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Comparison of Parent and Student Responses to Asthma Surveys: Students Grades 1-4 and Their Parents From an Urban Public School Setting

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Abstract

This study compared parent and child responses to a symptom questionnaire as a means of determining whether child and parent responses are equally valuable in case-detection procedures. We completed a study validating a multistage case-detection procedure. The case-detection procedure classified students into 3 categories based on their parents' questionnaire responses (probable asthma, possible asthma, and negative for asthma). Those who were classified as possible asthma by questionnaire underwent further testing, including spirometry and exercise challenge. The children with abnormal testing results were considered to have probable asthma. McNemar's test and kappa coefficients were used to examine parent-child agreement. Sensitivity and specificity of the case-detection procedure were compared using either the parent's or the child's responses to the questionnaire. The data indicated moderate agreement between parent and child responses to questions regarding previous diagnosis of asthma and past asthma therapy ($p < .001$, kappa coefficients of 0.603 and 0.597, respectively). Sensitivity, specificity, and predictive values in the multistage case-detection procedure were similar when using either parent or child responses to the questionnaire. Among the false negatives, the distribution of asthma severity was consistent whether using child or parent responses. Parent-child agreement did not differ significantly by gender or age of the child or whether the child had a previous diagnosis of asthma. These results suggest that the use of child responses is a viable option for case detection, particularly in identifying those with a previous diagnosis of asthma.

METHODS

Data from a study to validate an asthma case-detection procedure were used to examine the agreement between parents and children on questions about the child's asthma symptoms, medication use, and asthma diagnosis. A detailed description of the multistage case-detection procedure and its results has been previously published.^{1,2}

Study Population

This study was conducted in 10 elementary schools of 4 inner-city public school systems. Data were collected September 2001 to May 2003 from children in grades 1-4 and from their parents.

Children in these school systems were predominantly African American and low income. Study enrollment was a 2-stage process. Asthma symptom questionnaires (Table 1) were distributed to the entire school population ($n = 3539$). Children were asked to deliver the questionnaire to their parents. Children returning completed questionnaires ($n = 3463$, 98%) were asked to enroll in the study. Written informed consent was obtained from the child's parent or guardian, and assent was obtained from each child. This study was approved and monitored by the Institutional Review Board of the University of Alabama at Birmingham (UAB).

Case-Detection Procedure

The UAB asthma case-detection procedure^{1,2} had 3 stages—a symptom questionnaire, spirometry testing, and a submaximal exercise challenge. The case-detection procedure began with a 5-item questionnaire that was completed by the parent (Table 1). Because the procedure was multistage, the questionnaire was designed to be as inclusive as possible. Based on parental responses, children were categorized as probable asthma, possible asthma, and negative for asthma. A child was considered to have a previous diagnosis of asthma (probable asthma) when the answers to question 4 (Has a doctor ever said your child has asthma?) and question 5a (Has your child taken asthma medicine prescribed by a doctor in the past 12 months?) were “yes.” Children were considered to be negative for asthma when answers to all questions were “no.” Any other answer combination indicated possible asthma.

Parent questionnaires were sent home with the children. Children were asked to return parent-completed questionnaires to their classroom teachers. Frequent follow-up by study staff and incentives for teachers and children resulted in a high participation rate (98%). Implementation of the screening procedure began when 80% of parent questionnaires had been returned. Therefore, there was a 4- to 8-week delay between parent and child questionnaire completion. Children completed their questionnaires at school with the assistance of the study staff. Spirometry to assess for airflow obstruction and step testing to evaluate bronchial hyperresponsiveness followed the questionnaire.

Physician Assessment

The gold standard^{3,4} for validating the case-detection procedure was a diagnosis of asthma by a pediatric asthma specialist. One of 4 pediatric asthma specialists examined all children with a positive indication of asthma (ie, those classified as probable asthma by questionnaire, spirometry, or step test). In addition, the physicians examined a random sample of children who had been classified as having no evidence of asthma. All children who were examined by physicians completed spirometry testing. Although physicians had access to spirometry results, they were blinded to whether students had been identified as positive or negative for asthma by spirometry and/or step test.

Analysis

McNemar's test and kappa coefficients were used to examine parent-child agreement. Suggested interpretations of kappa coefficients for agreement include poor = <0.20 , fair = 0.21 to 0.40 , moderate 0.41 to 0.60 , good = 0.61 to 0.80 , and very good = 0.81 to 1.00 .⁵ Gender, age, and existence of previous asthma diagnosis were examined using the test for equal kappa coefficients. Sensitivity and specificity of the case-detection procedure, using the physician diagnosis as the gold standard, were calculated using both the parent's and child's answers to symptom questionnaires.

RESULTS

A total of 3463 (98%) parents returned questionnaires. Seventy-nine percent of these parents ($n = 2738$) enrolled their children in the study. Ninety-one percent of children were African

American, 8% were Caucasian, and 1% were Hispanic. Children's ages ranged from 5 to 13 years. A total of 2593 parent-child pairs were available for the agreement analysis.

