

## The Pinwheel: A Diagnostic Tool to Detect Wheezing in Young Children

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### ABSTRACT

**In mild bronchospastic episodes, it is sometimes difficult to hear wheezing, the primary objective diagnostic criterion, in young children. To induce children to perform a forced expiratory maneuver, we had children blow a pinwheel. We found that this method increased the frequency of detecting wheezing during an auscultation exam.**

**B**RONCHIAL ASTHMA is a common disease encountered in pediatric practice.<sup>(1)</sup> However, it is often difficult to determine this diagnosis in young children, and asthma is frequently underdiagnosed.<sup>(2)</sup> The most frequent symptoms of asthma include chest tightness<sup>(3)</sup> (which children under the age of 7 usually do not report), cough,<sup>(4,5)</sup> dyspnea,<sup>(6)</sup> and wheezing.<sup>(7)</sup> Coughing can be a manifestation of other disorders such as upper respiratory infections, pneumonia, postnasal drip, bronchitis, foreign body, etc.<sup>(8)</sup> Although some children as young as 4 years of age can use a low-range peak flow meter,<sup>(9)</sup> it is usually difficult to obtain objective laboratory measurements. Pulmonary functions and peak flows cannot always be performed on young children.<sup>(10)</sup> Wheezing has become the primary objective criterion for diagnosing asthmatic attacks.

Wheezing is the sound of air moving through contracted or obstructed bronchial tubes.<sup>(11)</sup> In moderately severe episodes of asthma, it is easy to detect wheezing. However, in mild bronchospastic episodes it is not always possible to hear wheezing during tidal expiration.<sup>(12)</sup> Young children will not blow forcefully (perform a forced expiratory maneuver), which is frequently necessary to detect wheezing.

Our study was done to determine if it was possible to induce children to perform a forced expiratory maneuver by blowing at a pinwheel. This would then answer the question of whether or not a forced expiratory maneuver would increase the ability to hear wheezing during auscultation in young children who are having active bronchospasms.

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## MATERIALS AND METHODS

One hundred children between the ages of 2 and 7 years, who had a previous diagnosis of bronchial asthma and at least two documented episodes of wheezing, were entered as study patients. These children (54 males, 46 females) had episodes of wheezing, shortness of breath, or coughing beginning the day before entering the study (as determined by the parents). Study patients were examined by one of three pediatric allergists in our private allergy practice. The physician, while blindfolded, auscultated each child. A medical assistant then directed the child to blow two times, once with and once without a pinwheel. The physician, who did not know when a pinwheel was being used, indicated to the medical assistant whether or not he could hear wheezing. The pinwheel was used in a randomized manner for each study subject.

## RESULTS

One hundred children who had acute episodes of asthma, historically ascertained by their parents, were entered into the study. Of these 100 study patients, 17 were heard to be wheezing only while blowing the pinwheel. The other 83 patients could be heard wheezing with usual physical exam maneuvers. This wheezing could not be heard without the patient blowing the pinwheel. There was no difference in presentation of signs/symptoms or medication useage between those groups.

## DISCUSSION

The results of this study demonstrate the efficacy of using a pinwheel as an aid to induce a young child to perform a forced expiratory maneuver, thus enabling the physician to hear wheezing by auscultation in children with bronchial asthma. Without use of the pinwheel, wheezing was not heard in some acute asthmatics.

The use of the pinwheel, a simple inexpensive device, can aid the diagnosis of acute asthma in young children. In addition, this technique was found to be useful in many older children and adults who have difficulty auscultating due to wheezing sounds produced in the upper airway. In fact, we have used the pinwheel maneuver to help distinguish those patients who have psychogenic asthma and are merely producing a wheezing sound in their oral pharynx. These patients are unable to produce a wheezing sound when they perform a forced expiratory maneuver by blowing a pinwheel. All children were equally at ease using the pinwheel.

The parents of our patients frequently report that they have taken their asthmatic child to the emergency room or an acute care center for spasms of cough. Because the examining physician frequently is unable to hear wheezing, many of these children who have underlying bronchospastic cough are not properly treated. Children with asthma are often not diagnosed and thus not treated properly. The use of a plastic pinwheel will also help distinguish those children who have a cough from a new asthmatic etiology.

In conclusion, we have found that the use of a safe, inexpensive toy pinwheel can induce a child to perform a forced expiratory maneuver and increase the physician's accuracy in detecting wheezing during an auscultation exam. The pinwheel maneuver may also be used in selective older children and adults who either are unable to perform a proper forced expiratory maneuver or have normal or psychogenic wheezing sounds in their upper airway.<sup>(8)</sup> Physicians will then be able to prescribe medication properly for the asthma or antitussive medication when needed to control cough.

## DIAGNOSTIC TOOL FOR WHEEZING

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