OSA for Primary Care
Part 1

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Learning objectives

• Appropriate screening in a primary care setting
• Approach to diagnosing OSA
Should sleep manage all OSA patients?

Diabetes 30.3 million per CDC

ABIM reports 6,964 endocrinologists with valid certificates in 2019

OSA (Wisconsin Sleep Cohort Study)

ABIM reports 3,535 sleep doctors with valid certificates in 2019

Should sleep manage all OSA patients?

1988-1994 to 2007-2010

10% with mild OSA
3.8% to 6.5% with moderate to severe OSA

Extrapolated to 2009

16% with mild OSA
20-30% for men, 10-15% for women age 30-70

10% with moderate to severe OSA


The OSA burden falls on the PCP

As high as 90-99% in PCP waiting rooms have sleep complaints when screened

22% self-report

30-40% “high risk” OSA

23% screen

Patients

Primary care physicians


Screening asymptomatic patients

• USPSTF; 2017
  “The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of screening for OSA in asymptomatic adults.”

• AASM response to above; 2017
  “…the AASM recommends screening patients who have a high risk for OSA, even if they don’t have any sleep-related symptoms.”
Routine health examination

Questions to ask, prompting a comprehensive sleep evaluation.

• Patient obese?
• Retrognathia?
• Daytime sleepiness?
• Snoring?
• Hypertension?

1. Consensus statement by the AASM clinical practice guidelines; 2009

Screening surveys

• STOP-BANG scoring
• ESS (Epworth Sleepiness Scale)
• Berlin Questionnaire
• Flemon’s Modified Neck Circumference
• Multivariate apnea prediction index
Case 1 – Symptomatic patient

55 year old male is accompanied by his wife. He has gained weight over the years and his wife is now frightened by him holding his breath while asleep, followed by gasping for air. He falls asleep at work and when watching TV, has morning headaches and sleeps elevated on a wedge pillow because of nocturnal acid reflux.

Symptoms of OSA

- Witnessed apneas, snoring, gasping, or waking up choking at night
- Insomnia (sleep fragmentation, difficulty staying asleep)
- Excessive sleepiness or non-refreshing sleep
  - Need to ask sleep hours to know if sleep deprived
- Nocturia, morning headaches, decreased libido, GERD
- Decreased concentration, memory loss, irritability
Physical Examination

- BMI > 30
- Blood pressure
- Respiratory, cardiovascular, neurologic exams
- Neck circumference
  - > 17” men
  - > 16” women
- Facial anatomy
  - Nasal patency/septal deviation
  - Crowded oropharynx
  - Mallampati commonly used

Mallampati Scoring

Image adapted from https://commons.wikimedia.org/wiki/File:Mallampati.svg
Retrognathia

Gnathion (midline chin)
Sits >0.5 cm behind Nasion (between eyes)

Malocclusion and unbalanced facial profile

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Primary care provider evaluation

Present with sleep complaints?

YES → Re-evaluate yearly

NO

High Risk Diseases?

YES → Yearly evaluation

NO

Undergoing surgery

YES → OSA Screening*

NO → Low likelihood of OSA

Concern for OSA

Sleep study or Referral for sleep evaluation

* OSA Screening = Overnight polysomnography (sleep study)
Home testing (minimum)

- Airflow
- Respiratory effort
- Blood oxygenation
In-laboratory testing

- Airflow
- Respiratory effort
- Blood oxygenation
- EEG → Sleep staging
- EOG → REM sleep
- EKG → Single lead
- EMG → Detect leg movements
- CO2 monitoring (Optional)

Apnea
- Airflow cessation

Hypopnea
- Reduced airflow
- Associated oxygen desaturation

Respiratory Effort-Related Arousal (RERA)
- Arousal caused by airflow, not qualifying for above

Each last at least 10 seconds
**AHI (Apnea Hypopnea Index)**

\[ AHI = \frac{Apneas + Hypopneas}{Total \ sleep \ time} \]

**RDI (Respiratory Disturbance Index)**

\[ RDI = \frac{Apneas + Hypopneas + RERAs}{Total \ sleep \ time} \]

