Children Who Snore – Do they have Sleep Apnea?

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Children's National

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No disclosures relevant to this talk

Objectives

- Describe the spectrum of sleep disordered breathing (SDB) in healthy children
- Describe Nocturnal Polysomnography (PSG)
- Describe phenotypes and diagnosis of obstructive sleep apnea (OSA)
- Discuss sequelae and treatment options of OSA

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Sleep History

- Bed-time problems
- How long a child takes to fall asleep
- Quantity
- Quality
- Sounds

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Sleep Disordered Breathing

- Spectrum of repetitive episodes of complete or partial obstruction of the airway during sleep.
- “Hark, how hard he fetches breath.”
  — William Shakespeare, *King Henry IV, Part 1*

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Primary Snoring (PS)

- No significant obstructive events, arousals, or gas exchange abnormalities
- Often noticed while family is on vacation and sharing a room with child
- 10-12 % of children

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Upper Airway Resistance Syndrome (UARS)

- Increasingly negative intra-thoracic pressures during inspiration that lead to arousals and sleep fragmentation
- Events may not meet scoring criteria for obstructive apnea or hypopnea
- Gas exchange unaffected

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Obstructive sleep apnea (OSA)

- Prolonged partial or complete upper airway obstruction
- Disrupts normal ventilation and gas exchange
- Disrupts normal sleep
- 1-4% of children

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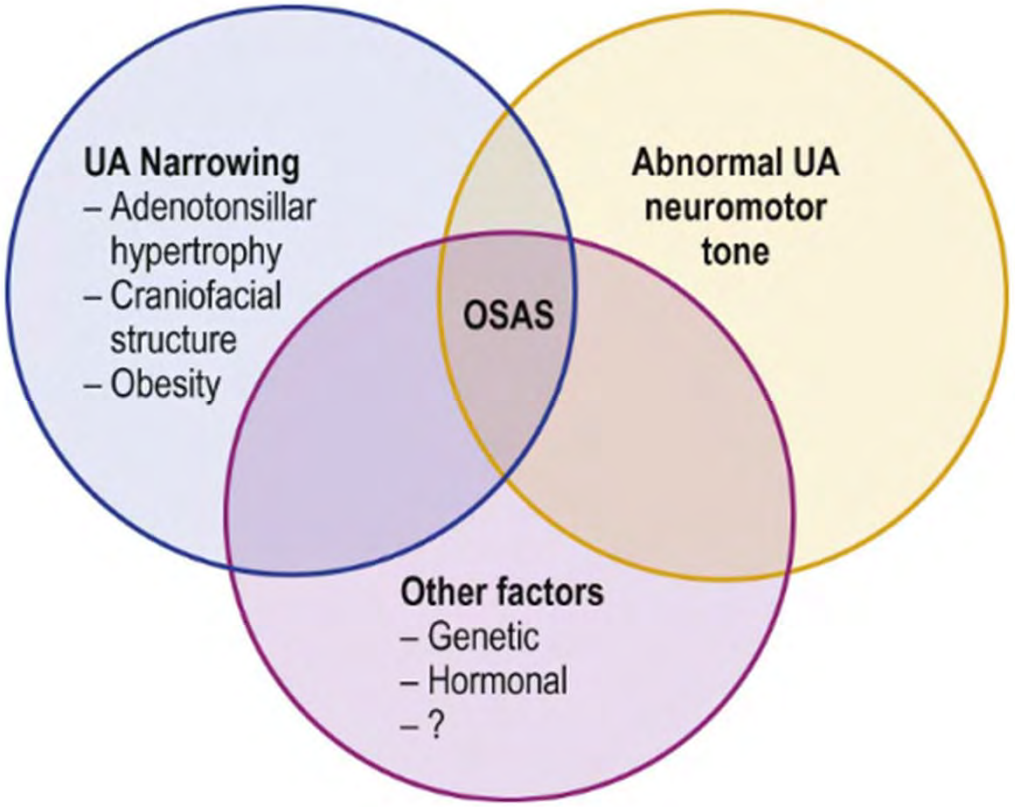
Pathophysiology of OSA



