# Common Pediatric Preoperative Concerns: What a Pediatrician/ Family Practitioner Needs to Know

Guideline developed and finalized 02/04/16 by Christie Yarnell, MD, in collaboration with the ANGELS Team.

## Key Points

- When a pediatric patient needs surgery with anesthesia, the child's health care provider should be actively involved in preparing the patient and family.
- Medical optimization of comorbid conditions prior to the day of anesthesia will decrease the risk of cancellation as well as facilitate a better experience for the patient and family.
- Educating the patient and family about the day of the procedure, NPO guidelines, and neurotoxicity associated with anesthesia can ease concerns and relieve anxiety.
- Medications used for anesthesia and sedation in infants and young children have been associated with possible neurotoxic effects. The current available evidence is inconclusive. Research and investigative efforts are in progress.

## Preparation for Surgery

Preparation for surgery may need to begin before the surgery is scheduled. The child's health care provider should do the following:

- Identify any health conditions of concern in the child's medical and family history; make sure this information is communicated to the anesthesiologist. See the "Anesthesia Prescreening Tool" in the Resources section.
- Treat the child's illness or manage the underlying condition. The goal is for the child to be in the best possible health at the time of the surgery with comorbid concerns optimized preoperatively.
- Encourage a preoperative consultation with the anesthesiologist for children with complex

medical conditions.
- Educate the patient's family by providing information about what to expect on the day of the surgery. Patient brochures, books, videos, and links to resources on the internet are options.

## Patient Medical Information

### Medical History

Before surgery the patient's medical history will be reviewed. Input from the child's health care provider is important so that all pertinent information will be considered. Advance preparations are needed before surgery for children with certain health conditions. Some specific preoperative health conditions of concern are listed in Table 1.

**Table 1. Preoperative Health Conditions of Concern**

To view a larger image on your device, please click or touch the image.

**Table 1.** Preoperative Health Conditions of Concern

| Health Condition | Concern |
|---|---|
| Central nervous system | • Autism<br>• Developmental delay<br>• History of trauma or abuse<br>• Poorly controlled seizures<br>• History of stroke |
| Airway | • Airway abnormalities<br>• Any syndromic facies<br>• Stridor |
| Respiratory | • Recurrent upper respiratory infections<br>• Lower respiratory tract infection<br>• Asthma<br>• Cystic fibrosis<br>• Pneumonia<br>• Hospitalizations for respiratory complications |
| Cardiac | • Congenital heart defects<br>• Arrhythmias<br>• Heart failure |
| Hematologic and oncologic | • Easy bruising or bleeding<br>• Personal or family history of bleeding/clotting problems<br>• Sickle cell disease, including serious complications and current therapy |
| Former prematurity | • Bronchopulmonary dysplasia<br>• Neurologic deficits<br>• Apnea or bradycardia<br>• Home oxygen therapy or monitoring<br>• Tracheal compromise due to prolonged intubation at birth |
| Overweight and morbidly obese | • Hypertension<br>• Type 2 diabetes<br>• Asthma |
| Diabetes | • Type 1<br>• Type 2 |
| Metabolic diseases | • Mitochondrial disorders<br>• Lysosomal storage diseases<br>• Galactosemia |
| Down syndrome | • Cardiac defects<br>• Unstable cervical spine symptoms (eg, myelopathy) |
| Need for isolation | • Recent methicillin-resistant Staphylococcus aureus (MRSA) infection<br>• Immunosuppression |

### Family History

Awareness of certain conditions from the patient's family medical history will help guide the choice of the most appropriate anesthetic agent or determine the need for specific laboratory testing. Important conditions include the following:

- Malignant hyperthermia (scheduling preference for first case of the day)
- Postoperative nausea and vomiting
- Pseudocholinesterase deficiency

### Physical Examination

- The health care provider's physical examination will be used as a baseline for comparison of the perioperative physical status.
- Provide any information that would be helpful to perioperative care providers, such as vital signs, respiratory problems, or health conditions of concern (see Table 1).

