

# SLEEP MEDICINE TERMINOLOGY- UNDERSTANDING THE LINGO

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# Learning Objectives

- ▣ After participating in this session, you should be able to to:
  - *Identify physiological terminology* involved with sleep medicine.
  - Compare and contrast the *labeling of sleep diagnostics*.
  - Distinguish among *terminology related to therapies* for sleep disorders.
  - *Provide additional resources* for those wishing to learn more about sleep medicine vocabulary and terms.

# Physiology Terminology--Normal Stages of Sleep

- Sleep is composed of two phases
  - *“Non-rapid eye movement” (NREM)*
  - *“Rapid eye movement” (REM)*
- NREM sleep is made up of three phases
- Each phase represents a progressively deeper stages of sleep.
- In adults, during a normal 8-h sleeping period
- NREM and REM stages cycle back and forth every 60 to 90 min for a total of 4 or 5 cycles

# “Rapid Eye Movement” Sleep (REM)

## ▣ *REM*

- Named for the presence of the rapid fluttering or rolling of the eyes and is characterized by the loss of muscle tone
- 25% of the total sleep period
- Dreaming occurs
- Skeletal muscle semi-paralysis
  - ▣ This further reduces VE; may be associated with hypoxemia and hypercapnia
  - ▣ May result in upper airway obstruction
  - ▣ Physiologic effects of REM may be more profound in patients with preexisting pulmonary or cardiac disease

# “FRAGMENTATION” OF SLEEP STAGES:

THE INTERRUPTION OF NOCTURNAL SLEEP FROM AROUSALS DURING YOUR SLEEP CYCLE WHICH THROW OFF YOUR NATURAL CIRCADIAN RHYTHMS, LEADING TO SLEEP DISRUPTION AND OVERALL POOR SLEEP.

## Stages of Sleep



■ REM

■ NREM Stage 1

■ NREM Stage 2

■ NREM Stages 3 & 4

# Screening Tools

- ▣ *“Epworth Sleepiness Scale”*: is commonly used subjective test of sleepiness
- ▣ *“Berlin Questionnaire”*: a validated patient survey that helps to identify Obstructive Sleep Apnea (OSA). It was developed in 1998 at a medical conference in Berlin, Germany, by a group of family practice physicians and sleep researcher
- ▣ *“STOP-BANG”*: Another assessment tool used to help diagnose Obstructive Sleep Apnea (OSA).

# Epworth Sleepiness Scale

**Situation Chance of Dozing:** Ratings → 0 = No Chance of Dozing  
3 = Very High Chance

- ▣ Sitting and reading .....
- ▣ Watching TV .....
- ▣ Sitting, inactive in a public place (e.g. a theatre or a meeting) .....
- ▣ As a passenger in a car for an hour without a break .....
- ▣ Lying down to rest in the afternoon when circumstances permit .....
- ▣ Sitting and talking to someone .....
- ▣ Sitting quietly after a lunch without alcohol .....
- ▣ In a car, while stopped for a few minutes in the traffic .....