Marcus, CL Pathophysiology of OSAS in Children. Sleep and Breathing in Children, A developmental approach. Marcel Dekker Inc. 2000

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When snoring is reported:

- “Heroic” snorts
- Asynchronous movements of chest & abdomen
- Witnessed apnea
- Disturbed sleep
- Sweating
- Enuresis

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Other red flags

- Behavioral problems
- Academic concerns
- Excessive daytime sleepiness
- Mouth-breathing
- Recurrent adeno-tonsillitis

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Despite taking a good history

- Cannot distinguish with certainty between primary snoring and obstructive sleep apnea
- Clinical suspicion is high ---Referral for a PSG

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Polysomnography – gold standard to diagnose OSA

Who needs a sleep study?

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Revised AAP Clinical Practice Guidelines (2012) - Diagnosis of OSA

- All children/adolescents should be screened for snoring
- PSG should be performed if OSA is suspected
- If not available, then specialist evaluation with an alternative test recommended

Marcus et al, PEDIATRICS Vol. 130, No. 3, Sept 2012

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AASM Practice Parameters

- Recommend PSG – suspected OSA in children (S)
- Nap - not recommended (O)
- Insufficient data for unattended in-home portable PSG testing
- PSG indicated in children considered for Tonsillectomy and Adenoidectomy (T & A) (G) to establish the severity of OSA, (postoperative risk) and need for a repeat PSG after surgery

Aurora RN, et al Sleep. 34:379-388 2011

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Otolaryngology guidelines (2011)

- PSG - most reliable and objective test to assess presence and severity of OSA,
- PSG is not necessary to perform routinely to diagnose SDB

Roland, PS et al *Otolaryngol Head Neck Surg July 2011 vol. 145 no. 1 suppl S1-S15*

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PEDIATRIC SLEEP DISORDERS LABORATORY

SLEEP STUDY REQUEST FORM

Phone: (202) 476-2022 Fax: (202) 476-2981

PATIENT INFORMATION: (may attach demographic sheet)

Name _____ DOB _____ Age _____Y _____M Sex: ☐ M ☐ F
Last First MI

Insurance Carrier and ID # _____ **Must send copy of Insurance card** ☐ Done

Parent's name _____ **Address** _____

Contact Information: Phone (Home) _____ **(Work)** _____ **(Mobile)** _____ **e-mail** _____

Referring Physician _____ **Specialty** _____ **Phone #** _____ **Fax#** _____

Primary Care Physician _____ **Ph #** _____ **Fax#** _____

Ordering Physician Signature _____ **Date** _____

REASON FOR SLEEP STUDY REFERRAL _____

NOTE: PLEASE ATTACH A COPY OF THE PATIENT'S MOST RECENT CLINICAL ENCOUNTER DOCUMENTING DETAILS OF THE SLEEP HISTORY, PHYSICAL EXAM AND REASON FOR REFERRAL

PRESENTING COMPLAINTS: *(Check all that apply)*

☐ Loud snoring	☐ Cyanosis/hypoxia	☐ On CPAP/BiPAP	☐ Bedtime resistance	☐ Restless legs symptoms
☐ Choking/gasping arousals	☐ ALTE	☐ Daytime sleepiness	☐ Difficulty falling asleep	☐ Sleepwalking
☐ Observed apneas in sleep	☐ Apnea of prematurity	☐ Mood/behavior problems	☐ Night wakings	☐ Sleep terrors
☐ Restless sleep	☐ On O2	☐ Attention problems/ADHD	☐ Insufficient sleep	☐ Circadian rhythm disruption
☐ Nocturnal diaphoresis	☐ On ventilator	☐ Academic concerns	☐ Inadequate sleep hygiene	☐ Nocturnal seizures
☐ Enuresis	☐ Tracheostomy	☐ Other	☐ Other	☐ Other

RISK FACTORS/MEDICAL CONDITIONS: *(Check all that apply):*

☐ Adenotonsillar hypertrophy	☐ Gastroesophageal reflux	☐ Cystic fibrosis
☐ S/P T&A Date	☐ Craniofacial anomalies	☐ Prematurity/BPD
☐ Obesity BMI	☐ Down syndrome	☐ Tracheostomy
☐ Allergies	☐ Neuromuscular disease/CP	☐ Seizures (type): _____
☐ Asthma	☐ Developmental delay/MR	☐ Other
☐ Family history OSA	☐ Sickle cell disease	