As shown in Table 1, parent-child agreement was statistically significant for 6 of the 10 questionnaire responses. Questions regarding specific asthma symptoms had statistically significant agreement; however, kappa coefficients were low ($\kappa = 0.152$ to 0.335). Prior asthma diagnosis and treatment had significant agreement with kappa coefficients in the moderate range ($\kappa = 0.597$ to 0.603). No significant differences were found in parent-child agreement among categories of gender, age (5-7 years vs 8-13 years), or previous diagnosis (yes vs no).

A comparison of parent and child affirmative responses to questionnaire items indicates children were more likely than parents to report symptoms. As shown in Table 2, a larger proportion of children, compared to parents, responded affirmatively to each question. Table 3 shows that, based on parental responses, a larger proportion of children would be classified as negative for asthma. Children's responses, on the other hand, would result in a larger proportion being classified as "possible asthma." According to the study's asthma classification criteria, multiple affirmative responses by children would result in 53% of the children being classified as possible asthma (Table 3). By contrast, only 25% of the children would be classified as possible asthma using the parents' responses to questionnaire items. Although the weighted kappa coefficient was significant, it was low ($\kappa = 0.294$).

Sensitivity and specificity of the multistage case-detection procedure were examined using parent and child responses (Table 4). Use of parent responses resulted in higher specificity, slightly less sensitivity, and higher positive predictive value than the use of children's responses.

Table 5 displays a comparison of false negatives based on parents' and children's responses. In general, false negatives were inversely proportional to disease severity. For both parents and children, questionnaire responses resulted in a majority of false negatives in the mild intermittent category. No children with severe persistent asthma were misclassified as negative by the case-detection procedure.

DISCUSSION

Clinicians generally rely on parental reports of children's symptoms to assess illness and evaluate treatment protocol despite literature suggesting that parental reports of child health may be flawed.⁶⁻⁸ Therefore, reliance on parents as the sole source of information has implications for clinical assessment in both the health care setting and the research arena. Although most school-based case-detection procedures rely on parent responses, the present study focused on the potential of children's responses by examining the agreement between parent and child reports of asthma symptoms, medication use, and asthma diagnosis.

The findings indicate moderate parent-child agreement for a previous diagnosis of asthma and use of asthma medications. These results support the findings of Sockrider et al⁹ who similarly found moderate parent-child agreement for reports of taking inhaled medications and having a diagnosis of asthma or reactive airway disease ($k = 0.63$ and 0.57 , respectively). The literature suggests that the underlying reasons for parent- and child-reported discrepancies may rest in the inherent objective and subjective qualities of the symptoms.¹⁰⁻¹⁵ For example, in a study examining reports of general health, current conditions, and recent symptoms among children, Sweeting and West¹⁶ found excellent parent-child agreement for reports of the child having an asthma condition ($k = 0.852$ for boys and $k = 0.862$ for girls) and moderate agreement for wheezy chest symptoms ($k = 0.598$ for boys and $k = 0.565$ for girls). On the other hand, agreement was poor for more subjective symptoms such as stomach ache ($k = 0.195$ for boys

and $k = 0.167$ for girls) and aching back, legs, or arms ($k = 0.138$ for boys and $k = 0.239$ for girls).

Our finding that children report more symptoms than parents confirms other reports in the literature.^{12,16} This finding has important implications for case-detection procedures because use of the child's responses to asthma-related questions results in more children being identified as possible asthma and leads to greater numbers of children being recommended for clinical evaluation.

Although reliance on children's symptom reports certainly has cost and labor implications, using the multistage case-detection procedure appears to minimize the discrepancy between parent and child symptom reports. Sensitivity, a measure of the test's ability to correctly identify someone who has the disease as "positive," was only slightly higher for children's responses (88.7%) than for parent's responses (81.6%). Specificity, a measure of the test's ability to correctly identify as "negative" someone who does not have the disease, is higher for parents than for children, 93.0% and 86.0%, respectively. The predictive value of children's responses, while lower, is not substantially different from the predictive value of parent's responses (87.8% vs 92.8%). Therefore, use of either the parent or child responses to the questionnaire may be acceptable for a multistage case-detection procedure.

The advantages of using the child's responses are the ease of access to the respondent and slightly higher sensitivity; the disadvantages are that more children will be classified as probable asthma and referred for further testing and that reading questions to some children may be necessary. The advantage of using the parent's responses is that fewer children will be referred for testing; the disadvantages include a slightly lower sensitivity and the costs associated with obtaining a high parent response rate (eg, use of incentives as was done in this study to achieve the 98% response rate).

The use of children as respondents with a procedure that uses "only" a questionnaire for case identification must be closely evaluated. In evaluating a subset of children who had a physician visit, we found that, when using children's questionnaire responses, 363 children were identified as positive for asthma. The study physician determined that 132 (36%) of these children did not have asthma. In contrast, when using parent responses to the questionnaire, 323 children were considered positive for asthma, and the study physician determined that 98 (30%) of these children did not have asthma. When using questionnaires for case identification, the fact that children's tendency to provide a higher number of positive responses will contribute to a higher referral rate for medical evaluation, and a higher rate of false-positive diagnoses must be given due consideration.