### Laboratory Evaluation

- Recent laboratory data will be evaluated. Additional tests may be ordered for specific procedures, illnesses, or identified risks. For example, a child scheduled for a posterior spinal fusion may be seen by an anesthesiologist the day before the procedure for a review of lab results.
- A urine pregnancy test is required prior to anesthesia for females because of uncertain effects of surgery and/or anesthesia on the developing fetus.
    - Discuss this requirement with the child's parents/caregivers. Make them aware that this testing is hospital policy and is routinely done for all females older than a specified age.
    - For individual circumstances this requirement may be waived, depending on the anesthesiologist.

## Patient Preparation

### Fasting Recommendations

The American Society of Anesthesiologists recommends the following NPO times (Table 2). For an example of a patient handout from Arkansas Children's Hospital, see Resources.

#### Table 2. NPO Guidelines

To view a larger image on your device, please click or touch the image.

**Table 2.** NPO Guidelines

| Intake | Prior to Surgery |
|---|---|
| Clear liquids | 2 hours |
| Breast milk | 4 hours |
| Formula, Non-human milk | 6 hours |
| Light snack | 6 hours |
| Solids or thickened liquids | 8 hours |

Information adapted from Practice guidelines for preoperative fasting and the use of pharmacologic agents to reduce the risk of pulmonary aspiration: application to healthy patients undergoing elective procedures. An updated report by the American Society of Anesthesiologists Committee on Standards and Practice Parameters. *Anesthesiology*. 2011;114(3):495-511. Available at http://dx.doi.org/10.1097/ALN.0b013e3181fcbfd9. Accessed September 2, 2015.

### Medication

- Most medications may be taken the morning of procedure with a sip of clear liquid.
- Certain medications (eg, ACE inhibitors) should not be taken before anesthesia.
- Diabetic patients should have a carefully developed medication strategy. See "Diabetes" in Management Recommendations.

### Consent and Assent

- Healthcare providers obtain consent from a legal guardian prior to performing surgery except in an emergency situation.
- Involving pediatric patients in some health care–related decisions at a developmentally appropriate level is highly recommended.
    - Children feel empowered if they are allowed to make some decisions about their perioperative experience.
    - This allows physicians to address questions and concerns directly from the child.

# Management

## General Health Issues

- Communicable diseases are common in children. Some diseases may result in cancellation of the surgery on the day of the procedure. In some cases surgery can proceed if restrictions are met or control measures are used.
- See the Resources section for an example of a communicable disease guideline chart for elective outpatient procedures. This chart lists restrictions and control measures used at Arkansas Children's Hospital.

### Specific Health Conditions

#### Central Nervous System

- **Children with special needs.** Anesthetic plans can be tailored for children with special needs, such as autism, developmental delay, or history of trauma or abuse.
- **Epilepsy.** Although anticonvulsant medications can increase the hepatic metabolism rate of some anesthetic medications, it is important to continue these medications in the perioperative

period.

#### Airway

**Airway abnormalities.** For a child with a potentially difficult airway, preparations are made in advance, including

- Appropriate scheduling to ensure support staff (eg, ENT) are available if needed
- Planning for postoperative care needs, such as possible admission to the hospital for observation and/or treatment of airway associated issues

#### Respiratory

- **Lower respiratory tract infection.** Children with a lower respiratory tract infection (productive or wet cough, wheezing) are likely to be rescheduled.
- **Upper respiratory tract infection.** Children with either an existing or recent (within 2 to 4 weeks) upper respiratory tract infection are more likely to have perioperative adverse respiratory events. These include laryngospasm, bronchospasm, breath holding >15 seconds, major oxygen desaturation (<90%), or severe cough. Additional variables that may influence the likelihood of adverse events include use of an endotracheal tube, history of prematurity, reactive airway disease, passive smoking, airway surgery, copious secretions, and nasal congestion. However, studies of pediatric patients with a mild-to-moderate upper respiratory infection have not demonstrated increased morbidity.

### Cardiac

**Congenital cardiac disease.** Advance preparations must be made for children with significant congenital cardiac disease.

