Update on Pediatric Ambulatory Anesthesia

Rita Agarwal MD, FAAP
Clinical Professor of Anesthesiology
Stanford School of Medicine

Disclosure

I've moved

Introduction

<table>
<thead>
<tr>
<th>Table 1:</th>
<th>Statistics on ambulatory surgery in patients younger than 15 years of age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total ambulatory procedures (all ages)</td>
<td>51,379,900</td>
</tr>
<tr>
<td>Ambulatory procedures younger than 15 y</td>
<td>3,744,850</td>
</tr>
<tr>
<td>% Case breakdown—patients younger than 15 y</td>
<td></td>
</tr>
<tr>
<td>Abdominal and rectal</td>
<td>86.7,400</td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>67.0,500</td>
</tr>
<tr>
<td>Genitourinary</td>
<td>30.1,000</td>
</tr>
<tr>
<td>Orthopaedic procedures</td>
<td>246,000</td>
</tr>
<tr>
<td>Operations on the major genital organs</td>
<td>146,900</td>
</tr>
<tr>
<td>Adenoidectomy</td>
<td>122,800</td>
</tr>
<tr>
<td>Hernia repair</td>
<td>77,000</td>
</tr>
</tbody>
</table>


Common Considerations

- Patient selection:
  - ASA 3, 4
  - Ex-premature or young infant
  - Sleep ordered breathing/OSA
  - Presence of URI
  - Post-operative Pain
  - PONV

Goals of Lecture:

- Discuss:
  - Child with a runny nose
  - Ex-premature infant
  - Sleep Disordered Breathing/OSA
  - Patients undergoing T&A
  - Post-Operative Pain

Included in Handout:

- Previously undetected murmur

Will discuss on Tuesday:

- Post operative Respiratory Complications
- Surgical Environment
- Codeine
- And more
95% of RTI are viral—wide spectrum of species and respiratory tract involvement

Hyper-reactivity of airways is common for several weeks

Airways may be more sensitive to "irritants" (secretions, anesthetic agents etc.)

Pulmonary function tests - ↓ FVC, FEV₁ and PEF

↓ Diffusion capacity and ↑ desaturation after apnea

… "although anesthesia is not good for the common cold, might it not be a good way of passing the time till the cold is gone?"

↑ anesthetic risk usually minor

Intubation ↑ risk

Bronchodilators do not ↓ risk

Glycopyrrolate does not ↓ risk

Cohen and Cameron: >20,000 children

2-7 x increased risk of respiratory complications with URI

11 x increased risk if they were intubated

Study criticized for incomplete documentation as to signs and symptoms of URI


Tait et al examined >1000 children for elective surgery. Risk factors for increased complications included:

- Use of ETT in child < 5 yrs
- H/O prematurity or RAD
- Paternal smoking (?)
- Airway surgery
- Copious secretions and/or nasal congestion

The Child With a Runny Nose

Parnis et al examining predictors of complications in 2051 patients found that the risk increased with:
- ETT > LMA > mask airway
- Parent’s report that child has a “cold”
- H/o snoring, passive smoking
- Presence of sputum and or nasal congestion
- Induction with STP > halo > sevo > propofol
- Non-reversal of muscle relaxant


The Child With a Runny Nose

The increased risk associated with RTI’s seems to be minimal
- No closed claims cases
- There are a few cases of increased atelectasis
- In Tait et al’s study of >1000 pts, 3 required admission post-op, 2 for pneumonia, 1 for stridor
- One case report of death related to laryngospasm and cardiac arrest after extubation in a 15 month old child with a URI

Tait and Malviya. Anesthesia with Upper Respiratory Tract Infection, A&A 100, 2005

More Recent Studies

- Oral ETT, inhalation agents and passive smoking ↑ risk

Schebesta, Güloglu et al Can J Anesth: 57; 745-50. 2010
- Lidocaine gel on LMA ↓ airway complications

