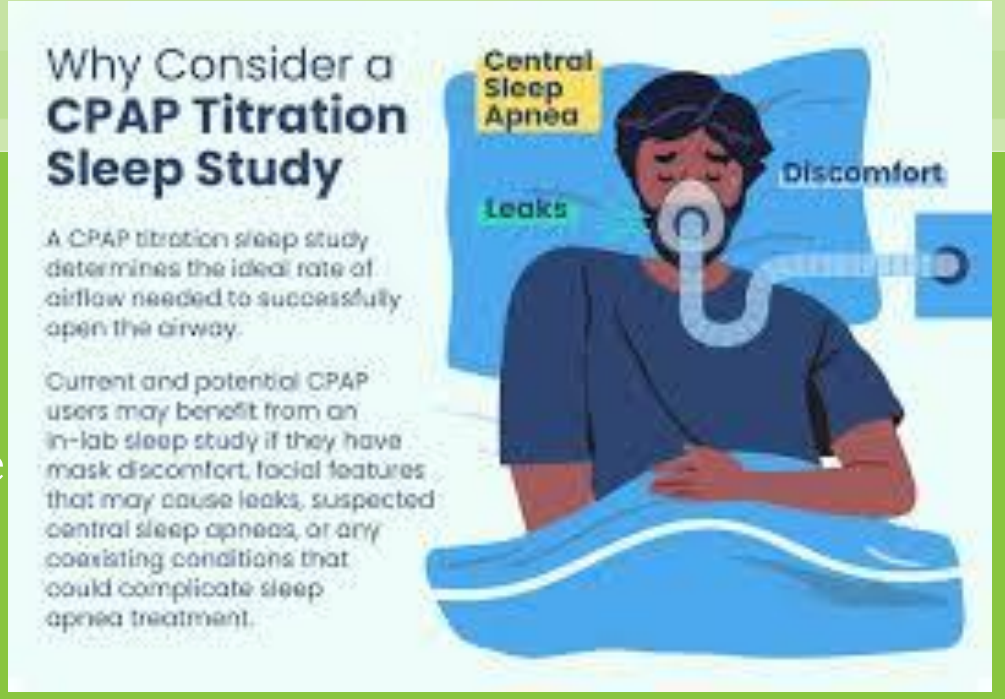
به نام خداوند بخشنده ی مهربان

PAP Titration

Farzaneh Jahanbakhsh

Psychiatrist

Fellowship in sleep medicine



- **Continuous positive airway pressure (CPAP)** allows the technologist to increase positive airway pressure throughout the polysomnographic recording to determine the single fixed pressure that will eliminate respiratory disturbances during subsequent nightly usage at home.

- No procedure is more challenging for the sleep technologist than positive airway pressure (PAP) titration.
- Although challenging, PAP titration is also the most potentially rewarding procedure that the technologist will perform in the sleep center.
- An adequate PAP titration can dramatically improve the health and quality of life for the patient.

- The technologist must use social skills to prepare the patient for titration and reduce his or her fears.
- From the moment the patient enters the sleep center, the technologist begins building a rapport with the patient to ensure a positive experience during PAP titration.

- Even the best treatment is useless if the patient doesn’t use it.
- A positive initial experience with PAP therapy has been shown to predict future adherence to the treatment .
- The initial impression of the patient to PAP therapy is an essential factor in treatment adherence.

Before the titration

- All potential PAP titration candidates must have an initial physician evaluation,
- PAP education,
- careful mask fitting
- acclimation to the device prior to titration.

patient education

- If possible, allow the patient to watch a video that follows a patient through diagnosis and treatment.
- Show the patient the equipment and describe how it works. Let the patient handle the equipment and the mask. Have the patient hold the PAP mask in place (at the lowest pressure of 4 cm H2O) without strapping the mask on.
- Allow the patient to practice breathing through the mask until he or she feels comfortable (a minimum of 2 to 3 minutes). Next, have the patient try PAP with the straps holding the mask in place.

- Demonstrate how to release the headgear in the event the patient panics and needs to remove the mask quickly.
- Allow the patient to remove the mask. Explain that he or she will be exhaling against the PAP.
- Explain that a nasal mask works best with the mouth closed, and that when the patient opens his or her mouth, the air will rush out, making it difficult to talk.
- Slowly raise the pressure to between 8 and 10 cm H2O in order to demonstrate a higher level of pressure to the patient.