## Total Score:

- ▣ 0-10 Normal range
- ▣ 10-12 Borderline
- ▣ 12-24 Abnormal

# Berlin Questionnaire

<b>CATEGORY 1</b>	<b>1 Complete the following:</b> height _____ age _____ weight _____ sex _____
	<b>2 Do you snore?</b> <input type="checkbox"/> yes <input type="checkbox"/> no <input type="checkbox"/> don't know
	If you snore:
	<b>3 Your snoring is?</b> <input type="checkbox"/> slightly louder than breathing <input type="checkbox"/> as loud as talking <input type="checkbox"/> louder than talking <input type="checkbox"/> very loud, can be heard in adjacent rooms
	<b>4 How often do you snore?</b> <input type="checkbox"/> nearly every day <input type="checkbox"/> 3-4 times a week <input type="checkbox"/> 1-2 times a week <input type="checkbox"/> 1-2 times a month <input type="checkbox"/> never or nearly never
	<b>5 Has your snoring ever bothered other people?</b> <input type="checkbox"/> yes <input type="checkbox"/> no
	<b>6 Has anyone noticed that you quit breathing during your sleep?</b> <input type="checkbox"/> nearly every day <input type="checkbox"/> 3-4 times a week <input type="checkbox"/> 1-2 times a week <input type="checkbox"/> 1-2 times a month <input type="checkbox"/> never or nearly never
<b>CATEGORY 2</b>	<b>7 How often do you feel tired or fatigued after your sleep?</b> <input type="checkbox"/> nearly every day <input type="checkbox"/> 3-4 times a week <input type="checkbox"/> 1-2 times a week <input type="checkbox"/> 1-2 times a month <input type="checkbox"/> never or nearly never
	<b>8 During your wake time, do you feel tired, fatigued or not up to par?</b> <input type="checkbox"/> nearly every day <input type="checkbox"/> 3-4 times a week <input type="checkbox"/> 1-2 times a week <input type="checkbox"/> 1-2 times a month <input type="checkbox"/> never or nearly never
	<b>9 Have you ever nodded off or fallen asleep while driving a vehicle?</b> <input type="checkbox"/> yes <input type="checkbox"/> no
	If yes, how often does it occur? <input type="checkbox"/> nearly every day <input type="checkbox"/> 3-4 times a week <input type="checkbox"/> 1-2 times a week <input type="checkbox"/> 1-2 times a month <input type="checkbox"/> never or nearly never
<b>CATEGORY 3</b>	<b>10 Do you have high blood pressure?</b> <input type="checkbox"/> yes <input type="checkbox"/> no <input type="checkbox"/> don't know
	BMI = _____

**Berlin Questionnaire Scoring:**

Scoring Questions:	Any answer within box outline is a positive response
Scoring Categories:	Category 1 is positive with 2 or more positive responses to questions 2-6 Category 2 is positive with 2 or more positive responses to questions 7-9 Category 3 is positive with 1 or more positive response and/or a BMI >30
Final Results:	2 or more positive categories indicates a high risk of obstructive sleep apnea



# STOP BANG Questionnaire

**TABLE 2**  
**STOP-BANG questionnaire\***

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**STOP**

S (snore)	Do you <i>snore</i> loudly (louder than talking or loud enough to be heard through closed doors)?	Yes/No
T (tired)	Do you often feel <i>tired</i> , fatigued, or sleepy during daytime?	Yes/No
O (observed)	Has anyone <i>observed</i> you stop breathing during sleep?	Yes/No
P (blood pressure)	Do you have or are you being treated for high blood <i>pressure</i> ?	Yes/No

**BANG**

B (body mass index [BMI])	<i>BMI</i> > 35 kg/m <sup>2</sup> ?	Yes/No
A (age)	<i>Age</i> > 50 years?	Yes/No
N (neck)	<i>Neck</i> circumference > 40 cm?	Yes/No
G (gender)	<i>Gender</i> male?	Yes/No

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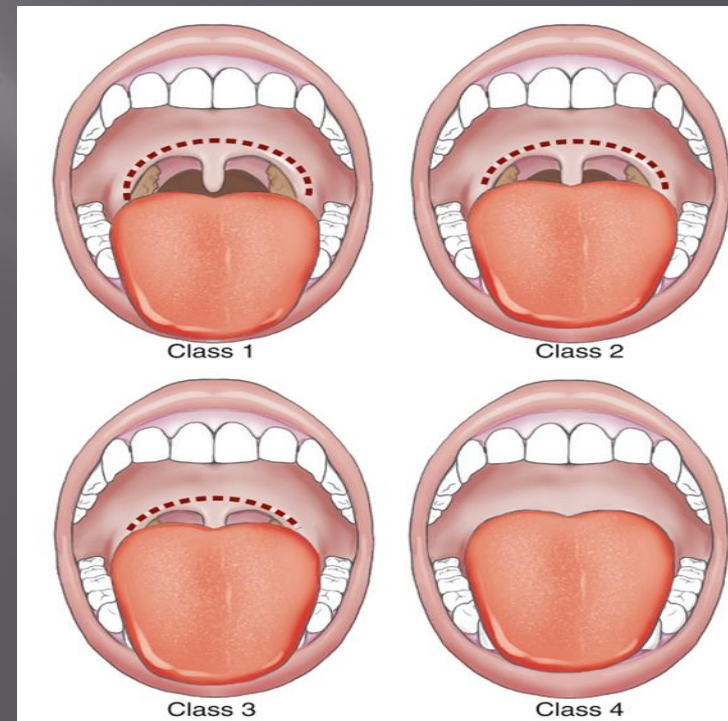
Yes to  $\geq 3$  questions = high risk of obstructive sleep apnea

