



بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ
السَّلَامُ عَلَيْكَ وَرَحْمَةُ اللَّهِ وَبَرَكَاتُهُ



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**OPERATIVE CARE FOR
PULMONARY AND
RHEUMATOLOGIC
PROBLEMS IN
PEDIATRIC**

GOALS

- **To decide if child fit to operation or not.**
- **To know the cautions if child undergoes urgent surgery & has pul., or connective tissue disease.**
- **To know pre & postoperative care for certain respiratory & connective tissue disease.**



**Most common
adverse
events
resulting from**

**Respiratory
events
during
procedure**

**Vomiting
during
recovery
period**

General anesthesia

Induction

**Excitation of
airway reflexes**

**Laryngospasm
secretion ↑
Bronchospasm**

depth of anesthesia ↑

↓ **Ms contractility**

↓ **Ciliary clearance**

**Central respiratory
response to hypoxia
↓ & hypercapnia**

↓ **Lung volume**

**increase intrapulmonary ↑
shunt**

**LIFE THREATENING
CONSEQUENCE**

**Upper airway obstruction
Hypoventilation
Hypoxemia**

The conditions compound the risks of : anesthesia

- Prematurity.

- Respiratory or airway diseases:
(e.g. asthma, BPD, URTI, CF).

 So detailed information about preexisting
respiratory disease should be available
to the anesthesiologist



UPPER RESPIRATORY TRACT INFECTIONS

To the PCP, Dx is of reassurance: “it's just a cold.” To pediatric anesthesiologist, a URTI is Dx that mandates a careful risk, benefit & .consequence analysis



Incidence

- **Children (especially infants) > respiratory events than adults.**
- **risk decreases by 8% ↑ yr of age.**
- **In children < 9 yrs incidence of laryngospasm is 17.4 per 1000 .**
- **Rate increased > 5-fold active (URTI) & > 3-fold in children with reactive airways disease.**



The incidence

The incidence of perioperative respiratory events is increased 7 times in children with URTI and 11 times .if the child is intubated

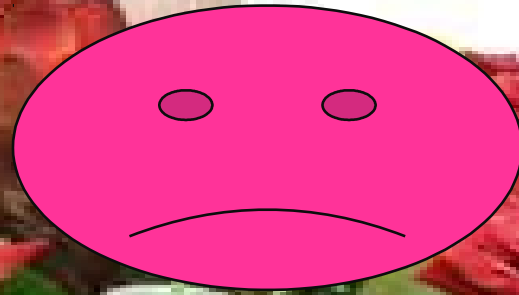
Children with URTIs undergoing elective cardiac :surgery

fold ↑ incidence of airway-4 *

, complications at induction of anesthesia

fold of postoperative respiratory-2 *

, complications



**Risk of airway complications
remains high for up to 6 wks
after a URTI, probably as a
result of altered airway
reactivity**

Risk Factors for Adverse Perianesthetic Respiratory Events During Acute URTI

- Age < 5 yr**
- Copious secretions**
- Plan for endotracheal intubation required for procedure**
- Hx of reactive airway disease**
- prematurity**
- Parental smoking Hx**
- URTI within previous 4 wks**
- Wet* cough**



:mild to moderate URTI management

- ❖ Oxygen supplementation,
- ❖ Inhaled beta-agonists,
- ❖ Corticosteroids.
- ❖ ↑ post anesthesia care unit stay,
- ❖ Small percentage of patients require unplanned hospitalization for stridor, pneumonia, or other complications.