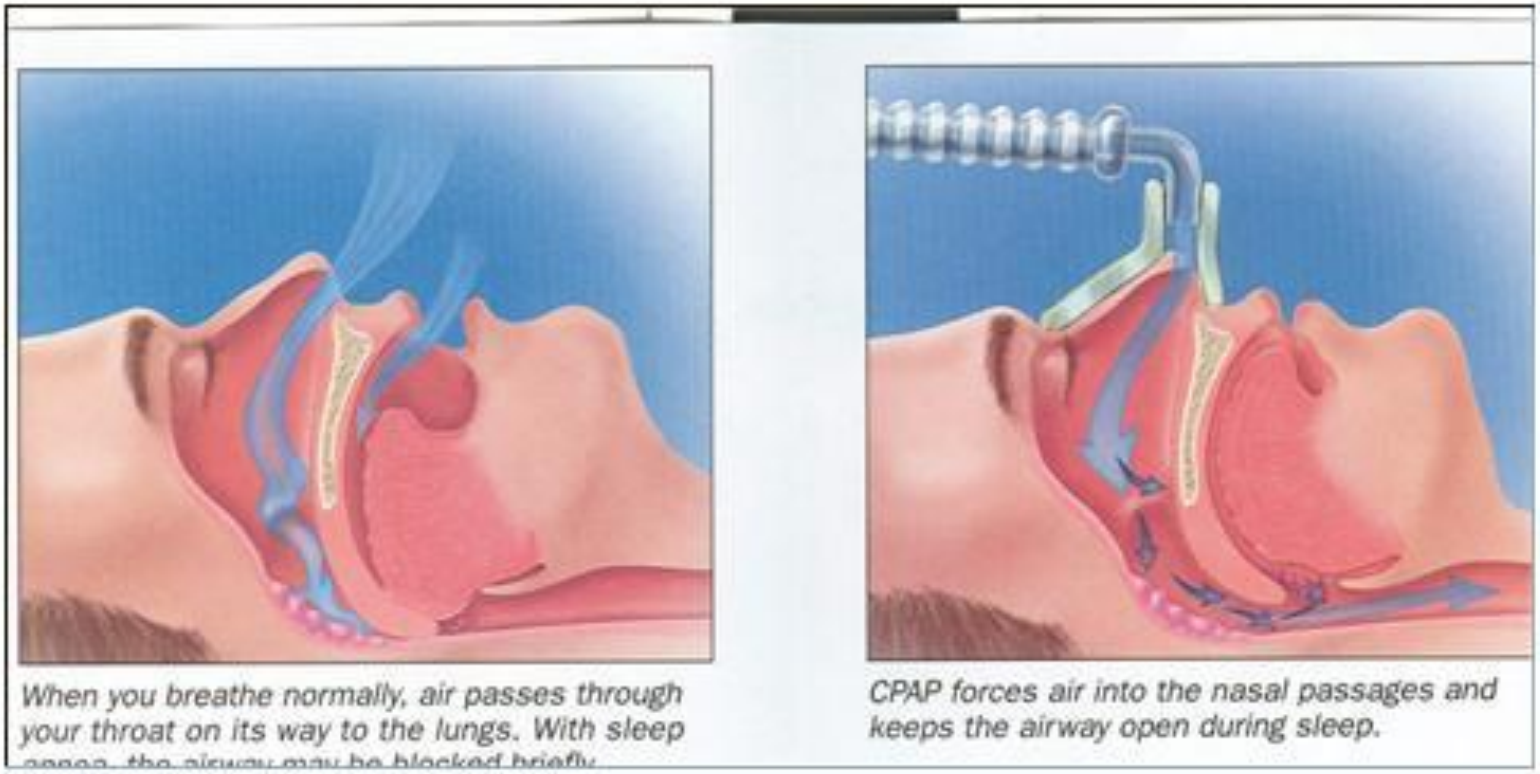
- Explain that the device uses room air and contains a fan that speeds up to produce increased air pressure when the airway is obstructed.
- Let the patient know that you will be controlling the pressure from another room. Describe the mask options that are available.
- Reassure the patient that the mask is clean or new and that procedures are in place to reduce infection.

- The most common question encountered before PAP titration is “How will I sleep with that on my face?”
- Telling the patient “almost everyone sleeps” is often not enough.
- It is more helpful to address the patient’s concerns directly. Ask if the patient is concerned about the mask, the pressure, or the newness of the situation.

- Patients often ask about going to the bathroom during the night, waking with the mask off, feelings of suffocation, and noise.
- Some technologists provide answers to these questions even before they are asked.
- It is also helpful to explain that you will be adjusting the pressure throughout the night with the goal of eliminating the patient's respiratory events.
- Explain that upon awakening the pressure may feel different from when they fell asleep.

