PERIOPERATIVE MANAGEMENT OF OSA

2014 Maine Sleep Society Meeting
March 7, 2014

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Mid Coast Hospital
Brunswick, Maine
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Anybody figure this out yet?
I am so clever that sometimes I don't understand a single word of what I am saying.

- Oscar Wilde
Am I the owner, the dog or the dynamite?
Preparing for the Memorial Day Parade
MCH Demographics

- 92 beds - average daily census 54 pts
- 11 bed ICU - No intermediate care unit/step down
- Full telemetry on all M-S beds
  - Continuous oximetry with pager alarm added 8/2013
- Annual ED visits - 24,000/yr
- Surgical Volume - 6,800 OR procedures/yr
- PAT Clinic 80 pts/week
- Rapid Response – Ave 20/yr
- Inpt code 99 out of ICU - Ave 10/yr
What does it take to force a change?
Case #1

- 44 yo male
- 400 lbs / severe OSA
- Long-term & successful CPAP use
- Outpatient procedure with MAC/narcotic

- What to do?
- Urologist admitted pt for o/n observation
Case #2

- 60 yo preop/same day screening – procedure with GET
- Recently identified new asymptomatic afib
- Echo WNL
- PCP ROS: probable OSA by Hx, minimal sx
- Preop eval of OSA deferred
- Call from PACU: What to do post op?
Case #3

- 70 yo post op on Med Surg
- Narcotic IV for post procedural pain
- Rapid response/Code 99
- Premorbid hx of undiagnosed OSA
- “Atypical” body morphology
- “Too thin to have OSA”

- Post D/C eval: severe OSA – confirmed wife’s report
Case #4

- 58 yo with post op on Med Surg
- Hx of severe OSA, intol/noncompliant with CPAP
- IV narcotics for procedural pain
- Rapid response w/ BVM, narcan, BiPAP
- Transfer to ICU
OSA at Mid Coast Hospital: Systematic Management

Hal Sreden, MD

June 1, 2011
Current System for OSA Management:  (As of June, 2011)
June 1, 2011

- There is no mandate / system for identification, evaluation, or management of surgical patients with OSA at Mid Coast Hospital.

- There should be…
OSA

• Disease of symptoms/safety

• Disease of metabolic derangement

• Disease of cardio/cerebrovascular risk

• Disease of perioperative/periprocedural risk

June 1, 2011
THE BAD

• CODE 99 / RAPID RESPONSE
• CONFUSION / UNCERTAINTY / AGNST
• INCONSISTENT MANAGEMENT
• POOR RESOURCE UTILIZATION
• HIGHER COSTS IF NOT EFFECTIVELY MANAGED

June 1, 2011
THE GOOD

• WE KNOW A LOT ABOUT OSA

• WE CAN SCREEN / DX EFFICIENTLY

• WE KNOW HOW TO REDUCE (NOT ELIMINATE) RISK

• WE KNOW HOW TO MANAGE ACUTE PROBLEMS

June 1, 2011
Periprocedural management

- Risk identification/mitigation vs disease mgmt

- Resource allocation – time, tests, personnel, beds - PACU, Med-Surg, ICU

- Cost – what is included in the equation?
  - Time, delay of procedure, cost of testing, unnecessary inpatient/ICU care…
  - Not dollars, but “deposition units”?

- Is it better to be lucky or good?

June 1, 2011
PERIOPERATIVE MANAGEMENT

• NOT A CHRONIC DISEASE MODEL
• ACUTE SETTING WITH HIGHER RISKS
• RISK REDUCTION – NOT CHRONIC DISEASE MANAGEMENT
• INSULIN GTT IN THE ICU – NOT DIABETES MANAGEMENT

June 1, 2011
OSA

- PREVALENT – UP TO 40% OF SURGERY PATIENTS

- SILENT: MISSED ON “ROUTINE” PREOP EVALUATION

- MANY PTS DX’D WITH OSA, BUT NOT EFFECTIVELY MANAGED IN THE CHRONIC SETTING

June 1, 2011
PERIOPERATIVE MANAGEMENT

• 2006 ASA “GUIDELINE” TO MANAGE

• NO SPECIFIC MANDATES FOR TESTING OR MANAGEMENT

• LARGE # OF STUDIES AND CONFERENCE PRESENTATIONS

• NO “ONE SIZE FITS ALL” SOLUTIONS
Premise

- OSA is prevalent in the surgical population
- Patient with untreated OSA have higher perioperative complications and more complicated and expensive hospital stays
- Identification and treatment/management of OSA patients reduces complications