**Exception
in mild
URTI**

- **Child < 1yr.**
- **s\s of asthma.**
- **Procedure
required
tracheal
intubation.**



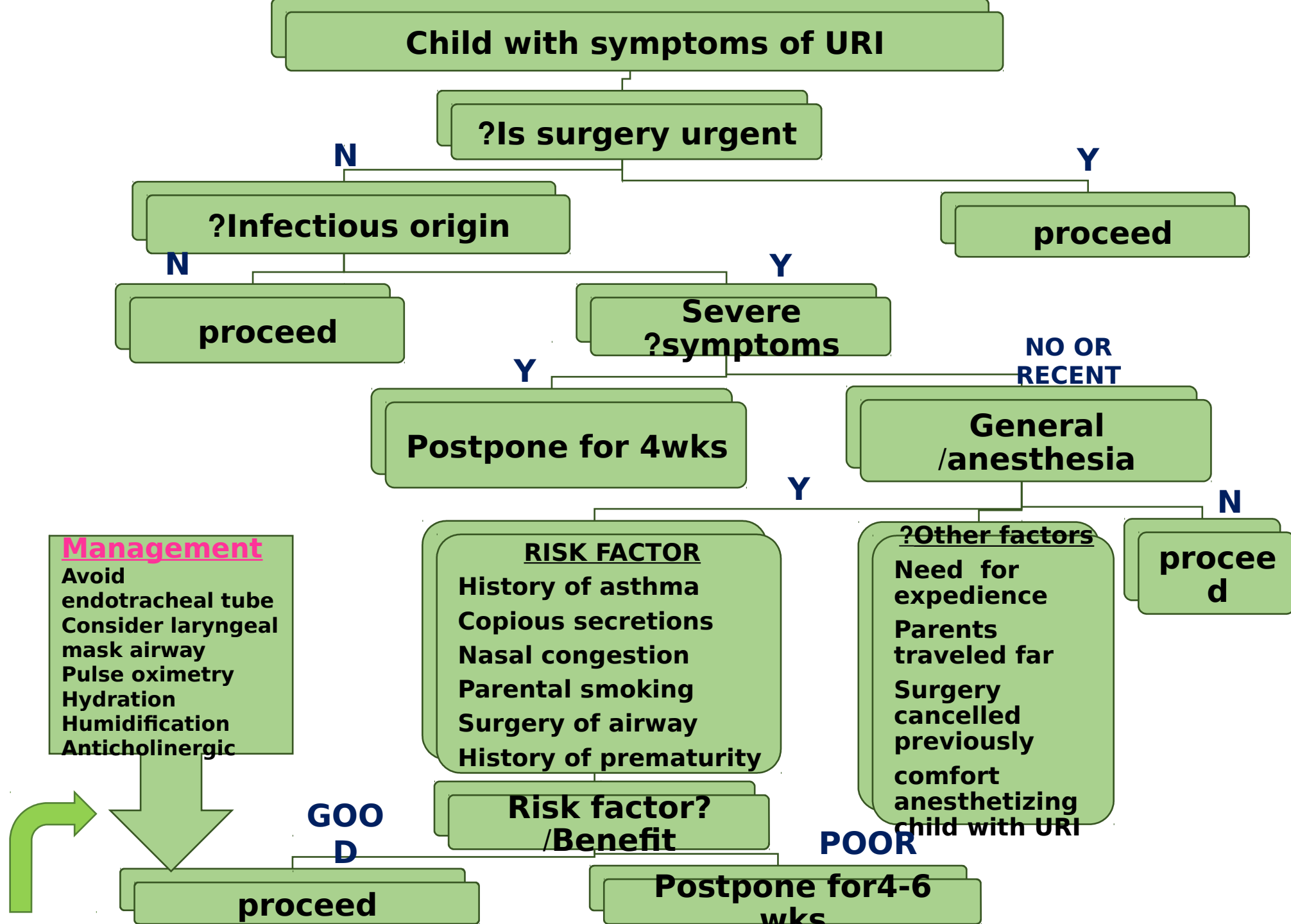
Emergency or Urgent Procedures and RTI

Minimal Interference Technique:

- **Administration of a volatile agent with a mask**
- **Avoidance of tracheal intubation.**

Maximal Support Technique:

- **If the surgery requires tracheal intubation must be used with**



ASTHMA

:goals of anaesthesiologic management

- To prevent catastrophic event of intraoperative bronchospasm.**
- To tailor an anesthetic plan to child to ensure an adequate airflow, avoiding drugs & techniques associated with increasing pulmonary resistance.**

