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Acute Asthma and Other Recurrent Wheezing Disorders in Children

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Not all acute wheezing is caused by asthma or bronchospasm, particularly in children younger than 2 years. If bronchodilators do not improve symptoms, alternative diagnoses (e.g., infection, foreign body) should be considered.

Although no evidence exists to support the use of oxygen in acute asthma, it is known to be effective and should be administered when oxygen saturation levels fall below 94% in all cases of acute asthma.

Although there is little evidence to support the use of inhaled bronchodilators, they remain one of the first-line treatment choices for acute asthma.

- In mild to moderate acute asthma, beta₂ agonists may be equally as effective from a metered dose inhaler/spacer combination compared with a nebulizer for control of acute symptoms, and may be associated with a shorter duration of stay in the emergency department and reduced adverse effects.

- In severe acute asthma, we do not know whether there is a difference between continuous and intermittent nebulized beta₂ agonists.

- **Caution:** Inhaled salbutamol has been associated with hypokalemia and tremor.

The only indication for ipratropium bromide for acute childhood asthma is in combination with salbutamol for acute severe wheezing.

Although there is little evidence to support the use of oral corticosteroids, they remain one of the first-line treatment choices for acute asthma.

- In mild to moderate asthma, oral corticosteroids are known to be more effective than placebo. We do not know whether

high-dose inhaled corticosteroids and oral corticosteroids differ in effectiveness because we found insufficient evidence.

For severe asthma, the addition of intravenous salbutamol, aminophylline, or magnesium sulfate is effective compared with the addition of placebo.

- In severe acute asthma, we do not know whether intravenous aminophylline and salbutamol differ in effectiveness because we found insufficient evidence from one small randomized controlled trial.

- **Caution:** Intravenous salbutamol and aminophylline have been associated with cardiac arrhythmias. Salbutamol has been associated with hypokalemia, and aminophylline has been associated with nausea. Intravenous theophylline can cause cardiac arrhythmias and convulsions if therapeutic blood concentrations are exceeded.

Clinical Questions

What are the effects of treatments for acute asthma in children?

Beneficial	Beta ₂ agonists (high-dose inhaled)* Corticosteroids (high-dose inhaled) Corticosteroids (systemic) Ipratropium bromide (inhaled) added to beta ₂ agonists Magnesium sulfate (intravenous) Oxygen* Salbutamol (intravenous)
Likely to be beneficial	Theophylline or aminophylline (intravenous)

*—In the absence of randomized controlled trial evidence, categorization is based on observational evidence and strong consensus.

Definition

Asthma is a chronic inflammatory disease of the airways characterized by episodic wheezing and reversible airway obstruction. Acute exacerbations of asthma are characterized by tachypnea, increased work of breathing (chest wall recession in young children and use of accessory muscles in older children), tachycardia, and reduced oxygen saturation levels. Acute childhood asthma is a common clinical emergency presenting across a range of ages and with a range of severities. This review was designed to assess the current evidence for best management of acute childhood asthma.

Acute asthma may be classified as severe or moderate. Severe acute asthma is characterized by an oxygen saturation level less than 92%, a pulse of greater than 125 beats per minute (in children older than 5 years) or greater than 140 beats per minute (in children 2 to 5 years of age), a respiratory rate of greater than 30 breaths per minute (in children older than 5 years) or greater than 40 breaths per minute (in children 2 to 5 years of age), obvious use of accessory muscles (in children older than 5 years) or obvious chest wall recession (in children 2 to 5 years of age), inability to complete sentences in one breath (the child speaks 1 or 2 words), and being too breathless to feed. Moderate acute asthma is characterized by an oxygen saturation level of 92% to 95%, a pulse of 100 to 125 beats per minute (in children older than 5 years) or 120 to 140 beats per minute (in children 2 to 5 years of age), a respiratory rate of 20 to 30 breaths per minute (in children older than 5 years) or 30 to 40 breaths per minute (in children 2 to 5 years of age), some use of accessory muscles (in children older than 5 years) or some chest wall recession (in children 2 to 5 years of age), and talking in short phrases.

Incidence and Prevalence

Acute asthma remains a common and sometimes serious presentation. The proportion of children with acute asthma presenting to primary care in England and Wales fell between 1993 and 1998. The proportion of all children admitted to the hospital in England and Wales who had acute asthma fell slightly

between 1998 and 2004, from around 19 per 1,000 admissions to 17 per 1,000. Fortunately, deaths from acute asthma are uncommon in children and are also decreasing. Asthma mortality fell by approximately 70% between 1968 and 2000 but remains highest in children 11 to 16 years of age. Between 1968 and 2000, asthma mortality (per 100,000 children per year) fell from 0.6 to 0.1 in children 1 to 5 years of age, from 0.5 to 0.2 in children 6 to 10 years of age, and from 1.4 to 0.4 in children 11 to 16 years of age.

Etiology and Risk Factors

The predominant precipitant for acute asthma symptoms is viral infection, detected in 80% to 85% of cases. Other causes include exercise, allergen exposure (inhaled or ingested), cold weather, and poor air quality. Children younger than 5 years with lower respiratory tract infection or foreign body aspiration can present with asthma-like symptoms. Some young children with acute wheezing have a diagnosis of asthma or viral-induced wheezing, but in the acute setting both should be treated in the same manner. Risk factors for asthma admissions include not having or not adhering to a written crisis management plan, taking inappropriate preventive treatment or poor compliance, and a delay of more than 24 hours in seeking advice.

Prognosis

A U.K. longitudinal study of children born in 1970 found that 29% of 5-year-olds who had wheezing in the past year were still wheezing at 10 years of age. Another study followed a group of children in Melbourne, Australia, from 7 years of age (in 1964) into adulthood. The study found that a large proportion (73%) of 14-year-olds with infrequent symptoms had few or no symptoms by 28 years of age, whereas two-thirds of 14-year-olds with frequent wheezing still had recurrent attacks at 28 years of age.

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