- If it is clear that a patient is tense or anxious, it may be necessary to let the patient take a break from PAP for a brief time and sit up for a while, instead of having him or her continue to try to sleep.
- By having the patient sit quietly, he or she is likely to calm down and relax, thus increasing the chance that the patient will be able to continue with the PAP titration and be able to sleep.
- While the patient is sitting up, the technologist can work with the patient to practice using PAP again.
- The technologist should reduce the pressure before reapplying the mask.

- For patients who awaken during the night and have difficulty tolerating PAP while awake, reduce the PAP until the patient returns to sleep.
- Once the patient is asleep, gradually increase to the pressure titrated before the awakening and continue the titration.
- With experience, technologists develop techniques and skills to respond to patient concerns and reassure patients in order to get an optimal titration.



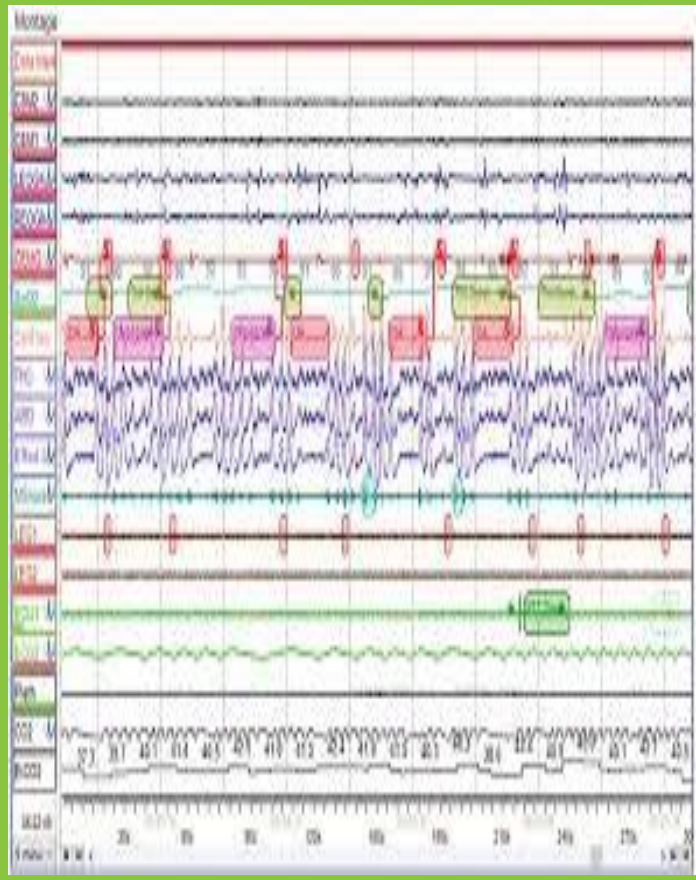
When you breathe normally, air passes through your throat on its way to the lungs. With sleep

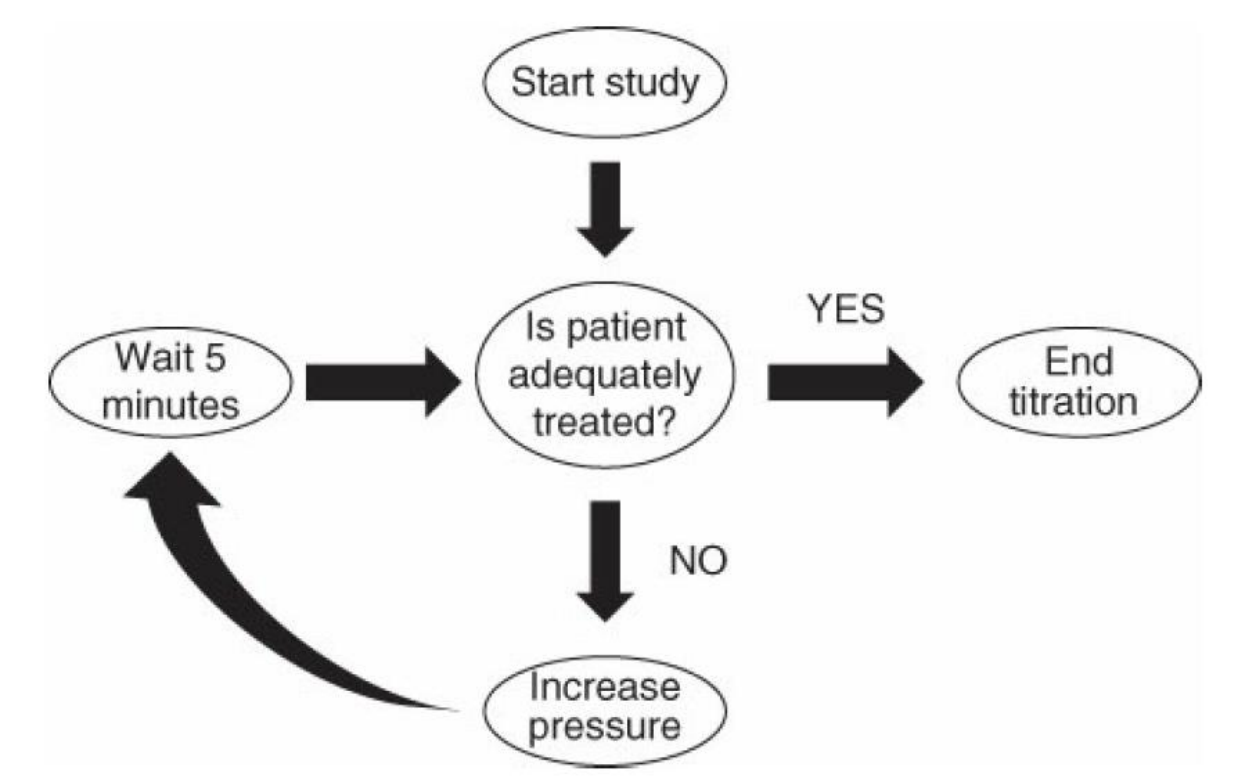
CPAP forces air into the nasal passages and keeps the airway open during sleep.