Preoperative assessment and risk factors evaluation

History

(Uncontrolled bronchial hyper reactivity represents most important risk factor for perioperative adverse respiratory events in asthmatic patients.)

poorly controlled disease:

- ✓ Recent flare of the disease requiring oral corticosteroids,
- ✓ Increased use of inhaled short-acting β_2 -agonists,
- ✓ Recent exacerbation of asthma symptoms,
- ✓ The occurrence of emergency room or hospital visit during the last months.

Hx of at least two family members having asthma, atopy, or smoking ↑ risk for perioperative respiratory adverse events.



ASTHMA

Children are not candidates for procedures performed at freestanding facilities if

- ✓ **Hospitalized for asthma within the previous 3 mo.**
- ✓ **Had an exacerbation in the previous month.**
- ✓ **Have a room-air oxygen saturation**

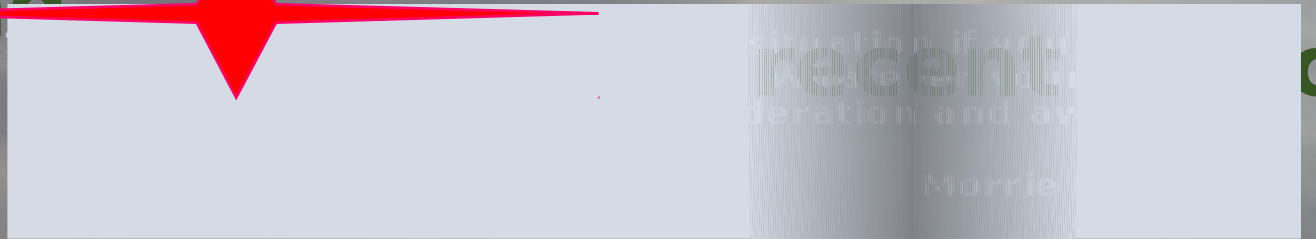


ASTHMA

... *Elective surgery never be performed in a child*

wheezi

na



recently

Morrie

ck

Decreased peak expiratory flow & (FEV₁) occur in adults and children for up to 6 wks after an acute asthma attack & airways are more reactive and prone to bronchospasm in this period

: Preoperative Medical the



- **children who take asthma medications only as needed should use of their inhaled beta-agonists or oral medications 3 - 5 days preoperatively.**
- **Children taking medications on a long-term basis (oral or inhaled) should have steroids added in doses that are normally used for an acute exacerbation.**

: preoperative Medical th



➤ ***Difficult* asthmatic child who takes bronchodilators & steroids regularly:**

- **Intensification in frequency of nebulizer ttt.**
- **Added bronchodilators.**
- **↑ steroids.**

Theophylline



Children taking theophylline should have serum levels measured preoperatively to → optimize drug use & avoid possible toxic effects **arrhythmias** in setting of local or general anesthetic, or catecholamine use (topical or infiltration administration .of epinephrine or cocaine)

Intraoperative Management

- ✓ Avoid as much as possible all potential stressful events.

Midazolam (PO or PR)


(oral midazolam 0.5 mg/kg; the rectal midazolam 0.6 mg/kg)

- ✓ inhaled β_2 agonists (salbutamol).
- ✓ Prednisone, 1mg/kg given 12 - 24 hrs before surgery



Induction and maintenance

Airway

- **Face mask or laryngeal mask more reliable than tracheal intubation.**
- **Endotracheal intubation better if  bronchospasm or(obviously laryngospasm) occurs.
uncuffed endotracheal tubes.**
- **Bronchospasm observed after endotracheal intubation under sevoflurane in mildly to**

Induction and maintenance

Muscle relaxation

- ❖ vecuronium
 - ❖ cisatracurium
- safe in the asthmatic patient.

