AAMI Foundation

Vision: To drive the safe adoption and safe use of healthcare technology

- National Coalition for Infusion Therapy Safety
- National Coalition to Promote Continuous Monitoring of Patients on Opioids
- National Coalition for Alarm Management Safety
- NEW: National Coalition to Promote the Safe Use of Complex Healthcare Technology

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Without their financial support, we would not be able to undertake the various initiatives under the National Coalition to Promote Continuous Monitoring of Patients on Opioids. The AAMI Foundation and its co-convening organizations appreciate their generosity. The AAMI Foundation is managing all costs for the series. The seminar does not contain commercial content.

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<th>Platinum</th>
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<td>Sotera Wireless</td>
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RESPIRATORY COMPROMISE: CAPNOGRAPHY PERFORMANCE IMPROVEMENT

Christine O’Farrell, BSN, CPHQ, CPHRM
Mary Kay Sennings, RRT
Dawn Evans MSN, RN, PHN, CPPS
DISCLOSURES

Barton Hospital partnered with Medtronic on this program. Medtronic assisted with the data analysis.
OUTLINE

I. Respiratory Compromise: Clinical Challenge
II. Methods: Role of Patient Monitoring
III. Results: Impact on Patient Outcomes
IV. Conclusions & Future Directions
QUALITY IMPROVEMENT PROGRAM
OBJECTIVES

1. Determine impact of continuous capnography & pulse oximetry monitoring on postoperative respiratory related events

2. Provide quantitative assessment relating the incorporation of patient monitoring with impact on key quality and cost metrics
BARTON HEALTH OVERVIEW

Located in South Lake Tahoe, California

• Opened in 1963
• Sole Community Provider
• 63 Bed General Acute Care
• 10 Bed Perinatal
• 8 Bed Intensive Care
• Leapfrog Hospital Safety Score A

• Mentor Hospital California Hospital Association
• Recognized as a Top Performer by the Joint Commission
• Four Star Rating for Patient Experience
## Barton Health DRG Overview

### Top 5 DRGs at Barton Hospital

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<th>DRG</th>
<th>% of Postop Patients</th>
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<tr>
<td>MAJOR JOINT REPLACEMENT OR REATTACHMENT OF LOWER EXTREMITY W/O MCC</td>
<td>22.9%</td>
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<tr>
<td>CESAREAN SECTION W/O CC/MCC</td>
<td>9.1%</td>
</tr>
<tr>
<td>CESAREAN SECTION W CC/MCC</td>
<td>3.7%</td>
</tr>
<tr>
<td>LOWER EXTREM &amp; HUMER PROC EXCEPT HIP, FOOT, FEMUR W/O CC/MCC</td>
<td>3.2%</td>
</tr>
<tr>
<td>LAPAROSCOPIC CHOLECYSTECTOMY W/O C.D.E. W/O CC/MCC</td>
<td>3.1%</td>
</tr>
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Respiratory Compromise
Early Detection/Prevention

RISK
INSUFFICIENCY
FAILURE
ARREST
DEATH

References:

Barton Health
QUALITY IMPROVEMENT PROGRAM

- Following a patient safety event in 2012, Barton Health investigated evidence-based best practices regarding monitoring devices for patients experiencing respiratory compromise.

- Capnography already in use for ventilated patients.

- The need to expand capnography was identified and an equipment needs assessment was completed. A proposal was sent to the Board of Directors and was approved.
MULTI-DISCIPLINARY CAPNOGRAPHY WORK GROUP

Members include:

• Anesthesia Medical Director
• Risk Management
• Patient Safety
• Respiratory
• Quality Management
• Nursing Leadership
• Frontline Nursing Staff
• Biomedical Engineering

Formed in 2012; meets monthly and is ongoing.
ACTION ITEMS

• Initial evidence-based criteria developed for patient populations

• Policy development to govern the Capnography Program

• Performance improvement indicator development

• Education to hospital staff and medical staff

• Educational pamphlet designed for patients and caregivers

• STOPBANG screening added to the electronic health record system

• Discharge letter developed for patients and their primary care provider regarding follow up

• Sleep Studies Lab capacity addressed to accommodate projected increased volume of sleep studies
MONITORING GUIDELINES

• Workgroup guideline development to help identify patients at risk for respiratory compromise
  – Sleep disorders: diagnosed or suspected
  • STOP BANG questionnaire used for OSA screening
  – Respiratory depressing medications including opioids & benzodiazepines
  – Sedated or obtunded patients
  – Opioid naïve patients including pediatric patients
  – Any patient based on RN/RT assessment and professional judgement
STOP BANG QUESTIONNAIRE

- Snoring? Do you Snore Loudly?
- Tired? Do you often feel Tired, Fatigued, or Sleepy during the daytime?
- Observed? Has anyone Observed you Stop Breathing during your sleep?
- Pressure? Do you have or are being treated for High Blood Pressure?
- Body Mass Index more than 35 kg/m²?
- Age older than 50?
- Neck size large? For male, is your shirt collar 17 inches or larger? For female, is your shirt collar 16 inches or larger?
- Gender = Male?