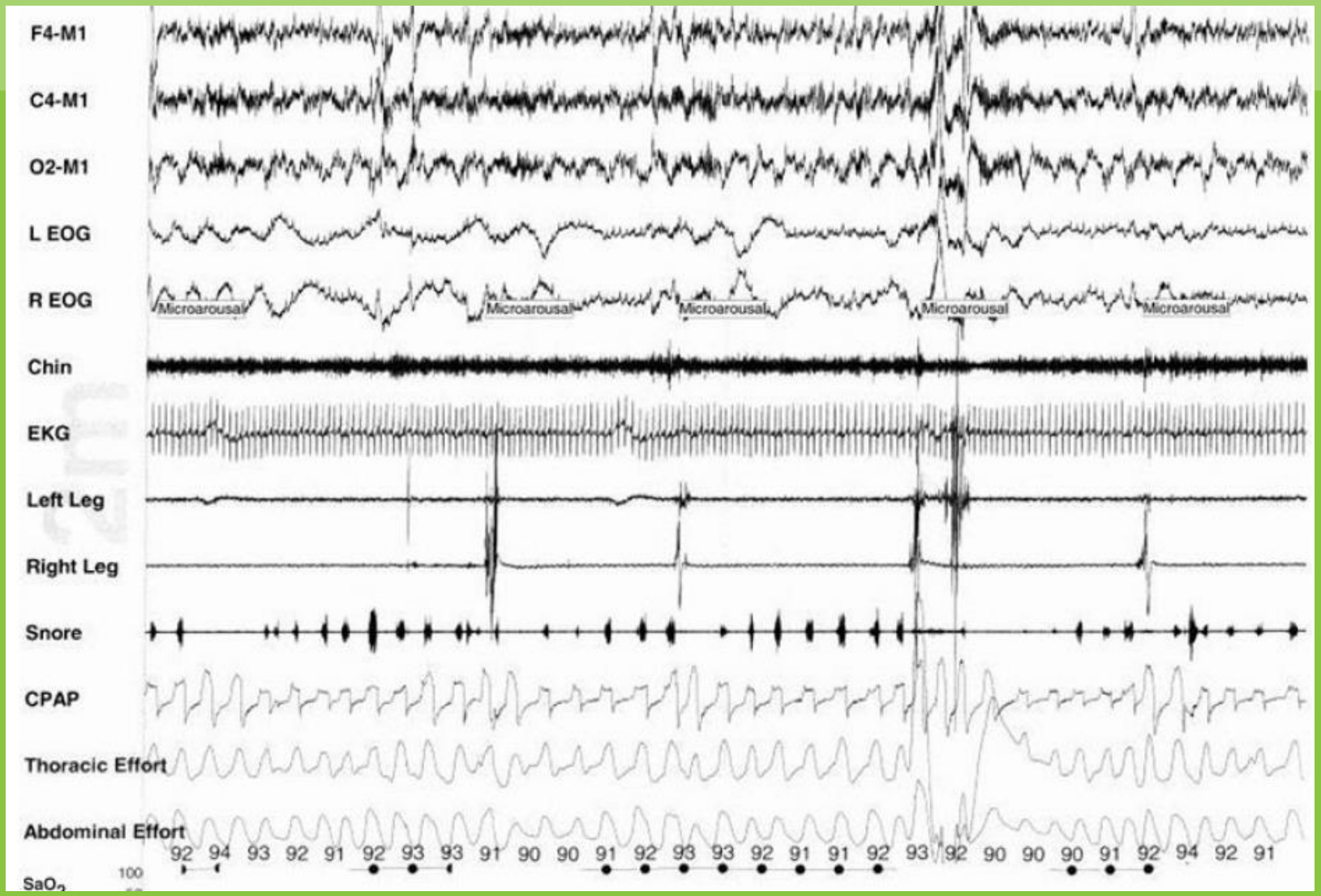
Start the titration test

- Increase pressure by a minimum of 1 cm H2O with an interval of no less than 5 minutes
- Larger increases?
  - appropriate during retitration of patients who have previously been determined to have high-pressure requirements,
  - or if there are other reasons to suspect high pressure will be needed.

- It is best to increase the pressure during inspiration, because the patient is less likely to notice the change.
- At times, a change in pressure may cause an arousal or change in sleep stage.
- Allowing a few minutes for the patient to settle down also provides a better assessment of the patient's response to the increased pressure.




Start study
Is patient adequately treated?
YES
End titration
NO
Increase pressure
Wait 5 minutes


F4-M1
C4-M1
O2-M1
L EOG
R EOG
Chin
EKG
Left Leg
Right Leg
Snore
CPAP
Thoracic Effort
Abdominal Effort
