MODULE

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 $5 \leq \text{AHI} \leq 14$ 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 *tirates 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 cmH20)

During the diagnostic study (2-3 hours of diagnostic time), if the technician observes cyclical respiratory disturbances that cause a drop in SaO2 ≤ 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 SaO2 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 ≤ 5/hour
2) Arousal index ≤ 5/hour
3) SaO2 ≥ 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 cmH20.
3) Titrate pressures in 2 cmH20 increments. Pressures should be increased if the technician observes apneas and/or hypopneas estimated to be ≥ 5/hour. There is no time frame to wait before increasing pressures so long as the estimated RDI/AHI is ≥ 5/hour.
LESSON 2: CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP) TITRATIONS

PROCESS (cont’d)

4) If the estimated AHI is ≤ 5/hour maintain the current pressure. If the estimated AHI is ≥ 5/hour increase the pressure by 2 cmH20.
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 2cmH20. 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/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
- SaO2 \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

Supine at 5 cmH20

If AHI ≤ 5/hour
Maintain at 5 cmH20

If AHI ≥ 5/hour
Increase to 7 cmH20

If AHI ≤ 5/hour
Maintain at 7 cmH20

If AHI ≥ 5/hour
Increase to 9 cmH20

If AHI ≤ 5/hour
Maintain at 9 cmH20

If AHI ≥ 5/hour
Increase to 11 cmH20

If AHI ≤ 5/hour
Maintain at 11 cmH20

If AHI ≥ 5/hour
Increase to 13 cmH20

If AHI ≤ 5/hour
Maintain at 13 cmH20

If AHI ≥ 5/hour
Increase to 15 cmH20

If AHI ≤ 5/hour
Maintain at 15 cmH20

If AHI ≥ 5/hour
Increase to 17 cmH20
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 H20 increments for:
    Hypopneas
    Desaturations
    Respiratory Arousals
    Snoring
Increase EPAP in 2 cm H20 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 ≤ 5/hr
- SaO2 ≥ 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