Lesson S06: PreAnesthetic Assessment of the Child with a Cold or Asthma

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A COURSE OF STUDY FOR AMA/PRA CATEGORY 1 CREDIT
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TIME TO COMPLETE ACTIVITY: 2 hours
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Needs assessment
Pediatricians, surgeons and anesthesiologists sometimes differ in opinion as to the best course of action for a child with asthma or respiratory infection who requires either scheduled or emergent surgery. The pediatrician may favor postponing the case until the patient is asymptomatic while a surgeon, with constraints in time and schedule, may wish to proceed. Administration of anesthesia is often cited as the most dangerous part of the procedure, although few studies confirm this supposition. The practitioner should be aware of available data to make a reasoned decision and appropriately advise all concerned.

Objectives
At the end of the lesson, the participant will be able to:

1. Define rhinitis and provide a differential diagnosis.
2. Describe the signs and symptoms of an upper respiratory infection.
3. Identify situations in which surgery for a child with a cold should be postponed.
4. Discuss circumstances in which surgery may proceed despite the presence of a runny nose.
5. List means to decrease postoperative critical incidents.
6. Describe the appropriate preoperative assessment of asthma in a child.

7. Discuss the possible complications of an upper respiratory infection.

8. Note the criteria that should be met prior to discharge from hospital of a child with a cold.

9. Discuss the use of a laryngeal mask airway.

10. Outline important viral effects on the airway.

**Case Presentation**

A 4 year old boy was brought to the ambulatory unit by his parents on the morning of surgery. He was scheduled for repeat laser ablation surgery of a port wine stain of his leg.

Past medical history was remarkable for several “colds” for which he was treated with a nebulizer and antibiotics. He was not on any regular medications. His mother reported that he had a slight cold over the past two days and had complained of an earache. She administered baby aspirin on several occasions. A clear nasal discharge had resolved. He was reported to be a mouth breather with occasional asthma type symptoms when exposed to dog and cat hair. He had been sneezing recently but had only coughed on one or two occasions. Although his mother reported that he was slightly febrile at one point, his temperature was found to be normal. The patient and two siblings attended a school where two cases of chickenpox were reported in the last month but not among their close contacts. None of the children had developed a rash.

Physical examination showed an appropriate 4 year old. There was some crusting around his nose and slight throat redness. Inspection of the eardrums was normal. Auscultation of the chest revealed clear breath sounds with no wheezing. Pulse was 110 beats/min; blood pressure was recorded at 95/60; temperature was 98.9°F; white cell count by finger stick was 9.9 th/cu.mm.

**Introduction**

In pediatric anesthesia, controversy often surrounds the decision to proceed with anesthetizing a child with an upper respiratory tract infection (URI). Elective surgical procedures are commonly postponed in patients with infectious disease processes. The rationale is that adverse surgical outcomes are more likely in persons weakened by some other pathological process. Also, patients who do not feel well are not motivated to recover quickly after added stress. An empirically supported premise is that anesthesia increases the risk of serious complications. Intubation and administration of general anesthesia in patients with upper respiratory infections could potentially result in complications such as pneumonia and bronchitis. Regional anesthetic techniques using narcotic administration or high spinal blockade could suppress respiratory function and potentially worsen respiratory diseases. However, few clinical studies have produced data to confirm these beliefs and experimental evidence is also lacking.

Asthma is a common disease among children with a rising incidence. These patients are often given special preoperative evaluation, and are considered to be at increased risk of adverse postoperative events and may not be candidates for ambulatory surgery.
With the increase in ambulatory surgical procedures, most children are prescreened as outpatients following a referral for surgery from a pediatrician. The surgeon typically sees the patient only once or twice before the day of the scheduled procedure. The anesthesiologist and/or the pediatrician see the patient immediately before the surgery for a pre-operative assessment. A respiratory infection may be present on the day of surgery as they occur about 5-10 times per year in children and are often characterized by mild disease symptoms. In addition to physical condition, several factors should be considered before a procedure is cancelled including the economic burden for the family, the impact on clinical staff, and traumatic psychological effects on both patients and parents who may have been preparing mentally for days or weeks.

Results from a wide number of studies addressing decisions to “cancel or proceed” are divergent in their conclusions. This may be partially attributed to varied definitions of a “cold”. While it is difficult to standardize a URI, a common definition is the presence of two or more of the symptoms listed in Table 1.

