Pediatric Sleep-Disordered Breathing

OSA in infants and young children is generally characterized by partial, persistent obstruction of the upper airway.
Benign primary snoring

Upper-airway resistance syndrome (UARS)

Severe OSA
- Tonsillar hypertrophy most common cause in children 2 – 8 years of age
- Early diagnosis essential to prevent complications
SIDS

- Infants (0 – 12 months)
  - Sudden death due to reduced arousability
  - More episodes of obstructive and mixed apnea
  - ALTE
    - Sleep disordered breathing
    - Lower heart rate variability
    - Altered autonomic control
    - Increased arousal thresholds
    - Fewer body movements
SIDS

Elective Cesarean section

- More respiratory events in quiet sleep
  - More central apneas
    - More dangerous than obstructive
    - Ondine’s curse
  - Longer duration of central apneas
  - More mixed apneas
  - Longer duration of mixed apneas
Snoring in Children

- 7 – 12 % snore
- Most common presenting symptom of OSA
- Primary snorers
  - Does not progress to OSA
UARS

- Snore and abnormal sleep histories / psg data
- Underrecognized and undertreated

Common symptoms with OSA
- Sleepiness
- Restlessness
- Diaphoresis
- Irritability
- Snoring
Differences
- Not predicted well by same clinical variables
- PSG generally normal except for
  - Elevation of EEG arousals
  - Characteristic breathing patterns
OSA

- Incidence 1 – 3%
  - More than 2 million children
    - Only 20% of pediatricians screen for problem

- More than one obstructive apnea of any length per hour of sleep should be considered abnormal
Consequences of OSA

- Repeated arousals needed to re-establish airway
  - Sleep fragmentation
  - Loss of sleep’s restorative nature

- Apneic episodes / periods of asphyxia
  - Hypoxemia
  - Hypercapnia
  - Acidemia
  - Profound hemodynamic alterations
Cyclical increases in systemic arterial pressure with episodes of apnea

- Degree of hypertension correlates with
  - Apnea index
  - Obesity

- Undiagnosed OSA may lead to increased risk of cardiovascular complications later in life

Increases in pulmonary artery pressure with each apnea

- Maximal PAP generated during REM
- Probably reflect hypoxic pulmonary vasoconstriction
- Cor-pulmonale and RHF
Decrease in cerebral blood flow
   – Decreased global and regional cerebral perfusion decreased during wakefulness
   – MRI shows metabolic pattern consistent with cerebral ischemia

Cognitive Consequences
   – Neurodevelopmental Complications
     - Developmental delay
     - Poor school performance
     - Hyperactivity
     - Aggressive behavior
     - Social withdrawal
Manifestations occur without frank sleepiness

Sleep deprived children manifest cognitive and behavioral changes mimicking ADHD
- 81% of snoring children who have ADHD could have their ADHD eliminated if the SDB were effectively treated.

Cognitive impairments
- Memory, attention, and visuospatial abilities affected
- Sustained attention (vigilance), divergent intelligence (creativity)

Grades improve with treatment
Poor growth common
- 50% - Failure to thrive
- Adenotonsillar hypertrophy
  - Anorexia
  - Dysphagia
- Abnormal nocturnal growth-hormone secretion
- Lack of end-organ responsiveness to growth factors
- Nocturnal hypoxemia, respiratory acidosis, and increased WOB

Increased weight-gain velocity after correction
Clinical Manifestations

- Nocturnal symptoms
  - Snoring
  - Restless sleep
  - Diaphoretic during sleep
  - Abnormal sleeping position
  - Parental anxiety

- Daytime symptoms
  - Internalized behavior problems
  - Externalized behavior problems
  - Overall lower incidence of obvious daytime somnolence than adults
Diagnosis

- OSA cannot be reliably distinguished from simple snoring through clinical assessment
- ATS Consensus statement on standards and indications for pediatric sleep studies recommends PSG to
  - detect presence and severity of OSA
  - differentiate between benign snoring, snoring with partial or complete airway obstruction, hypoxemia and sleep disruption
  - Evaluate disturbed sleep, EDS, Cor pulmonale, failure to thrive, unexplained polycythemia
  - Assess relevant symptoms in children with major risk factors
  - Assess child with OSA @ increased risk for perioperative and postoperative complications
  - Titrate CPAP therapy in pediatric OSA
Management

- Supplemental oxygen may depress ventilatory drive and aggravate apnea
- Adenotonsillectomy
  - SDB primary indication
- Nasal CPAP
  - Patient growth changes CPAP requirements
  - Pressures = to median pressures for adults
- HFNC (5 – 15 LPM)
  - Heated to body temp
  - Near 100% relative humidity