Previous sleep studies? ☐ Yes ☐ CNMC lab? ☐ Other lab? (if so, please attach previous sleep study results)

CURRENT MEDICATIONS: _____

POLYSOMNOGRAM REQUESTED: ☐ Elective ☐ Urgent ☐ Pre-op Surgery date _____

☐ **PSG** 95810 ☐ **PSG + CPAP/BiPAP titration (initial)** 95811

☐ **PSG + MSLT** 95810 + 95805 ☐ **PSG + CPAP/BiPAP titration (repeat)** 95811 **Current settings:** _____

☐ **PSG + Seizure montage** 95810
☐ **PSG + Other (Ventilator, O2, Tracheostomy)** 95810 (requires referral by a pediatric pulmonologist)

FOLLOW UP (please check one): ☐ CNMC Sleep Clinic _____ ☐ Referring physician ☐ PCP ☐ Other: _____

SPECIAL INTRUCTIONS: _____

Area Below For Sleep Laboratory Use Only _____

☐ Sleep Study Request reviewed and approved by Sleep Lab Medical Director ☐ Not approved ☐ Approval pending

Comments: _____ Signature: _____ Date: _____

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Pediatric Sleep Lab

- Requests are screened and prioritized
- Pediatric Sleep Lab - caters to infants, children and teenagers with “space” for parent
- Location - inpatient
- Staff – child-friendly, ratio of tech to patient is high
- Capnography
- Severe studies – priority in scoring and interpretation

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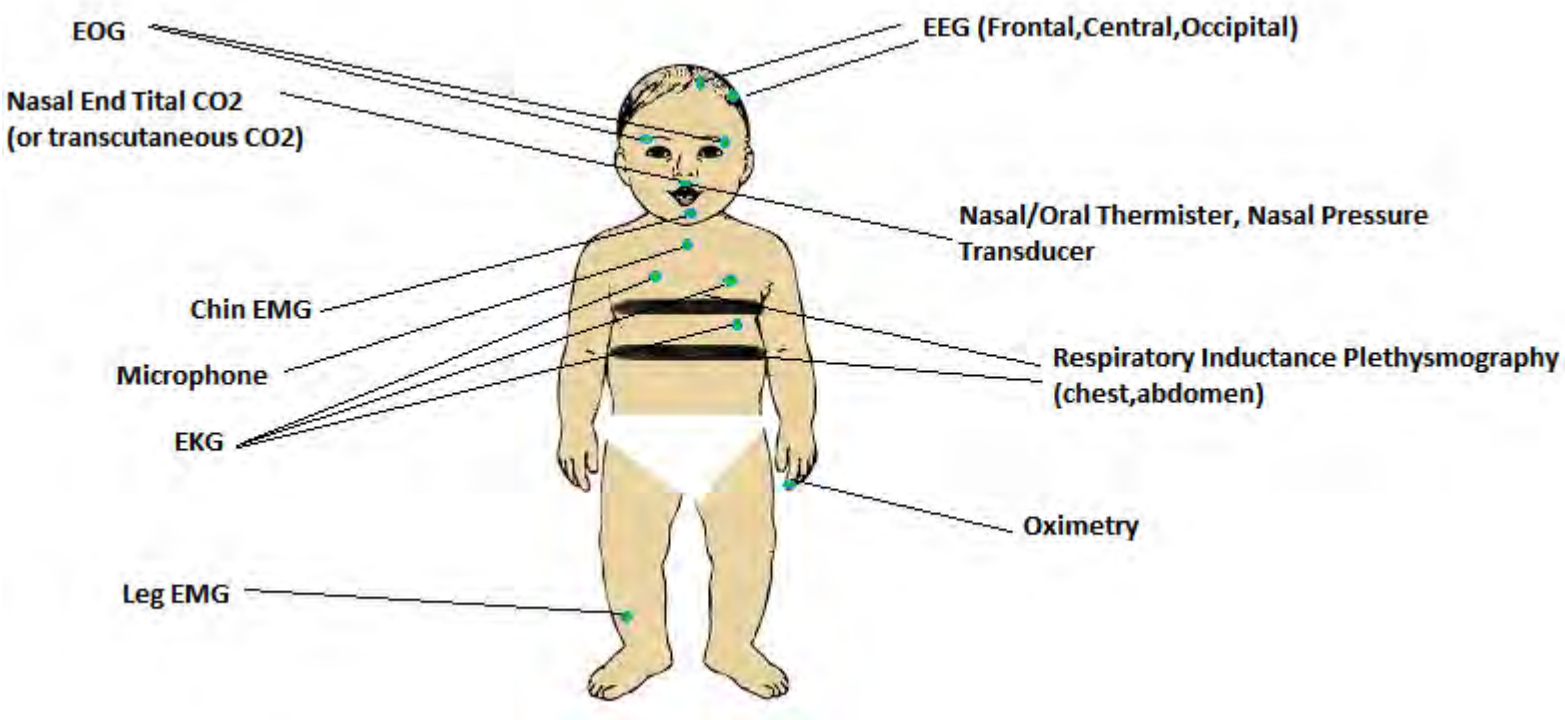
Polysomnography Recordings