Clinical studies examining the effects of general anesthesia on patients with viral infections are anecdotal. Experimental animal studies completed several years ago referred to anesthetics that are no longer in common use. A few larger surveys reached opposing conclusions. Furthermore, differences in study design have made interpretation and comparison difficult. The findings as to whether to cancel or proceed are presented as follows.

### Evidence for Canceling the Case

In 1979, McGill et al reported that eleven children developed wheezing, hypoxia and coarse breath sounds after intubation. All but one had a preexisting respiratory infection. Two required bronchoscopy to treat atelectasis. On the basis of these findings, the authors recommended postponement of elective surgery for children who were actively sneezing or who had a history of a recent URI. Desoto and colleagues prospectively compared a study group of 25 children with recent symptoms of URI to a control group of 25 asymptomatic children. Twenty percent of the study group experienced an immediate oxygen desaturation to less than 95% in the postanesthetic care unit but no patient in the control group became hypoxic. None of the children were given supplemental oxygen. There were no adverse outcomes or further morbidity in either group. Liu et al reviewed the anesthetic management of 93 infants and 295 children, most of who were intubated. Critical incidents (i.e. wheezing, laryngospasm, hypoxia, breath holding) were identified in 71% of infants with URIs as compared to 26% of controls, and in 30% of the group of children compared to 12% of the respective controls. The results indicated that infants are at greater risk. For these groups, there was no long term morbidity. However, these authors recommended cancellation until the infection had resolved.

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**TABLE 1**  
*Signs and symptoms of an Upper Respiratory Infection*  

<table>
<thead>
<tr>
<th>Symptom</th>
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<tr>
<td>Sore throat / slight redness</td>
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<tr>
<td>Sneezing</td>
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<tr>
<td>Rhinorrhea (clear secretions)</td>
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<tr>
<td>Congestion (including watery eyes)</td>
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<tr>
<td>Malaise, irritability</td>
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<tr>
<td>Non-productive cough</td>
</tr>
<tr>
<td>Fever 37.5 - 38.5°C</td>
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<tr>
<td>Laryngitis</td>
</tr>
<tr>
<td>WBC &gt;/= 10,000 cells/mm³</td>
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<tr>
<td>Mild ear ache</td>
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* Documentation of TWO or more of the above symptoms in children indicates a URI.
From a pediatric database of 29,220, Cohen and Cameron identified 1,283 children with URIs. All patients had clear nasal secretions, normal chest examinations, and normal or borderline white cell counts and some were febrile. Throughout the perioperative period, children with a URI were at a 2-7 fold increased risk of a respiratory related event. Non-intubated children with a URI were nearly 9 times more likely to develop problems than healthy control patients. Intubation increased the risk of a critical respiratory incident by over 5 times in all groups of children (i.e. those with and without a URI). Intubation in the presence of an URI was associated with an 11 fold risk increase. Morbidity and mortality rates were not increased by the presence of a URI when the study group was compared to controls.

Using a stepwise logistic regression, Bordet et al reviewed a database of 1,996 surgical pediatric patients of whom 7.87% developed respiratory complications, including bronchospasm, laryngospasm, oxygen saturation less than 90% and breath holding. Bordet et al identified recent upper respiratory infection as the most important contributor to postoperative respiratory complications (risk factors; p<0.0001, 95% CI= 2.31-5.99). Similar to findings of other investigators, no major morbidity or mortality was reported.

This evidence presented by these researchers support the clinical impression that a recent viral infection is a risk factor for pulmonary complications without long term sequelae.