- ASA Guidelines (2006) recommend screening all surgical patients for and perioperative management of OSA
- Expectation: Perioperative risk will be assessed and minimized
Challenges

• We have to do something
• What are we going to do?
• Uniform screening
• Uniform testing
• Uniform management
• This does not replace clinical judgment
“I have never had a problem before.”
“I already look for sleep apnea.”
“This looks like a solution looking for a problem.”
“This is just one more thing for us to do.”
“It sounds like you are just looking to fill your sleep lab.”
“Patients won’t like this.”
“It will be expensive for the patient.”
“Don’t put my patient in ICU because of this.”
“This will cancel/delay surgery.”
The percentage of undiagnosed OSA cases among the PSG study-identified OSA subjects, according to the severity of OSA (n=485).

PERIOPERATIVE MANAGEMENT

• SINCE 2006:
• NOT ALL OSA CREATED EQUAL
• RISK PROPORTIONATE TO SEVERITY
  – AHI > 20, > 15, >10, >5 ?
• Parental narcotics >> Oral
• Oral narcotics – minimal impact on CPAP/BIPAP

• EVAL/MGMT CAN BE DONE EFFICIENTLY AND EFFECTIVELY
Guidelines
“Anesthesiologists should work with surgeons to develop a protocol whereby patients in whom the possibility of OSA is suspected on clinical grounds are evaluated long enough before the day of surgery to allow preparation of a perioperative management plan.”
The Task Force recognizes that it is not possible to determine with 100% accuracy whether a given patient will develop perioperative complications related to OSA. Therefore, these Guidelines should be implemented with the goal of reducing the likelihood of adverse outcomes in patients who are judged to be at the greatest risk, with the understanding that it may be impractical to eliminate OSA-related perioperative morbidity and mortality completely. However, it is hoped that the implementation of these Guidelines will reduce the likelihood of adverse perioperative outcomes in patients with OSA.
The severity of the patient’s OSA, the invasiveness of the diagnostic or therapeutic procedure, and the requirement for postoperative analgesics should be taken into account in determining whether a patient is at increased perioperative risk from OSA (table 2).

Before patients at increased perioperative risk from OSA are scheduled to undergo surgery, a determination should be made regarding whether a given surgical procedure is most appropriately performed on a given patient on an inpatient or outpatient basis.”
ASA 2014 Guidelines Update

SPECIAL ARTICLES

Practice Guidelines for the Perioperative Management of Patients with Obstructive Sleep Apnea

An Updated Report by the American Society of Anesthesiologists Task Force on Perioperative Management of Patients with Obstructive Sleep Apnea

No major changes since 2006
“Threat Matrix”
OSA + surgery + opioids

Matrix  Revolutions
Agent Smith

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### Table 2. OSA Scoring System: Example

<table>
<thead>
<tr>
<th>Points</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>None</td>
</tr>
<tr>
<td>1</td>
<td>Mild</td>
</tr>
<tr>
<td>2</td>
<td>Moderate</td>
</tr>
<tr>
<td>3</td>
<td>Severe</td>
</tr>
</tbody>
</table>

#### A. Severity of sleep apnea based on sleep study (or clinical indicators if sleep study not available).

Point score _____ (0–3)**†

<table>
<thead>
<tr>
<th>Severity of OSA (table 1)</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>0</td>
</tr>
<tr>
<td>Mild</td>
<td>1</td>
</tr>
<tr>
<td>Moderate</td>
<td>2</td>
</tr>
<tr>
<td>Severe</td>
<td>3</td>
</tr>
</tbody>
</table>

