

**MODULE**

**POSITIVE AIRWAY PRESSURE  
(PAP) Titrations**

# POSITIVE AIRWAY PRESSURE (PAP) TITRATIONS

## OBJECTIVES

At the end of this module the student must be able to:

- Identify the standards of practice for administering positive airway pressure (PAP) to patient
- Explain the contraindications for PAP
- Explain the complications of PAP
- Identify the 3 types of PAP devices and determine what is applicable to the patient
- Explain and demonstrate the correct application of PAP titration techniques

# POSITIVE AIRWAY PRESSURE (PAP) TITRATIONS

## POSITIVE AIRWAY PRESSURE

- Positive Airway Pressure is the delivery of positive air pressure through the nasal passage forming an air splint of the upper airway to provide continuous air exchange during sleep in patients with Obstructive Sleep Apnea/Hypopnea Syndrome.
- **SETTING:** This guideline is confined to the use of PAP in the sleep laboratory setting to implement appropriate therapeutic intervention to titrate PAP to eliminate or reduce the apnea/hypopnea index. The polysomnographic evaluation must be performed in a facility based sleep study laboratory, and not in the home or in a mobile facility.

# POSITIVE AIRWAY PRESSURE (PAP) TITRATIONS

- **INDICATIONS :**

- 1) AHI greater than 15, or

- 2) AHI greater than 5 and less than or equal to 14 with documented symptoms of excessive daytime sleepiness , impaired cognition , mood disorders or insomnia, or documented hypertension , is chemic heart disease or history of stroke.

The AHI is equal to the average number of episodes of apnea and hypopnea per hour and must be based on a minimum of 2 hours of sleep recorded by polysomnography using actual recorded hours of sleep. Two hours of recorded sleep is consistent with current practice.

# **POSITIVE AIRWAY PRESSURE (PAP) TITRATIONS**

**APNEA** is defined as a cessation of airflow for at least 10 seconds.

**HYPOPNEA** in the adult is defined as an abnormal respiratory event lasting at least 10 seconds with at least a 30% reduction in the airflow as compared to baseline, and with at least a 4% oxygen desaturation.

# LESSON 1: POSITIVE AIRWAY PRESSURE (PAP) TITRATIONS

## STANDARDS OF PRACTICE

- A diagnosis of Obstructive Sleep Apnea (OSA) must be established by an acceptable method.
- Continuous Positive Airway Pressure (CPAP) is effective for treating OSA.
- Full-night, attended studies performed in the laboratory are the preferred approach for titration to determine optimal pressure, however split-night studies are usually adequate.

### Criteria for Split-Night Protocol (Medicare)

- 6 hours of Total Recording Time
- 2 hours of Total Sleep Time during the diagnostic portion of the study

# LESSON 1: POSITIVE AIRWAY PRESSURE (PAP) TITRATIONS

## STANDARDS OF PRACTICE (cont'd)

- AHI  $\geq$  15 events per hour of sleep
- 3 hours of treatment time

**NOTE:** Medicare will pay for CPAP if AHI  $\geq 5 \leq 14$  events per hour of sleep if other co-morbidity issues are involved (i.e., HTN, EDS, Obesity).

- CPAP & Bi-Level therapies are safe; side effects and adverse events are mainly minor and reversible.
- Bi-Level may be useful in treating some forms of restrictive lung disease or hypoventilation syndromes associated with hypercapnia.

# LESSON 1: POSITIVE AIRWAY PRESSURE (PAP) TITRATIONS

## COMPLICATIONS

- Claustrophobia  
Corrective Measure: Desensitization/Acclimatization
- Mouth breathing  
Corrective Measures:
  - Apply Chin strap
  - Apply Full Face Mask
  - Administer In-line heated humidification
- Nasal congestion
- Dentures

# **LESSON 1: POSITIVE AIRWAY PRESSURE (PAP) TITRATIONS**

## **CONTRAINDICATIONS**

- Cerebral Spinal Fluid Leak (CSF)
- Pneumothorax
- Bullous Lung Disease
- Pathologically Low Blood Pressure

# LESSON 1: POSITIVE AIRWAY PRESSURE (PAP) TITRATIONS

## 3 TYPES of PAP DEVICES

- Continuous Positive Airway Pressure (CPAP)
  - delivers a constant pressure compressed air via a hose to a nasal pillow, nose mask or full-face mask, splinting the airway (keeping it open under air pressure) so that unobstructed breathing becomes possible, reducing and/or preventing apneas and hypopneas
- Bi-Level Positive Airway Pressure
  - provides two levels of pressure: one for inhalation (IPAP) and a lower pressure during exhalation (EPAP)

# LESSON 1: POSITIVE AIRWAY PRESSURE (PAP) TITRATIONS

## 3 TYPES of PAP DEVICES (cont'd)

- Auto Self-Adjusting Positive Airway Pressure
  - automatically *titrates or adjusts* the amount of pressure delivered to the patient to the minimum required to maintain an unobstructed airway on a breath-by-breath basis by measuring the resistance in the patient's breathing, thereby giving the patient the precise pressure required at a given moment and avoiding the compromise of fixed pressure.

