Overlap Syndrome & Treatment Compliance

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Objectives

- Review COPD and OSA
- Understanding Overlap Syndrome
- Identifying Patients with Overlap Syndrome
- Effective Treatment for Overlap Syndrome
- Documentation Requirements
- Compliance to therapy
Chronic Obstructive Pulmonary Disease

Umbrella term to describe lung diseases characterized by shortness of breath/air flow limitation

- Emphysema and chronic bronchitis
- Refractory (non-reversible) asthma and some bronchiectasis

- Extrapulmonary effects: muscle myopathy, anemia, osteoporosis + depression
- High prevalence – high morbidity/mortality
COPD

• Bronchitis (‘blue bloaters’)
  - chronic productive cough 3/12mo, 2 years
  - Hypercapnia/hypoxemia/polycythemia

• Emphysema (‘pink puffers’)
  - pathological diagnosis, permanent abnormal enlargement of airspaces (distal to bronchioles) and destruction of alveolar walls

• Bronchiectasis
  – damage causes wall of airway to become flabby and scarred (injury, disease)

Increased mucus production and airway obstruction
Hypoxia and disruption to sleep

¹CDC; September 2014
²COPD Foundation; 2013
COPD

CDC Statistics:

- 3rd leading cause of death in the U.S.¹
- Estimated that 24 million adults are affected²
  - 50% with low pulmonary function were not aware
- Over 50% were women
- 22.3% reported a hospital or ED visit for COPD symptoms in previous 12 months
- >31% unable to work

2012: US HHS reported 3.38 M Medicare FFS beneficiaries had COPD
- 82% over 65/18% younger (20% increase from 2008)

¹CDC; September 2014 (results from 2011 BRFFS)
²COPD Foundation; 2013
Obstructive Sleep Apnea

OSA is one of the most common sleep disorders

- Characterized by partial or complete collapse of the upper airway during sleep

- Effects more than 18 million Americans according to NSF
- Estimated that up to 9% of the adult population suffer from OSA
- Approximately 70-80% of patients are not diagnosed
- Increase in childhood OSA due to obesity epidemic

1Al Lawati et al 2009; 2Punjabi et al 2008
Obesity a Major Factor

- 65% overweight (BMI >25)
- 29% obese (BMI >30)
- 26.4 adults reported that during past month, they had not participated in physical activity

Prevalence* of Self-Reported Obesity Among U.S. Adults by State and Territory,
Source, Behavioral Risk Factor Surveillance Team, CDC 2013
What is Overlap Syndrome?

Refers to diseases that overlap one another - combined effect of multiple diseases or conditions are worse than either one alone

Overlap Syndrome

- Combination of COPD and OSA which results in nocturnal hypoventilation and hypoxemia
- First introduced in 1985 by Professor David Flenley (University of Edinburgh)
- Additive effect ‘1+1=3’
- More by chance than pathophysiological link
  - Chance alone suggests that one disorder has 10% chance of the other
Overlap Syndrome

A great number of patients have both COPD and OSA

- causes more severe nocturnal hypoxemia than either disease alone
- Have a substantially greater risk of morbidity and mortality, compared to those with either COPD or OSA alone
- 11% of OSA patients have some degree of COPD
- 20-40% of COPD patients have OSA

- COPD closely related to cigarette smoking or airway contagions
- OSA closely related to obesity and snoring

Both experience a reduction in energy/activity, which further contributes to poor health

Douglas, Sleep Disorders 1998
Physiological Consequences

- Majority of patients with OSA are eucapnic during wakefulness
- Daytime hypercapnia attests to mechanical impairment
  - Obesity $^1$
  - COPD $^2$

- Higher breathing frequency and lower tidal volume
- Increased nocturnal desaturation $^3$
- Increases risk for:
  - Hypercapnia
  - Pulmonary hypertension
  - Polycythemia
- Increase risk of cardiac morbidity and mortality