Inhalational agents

- ❖ Sevoflurane is the most used volatile agent for anesthesia in children.
- ❖ inhaled β_2 -adrenergic agonists.

- ❖ Intravenous agents:

Perioperative complications

complications due to airway management

- Bronchospasm
- Laryngospasm
- Cough
- oxygen desaturation
- stridor

مطابق

complications due to air trapping

- Hypotension
- Pneumothorax
- subcutaneous emphysema
- cardiac arrest

Postoperative Care



An adequate post-operative pain control may reduce the risk of complications and improve the . outcome

OBSTRUCTIVE SLEEP APNEA SYNDROME

Upper airways obstruction is a consequence of (OSAS)

➤ abnormal upper airways anatomy syndrome ,

Congenital, as in Pierre Robin

Acquired as in adenotonsillar

hypertrophy.

➤ upper airways dysfunction,

➤ or both.

✓ Adenotonsillar hypertrophy is 1ry cause of (OSAS) in children age 2 - 6 yrs.

✓ Obesity,

✓ Airways dysfunction may be the result of central nervous system dysfunction, neuromuscular diseases, or hypotonia.

✓ Children with OSAS commonly have a combination of obstructive and central



Children with OSAS undergoing adenotonsillectomy have a 10% to 30% incidence of perioperative complications

➤ Complications

- ❖ Laryngospasm,
- ❖ pulmonary edema,
- ❖ postoperative airway obstruction & respiratory arrest

➤ Risk factors for complications :

- ❑ Age < 3 years,
- ❑ Severe OSAS on polysomnography,
- ❑ Prematurity.
- ❑ Right-ventricle hypertrophy,
- ❑ Pulmonary hypertension,
- ❑ Recent URTI,
- ❑ Respiratory distress,
- ❑ Trisomy 21,
- ❑ Craniofacial anomalies,
- ❑ Neuromuscular disease,

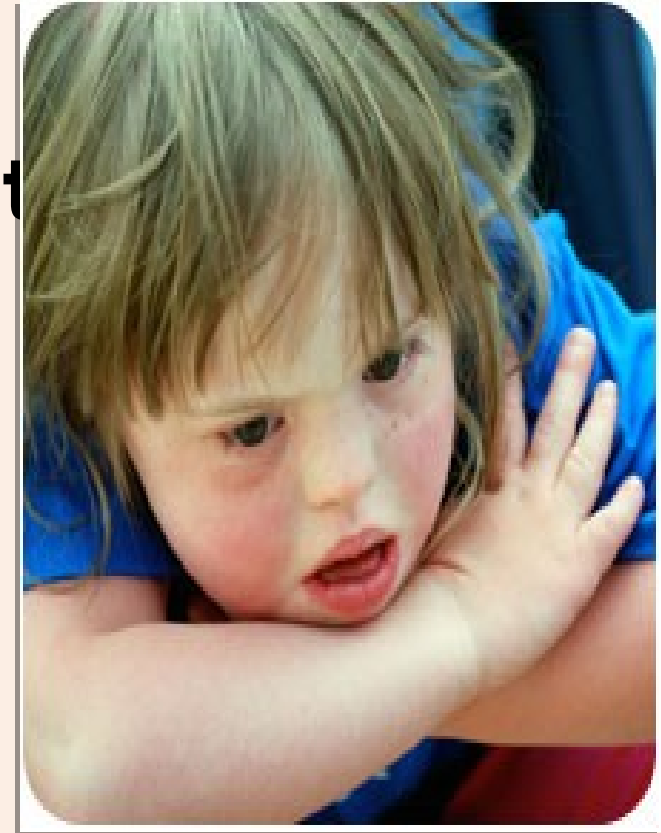


**children < 3 yrs have a high rate
of postadenotonsillectomy
airways obstruction and
respiratory complications so
should be admitted overnight
for observation and monitoring,
including cardiorespiratory
monitor and continuous pulse
.oximetry**

