

Managing Asthma in Elementary and Middle Schools: Adherence to Federal Laws and National Guidelines

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Abstract

The current study examined teacher-reported asthma management practices in school and adherence to federal guidelines for students with asthma. 593 kindergarten-eighth grade teachers completed surveys regarding compliance with federal laws and policies, information-seeking behavior, asthma-related professional development, and asthma management practices. The extent to which asthma services varied as a function of adherence to federal policy statements or teacher characteristics was also examined. Results indicated a small percentage of teachers reported students with asthma had Individualized Education Plans or 504 plans. Teachers reported medication policies were in place for students with asthma, consistent with national guidelines, but a limited number of students with asthma were reportedly allowed to self-administer medications. Teachers generally reported low compliance to federal policies. Finally, provision of asthma-related professional development, teachers' own history of chronic illness, and information-seeking behaviors were significant predictors of whether students with asthma were served by an IEP or 504 plan.

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Asthma management is a pressing concern for American schools with limited resources to meet the needs of children and adolescents who present with the condition. Prevalence data from the Centers for Disease Control and Prevention's National Health Interview Survey indicate 7.1 million children and adolescents, or 9.6% of the population aged 17 and under, have an asthma diagnosis (Bloom, Cohen, & Freeman, 2010). As children with asthma are found in almost every classroom in the nation (National Asthma Education and Prevention Program, 2003; Neuharth-Pritchett & Getch, 2001), schools need to be responsive to the health needs of these students so students can access equal opportunities for learning (Clay, Farris, McCarthy, Kelly, & Howarth, 2008).

With the reauthorization of the Individuals with Disabilities Education Improvement Act [IDEIA] (2004), the educational rights of children and adolescents with chronic illness to equal access to services within schools were reinforced. Moreover, the ability of students to receive special education services and/or accommodations when their educational achievement is compromised as a result of their illness was strengthened. Despite the abundance of guidelines addressing asthma management in schools both in federal laws, such as IDEIA, and other federal policies, the degree to which schools comply with mandated policies and guidelines is not well understood (Jones, Wheeler, Smith, & McManus, 2009).

As in other environments, poor asthma management in schools might result in delayed intervention resulting in exacerbations including asthma attacks, the use of emergency medication, and need for emergency care or other medical intervention (National Heart, Lung, and Blood Institute, 2009). As a result, schools become increasingly responsible for asthma management, including control, which ultimately might reduce the estimated \$3.2 billion in associated health costs (NAEPP, 2005; Weiss, Sullivan, & Lytle, 2000).

Students with chronic health problems frequently face challenges at school stemming from the cognitive, social, emotional, and behavioral sequelae of the disease process (Currie, 2005; Shiu, 2001). Those who support the education of students with asthma, including administrators, teachers, school nurses, and other school staff, must be cognizant of potential barriers to academic functioning.

Asthma is noted as a risk factor for a range of adverse educational outcomes, including increased absenteeism (Dean, Calimlim, Kindermann, & Khandker, 2009; Silverstein, Mair, Katusic, Wollan, O'Connel, & Yunginger, 2000), poor psychosocial functioning (Fiese, Everhart, & Wildenger, 2009; Röder, Kroonenberg, & Boekaerts, 2003), and decreased levels of academic achievement (Kohen, 2010; Liberty, Pattermore, Reid, & Tarren-Sweeney, 2010). The mechanisms by which asthma exerts its influence on such variables are not well understood. Whereas some researchers have found asthma independently predicts the presence of less positive school outcomes (Liberty et al., 2010), others have identified intervening variables accounting for this relationship such as severity (Moonie, Sterling, Figgs, & Castro, 2008), persistent nighttime asthma symptoms (Fiese, Everhart, & Wildenger, 2009), socioeconomic status (Koinis Mitchell, Adams, & Murdock, 2005) and self-esteem and self-efficacy in disease management (Schreier & Chen, 2008; Walker, Chim, & Chen, 2008). Thus, it is important to recognize the role schools play in promoting the health and school success of students with asthma.