**Evidence to Proceed with the Case**

Tait and Knight reviewed 3,585 cases and found no increase in postanesthetic complications in symptomatic patients but found a 3 fold increase in bronchospasm and laryngospasm in asymptomatic patients with a history of recent URI. Recognizing that the study may have been skewed with patients having chronic symptoms of nonviral origin, the authors performed a prospective cohort study of 489 patients between the ages of 1-12 undergoing myringotomy to investigate the prevalence of symptomatology and perioperative respiratory complications. Results of the prospective study demonstrated no increase in morbidity. One interesting finding was that administration of general anesthesia (halothane) to 78 children receiving a myringotomy was associated with a reduction in the appearance and duration of respiratory symptoms. Subsequently, the authors examined a study population of 1078 children aged 1 month to 18 years with URIs presenting for elective surgery. No significant difference was found in the incidence of laryngospasm and bronchospasm between children with active URIs, recent URIs (within 4 weeks) and asymptomatic children. However, children with active URIs did experience significantly more episodes of breath holding, desaturation to < 90% and a greater overall incidence of adverse respiratory events. Independent risk factors for adverse respiratory events in children with active URIs included use of an endotracheal tube (in those age < 5 years), history of prematurity, history of reactive airway disease, exposure to second hand smoke, surgery involving the airway, presence of copious secretions, and nasal congestion. There were no long term sequelae. These same authors also showed that different anesthetic agents may attenuate the histopathologic response to influenza viral infections in animals (ferrets) and halothane may even inhibit viral replication.

Attempts have been made to identify risk factors for postoperative desaturation. Betts et al found no difference in the frequency of laryngospasm or desaturation in children with an active URI, when
compared to a control group. Glazener and Motoyama, in a study of 97 healthy ASA 1 infants and children, found a mean SpO2 of 93% on admission to the postanesthetic care unit. These data seem to challenge the significance of the findings of the DeSoto study of SpO2 > 95% in healthy children and <95% in children with a cold. Other studies have indicated that children with colds do not have significant oxygen desaturation postoperatively. Rather, periods of postoperative desaturation are similar in degree and duration to preoperative values. Audit of a database of 24,165 anesthetized pediatric patients over a 30 month period in a pediatric teaching hospital revealed 724 adverse events. Respiratory events represented 53% of all intraoperative events and were more frequent in infants, during ENT surgery, in children who were intubated and in those with an ASA score of 3-5. Cardiac events were reported in 12.5% of cases, mostly in those with a higher ASA classification. There was 1 death which was not anesthesia related. Other complications were mainly related to postoperative nausea and vomiting.

The review of available data indicates that, while the presence of a cold may increase the incidence of critical events postoperatively, the effects are temporary. When making a decision to postpone a surgical procedure, consideration should be given to the ability of the surgical procedure to decrease future URIs (e.g. tonsillectomy, myringotomy); the difficulty in rescheduling the surgery at a time when the child does not have a cold or a reactive airway; and the requirements of the family and surgical team.

Asthma and Allergy Prone Children

Asthma is the most common chronic childhood disease, affecting 5-10% of children in the United States. As the incidence is steadily increasing, it is not unusual for patients with asthma to present for both minor and complex procedures in the ambulatory setting. The decision to proceed with anesthesia includes consideration of the severity and frequency of symptoms and the adequacy of pharmacologic control. Asthmatic children with mild disease and infrequent symptoms without the use of continuous medications are excellent candidates for ambulatory care. Children with moderate asthma (i.e. those who require daily medications to control symptoms) should be counseled to continue their medications up to and including the morning of surgery. A beta agonist should be administered in the holding area by nebulizer to a small child or by an inhaler to those accustomed to such use. If the child is wheezing, has a co-existent URI, persistent cough (both non and productive), or tachypnea prior to surgery, it is advisable to reschedule the procedure until the suspected infection is appropriately managed.

Mamie et al sought to quantify the incidence and risk factors for perioperative adverse events associated with elective surgery in allergy prone children. A questionnaire from the International Society of Allergy and Asthma was applied to identify risk factors such as atopy, eczema, rhinitis, food allergy, previous allergic tests including foods and pollen, passive smoking, and obstructive sleep disorders. A multivariate logistic regression was applied to the data collected for a group of 800 children. Twenty one percent of adverse events occurred intraoperatively and 13% occurred in the postanesthetic care unit. Analysis showed that children not anesthetized by a specialist pediatric anesthesiologist had a 1.7 increased risk. ENT patients had a 1.57 fold increased risk and there was a synergistic interaction with 2 factors: resident anesthesiologists and ENT surgery. The risk decreased when the anesthetic technique included tracheal intubation and relaxants. The study showed that risk for adverse events was associated with the age of the child and the type of anesthetic care rather than with factors in the medical history.
Although most URIs that occur in infancy are viral in origin, atopy and environmental factors are influential predisposing and triggering factors. Many children with runny noses are likely to become skin positive later in life to antigens such as D. pteronissinus. A study of 2304 schoolchildren was conducted to determine URI frequency and correlate it with family and environmental factors and allergic responses to common allergens. Results showed a wide overlapping of URI and asthma; and both passive smoking and low quality of housing were found to be triggering environmental factors. Skin positivity for common allergens largely exceeded the symptomatic portion of the whole population suggesting that asymptomatic children are at risk for allergic respiratory disease. Nasal troubles were frequent in asthmatic patients and considered as an additional symptom in asthma.