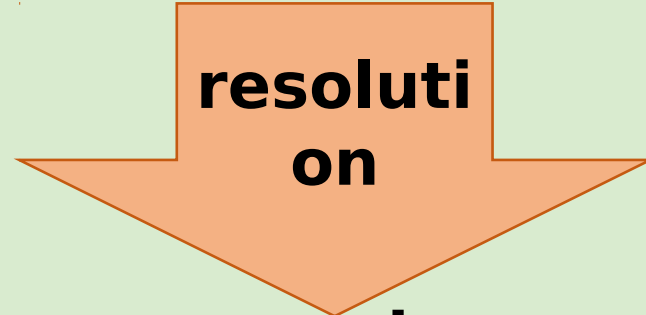


Preoperative laboratory tests:

- ✓ **Baseline room-air oxygen saturation**
- ✓ **Hematocrit.**
- ✓ **Electrolytes.**
- ✓ **PT, pTT.**
- ✓ **Chest x -ray.**
- ✓ **ECG.**
- ✓ **echocardiographic evaluation.**



Laryngospasm → pulmonary edema → Low oxygen saturation



**oxygen requirement ↑
usually occurs in 4 to 8
hours**

**Treated with 100%
oxygen by mask and a
single dose of
furosemide**



**overnight
monitoring in a
high-
observation
unit**

BRONCHOPULMONARY DYSPLASIA

perioperative risks are

- ❖ Bronchospasm,
- ❖ Atelectasis,
- ❖ Pneumonia,
- ❖ Respiratory, and possibly cardiac





- **Bronchodilators, antibiotics, diuretics, nutritional support & corticosteroid therapy all may benefit .**
- **Respiratory infections or bronchospasm must be treated thoroughly before elective surgery.**
- **Those with severe BPD and bronchospasm, preoperative treatment with ↑↑ inspired oxygen tension may ↓↓ pulmonary vasoreactivity & improve cardiovascular function.**
- **Right-ventricular dysfunction should be considered & when indicated, evaluate with (ECG) &**

➤ **Children taking diuretics e.g. furosemide ,spironolactone on a long-term, require a preoperative measurement of their S. electrolytes.**



➤ **Infants receive frequent courses of corticosteroids perioperative steroid coverage may be required.**

➤ **They require continuous postoperative monitoring and ventilatory assistance for an extended period (24 to 48 hours).**

➤ **Risks of general anesthesia& intubation can sometimes be avoided with judicious use of either a laryngeal mask airway or a regional anesthetic.**

CYSTIC FIBROSIS

:Children with CF mostly require anesthetics for

- Otolaryngology procedures (e.g. sinus surgery),
- Central line placement,
- Bronchoscopy,
- Esophagoscopy,
- Laparotomy for intestinal obstruction
- The placement of enteral feeding devices.

Incidence of postoperative complications 10 - 22%
perioperative mortality 1 - 5 %. Mostly pulmonary



CYSTIC FIBROSIS

perioperative evaluation is to determine the severity of their pulmonary disease and use all methods possible to optimize it in consultation .with the pediatric pulmonologist

- Pulmonary function tests.**
- Chest X-ray & CT .**
- Preoperative room air pulse oximetry.**
- Echocardiographic evaluation.**



❑ **Preoperative nutritional support & pancreatic enzyme supplementation will ↓ ↓ effects of growth failure & hypoalbuminemia on anesthetic pharmacodynamics.**

❑ **Correction of electrolyte and coagulation abnormalities .**



Complications in the PACU

- **Respiratory Depression**
- **Atelectasis**
- **Postoperative stridor**
- **Postoperative Apnea**



Postoperative Care

POSTINTUBATION CROUP

- ❑ Children are more than adults.
- ❑ Incidence has been lowered from 6% to 1% of all endotracheally intubated children.

This reduction through

- ✓ Use of sterile, implant-tested endotracheal tubes.
- ✓ Routine intraoperative use of humidified administered gases.
- ✓ Using appropriately sized , uncuffed endotracheal tubes.

