Sleep Apnea: a Primary Driver of Hospital Admissions and Outcomes

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Sleep Apnea Registry: Principal Investigator

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Sleep Apnea Registry: Co-Investigator

Research Summit
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Investigators

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- Gina Gore, BS
- Tami Gumpert, BSN, RN
- Mike Malloy, MCSE, MCP+I
- Braxton Lancial, Student,
  St. Ambrose University, Davenport, IA
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  Uppsala University, Sweden
Objectives

1) Provide an overview of Sleep Apnea and the purpose of the Sleep Apnea Registry

2) To understand how patients' sleep apnea status impacts their reason for being in the hospital

3) To recognize how patients' sleep apnea status impacts their duration of stay and outcomes
   - **ALL 41 Institutes in NIH claim diagnosis and treatment of sleep apnea is crucial to their mission.**
   - Sleep disordered breathing is associated with health conditions across **ALL** organ systems.
Sleep Apnea – Different Types

- **Obstructive Sleep Apnea (OSA):** Apnea resulting from complete collapse of the pharynx during sleep.

- **Central Sleep Apnea (CSA):** Apnea resulting from complete withdrawal of central respiratory drive to the muscles of respiration during sleep.

- **Mixed Apnea:** Apnea resulting from an initial central component followed by an obstructive component.
• **Hypoxia:** The condition in which the body or region of the body is deprived of adequate oxygen supply.

**Hypopnea:** A reduction in, but not complete cessation of, airflow to <50% of normal

**Apnea:** Cessation of airflow for >10 s

**Apnea Hypopnea Index (AHI):** The frequency of apneas and hypopneas per hour of sleep; a measure of the severity of sleep apnea

- \[ \text{AHI} = \left( \frac{\# \text{ of apneas} + \# \text{ of hypopneas}}{\text{hours of sleep}} \right) \]
Syndromes with Sleep Apnea

**Syndrome Z**
Sleep Apnea + Metabolic Syndrome

After 3 months of CPAP-treatment the patients had a reduction in blood pressure, glycated hemoglobin, triglycerides, LDL, total cholesterol and BMI (Soneja et. al. 2012)

**Overlapping Syndrome**
Sleep Apnea + COPD
<table>
<thead>
<tr>
<th>Relative Risk</th>
<th>Medical Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.38</td>
<td>Heart Failure</td>
</tr>
<tr>
<td>2.18</td>
<td>Atrial-fib</td>
</tr>
<tr>
<td>2.00</td>
<td>Depression</td>
</tr>
<tr>
<td>1.62</td>
<td>Type 2 Diabetes</td>
</tr>
<tr>
<td>1.58</td>
<td>Stroke</td>
</tr>
<tr>
<td>1.51</td>
<td>Hypertension</td>
</tr>
<tr>
<td>1.40</td>
<td>Obesity</td>
</tr>
<tr>
<td>1.27</td>
<td>Coronary Artery Disease</td>
</tr>
</tbody>
</table>
Previous research shows that patients with sleep apnea have...

- Longer post surgical length of stay - 1.6 days longer (Gupta et. al. 2001)
- Higher incidences of post operative complications - 44% vs. 28% (Liao et. al. 2009)
- 4.9 times as high cancer mortality in patients with severe sleep-disordered breathing (Nieto et. al. 2012)
- OSA is the only identifiable risk factor for post surgical delirium (Flink et. al. 2012)
- 32% increase (from 37% to 49%) of Left Ventricular Ejection Fraction (LVEF) after one month of PAP use; results reversed after one week without PAP (Bradley et. al. 2003)
Sleep Apnea Risk Groups

1. Dx-Adherent
   - History of Sleep Apnea?
     - No
     - Do you snore/have you been told that you snore?
     - Do you stop breathing, snort or gasp while sleeping?
     - Have you been told you stop breathing while sleeping?
     - Are you frequently tired?
       - AND
         - Staff observations:
           - E - Snoring?
           - F - Absence of breath?
     - Yes on either B, C OR F
     - Yes on A and D
     - Yes on E and D