Asthma Management

Treatment of asthma includes medical management of the disease and avoidance of environmental triggers, which can exacerbate disease symptoms (Environmental Protection Agency, 2010). Asthma management is enhanced when triggers in the school environment (e.g., dust, strong chemicals) are minimized. Medical management is often accomplished through quick-relief inhaled bronchodilators targeting sudden respiratory symptoms (Wang, Zhong, & Wheeler, 2006). Despite the effectiveness of medications in controlling asthma symptoms, researchers have documented underuse of long-acting preventative medications and the overuse

of quick-relief medications in school-age children (Wang et al., 2006; Adam et al., 2001; Lozano, Finkelstein, Hecht, Shulruff, & Weiss, 2003).

Barriers to adequate management exist in the degree to which students are permitted access to quick-relief asthma medications while at school. Although all 50 states protect the rights of students with asthma to carry and self-administer asthma medications, including inhalers, laws vary by state and individual school districts may have specific policies regarding medication administration (American Lung Association, 2011). Most states require written documentation of an asthma diagnosis from the child's health care provider along confirmation on an asthma action plan that the use of medication at school is necessary for management (American Lung Association, 2011). Written consent from the child's guardian(s) is also required (a) to allow the school to supervise and directly administer medication, and (b) to release the school from liability for claims that may arise relating to administration of approved medications (American Lung Association, 2011).

Whereas all states currently allow students with asthma to carry quick-acting medications on their person at all times, some states (e.g., Arkansas, Delaware) require medications be kept in their original containers with original prescription labels (Allergy and Asthma Network, 2011). Other states (e.g., Arkansas, California, Colorado) require that asthma inhalers be kept in the school nurse's office should the student forget medication at home. Some states also require students with asthma to demonstrate adequate skills in and responsibility for the self-administration of asthma medications before they are allowed to self-carry (e.g., Alaska, Colorado, Hawaii) (Allergy and Asthma Network, 2011).

The National Asthma Education and Prevention Program [NAEPP] (2005) provides guidelines for health care providers to decide whether a child with asthma has the maturity to carry and to self-administer quick-relief medications at school. Despite the existence of federal policies for asthma management in schools, previous research has not adequately addressed the degree to which schools follow policy statements or whether adherence varies as a function of school setting (e.g., elementary vs. middle-school). Given that previous research has demonstrated a higher incidence of medication use in older children with asthma with more complicated treatment regimens (Wang et al., 2006), it is reasonable hypothesize compliance with policies might be higher in secondary schools. However, this finding has not been evidenced in the literature.

What Asthma Policies Are Available for Schools?

Federal education statutes. IDEIA (2004) mandates the free and appropriate education of all students with disabilities within the least restrictive school environment. Disability includes children and adolescents with other health impairments, who as a function of the disability necessitate special education and related services to make meaningful progress in comparison to typically-developing peers (Margolis, 2002). IDEIA specifically includes chronic or acute health problems such as asthma, which adversely affect a child's educational performance. The educational performance of students with asthma might be adversely affected by absences, difficulties concentrating as a result of breathing problems, or more direct cognitive effects of the disease. In making a determination of what services are appropriate for students with asthma in encouraging educational progress, IDEIA also mandates Individualized Education Plans (IEPs)

be written and revised accordingly for students with disabilities served under the law (IDEIA, 2004).

For students whose asthma impedes their access to learning or an appropriate education, the development of an asthma management/action plan is often a necessary part of the IEP process (Jones & Wheeler, 2004). The asthma management plan should include instructions from healthcare providers regarding management of the student's asthma during the school day, medication schedules, appropriate use of self-administered medication, typical symptoms, and guidelines for school staff during presentation of asthma symptoms at school (Jones & Wheeler, 2004; National Heart, Lung, and Blood Institute, 2009).

Recent research suggests school officials lack sufficient knowledge of the implications of chronic illness, which can serve as a barrier to identifying appropriate accommodations for students with asthma (Wodrich & Spencer, 2007). Although students with asthma may be eligible for services under IDEIA, including the implementation of an IEP, this is not typical practice (Grice, 2002). That is, if students with asthma are receiving services in accordance with IDEIA, services are likely the result of the presence of a co-occurring condition affecting school functioning (i.e., ADHD) or the direct effects of the student's asthma on educational performance. As such, the needs of students with asthma are more often addressed with 504 plans (Grice, 2002).

Section 504 of the Rehabilitation Act of 1973 exists as another federal statute that guides schools in supporting the needs of students with asthma (Zirkel, 2009). This law prohibits discrimination against otherwise qualified individuals on the basis of disability alone (Section 504 of the Rehabilitation Act, 2000). The definition of disability under Section 504 is much broader than the IDEIA definition and subsumes any person who "(i) has a physical or mental impairment which substantially limits one or more major life activities, (ii) has a record of such impairment, or (iii) is regarded as having such an impairment" (Section 504 of the Rehabilitation Act, 2000).