:Treatment



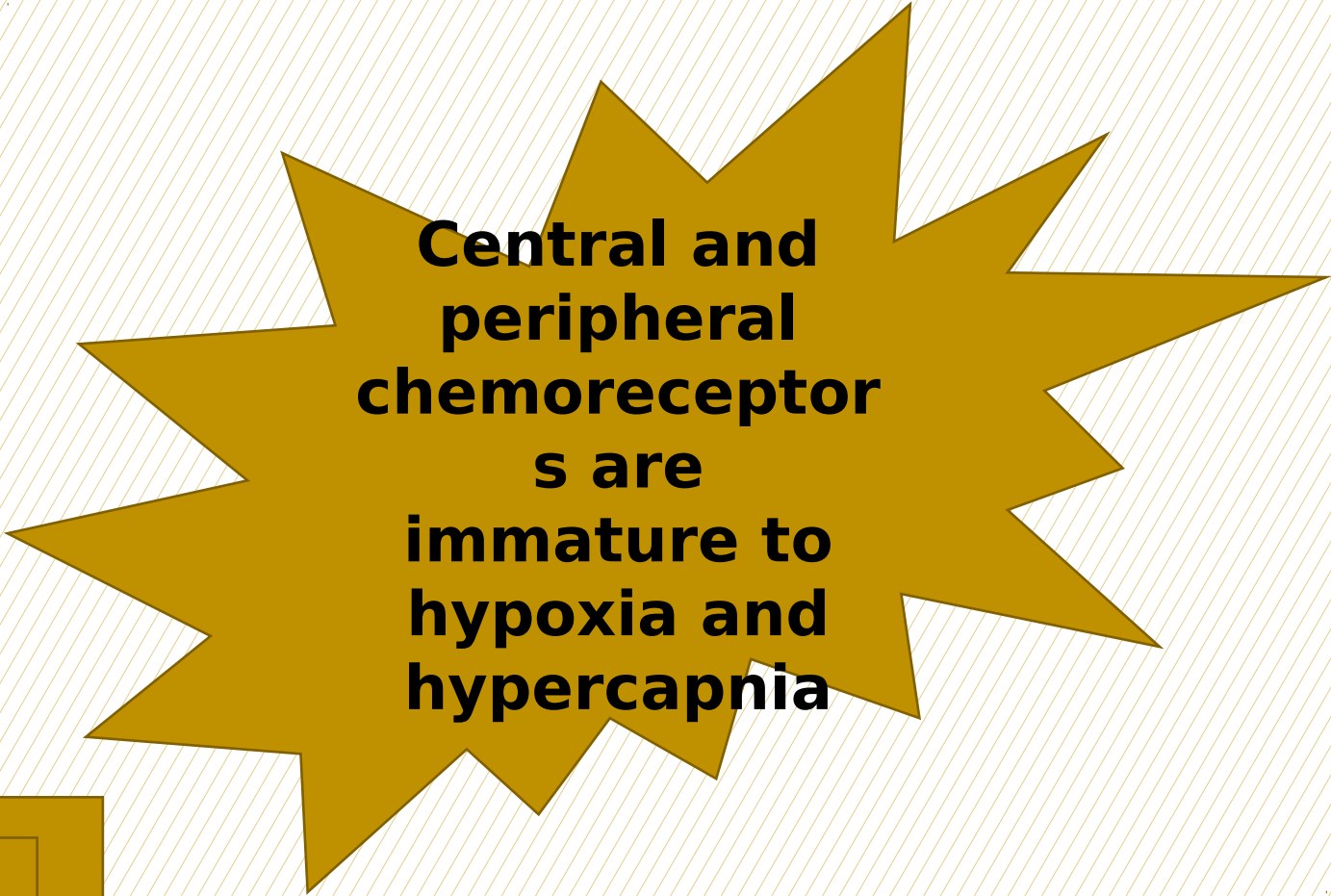
- **As viral laryngotracheitis is effective in most cases . Humidification is**
- **Nebulized racemic epinephrine therapy is rarely necessary.**
- **Patients should not be discharged from the PACU to their homes.**
- **Must be admitted for overnight observation because of the potential rebound edema formation.**
- **Corticosteroids is controversial.**

A close-up photograph of a newborn baby sleeping peacefully. The baby's face is the central focus, with their eyes closed and a calm expression. They are being held gently by a person's hands, which are visible at the bottom and left sides of the frame. The background is a soft, out-of-focus grey. Overlaid on the image is the text 'POSTOPERATIVE APNEA AND PREMATUREITY' in a bold, pink, sans-serif font.

