

# Associated medical conditions in children

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## Abstract

Children with acute and chronic associated medical conditions often present for surgical and radiological procedures. An understanding of the implications of these conditions for anaesthesia is important in preventing perioperative adverse events. In this article, we outline the relevant clinical features of some of the commonly encountered associated medical conditions and provide guidance on the current practice in the anaesthetic management of these conditions.

**Keywords** Asthma; autism; cerebral palsy; children; diabetes mellitus; Down syndrome; gastro-oesophageal reflux; obesity; obstructive sleep apnoea; preoperative assessment; sickle cell disease

**Royal College of Anaesthetists CPD matrix:** 2D02, 3D00

## Upper respiratory tract infection

Acute upper respiratory tract infections (URTIs) are common among children, with most children experience between three and eight URTIs per year. These may be even more frequent in nursery age children. They include rhinosinusitis (common cold), sinusitis, pharyngitis/tonsillitis, ear infections and laryngitis. Airway hyper-reactivity is common after an URTI and can persist for up to 6 weeks. Children with URTIs or within 2–4 weeks of cessation of symptoms are at increased risk of perioperative respiratory adverse events. Whilst the incidence of serious events is low, they have a 2- to 7-fold increased risk of laryngospasm, bronchospasm and hypoxaemia, 11-fold if their trachea is intubated. However, routine cancellation of every child with a URTI is impractical for both families and hospitals.

Factors that increase the risk of adverse events in children with URTI include the following.

### URTI related

- Fever (>38 °C)
- Purulent and copious secretions
- Productive cough
- Malaise, lethargy, decreased appetite
- Lower respiratory tract signs

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## Learning objectives

After reading this article, you should be able to:

- identify the specific anaesthetic implications of children with upper respiratory tract infections, asthma, obstructive sleep apnoea, cystic fibrosis, sickle cell disease, anaemia, obesity, diabetes mellitus, renal failure, cerebral palsy, epilepsy, autism, Down syndrome, oncological diseases, latex allergy, pregnancy, gastro-oesophageal reflux and those on long-term steroids
- perform a focused preoperative assessment to establish the severity and current status of these children
- formulate an individualized anaesthetic plan for the safe perioperative management of children with these medical conditions

### Child factors

- Age <1 year
- History of prematurity
- Sickle cell disease
- History of snoring
- History of reactive airway disease (asthma)
- Parental smoking

### Anaesthesia and surgical factors

- Airway instrumentation (endotracheal tube (ETT) > laryngeal mask airway (LMA) > face mask)
- Airway surgery
- Inhalational induction
- Method of endotracheal extubation (deep > awake)
- Major surgery
- Anaesthetist with limited paediatric anaesthesia experience

The parent's perception of the severity of illness in their children is the best predictor of perioperative airway complications, particularly if parents describe their child as having a 'cold' on the day of surgery. Children with significant URTI symptoms, especially if they have any other risk factor, should have elective surgery deferred for 4–6 weeks. Management decisions in these children should involve a senior anaesthetist. Each decision should be individualized; however there is increasing interest in creating a scoring system to stratify risk. An example is shown in [Table 1](#).<sup>1</sup>

### Anaesthetic management:

- Avoid sedative premedication where possible (particularly midazolam).
- Consider premedication with inhaled bronchodilator 10–30 minutes prior to surgery.<sup>2</sup>
- Facemask or LMA should be used in preference to endotracheal tube if appropriate.
- In intubated children, suction the airway before extubation and extubate awake.
- Airway problems must be anticipated on induction and emergence.

### Asthma

Asthma is one of the most common chronic diseases and a leading cause of morbidity in children throughout the world.

