

DON'T FORGET THE BUBBLES

Easing the wheeze

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Wheezing children commonly present to the ED. Bronchiolitis, preschool wheeze and asthma are common causes of such presentations. It is important to note that the term 'wheeze' is frequently misused by parents to describe a number of respiratory noises, including transmitted upper airway sounds and stridor.¹ Wheeze is, in itself, a symptom manifested by 'a continuous whistling sound during breathing that suggests narrowing or obstruction in some part of the respiratory airways'.² One British study reported that 29.3% of children have had a wheeze by the age of three, and 30% of preschoolers with recurrent wheeze are diagnosed with asthma by 6 years of age.^{3,4} This article briefly reviews the diagnosis and management of preschool wheeze, while considering recent guidelines on bronchiolitis and asthma.

Bronchiolitis

The American Academy of Pediatrics (AAP) and the National Institute for Health and Care Excellence (NICE) have updated their bronchiolitis guidelines in the past 2 years.^{5,6}

Both guidelines agree that bronchiolitis occurs in patients under 2 years of age and most commonly under 12 months. It peaks in frequen-

cy and hospitalisation rate at around 3 months of age.

Significantly, both guidelines mention the auscultatory findings of wheeze, crackles or both as being important in making the diagnosis. Several historic papers on the description of bronchiolitis do not mention specific auscultatory findings.^{7,8} Mulholland *et al.* found that only half of the patients in their 1990 cohort study had crackles and that these were associated with an increased severity of illness.⁹ Hence, it is possible to diagnose bronchiolitis with only wheeze on auscultation. NICE further states that a diagnosis of viral induced wheeze or early onset asthma should be considered in children presenting with wheeze without crackles, or a personal or family history of atopy.

Bronchiolitis might also present as apnoea.⁸ The NICE guideline emphasises apnoea might be the sole presenting symptom in infants under 6 weeks of age, and the AAP note that apnoea is rare after the first month of life or after 48 weeks post conceptual age.⁶ For infants presenting with apnoeas, safe management dictates admission and a period of monitoring as a minimum.

Although the UK guidelines emphasise consideration of relevant differ-

entials such as pneumonia and sepsis, the American guidelines provide advice on when to avoid anti-infectives. The AAP specifically cites the 'extremely rare' rate of serious bacterial infection in children aged 30–90 days presenting with a clinical diagnosis of bronchiolitis.^{5,6}

In recent years, nebulised hypertonic saline (HS) has been suggested as a treatment option to reduce the severity and duration of bronchiolitis. The AAP suggest that it is acceptable to trial HS for inpatients admitted with bronchiolitis. The use of HS as a mucolytic for children with cystic fibrosis is well established.¹⁰ The SABRE trial sought to compare HS with 'standard supportive care involving oxygen as required, minimal handling and fluid administration as appropriate to the severity of the disease'.¹¹ It found that overall there was no benefit in symptom severity or duration nor any change to length of stay. The results seem to consign nebulised HS to the growing list of ineffective therapies for moderate bronchiolitis, along with salbutamol, nebulised adrenaline and heliox.^{12–14}

A trial investigating the benefits of high flow nasal cannulae (HFNC O₂) in the context of acute bronchiolitis is currently recruiting throughout Australia.¹⁵ The primary outcome measure being a reduction in transfer rates to tertiary centres, with secondary outcomes of reduced rates of intubation and reduced lengths of stay. They aim to recruit children aged less than 12 months of age with a diagnosis of bronchiolitis and oxygen saturations of less than 94% on room air. This work has its origins in a pilot study undertaken in a centre where a paediatric intensive care unit (PICU) was available. They found that patients

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receiving HFNC O₂ on the ward were less likely to require PICU admission.¹⁶

One key challenge in the ED is ascertaining which children are at risk of deterioration.¹⁷ Of particular interest are those children whom appear to be well but are 'coming down with something'. Selection of patients for referral and likely admission necessitates an awareness of those at risk of rapid deterioration. This includes patients with chronic lung disease (including bronchopulmonary dysplasia), those under 3 months of age, ex-premature neonates (especially less than 32 weeks gestation), immunodeficiency, neuromuscular disorders or those with haemodynamically significant congenital heart disease.^{5,6} Awareness of these risk factors might reduce premature discharge home.