#### B. Invasiveness of surgery and anesthesia. Point score _____ (0–3)

<table>
<thead>
<tr>
<th>Type of surgery and anesthesia</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superficial surgery under local or peripheral nerve block anesthesia without sedation</td>
<td>0</td>
</tr>
<tr>
<td>Superficial surgery with moderate sedation or general anesthesia</td>
<td>1</td>
</tr>
<tr>
<td>Peripheral surgery with spinal or epidural anesthesia (with no more than moderate sedation)</td>
<td>1</td>
</tr>
<tr>
<td>Peripheral surgery with general anesthesia</td>
<td>2</td>
</tr>
<tr>
<td>Airway surgery with moderate sedation</td>
<td>2</td>
</tr>
<tr>
<td>Major surgery, general anesthesia</td>
<td>3</td>
</tr>
<tr>
<td>Airway surgery, general anesthesia</td>
<td>3</td>
</tr>
</tbody>
</table>

#### C. Requirement for postoperative opioids. Point score _____ (0–3)

<table>
<thead>
<tr>
<th>Opioid requirement</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>0</td>
</tr>
<tr>
<td>Low-dose oral opioids</td>
<td>1</td>
</tr>
<tr>
<td>High-dose oral opioids, parenteral or neuraxial opioids</td>
<td>3</td>
</tr>
</tbody>
</table>

#### D. Estimation of perioperative risk. Overall score = the score for A plus the greater of the score for either B or C. Point score _____ (0–6)‡
Practice Advisory for Preanesthesia Evaluation

An Updated Report by the American Society of Anesthesiologists Task Force on Preanesthesia Evaluation

“The current scientific literature does not contain sufficiently rigorous information about the components of a preanesthesia evaluation to permit recommendations that are unambiguously based.

Therefore, the Task Force has relied primarily upon observational literature, opinion surveys of consultants, and surveys of a random sample of members of the American Society of Anesthesiologists.”

No reference to obstructive sleep apnea
Perioperative Management of Obstructive Sleep Apnea

Hairil R. Abdullah • Frances Chung
Perioperative Management of Obstructive Sleep Apnea

Adeola O. Adesanya, MD, FCCP; Won Lee, MD; Nancy B. Greilich, MD; and Girish P. Joshi, MD

- Focused history and physical examination
  - PLUS
    - OSA preoperative screening tool (STOP-Bang, Berlin or ASA)
      - Low risk for OSA: Proceed to surgery with usual perioperative care
      - High risk for OSA: Identify patient with wrist or arm alert band
  - Patient with known OSA
### Intraoperative Management
- Consider regional anesthesia or peripheral nerve block with minimal sedation if appropriate.
- Prepare for difficult airway management. Consider CPAP and 25 degree head position prior to induction to improve FRC. Use short acting anesthetic, opioid or sedative medications.
- Consider invasive monitoring for respiratory and hemodynamic management.
- Extubate trachea after patient is completely awake and neuromuscular blocking drugs reversed.

### Postoperative Anesthesia Recovery Management
- Careful observation of oxygen saturation and hemodynamics in the post anesthesia recovery room.
- Observe at 30 degree head-up position and/or lateral position for a minimum of 2 h in most patients.
- Consider use of non-opioid analgesics, opioid adjuncts and regional anesthesia. Use opioids judiciously.
- Use PAP early in case of desaturation.
Perioperative Management of Obstructive Sleep Apnea

Adesanya, MD; FCCP; Won Lee, MD; Nancy Breidich, MD; and Girish Joshi, MD

In Hospital Management
- Monitor in an appropriate medical-surgical floor that provides continuous oxygen saturation monitoring.
- Continue PAP therapy if known diagnosis of OSA and compliant use of PAP therapy preoperatively.
- Consider auto-PAP therapy if high risk of OSA or known OSA but non compliant with preoperative PAP therapy or known OSA but PAP pressure settings unknown.

