

# Preoperative Pulmonary Assessment

1



2

The scary twins of Anesthesia!

- **Laryngospasm** – obstruction before intubation
- **Bronchospasm** – obstruction even after intubation

3

Who is at risk for one or both?

Laryngospasm = Anyone under the "right" conditions or who has or had a recent Upper Respiratory Illness or Lower Resp. Illness **URI/LRI**

Bronchospasm = Same as Laryngospasm and/or a history of **Reactive Airway Disease** or Asthma

4

Goal for Pulmonary Assessment

**1**

Risk stratification for Stridor or Bronchospasm

**2**

Pre-operative optimization

**3**

Prepare for an intraoperative event

5

...**"Although Anesthesia may not be good for a cold, might be a good way to pass the time till the cold has past"**

Ellis G. Anesthesia and the common cold. Anaesthesia 1955 10:78-79

**"Common sense dictates that a patient with an active but self limited disease not be subject to elective anaesthesia and surgery until resolution of the illness"**

McGill WA, Coveler LA, Epstein BS. Subacute upper respiratory infection in small children. Anesth Analg 1979;58:331-3.

6



7

## Reactive Airway Disease

- Asthma like disease developing after single exposure to an "irritant" S.M. Brooks, M.A. Weiss, I.L. Bernstein. "Reactive Airway Dysfunction Following Single Exposure to Airway Irritants and Oral Intra-Respiratory". Chest, Volume 88, 1985, 376-384.
- Anesthetic gases: Sevoflurane and Desflurane
- Advanced airway devices: masks, oral airway, LMA and endotracheal tubes
- Airway surgery or airway manipulation

8

## Bronchospasm

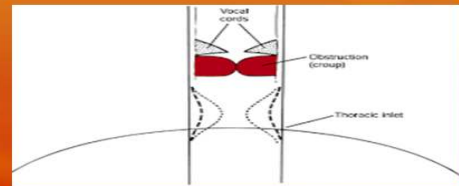
- Caused by degranulation of Mast cells and basophils
- Leads to unopposed activation of alpha 1 adrenergic receptors
- Which causes smooth muscle constriction of the walls of the bronchioles and mucous production
- Wheezing, coughing
- Hypoxia, hypoxemia



9

## Stridor

- High pitched inspiratory sound from turbulent airflow
- Increased work of breathing, hypoxia



10

## Laryngospasm

- Uncontrolled involuntary spasm of the laryngeal cords
- Fulliniant laryngospasm – complete closure
- Partial laryngospasm –some air movement with positive pressure ventilation
- Increased work of breathing , rapid hypoxia

11

Oxygen Desaturation leads to.....  
 More desats leads -  
 Hypoxia and hypoxemia....  
 Respiratory arrest

**CODE!**



12

### Sounds really bad right?

1. No closed claims literature directly implicating URI or RAD and its sequelae as cause of death
2. Evidence mostly from observational retrospective studies not double blinded controlled studies

13

- o **Death of boy at VCU dental clinic was due to natural causes**
- o *Posted: Jun 28, 2010 by Andy Jenks*
- o RICHMOND, VA (WWBT) – According to the state medical examiner, the death of a 6-year-old boy at the VCU Dental Clinic was caused by an irregular heart beat due to breathing tube removal.
- o Jacobi Hill died May 11 after he underwent anesthesia for dental treatment at VCU's Pediatric Dental Clinic in Richmond.
- o Following weeks of unanswered questions, the medical examiner determined the boy died of natural causes, officially listed as "cardiac dysrhythmia due to endotracheal extubation."
- o Hill had asthma, but no other known health problems when he was taken to VCU's Dental Clinic for a procedure May 11

14

### Joan Rivers: 1933-2014

"OCME has completed its investigation. The cause of Ms. Rivers' death is anoxic encephalopathy due to hypoxic arrest during laryngoscopy and upper gastrointestinal endoscopy with propofol sedation for evaluation of voice changes and gastroesophageal reflux disease. The manner of death is therapeutic complication."

