OSA Pathway Implementation: How to Measure Success
Mayo Clinic Experience

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Objectives
• Discuss creation and implementation of perioperative OSA patients at a single tertiary care center and spread to an enterprise
• Discuss lessons learned during this period
• Describe practice changes based on this process
What was our Driving Factor?

• Mortalities as well as morbidities in practice and reported in literature presumed OSA-related
• How do we make our environment safer?
• What criteria do we use to assess patients?

Next most important steps…. 
Anecdotes… Data…

Paired Opioid + Narcan Utilization Rates

[Graph showing paired opioid and narcan utilization rates]
Three efforts

- Develop Just-in-time PAP management protocols
  - Address deployment issues
  - Address comfort issues
  - Assess impact of PAP interventions

- Standardize/improve Narcotic Analgesia Management
  - Lock-down PCA protocols
  - Standardize vital sign management programs
  - Resting quietly—can mean dead!

- Develop OSA Risk Management Protocols
  - Ensure detection of risk
  - Then what?

PAP naïve patient in perioperative period

- We learned that nobody owned it....
- Patients don’t like it
- Not innocuous
  - Bloating
  - Balancing competing priorities
  - Effect on sleep not certain
- Unlikely to be adherent without dedicated “team” approach and nearly direct supervision
- Reserve for very high risk with monitoring, or high risk with lots of attendance
“Dream Team”

- Increased variety of PAP interfaces
- Dedicated “expert” RT for fitting, education, introduction
- Close monitoring of adherence with feedback

Physician uses CPOE to place post-op orders, they are directed to the new PCA orders

Orders apply to surgical patients ≥65 years of age and older. Drug therapy based on renal and hepatic function.

**ALERT:**

To be used only for post-operative patients who have received intrathecal spinal injection within 24 hours or have current epidural catheter in situ requiring new analgesia infusion. Consider avoiding oxycodone for patients less than 50 kg, 75 years of age and older, or inpatient status less than 24 hours.

Consider starting at level 3 for patients less than 70 years and weighing greater than 50 kg.

**PRECAUTIONS:**

- All patients ≥65 years of age and older
- All patients with renal and hepatic failure

**CLINICAL SAFETY:**

- Pain levels ≤3
- Pain levels >3, titrate to pain level ≤3
- Pain level ≤3, no significant pain

**RESEARCH:**

- No studies available for this indication

**REFERENCES:**

- *Must Read Only One*
Less than 1 week ago….

Mayo completes Epic transition with Arizona, Florida go-lives

Beckers Hospital Review Oct 9, 2018

Paired Opioid + Narcan Utilization Rates

Identify those at risk for deterioration

OSA

Finkel, Sleep Medicine, 2009
How well do they identify those at risk for deterioration?

Additive factors

Integration model
Perioperative

- How to identify patients
- What preoperative screening tool
- What changes in management

Sleep Apnea Clinical Score

1. Do you have high blood pressure or have you been told to take medication for high blood pressure?  
   - Yes  
   - No

2. People who have shared (or are sharing) my bedroom tell me that I snore. Please pick the best response for the frequency of your snoring:
   - Usually (3-5 times/week) [= 1 "Historical Feature"]
   - Always (every night) [= 1 "Historical Feature"]

3. I have been told by other people that I gasp, choke, or snort while sleeping. Please pick the best response for the frequency of any of these symptoms:
   - Usually (3-5 times/week) [= 1 "Historical Feature"]
   - Always (every night) [= 1 "Historical Feature"]

4. Neck measurement. (We will measure you.) _____ cm

Prediction of OSA based on linear regression model utilizing above factors:

Low = Sleep Apnea Clinical Score <15
High = Sleep Apnea Clinical Score >15

Flemons et al Am J Respir Crit Care Med 1994;150:1279-1285

PACU Evaluation

| Bradyptonea: < 8 respirations/minute (3 episodes needed for yes) |
|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| Apnea: > 10 seconds (only 1 episode needed for yes) |
| Desaturations: Pulse Ox <90% with nasal cannula (3 episodes needed for yes) |
| Pain/Sedation mismatch: RASS score -3 thru -5 and Pain scale score > 5 (only 1 episode needed for yes) |