From I Sami & J Owens, Polysomnography for the Pediatric Pulmonologist, Diagnostic Tests in Pediatric Pulmonology, 1st Ed. 2014

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“Wired up”

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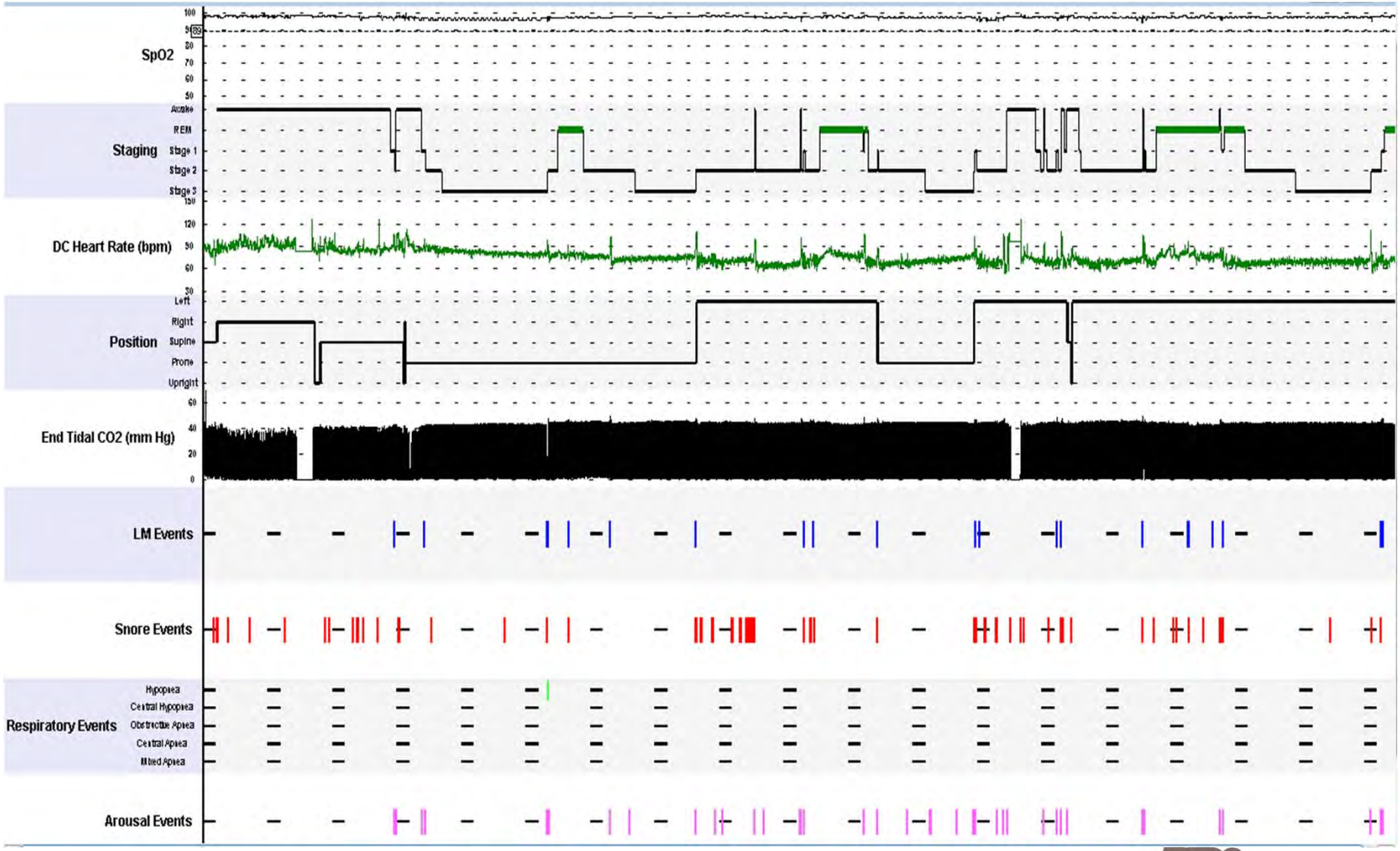
BASELINE POLYSOMNOGRAPHY REPORT