- The child may need a pediatric cardiac anesthesiologist. These cases are reviewed at the time of scheduling to determine the appropriate anesthesiologist.
- Recent cardiology consultation can be beneficial in selection of anesthetic agents and identification of patients who need subacute bacterial endocarditis (SBE) prophylaxis.

### Hematologic and Oncologic

**Disease specific.** Depending on the specific disease process (eg, sickle cell disease), a preoperative hematocrit may be obtained by the anesthesiologist.

**Hematologic.** Patients with known bleeding disorders are typically seen by a hematologist well in advance of any surgical procedure. Medications are administered preoperatively as needed.

**Oncologic.** Pediatric oncology patients can require anesthesia care for many procedures, including intrathecal chemotherapy treatment, multiple imaging studies, or daily radiation therapy. Depending on chemotherapeutic agents, an echocardiogram, pulmonary exam, or other laboratory data may be needed.

### Former Prematurity

- Former preterm infants <60 weeks postconceptual age (PCA)
  - PCA = EGA-PNA (postnatal age)
- May be at risk for apnea following anesthesia and require admission to the hospital for observation.

- Anemia (HCT < 30%) can predispose a child to postoperative apnea; therefore, some anesthesiologists may request a hematocrit in young infants the day of surgery before anesthesia induction.

### Overweight and Morbidly Obese

- Comorbidities associated with overweight and obese children include preoperative diagnoses of hypertension, type 2 diabetes, and asthma.
- These children are more likely to have a difficult airway, upper airway obstruction in the recovery room and longer lengths of stay in the recovery room.

### Diabetes

- Preoperative evaluation by an endocrinologist is beneficial in development of an individualized patient strategy.
- The plan will be developed based on the age of the patient, length and complexity of the procedure, and how the diabetes is managed (oral medications or insulin regime).
- Clinical practice guidelines and algorithms can be helpful for managing tight glucose control.

### Metabolic Diseases

Some patients with metabolic diseases should have a genetics evaluation prior to anesthesia. A specific anesthesia care plan should be developed; preoperative consultation with the anesthesiologist is advised.

### Down Syndrome

Children with Down syndrome may have cardiac defects and unstable cervical spine symptoms (eg, myelopathy). However, routine cervical spine films for asymptomatic Down syndrome patients are not required.

## Anxiety

- Anxiety in the perioperative period is almost certain for both patients and parents. When the child experiences distress during this period, negative behavioral changes may occur postoperatively, including nightmares, aggression towards authority, and separation anxiety.
- Predictive factors for poor compliance during induction of anesthesia include age <4, previous anesthesia, preoperative anxiety, and short preoperative preparation time.
- Parental presence during the induction of anesthesia may be beneficial to the parent or patient in select circumstances.
- There is no perfect pharmacological option; many medications used for sedation (eg, midazolam, clonidine, ketamine, dexmedetomidine) have unwanted side effects, such as prolonged sedation, hypotension, excessive salivation, nystagmus, dysphoria, and adverse reactions.
- Nonpharmacological options that may decrease patient anxiety include acupuncture, clown doctors, low sensory stimulation, and playing video games on a hand-held device. One study found that tablet-based interactive distraction may reduce perioperative anxiety, emergence delirium, and time to discharge compared to oral midazolam.

## Postoperative Pain Control

- Pediatric patients benefit from multi-modal pain therapy after surgical procedures, such as peripheral nerve blockade and caudal and epidural medication administration. Therapies are

tailored based on each individual child and surgery.

- In 2015 practice advisories were published that specifically addressed the risks associated with neuraxial and regional anesthesia in a sedated or anesthetized child.
    - These practice advisories indicate that performing regional or neuraxial anesthesia on sedated or anesthetized pediatric patients or on developmentally delayed adults has an acceptable level of safety and should be the standard of care.
- Pediatric patients may also benefit from patient-controlled analgesia (PCA). With this method of pain control, the patient, nurse, or parent can press a button to safely administer pain medication as needed within predetermined limits. This is in addition to a continuous infusion of pain medication. The use of PCA has improved overall pain control and resulted in improved patient and family satisfaction.

