (19.2)	479 (80.8)
Have you had specific training in dealing with medical emergencies in the classroom?	54 (9.1)	539 (90.9)	14 (2.4)	579 (97.6)	403 (68.0)	190 (32.0)
Have you had first aid/CPR training?	84 (14.2)	509 (85.8)	22 (3.7)	571 (96.3)	296 (49.9)	297 (50.1)

Some totals may not equal 100% due to rounding.
CPR, cardiopulmonary resuscitation.

illness or asthma management portray that existing structures in teacher training and preparation do not typically contain coursework related to chronic illness or medical management of conditions such as asthma.

Findings from this study are also consistent with results from a recent study indicating that as much as 85% of teachers do not receive any formal training related to asthma throughout their formal education in preparation for teaching careers.³¹ A potentially promising finding in this study exists in that teachers did report receiving a greater level of training at the in-service level, at least in reference to chronic health conditions in students in general; however, it should be noted that almost 35% of teachers still reported not receiving this type of on-the-job training.

This study serves as an update to data collected in 2001 regarding the education and training of teachers in the areas of chronic health difficulties and asthma.⁸ Whereas the previous study examined these perceptions among a sample of teachers in one large southeastern state, this study expanded the reach of this survey to also include teachers from an additional state in the southeastern United States. It should also be noted that, since the collection of data in 2001, the mortality rate for children with asthma in the United States has gone down² and self-carry laws allowing students with asthma to carry an inhaler on their person at all times have been expanded to include all 50 states.¹¹ Despite these changes, current results are largely consistent with teachers' previously reported lack of education and training related to asthma and asthma management 15 years before.

Taken together, these findings point to the clear gaps in the training and education of US teachers with regard to asthma and asthma management and the subsequent need for more informed professionals within the school setting to adequately serve the needs of these students. The school nurse is the logical professional to serve in this role, however, data indicate school nurses might lack the necessary education, training, and experience to develop and implement asthma management programs in schools.

The lack of AE-Cs and NBCSNs along with the documented shortage of school nurses is likely to result in gaps in asthma care and management for students.^{25,26,32} With the

overwhelmingly high student-to-nurse ratio,¹⁶ school nurses can only do so much in regard to training school personnel and supporting students with asthma management. Unfortunately, as a result, students often rely on teachers or other school personnel who lack the requisite medical training and knowledge to assist them with disease management.

Implication for school nurses

As core medical providers in schools,^{33,34} school nurses can serve a vital role in assisting other school personnel such as teachers and administrators in managing asthma.³⁵ Researchers suggest that even when teachers are trained to assist with medical procedures, teachers express concerns about such intervention given the difficulty of managing such situations and that the medical expertise needed is outside the bounds of their training.^{36,37} Despite best intentions, teachers also might complicate appropriate management of symptoms.³⁸ To minimize these anxieties and improper intervention, school nurses, through training experiences, can supplement teacher knowledge in asthma management.³⁹

Given that school nurses are responsible for the management of a child's asthma at school, it is vital that they stay current on the GINA guidelines¹⁷ and in the use of the NHLBI NAEPP's Expert Report 3: Guidelines for the Diagnosis and Management of Asthma.^{14,15} Nurses should be aware of the 4 components of asthma care that include (1) assessing and monitoring asthma severity and asthma control, (2) education for a partnership in care, (3) control of environmental factors and comorbid conditions that affect asthma, and (4) medications.

Nurses should be trained to help teachers understand why children are engaged with specific treatment protocols (eg, short-term or long-term therapies, seasonal treatments), medication side effects, preferred medication delivery mechanisms such as inhalers or nebulizers, when to engage or curtail physical activity, and how to ensure the asthma action plan is followed. Although there is no expectation teachers should assume the roles of school nurses, teachers are key members of a child's overall care team who can alert nurses to exacerbations, intervention needs, and follow-up.⁴⁰

Although this study did not ask about the thoroughness of the training received when teachers reported they had received such training, school nurses could serve as powerful resources in schools by providing basic asthma management training, working with school staff to remove environmental allergens that trigger episodes, and serving as liaisons between families and schools to increase continuity of care from the home to the school setting^{41,42} provided that the school nurses have received adequate training and education in the management of childhood asthma.

In addition to direct training, school nurses could serve as local advocates in adopting local policies to encourage completion of asthma action plans.³⁰ As noted in the NASN's 2017 position statement titled "Chronic health conditions: The role of the school nurse," school nurses should coordinate and conduct assessment, planning, and implementation of individualized health plans for the safe and effective management of students with health conditions during the school day.¹⁶ This role for school nurses might be consultative in nature. Sharing information through informal case-based management strategies or formally through teacher in-service trainings, school nurses can assist with exploring a variety of ways to communicate information about successful asthma management.