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$^2$ Leech et al, Chest 1987; 92:807-13
$^3$ Owens et al, Resp Care 2010; 55(10):1333-1346
Identifying Patients with Overlap Syndrome
<table>
<thead>
<tr>
<th>OSA</th>
<th>COPD</th>
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</thead>
<tbody>
<tr>
<td>• Snoring, choking or gasping during night</td>
<td>• Increase in sputum</td>
</tr>
<tr>
<td>• Sleepiness during the day</td>
<td>• Increase in SOB, cough and/or wheezing</td>
</tr>
<tr>
<td>• Morning headaches</td>
<td>• Forgetfulness, confusion</td>
</tr>
<tr>
<td>• Memory, learning problems, lack of concentration</td>
<td>• Trouble sleeping</td>
</tr>
<tr>
<td>• Irritable, depressed, or moodiness</td>
<td>• Using more pillows or sleeping in a chair instead of a bed to avoid shortness of breath</td>
</tr>
<tr>
<td>• Nocturia</td>
<td>• Increased feeling of fatigue and lack of energy that is persistent</td>
</tr>
<tr>
<td>• Dry mouth or sore throat on awakening</td>
<td>• Morning headaches, dizzy spells, restlessness</td>
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**Overlap:**
- Hypoxemia + hypercapnia
- Increased pulmonary artery pressure
- Older
- Similar BMI
Diagnosis

Awareness of that Overlap Syndrome might be a possibility...

- Patient history + physical exam
- PFT
- Patients with a mild to moderate COPD – nocturnal oximetry study
- Based on clinical findings
- Confirmed by full-night PSG – lab based not HST

Increased awareness is first line of defense
Nocturnal Oximetry

Prolonged desaturations during REM

Published online 2006 December.
PSG of Overlap Patient

- Alveolar hypoventilation during REM
- Fragmented sleep
- Hypercapnia

Legend:
- THER – Thermistor
- DEB – Nasal pressure
- THO – Thoracic movement
- ABD – Abdominal movement
- PTT – Pulse Transit
- SAT – O2 Saturation
- PC02 – Transcutaneous PaCO2
Screening your Patients

Patient assessment for Sleep

- Persistent cough
- Inhaler use/pulmonary medications
- Home oxygen use
  - Continued desaturations with proper use
- Accessory muscle use
- Inability to lie flat
- Mobility - SOB with activity
Treatment Options for the Overlap Patient
Treatment Options

- Weight loss
- Oxygen therapy
- Bronchodilator therapy – manage exacerbations with antibiotics/steroids

1. CPAP therapy - high humidification to mobilize secretions (+ supplemental O2)\(^1\)
2. Bi-level ventilatory support
3. Volume preset ventilation
   - Most commonly used for individuals where bi-level support has failed to control sleep hypoventilation, where tracheostomy ventilation is needed

- Newer technology might include Nasal High Flow (NHF) with a high level of humidity

\(^1\) Sampol et al 1996
Weight Loss

• Weight loss can clearly be of benefit for those with OSA and obesity

• In COPD, weight loss has generally been associated with increased mortality, since cachexia (malnutrition) sets in with increasing disease severity
Oxygen Therapy

- Oxygen is a common treatment
- Shown to improve overall mortality *if* used for more than 18 hours per day, including during sleep

Data is lacking for improvement with oxygen therapy alone in OSA\(^1\)
- nocturnal oxygen desaturations are improved, *BUT* ...not
  - sleep architecture
  - arousals
  - blood pressure (which is improved after 2 weeks of CPAP therapy)
  - subjective daytime sleepiness

Alford Study
- 4 lpm O2 administered to 20 men with Overlap Syndrome
  - Obstructive events increased in duration (25.7 to 31.4)
  - PC02 increased (52.8 to 62.3)
- O2 should not be used alone for treatment

CPAP Therapy

CPAP remains the accepted standard treatment for OSA and is also the accepted standard for overlap syndrome.

- But CPAP alone may not fully correct hypoxemia, so supplemental oxygen may be required.
- By using CPAP there could potentially be an unloading of the respiratory muscles which could lead to:
  - decrease hypoventilation, oxygen consumption, or carbon dioxide production by the respiratory muscles.
- These muscles may be rested by CPAP use, since it prevents the increase in upper-airway resistance that occurs during sleep.
- Alternatively, CPAP may offset intrinsic PEEP in severe COPD.
 Evaluated the impact of OSAS treatment with CPAP on the survival of hypoxemic COPD patients between January 1996 and July 2006.
CPAP therapy was associated with a higher survival in patients with moderate-to-severe OSAS and hypoxemic COPD.
Of 603 hypoxemic COPD patients receiving LTOT, 95 were diagnosed with moderate-to-severe OSAS.