As Section 504 recognizes any major life activity, and not just educational functioning as in IDEIA, might be affected by a disability such as asthma. The law is particularly useful in providing access to non-academic accommodations (i.e., to medication access) within the school setting (Section 504 of the Rehabilitation Act, 2000). Furthermore, this law, in serving as an anti-discrimination statute, holds schools to rigorous standards in ensuring appropriate and adequate accommodations are made for students with disabilities (Section 504 of the Rehabilitation Act, 2000). Despite the high prevalence rate of students with chronic health difficulties such as asthma in schools, results of a recent national survey indicate that only 1.2% of the public school population are served under section 504 alone (i.e., in the absence of an IEP plan) (Holler & Zirkel, 2008). This finding may result from a misunderstanding of 504 eligibility standards by schools, which prompts the under-identification of students for services (Holler & Zirkel, 2008). Finally, Section 504 is an unfunded mandate and schools are often hesitant to offer 504 as a solution as the schools would incur costs associated with any accommodations afforded the child (e.g., use of specialized filters to address environmental triggers in classrooms).

Other Federal Policy Statements for Asthma Management at School

A number of federal agencies have provided extensive guidance on school-based asthma management. Although these policies and suggested procedures are not regulatory, they do provide useful tools for schools on ensuring access to students whose asthma conditions necessitate intervention in school settings.

NAEPP resolution on asthma management at school. In 2005, the National Asthma Education and Prevention Program [NAEPP] released a position statement encouraging schools to adopt specific asthma management policies with the goals of ensuring the safety of students with asthma, allowing for the active participation of students with asthma in all school activities, and encouraging greater self-management of asthma by students (NAEPP, 2005). The core policy recommendations put forth in this statement are (i) smoke-free environments, (ii) an asthma emergency plan guiding staff during asthma episodes, (iii) professional development for all staff regarding medication policies, steps for communicating about health concerns of students, and emergency procedures, and (iv) a written medication policy that allows for safe and easy access to asthma medications as needed (NAEPP, 2005). Regarding this last recommendation, NAEPP encourages all schools to allow students with asthma to carry and self-administer quick-relief medications when possible.

NAEPP guidelines also state schools should provide access to regular health services at school, including monitoring and treatment of asthma symptoms, school nurse support, and individualized asthma action plans for all students with asthma (NAEPP, 2005).

Recommendations also suggest schools should provide appropriate physical education options for students with asthma, and the development of healthy environments through indoor air quality management plans, pest management activities, and reduction of exposure to common school-based asthma trigger (NAEPP, 2005). A recent study examined adherence to NAEPP recommendations and found that, although a large percentage (80% or more) of schools nationwide allowed students to carry and self-administer quick-relief asthma medications and kept asthma action plans on file for students, adherence to other recommendations was not as high including, for example, the provision of a full-time school nurse (Jones, Wheeler, Smith, & McManus, 2009).

Centers for Disease Control and Prevention. The Centers for Disease Control and Prevention [CDC] (2006) also provides written policy guidelines for schools on best practices in asthma management. While fairly consistent with NAEPP guidelines, the CDC policy guidelines add a further provision, which is a recommendation for coordinated family, school, and community efforts to improve asthma symptoms and reduce school absences of students with asthma (CDC, 2006). Whereas CDC guidelines regarding the usefulness of coordinated efforts in managing asthma can certainly be helpful to schools in addressing the needs of students with asthma, like other federal guidelines, not much is known regarding their implementation.

Environmental Protection Agency. The Environmental Protection Agency [EPA] (2010) has developed materials for school administrators and staff on the successful management of asthma at school. The EPA offers three overarching guidelines for schools. Their first two guidelines, in contrast to NAEPP and CDC statements, focus more on optimal school environments for students with asthma including adequate indoor air quality and the reduction of student exposure

to asthma triggers within the school environment, such as animal allergens, pests, dust mites, and other indoor air pollutants³. Finally, the EPA, in agreement with NAEPP and CDC statements, encourages the development of a school-wide asthma management plan, the implementation of individualized asthma action plans, allowing easy access to medications as needed, and clear emergency procedures for dealing with students' asthma attacks (EPA, 2010).