15

She had a cold a week ago but just has a lingering cough!

16

Thanks for the "Note" of confidence

17


18

### Bad Outcomes

Retrospective study 3/1078 children with URI undergoing general anesthesia for elective procedures

- 1 hospitalized for post operative stridor
- 2 hospitalized for pneumonia

Tait et al., Bad Outcomes in perioperative, elective, ambulatory anesthesia for children with upper respiratory tract infections. Anesthesiology 9: 229-266, 2001

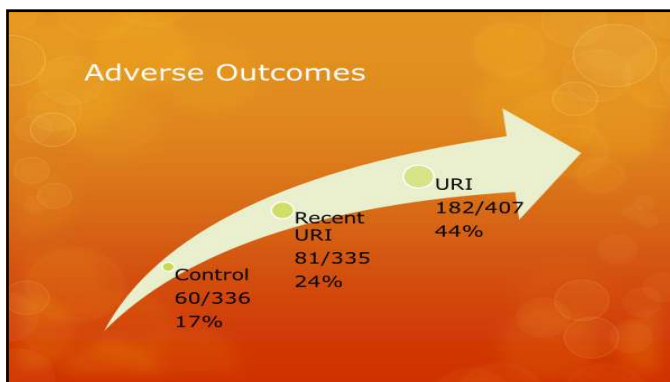


19

### Adverse Outcomes

- 1 month to 18 years
- Adverse events: desats < 90%, stridor, severe cough, bronchospasm, laryngospasm
- Rhinorrhea, sore throat, sneezing, nasal congestion, malaise, cough, fever > 38°C
- Minimum of 2/7 symptoms and signs
- active uri/recent uri/ no reported uri for 4 weeks

20



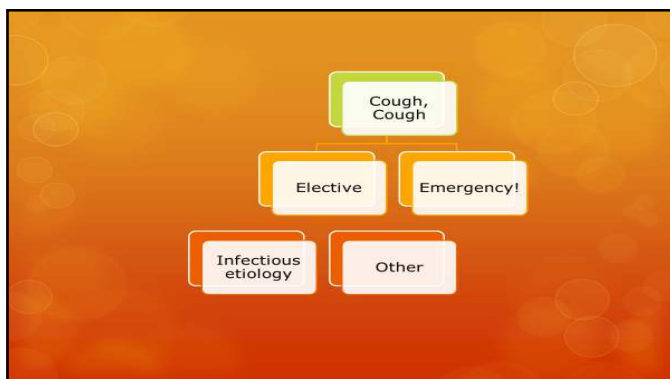
21

### Adverse Outcomes

- Dr Tait's conclusions.....
- Increase risk for respiratory complications with current or recent URI in last 4 weeks

1. ETT>LMA>masking
2. Airway surgery
3. Independent risk factors included copious secretions, age < 5, prematurity < 37weeks, paternal smoking, and h/o asthma

22



23

### Other?

- Seasonal allergies or Pet allergies
- Reflux associated asthma
- Eczema?
- Anxiety
- Air conditioning
- Second (or first?) hand smoking
- Actually I think your child really is sick

24

### Bonus Round

- Anyone else sick in the family or sick contacts
- What's coming out of that nose?
- Auscultate/auscultate/auscultate!




25

### Postponing surgery

2 weeks? 4 weeks? 6 weeks?

Average of 6 – 9 URT's/year

Empey DW, Laitinen LA, Jacobs L, et al. Mechanisms of bronchial hyperreactivity in normal subjects after upper respiratory tract infection. Am Rev Respir Dis 1976; 113: 131–9.