# Anesthesia and Neurotoxicity

## Current Evidence

- Numerous animal studies have demonstrated that anesthetic exposure during a critical period of brain development may lead to neurodegeneration and abnormal synaptic development with functional deficits in learning and behavior later in life.
- Almost all anesthetic medications have been implicated (eg, inhalational anesthetics, propofol, benzodiazepines, ketamine, nitrous oxide). The only medications deemed completely safe thus far are local anesthetics and narcotics.
- These neurotoxic effects seem to be dependent upon age and number of anesthetic exposures.
- Possible adverse effects include neurological injury, learning disabilities, and attention deficit hyperactivity disorder (ADHD); however, causality has not been consistently demonstrated.
- Human cohort studies thus far are retrospective, have confounding variables, or are inconclusive.

## Continuing Research and Investigative Efforts

- Concerns about the effect of anesthesia on the brains of young infants and children have resulted in research and investigative efforts.
    - In 2009 the International Anesthesia Research Society and the Food and Drug Administration (FDA) established SmartTots—a research initiative to investigate potential toxicity of drugs used for anesthesia and sedation in infants and children.
    - The following 2 large-scale studies are being conducted:
        - The Pediatric Anesthesia and NeuroDevelopment Assessment (PANDA) is a multisite, ambidirectional, sibling-matched cohort study in the US. The purpose is to examine the neurodevelopmental effects of exposure to general anesthesia during inguinal hernia surgery before 36 months of age.
        - GAS is another study designed to compare neurodevelopmental outcome between 2 anesthetic techniques (general sevoflurane anesthesia and regional anesthesia) in infants undergoing inguinal hernia repair. Although the primary endpoint of cognitive development is a test of intelligence at age 5, a recent secondary endpoint indicated no difference in cognitive development at the 2 year timepoint for surgical procedures lasting less than 1 hour. However, some changes may not be apparent at this early stage.
- The most recent Consensus Statement (October 2015) indicates that the initial data from the GAS study is encouraging, but many questions remain unanswered. The current recommendations include answering questions parents may have and emphasizing the importance of animal data versus data in children. In addition, decisions to proceed with

surgery or anesthestics should be a combined, team approach, weighing the benefits of the surgery against the potential risks of anesthesia.

# Resources

## For Health Care Providers

The Pediatrician’s Role in the Evaluation and Preparation of Pediatric Patients Undergoing Anesthesia (American Academy of Pediatrics Policy Statement)

SmartTots

Anesthesia Prescreening Tool

**Anesthesia Prescreening Tool (Arkansas Children’s Hospital)**

## Anesthesia Pre-screening Tool

If any condition below is checked, please call to inquire about a pre-operative anesthesia evaluation prior to the day of surgery through ACH Ambulatory Surgery Center at (501) 364-4341

**ANESTHESIA HISTORY**

__Has had a life threatening problem with anesthesia or anesthesia medications.( does not include nausea/vomiting)

__Family history of Malignant Hyperthermia or unexplained deaths with anesthesia

__Previous difficult intubation

**SURGERY PLAN**

__The patient could require **ICU care** following the procedure.

**MEDICAL HISTORY**

__Patient is less than 3 months of age

__Severe OSA with a positive sleep study or requiring CPAP and/or AHI >10

__Abnormal airway anatomy

__Congenital heart defect/ Arrhythmia/ Hypertension

__Asthma (hospitalized within the last 3mth.)

__Epilepsy/Seizures-poorly controlled

__Severe scoliosis

__Muscular Dystrophy/Myasthenia Gravis

__Status post transplantation of any solid organ

__Thyroid/Adrenal/Metabolic disorders

__Down Syndrome

__Hunter's syndrome

__Hurler's syndrome

__Severe Behavior problems excluding ADHD

__Aspiration pneumonia within the last 3 months.

__Chronic lung disease (BPD, Cystic fibrosis)

__Home mechanical ventilation and/or 02

__Liver disease

__Morbid obesity

__Acute or Chronic Renal failure

__Anemia (transfused in past 2-4 wks)

__Sickle Cell Disease

__Bleeding disorder

__Cancer (currently being treated)

__Autism with special needs

__Craniofacial abnormalities

__Diabetes

**Any patient having the following procedures requires a Pre-operative Anesthesia Evaluation prior to the day of surgery:**