Chest x-rays produce little or no information especially if chest sounds are clear. The clinical state of asthmatic and bronchitic patients often markedly deteriorates when a viral respiratory tract infection is superimposed. However, even in asthmatic children with a history of recent URI, a chest X-ray is rarely warranted. Furthermore, pulmonary function tests - including preoperative arterial blood gas analyses - do not offer any useful information in asymptomatic children and may increase discomfort and anxiety in patients and parents. Auscultation of the chest and careful inspection of the upper airway, ears and eyes should always be performed.

The choice of anesthetic is based on the surgical procedure. Intubation should be avoided, if possible. Use of a supraglottic device would obviate the need for endotracheal instrumentation. However, at least one study identified young age and the use of a laryngeal mask airway (LMA®) as independent factors associated with an increased risk of airway complications. An endotracheal tube should only be placed after sufficient depth of anesthesia has been achieved. Intravenous lidocaine and /or a beta agonist inhalant may be administered immediately prior to intubation and extubation. Extubation at a deep plane of anesthesia should be considered.

**Pathophysiology of a URI**

Adverse effects of respiratory viruses on the airway are listed in Table 2. Several distinct effects of viruses on the airway have been identified.

Most URIs in children are associated with rhinovirus, adenovirus or respiratory syncytial virus. Significant correlation exists between acute otitis media and the presence of respiratory syncytial virus (57%) and adenovirus (30%). The lower airway is rarely infected by “typical” URI viruses but is susceptible to infection by influenza virus resulting in an increased morbidity. Several studies have examined the effects of influenza virus in anesthetized animals. Influenza virus infections in sheep were shown to significantly enhance the pulmonary effects of anesthetics such as an increase in ventilation perfusion shunt, a decrease in functional residual capacity and arterial desaturation. These effects may be attributed to increased oxygen consumption by inflamed and hypermetabolic lungs. Airway disease may also reduce the ability to clear excess secretions associated with anesthetic agents or intubation.

**TABLE 2  Viral effects on the airway**

<table>
<thead>
<tr>
<th>Effect</th>
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<tr>
<td>Increased vagal effect</td>
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<tr>
<td>Increased tachykinin responsivity</td>
</tr>
<tr>
<td>Increase secretions</td>
</tr>
<tr>
<td>Decreased clearance of secretions</td>
</tr>
<tr>
<td>Increased pulmonary shunting</td>
</tr>
<tr>
<td>Decreased hemoglobin oxygen saturation</td>
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Exacerbations of asthma are known to be associated with viral infections. Even in the absence of lung disease, airway hyperresponsiveness can be induced. It has been described as a simple autonomic imbalance with a relatively increased parasympathetic activity in the lung. Pulmonary sympathetic activity is very limited and difficult to identify. Circulating catecholamines act on β2 receptors to cause bronchodilation. Parasympathetic fibers control both the baseline tone and rapid changes in airway size in response to stimulation. Sensory receptors within the airway wall alter bronchial smooth muscle tone through parasympathetic vagal pathways. Receptors in the mucosa of the cartilaginous airways, the trachea and the carina are able rapidly adapt to irritants and are generally triggered by mechanical stimulation, heat, and inhaled particles. Edema and histamine also elicit activity and cause coughing, bronchocstriction and mucus secretion.

Respiratory viruses do not necessarily cause direct changes in the intrinsic contractile properties of airway smooth muscle. In vitro studies of animal airway smooth muscle demonstrate normal contractile response to acetylcholine and a relaxation response to isoproterenol. Bronchial smooth muscle is influenced by production of virus-specific IgE antibodies, epithelial injury, polymorphonuclear dependent inflammation and enhanced mediator release (e.g., histamine). Neural abnormalities in virus infected airways can be broadly categorized as increased tendency for vagally-mediated reflex bronchoconstriction and increased response to tachykinins. Reflex bronchoconstriction may be induced by touching the inside of the airway as during intubation. Airway hyperresponsiveness can be blocked by atropine or glycopyrrolate.

