Portable Sleep Studies in Hospitalized Patients

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Portable Sleep Study Program in Hospitalized Patients - Disclosures

• NIH grants - RO1/PPG (Obesity and OSA)

• Consultant:
  – Apnicure
  – Foramis Medical Group

Sleep Consult Service Model for Inpatient PSGs and Auto-CPAP Titration

OSA & CV Consequences
**Why Should We Perform Inpatient Sleep Studies?**

- Many diseases adversely impacted by sleep apnea
  - MI, HTN, CVA, pulmonary hypertension
  - Atrial fib, DM, CHF
- Quality of care improvement
- CPAP helps heart failure - ? reduce 30 day readmissions
- ? Decrease rapid responses, cardiac arrests at night?

**Why Start an Inpatient Sleep Study Program Now?**

- Home sleep studies approved for the diagnosis of sleep apnea
- Auto-CPAP can determine optimal CPAP settings
- Insurance will cover CPAP with a home or inpatient sleep study
- Patient can get CPAP at or before discharge

**Sleep Consult Service Model/Algorithm for Inpatient PSGs and Auto-CPAP Titration**

- Started: January, 2012
- Pilot program on 4 hospital floors in pulmonary/cardiac patients (CHF/A fib/COPD)
- Sleep studies primarily to rule out OSA or CSA
- Using portable Embletta Gold units
- Auto-CPAP or Auto-BiPAP titrations
- Patient leaves hospital with their own CPAP/BiPAP
- Outpatient follow-up with sleep medicine

**Who is an appropriate candidate for an inpatient sleep study?**

- Evaluation for OSA, CSA or CSR
- In patients with comorbid conditions affected by OSA
  - MI
  - HTN
  - CVA
  - CHF
  - Atrial fibrillation
  - Cardiac arrhythmia
  - Pre-operative evaluation for bariatric surgery
  - DM
  - Obese patient undergoing any type of surgery
Who should not get an inpatient sleep study?

- Any mentally or psychiatrically unstable patient
- Mental status concerns - patient cannot cooperate
- Patient too sick – hypotensive, multiorgan failure, on ventilator
- GI bleed
- Open wound
- ? Infected patient - MRSA
  - Device would require disinfection after use

Embletta Gold Features

- Slightly larger than an iPhone
- Meets all criteria of the AASM practice parameters
- Can accurately measure $O_2$ flow even for patients on oxygen by using dual lumen nasal cannula
- Unit can be disinfected by wipe-down
- Some accessories disposable; others require disinfection after use

The Embletta Gold

Summary of Three Day Process

- Day 1: patient identified as possible OSA, has sleep consult, approved for overnight PSG by fellow
- Night 1: The sleep tech hooks up patient to the Embletta Gold; overnight inpatient PSG takes place
Summary of Three Day Process

• Day 2: Sleep tech returns in the AM to retrieve the Embletta; uploads and scores data
  – Alerts fellow that data is ready for interp
  – Fellow reviews study and does interp, attending signs off, study is scanned into Epic, then sent back to Clinical Research Coordinators (CRC)
  – CRC will also contact patient’s insurance company with results that day, to get pre-approval for CPAP
• Night 2: Sleep tech brings auto-CPAP unit (owned by us) and hooks up patient for titration study

• Day 3: Sleep tech obtains data from auto-CPAP trial and oximetry study (separate oximeter)
  – Fellow examines the data then has attending sign off
  – Results also scanned into Epic (EMR), and then a prescription sent to CRC by noon and placed in patient’s paper chart
  – Patients that did well with the auto-CPAP will get their own auto-CPAP unit after DME comes to set them up

A New Paradigm for the Diagnosis and Management of Hospitalized Cardiac Patients with Sleep Disordered Breathing

Methods

• 106 consecutive cardiovascular hospitalized patients reporting symptoms of SDB were evaluated between January 2012 - March 2013
• Demographic data, SDB type, PAP adherence, and data regarding 30-day hospital readmission/ED visit were collected
• We evaluated whether PAP adherence in cardiac patients with SDB reduced readmission rates 30 days after discharge

S Kauta, L Goldberg, B Keenan, R Schwab. Clin Sleep Med (conditionally accepted)
Clinical Characteristics of Cohort