Yes to < 3 questions = low risk of obstructive sleep apnea

\*Adapted from Chung et al.<sup>20</sup>

# “Mallampati Score”

- ❑ Categorizes the amount of open space in the oropharynx.
- ❑ Ranges from a Score of 1 large opening to 4 smaller upper A/W
- ❑ A Mallampati class of 3 or 4 is highly associated with OSA issues



# Diagnostic Gold Standard: The “Polysomnogram”

- ▣ Polysomnogram-AKA: Sleep Study
- ▣ Recording of diagnostic variables the patient's sleep
- ▣ Variables simultaneously measured
  - Eye movements
  - Airflow
  - Respiratory movements
  - Leg movements
  - EEG
  - Pulse oximetry
  - ECG
- ▣ *Split sleep study*: If half is diagnostic PCG and second half involves PAP titration to identify appropriate pressure

# “Apnea-Hypopnea Score/Index” (AHI)

AHI= Number of apneas and hypopneas during each hour of sleep.

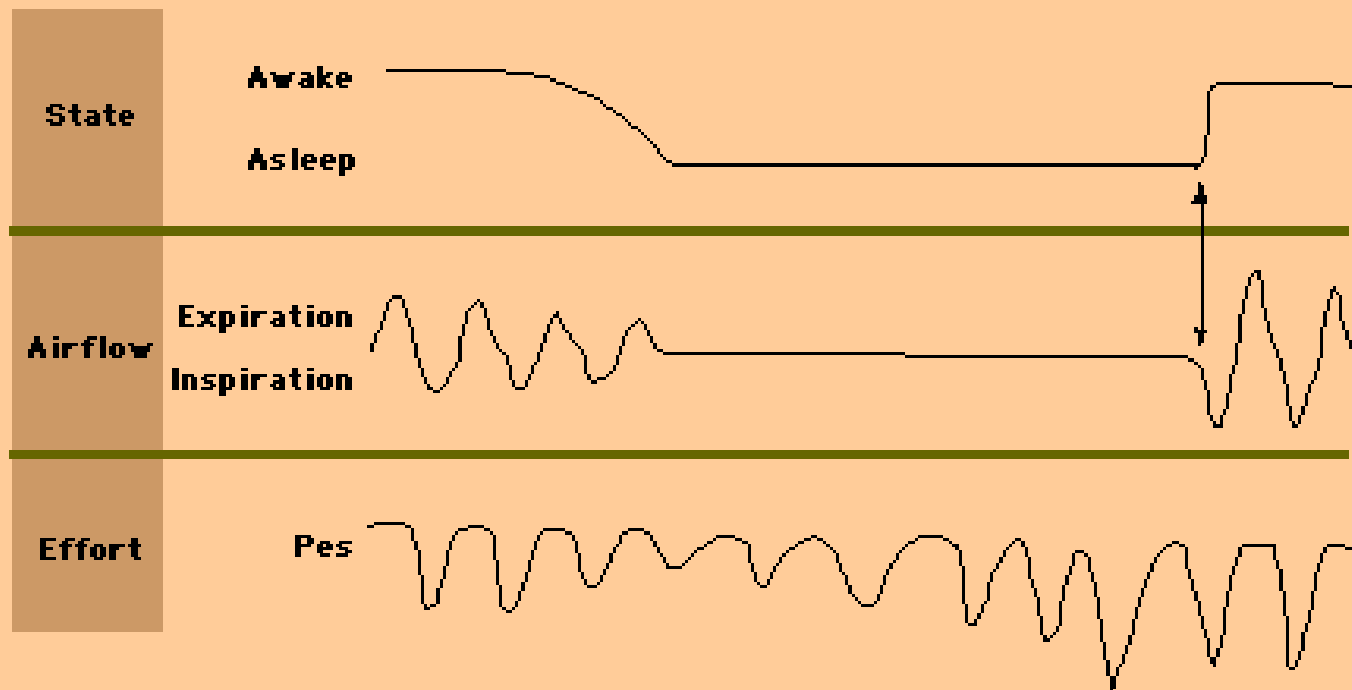
Hypopnea: When a patient takes in shallow breaths for 10 seconds or longer while asleep and airflow is at least 30% lower than normal.