The Child With a Runny Nose

Assessment:
- History of “cold” by parents better predictor of laryngospasm than reliance on symptoms
- Presence of sputum, nasal congestion and RAD ↑ incidence of adverse resp events
  ✓ for fever, dyspnea, lethargy, wheezing, productive cough and lung field abnormalities
- Labs, CXR, naso-pharyngeal swabs, rarely practical or helpful

The Child With a Runny Nose

More Recent Studies

- Oral ETT, inhalation agents and passive smoking ↑ risk

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The Child With a Runny Nose

Anesthetic Management
- Avoid irritants!!! (ETT, excessive secretions)
- Keep child well hydrated, consider humidification
- Consider anticholinergics
- Ensure adequate anesthetic depth before any airway manipulations
- Awake or deep extubation per practioner’s preference

The Child With a Runny Nose

COLDS Score

<table>
<thead>
<tr>
<th>Score (total)</th>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>Oral surgery</td>
<td>Operative site, age, weight, sedation, type of surgery</td>
</tr>
<tr>
<td>3-4</td>
<td>Oropharynx</td>
<td>History, current health status, comorbidities</td>
</tr>
<tr>
<td>5-6</td>
<td>Environmental factors</td>
<td>Operation type, room air conditions, oxygenation</td>
</tr>
<tr>
<td>7-8</td>
<td>Airway devices</td>
<td>Awake intubation, sedation technique, airway management</td>
</tr>
<tr>
<td>9-10</td>
<td>Difficult intubation, extubation</td>
<td>History, airway anatomy, co-existing conditions</td>
</tr>
</tbody>
</table>

- ✓ for fever, dyspnea, lethargy, wheezing, productive cough and lung field abnormalities
- Labs, CXR, naso-pharyngeal swabs, rarely practical or helpful

The Child With a Runny Nose

Anesthetic Management
- Avoid irritants!!! (ETT, excessive secretions)
- Keep child well hydrated, consider humidification
- Consider anticholinergics
- Ensure adequate anesthetic depth before any airway manipulations
- Awake or deep extubation per practioner’s preference
Cancel When:
- Fever
- Lethargy, wheezing or other pulmonary signs

Consider Cancellation
- Unable to escalate care
- Can't admit
- "just don’t feel right"

EX-PREMATURE INFANT FOR OUT PATIENT ANESTHESIA

Ex-premature infant
- When are they candidates for outpatient anesthesia?
- Does type of anesthetic matter?
- Does procedure Matter?
- What about full term infant

Apnea and the Ex-preemie
- Risk is low
- Occurs in PACU
- Younger gestational age
- Pre-existing apnea
- Need for opioids or other sedatives
Guidelines for Ex-Premature infants (CHCO)

- **GUIDELINES:** Risk of post-operative apnea and need for post-procedure admission or observation will be determined at the discretion of the attending anesthesiologist. PCA or post-conception age, gestational age or post-natal age.
- Former premature infants born prior to 37 weeks gestational age who are less than 58 weeks PCA at the time of surgery should be admitted overnight for cardiorespiratory monitoring or may require prolonged observation in the PACU prior to discharge.
- Full term infants (gestational age greater than 37 weeks) require overnight admission or extended PACU observation if they are less than 44 weeks PCA at the time of surgery.
- Patient who receive local anesthesia or spinal anesthesia only without systemic sedation, may be post-operatively managed at the discretion of the attending anesthesiologist.

Full Term Infants

- Several case reports
- One with clonidine in caudal
- Some of these babies were found to have abnormal sleep studies
- < 44 weeks PMA

Ambulatory Surgicenter (CHCO)

- Term infants > 6 months of age
- Or a former premature infant older than 60 weeks post-conception and not currently on home monitors may be discharged home on the day of surgery if no other indications for admission exist.