Discharge Management: Follow-up with sleep medicine specialist for diagnostic PSG testing or PAP management
Society for Ambulatory Anesthesia Consensus Statement on Preoperative Selection of Adult Patients with Obstructive Sleep Apnea Scheduled for Ambulatory Surgery

Girish P. Joshi, MBBS, MD, FFARCSI, * Saravanan P. Ankichetty, MD, DA, MBA, † Tong J. Gan, MD, MHS, FRCA, † and Frances Chung, MBBS, FRCPC †
Primary search results: 1905 records

Articles excluded on title review: 1833

Papers considered for abstract and/or full-text review: 72

Exclusions = 69
- Irrelevant papers - excluded by abstract/full-text review: 39
- Reviews: 15
- Duplicate records: 8
- Case reports and correspondence: 4
- Obese patients without OSA: 3

Additions
Hand search and cross reference: 4

Studies included in qualitative analysis: 7
Prospective observational trials: 2
Retrospective chart review: 5
Society for Ambulatory Anesthesia Consensus Statement on Preoperative Selection of Adult Patients with Obstructive Sleep Apnea Scheduled for Ambulatory Surgery

Girish P. Joshi, MBBS, MD, FFARCSI, * Saravanan P. Ankicchetty, MD, DA, MBA, † Tong J. Gan, MD, MHS, FRCA, ‡ and Frances Chung, MBBS, FRCPC †

www.anesthesia-analgesia.org • November 2012 • Volume 115 • Number 5

Preoperative Evaluation

Patient With Known OSA
- Optimized Comorbid Conditions
  - AND
  - Able to use CPAP after discharge
  - Proceed With Ambulatory Surgery

Patient With Presumptive Diagnosis of OSA
- Patients With Non-optimized Comorbid Conditions
  - Not Suitable For Ambulatory Surgery, may benefit from diagnosis and treatment

- Optimized Co-morbid Conditions
  - AND
  - Postoperative pain can be managed predominantly by using non-opioid analgesic techniques
  - Proceed With Ambulatory Surgery
Society for Ambulatory Anesthesia Consensus Statement on Preoperative Selection of Adult Patients with Obstructive Sleep Apnea Scheduled for Ambulatory Surgery

Girish P Joshi, MBBS, MD, FFARCSI,* Saravanan P Ankichetty, MD, DA, MBA,† Tong J. Gan, MD, MHS, FRCA,‡ and Frances Chung, MBBS, FRCP†

Table 6. STOP–Bang Questionnaire Used to Screen Patients to Determine the Risk of Obstructive Sleep Apnea (OSA)\textsuperscript{8}

<table>
<thead>
<tr>
<th>S</th>
<th>Snoring. Do you snore loudly (louder than talking or loud enough to be heard through closed doors)?</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>Tiredness. Do you often feel tired, fatigued, or sleepy during daytime?</td>
</tr>
<tr>
<td>O</td>
<td>Observed apnea. Has anyone observed you stop breathing during your sleep?</td>
</tr>
<tr>
<td>P</td>
<td>Pressure. Do you have or are you being treated for high blood pressure?</td>
</tr>
<tr>
<td>B</td>
<td>BMI &gt; 35 kg/m\textsuperscript{2}</td>
</tr>
<tr>
<td>A</td>
<td>Age &gt; 50 years</td>
</tr>
<tr>
<td>N</td>
<td>Neck circumference &gt; 40 cm</td>
</tr>
<tr>
<td>G</td>
<td>Male gender</td>
</tr>
</tbody>
</table>

From Hathaway, 2006.\textsuperscript{15} Fewer than 3 questions positive = low risk of OSA; 3 or more questions positive: high risk of OSA; 5 to 8 questions positive: high probability of moderate-to-severe OSA.\textsuperscript{11}
The STOP-Bang Equivalent Model and Prediction of Severity of Obstructive Sleep Apnea: Relation to Polysomnographic Measurements of the Apnea/Hypopnea Index

Robert J. Farney, M.D.¹; Brandon S. Walker¹; Robert M. Farney¹; Gregory L. Snow, Ph.D.²; James M. Walker, Ph.D.¹

¹Intermountain Sleep Disorders Center, LDS Hospital, Salt Lake City, UT; ²Statistical Data Center, LDS Hospital, Salt Lake City, UT
Oximetry(?)
**Oxygen Desaturation Index from Nocturnal Oximetry: A Sensitive and Specific Tool to Detect Sleep-Disordered Breathing in Surgical Patients**

Frances Chung, FRCP,† Pu Liao, MD,* Hisham Elsaid, MD,* Sazzadul Islam, MSc,* Colin M Shapiro, FRCP,† and Yuming Sun, MD*

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**Figure 1.** Apnea hypopnea index (AHI) from portable polysomnography versus oxygen desaturation index (ODI) from simultaneous oximetry with linear regression and 95% confidence interval. $R^2 = 0.789$, AHI = $1.125 \times \text{ODI} - 0.196$.