# LESSON 1: POSITIVE AIRWAY PRESSURE (PAP) TITRATIONS

## PAP Treatment

Can be applied through:

- Nasal
- Oral
- Oronasal Interface

It is the preferred treatment for OSA but may also be used for some patients with central sleep apnea (CSA) and chronic hypoventilation.

# **LESSON 1: POSITIVE AIRWAY PRESSURE (PAP) TITRATIONS**

On lesson 1 you have learned about the standards of practice for administering positive airway pressure (PAP) to patient, the complications and contraindications of PAP and the three types of PAP devices.

The next lessons will be about 2 most common PAP devices used on the sleep laboratory:

First is the Continuous Positive Airway Pressure (CPAP)

# LESSON 2: CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP) TITRATIONS

## PROCEDURE

During the hook-up procedure the technician must:

- show the CPAP videotape,
- explain and demonstrate the use of the CPAP to the patient
- size and fit a patient with the proper mask size and
- have the patient try the CPAP for a couple of minutes at a very low setting (3-5 cmH<sub>2</sub>O)

During the diagnostic study (2-3 hours of diagnostic time), if the technician observes cyclical respiratory disturbances that cause a drop in SaO<sub>2</sub> ≤ 85%, the technician is to apply CPAP.

# **LESSON 2: CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP) TITRATIONS**

## **PROCEDURE (cont'd)**

There should be an estimated AHI of  $>15$  per hour before administration of CPAP and 2 hours of Total Sleep Time.

A notation in the patient's chart should be made, making note of the severity of the respiratory events, lowest SaO<sub>2</sub> and time of CPAP administration.

# LESSON 2: CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP) TITRATIONS

## OBJECTIVE

The objective for titrating CPAP is to achieve the following:

- 1)  $AHI \leq 5/\text{hour}$
- 2) Arousal index  $\leq 5/\text{hour}$
- 3)  $SaO_2 \geq 90\%$
- 4) Eliminate snoring

# LESSON 2: CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP) TITRATIONS

## PROCESS

The process for titrating CPAP is as follows:

1) Have the patient sleep in the supine position (if possible).

NOTE: Final CPAP titration is contingent that the patient be in supine and in REM.

2) Start off with a CPAP of 5 cmH<sub>2</sub>O.

3) Titrate pressures in 2 cmH<sub>2</sub>O increments. Pressures should be increased if the technician observes apneas and/or hypopneas estimated to be  $\geq 5$ /hour. There is no time frame to wait before increasing pressures so long as the estimated RDI/AHI is  $\geq 5$ /hour.

# LESSON 2: CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP) TITRATIONS

## PROCESS (cont'd)

4) If the estimated AHI is  $\leq 5$ /hour maintain the current pressure. If the estimated AHI is  $\geq 5$ /hour increase the pressure by 2 cmH<sub>2</sub>O.

5) If mouth breathing is observed, place a chin strap or convert to a full face mask. All CPAP patients will have in-line heated humidification. It is important that the technician physically observe for mouth breathing by going into the patient's room and feeling around the mask and face for any signs of leakage. If it is true mouth breathing, you should be able to see the mouth opening (possibly "pursed lips") and air seeping out.

# LESSON 2: CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP) TITRATIONS

## PROCESS (cont'd)

6) If the patient is snoring, increase pressure by 2cmH<sub>2</sub>O. Once all four of the above listed objectives have been reached, then optimal CPAP has been obtained.

NOTE: If the patient shows cyclical desaturations unassociated with any respiratory events, then the tech is to switch to Bilevel.

# LESSON 2: CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP) TITRATIONS

## PROTOCOL for CPAP THERAPY

- Patients must be asleep in order to obtain optimal pressure
- Increase CPAP for the following:
  - Apneas
  - Hypopneas
  - Desaturations
  - Arousals (respiratory/spontaneous)
  - Snoring

# **LESSON 2: CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP) TITRATIONS**

## **PROTOCOL for CPAP THERAPY**

**(cont'd)**

- If “estimated” AHI/RDI is  $> 5/\text{hr}$ , then pressures should be increased ideally in 1.0 to 2.0 cm increments.