SaO2
100
Microarousal
Microarousal
Microarousal
Microarousal
Microarousal
92 94 93 92 91 92 93 93 91 90 90 91 92 93 93 92 91 91 92 93 92 90 90 90 91 92 94 92 91

Patients < 12 years old	Patients > 12 years old
1 obstructive apnea	2 obstructive apneas
3 RERAs	5 RERAs
1 hypopnea	3 hypopneas
1 min. of loud or unambiguous snoring	3 min. of loud or unambiguous snoring

Exploration Of Higher Pressure Levels?

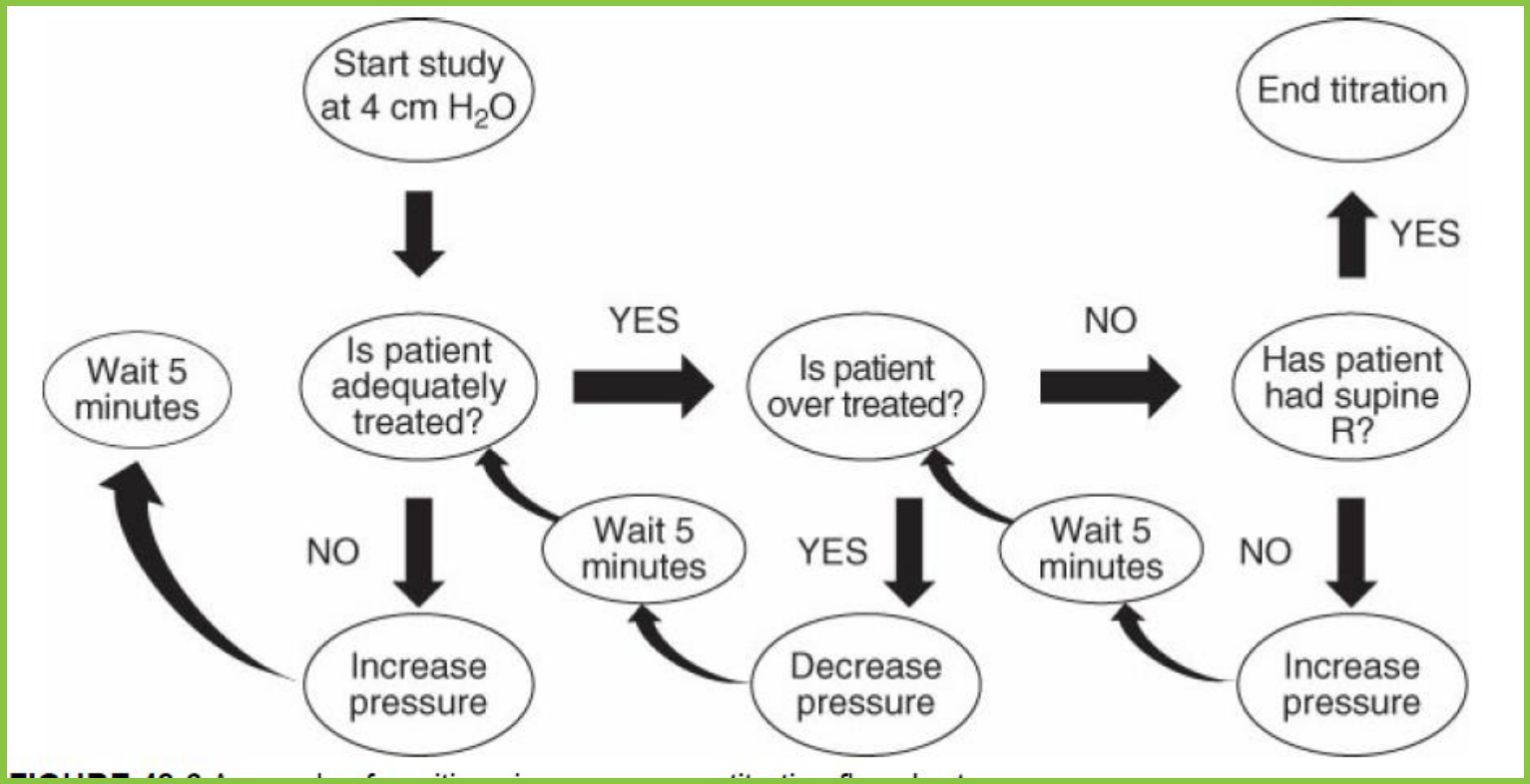
- In patients who no longer have apneas, hypopneas, RERAs, and snoring, an additional increase in pressure **may provide benefits** including resolution of flow limitation (as evidenced by elimination of flow signal flattening) and improved sleep continuity.
- The guidelines recommend increasing pressure **by 2 and no more than 5 cm H2O** over the pressure needed for resolution of respiratory events and snoring in the exploratory phase of PAP titration.