**REI (Respiratory Event Index)**

\[ REI = \frac{Apneas + Hypopneas}{Total \ Recording \ Time} \]

<table>
<thead>
<tr>
<th>Home Sleep testing</th>
<th>In-lab polysomnogram</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limited channels</td>
<td>Full study</td>
</tr>
<tr>
<td>Only if OSA has a</td>
<td>Gold standard OSA test</td>
</tr>
<tr>
<td>high pretest probability</td>
<td></td>
</tr>
<tr>
<td>Not appropriate if</td>
<td></td>
</tr>
<tr>
<td>severe comorbid diseases</td>
<td></td>
</tr>
<tr>
<td>$</td>
<td>$$$</td>
</tr>
<tr>
<td>Reports REI Events / Recording Time</td>
<td>Reports AHI, RDI Events / Sleep Time</td>
</tr>
</tbody>
</table>
OSA (Obstructive sleep apnea)

*AHI > 5 -15 with symptoms
- Excessive daytime sleepiness
- Impaired cognition
- Mood disorders
- Insomnia
- Waking up breath holding, gasping, or choking
- HTN, ischemic heart disease, or stroke

Central Sleep Apnea

- Absence of air-flow and respiratory effort
- Examples:
  - Cheyne-Stokes respiration in heart failure.
  - Opiates causing ataxic breathing
Obesity hypoventilation syndrome

Diagnostic criteria:
- BMI > 30
- Sleep disordered breathing
- Daytime hypercapnia
  - PaCO2 > 45 mm Hg
  - Other hypoventilation causes excluded

Obesity hypoventilation syndrome

Prevalence 8-20% in patients undergoing sleep testing

- High pretest probability: BMI > 40
  Obtain ABG

- Low/mod pretest probability: BMI 30-40
  Obtain serum bicarbonate
  If bicarbonate > 27 → ABG
For this patient...

Primary care provider evaluation

Present with sleep complaints?

YES

Re-evaluate yearly

NO

High Risk Diseases?

YES

Yearly evaluation

NO

Undergoing surgery

YES

OSA Screening*

NO

Low likelihood of OSA

Concern for OSA

Sleep study or Referral for sleep evaluation

For this patient...

Concern for OSA

High OSA pre-test probability?

YES

Cardiopulmonary disease, NDM, recent stroke, opiate use?

NO

Risk for OHS or hypoventilation?

NO

Another sleep disorder (parasomnia, severe insomnia)?

YES

Home sleep testing

OSA

Low-moderate risk

In-lab polysomnogram

YES

Negative

OSA

Referral to sleep specialist

Negative; repeat testing if clinical suspicion remains high
Home sleep study results = REI 3.9

Overview

REI(AHI): 3.9 /h  ODI: 3.1 /h  Snore Percentage: 11.0 %

Respiratory Indices

<table>
<thead>
<tr>
<th></th>
<th>Index</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
</tr>
<tr>
<td>Apnea + Hypopneas (AH):</td>
<td>3.9 /h</td>
</tr>
<tr>
<td>Apneas:</td>
<td>1.5 /h</td>
</tr>
<tr>
<td>Obstructive (OA):</td>
<td>1.3 /h</td>
</tr>
<tr>
<td>Mixed (MA):</td>
<td>0 /h</td>
</tr>
<tr>
<td>Central (CA):</td>
<td>0.2 /h</td>
</tr>
<tr>
<td>Hypopneas:</td>
<td>2.4 /h</td>
</tr>
<tr>
<td>Obstructive (OH):</td>
<td>0 /h</td>
</tr>
<tr>
<td>Central (OC):</td>
<td>0 /h</td>
</tr>
<tr>
<td>Obstructive Apnea Hypopnea (CA + MA + OH):</td>
<td>1.3 /h</td>
</tr>
<tr>
<td>Central Apnea Hypopnea (CA + CH):</td>
<td>0.2 /h</td>
</tr>
<tr>
<td>Hypoventilation:</td>
<td>0 /h</td>
</tr>
<tr>
<td>Respiration Rate (per m):</td>
<td>18.4 /m</td>
</tr>
</tbody>
</table>

Concern for OSA

- High OSA pre-test probability? (YES)
- Cardiopulmonary disease, NDM, recent stroke, opiate use? (NO)
- Risk for OHS or hypoventilation? (YES)
- Another sleep disorder (parasomnia, severe insomnia)? (NO)
- Home sleep testing (OSA)

Referral to sleep specialist

Low-moderate risk

In-lab polysomnogram

For this patient...