- ***Signals recorded**:*
- ***Methodology**:*
- **<u>Patient Information</u>**
- **Reason for referral:**
- **<u>Study Summary</u>**
- **History:**
- **Medications Reported**:
- **Sleep Staging and Architecture: EEG**
- **Respiratory findings:** RDI (includes all apneas, hypopneas and RERAs). The AHI (includes all respiratory events except RERA's)
- **Oxygenation and ETCO2**:
- **Limb Movement findings:**
- **EKG findings:**
- **Impression/Recommendations:**
- **Final Diagnosis:**

Hypnogram



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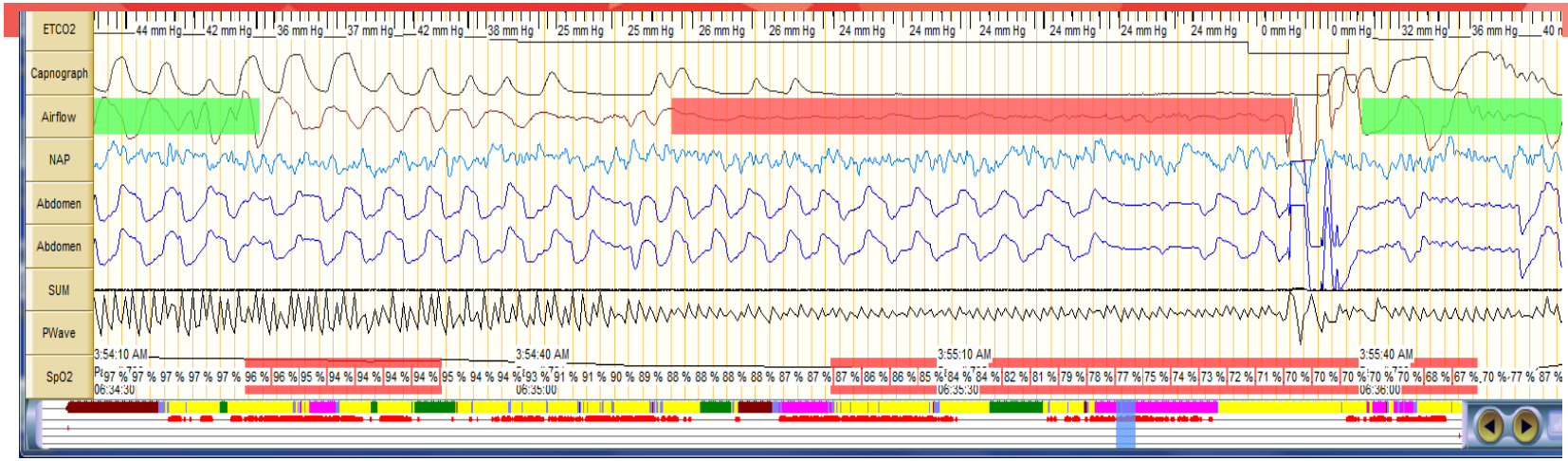
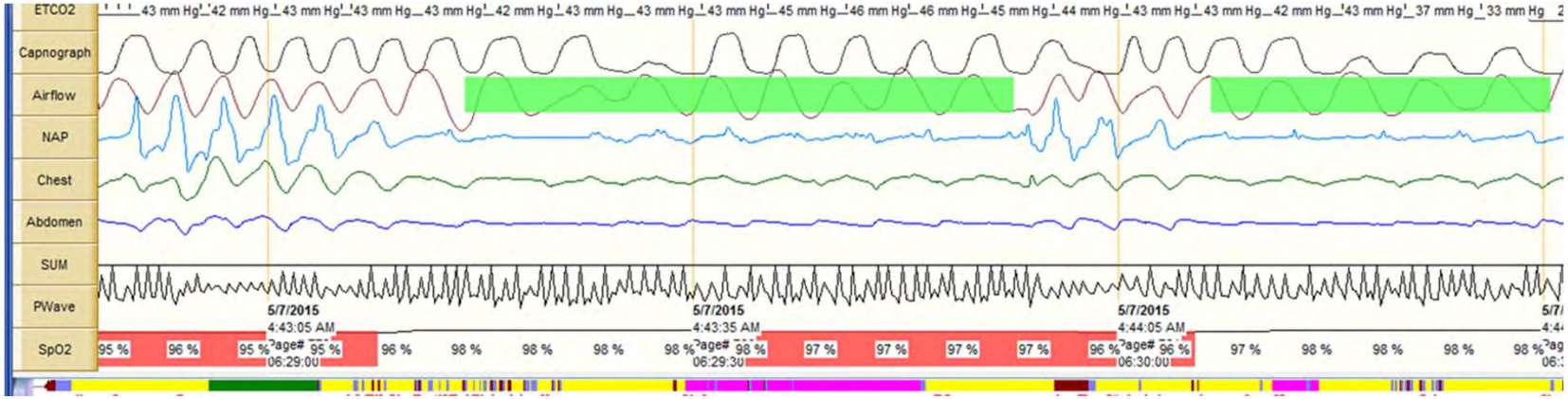
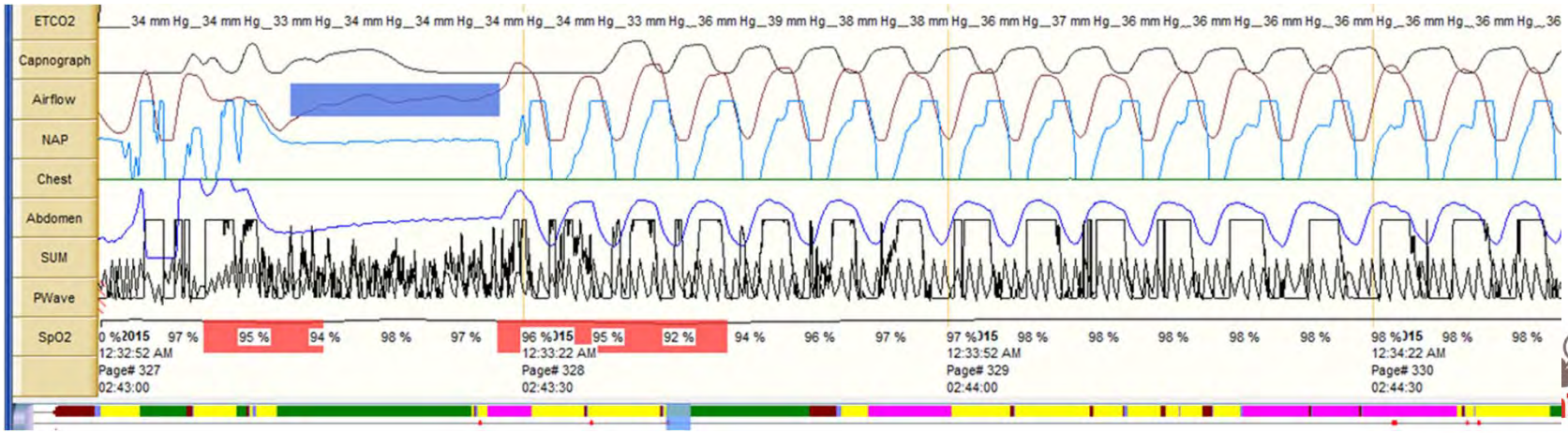