Patients < 12 years old

- **CPAP minimum = 4 cm H2O**
- **CPAP maximum = 15 cm H2O**

Patients > 12 years old

- **CPAP minimum = 4 cm H2O**
- **CPAP maximum = 20 cm H2O**


Start study at 4 cm H_2O
Is patient adequately treated?
YES
Is patient over treated?
NO
Has patient had supine R?
YES
End titration
Wait 5 minutes
NO
Increase pressure
Wait 5 minutes
YES
Decrease pressure
Wait 5 minutes
NO
Increase pressure

Down titration

- “Down” titration is not required but may be considered as an option
- Down titration may be utilized following a minimum of 30 minutes of recording where obstructive events have been eliminated.

Down titration

- Reduce PAP or IPAP pressure by a minimum of 1 cm H2O with an interval of no less than 10 minutes until obstructive events reappear, then increase pressure by a minimum of 1 cm H2O with an interval of no less than 5 minutes until obstructive events are eliminated.

Bilevel Positive Airway Pressure

BPAP

- PAP device with two adjustments; one adjustment for inspiratory and one for expiratory pressure (IPAP and EPAP).

Patients < 12 years old

- **Minimum IPAP = 8 cm H2O**
- **Minimum EPAP = 4 cm H2O**
- **Maximum IPAP = 20 cm H2O**
- **Minimum I/E difference = 4 cm H2O**
- **Maximum I/E difference = 10 cm H2O**