The Current Study

The purpose of the current study was to examine elementary and middle-school teacher-reported efforts in school-based asthma management and adherence to policy guidelines. The first goal was to examine teacher-reported school compliance with policy recommendations regarding asthma management at school. Compliance regarding reducing exposure to environmental asthma triggers as measured by the number of reported irritants present in classrooms, the presence of formalized medication policy statements, encouraging coordinated family, school, and community efforts regarding asthma management as evidenced by teachers' information-seeking behavior, and providing asthma-related professional development opportunities to school staff, was examined. The second goal was to determine the degree to which students with asthma in Georgia are currently served under appropriate federal statutes, including section 504 of the Rehabilitation Act and IDEIA as reported by teachers. The third goal was to describe the nature of current teacher-reported asthma management practices related to medication administration (i.e., in accordance with self-carry of asthma medication laws). Finally, the fourth aim of the study was to discover whether the provision of services (e.g., in the presence of a 504 plan or IEP) varied as a function of teacher-reported adherence to federal policy statements.

Method

Participants

Study participants consisted of 593 teachers who completed a survey as part of the Georgia Healthy Schools Asthma Study (Neuharth-Pritchett & Getch, 2001). The study was approved by the institution's Institutional Review Board with surveys returned by teachers indicating consent to participate. Data were collected on 291 elementary school teachers in 1999 and 302 middle-school teachers in early 2001. The sample represented an equally balanced distribution across the nine grade levels. Teachers from elementary schools taught kindergarten (7.4%), first grade (9.8%), second grade (7.9%), third grade (8.3%), fourth grade (5.2%), fifth grade (5.1%), special education (.7%) and other classrooms (5.2%). Middle-school teachers taught in sixth grade (17.7%), seventh grade (13.3%), eighth grade (14.3%), and special education classrooms (1.7%). Survey respondents were representative of all the metropolitan statistical areas of the state of Georgia. Further, 60% of counties across the state were represented in the sample, as areas ranging from major metropolitan to very rural. Gender of the teachers was reported as 89% female and 11% male. The ethnic breakdown of the teacher respondents was 85% Caucasian and 12.5% African American, with less than 1% identifying themselves as Hispanic/Latino, Native American, or other. Most teachers reported an age of 30 or older (90%). All teachers reported having earned a minimum of a bachelor's degree and two thirds reported the attainment of a graduate degree. Teaching experience reported by teachers ranged from 1 year to 36 years ($M = 15.45$ years, $SD = 8.66$). Of note, although data was initially collected in 2001, a further

look at this data is warranted in reference to more recent policy guidelines concerning students with asthma in schools.

Procedures

From 1999 to 2001, as part of the Georgia Healthy Schools Asthma Study (Neuharth-Pritchett & Getch, 2001), a survey was sent to a random sample of 2000 kindergarten through eighth grade teachers across the state of Georgia. 593 teachers completed and returned the survey, representing a 30% return rate that is consistent with the response rate to the U.S. Center for Disease Control's Behavioral Risk Factor Surveillance Survey [39.8%] (CDC, 2006). Data collected included teachers' levels of training and professional development on chronic health conditions including asthma, classroom environments, teacher knowledge regarding asthma, level of comfort in the school's current asthma management activities, and school policies regarding meeting the needs of students with asthma.

Asthma management by teachers. Teachers' confidence in their own abilities to manage asthma in the classroom and to seek out information when needed was assessed using the Teacher Asthma Management and Information Seeking Scale (Getch & Neuharth-Pritchett, 2007). The scale consists of 13 items for which teachers were asked to identify how certain they were that they could engage in each behavior presented (1 = not sure, 10 = very sure) including signs of asthma, warning signs, and identification of triggers. Construct validity of the scale is indicated by a strong two-factor structure. Internal consistency for both subscales is also adequate with Cronbach's alpha values of .90 and .71, respectively. Both subscales were examined in the current study for the purposes of determining adherence to federal guidelines. An additional asthma management item was administered and summarized the Level of Exposure to Classroom Asthma Triggers, which includes the presence of triggers such as carpeting, chalkboards, cleaning supplies, and plants.

Training and professional development. Teachers' levels of training and professional development around issues of asthma in schools were assessed by the following item: During your professional preparation, did you have specific course work on asthma? Participants were asked to specify whether such training was received at the (i) undergraduate, (ii) graduate, or (iii) in-service level. Participants also responded to a question asking them to estimate the percentage of teachers in their school who have received staff development around the presence of students with asthma in the classroom.