Animal studies suggest that the vagus nerve increases the release of acetylcholine (Ach) because of a loss of Ach-inhibitory function of the M2 muscarinic receptors. M2 muscarinic receptor inhibitory function is damaged by the viral enzyme, neuraminidase, a component of parainfluenza and influenza viruses. Sialic acid residues in the receptors are susceptible to cleavage by neuraminidase. Tachykinin response represents another broad category of abnormal neural effect. These sensory neuropeptides are found in vagal afferent C fibers and cause airway smooth muscle contraction directly and by facilitation of cholinergic neurotransmission. Tachykinin release is induced by capsaicin, bradykinin, histamine, nicotine, and electrical stimulation. Viral potentiation of tachykinin is caused by a 50% loss of neural endopeptidase, the naturally occurring enzyme which inactivates tachykinin. Increased tachykinin contributes to excess stimulation of submucosal gland secretion. Acetylcholine also increases airway secretions.

**Differential Diagnosis of URI**

Several disease states may mimic the common cold. Differential diagnoses must be considered (Table 3). A careful assessment must be performed to differentiate a child with an infectious process from one with allergic or vasomotor rhinitis or a physical abnormality. A URI can be part of the prodrome of many systemic viral infections such as mumps, measles or chickenpox. An interview with parents should include questions regarding possible exposure, especially with children who have just started school, and the child’s immunization history. If there is reasonable evidence that the child is harboring one of these infections, the procedure should be postponed for 24 - 48 hours to observe for development of a rash. The delay is necessary to protect potentially susceptible health care workers and patients. There is no firm evidence that administration of anesthesia worsens the symptoms or increases morbidity associated with mild childhood infectious diseases.
Children with allergic rhinitis have clear nasal secretions and are afebrile. Nasal and pharyngeal mucosa are usually pale and swollen and generally not inflamed. Allergic rhinitis tends to occur seasonally, has a long standing history and runs a longer course.

Other causes of upper respiratory system disease include croup, epiglottitis and foreign body aspiration. Epiglottitis is usually caused by *H. influenza* type B and involves an acute fulminant inflammation of the entire supraglottic region (i.e., the epiglottis, arytenoids, aryepiglottic folds and uvula). Croup, a viral syndrome of insidious origin, involves gradual, progressive inflammation and edema of the subglottic area, and may extend to the entire tracheobronchial tree. The child usually presents with tachypnea, labored ventilation and cyanosis and appears acutely ill. Epiglottitis may cause rapid and complete obstruction. In these patients, the abrupt onset of high fever and sore throat often progresses rapidly to dysphagia, drooling and severe respiratory distress, especially on inspiration. The child is sitting up, struggling to breathe and appears acutely ill.

Foreign bodies may lodge anywhere in the respiratory system. If they lodge in the esophagus or cricopharyngeal area, they can compress the trachea and cause wheezing or infection with purulent secretions. Objects lodged outside the respiratory tract will not produce stridor. Aspiration, ingestion, or insertion of objects into the nose or mouth may be unwitnessed. A problem may not be apparent until infection causes symptoms. A high index of suspicion must be maintained in babies and small children.

Several congenital abnormalities may present as chronic upper respiratory problems including choanal atresia, disorders of branchial arch development (e.g., Pierre Robin and Treacher Collins syndromes), palatal clefting, and mucopolysaccharioidoses (e.g., Hunter-Hurler syndrome). Children with hydrocephalus in whom a ventricular peritoneal shunt has become obstructed are prone to runny noses, probably related to increased intracranial pressure on the brain stem. Surgery should not be delayed pending resolution of coryza in a baby with a disconnected shunt.
Children with chronic adenotonsillitis are prone to respiratory obstruction, wheezing and increased secretions. Frequently they are overweight, mouth breathers with a history of sleep apnea and snoring. Such children are usually identified by history and are at increased risk for postoperative apnea.

Parents should be instructed to contact the surgical office on the day prior to surgery if a URI develops so that a distinction between allergy and infectious rhinitis may be made preoperatively. Children frequently present for elective surgery with an active or recent cold. The threshold for canceling the case varies widely between clinicians. Decision to cancel should consider the amount of secretions, coexisting pulmonary disease, the need for intubation, and the surgical site. Evidence based reviews of patient selection in the ambulatory setting (including office based anesthesia) indicate that as the database expands, more information regarding patient outcomes must be examined.