In addition, school nurses could coordinate the implementation of a supportive network by creating an alliance with their local chapter of the American Lung Association and tapping into Asthma Educators and supportive personnel to assist in asthma management training and education for students, parents, and school personnel. These types of coordinated efforts are encouraged by the CDC as a way to increase community knowledge when medical resources are limited.³

Implications for school administrators

Results of this study indicate that many teachers acquire information about chronic medical conditions including asthma from in-service training rather than other sources. However, results also indicated that almost 35% of teachers receive no formal asthma training from any source. Given the shortage of school nurses³² and then need to ensure that existing school nurses have the requisite asthma treatment and medical knowledge, school administrators can play a crucial role in establishing continuing education opportunities for school nurses and in-service training that includes information on asthma and management of asthma in schools for all school staff. Teachers and other school personnel are in close contact with students for extended periods during the day. These professionals could and should provide an extra layer of prevention and early intervention for both asthma and other chronic conditions.

Administrators can also play a key role in advocating for additional school nurses, continuing education for school nurses, proactively identify structural and environmental asthma triggers in the school, and actively seek ways to reduce or eliminate asthma triggers in the school environment. Administrators should also be actively involved in creating asthma-friendly schools by creating asthma-friendly policies and protocols. Administrators should evaluate and proactively develop comprehensive plans by utilizing tools such as Power Practices: A Checklist for School Districts Addressing the Needs of Students with Asthma.⁴³

In addition, school administrators can utilize the Asthma Communications Toolkit for School District Leaders that was developed as a comprehensive resource guide to assist leaders in responding to the needs of students with asthma.⁴⁴ These tools are likely to help administrators evaluate their schools' and school districts' policies, training needs, and resources, thus providing data necessary to create and implement plans to create asthma-friendly schools.

Implications for teacher education programs

Given the increase in attention to asthma and asthma management at the state and federal levels, it seems logical that teacher education programs would follow suit in preparing teachers for understanding the policies that support the management of asthma in schools. However, although all 50 US states have asthma medication self-carry and self-administration laws¹¹ and GINA, NAEPP, and NHLBR guidelines recommend that all children with asthma have an asthma action plan,^{14,15,17} teacher education programs may not be passing the policies to teachers in training. Thus, there is currently a gap in what can happen to improve asthma management in schools and what actually occurs.

Given the increasing numbers of students with chronic illness in schools,² it seems prudent for teacher education programs to cover the most prevalent chronic illnesses and their management in the required curriculum. In addition, teacher education programs can stress the importance of teachers being a part of the management and advocacy team for students with asthma and other chronic medical conditions.

Summary

Results from this study indicate that despite some very positive changes in asthma management practices and legislative successes allowing for self-carry of inhalers in schools for management, addressing asthma in schools continues to be hampered by lack of training for teachers and inadequate numbers of qualified school nurses. A limitation of this study was its focus on 2 statewide samples in the southeastern United States. Future research expanding this line of inquiry to teachers across the country would provide for a more robust assessment of teachers' preparedness for managing asthma in schools.

Despite this limitation, this study provides a clear need for teachers to be better equipped with knowledge about medical conditions in general and asthma in particular. Such knowledge will set the stage for teachers to be better included and to communicate as part of a comprehensive health management team with school nurses and other important asthma management personnel in their joint delivery of supports addressing the individual needs of children with asthma. Teachers who are informed about the early warning signs of asthma, classroom and environmental triggers, and are familiar with students' asthma action plans and/or health plans become an important part of the asthma management team.

School nurses continue to be a vital link to the successful management of asthma and other chronic conditions in schools by becoming advocates for comprehensive school health programs and integrated health education programs for school staff, students, and their families.^{45,46} However,

given the high student to nurse ratio,¹⁶ it is imperative that school nurses, school administrators, and teachers become advocates for building collaborative teams that include school nurses, teachers, school administrators, community providers, asthma educators, health departments, and parents. Emphasis should be placed on working together to create a coordinated asthma management network that establishes proactive asthma management efforts while providing a safety net for children with asthma.

Author Disclosure Statement

No competing financial interests exist.

Funding Information

This research was funded by a grant from the University of Georgia's College of Education.

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Received for publication May 12, 2018; accepted after revision August 2, 2019.