<b>Apnea Hypopnea Index (AHI)</b>	
<b>Severity</b>	<b>AHI per Hour</b>
None/Minimal	< 5
Mild	5 -15
Moderate	16-30
Severe	> 30

# Diagnostic Classification Terminology

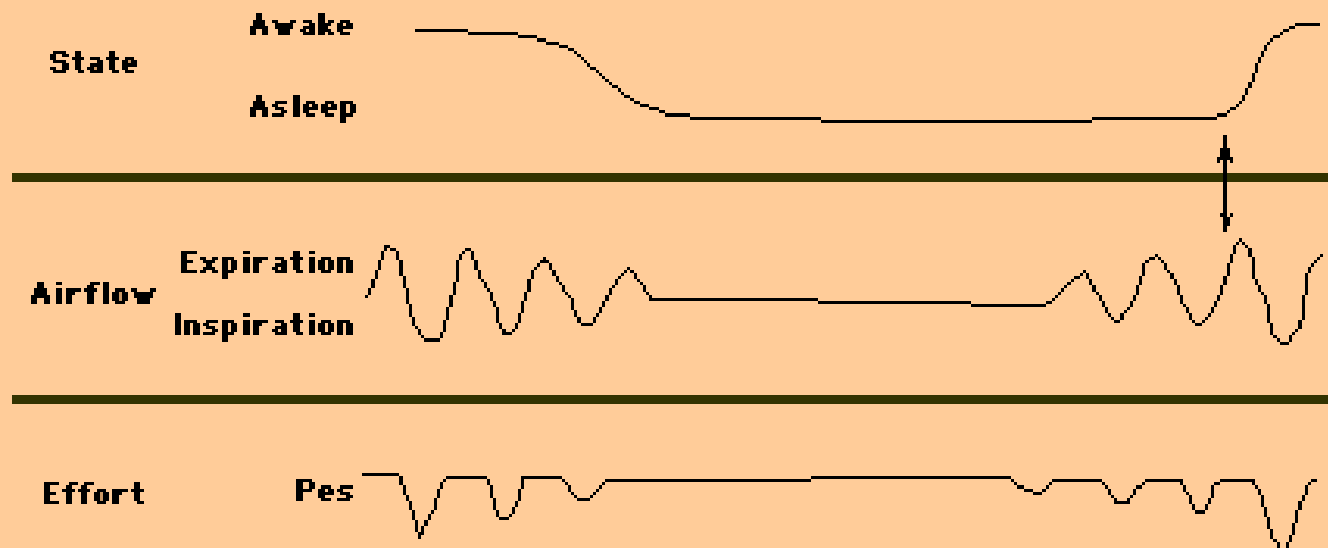
- Sleep disorders can be broadly classified into:
  - *“Sleep-related breathing” disorders*
    - *Obstructive Sleep Apnea (OSA)* which is the cessation of airflow for more than 10-15 s due to complete anatomic upper airway closure and hypopnea
    - *“Hypopnea”*: When a patient takes in shallow breaths for 10 seconds or longer while asleep and airflow is at least 30% lower than normal.
    - *“Central sleep apnea”*- Apnea generally resulting from neurologic causes whereby there is an absence of respiratory efforts.

# “Obstructive Apnea”



**Obstructive sleep apnea** Obstructive sleep apnea in which there is continuing respiratory effort, as shown by progressively increasing fluctuations in esophageal pressure (Pes) at the time of cessation of airflow. The arrow illustrates that arousal in obstructive apnea occurs simultaneously with the resumption of airflow.

# “Central Apnea”



**Central sleep apnea** There is no respiratory effort, as shown by absence of changes in esophageal pressure (Pes), at the time of cessation of airflow. The arrow illustrates that arousal in central apnea typically occurs in the middle of the hyperpneic phase.