This study has several limitations. Because the cohort of children (grades 1-4) was relatively young and had different levels of reading skills, study staff read the questions for each child. Although this is not a limitation of the study per se, it does affect the time and resources required when using children's responses. In addition, experimental bias may have been introduced in that children's perceived expectations of responding positively contributed to a higher positive response rate for children. Our experience working with inner-city children has shown that children are eager to please study staff. Whether this behavior is unique to the inner-city population or characteristic of most young schoolchildren remains unclear.

The 4- to 8-week delay between the time the parent answered the symptom questionnaire and the time the child answered the symptom questionnaire may have affected the agreement analysis. However, the effect was most likely small when one considers that the questionnaire assessed symptoms within the past year. The effect of a time delay on agreement analysis is an important consideration but is more likely to have a greater effect when questionnaires assess symptoms within a shorter time span.

Children may be acceptable respondents when using key questions to elicit information for a multistage case-detection procedure; however, as mentioned above, there are trade-offs. Using children's responses may provide a viable alternative in the inner-city school setting where acquiring information from parents or guardians poses a number of difficulties. Given the recent discussions regarding the questionable impact of population-based case-detection programs,^{17,18} focusing on identifying undertreated asthma may have greater health impact on children suffering from asthma. In this case, identifying children with a diagnosis or on medications who are still experiencing symptoms may be preferable. Using children's responses to questions regarding diagnosis and treatment may enable program managers to identify more efficiently those children who currently have a diagnosis of asthma. These children can then be assessed for adequacy of asthma management. Refer to pages 235 and 241 for related papers.

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Table 1

Parent and Child Agreement: Statistical Summary

Question	Child Yes/ Parent No	Child No/ Parent Yes	Child Yes/ Parent Yes	Child No/ Parent No	McNemar's Test	Simple Kappa Coefficient	N
1. Has your child ever had wheezing or a whistling sound in the chest?	439	331	485	1332	<.0001	0.3345	2587
1a. If yes, has this been in the past 12 months?	90	86	233	61	NS	—	470
2. Has your child ever had breathing problems (coughing, wheezing, whistling in the chest, shortness of breath, chest tightness) when he/she first woke up in the morning?	616	348	342	1281	<.0001	0.1521	2587
2a. If yes, has this been in the past 12 months?	58	54	200	21	NS	—	333
3. Has your child ever had breathing problems (coughing, wheezing, whistling in the chest, shortness of breath, chest tightness) that woke him/her up at night?	582	318	360	1326	<.0001	0.2007	2586
3a. If yes, has this been in the past 12 months?	64	58	203	19	NS	—	344
4. Has a doctor ever said your child has asthma?	219	107	347	1912	<.0001	0.6030	2585
4a. If yes, has this been in the past 12 months?	24	101	123	68	<.0001	0.2312	316
5. Has your child ever taken asthma medicine (pills, inhaler, or puffers) prescribed by a doctor?	195	150	368	1871	.0154	0.5966	2584
5a. If yes, has this been in the past 12 months?	25	39	254	38	NS	—	356
NS not significant.							

Table 2
Affirmative Questionnaire Responses: Parent vs Child

Question	Parent (%)	Child (%)
1. Has your child ever had wheezing or a whistling sound in the chest?	32	36
2. Has your child ever had breathing problems (coughing, wheezing, whistling in the chest, shortness of breath, chest tightness) when he/she first woke up in the morning?	27	37
3. Has your child ever had breathing problems (coughing, wheezing, whistling in the chest, shortness of breath, chest tightness) that woke him/her up at night?	26	36
4. Has a doctor ever said your child has asthma?	18	22
5. Has your child ever taken asthma medicine (pills, inhaler, or puffers) prescribed by a doctor?	20	22

Table 3
Comparison of Case-Detection Questionnaire Diagnosis Using Parent or Child Responses

Parent	Child			Total N (%)
	Previous N (%)	Negative N (%)	Possible N (%)	
Previous	221	5	92	318 (12)
Negative	44	739	840	1623 (63)
Possible	53	158	441	652 (25)
Total	318 (12)	902 (35)	1373 (53)	2593 (100)

Weighted kappa = 0.2935, 95% confidence interval (0.2461, 0.3040).

Table 4

Comparison of Case-Detection Procedure Sensitivity and Specificity: Parent vs Child Responses to the Questionnaire

Respondent	MD Diagnosis	Case-Detection Diagnosis			Sensitivity	Specificity	Predictive Value
		Positive N	Negative N	Total N			
Parent	Positive	208	47	255	81.6%	93.0%	92.8%
	Negative	16	213	229			
	Total	224	260	484			
Child	Positive	174	22	196	88.7%	86.0%	87.8%
	Negative	24	148	172			
	Total	198	170	368			

Table 5

Comparison of False Negatives for the Case-Detection Procedure Using Parent or Child Responses to the Questionnaire

	Asthma Severity				Total N (%)
	Mild Intermittent N (%)	Mild Persistent N (%)	Moderate Persistent N (%)	Severe Persistent N (%)	
Parent	13 (59)	2 (23)	4 (18)	0	22 (100)
Child	27(58)	11 (23)	9 (19)	0	47 (100)