**Figure 3.** Receiver operating characteristic (ROC) curves for oxygen desaturation index (ODI) to predict AHI $>5$, AHI $>15$, and AHI $>30$. The area under ROC curve was 0.908 (CI: 0.880 to 0.936) for AHI $>5$, 0.931 (CI: 0.909 to 0.952) for AHI $>15$ and 0.958 (CI: 0.937 to 0.979) for AHI $>30$. 

The graph illustrates the distribution of test results for individuals with and without a disease. It shows two overlapping normal distributions, labeled 'Without disease' and 'With disease'. The x-axis represents the test result, and the y-axis is not labeled. The criterion value is indicated by a horizontal line dividing the graph into two regions: true negatives (TN) and false positives (FP) on the left side, and true positives (TP) and false negatives (FN) on the right side. The graph visually represents the concept of diagnostic accuracy.
Figure Legend:

The aggregated model using a combination of all 10 oximetry indexes to predict the AHI from the derivation group (n = 224). The predicted and actual AHI values are shown on logarithmic scale. The coefficient of determination ($r^2$) between the actual and predicted AHI was 0.70, which is significantly improved compared to 0.60 (data not shown) using the initial model ($p < 0.05$).
### Prediction of the Apnea-Hypopnea Index From Overnight Pulse Oximetry


<table>
<thead>
<tr>
<th>Oximetry Index</th>
<th>c Index</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Δ index</td>
<td>0.881</td>
<td>0.8384–0.9236</td>
</tr>
<tr>
<td>Desaturation index (3% level)</td>
<td>0.873</td>
<td>0.8284–0.9176</td>
</tr>
<tr>
<td>Desaturation index (2% level)</td>
<td>0.868</td>
<td>0.8222–0.9138</td>
</tr>
<tr>
<td>Desaturation index (4% level)</td>
<td>0.852</td>
<td>0.8010–0.9030</td>
</tr>
<tr>
<td>Cumulative time spent below 90% saturation</td>
<td>0.772</td>
<td>0.7096–0.8344</td>
</tr>
<tr>
<td>Cumulative time spent below 88% saturation</td>
<td>0.757</td>
<td>0.6924–0.8216</td>
</tr>
<tr>
<td>Cumulative time spent below 86% saturation</td>
<td>0.723</td>
<td>0.6566–0.7894</td>
</tr>
<tr>
<td>Cumulative time spent below 84% saturation</td>
<td>0.692</td>
<td>0.6262–0.7578</td>
</tr>
<tr>
<td>Cumulative time spent below 82% saturation</td>
<td>0.674</td>
<td>0.6108–0.7372</td>
</tr>
<tr>
<td>Cumulative time spent below 80% saturation</td>
<td>0.647</td>
<td>0.5854–0.7086</td>
</tr>
</tbody>
</table>
Nonin Wrist Oximeter

- Simple
- Reliable
- Relatively inexpensive
- 8 acquired
  - 4 PAT
  - 2 PFT lab
  - 2 Pulmonary office
Oximetry interpretation

Harry Potter and the Prisoner of Azkaban
The Grim
Overnight Oximetry: Pearls and Pitfalls

• Not all oximeters/software are equal
  – Sampling rate, window averaging, calculations
  – Report format/complexity and waveform display/graphs
  – Batteries!
• Patient documentation
• GIGO - Garbage in, garbage out
• Look for things other than ODI
  – Pattern of desaturations
  – Baseline sat
  – HR - pacer, ectopy, afib
### Event Data