<table>
<thead>
<tr>
<th>95 Patients</th>
<th>Treatment</th>
<th>Control</th>
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<tr>
<td>CPAP adherence</td>
<td>61 (64%)</td>
<td>34</td>
</tr>
<tr>
<td>5 year survival</td>
<td>71%</td>
<td>26%</td>
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Toraldo et al, Spain 2010

- Supports early treatment with nasal CPAP in overlap patients.
- Included patients with both severe OSA and mild-to-moderate COPD

- After 3 months of CPAP therapy:
  - arterial blood gases and mean pulmonary artery pressure (MPAP) improved and stabilized
  - patients reported improvements in daytime sleepiness utilizing Epworth Sleepiness Score (ESS),

- The improvement in these parameters remained stable over 12 months' follow-up.
Non-Invasive Ventilation

- A subset of patients with stable COPD who may benefit from NIPPV includes
  - those with daytime hypercapnia and super-imposed nocturnal hypoventilation

- Bi-level
  - The effects of b-level PAP have not been specifically evaluated
  - Difference between IPAP and EPAP maintaining alveolar ventilation and reducing PaC02

Benefits vs. Quality of Life?

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1 Nick Hill Noninvasive ventilation for chronic obstructive pulmonary disease. Respir Care 2004; 49:72–87
Other Considerations

• Reduce alcohol consumption
  – Worsens hypoxemia\(^1\)
  – leads to hypercapnic respiratory failure\(^2\)

• Smoking cessation
  – Dangers when on O₂ therapy

\(^1\) Easton et al. Sleep 1987; 10:224-33
Therapy Compliance
“Keep watch also on the faults of the patients which often make them lie about the taking of things prescribed.”

Hippocrates, Father of Medicine, warned physicians of non-adherence
Compliance...Adherence

- **Compliance** – degree a patient follows or completes a prescribed diagnostic, treatment, or preventive procedure

- **Adherence** – extent a patient follows a prescribed treatment regimen and physician advice as an *active participant in their own care and in collaboration with the healthcare providers*
## The 4A’s of Adherence

<table>
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<tr>
<th>Acceptance</th>
<th>• breaking down psychological barriers of diagnosis and treatment</th>
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<tbody>
<tr>
<td>Acquiring</td>
<td>• the device and mask</td>
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<tr>
<td>Acclimating</td>
<td>• to therapy</td>
</tr>
<tr>
<td>Adapting</td>
<td>• long term</td>
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Acceptance (1)

- Acceptance must occur before adherence can be achieved

- Perceived need for CPAP therapy

- Not uncommon for patient to doubt their severity of OSA
  - First night affect

- Concerns about side effects
Acceptance

• Research has shown that educated patients are more compliant\textsuperscript{1,2} and spousal feelings are important\textsuperscript{3}

• Education should encompass discussion about co-morbidities and long term health consequences. Provide encouragement and involve the family

• Various methods of education can be inexpensive & effective:
  • Phone calls\textsuperscript{1}
  • Literature\textsuperscript{1}
  • Attendance in group clinic\textsuperscript{2}

\textsuperscript{1}Chervin et al 1997; 2Likar et al 1997; 3Weaver et al 2003
Acquiring the Medical Device (2)

This is the time when Psychological barriers kick in.

