

Vince WinklerPrins, MD;
David T. Walsworth, MD
Michigan State University
College of Human
Medicine, East Lansing

John Coffey, MLIS, AHIP
Michigan State University
Libraries, East Lansing

Q / How best to diagnose asthma in infants and toddlers?

EVIDENCE-BASED ANSWER

A / NO RELIABLE WAY EXISTS TO DIAGNOSE ASTHMA IN INFANTS AND TODDLERS. Recurrent wheezing, especially apart from colds, combined with physician-diagnosed eczema or atopic dermatitis,

eosinophilia, and a parental history of asthma, increase the probability of a subsequent asthma diagnosis in the absence of other causes (strength of recommendation: **B**, 2 good-quality cohort studies).

Predictors of asthma in youngsters include recurrent wheezing accompanied by physician-diagnosed eczema or atopic dermatitis, eosinophilia, and a parental history of asthma.

Evidence summary

Wheezing in children is common and the differential diagnosis is broad. The many potential causes include upper respiratory infection, asthma, cystic fibrosis, foreign body aspiration, vascular ring, tracheomalacia, primary immunodeficiency, and congenital heart disease.¹

Outpatient primary care cohort studies estimate that about half of children wheeze before they reach school age. Only one-third of children who wheeze during the first 3 years of life, however, continue to wheeze into later childhood and young adulthood.²⁻⁴

These findings have led some experts to suggest that not all wheezing in children is asthma and that asthma exists in variant forms.⁵⁻⁷ Variant wheezing patterns include transient early wheezing, which seems to be most prevalent in the first 3 years of life; wheezing without atopy, which occurs most often at 3 to 6 years of age; and wheezing with immunoglobulin E-associated atopy, which gradually increases in prevalence from birth and dominates in the over-6 age group. It is children in this last group whom we generally consider to have asthma.

Objective measures of lung function are challenging to perform in young children. Clinical signs and symptoms thus suggest the diagnosis of asthma.

Atopy, rhinitis, and eczema most often accompany persistent wheezing

Primary care cohort studies provide the best available evidence on which findings in infants and toddlers most likely predict persistent airway disease in childhood. A whole-population cohort study followed nearly all children born on the Isle of Wight from January 1989 through February 1990 to evaluate the natural history of childhood wheezing and to study associated risk factors.⁸ Children were seen at birth and at 1, 2, 4, and 10 years of age.

Findings most associated with current wheezing (within the last year) in 10-year-olds were atopy (odds ratio [OR]=4.38; 95% confidence interval [CI], 3.07-6.25), rhinitis (OR=3.72; 95% CI, 2.21-6.27), and eczema (OR=3.04; 95% CI, 2.05-4.51).⁸

An index to predict asthma

Since 1980, the Tucson Children's Respiratory Study has followed 1246 healthy newborns seen by pediatricians affiliated with a large HMO in Tucson, Arizona. Questionnaires about parental asthma history and prenatal smoking history were obtained at enrollment. Childhood wheezing and its frequency, as well as physician-diagnosed allergies or asthma, were assessed at ages 2 and 3. If the child had wheezed in the past year, then the child was considered to be an "early wheezer." If the

TABLE 1

A clinical index of asthma risk^{9*}

Major criteria	Minor criteria
Parental asthma (history of physician diagnosis of asthma in a parent)	Allergic rhinitis (physician diagnosis of allergic rhinitis as reported in questionnaires at ages 2 or 3 y)
Eczema (physician diagnosis of atopic dermatitis as reported in questionnaires at ages 2 or 3 y)	Wheezing apart from colds
	Eosinophilia ($\geq 4\%$)

*Stringent index for predicting asthma: Child has early, frequent wheezing plus at least 1 of the 2 major criteria or 2 of the 3 minor criteria.

Loose index for predicting asthma: Child has early wheezing plus at least 1 of the 2 major criteria or 2 of the 3 minor criteria.