Cote: A Practice for Infants and children

- Risk of apnea exceeds 1% in infants born at 32 weeks PCA until ~ 56 weeks
- Increased risk with:
  - Anemia
  - AGA infants
  - On-going apnea at home
- All anesthetics have been implied

Lucille Packard

It is the policy of Lucille Packard Children Hospital Stanford to admit infants for observation after receiving anesthesia or sedating drugs if they meet any of the following criteria:

A. Born prior to 37 weeks gestational age (GA) and current age is less than 52 weeks post-menstrual age (PMA).
B. All infants less than 44 weeks PMA irrespective of GA.
C. Meet criteria 1 AND currently less than 60 weeks PMA AND have concurrent pertinent medical issues as defined by anesthesiologist.

These infants will be admitted to a monitored bed in a unit with the staff equipment and experience necessary to respond immediately to an apnea episode. Observation will occur for a minimum of 12 hours post-anesthetic, and will be continued for at least 12 hours following any apneic event.

Predicted probability of apnea for all patients, by gestational age and weeks of postconceptional age. The risk for apnea diminishes for infants born at a later gestational age. The shaded boxes represent the overall range of rates of apnea for infants within that gestational age range. (From Coté et al.)
Spinal Anesthesia?

Post-operative recovery after inguinal herniotomy in ex-premature infants: comparison between sevoflurane and spinal anaesthesia

<table>
<thead>
<tr>
<th></th>
<th>Sevoflurane Pre</th>
<th>Sevoflurane Post</th>
<th>Spinal Pre</th>
<th>Spinal Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>SpO2 (%)</td>
<td>97</td>
<td>97</td>
<td>96</td>
<td>96</td>
</tr>
<tr>
<td>Heart Rate (BPM)</td>
<td>150</td>
<td>155</td>
<td>142</td>
<td>150</td>
</tr>
<tr>
<td>% time SpO2 &lt; 90%</td>
<td>6 (1-63)</td>
<td>6 (0-48)</td>
<td>6 (0-17)</td>
<td>6 (2-28)</td>
</tr>
<tr>
<td># of episodes of desat/hour</td>
<td>9 (3-20)</td>
<td>10 (4-14)</td>
<td>6 (2-11)</td>
<td>7 (3-16)</td>
</tr>
</tbody>
</table>

Fig 1 Group distribution of ‘excess’ post-operative cardiorespiratory complications related to pre-operative respiratory function.

- No difference-but small numbers

Cochrane Database Syst Rev. 2003;3:CD003669
Regional (spinal, epidural, caudal) versus general anaesthesia in preterm infants undergoing inguinal herniorrhaphy in early infancy.
Craven PD, Badawi N, Henderson-Smart DJ, O’Brien M.

- No complications, smaller babies

**Postoperative apnea after inguinal hernia repair in formerly premature infants: impacts of gestational age, postconceptional age and comorbidities.**

**Abstract**

A common practice for premature infants undergoing elective inguinal hernia repair is hospitalization due to postoperative apnea monitoring. This study evaluated the risk of apnea after inguinal hernia repair regarding gestational age (GA) and postconceptional age (PCA) in former premature infants.

**METHOD:** Formerly premature infants who had elective inguinal hernia repair between 2008 and 2012 were reviewed retrospectively in terms of GA, PCA, body weight, and comorbidities. All postoperative apneas were reviewed.

**RESULTS:** A total of 428 former premature infants were reviewed. Eleven infants had postoperative apneas. Infants younger than 45 weeks PCA were more prone to developing postoperative apneas. Two infants had apneas in Group 1 (4.7%) and 2 apneas in Group 2 (0.8%). The factors contributing to postoperative apneas included respiratory distress, hypotension, and hypothermia. Significant factors were prematurity, respiratory complications, and high body weight. PCA > 60 weeks was statistically significant for group 1 and group 2.

**CONCLUSION:** Prematurity, body weight, and complications affect respiratory complications. Postoperative apnea in former premature infants undergoing inguinal hernia repair. Severe apneas occurred earlier than mild ones. Overnight monitoring is necessary in small infants with low GA and PCA. Otherwise, older infants may be operated on the next day.