Scoring Criteria:
Low risk of OSA: Yes to 0-2 questions
Intermediate risk of OSA: Yes to 3-4 questions
High risk of OSA: Yes to 5-8 questions
IMPLEMENTATION

• Expanded continuous capnography and oximetry monitoring began in October 2013 in the following departments:
  – Orthopedic Floor
  – Medical/Surgical Floor
  – Intensive Care Unit
  – Gastrointestinal Lab
  – Post-Anesthesia Care Unit
POST-IMPLEMENTATION ACTION ITEMS

• Designed capnography patient room door magnet
• Alarm parameters adjusted to reduce alarm burden
• Hourly rounding reinforced for safety and patient satisfaction
• Employee satisfaction survey designed and completed with follow up on identified issues
• Enacted black and white checkered wrist band to readily identify patients with increased respiratory risk
• Patient Safety newsletter articles to increase capnography awareness
• Criteria updated as new evidence-based research became available
RESULTS AND SIGNIFICANCE

Capnography for Obstructive Sleep Apnea Patients

Benchmark
Median
Capnography for Obstructive Sleep Apnea Patients
ALARM IMPACT
Initially, the introduction of additional capnography monitors increased the overall alarm load.
ALARM REDUCTION - PHASE 1

Alarm Data Med-Surg Ortho

- Pulse Ox Calls
- EtCO2 Calls

Data from January 2015 to March 2016.
Clinical Alarm Study

- Parameter settings changed:
  - Low EtCO2 alarm decreased from 15 to 10
  - Low Respiratory Rate alarm decreased from 8 to 6
  - Sat Seconds delay increased from 50 to 100
ALARM REDUCTION - PHASE 2

Reduction achieved:
- Low EtCO2 alarms decreased 39%
- Low Respiratory Rate alarms decreased 52%
The capnography manufacturer’s initial data analysis revealed Barton’s respiratory compromise rate is slightly higher than the national average.

**RISK-ADJUSTED PERFORMANCE: RESPIRATORY COMPROMISE (LEAST SEVERE)**

After adjusting for the risk profile of Barton Health’s patient population, your hospital respiratory compromise rate is slightly higher than the national average.

![Graph showing predicted vs. actual respiratory events with a risk-adjusted estimate.](Image)
Alternatively, the analysis identified Barton’s post-operative respiratory failure rate is significantly lower than the national average.
In 2012, Barton had thirty-nine (39) in house cardiac arrests. By 2015, the number was reduced to nine (9) representing a 77% reduction in cardiac arrests. As of June 2016, there was a total of three (3) in house cardiac arrests. This represents a 92% reduction in cardiac arrests since 2012 and approximately thirty (30) fewer patients requiring cardiopulmonary resuscitation while hospitalized annually.
Early warning allows for rapid response to respiratory compromise
ICU mortalities were at twenty-five (25) in 2012. In 2015, mortalities decreased to two (2). As of June 2016, there have been zero (0) ICU deaths. This represents approximately twenty-three lives saved in the ICU annually.
Impact on Mortality and Length of stay for these events is significantly lower than the national average.

**IMPACT OF RESPIRATORY EVENTS ON YOUR HOSPITAL**

When any respiratory event occurs, the patient on average requires 3.65 additional days, $70,000 additional charges and 1.26% increase in mortality. Mortality and length of stay for these events are significantly lower than the national average.

### Impact of Respiratory Events Compared to National Average

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<tr>
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<th>Length of Stay</th>
<th>Total Charges</th>
<th>Mortality</th>
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<tbody>
<tr>
<td>Avg. all post-op patients</td>
<td>4.09</td>
<td>$124,814</td>
<td>0.44%</td>
</tr>
<tr>
<td>Avg. for any Respiratory Event</td>
<td>7.74</td>
<td>$194,395</td>
<td>1.70%</td>
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<tr>
<td>National Benchmark for Respiratory Event</td>
<td>13.05</td>
<td>$181,297</td>
<td>13.97%</td>
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<tr>
<td>Avg. Burden of Respiratory Events across all post-op patients</td>
<td>0.28</td>
<td>$5,423</td>
<td>0.10%</td>
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CONCLUSIONS & FUTURE DIRECTIONS

• Expand STOP BANG assessment to the outpatient clinic setting
• Continue alarm reduction work
• Implementing middleware
• Continue focus on reducing opioid use across the continuum of care
• Patient and family education on follow up screening for sleep apnea is a priority
• Review new evidence and technology as they become available
• Key stakeholder involvement is crucial
Barton Health’s early identification and response to deteriorating respiratory status saves lives and ultimately improves the overall health of our community.
Future/Ongoing Initiatives
Mark Your Calendars!
June 26 and July 10; 12pm to 1pm EST

Case Study from Parallon* – Improving Compliance with the Smart Pump Drug Library Across a Large Hospital System (Part 1 and Part 2).

*Parallon Business Solutions is a subsidiary of HCA Healthcare and works side-by-side, or in parallel, with the HCA healthcare providers to enhance their performance.

Part 1: June 26, 2017 - 12 noon to 1pm
Lori Marsh, DPh
Tristar Division Director of Medication Safety
Register: https://attendee.gotowebinar.com/register/6328164788039190531

Part 2: July 10, 2017- 12 noon to 1pm
Laura Monroe-Duprey, BS Pharm, PharmD
(Formerly) West Florida Division Director of Medication Safety
Register: https://attendee.gotowebinar.com/register/4764884653225425923
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- Or you can email your question to: mflack@aami.org.
Thank you for attending!

This presentation will be posted to this webpage within one week:

http://www.aami.org/PatientSafety/content.aspx?ItemNumber=2933&navItemNumber=3086