# “Complex Sleep Apnea”

- ▣ Combines aspects of OSA and CSA (mixed)
- ▣ Without a PSG study, MSA is virtually impossible to detect
- ▣ Often the PSG study shows CSA first, followed by OSA
- ▣ Once CPAP pressures are adequate to prevent OSA events, the CSA can be addressed



# “Hypoventilation Syndrome”

- ▣ There are multiple hypoventilation syndromes
- ▣ Most notable is obesity hypoventilation syndrome (OHS)
  - Seen in patients are obese with BMIs >30
  - They have elevated PaCO<sub>2</sub> during wakefulness of greater than 45 mm Hg
  - To make the diagnosis, daytime hypercapnia must be present



# Other Sleep Disorders & Terms

- ▣ Sleep disorders can be broadly classified into:
  - *“Circadian rhythm disorders”*
    - ▣ Result from a disruption of the normal 24-h sleep wake cycle and include jet lag and shift work disorder
  - *“Parasomnias”*
    - ▣ Undesirable physical events or experiences that occur during sleep such as night terrors, and sleep walking
  - *“Insomnia”*
    - ▣ Persistent difficulty with sleep initiation, duration, consolidation or quality of sleep despite adequate opportunity and circumstances for sleep
  - *“Hypersomnolence disorders”*
    - ▣ Relate to patients that have symptoms of excessive sleepiness and include Narcolepsy

# “Consequences” of Untreated Obstructive Sleep Apnea (OSA)

- ▣ Consequences of untreated OSA
  - *“Daytime Somnolence”*: Chronic sleepiness during the day impairing ability to function
  - *“Decreased administrative function”*: Diminished ability to organize professional and personal responsibilities.
  - *“Attention deficit”*: Untreated OSA has a sizable effect on the ability to sustain attention over time
    - ▣ Less on reaction time
    - ▣ More impact on the quality of the performance

# Consequences of Untreated Obstructive Sleep Apnea (OSA) (cont)

- ▣ Consequences of untreated OSA
  - *“Refractory Diabetes”*- Elevated blood glucose not readily responsive to insulin
  - *“Hypertension”*: High blood pressure > 129/90
    - ▣ Can lead to stroke or MI
  - *“Psychosocial dysfunction”*: Worsening of anxiety and depression.
  - Reduced *“Quality of Life (QOL)”*: Research using standardized surveys show that those with untreated OSA have a statistically significant lower quality of life

# OSA Treatment: Some Pathophysiology is Reversible

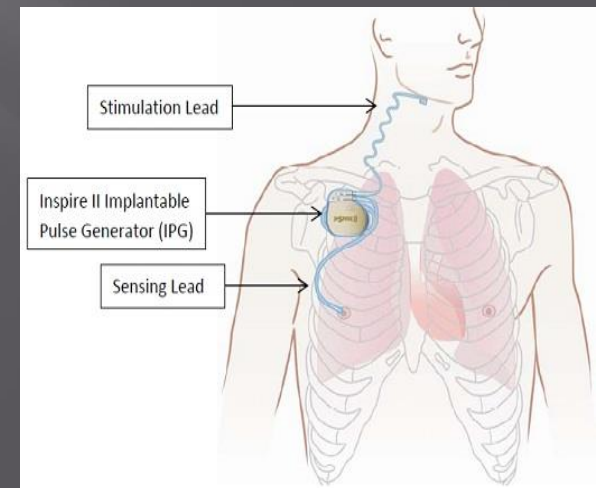
- ▣ Mainly via Positive Pressure: BiPAP or CPAP
  - Determined via pressure titration
- ▣ Other Treatments:
  - Address risk factor:
    - ▣ Weight Loss
    - ▣ Avoid Alcohol
    - ▣ Smoking Cessation
  - Dental Appliance
  - Surgery:
    - ▣ “Uvulopalatopharyngoplasty” (UPPP)

# Positive Pressure Therapy Terms

- ▣ *CPAP-Continuous Positive Airway Pressure-*  
The administration of positive pressure at a fixed level.
- ▣ *BiPAP- The administration of positive pressure at two levels of pressure-* one level (IPAP) at inspiration and another at expiration (EPAP).
- ▣ *AVAPS-Average volume-assured pressure support* - Fixed EPAP (baseline) pressure with auto-titrating IPAP to achieve targeted tidal (and minute) volume.
- ▣ *“Auto-titrating” NIV-*Titrates to give the lowest pressure to overcome obstruction.