# LESSON 2: CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP) TITRATIONS

## OPTIMAL THERAPY

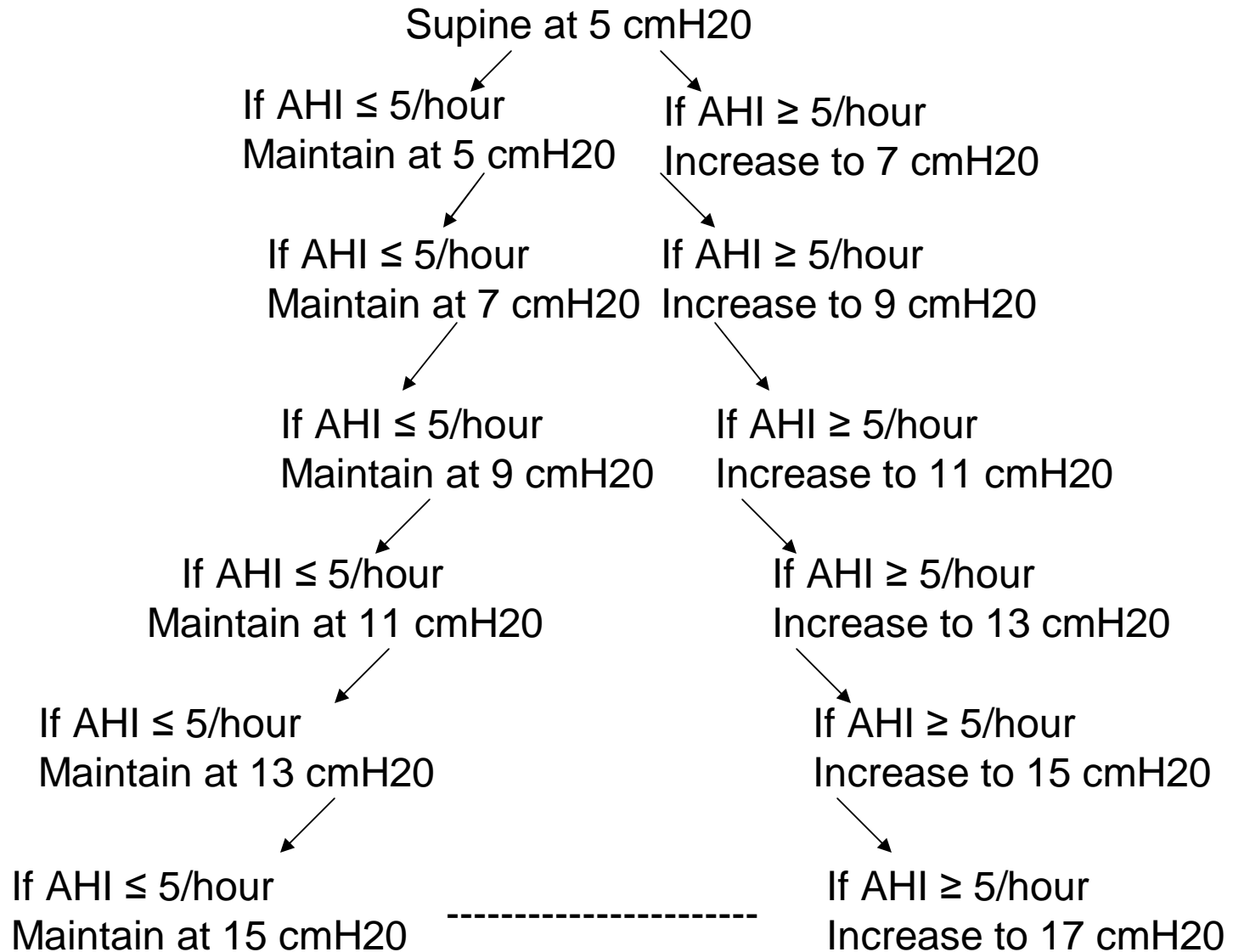
During CPAP titrations, optimal pressure is obtained once you've met the following:

- $AHI \leq 5/hr$
- $SaO_2 \geq 90\%$
- Snoring eliminated
- Patient observed while Supine/REM

# **LESSON 2: CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP) TITRATIONS**

For easy memorization on the protocol of CPAP titration please refer to the CPAP titration tree on the next slide.