Evaluation Period

Initial 30 min. after extubation or PACU admittence, whichever occurs later
2nd 30 min. after Initial eval. (60 min after extubation or PACU admittence)
3rd 30 min. after 2nd eval. (90 min after extubation or PACU admittence)

RASS = Richmond Agitation-Sedation Scale  
Pain Score = Visual Analog Scale  
Recurrent events: if any event occurs at more than one eval period (not necessary to be same event)
Apply SACS

High likelihood (≥15)
Low likelihood (<15)

Apply PACU Criteria for Events*

Group 1 “OSA-Risk”
High likelihood
Events ≥ 2

Group 2
High likelihood
Events = 0 or 1

Group 3
Low likelihood
Events ≥ 2

Group 4
Low likelihood
Events = 0 or 1

Recording pulse oximetry X 48 hours
ODI calculations
Monitor Cardiorespiratory calculations

* Event: Hypoventilation < 8 respirations/minute, apnea ≥ 10 seconds, desaturations < 90% pulse oximeter on nasal cannula, Ramsay score > 3 with Visual analog score > 5

Study Results

- Utilization of preoperative screening with SACS, and recurrent PACU respiratory events most useful
- Two phase process identified patients higher risk for perioperative respiratory desaturations and complications

Gali B et al Anesthesiology. 2009; 110
Translation to Practice

• Stepwise implementation
• PACU assessments
• Pre-operative screening
• PACU nurse initiated protocol

Stakeholders

• PACU nursing
• Floor nursing
• Surgeons
• Anesthesiologists
• Sleep physicians

Obstructive Sleep Apnea

| Known OSA | No |
| High Blood Pressure | No |
| Frequency of Snoring | Occasional |
| Gasp/Choke/Snort | Never |
| Neck Measurement (cm) | 35 |
| OSA Total Score | 3 |
| Probability of OSA | Low |
Implementation Issues

- Adding work to preoperative process
- Education of involved care teams
- Adherence to protocol

Automated Vs Manual Pulse Oximetry

- 5 patient units
- Compared manual oximetry data to automated continuous oximetry
- Manual data higher oxygen saturations (6.5%)
- Continuous electronic monitoring more effective

Taenzer A et al. Anes Analg 2014;118:326-331
Remotely monitored oximetry

- Limited availability
- Expand units
- Expand resources
Unanticipated Issues

• Who would perform pre-screening

• Floor nursing

• Anesthesiologists
How to Ensure Continuity

• Sleep physicians not available in hospital
• Inability to address need for follow-up on weekends
• Now pager/consult accessible

Mayo Clinic practice sites

Mayo Health System
Healthcare in Minnesota, Iowa and Wisconsin
Almost 900 physicians in 70 communities
What about Initiation of CPAP from preop assessment?

- High risk patients offered PAP preop
  - 431 referred, 211 underwent PSG
  - Mean adherence 2.5 hrs/night
- Low interest in pursuing PSG
- Low adherence

Guralnick AS et al. JCSM 2012;8(5):501-506

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Postoperative PAP Initiation

- High risk
  - Standard care vs initiation auto-titrating PAP (APAP): 43 each group
  - No benefit in postoperative complications
  - Multiple obstacles to adherence
  - Poor enrollment


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Alternatives to PAP

- Nasal high flow therapy
  - Single blinded randomized
  - Recruitment preoperative clinic
  - Nasal high flow 30 LPM vs 1 LPM
  - 42 completed
  - ODI 4% higher in nasal high flow
    - Median 7.4 (IQR 3.5-13.3) vs 3.1 (IQR 1.5-6.7)

Selim B et al Chest 2018
Assessing Impact
- Pre Implementation
  - 2003-2007
- Post Implementation
  - 2008
  - Stepwise changes following this
- Codes, RRTs, transfers to ICU

Protocol Process

What have we found?
- Retrospective
  - Patients high risk
  - Utilization of RRT
  - Admission to ICU from floor
Further Assessment of Initial Results

• Did use of increased monitoring lead to increased RRT/ICU transfer?
• What is our success rate with use of CPAP?
• Has our education led to changes in views of perioperative management?

Future Assessment

• Is this cost effective?
• How well do we comply with protocols?
• What happens when patients are missed?
• Outcomes in high risk sedation areas