# A New(er) OSA Treatment: “Upper Airway Stimulation” (UAS):

- An implantable nerve stimulator used to treat moderate to severe obstructive sleep apnea (OSA).
- Patient must have failed other conventional therapy (CPAP/BiPAP)



# “Night Balance Lunoa”—by Philips

- ▣ Mask-free treatment that helps you stay in a side-sleeping position to reduce breathing disturbance.
- ▣ Night Balance Lunoa is a clinically proven.
  - Has been found to be *non-inferior* to PAP therapy.
- ▣ It is a palm-sized, compact and discreet device that is worn comfortably across the chest in a soft, adjustable belt under your nightclothes.
- ▣ During your sleep, it delivers auto-customized, gentle vibrations that prompt you to move off your back without disturbing your sleep.





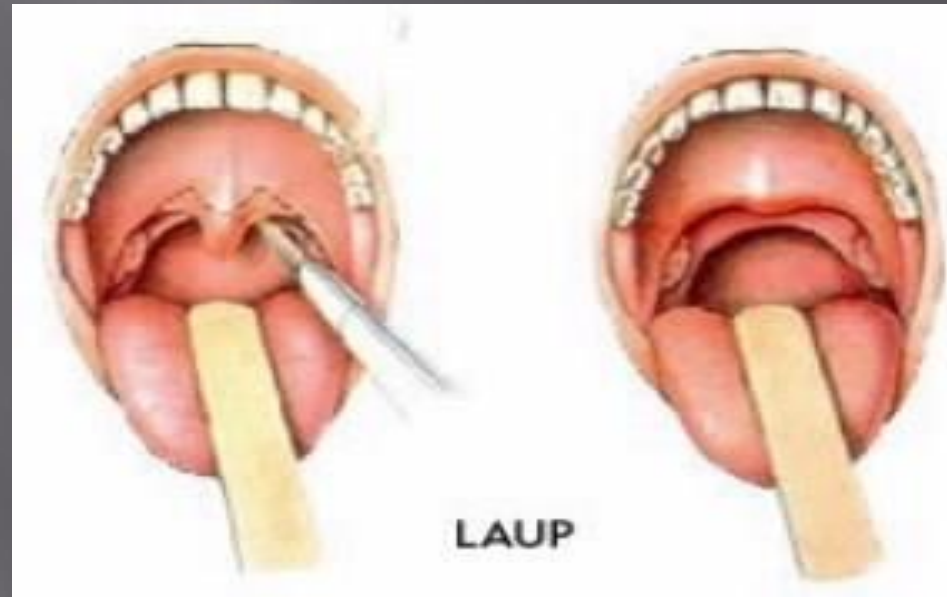
# Surgery

- ▣ *“Tonsilectomy”* – Removal of the tonsils for patients with enlarged tonsils and adenoids.



# Surgery (Cont.)

- ▣ *UP3* – “Uvulopalatopharyngoplasty” or *uvulectomy* –
  - A procedure to remove excess tissue in the soft palate to widen the airway.
  - May be effective in mild to moderate cases of OSA



# Surgery- (Cont.)

- ▣ MMA surgery – “Maxillomandibular advancement”:
  - The upper jaw (maxilla) and the lower jaw (mandible) are lengthened and moved forward.
  - Patients with shortened upper or lower jawbones may benefit



# Surgery (Cont.)

- ▣ *“Tongue reduction surgery”* – Surgical removal of a portion of the tongue
  - May be helpful when the tongue is abnormally enlarged.
- ▣ *“Tracheostomy”*- Surgical stoma & airway in the throat
  - A last Resort



# Take Home Points

- ▣ There is a lot of terminology specific to Sleep Medicine.
- ▣ It can be categorized by terms related to physiology, diagnostics, clinical consequences and treatment.
- ▣ Some terms are similar but not the same... and may be confused.
- ▣ Understanding the terminology and distinctions can help you provide enhanced care.

# Selected References

- ▣ Sprigg's Essentials of Polysomnography: Endee, ed 3, 2021.
- ▣ Egan's Fundamental of Respiratory Care: Kacmarek, Stoller & Heuer, ed 12, 2021.
- ▣ Clinical Assessment in Respiratory Care, ed. 9, Heuer, 2021.
- ▣ Respiratory Disease: A Case Study Approach to Patient Care, Wilkins & Dexter, ed 3, 2007.
- ▣ Sajkov, D & McEvoy RD, Obstructive Sleep Apnea & Pulmonary Hypertension, Prog Cardiovasc Dis. 51 (5): 363-70, 2009.
- ▣ AARC.org
- ▣ Pubmed
- ▣ Medline