TABLE 2

Likelihood of active asthma predicted by stringent index⁹

Active asthma	OR (95% CI)	Sensitivity, % (95% CI)	Specificity, % (95% CI)	PPV, % (95% CI)	NPV, % (95% CI)
At 6 y	9.8 (5.6-17.2)	27.5 (24.6-30.4)	96.3 (95.1-97.5)	47.5 (44.3-50.7)	91.6 (89.8-93.4)
At 8 y	5.8 (2.9-11.2)	16.3 (13.7-18.9)	96.7 (95.4-98.0)	43.6 (40.1-47.1)	88.2 (85.9-90.5)
At 11 y	4.3 (2.4-7.8)	15 (12.6-17.4)	96.1 (94.8-97.4)	42.0 (38.7-45.3)	85.6 (83.3-87.9)
At 13 y	5.7 (2.8-11.6)	14.8 (12.1-17.5)	97.0 (95.7-98.3)	51.5 (47.7-55.3)	84.2 (81.4-87.0)

CI, confidence interval; NPV, negative predictive value; OR, odds ratio; PPV, positive predictive value.

TABLE 3

Likelihood of active asthma predicted by loose index⁹

Active asthma	OR (95% CI)	Sensitivity, % (95% CI)	Specificity, % (95% CI)	PPV, % (95% CI)	NPV, % (95% CI)
At 6 y	5.5 (3.5-8.4)	56.6 (53.3-59.9)	80.8 (78.3-83.3)	26.2 (23.4-29.0)	93.9 (92.4-95.4)
At 8 y	4.4 (2.8-6.8)	50.5 (47.0-54.0)	81.1 (78.3-83.9)	29.4 (26.2-32.6)	91.3 (89.3-93.3)
At 11 y	2.6 (1.8-3.8)	40.1 (36.8-43.4)	79.6 (76.9-82.3)	27.1 (24.1-30.1)	87.5 (85.3-89.7)
At 13 y	3.0 (1.9-4.6)	39.3 (35.5-43.1)	82.1 (79.1-85.1)	31.7 (28.1-35.3)	86.5 (83.9-89.1)

CI, confidence interval; NPV, negative predictive value; OR, odds ratio; PPV, positive predictive value.

frequency was 3 or more on a 5-point scale, then the child was considered to be an “early frequent wheezer.” Questionnaires were re-administered at ages 6, 8, 11, and 13. Three episodes of wheezing within the past year or a physician diagnosis of asthma with symptoms in the past year was considered “active asthma.” Blood specimens for eosinophils were obtained at age 10.

Using these data, the researchers developed stringent and loose criteria (TABLE 1) and odds ratios (TABLES 2 and 3) for child-

hood factors most predictive of an asthma diagnosis at an older age. The findings of the study may help clinicians care for wheezing infants and toddlers.⁹

Recommendations

A European and United States expert panel guide to the diagnosis and treatment of asthma in childhood, PRACTALL, states that “asthma should be suspected in any infant with recurrent wheezing and cough

CLINICAL INQUIRIES

episodes. Frequently, diagnosis is possible only through long-term follow-up, consideration of the extensive differential diagnoses, and by observing the child's response to bronchodilator and/or anti-inflammatory treatment."¹⁰

The National Asthma Education and Prevention Program's Expert Panel Report 3 (EPR-3) notes that diagnostic evaluation for asthma in children 0 to 4 years of age should include history, symptoms, physical examination, and assessment of quality of life.¹ **JFP**

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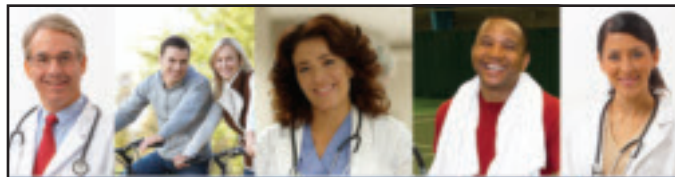
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