OSA Diagnosis & Initiation of Therapy

- Perception
- Emotion
- Cognition
### Psychological Adaptation Barriers

<table>
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<tr>
<th>Psychological Perception</th>
<th>Patients develop their own beliefs/expectations before they try CPAP based upon perception of disease severity. The imposed behavior changes versus their own role in regulating health practices.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emotional Context</td>
<td>Often relates to patient- doctor rapport however in OSA/CPAP devices is relevant to Aesthetics (ugly versus beautiful), sounds (buzzard versus Chime), tone qualities (authoritative – empathetic), and grammatical structure (command versus request)</td>
</tr>
<tr>
<td>Cognitive Context</td>
<td>The clarity of the message linked to usage and AHI – able to notice they have achieved something.</td>
</tr>
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There are a number of studies that report that the first 2 weeks of CPAP initiation are most important
  - Correlate to what the 30th day of usage may be

Budhiraja et al reported in a study (N100)
  - 84% of patients who used CPAP for more than 4 hours/day at day 3 used CPAP for an average of more than 4 hours a day at day 30
  - Compared with only 26% of those who used CPAP for less than 4 hours/day at day 3
  - Minority of patients who used CPAP for less than 4 hours/night at day 3 and at day 7, used it for more than 4 hours a night when assessed at day 30

1) SLEEP, Vol. 30, No. 3, 2007 324 1997;20:278-83.) (Early CPAP Use Identifies Subsequent Adherence to CPAP, MD et al)
Adapting

• Patients experiences are different and unique to them

• Psychological and Social Factors
  – Risk perception of disease
  – Treatment outcome expectancies
  – Self efficacy
  – Coping mechanisms
  – Facilitators/barriers with treatment

Facilitators/Barriers with Treatment

• Social Support
  – CPAP users living with someone had higher use than those who lived alone¹
  – Older adherent men were more likely to attend a CPAP education support group²
  – Spousal pressure to use CPAP was negatively influential on three-month CPAP use³

• Common treatment related experiences
  – nasal stuffiness, claustrophobia, and disturbance of their bed partner

¹Lewis et al 2004, ²Russo-Magno et al 2001, ³Baron et al 2010
Intervention Strategies and Tools

- Educational
- Technological
- Psychosocial
- Pharmacological
- Multidimensional
Drivers of Adherence

- Sleep Lab
- DME
- Successful Methods? Materials?
- Physicians Role
- Follow up? Frequency/Triggers
What if PAP doesn’t work?

Alternate therapies might be considered:

- Oral devices
- Surgery
- Nasal Valves

Therapy as an adjunct to CPAP or for mild cases of OSA:
- Nasal High Flow with high humidification
  - Washes out CO2
  - Promotes deeper, slower breaths – improved gas exchange
  - Flow creates PAP
  - High humidification aids in mobilizing secretions
  - Has shown improvement with lung function
Summary

- Overlap Syndrome is when COPD and OSA coexists

- Because both are so common, overlap syndrome is also common

- CPAP is gold standard for OSA

- Oxygen as needed, to reduce hypoxemia, is also commonly used with the PAP devices

- Heated Humidification (optimal levels) may enhance the adherence to CPAP treatment and is especially important for the COPD patient to mobilize secretions, reducing risk of exacerbations
1. Epidemiology, risk factors, and consequences of obstructive sleep apnea and short sleep duration
2. Estimation of the clinically diagnosed proportion of sleep apnea syndrome in middle-aged men and women
3. Association of Chronic Obstructive Pulmonary Disease and Obstructive Sleep Apnea Consequences
4. Outcomes in Patients with Chronic Obstructive Pulmonary Disease and Obstructive Sleep Apnea
5. Nasal CPAP with Supplemental O2 in Coexistent Sleep Apnoea-Hypopnoea Syndrome and Severe COPD
6. Sleep-Disordered Breathing and COPD: The Overlap Syndrome
   – Owens and Malhotra, Respir Care. 2010 October; 55 (10): 1333-1346
7. Acute Oxygen in Patients with Sleep Apnea and COPD
   – Alford et al, Chest 1986 Jan; 89 (1): 30-8
8. Effect of continuous positive airway pressure versus supplemental oxygen on sleep quality in obstructive sleep apnea
9. Fixed-pressure nCPAP in patients with obstructive sleep apnea (OSA) syndrome and COPD a 24-month follow-up study
10. CPAP and survival in moderate-to-severe obstructive sleep apnoea syndrome and hypoxaemic COPD.
    – Nick Hill Respir Care 2004; 49:72–87
12. Association of Chronic Obstructive Pulmonary Disease and OSA
    – Chaouat et al, Am J Respir Crit Care Med 1995; 151:82-86