<table>
<thead>
<tr>
<th>Event Data</th>
<th>SpO2</th>
<th>Pulse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Events</td>
<td>685</td>
<td>128</td>
</tr>
<tr>
<td>Time In Events (min)</td>
<td>310.2</td>
<td>47.6</td>
</tr>
<tr>
<td>Avg. Event Dur. (sec)</td>
<td>27.2</td>
<td>22.3</td>
</tr>
<tr>
<td>Index (1/hr)</td>
<td>93.1</td>
<td>17.4</td>
</tr>
<tr>
<td>% Artifact</td>
<td>3.0</td>
<td>3.1</td>
</tr>
<tr>
<td>Adjusted Index (1/hr)</td>
<td>96.0</td>
<td>18.0</td>
</tr>
</tbody>
</table>

### %SpO2 Data

<table>
<thead>
<tr>
<th>%SpO2 Data</th>
<th>%SpO2 Level</th>
<th>Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basal SpO2(%)</td>
<td>99 - 95</td>
<td>0</td>
</tr>
<tr>
<td>Time (min) &lt; 88%</td>
<td>94 - 90</td>
<td>3</td>
</tr>
<tr>
<td>Events &lt; 88%</td>
<td>89 - 85</td>
<td>15</td>
</tr>
<tr>
<td>Max Single Time &lt; 88%</td>
<td>84 - 80</td>
<td>8</td>
</tr>
<tr>
<td>Minimum SpO2 (%)</td>
<td>79 - 75</td>
<td>43</td>
</tr>
<tr>
<td>Average Low SpO2 (%)</td>
<td>74 - 70</td>
<td>192</td>
</tr>
<tr>
<td>Average Low SpO2 &gt; 88%</td>
<td>69 - 65</td>
<td>266</td>
</tr>
<tr>
<td>Minimum SpO2 (%)</td>
<td>64 - 60</td>
<td>63</td>
</tr>
<tr>
<td>Average Low SpO2 (%)</td>
<td>59 - 55</td>
<td>54</td>
</tr>
<tr>
<td>Average Low SpO2 &gt; 88%</td>
<td>54 - 50</td>
<td>29</td>
</tr>
</tbody>
</table>

### Pulse Data

<table>
<thead>
<tr>
<th>Pulse Data</th>
<th>Below(%)</th>
<th>Time(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg. Pulse Rate(bpm)</td>
<td>77.4</td>
<td>100.0</td>
</tr>
<tr>
<td>Low Pulse Rate (bpm)</td>
<td>50</td>
<td>98.2</td>
</tr>
</tbody>
</table>

#### Analysis Parameters
- Desaturation Event: drop in SpO2 by at least 4% for a minimum duration of 10 seconds.
- Pulse Event: Change in rate by at least 6 bpm for a minimum duration of 8 seconds.

### Graphic Summary

#### SpO2

- 100: 10% per division

#### Pulse Rate (10 BPM per division)

- 120: 10 BPM per division
### Event Data

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### %SpO2 Data

<table>
<thead>
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<th>%SpO2 Level</th>
<th>Events</th>
<th>Below(%)</th>
<th>Time(%)</th>
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<td>99 - 95</td>
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<td>3</td>
<td>95</td>
<td>98.2</td>
</tr>
<tr>
<td>89 - 85</td>
<td>15</td>
<td>90</td>
<td>89.4</td>
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<tr>
<td>84 - 80</td>
<td>8</td>
<td>85</td>
<td>80.8</td>
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<tr>
<td>79 - 75</td>
<td>43</td>
<td>80</td>
<td>67.1</td>
</tr>
<tr>
<td>74 - 70</td>
<td>192</td>
<td>75</td>
<td>49.5</td>
</tr>
<tr>
<td>69 - 65</td>
<td>266</td>
<td>70</td>
<td>26.1</td>
</tr>
<tr>
<td>64 - 60</td>
<td>63</td>
<td>65</td>
<td>11.4</td>
</tr>
<tr>
<td>59 - 55</td>
<td>54</td>
<td>60</td>
<td>5.0</td>
</tr>
<tr>
<td>54 - 50</td>
<td>29</td>
<td>55</td>
<td>1.5</td>
</tr>
<tr>
<td>Max Single Time &lt; 88%</td>
<td>1370 sec at 07:17:28</td>
<td>50</td>
<td>0.3</td>
</tr>
<tr>
<td>Minimum SpO2 (%)</td>
<td>43</td>
<td>45</td>
<td>0.0</td>
</tr>
<tr>
<td>Avg. Low SpO2 (%)</td>
<td>67.5</td>
<td>40</td>
<td>0.0</td>
</tr>
<tr>
<td>Avg. Low SpO2 &lt; 88%</td>
<td>67.2</td>
<td>35</td>
<td>0.0</td>
</tr>
</tbody>
</table>