26

### Postponing surgery

- 4 weeks for healthy children under 5 years old
- 2 weeks over 5 years old
- 4 to six weeks with co-morbidities



27

### Asthma/COPD and the Pulmonary consult

- Optimizing patients already on or needing additional inhalers or oral medications
- Testing pulmonary function to guide anesthetic plan\*
- Recommendations for Postoperative management

28

### Preoperative Optimization

#### Arozullah Respiratory failure risk index


Predictor	Multivariate Analysis OR	Risk score
Age 60-69	1.5	4
Age >=70	1.9	6
History of COPD	1.8	6
Partially/fully dependent functional status	1.9	7
BUN >30	2.3	8
Albumin <3	2.5	9
Neck surgery	3.1	11
NSG: upper abd, peripheral vascular	4.2	14
Theracic	8.1	21
AAA	14.3	27
Emergency	3.1	11

Risk category	PPV rate
Class 1, <= 10 points	0.5%
Class 2, 11-19 points	1.8%
Class 3, 20-27 points	4.2%
Class 4, 28-40 points	10.1%
Class 5, >=40 points	26.0%

Multifactorial Risk Index for Predicting Postoperative Respiratory Failure in Men After Major Noncardiac Surgery  
[Ahsan M. Arozullah, MD, MPH,](#) [Jennifer Daley, MD,](#) [William G. Henderson, PhD,](#) [Shukri F. Khuri, MD,](#) and for the National Veterans Administration Surgical Quality Improvement Program

29

### Key Factors in Dental Cases



- History of COPD
- Age
- Emergency "neck" surgery ie: mandibular abscess? Ludwig's Angina
- Partial or full dependency – walker, wheel chair, bed bound
  - Age related
  - Obesity related
  - Neuromuscular disease
  - Injury related

30

Can we predict who will need post operative ventilatory support and hospital admission? (Or what keeps me up at night thinking about next day's patient)

- Trial of extubation even if high risk on index?
- Other issues


1. Difficult airway
2. Surgery – possible complications with reintubation
3. Outstanding issues like acute respiratory illness or exacerbation of neuromuscular disease



31

### Asthma/COPD pre-operative optimization

- Continue use of inhalers up to day of surgery
- Jeon's Rule: Bring home inhaler to hospital and use right before going into OR**
- Adjuncts for higher risk patients:
  1. Inhaled steroids
  2. Oral prednisone
  3. Montelukast
  4. H2 blockers – Famotidine
- Smoking cessation? – over 2 weeks but under 6 weeks is worse than smoking on the day before!



32

### Pulmonary Function Tests (PFTs)

- Can be useful for assessing response to bronchodilator therapy
- FEV1 < 80% of predicted value may reflect poor or partly controlled disease despite a patient denying symptoms of asthma or COPD
- PFTs require cooperation from patient therefore poor estimation in children under 5 years of age
- May be useful in evaluating respiratory impairment however they do not quantify peri-operative risk\*



33

### PFTs and ventilator management

- severity of COPD/asthma may steer us toward type of ventilation pressure control vs volume control, PEEP, Total volumes, I:E ratio
- DO not create a pneumothorax!
- Type of anesthetic: Sevoflurane vs Desflurane vs TIVA
- Extubation plan
  1. Fully awake vs deep extubation or in between
  2. Lidocaine IV/nebulized/LTA? Irritant in severe cases
  3. Glycopyrrolate for secretions? Thicker not inhibited

#### COPD (PFT)

□ Stage I: Mild	FEV1/FVC < 0.70 FEV1 ≥ 80% predicted
□ Stage II: Moderate	FEV1/FVC < 0.70 60% < FEV1 < 80% predicted
□ Stage III: Severe	FEV1/FVC < 0.70 30% < FEV1 < 60% predicted
□ Stage IV: Very Severe	FEV1/FVC < 0.70 FEV1 < 30% predicted or FEV1 < 50% predicted plus chronic respiratory failure

34

### Postoperative management

- PFTs and sleep studies of OSA can help steer peri-operative and post operative pain management
- Narcotic use and chronic CO2 retention can have dangerous consequences
- Non narcotic pain medications
  1. NSAIDS
  2. Acetaminophen
  3. Ketamine
  4. Tramadol?
  5. Gabapentin?



35

### Any Questions?

36