**Assessment of Respiratory Function**

Routine laboratory testing of children prior to anesthesia is not generally indicated. However, in the presence of an URI, performing a white blood cell count with differential may be indicated. White blood cell counts over 10,000/cu mm can be indicative of a bacterial infection and the patient may benefit from a course of antibiotics preoperatively. If chest sounds are clear, a chest x-ray will not provide additional useful information, even in the asthmatic child with a superimposed URI. Also, pulmonary function tests, including preoperative arterial blood gas analyses, will not offer any additional useful information.

Auscultation of the chest and careful inspection of the upper airway, ears and eyes should be performed. Erythema should be documented. Postponement of the case is probably prudent if examination reveals marked inflammation; bulging, tender eardrums; productive cough; purulent nasal secretions; temperature greater than 38.5°C; chest rales or bronchospasm. Wheezing is a common manifestation of viral upper respiratory tract disease in infants and, as a single symptom, may not automatically require that the case be cancelled, especially if intubation can be avoided. Surgery should not be rescheduled for 4-6 weeks which is a time frame that reflects the duration of hyperreactivity of the airways.

**Treatment**

In infants, therapies similar to those used to treat asthma are employed to treat virus induced wheezing but their efficacy remains controversial, especially in bronchiolitis. Warmed humidified gases should be used. Antiviral agents can shorten and decrease the severity of influenza infection but do not shorten the duration or degree of airway hyperreactivity. Although antibiotics are commonly administered to children less than one year of age, their use in that population has been associated with an increased risk of asthma. This risk increases with the number of courses of antibiotics prescribed. Corticosteroid use for the child with asthma has not been shown to adversely affect wound healing of increase the rate of infections postoperatively.

Atropine-like drugs are effective in blocking the vagal processes prior to intubation. A selective cholinergic drug may be useful. The drug should block only the muscarinic receptors (M3) on the smooth muscle without interfering with the inhibitory muscarinic receptors (M2), especially if the latter are partially damaged by the virus. Prototypes of selective M3 antagonists include hexahydrosiladifenidol and its analogue, parafluorohexa-hydrosiladifenidol.
Recombinant human neural endopeptidase has been given experimentally to guinea pigs, and has been shown to attenuate coughing for at least 2 hours.\(^{36}\) Dexamethasone has also been shown to decrease tachykinin induced plasma extravasation in animals, an effect that may be related to steroid stimulation of neural endopeptidase. Clinical application is not yet apparent.

**Perioperative Measures**

In 1991, Jacoby and Hirshman performed a literature review of the “cancel or proceed” controversy and suggested therapeutic strategies to decrease the incidence of complications associated with administering anesthesia to the child with a URI.\(^2\) These strategies were reiterated in 2005 by Tait and Malviya.\(^1\) Some general guidelines are shown in Table 4.

If possible, intubation should be avoided. Some studies have shown that the supraglottic airway is a safe alternative in children, even if positive pressure ventilation is required for prolonged periods.\(^{37}\) and wide experience has demonstrated its usefulness during tonsillectomy. However, Bordet et al, indicated that the incidence of respiratory complications was significantly increased when a LMA\(^\circledast\) was used.\(^{22}\) The time of device removal impacted development of complications.\(^{38}\) Children in whom the LMA\(^\circledast\) was not removed until they were awake were more likely to suffer critical events such as laryngospasm and temporary desaturation. For those children having the LMA\(^\circledast\) removed while still deeply anesthetized, there was a greater tendency to suffer respiratory obstruction.

If intubation is required, the child should be pretreated with atropine. The incidence of stridor post-extubation does not differ between patients intubated with non-cuffed and cuffed tubes, provided minimum leakage is maintained. Exubation should be delayed until the trachea has been adequately cleared of secretions. Desflurane may allow extubation at a relatively deeper plane with the patient subsequently awakening in 2-3 minutes.