Obstructive Apnea



Obstructive Hypopnea



Central Apnea

PSG diagnostic criteria for OSA

- Mild OSA - AHI > 1.5 or AI > 1 /hour
- Moderate OSA - AHI is >5,
- Severe OSA – AHI > 10.
- Hypoxemia
  - Oxygen desaturation nadir < 91%
  - Change in oxygen nadir from baseline > 3%

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PSG diagnostic criteria for OSA

- Hypoventilation:
  - Maximum end-tidal carbon dioxide > 54 mmHg
  - End-tidal carbon dioxide > 50 mmHg for more than 25 % of TST
- Sleep Fragmentation:
  - Increased EEG arousals - >10/hr
  - Increased awakenings

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Case I

- 4 year old
- History: Snores, poor appetite, has wheezed with URIs,
- Mouth-breathes during sleep with head extended
- Pre-school told his parent he should be evaluated for “ADHD”.

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Case I

- Physical Exam:
- Weight < 3%, length 10-25%
- Adenoidal facies with allergic shiners
- Cervical lymph nodes: ++
- Rest of exam unremarkable except:

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Type I OSA

- Most common cause is Adeno-tonsillar Hypertrophy
- Strong association between OSA, and asthma

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Case II

- 12 year old – snores very loudly so siblings do not want to share a room
- Has asthma with worsening control in last 3-4 years despite ICS and leukotriene modifier
- Academic performance: poor, sometimes falls asleep in class, always in the car
- Teased by other kids

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Case II

- BMI – 34, large neck circumference
- Edematous nasal turbinates,
- Narrow palate, tonsils: 2+
- End-expiratory wheezing on lung examination

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Type II OSA

- Major risk factor: Obesity
- Morning headaches
- Co-morbidities:
  - Allergic rhinitis
  - Asthma
  - Hyperglycemia
  - Hypertriglyceridemia

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Other Investigations

- Serum HCO_3 and hematocrit
- Imaging
- EKG
- Echocardiogram
- Pulmonary Function Tests

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Why do we care about OSA?

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Cognitive and Behavioral Consequences of OSA

- Strong association between SDB and:
  - Behavior - hyperactivity, inattention, & aggression
  - Cognition – IQ, memory, academic performance and executive functioning

Gozal D. Pediatrics. 102 (3 Pt 1):616-620 1998
Bourke R, et al. Sleep Med. 12 (5):489-496 2011

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Cognitive and Behavioral Consequences of OSA

- Mechanisms: Sleep fragmentation and intermittent hypoxemia impact prefrontal cortex
- Window of vulnerability in developing children
- Treatment interventions may only partially reverse deficits