**The COLDS score**

	1	2	5
<b>C</b> Current Signs/Symptoms	<b>NONE</b>	<b>MILD</b> Examples: Parent confirms URI and/or congestion, rhinorrhoea, sore throat, sneezing, low fever, dry cough	<b>MODERATE/SEVERE</b> Examples: Purulence, wet cough, abnormal lung sounds, lethargy, 'toxic' appearance, high fever
<b>O</b> Onset	<b>&gt;4 WEEKS AGO</b>	<b>2–4 WEEKS AGO</b>	<b>&lt;2 WEEKS AGO</b>
<b>L</b> Lung disease	<b>NONE</b>	<b>MILD</b> Examples: history of RSV, mild intermittent asthma, CLD if >1 year old, loud snoring, passive smoker	<b>MODERATE/SEVERE</b> Examples: Moderate persistent asthma, infant with CLD, OSA, pulmonary HTN
<b>D</b> Airway Device	<b>NONE or FACEMASK</b>	<b>LMA or SUPRAGLOTTIC</b>	<b>TRACHEAL TUBE</b>
<b>S</b> Surgery	<b>OTHER</b> (including ear tubes)	<b>MINOR AIRWAY</b> Examples: T/A, NLD probe, flexible bronchoscopy, dental extractions	<b>MAJOR AIRWAY</b> Examples: Cleft palate, rigid bronchoscopy, maxillofacial

Each category (C, O, L, D, S) is assigned 1, 2, or 5 points, to obtain a total score ranging from 5 to 25. Examples given are illustrative and not intended to be all-inclusive. Abbreviations: URI, upper respiratory tract infection; RSV, respiratory syncytial virus; CLD, chronic lung disease, also known as bronchopulmonary dysplasia; OSA, obstructive sleep apnea; HTN, hypertension; LMA, laryngeal mask airway; T/A, tonsillectomy and/or adenoidectomy; NLD, nasolacrimal duct.

**Table 1**

Children are at a higher risk of asthma-related morbidity and mortality compared with adults. Its prevalence among children in Western countries is 1–20%. Symptoms of asthma in children include recurrent episodes of wheezing, dry cough, chest tightness and dyspnoea. The disease is characterized by airway hyper-responsiveness, airway inflammation and airway obstruction, which are reversible. Airway obstruction can be more severe in children, for a given severity of illness, due to their smaller airway diameter. Risk factors include atopy, allergens, infection, obesity and exposure to tobacco smoke. Asthma may be precipitated by URTI, aeroallergens, exercise, emotion and cold air. The severity of asthma can be defined by the level of treatment required to control symptoms (Table 2 shows the 2014 British Thoracic Society summary of the stepwise management of asthma in children). Children with a history of reactive airways disease and atopy are at increased risk of perioperative bronchospasm. There are three mechanisms of perioperative bronchospasm: mechanical, anaphylactoid and anaphylactic with the most common being mechanical. In line with this, the periods of highest risk are during intubation and extubation.

**Preoperative assessment**

When evaluating a child with asthma, history should focus on the frequency and severity of symptoms, activity level, current medication including steroids, emergency attendances, hospital and intensive care admissions, recent URTI, previous reactions to anaesthesia and tolerance of NSAIDs. Physical examination should be comprehensive, assessing the presence of tachypnoea, cyanosis, wheeze, crepitations, and increased work of breathing. Up to 15% of asthma sufferers have nasal polyps and this should be considered when nasal intubation may be required. Routine peak expiratory flow rate (PEFR) testing in children with well-controlled asthma is

unnecessary, difficult to perform in children under 5, and does not correlate with severity of illness or degree of hypoxia.

All asthma medications should be administered on the day of surgery to ensure optimal treatment prior to surgery. Premedication with oral midazolam 0.5 mg/kg (maximum 20 mg) reduces anxiety-related bronchospasm. Preoperative inhaled or nebulized bronchodilator 1–2 hours before surgery improves lung function and attenuates the increased airway resistance associated with tracheal intubation. Elective surgery should be postponed if asthma is poorly controlled (>10 puffs of short-acting  $\beta_2$ -agonist/day) and the child referred for optimization of treatment.

**Anaesthetic management:**

- In patients with severe asthma, avoid histamine-releasing drugs such as atracurium, mivacurium, thiopentone, morphine and suxamethonium. Propofol, ketamine, vecuronium, rocuronium and fentanyl are preferable.
- Intubation should be avoided if possible. Ensure adequate depth of anaesthesia.
- Topical lignocaine increases the risk of perioperative respiratory events.
- Whenever possible, supplement general anaesthesia with regional anaesthesia.
- Desflurane increases airway resistance and should be avoided.
- If the child has been on regular oral steroids or on high-dose inhaled steroids within the past two months, supplementary intravenous steroids need to be administered perioperatively (hydrocortisone 2 mg/kg).
- NSAIDs should only be avoided in children with severe or brittle asthma, nasal polyps, and in those with history of previous adverse reactions to NSAIDs.

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