- Negative; repeat testing if clinical suspicion remains high
- OSA

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Case 2 – Hospital follow up

A 63 year old male who had a heart attack 6 months ago. Recent echocardiogram shows ischemic cardiomyopathy with an estimated ejection fraction of 40-45%. When asked, he has always snored but it never bothered him.

High Risk Patients

- Treatment refractory hypertension
- Atrial fibrillation
- Congestive heart failure
- Stroke
- Obesity (BMI > 30)
- Impaired glucose tolerance, or type 2 diabetes
- Nocturnal dysrhythmias
- Pulmonary hypertension
- High-risk driving populations*
- Preoperative for bariatric surgery

AASM 2009 Guidelines.
## Prevalence in hypertension

- **Up to 50%** of patients with hypertension have OSA in observational studies

- Cohort of patients with **difficult to control** hypertension
  
  **64%** prevalence of OSA


## Prevalence in atrial fibrillation

- Cohort of patients with atrial fibrillation in 2005
  
  **32-49%** of patients had OSA

- 12 month period **after cardioversion** in OSA patients
  
  - 82% recurrence rate if untreated
  
  - 42% recurrence rate while on effective CPAP

Prevalence in Systolic Heart Failure

- 61% of 450 patients with a sleep related breathing disorder.
  - Obstructive sleep apnea
  - Central sleep apnea


A home sleep study would not be appropriate in this group since the prevalence of central sleep apnea is high

Prevalence in stroke patients

- Cohort studies
  - 1996 study, 47 patients monitored for SaO2 desaturations. 18 of 19 tested with PSG.
    - 38% with AHI over 10
  - 2008 prospective study in 25 patients with ischemic stroke
    - 74% of patients with AHI > 5

Increased weight = increased OSA

10% weight gain increases OSA severity (AHI) by about 32%

10% weight loss reduces OSA severity (AHI) by about 26%


Prevalence in type 2 diabetes

- Data from SHHS (Sleep heart health study)
  - 58% of type II diabetes patients had elevated AHI
- Type 2 diabetes and obesity
  - 87% of patients had OSA
- Primary care setting (2012)
  - Retrospective study; 16,066 patients
  - 18% of type 2 diabetics with OSA diagnosis

Other associations

- **Prevalence of OSA in Coronary Artery Disease**
  - 35-57%

- **Prevalence of OSA in Pulmonary Hypertension**
  - 17-52%
    - (in patients with pulmonary or cardiac disease)

- Increased risk for cardiac arrhythmias
  - Type II-III AV block/sinus arrest in 7% of OSA patients
  - Odds ratio for ventricular ectopy of 1.7

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OSA treatment

- PAP is recommended 1st line
  - All OSA severity
  - Excessive sleepiness
  - Impaired quality of life
  - Comorbid hypertension

- In-lab CPAP titration
- AutoCPAP
  - Symptomatic patients
  - No significant comorbid illnesses
Recommended Reading/Guidelines

2019

REVIEW ARTICLES

Treatment of Adult Obstructive Sleep Apnea With Positive Airway Pressure: An American Academy of Sleep Medicine Systematic Review, Meta-Analysis, and GRADE Assessment

Bhattacharjee P. Patel, MD, PhD, Indra P. Arora, MD, PhD; Jean M. Caples, DO; D. John Knecht, MD; Sanjay R. Patel, MD; Christopher G. Horne, MD

St. Louis University Health Center, St. Louis, Missouri; St. Louis University School of Medicine, New York, New York; *Loma Linda University, Rochester, Minnesota; **University of Pittsburgh, Pittsburgh, Pennsylvania; American Academy of Sleep Medicine, Darien, Illinois