# CPAP TITRATION TREE



# **LESSON 2: CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP) TITRATIONS**

You have learned from this lesson the procedures and objectives of conducting a CPAP therapy and the process for CPAP titrations and when to consider the optimal pressure has been reached.

Next lesson will be Bilevel Positive Airway Pressure.

# **LESSON 3: BILEVEL POSITIVE AIRWAY PRESSURE**

## **INDICATIONS**

Bilevel administration is performed whenever patients have difficulty tolerating CPAP or have any or all of the following conditions:

- 1) COPD only if desaturations are observed without apneas
- 2) Restrictive Lung Disease
- 3) Post-polio if desaturations are observed.

# LESSON 3: BILEVEL POSITIVE AIRWAY PRESSURE

## PROTOCOL FOR BILEVEL THERAPY

### **Increase IPAP** for:

- Hypopneas
- Desaturations
- Arousals
- Snoring

### **Increase EPAP** for:

- Apneas
  - Obstructive & Mixed

# LESSON 3: BILEVEL POSITIVE AIRWAY PRESSURE

## BILEVEL BASICS

- If IPAP is equivalent to EPAP then that is equivalent also to CPAP (IPAP = EPAP = CPAP)
- For Bilevel, IPAP should be greater than EPAP (IPAP > EPAP)

“Generally” there should be a 3-4 cm difference between  
IPAP & EPAP”

# LESSON 3: BILEVEL POSITIVE AIRWAY PRESSURE

## JUSTIFICATION FOR BILEVEL THERAPY

### Process #2:

If performing CPAP, you can switch to BiLevel whenever the following may occur:

- You've maxed out your CPAP
- Patient ***failed*** CPAP
- Patient experiencing difficulty exhaling on CPAP
- Cyclical desaturations unassociated with any respiratory events
- Ending CPAP pressure can be starting EPAP pressure (increase IPAP by 3-4 cm)

# **LESSON 3: BILEVEL POSITIVE AIRWAY PRESSURE**

For easy understanding of the Bilevel titration protocol please refer on the next slide for the Bilevel titration tree.

# LESSON 3: BILEVEL POSITIVE AIRWAY PRESSURE

## BILEVEL TITRATION TREE

Supine at optimal EPAP/CPAP

Increase IPAP 2 cm higher than ending CPAP

Increase IPAP in 2 cm H<sub>2</sub>O increments for:

Hypopneas

Desaturations

Respiratory Arousals

Snoring

Increase EPAP in 2 cm H<sub>2</sub>O increments for:

Apneas

# LESSON 3: BILEVEL POSITIVE AIRWAY PRESSURE

## ALL NIGHT BILEVEL THERAPY

### Process #1:

- Start out with IPAP & EPAP at same pressures (i.e., IPAP 7; EPAP 7).
- Increase both for apneas
- Once hypopneas, desaturations, arousals, or snoring start to appear, then raise IPAP by 3-4 cm.

# LESSON 3: BILEVEL POSITIVE AIRWAY PRESSURE

## OPTIMAL THERAPY

During Bilevel titrations, optimal pressure is obtained once you've met the following:

- $AHI \leq 5/hr$
- $SaO_2 \geq 90\%$
- Snoring eliminated
- Patient observed while Supine/REM

# LESSON 3: BILEVEL POSITIVE AIRWAY PRESSURE

## Supplemental Oxygen vs. BiLevel

- If *desaturations* are present without any associated respiratory events, then contact the Medical Director for supplemental oxygen (unless Standing Orders are already in place)
- If the patient is showing *cyclical desaturations* unassociated with any respiratory events, then the patient should be switched to BiLevel therapy.

# **LESSON 3: BILEVEL POSITIVE AIRWAY PRESSURE**

On this lesson you have learned about the indications for switching from CPAP to Bilevel, the protocol for titrating Bilevel pressures, when to know if the optimal pressure was reached and the conditions where oxygen or bilevel is indicated.

# POSITIVE AIRWAY PRESSURE (PAP) TITRATIONS

## Reference

- Practice Parameters for the Use of Continuous and BiLevel Positive Airway Pressure Devices to Treat Adult Patients with Sleep-Related Breathing Disorders. *Sleep*, Vol. 29, No. 3, 2006
- Evaluation of Positive Airway Pressure Treatment for Sleep Related Breathing Disorders in Adults. *Sleep*, Vol. 29, No. 3, 2006