### Pulse Data

<table>
<thead>
<tr>
<th>Pulse Data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg. Pulse Rate(bpm)</td>
<td>77.4</td>
</tr>
<tr>
<td>Low Pulse Rate (bpm)</td>
<td>50</td>
</tr>
</tbody>
</table>
MCH Protocol
2008-2011

- Frequent curbside discussions
- Occasional Departmental discussions
- Lack of ownership/engagement/investment
- Lack of data / applicable protocols
- ASA 2006 Guideline
- APSS 2010 – data presented prior to publication
- “Tipping Point” cases at MCH
- Change in Departmental leadership
- Trump Card: MCH Office of Safety and Risk Management
2011: Assumptions

- Never event vs less frequent event
- Post op events would still occur
- Lead time before surgery would not increase
- Pt population / case mix constant
- STOP-BANG and oximetry sufficient
- In-house oximetry - DME oximetry untenable
- Inpatient status surrogate for surgical risk
- Stage 2 – Outpt surgery protocol
- We could not / should not wait for a major advance in the literature
Unknown Unknowns

- Observation of respiratory events
- Frequency of nurse interventions
- Rapid response rate and documentation
- Home CPAP use in hospital
  - Settings and condition of equipment
  - Biomed and Infection Control
- What does it (really) mean to be medically cleared for surgery?
- What is a preop anesthesia consult and when does it happen?
Surgical Services Guideline for OSA screening
Mid Coast Hospital

Undiagnosed/Unknown OSA

STOP-BANG (SB), score 2 or less
No interventions required. STOP

STOP-BANG (SB), score 3-5
Order Screening Overnight Oximetry
Interpretation

"Negative"

"Positive"
1. "SB" score added to OR schedule, Anesthesia record and ACU check list
2. "Cont. O2 monitor"- added to OR schedule
3. Paper Order generated for cont. O2 monitor

STOP-BANG (SB), Score 6-8
PCP/PAT calls pulmonary office for appt

"Positive"
Expedited pulmonary consult

STOP-Bang Score 3-8 without time to complete assessments

- PAT notifies Anesthesiologist or Surgeon with concerns
- Continuous O2 Order x 24 hours post op generated
- Disposition location determined per Surgeon order

ICU needed: Pulmonologists contacts surgeon with recommendations for perioperative care And admission location determination by Surgeon.

Amended: 2/18/2014
Surgical Services Extended Observation Guideline (January 2013)

After Phase I Recovery—Does Patient have a Modified Aldrete Score of 8 plus one additional respiratory assessment finding?

Yes

Does patient have STOP Bang score 3 or higher?

Yes

Notify Anesthesiologist and begin 3 hour additional stay with continuous monitoring

After 3 hours—Does patient have two consecutive 30 minute intervals with no additional respiratory assessment findings?

No

ACU/PACU Nurse updates surgeon

Surgeon plans disposition

No

Continue monitoring.

No

Does patient have two 30 minute intervals with no additional respiratory assessment findings?

Yes

No change in path to discharge by ACU criteria

Additional Respiratory Assessment Criteria-

1. RR below 8/min x 3 in 30 minutes
2. Oxy Sat < 90% for ten seconds, x 3 in 30 minutes (patient is off supplemental oxygen, unless pt. is on home O2)
3. Apnea episode > 10 secs x 3 in 30 minutes
4. Pain-Sedation Mismatch noted
Surgeon plans disposition

Overnight stay?

Yes

Order for discharge and note in chart by provider and nurse documenting rationale.

Extended stay orders
1. Continuous O2 Monitoring
2. HOB elevated > 30 degrees
3. Limit parenteral narcotics

Add “Consult Hospitalist for further medical orders” if hospitalist is consulting.