AMERICAN THORACIC SOCIETY DOCUMENTS

Evaluation and Management of Obesity Hypoventilation Syndrome
An Official American Thoracic Society Clinical Practice Guideline: Executive Summary

Babak Mohseni, Juan Fernando Mesa, Jan L. Brozek, Indra Gurubhagavatula, Patrick B. Murphy, Amanda J. Piper, Arman Tulsani, Majid Afshar, Jay S. Balschandran, Raad A. Dweik, Ronald R. Grunstein, Nicholas Hart, Roop Kaur, Gerardo Lorenzo-Filho, Sushmita Paradi, Bhakti K. Patel, Bhusnur P. Patel, Jean Louis Pibarot, Ismail Soghier, Maximiliam Tamazue Kakuiz, and Mihaela Teodorescu; on behalf of the American Thoracic Society Assembly on Sleep and Respiratory Neurobiology

This official clinical practice guideline of the American Thoracic Society was approved May 2019

Recommended Reading/Guidelines

2017

Screening for Obstructive Sleep Apnea in Adults
Evidence Report and Systematic Review for the US Preventive Services Task Force

Danish F. Johnson, MD, MPH; Halio R. Armstrong, MD, MPH; Cynthia Fulltor, MD, MPH; Rachel Palferi Wabo, PhD; Marina Anavantis, MD, MPH; Alexander Stina, BA; Linda Loo, MPA; Russell P. Harris, MD, MPH

Contents lists available at ScienceDirect

Sleep Medicine Reviews

journal homepage: www.elsevier.com/locate/smr

CLINICAL REVIEW

Screening and assessment for obstructive sleep apnea in primary care

Jennifer N. Miller*, Ann M. Berger

University of Nebraska Medical Center, USA
Obstructive Sleep Apnea
Part 2: Follow Up

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Assistant Professor- Clinical
Department of Internal Medicine
Division of Pulmonary Medicine
The Ohio State University Wexner Medical Center
Disclosures

- Nothing to disclose

Objectives

- What to address at a follow up visit?
- PAP adherence
- Residual Daytime Sleepiness
- Nasal Congestion
What should be addressed at follow up for OSA?

1. OSA specific quality of life measures
   - Ex. Functional Outcomes of Sleep Questionnaire

2. Patient and bed partner satisfaction


What should be addressed at follow up for OSA continued?

3. Avoidance of factors worsening disease severity
   - Alcohol and sedatives

4. Obtaining adequate amount of sleep

5. Weight loss for overweight/obese patients

What should be addressed at follow up for OSA continued?

6. Adherence
   - Up to 30% of newly diagnosed patients refuse PAP treatment from the beginning.\textsuperscript{1}
   - Approximately 25% discontinue PAP within the first year.\textsuperscript{2}


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Adherence

What defines adherence to therapy per CMS?

1. Office visit follow-up between 31 and 90 days after starting PAP.
2. Within the 1\textsuperscript{st} 90 days, PAP use \geq 4 hours per night on \geq 70\% of nights over a consecutive 30 day period.
3. Patient’s symptoms have improved.
## Adherence

### Factors associated with poor adherence:
- Poor early adherence
- Bed partner referral
- High Mask Leak
- High nasal resistance
- Race
- Lower socioeconomic group
- Psychiatric Comorbidity

### Factors associated with good adherence:
- Pretreatment daytime somnolence
- Good early adherence
- Subjective improvement
- High oxygen desaturation index
Ways to Improve Adherence

- Education
- Cognitive behavioral therapy
- Desensitization
- Telemedicine

The earlier patients seek help, the more likely they will succeed!!

Adherence

- What defines adherence to therapy per CMS?
  1. Office visit follow-up between 31 and 90 days after starting PAP.
  2. Within the 1st 90 days, PAP use ≥ 4 hours per night on ≥70% of nights over a consecutive 30 day period.
  3. Patient’s symptoms have improved.
Case 1

- 35 year old man with a history of Down Syndrome presents for follow up.
- First visit since diagnosis of severe obstructive sleep apnea (AHI 55 events/hr).
- He is accompanied by his aunt who reports no change in symptoms of excessive daytime sleepiness.
- Reports that he is using his machine every night while sleeping.