School resources. The Teacher Capability and School Resource Scale for Asthma Management (Neuharth-Pritchett & Getch, 2006) was used to determine teachers' levels of confidence in their school's asthma management capabilities. This 10-item measure asked teachers how capable they were in managing stressful asthma-related episodes in the classroom and identifying any concerns regarding current school policies, regulations, and liabilities regarding management practices (Neuharth-Pritchett & Getch, 2006). Two subscales were present in the measure and included Teacher Capability and School Resource scales with internal consistency for both scales on Cronbach's alpha as .83 and .86, respectively.

Results

Of note, missing data were present across surveys and respondents. In such cases, listwise deletion was employed before running statistical analyses. The first set of analyses addressed whether students with asthma were currently being served under appropriate federal statutes (IDEIA or 504). Frequency counts were examined for the questions asking teachers whether children in their school had an individualized education plan (IEP), or whether children in their school had a 504 plan. The data indicated some teachers were unaware of the presence of these policies for students with asthma. Regarding the use of an IEP, 12.1% ($n = 72$) of teachers reported that their schools employed IEPs for children with asthma while 72% of teachers indicated that their school did not use an IEP to assist children with asthma. It should be noted that 94 teachers (15.9%) did not respond to the question. The same pattern held for the use of 504 plans for children with asthma. Specifically, 102 teachers (17.2%) reported that students with asthma in their schools had a 504 plan while 346 (58.3%) indicated that 504 plans were not used for students with asthma. In response to this question, 145 teachers (24.5%) did not respond to the item perhaps indicating either their unawareness of the use of 504 plans or perhaps their lack of knowledge of what a 504 plan provides. Phi analyses were conducted to examine potential differences in response patterns between elementary and middle-school teachers on the same two questions. Significant differences were found regarding the use of IEPs and 504 plans in the different schooling environments. That is, middle-school teachers were more likely to report the use of IEPs ($\phi(499) = -.14, p = .00$) and 504 plans ($\phi(448) = -.15, p = .00$) to assist children with asthma.

The second set of analyses addressed the question of whether schools were currently following available federal policy statements regarding asthma management at school. On the presence of a medication policy, 97.6% of teachers responded that their schools did have medication administration policies in place. A chi square analysis revealed no differences between elementary and middle-school teachers' responses to this question.

Frequency counts were also conducted to examine the number of triggers present in elementary and middle-school classrooms as reported by teachers in this sample, a further indicator of adherence to policy statements. The total number of triggers in each classroom was calculated. Across all classrooms, the modal number of triggers present was three (21.6%). Of the 13 triggers present, 59.8% of classrooms had four or more triggers present. Of these 13 triggers, the mean number was also calculated and a comparison made between elementary and middle-school classrooms. Elementary school classrooms were found to have more triggers present [$F(1,588) = 151.67, p < .00$]. Table 1 presents the frequencies for each of 13 triggers indicated as present or absent by the teachers who completed the survey. In all cases where a significant difference was found between school settings, there were a greater proportion of triggers present in elementary than in middle-school classrooms.

Table 1

Summary of specific asthma triggers present across classrooms with tests for differences in the presence of specific triggers between elementary and middle-schools

Trigger	Elementary	Middle-School	Phi	Significance
Carpeting	236 (81) ^a	168 (56)	-.25	.00
Furry animals	24 (8)	12 (4)	-.09	.04
Chalkboard	167 (28)	129 (43)	-.13	.00
Eraser board	221 (76)	197 (65)	-.10	.02
Cloth Furniture	38 (13)	37 (11)	-.01	.87
Cleaning Chemicals	96 (33)	104 (34)	.03	.54
Plants	128 (44)	110 (36)	-.07	.11
Fish bowl	47 (16)	23 (8)	-.13	.00
Cockroaches	78 (27)	54 (18)	-.10	.02
Strong smells	38 (13)	44 (15)	.03	.51
In-class storage of personal items	240 (82)	97 (32)	-.50	.00
Pillows for reading	78 (27)	17 (6)	-.29	.00
Toys	132 (45)	7 (2)	-.50	.00

^aPercentages of classrooms reporting the presence of a given trigger are presented in parentheses

An additional six trigger items were posed to middle-school teachers given the diversity and specialization in the curriculum covered in middle-school. Specifically, middle-school teachers were questioned about the presence of chemicals for science experiments, art supplies, materials for agricultural or technical training, materials for family and consumer science, storage facilities for student belongings, and carpentry supplies. Of these six triggers, two were found to be relatively prevalent in middle-school classrooms and were chemicals for science experiments (16.1%) and art supplies (45.3%).