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>(n) Mean ± SD or (n) %</th>
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<tbody>
<tr>
<td>Age</td>
<td>(104) 58.7 ± 14.7</td>
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<tr>
<td>Male</td>
<td>(65) 62.5%</td>
</tr>
<tr>
<td>Body Mass Index</td>
<td>(104) 34.1 ± 8.9</td>
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<tr>
<td>LVEF*</td>
<td>(101) 36.3 ± 21.2</td>
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<tr>
<td>Ischemic Cardiomyopathy</td>
<td>(31) 33.7%</td>
</tr>
<tr>
<td>Heart Failure</td>
<td>(90) 87.4%</td>
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<tr>
<td>Atrial Fibrillation</td>
<td>(49) 47.1%</td>
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<tr>
<td>Hypertension</td>
<td>(85) 51.0%</td>
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<tr>
<td>Hyperlipidemia</td>
<td>(70) 67.3%</td>
</tr>
<tr>
<td>Stroke</td>
<td>(18) 17.3%</td>
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<tr>
<td>NYHA</td>
<td>(103) 13.0 ± 8.7</td>
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<tr>
<td>0</td>
<td>(1) 1.1%</td>
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<tr>
<td>1</td>
<td>(0) 0.0%</td>
</tr>
<tr>
<td>2</td>
<td>(4) 4.4%</td>
</tr>
<tr>
<td>3</td>
<td>(46) 53.3%</td>
</tr>
<tr>
<td>4</td>
<td>(37) 41.1%</td>
</tr>
<tr>
<td>Total Admission Days</td>
<td>(103) 53.7 ± 22.6</td>
</tr>
<tr>
<td>% of Visit Complete at Study</td>
<td>(103) 53.7 ± 22.6</td>
</tr>
<tr>
<td>30 Day Readmission/ED Visit</td>
<td>(16) 16.2%</td>
</tr>
</tbody>
</table>

* Left Ventricular Ejection Fraction; § New York Heart Association Class; †Emergency Department

Results

- Of the 106 patients, 104 patients had conclusive diagnostic studies
- 78% patients (81/104) had SDB (AHI ≥ 5 events/hr)
- Of the patients with SDB, 80% (65/81) had predominantly obstructive sleep apnea and 20% (16/81) had predominantly central sleep apnea

Distribution of AHI Severity from Portable PSGs

- 78% patients (81/104) had SDB (AHI ≥ 5 events/hr)
- Of the patients with SDB, 80% (65/81) had predominantly obstructive sleep apnea and 20% (16/81) had predominantly central sleep apnea

106 consecutive cardiac patients who underwent an in-hospital sleep study between January 2012 and March 2013. There were 31 patients who were discharged without PAP due to patient refusal of treatment, further in-lab testing or heart failure optimization required for treatment prescription, or death before discharge. Insufficient compliance data were secondary to 1 death and 1 patient requiring a tracheostomy within 30 days from discharge. Full PAP use was defined as use of PAP 24 hours per night on 70% of nights during a consecutive 30 days in the first 90 days of PAP treatment. SDB = sleep disordered breathing; OSA = obstructive sleep apnea; CSA = central sleep apnea; PAP = positive airway pressure.
**Results**
- Of the 106 patients diagnosed with SDB, 50 patients were discharged from the hospital with PAP.
- At least 1 month of compliance data were available on 42 of these 50 patients (84%)
  - 19/42 (45%) patients had good PAP use
    - ≥ 4 hours of use on 86% of nights
    - PAP used 95% of nights
    - Mean of 6 hours and 44 minutes usage
  - 20/42 (48%) patients had inadequate PAP use
    - ≥ 4 hours of use on 28% of nights
    - PAP used 60% of nights
    - Mean of 5 hours and 3 minutes usage
  - 3/42 (7%) patients had 0% PAP use

**Results - Readmission Rates**
- 0% (0/19) of patients with adequate PAP adherence, 30% (6/20) with partial PAP use, and 29% (5/17) of patients who did not use PAP were readmitted to the hospital or visited the emergency department for a cardiac issue within 30 days from discharge (p = 0.025)
- Adequate adherence was defined as CPAP use on ≥ 70% of nights with an average of ≥ 4 hours of use per night used

**Conclusions**
- Performing inpatient sleep studies is feasible
- Our study indicates that SDB is common in hospitalized cardiac patients with the majority of patients manifesting obstructive sleep apnea
- The data suggests that hospital readmission and ED visits 30 days after discharge are significantly lower in patients with cardiac disease and SDB who adhere to PAP treatment than those who are not adherent.
**Benefits of Sleep Consult Service**

- Efficient method of OSA diagnosis and treatment initiation
- Sleep consult team provides important new clinical information
- Diagnosis of OSA in patients who may otherwise never had known they had sleep apnea
- Introduction of OSA as a disorder playing a role in severity of their underlying disorder
- Reduction in rapid responses, cardiac arrests?
- Improved cardiovascular disease management
- Decreased frequency of hospitalizations?
- Cardiologists are thrilled with the sleep service/sleep studies

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**Portable Sleep Studies in Hospitalized Patients**

Thank you for your attention. Any Questions?

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