Case 1 Continued

<table>
<thead>
<tr>
<th>Compliance Summary</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Date Range</td>
<td>2/2/2019 - 3/14/2019 (41 days)</td>
</tr>
<tr>
<td>Days with Device Usage</td>
<td>37 days</td>
</tr>
<tr>
<td>Days without Device Usage</td>
<td>4 days</td>
</tr>
<tr>
<td>Percent Days with Device Usage</td>
<td>90.2%</td>
</tr>
<tr>
<td>Cumulative Usage</td>
<td>12 days 9 hrs. 10 mins. 21 secs.</td>
</tr>
<tr>
<td>Maximum Usage (1 Day)</td>
<td>11 hrs. 29 mins. 27 secs.</td>
</tr>
<tr>
<td>Average Usage (All Days)</td>
<td>7 hrs. 15 mins. 52 secs.</td>
</tr>
<tr>
<td>Average Usage (Days Used)</td>
<td>8 hrs. 3 mins.</td>
</tr>
<tr>
<td>Minimum Usage (5 Day)</td>
<td>10 mins. 21 secs.</td>
</tr>
<tr>
<td>Percent of Days with Usage &gt;= 4 Hours</td>
<td>85.4%</td>
</tr>
<tr>
<td>Percent of Days with Usage &lt; 4 Hours</td>
<td>14.6%</td>
</tr>
<tr>
<td>Total Blower Time</td>
<td>13 days 7 hrs. 7 mins. 31 secs.</td>
</tr>
</tbody>
</table>
Case 1 continued - Why still sleepy?

Causes of continued sleepiness

1. Inadequate CPAP treatment
   - Inadequate pressure

• What is the residual AHI?

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto-CPAP Mean Pressure</td>
<td>7.6 cmH2O</td>
</tr>
<tr>
<td>Auto-CPAP Peak Average Pressure</td>
<td>6.1 cmH2O</td>
</tr>
<tr>
<td>Average Device Pressure &lt;= 95% of Time</td>
<td>8.7 cmH2O</td>
</tr>
<tr>
<td>Average Time in Large Leak Per Day</td>
<td>0 secs.</td>
</tr>
<tr>
<td>Average AHI</td>
<td>2.5</td>
</tr>
<tr>
<td>Device Settings as of</td>
<td>3/14/2019</td>
</tr>
</tbody>
</table>
Case 1 Continued- Why still sleepy?

Causes of continued sleepiness:

1. Inadequate CPAP treatment
   • Is the patient adherent to therapy and using PAP appropriately?
Case 1 continued- Why still sleepy?

1. Inadequate CPAP treatment
   • Mask leak, mouth leak or both arousing patient?

<table>
<thead>
<tr>
<th>Auto-CPAP Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto-CPAP Mean Pressure</td>
</tr>
<tr>
<td>Auto-CPAP Peak Average Pressure</td>
</tr>
<tr>
<td>Average Device Pressure &lt;= 90% of Time</td>
</tr>
<tr>
<td>Average Time in Large Leak Per Day</td>
</tr>
<tr>
<td>Average AH1</td>
</tr>
</tbody>
</table>

2. Disturbance of sleep from PAP discomfort
3. Another sleep disorder- insufficient sleep, narcolepsy, restless legs syndrome, periodic limb movements of sleep disorder
4. Depression or mood disorder
Case 1 continued- Why still sleepy?

5. Chronic pain disorders.
6. Medications or other medical disorders disrupting sleep.
7. Residual hypersomnia in patients with adequately treated OSA.

• If PAP usage is optimized for at least 3 months and patient continues to be sleepy and other causes are ruled out, consider:
  • Referral to a Sleep Medicine Specialist for further evaluation.
Case 2:

• 45 year-old Caucasian male presents for follow up of his obstructive sleep apnea.
• An overnight PSG showed severe obstructive sleep apnea (AHI 45 events/hour).