2. Dx-Nonadherent
   - Do you have a CPAP-machine?
     - Yes
       - Do you use your CPAP-machine?
         - Yes

3. No Dx-Probable Sleep Apnea
   - No

4. No Dx-Unlikely to have Sleep Apnea
## Relative Risk for Medical Conditions

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>23.0%</strong></td>
<td>Men with a history of sleep apnea (of all)</td>
</tr>
<tr>
<td><strong>15.6%</strong></td>
<td>Women with a history of sleep apnea (of all)</td>
</tr>
<tr>
<td><strong>36.7%</strong></td>
<td>Men Dx-Nonadherent (of diagnosed)</td>
</tr>
<tr>
<td><strong>46.7%</strong></td>
<td>Women Dx-Nonadherent (of diagnosed)</td>
</tr>
<tr>
<td><strong>18.7%</strong></td>
<td>Men <em>probable</em> to have sleep apnea (of all)</td>
</tr>
<tr>
<td><strong>13.2%</strong></td>
<td>Women <em>probable</em> to have sleep apnea (of all)</td>
</tr>
</tbody>
</table>
Boxplot of BMI by Sleep Apnea Risk Group

Extreme Outliers Suppressed
Elective Surgery Patients: Percent SA Dx-Adherent among SA Dx or Probable SA

- Bariatric Center: 88.2%
- Surgery Patients: 51.3%
- Medical Patients: 39.0%
Percents of Surgical Patients Primary DRG Type by Sleep Apnea Risk Group on Index Visit

Genesis Inpatient Sleep Apnea Registry (August 22, 2013)
Genesis Medical Center’s Sleep Apnea Registry

Mean Duration of Initial Inpatient Stay
Survival Analysis with censoring on Expired and AMA (P<0.0005)

<table>
<thead>
<tr>
<th>Sleep Apnea Risk Group</th>
<th>Mean Duration of Stay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dx-Adherent</td>
<td>4.20</td>
</tr>
<tr>
<td>Dx-Nonadherent</td>
<td>4.45</td>
</tr>
<tr>
<td>No Dx-Probable</td>
<td>4.92</td>
</tr>
<tr>
<td>No Dx-Unlikely</td>
<td>4.19</td>
</tr>
</tbody>
</table>

July 2013-March 2014
Genesis Medical Centers Sleep Apnea Registry
Mean Duration of Initial Inpatient Stay
Survival Analysis with Censoring on Expired and AMA (P<0.0005)

Mean Duration of Stay

<table>
<thead>
<tr>
<th>Sleep Apnea Risk Group</th>
<th>Dx-Adherent</th>
<th>Dx-Nonadherent</th>
<th>No Dx-Probable</th>
<th>No Dx-Unlikely</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3.71</td>
<td>4.18</td>
<td>4.10</td>
<td>3.65</td>
</tr>
</tbody>
</table>

3.74
Genesis Medical Center's Sleep Apnea Registry

Initial Registry Visit Inpatient Mortality Rate by Risk Group

<table>
<thead>
<tr>
<th>Sleep Apnea Risk Group</th>
<th>Mortality Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dx-Adherent</td>
<td>1.23%</td>
</tr>
<tr>
<td>Dx-Nonadherent</td>
<td>2.14%</td>
</tr>
<tr>
<td>No Dx-Probable</td>
<td>1.99%</td>
</tr>
<tr>
<td>No Dx-Unlikely</td>
<td>1.55%</td>
</tr>
</tbody>
</table>

July 2013-March 2014
Genesis Medical Centers Sleep Apnea Registry
Initial Registry Visit Inpatient Mortality Rate by Risk Group
(P-Value = 0.014)
Mean Number of Visits per Patient by Risk Group since November 3, 2012

95% CI for the Mean (P-value < 0.0005)
Conclusions

- Recognize every patient as either
  1) SA Dx-Adherent
  2) SA Dx-Nonadherent
  3) No SA Dx-Probable (Self-Reported or Observed)
  4) No SA Dx-Unlikely (No Evidence)

- Assure that patients who bring in their CPAP use it!

- SA patients and SA-Probable patients have significantly more hospital visits and higher readmission rates!

- SA Dx-Nonadherent and No SA Dx-Probable have longer durations of stay, and a higher risk of mortality compared to the others!

- SA Dx-Adherent patients with sleep apnea do significantly better than nonadherent patients on all outcomes!
References