**Current Recommendations (Côte)**

- Admit all ex preemie < 60 weeks PCA until apnea free for at least 12 hours
- Consider Caffeine (10mg/kg)
- Consider regional
- Ensure adequate HgB
- Full term infants < 44 weeks PMA may be at risk
Sleep Disorder Breathing and OSA

Anesthesia & Analgesia:
June 2014 - Volume 118 - Issue 6 - p 1157–1159
doi: 10.1213/ANE.0b013e31829ec1e6
Editorials: Editorial
The Elephant in the Room: Lethal Apnea at Home after Adenotonsillectomy
Brown, Karen A. MD*; Brouillette, Robert T. MD†

Table 2

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<th>Outcome, Venue of Event, and Attributed Cause of the Event</th>
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<td>Children at Risk for OSA (n = 44)</td>
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Childhood versus Adult OSAS features

<table>
<thead>
<tr>
<th>Children</th>
<th>Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical history</td>
<td>(O-) and increasing obesity</td>
</tr>
<tr>
<td>Artifacts</td>
<td>Facial, facial dysmaturity</td>
</tr>
<tr>
<td>History of respiratory symptoms</td>
<td>History of respiratory symptoms</td>
</tr>
<tr>
<td>Congenital anomalies (e.g., Down syndrome)</td>
<td>Congenital anomalies (e.g., Down syndrome)</td>
</tr>
<tr>
<td>Sleep behavior</td>
<td>Sleep behavior</td>
</tr>
<tr>
<td>Symptoms</td>
<td>Sleep behavior</td>
</tr>
<tr>
<td>Snoring</td>
<td>Snoring</td>
</tr>
<tr>
<td>Snoring at night</td>
<td>Snoring at night</td>
</tr>
<tr>
<td>Restlessness</td>
<td>Restlessness</td>
</tr>
<tr>
<td>Difficulty breathing</td>
<td>Difficulty breathing</td>
</tr>
<tr>
<td>Gastroesophageal reflux disease</td>
<td>Gastroesophageal reflux disease</td>
</tr>
<tr>
<td>Obstructive sleep apnea</td>
<td>Obstructive sleep apnea</td>
</tr>
<tr>
<td>Overlap</td>
<td>Overlap</td>
</tr>
<tr>
<td>Apnea-hypopnea index</td>
<td>Apnea-hypopnea index</td>
</tr>
<tr>
<td>Normal 0-1</td>
<td>Normal 0-1</td>
</tr>
<tr>
<td>Mild OSA 2-4</td>
<td>Mild OSA 2-4</td>
</tr>
<tr>
<td>Moderate OSA 5-9</td>
<td>Moderate OSA 5-9</td>
</tr>
<tr>
<td>Severe OSA &gt;10</td>
<td>Severe OSA &gt;10</td>
</tr>
<tr>
<td>Oxygen Saturation Nadir</td>
<td>Oxygen Saturation Nadir</td>
</tr>
<tr>
<td>Normal &gt;92</td>
<td>Normal &gt;92</td>
</tr>
<tr>
<td>Mild OSA &gt;92</td>
<td>Mild OSA &gt;92</td>
</tr>
<tr>
<td>Moderate OSA &gt;92</td>
<td>Moderate OSA &gt;92</td>
</tr>
<tr>
<td>Severe OSA &lt;80</td>
<td>Severe OSA &lt;80</td>
</tr>
</tbody>
</table>

Severity Ranking System Based on Polysomnography

- Normal: Apnea-hypopnea index 0-1, Oxygen Saturation Nadir >92
- Mild OSA: Apnea-hypopnea index 2-4, Oxygen Saturation Nadir >92
- Moderate OSA: Apnea-hypopnea index 5-9, Oxygen Saturation Nadir >92
- Severe OSA: Apnea-hypopnea index >10, Oxygen Saturation Nadir <80