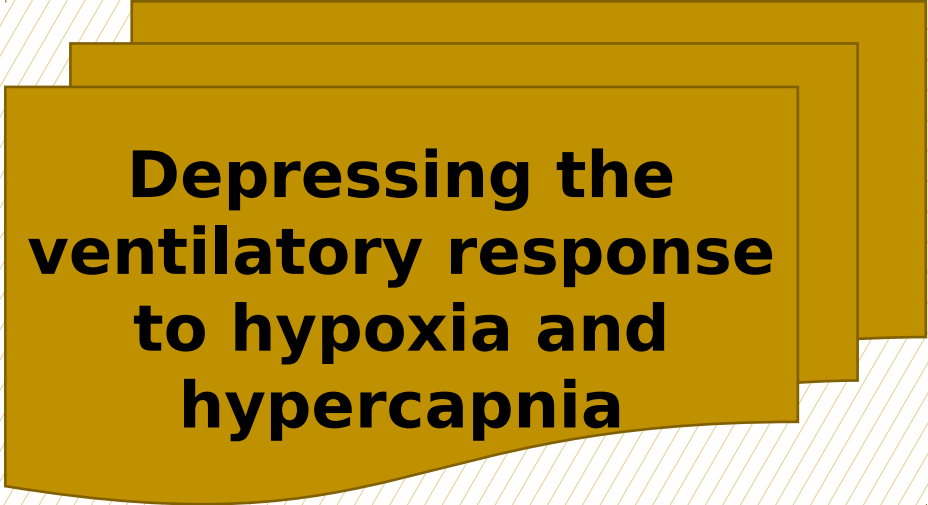
**POSTOPERATIVE APNEA AND
PREMATUREITY**



Anesthetic agents



Central and peripheral chemoreceptors are immature to hypoxia and hypercapnia



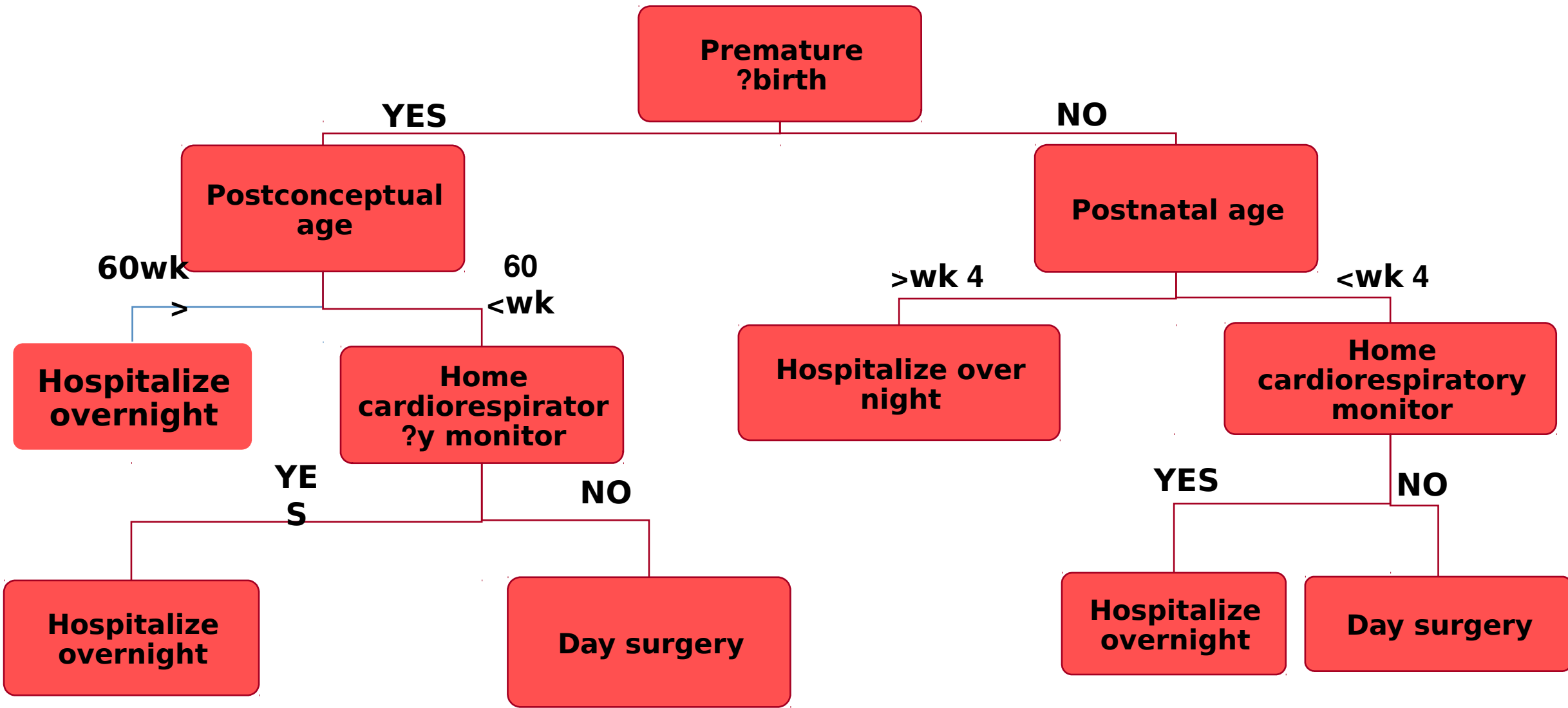
Depressing the ventilatory response to hypoxia and hypercapnia

Postanesthetic apnea

- **Postoperative apnea is serious**
- **central in origin , brief , frequently resolves either spontaneously or with minor stimulation.**
- **Most episodes occur within first 2 hours after an anesthetic but can be seen for up to 12 hours.**
- **The safest course is to monitor premature infants < 60 wk postconceptual age**
- **full-term infants younger than 1 mo for at least 24 hr after anesthesia.**

The risk of apnea can be ↓ by both perioperative use of caffeine & regional anesthesia instead of .general anesthesia



Admit all at-risk patients (postconceptual age wks), regardless of anesthetic 60 < technique used for monitoring in





CONNECTIVE TISSUE DISORDERS

CONNECTIVE TISSUE DISORDERS

- Children may have multiple organ systems involvement.
- They often treat with aspirin or other NSAID  complicate perioperative management further by causing a bleeding diathesis resulting from platelet dysfunction.
- Aspirin and NSAID drug  stopped 1 week preoperatively.
- If cannot be stopped, then a bleeding time performed to evaluate platelet impairment.

CONNECTIVE TISSUE DISORDERS

Problems should be considered

- Dysphagia & esophageal dysmotility → pulmonary aspiration .
- Extensive fibrosis of the temporomandibular or cricoarytenoid joint complicate endotracheal intubation.
→
- Pulmonary infiltration and fibrosis → intraoperative hypoxemia.
- Hematologic abnormalities, e.g anemia of chronic disease, may complicate management further.

S O

:The history should focus on

- Extent of disease,
- Type of treatment,
- The child's response to therapy.

Laboratory assessment:

- ECG and chest x-ray;
- Electrolytes, blood urea nitrogen, creatinine, Hb, hematocrit, and platelet ,evaluation of the peripheral blood smear.



**THANK YOU FOR
ATTENTION**