- Posterior spinal fusion
- Cranioplasty
- Major oral/mandibular surgery with possible airway issues
- Kidney transplantations
- Morbidly obese patients undergoing ENT procedures
- Complex patients for dental cases

___Is the patient considered an **ASA 3 or 4** physical status?

**If ANY diagnosis above is checked, please schedule the patient for an anesthetic pre-operative consult through ASC prior to the day of surgery.**

**Contact #364-4341 and ask for the team leader**

**ASA Physical Status 1** - A normal healthy patient

**ASA Physical Status 2** - A patient with mild systemic disease

**ASA Physical Status 3** - A patient with severe systemic disease

**ASA Physical Status 4** - A patient with severe systemic disease that is a constant threat to life

**ASA Physical Status 5** - A moribund patient who is not expected to survive without the operation

**ASA Physical Status 6** - A declared brain-dead patient whose organs are being removed for donor purposes

JA 2012

# Communicable Disease Guideline Chart for Elective Outpatient Procedures (Arkansas Children's Hospital)

**Table 1. COMMUNICABLE DISEASE GUIDELINE CHART FOR ELECTIVE OUTPATIENT PROCEDURES**

If it can be treated before surgery, please treat

These are generalized recommendations, and can be variable based on patient and anesthesiologist

| Disease & Incubation | How Transmitted | When Communicable | Restrictions at ACH | Additional Control Measures |
|---|---|---|---|---|
| **Cytomegliovirus** | Contact secretions with infected infant. | 3 to 8 weeks after exposure | | Strict hand washing procedures |
| **Chicken Pox (Varicella)** | Airborne or direct contact w/vesicle fluid | 1-2 days before outbreak, till blisters dry | Until all the blisters have dried | Vaccination and isolation of sick individuals. |
| **Diarrheal Diseases: (Varies) Salmellosis Shigellosis Giardiasis Rotaviral Enteritis E Coli 0157:H7 Cryptosporidiosis Campybacteriosis** Varies from 6-14 hrs | Fecal-oral route, through contaminated articles, food/beverages and hands. | Throughout acute infection and as long as organisms are in stool. | Until diarrhea is gone for 24 hours | Proper handwashing, sanitize all contaminated articles and equipment. |
| **Fifth Disease**<br><br>4 - 21 days | Sneezing & coughing on others, contact with mucus or saliva, contaminated articles | Prior to onset of rash; Not communicable after onset of rash. During the week prior to the rash appearance. | Depends on respiratory status | |
| **Hand, Foot & Mouth (Coxsackie Virus)** Up to 6 days, usually 3-6 days. | Direct contact with nose & throat secretions and with feces | During acute stage of illness (virus may stay in stools for several weeks) | Self-limited, exclude during acute symptoms (serious in young infants). Lesions should not be weeping. | |
| **Head Lice (Pediculosis)** Eggs hatch in 7 days/1 week (can multiply in 8-10 days, lives 20-30 days). | Direct contact with infested individual or their clothing, article to article contact, i.e. coats, blankets and hats. | As long as live lice remain on an infested person, or until eggs are 1/4" away from scalp | Until after child is treated once | Protective covering (hat) |
| **Hepatitis A**<br><br>15-50 days. Average 25-30 days | Fecal-oral route, through contaminated articles, food/beverages & hands. | Two weeks prior to jaundice until 1 week after jaundice (yellow) appears. If no jaundice one week prior until 2 weeks after symptoms | Variable depending on severity of symptoms | |
| **Impetigo**<br><br>4-10 days Staphylococcus Streptococcus 1-3 days | Direct contact with infected area or with nasal discharges from infected child. | When weeping, crusted lesions are present. | on antibiotic Rx for 24 hrs. and lesion no longer "weeping" and forming yellow crust. | Cover draining lesions? |
| **Influenza** | Virus spread from resp secretions | 1 day before symptoms, until up to 7 days after symptoms begin | Post-pone elective procedures until 2-6 weeks, depending on severity of symptoms | |
| **Measles** | Droplet and direct contact with nasal or throat secretions. | 7-18 days from exposure | From time of initial fever till 4 days after rash | |