Role of Hypoxia

- Rats -- intermittent hypoxia → develop opioid sensitivity
- Hypoxia → inflammatory response and vascular remodeling
- Wilson et al. and others have found a 2.5 X increase in the incidence of respiratory complications in children undergoing T&A who had evidence of nocturnal desaturation to 80% or less
Relationship between intermittent Hypoxia and Systemic responses


Obstructive symptoms and sleep disordered breathing are most common causes of T&A

Few polysomnography

↑ incidence of peri-op complications

↓ doses of opioids or sedatives

Tonsillectomy in 2012


Surgical indications for adenotonsillectomy (T&A) in Olmsted County, Minnesota, USA between 1970 and 2005.

STBUR

Snoring
Trouble Breathing
UnRefreshed

STBUR

Does your child:
- Snore more than ½ the time?
- Snore loudly?
- Trouble/struggle to breath
- Stop breathing during the night
- Wake up Unrefreshed

Score > 3 = 3X risk of PRAE (perioperative respiratory adverse events)
Score = 5 + 10 X risk of PRAE

Anesthetic Considerations

↑ pre-op desat= ↑ sensitivity to opioids
Require less opioids

Standard opioid doses may be relative overdose
Consider nocturnal oxygen monitoring
IV Ibuprofen vs. Placebo

- 161 patients
- T&A
- Lower fentanyl requests
- Lower # of doses
- Lower total dose

Morphine vs. Ibuprofen

Table 3: Adverse events, prior to discharge

<table>
<thead>
<tr>
<th>Event</th>
<th>Placebo (N = 80)</th>
<th>Ibuprofen (N = 60)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No adverse</td>
<td>76 (95.0%)</td>
<td>49 (81.7%)</td>
</tr>
<tr>
<td>Events</td>
<td>4 (5.0%)</td>
<td>11 (18.3%)</td>
</tr>
</tbody>
</table>

Morphine or Ibuprofen for Post-Tonsillectomy Analgesia: A Randomized Trial

Lauren S. Kelly, MD, Diane S. Bernek, MD, Jyoti Ramakrishna, MD, Kathleen Nelligan, MD, Biju S. Kudari, MD, John Kowalski, MD, Joseph A. Alvarado, MD

Pediatrics 2015
Morphine vs. Ibuprofen

**Table 3**

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Pain scores</th>
<th>O2 nadirs and mean O2 nadirs-similar</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pretreatment</td>
<td>4.32 (7.81)</td>
<td>3.84 (3.71)</td>
</tr>
<tr>
<td>Posttreatment</td>
<td>3.94 (3.27)</td>
<td>14.28 (11.68)</td>
</tr>
</tbody>
</table>

Race

- African Americans compared to Caucasians
  - ↑ SDB
  - ↑ OSAS
- African Americans have lower O2 Sat nadir
- May need higher doses

Gender

Pain Medicine

**Table 4**

<table>
<thead>
<tr>
<th>Gender</th>
<th>Total Morphinol by Weight (% mg)</th>
<th>Total Morphinol by Weight (% mg)</th>
<th>P-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0-2 yr</td>
<td>3-5 yr</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0-2 yr</td>
<td>3-5 yr</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0-2 yr</td>
<td>3-5 yr</td>
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<td></td>
<td>0-2 yr</td>
<td>3-5 yr</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0-2 yr</td>
<td>3-5 yr</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at the 0.05 level.
Severely obese children have a higher incidence of unplanned admission and readmission.

