First National Patient-Controlled Analgesia Survey of Hospital Practices: Results & Best Practices
Presenters

Survey Results

Michael Wong, JD
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Physician-Patient Alliance for Health & Safety
Executive Director
A Promise to Amanda Foundation

Best Practices

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First National Patient-Controlled Analgesia Survey of Hospital Practices: The Results
A. Impetus for the Survey
B. Survey Methodology & Respondents
C. Statistical Analysis
D. Result Yardstick
E. Results Discussion Agenda
F. The Bad News for Patient Safety:
G. Meeting National Goals (The Joint Commission)
H. The Good News for Patient Safety & Hospital Costs
Impetus for the Survey

- More than 13 million patients each year receive PCA in US
- 0.16 to 5.2% suffer respiratory depression (est.)
- Between 20,800 to 676,000 PCA patients will experience opioid-induced respiratory depression

Robert Stoelting, MD
(President, Anesthesia Patient Safety Foundation) presentation,
Patient, Safety Science & Technology Summit (January 2013)
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• Code Blues - half of Code Blues involve patients receiving opioid analgesia
• Daily Occurrence at Hospitals - unrecognized postoperative respiratory failure that results in cardiopulmonary arrest
• Failure to Rescue -
  - cardiopulmonary arrest that results in death or anoxic brain injury
  - first and third most common cause of adverse events related to patient safety, accounting for 113 events per 1,000 at-risk patient admissions.

Impetus for the Survey

**Amanda Abbiehl**
18-year old, admitted for “severe strep throat”
unmonitored use of PCA
http://promisetoamanda.org/?page_id=32

**Robert Goode**
unmonitored use of PCA following hiatal hernia surgery

**Louise Batz**
unmonitored use of PCA following knee replacement surgery

**Leah Coufal**
unmonitored epidural anesthesia after surgery for pectus carinatum
http://ppahs.org/2012/02/01/guest-post-yes-real-time-monitoring-would-have-saved-leah-2/

**Tyler Ireland**
unmonitored PCA after surgery for collapsed lung

**Justin Micalizzi**
unmonitored PCA after surgery for surgery to incise and drain a swollen ankle
http://ppahs.org/2011/08/18/would-monitoring-have-saved-justin-micalizzi/
Survey Methodology & Respondents

Online survey developed & sent out

Survey questions developed with input from:

- Corey Angst, PhD, MBA (Assistant Professor, Department of Management, Mendoza College of Business, University of Notre Dame)
- Richard Dutton, MD, MBA (Executive Director, Anesthesia Quality Institute)
- Frank Federico, RPh (Executive Director, Institute for Healthcare Improvement; Patient Safety Advisory Group, The Joint Commission)
- Matthew Grissinger (Director, Error Reporting Programs, ISMP)
- Stephen Howell, MSN (Lead Nurse Practitioner, University of Alabama School of Medicine)
- Ken Kelley, PhD, MA (Viola D. Hank Associate Professor of Management, Department of Management, Mendoza College of Business, University of Notre Dame)
- Joe Kiani, MSEE (CEO, Masimo)
- Carter King, MBA (Vice-President, Business Operations, AcelRx)
- Mary Lynn McPherson (Professor, University of Maryland School of Pharmacy)
- John Tucker, MBA (Chief Commercial Officer, Incline Therapeutics)
- Rodney Tucker, MD, MMM (Associate Professor, University of Alabama)
- Greg Spratt, RRT, CPFT (Director of Clinical Marketing, Covidien)
- Tim Vanderveen, PharmD, MS (Vice President, Center for Safety and Clinical Excellence, CareFusion)

Email link provided to:
- hospital pharmacists
- IHI hospital networks
- Premier members
Survey Methodology & Respondents

This survey was conducted during March & April 2013*. Respondents include...

- **168 Respondents**
  - 18% Physicians
  - 35% Non-Physicians (Nurses, R.T.s)
  - 47% Pharmacists

- Hospitals from across **40 States**
- Institution Type
  - Non-Teaching: 45%
  - Teaching: 55%

- Hospital Size Range
  - 14 - 1,500+ beds
  - Median = 200
Statistical Analysis

Anuj Mabuyi, PhD
Assistant Professor Department of Mathematics
Northeastern Illinois University

Beverly Gonzalez, ScM
Biostatistician
Johns Hopkins Bloomberg School of Public Health
Anesthesia Patient Safety Foundation
“Conclusions and Recommendations-Conference on Electronic Monitoring Strategies”

Association for the Advancement of Medical Instrumentation

Institute for Safe Medication Practices
“Part II - How to Prevent Errors - Safety Issues with Patient-Controlled Analgesia (July 24, 2003)

The Joint Commission
“Safe use of opioids in hospitals”
Sentinel Event Alert, Issue 49, August 8, 2012

National Comprehensive Cancer Network

Pennsylvania Patient Safety Authority
“Making Patient-Controlled Analgesia Safer for Patients”
Vol. 8, No. 3 (September 2011)