Asthma

The diagnosis and management of acute asthma is well described although full documentation falls outside the scope of this article. A detailed podcast produced by the RagePodcast team in March 2014 discusses some of the options for severe, life threatening asthma in adults and children.¹⁸

In March 2014, the National Asthma Council Australia updated their Australian Asthma Handbook.¹⁹ In a divergence from previous publications, the handbook is available only in web-based format, ostensibly to allow regular updates. It is available at asthmahandbook.org.au and includes specific sections on the diagnosis and management of asthma in children of all ages. Specifically, the handbook advises a trial of a beta agonist to assess clinical response in children 6 months or older. Children under 6 months should be discussed with a paediatrician or paediatric respiratory physician prior to a salbutamol trial.¹⁹ This advice challenges the myth of 'no beta receptors' before 12 months of age.²⁰

Diagnostic dilemmas in preschool children

A preschool child presenting with a wheeze poses a significant diagnostic and therapeutic challenge in the ED.

The clinical entity of preschool wheeze classically affects children aged 0–5 years. There is frequently a grey area between those patients with a clear-cut asthma presentation and those with clinically obvious bronchiolitis. In 2008, the European Respiratory Task Force proposed a system for classifying wheeze for clinical purposes. These phenotypes are either an episodic viral wheeze (EVW) or multiple trigger wheeze (MTW).²¹ Notably, the classification of EVW and MTW phenotypes is made retrospectively, with one study identifying 54% of patients changing types after a year of follow up.²² At least one of the original authors suggested that the EVW-MTW approach is an oversimplification of the process. Several papers advocate diagnosis and management based on the indices of severity, frequency, temporal pattern, association with atopic sensitisation and the long-term outcome of symptoms.^{23,24}

The management of preschool wheeze remains somewhat controversial. This is understandable given the challenges around making the diagnosis. Bronchodilators are advocated by the Australian Asthma handbook; however, at least one large Cochrane review noted the lack of good evidence for this therapy under 2 years of age.¹² In practice, most clinicians would trial salbutamol. The management of severe preschool wheeze is essentially the same as a severe or life-threatening exacerbation of asthma.

For moderate, acute exacerbations, Schultz *et al.* advise that there is no benefit in the use of systemic corticosteroids for preschool wheeze and that they 'should not be routinely used in the management of acute exacerbations of wheeze in preschool-aged children'.²³ This advice builds on the findings of a well run randomised trial that found neither length of stay nor beta-agonist usage was significantly changed in the prednisolone arm versus placebo.²⁵ Additionally, Brand *et al.* stated that 'oral corticosteroids are indicated only in preschool children admitted to hospital with very severe wheeze; even in this group, evidence to support the use of prednisolone is not robust'.²⁴ The Australian Asthma handbook takes a more traditional view that, if there is clinical

response to bronchodilators, systemic corticosteroids can be omitted in mild to moderate wheeze. In children under 5 years of age with acute, severe wheezing, it would be reasonable to initiate prednisolone, initially 2 mg/kg then 2 days of 1 mg/kg.¹⁹

Regarding medium- and long-term management of preschool wheeze, the 2013 European Respiratory Society consensus statement suggests daily low dose inhaled corticosteroids as the most appropriate first-line therapy for those patients whose presentation is most consistent with MTW. Patients with EVW might initiate either montelukast or inhaled steroids as first-line prevention.²⁴

Parents frequently ask if preschool wheeze augurs the diagnosis of asthma. The Asthma Prediction Index was first described by clinicians at Tuscon in 2000, using data from a large longitudinal study.^{4,26} They sought to develop a tool for predicting which patients wheezing as preschoolers would proceed to a diagnosis of asthma by 6 years of age. The tool used a loose criteria, comprising a diagnosis of 'early wheezer', plus at least one major criteria, parental medically diagnosed (MD) asthma or MD eczema, and at least two minor criteria of MD allergic rhinitis, wheezing 'apart from colds' and eosinophilia >4%. The authors report an odds ratio of 2.6 to 5.5 for asthma during the school years for a positive criteria. However, the tool itself lacks sufficient specificity (~84%) or sensitivity (~42%) to justify regular use.⁴ More recently, Leonardi *et al.* attempted to externally validate the tool; their data were similar and described as not particularly useful considering the low level of prediction.²⁷

To conclude, current evidence suggests the best treatment approach for preschool wheeze is based on the severity and frequency of symptoms. Moreover, we advise emergency clinicians follow the Australian Asthma Handbook guidelines. Establishing a guideline-based management approach allows for a consistent standard of care, clear expectations of management between the ED and inpatient teams, and assists in the progression of further research. We advocate for a trial of bronchodilator and, only if

the symptoms are severe enough to warrant admission, the addition of systemic corticosteroids. Although there is a growing understanding of preschool wheeze, there are no good tools for predicting the likelihood of asthma in these patients.

Competing interests

HG, AT, BL and TD are section editors for *Emergency Medicine Australasia*.

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