**Table 2. Frequency of GI events between normal-weight, overweight and obese children**

<table>
<thead>
<tr>
<th>Event</th>
<th>Normal weight (n = 87), %</th>
<th>Overweight (n = 87), %</th>
<th>Obese (n = 136), %</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nausea</td>
<td>15 (17)</td>
<td>21 (24)</td>
<td>31 (23)</td>
<td>0.001</td>
</tr>
<tr>
<td>Vomiting</td>
<td>6 (7)</td>
<td>11 (13)</td>
<td>17 (13)</td>
<td>0.001</td>
</tr>
<tr>
<td>Sedation</td>
<td>9 (10)</td>
<td>12 (14)</td>
<td>15 (11)</td>
<td>0.001</td>
</tr>
<tr>
<td>Pain</td>
<td>12 (14)</td>
<td>18 (21)</td>
<td>30 (22)</td>
<td>0.001</td>
</tr>
<tr>
<td>Orthostatic hypotension</td>
<td>1 (1)</td>
<td>2 (2)</td>
<td>3 (2)</td>
<td>0.001</td>
</tr>
<tr>
<td>Hypertension</td>
<td>3 (3)</td>
<td>6 (7)</td>
<td>10 (8)</td>
<td>0.001</td>
</tr>
</tbody>
</table>

**More References**

- **Brown KA, et al:** Recurrent hypoxemia in young children with obstructive sleep apnea is associated with reduced opioid requirement for analgesia. *Anesthesiology*, 2004 Apr;100(4):806-10;

Counsel Family
Discuss with Surgery

Other Analgesics
- Dexmedetomidine
- IV Acetaminophen
- Ibuprofen
- Short Acting Opioids
- Topical LA infiltration

Post-operative Pain

ASA 2014 Abstracts

Multimodal Versus Single Agent Analgesia for Pediatric Myringotomy and Pressure Equalization Tube Insertion
- >3000 pts undergoing ear tubes
- RCT
  - Fentanyl
  - Entanyl + ketorolac
  - Ketorolac

Figure 1. Mean Highest Pain Score

Figure 2. Percentage of Patients Resolving Otorrhea nose in PAU
Post-operative Pain Management

- Combined general-regional techniques are very common
- Most blocks are placed after the child is anesthetized.
- Ultrasound has made this easier and more practical

Catheters

- With good education and follow up, easy and effective
- Minimal complications
  - Skin
  - Mechanical
  - Leaking

PRAN Data Base

- Caudals
- Transverse Abdominals plane blocks

References:

- Dyloject (dilocfenac)
  - New dosage route for management of mild-to-moderate pain and of moderate-to-severe pain alone or in combination with opioid analgesics.
  - Approval was based on 277 patients undergoing elective orthopedic surgery who were randomized to receive diclofenac injection, ketorolac tromethamine, or placebo starting within 5 hr after surgery and given for up to 5 days. Efficacy was measured by the sum of pain intensity differences (SPID). SPID scores were significantly better with diclofenac and ketorolac than with placebo (P<0.001). In patients aged 65 yr, diclofenac was associated with significantly improved analgesia (P<0.05) and lower opioid requirement versus ketorolac.10
  - Mechanism: Inhibit cyclooxygenases (COX 1 and COX 2) pathways, thereby inhibiting prostaglandin synthesis.
  - Dosage: 37.5 mg IV bolus injection infused over 55 sec every 6 hr as needed, not to exceed 375 mg/day. Use for the shortest duration consistent with individual patient treatment goals.

- Fentanyl can be used intra-nasally if no IV access. Blood levels appear to be equivalent to IV
- Morphine 0.05-0.1 mg/kg
- Hydromorphone 5-15 ug/kg
- Ketorolac 0.5 mg/kg IV, 1mg/kg IM, intranasal max doses 30mg

  - Dadure C, Bringuier S, Raux et al

- Anesth Analg. 2003 Sep;97(3):687-90
  - Perioperative continuous peripheral nerve blocks with disposable infusion pumps in children: a prospective descriptive study.
  - Dadure C, Prat P Raux et al

- Paediatr Anaesth. 2011 Aug;21(8):806-10
  - Pondes VC, Desai AP, Shah DM, Jahan AN,