Telephone order Dr. Surgeon/nurse name

No

1. Patient placed in monitored bed in “observation” status.
2. Nursing writes extended observation orders
3. If Hospitalists are consulting, they do not have to re-write dc instructions or med recon unless new medications are added.
4. Surgeons do not have to come in person to discharge-patients have dc instructions from ACU in place, patients are dc’d per criteria.

Notes-
• *Overnight stays are preferred when discharges are occurring late in the day or evening.
• STOP Bangscore 3 or greater- Discharge instructions include direction to follow up with PCP for sleep apnea evaluation, limit narcotics
• Clinical Judgment supersedes this guideline. Providers should note rationale in the record.

References-
ASA Practice Guideline for Management of OSA, 2006 and 2012
Chung et al, Perioperative Management of OSA Patients, 2010
MCH Oximetry Process Flow

Process flow for Overnight Oximetry Screening

Patient identified at PAT with STOP-BANG score of 3-5
(Planned **surgical admissions** only)

1. Oximetry unit applied in PAT
2. Patient given instructions
3. Nurse initiates Oximetry log

Patient returns the next day, drops unit off in PAT before noon

1. Nurse updates Oximetry log
2. Applies identifiers to unit

PAT staff calls PFT lab for pick up

1. PFT lab downloads screening data
2. Adds demographics
3. Prints results
4. Hand delivers to Pulmonology office

Pulmonologists reviews/reads screening data
MCH Oximetry Process Flow

1. PFT lab downloads screening data
2. Adds demographics
3. Prints results
4. Hand delivers to Pulmonology office

Pulmonologists reviews/reads screening data

Positive

Provider calls surgeon.

Reports faxed to PAT and scanned into Centricity

PAT staff change surgical schedule, admission for "Positive" patients

Negative
MCH Statistics

• PAT sees about 75-80 pts/week (300-350 patients per month)
• 13% pts are scheduled as inpatient or day surg with observation
• 34% of screened pts have STOP-BANG >2
• 30% of pts “positive” O/N oximetry (ODI ≥ 20) change in post-op monitoring/status (1-3 pts)
• 2013 - Addition of continuous oximetry with pager alarm reduced the need for ICU
Outcomes: c.2013-14

- High patient participation and satisfaction.
- High staff participation and satisfaction.
- Marked increase in staff awareness of OSA and comfort with CPAP use.
- Rare repeat oximetry for technical/pt failure.
- No lost oximeters.
- Marginal increase in referral for sleep consult.
Outcomes: c.2013-14

- Better resource allocation
- Better screening and better communication
- Change in anesthesia and analgesia mgmt

- Historical: 20-30 post-op rapid responses/yr, most respiratory related.
- **ZERO** rapid responses for post op respiratory distress since 2011
Outcomes: c.2013-14

• Trends:
  – Fewer PAT clinic screen+/oximetry
  – Earlier intervention
    • PCP o/n oximetry
    • Sleep referral
• Better CPAP documentation
  • Settings in office chart
    • In hospital use with order on record
• Nobody Talks About It Anymore
2006-2011 / 2012-2014 Evolution

• More data – on everything!
• Technological improvements (local and global)
  – Home oximetry
  – Hospital monitoring
  – Ambulatory sleep testing
• Increased patient and provider awareness
THINK GLOBAL, ACT LOCAL

• Institution specific – uniform care across all clinical programs

• Identify/Engage stakeholders
  – Anesthesia, Surgery, Sleep/Pulmonary/CCM, OR, PACU, Nursing, RT
  – Quality and Risk management, PFT lab, Biomed, Infection control, Materials Management

• Burn your boats, not your bridges
STOPBang Questionnaire

- Snoring
- Tiredness / sleepiness / fatigue
- Observed apnea
- BP (>140/90) Rx or no
Perioperative Management of OSA: 2014

• Screen for OSA preop
  – Local protocol, automate as much as possible
• Minimize respiratory depressants
  – Physicians, nurses, pharmacy, patients
• Monitor postop
  – Protocol, facility/technology, nurses, physicians, hospital administration
• Treat OSA
  – Outpt data, protocol, educated patient, nurses, RT, physicians

• Questions?