Case 2 continued

• He underwent titration and was started on a CPAP of 13 cmH₂O.
• He notes minimal improvement in his symptoms with his Epworth Sleepiness Scale decreasing from 16 to 14.
• Complains of nasal congestion.
## Compliance Summary

<table>
<thead>
<tr>
<th>Data Range</th>
<th>5/4/2019 - 8/1/2019 (90 days)</th>
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<td>Days with Device Usage</td>
<td>76 days</td>
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<tr>
<td>Days without Device Usage</td>
<td>11 days</td>
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<tr>
<td>Percent Days with Device Usage</td>
<td>87.9%</td>
</tr>
<tr>
<td>Cumulative Usage</td>
<td>30 days 13 hrs. 27 mins. 38 secs.</td>
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<tr>
<td>Maximum Usage (1 Day)</td>
<td>17 hrs. 23 mins. 32 secs.</td>
</tr>
<tr>
<td>Average Usage (All Days)</td>
<td>8 hrs. 5 mins. 58 secs.</td>
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<tr>
<td>Average Usage (Days Used)</td>
<td>9 hrs. 17 mins. 3 secs.</td>
</tr>
<tr>
<td>Minimum Usage (1 Day)</td>
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<tr>
<td>Percent of Days with Usage &gt;= 4 Hours</td>
<td>85.7%</td>
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<tr>
<td>Percent of Days with Usage &lt; 4 Hours</td>
<td>13.3%</td>
</tr>
<tr>
<td>Total Blower Time</td>
<td>32 days 23 hrs. 27 mins. 27 secs.</td>
</tr>
</tbody>
</table>

## CPAP Summary (Phillips Respironics)

- Average Time in Large Leak Per Day: 2 hrs. 15 mins. 49 secs.
- Average AHI: 14.7

**CPAP**

- 13.0 cmH2O

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![Graphs showing CPAP performance](image)

- **Min in Large Leak**: 39.0 mins.
- **% of Night in Large Leak**: 98.3 % of Night
- **Average Total Leak**: 0.2
- **Min in Large Leak**: 44.8 mins.
- **% of Night in Large Leak**: 31.6 % of Night
- **Average Total Leak**: 0.4
Case 2 continued

How to address mask leaks?

• Evaluate condition of mask-worn cushions or headgear?
• If the patient is wearing a nasal mask or pillows and has dry mouth consider addition of a chin strap
• Alternatively, switch to full facemask.
• Increased humidity could overcome mild leak

Case 2 continued

• What to consider in a patient complaining of nasal congestion after starting CPAP?
  • Did the patient have nasal congestion prior to initiation of PAP therapy?
    • Yes: evaluate for obstruction, review history of trauma, and for allergic components.
Case 2 continued

• Did the patient have nasal congestion prior to initiation of PAP therapy?
  • No: do symptoms occur only at night when sleeping? likely related to drying of the nasal mucosa.
  • Suspect mask or mouth leak

Case 2 continued

• Underlying nasal congestion
  • Use nasal corticosteroids
  • Inhaled antihistamines (astelin) or oral antihistamines

• Inferior turbinate hypertrophy
  • Referral to ENT for turbinate reduction
Case 2 continued

- Chin strap added and humidification was increased resulting in improvement in his symptoms.

Algorithm for CPAP Success

I. Assess and Enhance Patient Readiness
   - Perceived importance?
   - Perceived self-efficacy?
   - Educate: OSA and PAP
   - Enhance motivation

II. Map a Plan for Change
   - Manage patient expectations
   - Set realistic behavioral goals
   - Identify self-rewards

III. Identify & Overcome Potential Barriers
   - Insomnia? Anxiety?
   - Rhinitis? Reduced nasal airflow?
   - Facial hair or mouth-breather?

IV. Maximize Early Experiences with PAP

- Mask selection?
- PAP comfort features?
- Sedative Hypnotic use?
- Cognitive behavioral therapy?

V. Follow up, Troubleshoot & Support

- Early assessment of PAP response
- Medical/physiologic
- Behavioral/motivational
- Technical