Patients > 12 years old

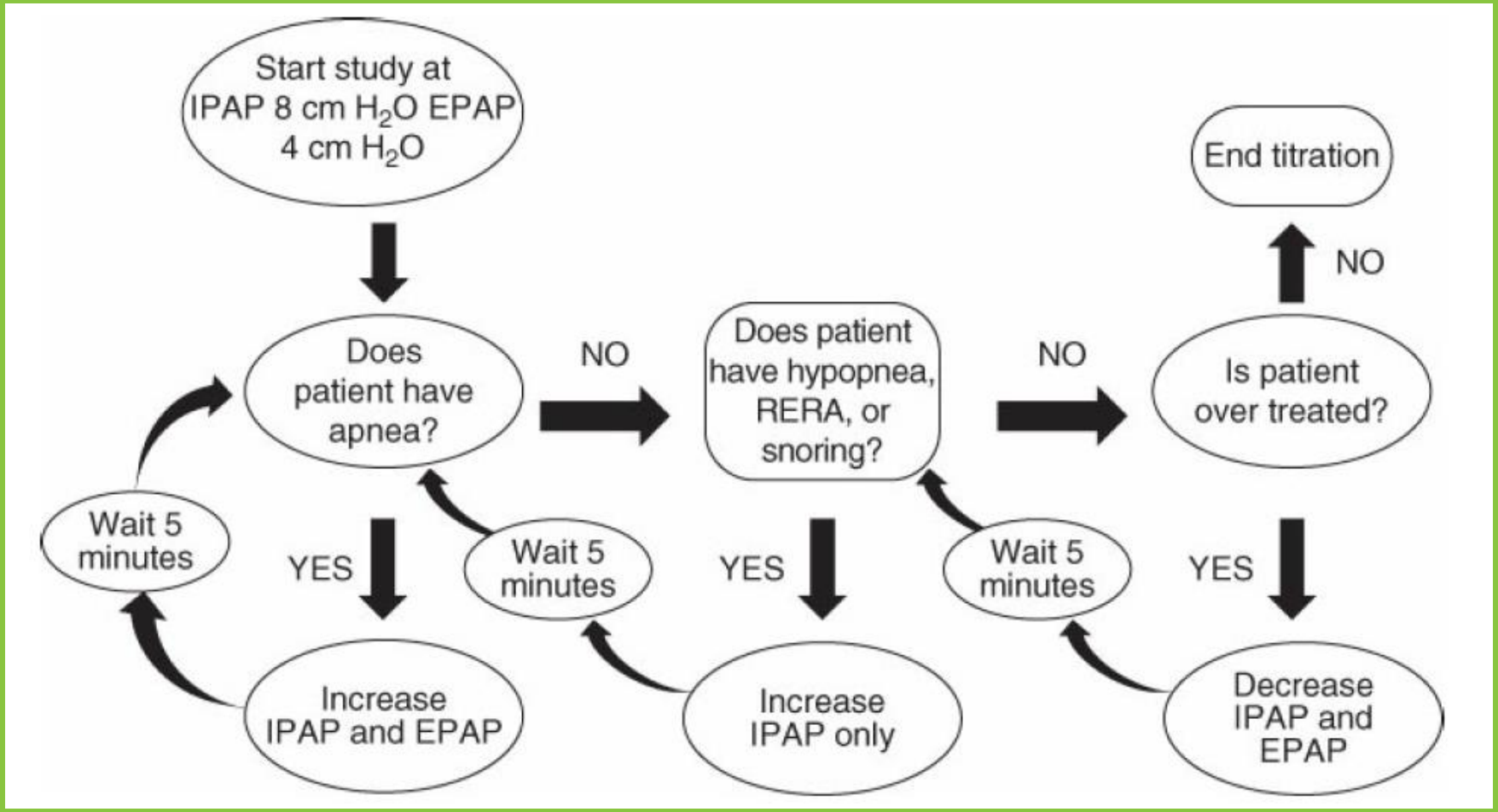
- **Minimum IPAP = 8 cm H2O**
- **Minimum EPAP = 4 cm H2O**
- **Maximum IPAP = 30 cm H2O**
- **Minimum I/E difference = 4 cm H2O**
- **Maximum I/E difference = 10 cm H2O**

Start the BPAP titration test

- IPAP 8 cm H2O and EPAP 4 cm H2O
- Increase **both IPAP and EPAP** pressures by a minimum of 1 cm H2O with an interval of no less than 5 minutes when you see 2 obstructive **apneas**