Teachers also responded to three items that focused on their professional development on asthma management at the undergraduate, graduate, or in-service level. Of the 593 teachers, 15.9% ($n = 94$) indicated some professional development on the topic. No significant differences were found in the reporting of professional development experiences between elementary and middle-school teachers [$F(1,592) = 2.65, p = .104$].

To examine the extent of coordinated efforts in asthma management at school, teachers' responses on the Information Seeking (IS) subscale of the Teacher Asthma Management and Information Seeking Scale were examined. The mean score for the total sample of teachers on the IS subscale was 7.34 ($SD = 2.25$). No significant difference was found among elementary and middle-school teachers on their skills in seeking information to assist students with asthma ($F(1,586) = 1.12, p = .29$). It should be noted that the mean score for both elementary and middle-school teachers representing their skills in seeking information fall below a scale score of

7.5, indicating that these teachers have mixed capability in seeking information to support students with asthma.

A third set of analyses was undertaken to address the question of the current nature of asthma management in Georgia classrooms, particularly in regard to compliance with self-carry laws. The Teachers completed the Asthma Management (AM) subscale of the Teacher Asthma Management and Information Seeking Scale as an indicator of current asthma management practices. On the AM, the total sample had a mean score of 4.69 ($SD = 2.13$), indicating mixed skill capabilities in managing asthma in the classroom. No statistically significant difference was found on the mean score between the elementary and middle-school teachers ($F(1,587) = .04, p = .85$). Teachers also completed the School Resources/Institutional Capability subscale of the Teacher Capability and School Resources Scale For Asthma Management as a measure of school-wide asthma management practices. On this subscale, the total sample had a mean score of 3.06 ($SD = 1.12$), with scores of 3.5 or higher denoting feelings that schools are capable in meeting the needs of children with asthma. On average, middle-school teachers reported greater resources for students with asthma than elementary school teachers, although both groups' scores were below this cutoff ($F(1,585) = 23.08, p < .00$).

Teachers also responded to an item questioning them about a student with asthma's ability to self-carry their rescue medication and administer such medication. The number of elementary and middle-school teachers who reported that children were able to self-administer medication was 36 (6.1%). No significant difference was found between elementary and middle-school teachers on this item ($\phi(587) = -.03, p = .49$).

Finally, a logistic regression analysis was employed to answer the question of whether adherence to federal policy statements is a significant predictor of whether students with asthma are served under IEPs or 504 plans in schools. Separate models were tested for each of these questions. In the first model, an analysis was conducted to predict the presence of IEPs for students with asthma using teachers' past professional development regarding asthma, level of information seeking behavior, number of years of teaching experience, teachers' reported diagnosis of a chronic illness or asthma, their school's presence of a formal medication policy, and level of reported school resources for students with asthma as predictors. Results of this logistic regression can be found in Table 2.

Table 2

Summary of logistic regression predicting presence of an IEP for students with asthma

Variable	β	SE β	Wald's X^2	p	OR
Professional Development	1.29	.30	19.05	.00*	3.64
Information Seeking	-.09	.30	1.86	.17	.91
Teaching Experience	.01	.02	.56	.45	1.01
Teacher's Illness	.01	.42	.00	.99	1.01

Teacher's Asthma	-.38	.48	.62	.43	.69
Medication Policy	.82	.92	.79	.37	2.27
School Resources	-.08	.13	.37	.54	2.15

Note. $df = 1$

* $p < .01$

A test of the full model indicated that these predictors as a set reliably distinguished between whether or not students with asthma were reportedly being served by an IEP ($\chi^2(7) = 23.04, p = .00$). Furthermore, the Hosmer and Lemeshow test indicated good model fit for included variables ($\chi^2(8) = 7.32, p = .50$). The Wald criterion indicated that only past professional development regarding asthma accounted for significant unique variance in the model beyond the contribution of other variables ($\chi^2(1) = 19.39, p < .00$). The odds ratio for this predictor portrayed that those teachers who reported having received some previous professional development regarding asthma were 3.64 times more likely to report that students in their schools were currently being served under an IEP.