Gozal D, et al. Pediatrics. 107 (6):1394-1399 2001

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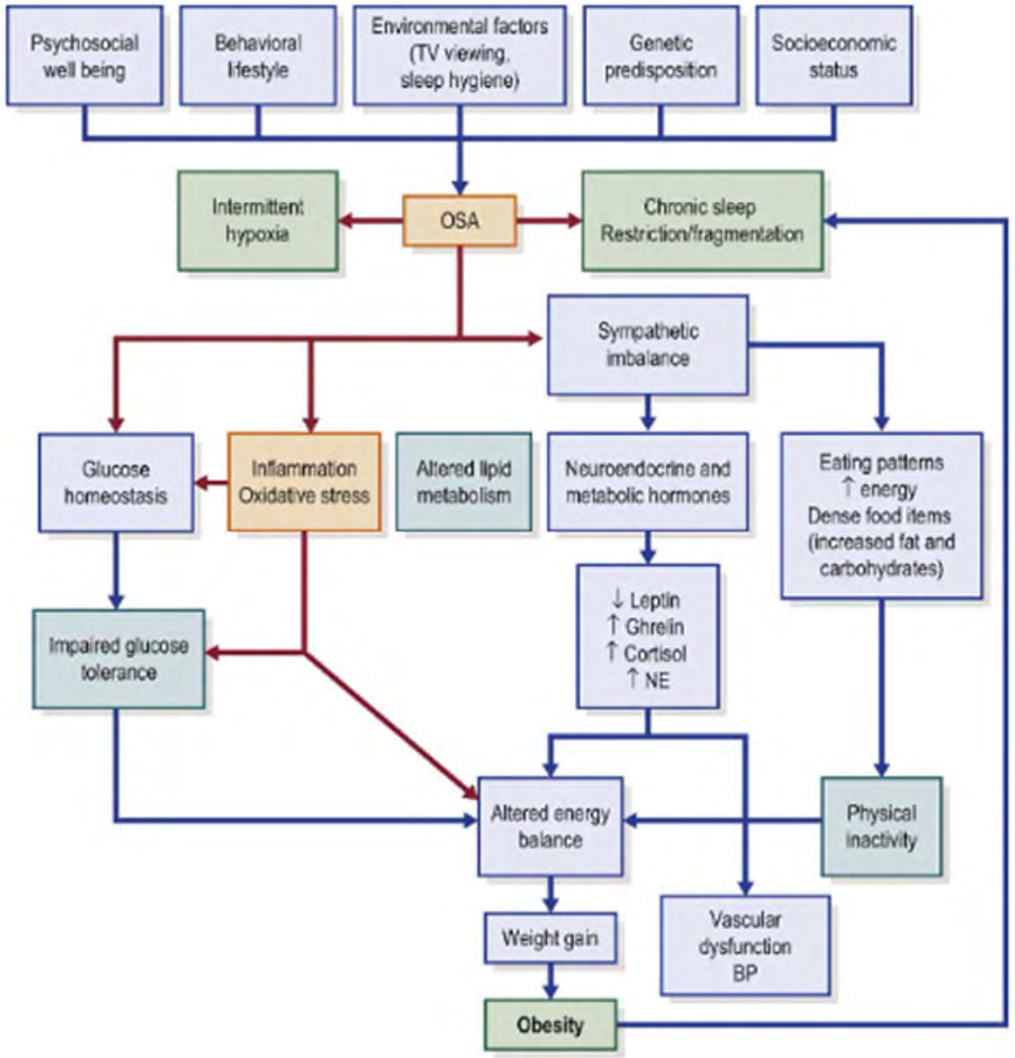
Metabolic & Cardiovascular Consequences of OSA



From D Gozal Metabolic Consequences of SDB, Principles & Practice of Pediatric Sleep Medicine. 2nd Ed. 2014

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You have the report – what next?

- It's not just the AHI -
- Impact on the child's wellbeing
- Mild cases: trial of anti-inflammatory therapy - montelukast and nasal steroids
- Orthodontal procedures
- Moderate and severe cases – surgical treatment and/or positive airway pressure

Goldbart AD, et al. Pediatrics. 130 (3):e575-e580 2012
Villa MP, et al. Sleep Breath. 15 (2):179-184 2011

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Revised AAP Clinical Practice Guidelines (2012) - Management of OSA

- Adeno-tonsillectomy - first-line treatment of patients with adeno-tonsillar hypertrophy
- High-risk patients - monitored postoperatively
- Postoperative evaluation
- Intranasal corticosteroids - mild OSA
- Weight loss - in patients who are overweight or obese.

Marcus et al, PEDIATRICS Vol. 130, No. 3, Sept 2012

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Persistence of OSA post T & A

- Up to 27%
- Risk factors:
  - Obesity
  - Asthma
  - High AHI
  - GERD
  - Down's syndrome
  - CP

Bhattacharjee R, et al. Am J Respir Crit Care Med. 182 (5):676-683 2010

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Revised AAP Clinical Practice Guidelines (2012) - Management of OSA

- Continuous positive airway pressure - if adeno-tonsillectomy not performed or OSA persists postoperatively.

Marcus et al, PEDIATRICS Vol. 130, No. 3, Sept 2012

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Treatment Options

- Mask-fitting
- CPAP after a protocol of desensitization
- Titration study
- Bilevel PAP if pressures high or hypoventilation

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Acknowledgements

- Pulmonary and sleep colleagues in the Division of Pulmonary and Sleep Medicine, CNHS

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Thank you – Questions?

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