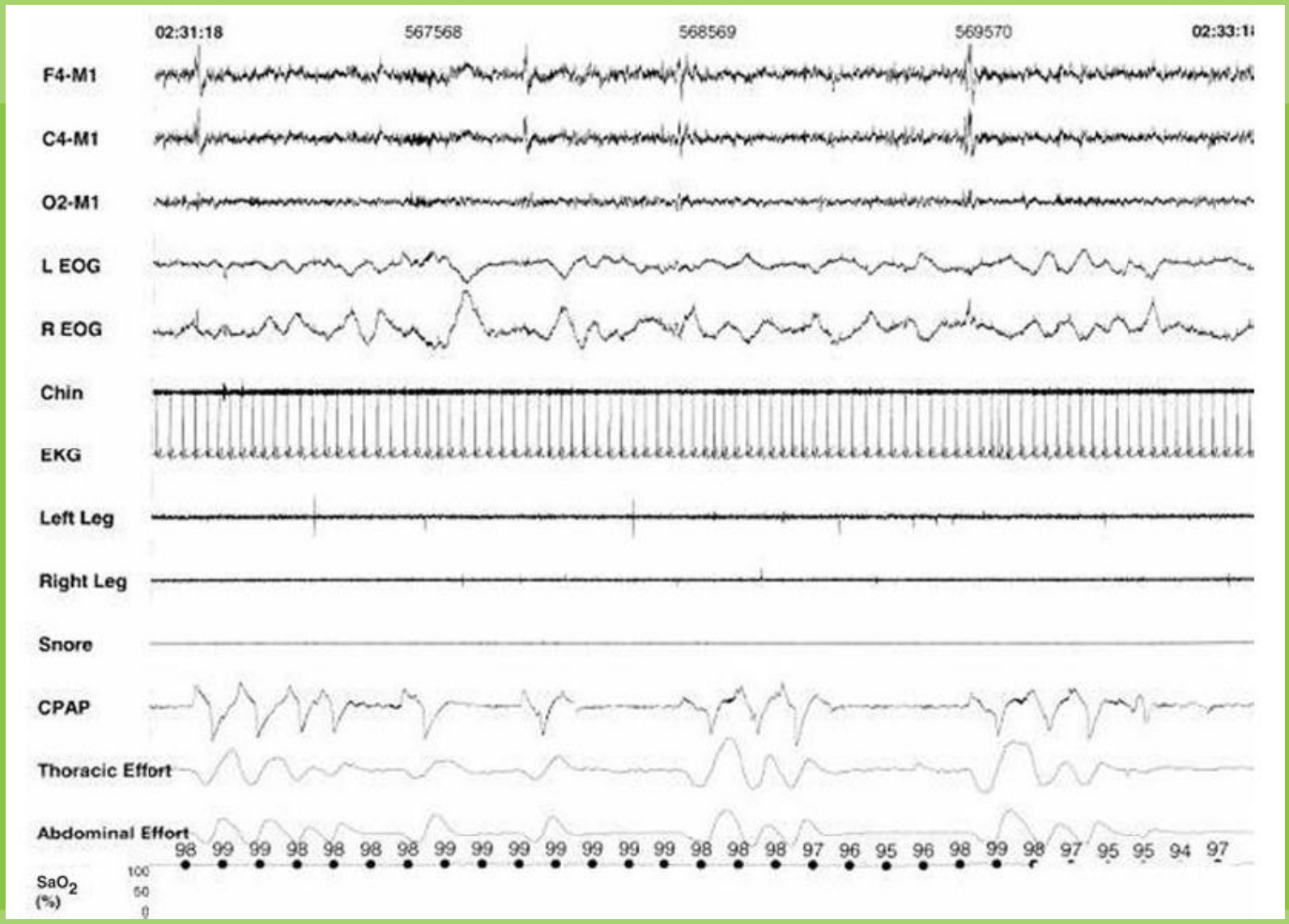
- Increase **IPAP** pressure by a minimum of 1 cm H2O with an interval of no less than 5 minutes, if at least 3 **hypopneas**, 5 **RERAs**, or if at least 3 min of loud or unambiguous **snoring** are observed
- To change from CPAP to BPAP during a titration, set the EPAP at the pressure that resolved obstructive events, and set the IPAP 4 cm H2O higher.

BPAP


Start study at IPAP 8 cm H_2O EPAP 4 cm H_2O
Does patient have apnea?
NO
Does patient have hypopnea, RERA, or snoring?
NO
Is patient over treated?
NO
End titration
YES
Increase IPAP and EPAP
Wait 5 minutes
YES
Increase IPAP only
Wait 5 minutes
YES
Decrease IPAP and EPAP
Wait 5 minutes

Over Titration

- If the pressure is too high, the patient may develop frequent arousals and/or treatmentemergent central sleep apneas
- If the patient awakens and complains that the pressure is too high, the pressure should be restarted at a lower IPAP, chosen as one that the patient reports is comfortable enough to allow return to sleep


02:31:18
567568
568569
569570
02:33:1
F4-M1
C4-M1
O2-M1
L EOG
R EOG
Chin
EKG
Left Leg
Right Leg
Snore
CPAP
Thoracic Effort
Abdominal Effort
98 99 99 98 98 98 98 99 99 99 99 99 99 99 98 98 98 97 96 95 96 98 99 98 97 95 95 94 97
SaO2 (%)
100
50
0

criteria for an optimal, good, adequate, and unacceptable PAP titration.

- The overall goal of PAP is to control the patient's obstructive respiratory events while maintaining SpO2 above 90%, with acceptable leak parameters at the selected pressure.

criteria for an optimal, good, adequate, and unacceptable PAP titration

Optimal PAP Titration

- **RDI below 5** for at least 15 minutes while the patient is supine and in stage R sleep without spontaneous arousals or awakenings.

Good PAP Titration

- **RDI below 10**, or **reduced by 50%** if the baseline RDI was below 15, while the patient is supine and in stage R sleep without spontaneous arousals or awakenings.

criteria for an optimal, good, adequate, and unacceptable PAP titration

Adequate PAP Titration

- RDI may be above 10 but is reduced by 75% from the baseline study.
- A PAP titration is also considered adequate if it meets the criteria for optimal or good without evaluation of REM sleep in the supine position.
- An **unacceptable PAP titration** is one that does not meet any of the above-mentioned criteria

Thanks for your attention