| | | | | |
|---|---|---|---|---|
| | | | appears. | |
| **Meningitis**<br><br>Bacterial: 1-10 days (usually less then 4 days)<br>Viral: Varies | Sneezing & coughing on others, contact with mucus or saliva, contaminated articles, or fecal-oral route- depending upon organism involved | Bacterial-Noncommunicable 24 hrs. after starting antibiotic Rx. Viral-Prolonged period | Reschedule until treated and symptoms resolved | |
| **Pertussis** | Direct contact with oral or nasal secretions | 6-20 days | 5 Full days after azithromycin or 14 days for erythromycin | |
| **Pinkeye (Conjunctivitis)** *Bacterial:* 24-72 hrs. *Viral:* Usually 12-72 hrs. (3 days) | Contact with discharges from eye, nose or mouth. Contaminated fingers and shared articles. | During active symptoms and while drainage persists. Dependent upon cause of the infection. | Exclude until drainage/secretion of eye is gone or on antibiotic Rx for full 24 hrs. | |
| **RSV (Respiratory Syncytial Virus)** 1-10 days | Virus spread from resp. secretion (sneezing, coughing) through close contact with infected persons or contaminated surfaces or objects. | Just prior to symptoms and when febrile | Reschedule 4-6 weeks from diagnosis | |
| **Ringworm**<br><br>(Varies by site) Mainly: 4-10 days | Personal contact with infected humans or animals, skin to skin contact or with contaminated articles | As long as lesions/infection is active. Some lesions may not be seen with the human eye. | If on Rx, ok; otherwise exclude unless lesions are coverable | |
| **Roseola**<br><br>5-15 days | To susceptible person with direct contact, (children under 4 may be susceptible, usually on children under 2) | Uncertain | Variable | |
| **Rubella** | Contact with nasal and throat secretions. | 14-23 days | 7 days from onset | |
| **Strep Throat/Scarlet Fever** 1-3 days (rarely longer) | Sneezing & coughing on others, contact with mucus or saliva, contaminated articles. | 2 days before symptoms until on antibiotic Rx for 24- 48 hrs. Untreated cases 10- 21 days. | Exclude until on antibiotic Rx for full 24 hrs. and no fever | |
| **Scabies**<br><br>2-6 weeks-initial exposure<br>1-4 days-Re- exposure | Skin to skin contact. Shared clothing. | Until mites are destroyed | 24 hours after treatment completed. | |
| **Viral Respiratory Illness** | Respiratory | Variable | Variable depending on severity of symptoms, upper vs lower respiratory tract involved, and patient's baseline; reschedule 1-4 weeks if possible | |



## NPO Guidelines

**Table 2.** NPO Guidelines

| Intake | Prior to Surgery |
|---|---|
| Clear liquids[1] | 2 hours |
| Breast milk | 4 hours |
| Formula, Non-human milk | 6 hours |
| Light snack[2] | 6 hours |
| Solids[3] or thickened liquids | 8 hours |

1. Clear liquids include: Pedialyte®, Gatorade®, water, apple juice, white grape juice, sprite, clear tea, black coffee, gum if not swallowed

2. Light Snack: Late cases after noon, may be allowed (depending on anesthesiologist) a light snack (1 piece of dry toast or 4-6 crackers and a clear liquid) if absolutely necessary.

3. Solids include: food, Simply Thick® or Thickit®, AR® (added rice formula), cereal, gum if swallowed, broth

### For Patients

- Anesthesia and Children: Information for Parents
- Society for Pediatric Anesthesia
- Pediatric Anesthesia and Pain Medicine (Arkansas Children's Hospital)
- Cardiothoracic Anesthesia Team (Arkansas Children's Hospital)

*This guideline was developed to improve health care access in Arkansas and to aid health care providers in making decisions about appropriate patient care. The needs of the individual patient, resources available, and limitations unique to the institution or type of practice may warrant variations.*

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