- Anesth Analg. 2003 Sep;97(3):687-90
Post-operative Pain Management

- Acetaminophen (A) up to 45 mg/kg p.r.
- Bolton et al. measured serum levels in 55 pts undergoing T&T, who received 40 mg/kg p.r. pre-operatively.
  - Levels did not reach toxicity in any pts
  - Efficacy, esp post discharge was deemed greater (although no control group)


Acetaminophen

- Intravenous-
  - 12.5 mg/kg IV infused over 15 mins q 4 hours
  - 15 mg/kg over 15 minutes q 6 hours
- Very effective can be used in a wide variety of situations
- Educate health care providers regarding other meds with acetaminophen


Evaluation of the Pre-PADSS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Total Number of Patients, n</th>
<th>Median</th>
<th>Q1</th>
<th>Q3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of patients</td>
<td>1000</td>
<td>75.5 (75.5, 87.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male, n (%)</td>
<td>500 (50)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female, n (%)</td>
<td>500 (50)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (months)</td>
<td>8 (7-11)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>19 (13-31)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of surgery, n (%)</td>
<td>1</td>
<td>81 (8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digestive</td>
<td>61 (6)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urological</td>
<td>34 (3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orthopaedic</td>
<td>30 (3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENT/Mandibular/Orbital</td>
<td>18 (1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plastic</td>
<td>8 (8)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neurosurgery</td>
<td>8 (8)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long-term central venous catheter</td>
<td>24 (2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Endoscopic procedure</td>
<td>20 (2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of anesthesia</td>
<td>General, n (%)</td>
<td>613 (61)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>General combined with loco-regional, n (%)</td>
<td>477 (48)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length of surgery (min)</td>
<td>60 (60-70)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length of PACU (min)</td>
<td>60 (60-70)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PACU: post-anesthesia care unit.
Demographics of Unplanned Admissions Following Ambulatory Surgery During 33 Months at a Children’s Hospital

Arlyne K. Thung, M.D., Vidya T. Raman, M.D., Thomas A. Taghon, D.O., Joseph Tobias, M.D.
Nationwide Childrens, Columbus, Ohio, United States

- All Ambulatory patients 2011-2013
- 1.07% unplanned admission
- Most common cause: surgery
- Most common service: ENT

Conclusion

- RTI have increased but minor risks of respiratory complications
- Ex-premature infants
- STBUR score and opioids dosing
- T&A-new concerns, new options for pain relief
- PAD-SS

I hear a “new” murmur, now what?
Murmurs

- Very common
- Highest incidence at 3 or 4 years
- "Functional" = normal heart
- Usually short, and soft
- Louder when pt supine or ↑ heart rate

Common Locations to Hear Murmurs

- Common "functional" murmurs
  - Still murmur-
    - musical or vibratory, midsystolic,
    - left sternal border
  - Peripheral pulmonary stenosis-
    - ejection murmur
    - LUSB, radiates-neonates
  - Venous Hum-
    - continuous murmur louder in upright position
    - Upper chest

How loud?

- Grade I Heard only with intense concentration
- Grade II Faint, but heard immediately
- Grade III Easily heard, of intermediate intensity
- Grade IV Easily heard, palpable thrill/vibration on chest wall
- Grade V Very loud, thrill present, audible with only edge of stethoscope on chest wall
- Grade VI Audible with stethoscope off the chest wall

What to do?

- Controversial
- If child is growing well, acyanotic and has good exercise tolerance-anesthesia well tolerated
- Look for systemic symptoms
- If in doubt-Echo +/- Pediatric cardiologist

Symptoms of Heart Disease

- Feeding difficulties: disinterest, fatigue, diaphoresis, tachypnea, dyspnea
- Poor exercise tolerance
- Resp distress, grunting, nasal flaring, retractions
- Frequent respiratory tract infections
- Central cyanosis or poor capillary refill
- Absent or abnormal peripheral pulses

If in Doubt

- Call Cardiology
- Postpone Case
- Reschedule?