In the second model, an analysis was conducted to predict the presence of 504 plans for students with asthma using these same variables as predictors. Results of this logistic regression can be found in Table 3.

Table 3

Summary of logistic regression predicting presence of a 504 plan for students with asthma

Variable	β	SE β	Wald's X^2	p	OR
Professional Development	.90	.29	9.72	.00**	2.46
Information Seeking	-.12	.06	4.33	.04*	.88
Teaching Experience	.01	.01	.50	.48	1.01
Teacher's Illness	-.81	.34	5.66	.02*	.45
Teacher's Asthma	.37	.44	.70	.40	1.45
Medication Policy	.47	.99	.22	.64	.95
School Resources	-.05	.11	.94	.33	2.93

Note. $df = 1$

* $p < .05$, ** $p < .01$

A test of the full model indicated that this set of variables reliably distinguished between whether or not students with asthma were currently being served by 504 plan as reported by teachers ($\chi^2(7) = 22.58, p = .00$). Furthermore, the Hosmer and Lemeshow test indicated good model fit for included variables ($\chi^2(8) = 1.76, p = .99$). The Wald criterion again indicated that past professional development regarding asthma accounted for significant unique variance in this model ($\chi^2(1) = 9.72, p = .00$) with those having received professional development around this issue 2.46 times more likely to report that students with asthma in their schools were being served by 504 plans. Additionally, teachers who reported having a diagnosis of a chronic illness were .45 times more likely to report the presence of 504 plans for students with asthma as this variable also made a significant contribution to prediction ($\chi^2(1) = 5.66, p = .02$). Finally, results demonstrated that those teachers who reported engaging in less information-seeking behavior were 0.88 times more likely to report that students with asthma are served by 504 plans in their schools ($\chi^2(1) = 4.33, p = .04$). This result might indicate a feeling among teachers that the medical treatment of students' asthma is under control and, thus, there is no need to seek additional information from others regarding the condition.

Discussion

The purpose of the current study was to examine teacher-reported aspects of asthma management at school with the purpose of identifying whether schools in Georgia are adequately following available federal statutes and policy statements in addressing the needs of students with asthma. Specifically, it was hypothesized that teachers would report compliance with certain policies, namely the provision of services through an IEP or 504 plan and the presence of medication policy statements allowing students to self-carry and administer asthma medications at school. It was also expected that compliance with other guidelines, including reducing exposure to asthma triggers in the classroom, coordinating efforts between all those involved in the care of students with asthma, and the provision of professional development to teachers regarding asthma would not be as high. Finally, it was hypothesized that those teachers who reported having more teaching experience, a personal experience with chronic illness or asthma, the presence of a formal medication policy in their school, higher levels of confidence in their school's capability to address the needs of students with asthma and coordinated family, school, and community efforts regarding asthma management will be more likely to also report that the needs of students with asthma are currently being addressed by an IEP or 504 plan. Hypotheses were partially supported.

First, only 12% and 17% of teachers respectively reported that students with asthma in their schools were being served by an IEP or 504 plan. Of those who responded to the presence of an IEP or 504 plan, teachers more often reported students had 504 plans instead of IEPs. These results are consistent with previous research indicating students with asthma more often receive services under 504 plans as they often don't meet the stipulation under IDEIA that their condition adversely affects educational performance (Grice, 2002). The finding that middle-school teachers were more likely to report the presence of formalized services in the form of an IEP or 504 plan might further suggest either older students with asthma are in greater need of formalized school services as they progress in their schooling or that the middle-school teachers in this sample were more knowledgeable regarding the provision of formalized services to students with asthma than their elementary school counterparts. Additionally, as expected, most

teachers (98%) reported that their schools did have medication policies in place for students with asthma, as is consistent with guidelines from NAEPP (2005), the CDC (2006), and the EPA (2010). However, it should also be noted that only 6% of teachers responded that students with asthma in their schools were allowed to self-administer medication, more often noting that medications were administered by the school nurse, teachers, or other school staff. As this question did not delineate between rescue and maintenance medication, it is not clear whether this finding is due to a misunderstanding of the question by teachers or truly that students in their schools were not allowed to self-administer medication. If the latter is true, it appears that schools in this sample are not compliant with NAEPP guidelines and other federal mandates regarding self-administration.