Standard monitoring devices such as pulse oximetry must be used, even in the shortest cases, as they provide early warning of critical incidents thereby allowing sufficient time for prompt evasive action. Adequate warming and humidification of gases are essential. Less irritating agents such as sevoflurane are appropriate for induction rather than isoflurane or desflurane. Intravenous access should be established prior to induction. Pain caused by placement of the needle may be attenuated by application of EMLA \(^\circledast\) cream (remembering that absorption of the anesthetic may require 45 minutes). Transfer to the postanesthetic care unit with supplemental oxygen therapy which should continue for at least 30 minutes is strongly recommended. Adequate hydration must be maintained. As soon as the child wishes to drink, he/she should be permitted to do so, even in the absence of bowel sounds. However, forcing fluids to a child often results in vomiting and a delay in discharge.

**TABLE 4 Guidelines in the Perioperative Care of the Child with a URI**

- Avoid intubation if possible
- If intubation is required, pre-treat with atropine
- Continuous intraoperative monitoring of SpO2
- Administer supplemental oxygen during transfer and in the PACU
- Careful physician assessment prior to discharge
Discharge criteria from the ambulatory unit should include documentation that the child is awake and alert, afebrile, not wheezing, and with an adequate SpO2 (>95% on room air). Auscultation of the chest should also be performed and the findings noted. The parents must be given a contact telephone number at the hospital should they have questions or concerns later.

**Management of the case presented**

After consultation with the anesthesiologist, the surgeon and the parents, it was decided to proceed with the hernia repair. As the surgeon had several cases scheduled that day, it was possible to postpone the child to the second slot, allowing time for the EMLA® patch to become effective. A vein was cannulated with a #22 gauge needle and atropine 0.1mg administered. Propofol, 25mg, mixed with lidocaine was infused slowly and after the child lost consciousness, anesthesia was continued with desflurane. An LMA®, size 2 was inserted. The surgery proceeded smoothly and was completed within 20 minutes. The child was transferred to the recovery room with supplemental oxygen where his parents were waiting for him. There were no adverse sequelae.

**Summary**

Administration of anesthesia to a child with an URI increases the risk of an adverse respiratory event. However, the critical incidents that occur can almost always be detected quickly by a vigilant anesthesiologist and appropriate action can be taken to prevent morbidity and mortality. Each case should be reviewed individually. Children with a greater number or more severe symptoms are at greater risk of complications. Risks decrease with age, especially over 6 years, probably because of the anatomically larger airways. Problems are encountered much less frequently. All the specialists involved should work closely with the hospital, postanesthetic care unit and ambulatory center to develop discharge criteria for children presenting for surgery with URIs.

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References


POST-TEST

1. A diagnosis of URI is made if:
   a. the temperature exceeds 98.5°F
   b. the white cell count is 10,000/cu mm
   c. the child has a runny nose
   d. two or more of the above symptoms are documented

2. The most common infective agent in URI is:
   a. parainfluenza virus 3
   b. herpes simplex
   c. respiratory syncytial virus
   d. streptococcus

3. Respiratory viruses cause
   a. hyperreactivity of airways for up to 5 weeks
   b. decreased acetylcholine release
   c. reflex bronchodilation
   d. decreased ventilation perfusion shunt

4. Release of tachykinin is enhanced by:
   a. sensory neuropeptides
   b. histamine
   c. viruses
   d. neural endopeptidase

5. In a child with a history of asthma an elective procedure should probably be postponed if:
   a. the temperature is 38°C
   b. the child has a productive cough
   c. the white count is 9,500/cu mm
   d. the pediatrician insists
6. **Wheezeing:**
   a. is common in infants with URIs
   b. always warrants cancellation of a case
   c. means that the child has aspirated
   d. indicates that the baby is developing asthma

7. **Administration of anesthesia to a child with a URI:**
   a. increases the risk of critical events
   b. increases morbidity and mortality
   c. should only be undertaken if special consent is obtained
   d. generally cures the infection

8. **Critical events include**
   a. bronchospasm
   b. breath holding
   c. desaturation to 95%
   d. all of the above

9. **The disease which is most likely to mimic a URI is:**
   a. allergic rhinitis
   b. recent foreign body aspiration in the lower lobe
   c. pneumonia
   d. acute epiglottitis

10. **In the presence of an URI, intubation of the airway.**
    a. may be associated with a 10-fold increase in postoperative complications
    b. always results in severe croup
    c. should be preceded by treatment with atropine
    d. is not associated with increased critical incidents