Also as expected, teachers reported lower compliance to other federal policy guidelines regarding asthma management at school. First, regarding reducing the number of potential asthma triggers in the classroom, results indicated nearly 60% of teachers reported more than four asthma triggers were typically present in classrooms surveyed. As policy recommendations from NAEPP, CDC and EPA all stipulate that exposure to such triggers should greatly be limited and indoor air quality ensured, classrooms in this sample are again at odds with this guideline. Second, only 16% of teachers surveyed reported having received some professional development regarding asthma throughout their training, again indicating incongruence with policy recommendations. Additionally, teachers' reports regarding current asthma management practices as well their own abilities to seek out information and help coordinate services for students with asthma denoted less than adequate abilities in these areas. These findings are consistent with the literature regarding schools' compliance with asthma guidelines including a 2009 study conducted by Jones and colleagues in which compliance with NAEPP guidelines was found to be low with the exception of the implementation of medication policies.

Finally, in examining what factors might play a role in determining whether a student with asthma receives formalized services (i.e., in the form of an IEP or 504 plan), hypotheses were again partially supported. That is, it was found that the provision of professional development to teachers regarding asthma is a reliable predictor of whether students with asthma are served by an IEP, at least as reported by teachers. This finding supports the importance of continued professional development for teachers as emphasized by NAEPP and the CDC in helping to ensure that the needs of students with asthma are adequately addressing at school. Furthermore, this same variable as well as a teacher's own diagnosis of a chronic illness were found to serve as viable predictors for the presence of a 504 plan for students with asthma. It is reasonable to believe that a teacher's own experience with chronic illness might make him/her more likely to advocate for or at least be aware of the educational needs of students with asthma. The finding that teachers' information-seeking behavior around asthma management was negatively predictive of teacher-reported provision of 504 services is somewhat surprising. Namely, it might be expected that teachers who are more confident in their own abilities to seek out information about asthma management when needed would be more likely to report that the educational needs of students with asthma are being addressed by a 504 plan. Alternatively, this finding could represent a lack of understanding by teachers of section 504 in general as noted in the literature (Holler & Zirkel, 2008).

Despite an increased understanding of how federal policies and guidelines for asthma management are implemented in schools, several limitations of the current study exist. First, it must be noted that variables regarding the current nature of asthma management in schools were measured solely by teacher report. For example, although a majority of teachers reported that students with asthma in their schools were not currently being served by an IEP or 504 plan, it is feasible to believe that actual student records might point to the contrary. Thus, future research investigating the provision of services to students with asthma could benefit from examining student records in corroborating teacher reports.

Another limitation of the current study is the potential difficulty in generalizing study results to other areas of the United States. As data were collected from teachers across a large southeastern state and from a variety of both metropolitan and rural areas, it is evident that results are representative of teacher viewpoints and school policies within that geographical region. However, it is less clear whether similar results might be found within schools throughout other areas of the country. Future research could continue to examine these issues at more of a national level in gaining a clearer picture of nationwide school policies related to students with asthma.

Despite its limitations, this study adds to the understanding of how schools are functioning in addressing asthma management and how teachers view this process. Although best practices and related policy guidelines for serving the needs of students with asthma have been developed, this is one of the first studies examining the question of actual implementation of these standards. In particular, results suggest that whereas teachers view schools as adequately meeting policy recommendations in some areas (i.e., in the implementation of medication policy statements, providing services to students with asthma), compliance with other guidelines is not as high. That is, teachers recognize a failure to limit exposure to potential asthma irritants in classrooms, lower levels of coordinated asthma efforts, inadequate confidence in schools' capabilities for asthma management, and a lack of professional development around asthma. However, it was also noted that the presence of potentially protective factors such as these, particularly the provision of professional development to teachers, can play a role in determining whether students with asthma ultimately obtain access to needed services within the school setting. Therefore, future investigations into similar factors ensuring the successful implementation of asthma-related policies by schools are warranted.

Implications for Schools

This study helped illuminate the asthma management practices in a representative sample of one state's elementary and middle-schools. Findings suggest that teachers and school administrators need support in implementing best practices associated with asthma management. It is imperative that schools are well informed regarding policies and guidelines for best practices for school-based asthma management that are available. Of note, results of the current study indicate the potential of continued professional development provided to school staff around these asthma-related issues for ensuring the unique needs of students with asthma are met at school.

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