Numerous Peer-Reviewed Research and Studies
Results Discussion Agenda

A. The Bad News for Patient Safety:
   • Patient Risk Factors Considered
   • Double-Checks to Verify Proper PCA Connection and Settings

B. Meeting National Goals (The Joint Commission):
   • Role of Alarm Fatigue
   • Tools and Training Hospitals Want

C. The Good News for Patient Safety & Hospital Costs:
   • Technological Safety Practices
   • Education of Patients
The Bad News for Patient Safety: Patient Risk Factors Considered

Tremendous variation between the treatment received by patients across the country:
• About 2 out of every 3 hospitals not considering all six major patient risk factors
• More than 60 percent of respondents are considering five or less factors
• Less than 40 percent are considering all six patient risk factors
The Bad News for Patient Safety:
Patient Risk Factors Considered (Opioid Naive)

Recommendation

The Joint Commission: take “extra precautions with patients who are new to opioids or who are being restarted on opioids” [Sentinel Event Alert, Issue 49, August 8, 2012]

Practice

Almost 1 out of 5 hospitals are not assessing patients for being opioid naive:
- Pharmacists 4x more likely to consider
- Physicians approximately 70% less likely to consider

1 out of 5 hospitals not assessing being Opioid Naive
The Bad News for Patient Safety: Patient Risk Factors Considered (Obese Patients)

**Recommendation**

Many studies have shown the increased risk of using anesthesia with obese patients [J. Ingrande and H. J. M. Lemmens, “Dose adjustment of anaesthetics in the morbidly obese” British of Journal of Anesthesia Volume 105, Issue suppl 1]

**Practice**

Three out of every 10 hospitals do not consider obesity as a patient risk factor.
The Bad News for Patient Safety: Patient Risk Factors Considered (Advanced Age)

Recommendation

The Joint Commission cautions against the use of opioids in older patients because of the heightened risk of oversedation and respiratory depression [The Joint Commission, Sentinel Event Alert, Issue 49, August 8, 2012]:

- 2.8 times higher for individuals aged 61-70
- 5.4 times higher for age 71-80
- 8.7 times higher for those over age 80

Practice

About three out of every 20 hospitals do not consider advanced age as a patient risk factor.
1. Need for better selection of patients who are placed on PCA.
2. Perhaps a scoring system for the inclusion or exclusion of patients using PCA might be of assistance (similar to STOPBang for obstructive sleep apnea?)
Double-Checks to Verify Proper PCA Connection & Settings: What Checks Check

- **Patient’s identification** — is the correct patient receiving the opioid?
- **Patient allergies** — is the patient allergic to the medication?
- **Drug selection and concentration** — is the patient receiving the prescribed medication and dosage?
- **Dose adjustments** — has any dose adjustment been completed?
- **PCA pump settings** — has the pump been programmed correctly?
- **Line attachment** — has the pump been attached correctly to the patient?

approximately 70% of PCA adverse events are due to errors associated with pump use (e.g., misprogrammed doses and concentrations, installation of the wrong drug or concentration)

[Pennsylvania Patient Safety Authority, “Making Patient-Controlled Analgesia Safer for Patients” Vol. 8, No. 3 (September 2011)]
Double-Checks to Verify Proper PCA Connection & Settings: Not Checked Consistently

There is great variation on what double-checks are made.

- Checks Settings: 98.1%
- Confirms Drug Selection & Concentration as prescribed: 95.7%
- Checks Patients' ID: 93.2%
- Any Dosage Adjustments Needed: 77.2%
- Checks Patients Allergies: 75.9%
- Tube Line Attachments: 68.5%
Double-Checks to Verify Proper PCA Connection & Settings: Not Checked Consistently

• only slightly more than 1 out of every 2 hospitals (51.19%) performed all six double-checks
• 1 out of ten hospitals performed just one or less double checks (10.71%)
Meeting National Goals (The Joint Commission): Role of Alarm Fatigue

More than 19 in 20 hospitals (95.1%) say they are concerned about alarm fatigue

How would you rate your concern about potential alarm fatigue about continuous electronic monitoring?

- Concerned but don’t believe it will be an unmanageable problem: 61.4%
- Concerned that it will be a problem that is difficult to manage or is preventing us from implementing: 33.73%
- Not concerned at all: 4.90%
- Concerned but don’t believe it will be an unmanageable problem: 61.4%
Meeting National Goals (The Joint Commission): Role of Alarm Fatigue

If No Alarm Fatigue, More Hospitals Would Monitor
Almost one in ten hospitals (87.8 percent) believe that a reduction of false alarms would increase the use of patient monitoring devices, like an oximeter or capnograph.

9/10 HOSPITALS BELIEVE REDUCING FALSE ALARMS WOULD INCREASE USE of PATIENT MONITORING DEVICES (i.e. OXIMETER or CAPNOGRAPH)
Meeting National Goals (The Joint Commission): Tools and Training Hospitals Want

Ease of Assessment: Need for Single Indicator

Seven out of 10 hospitals (70.7%) would like “a single indicator that accurately incorporates key vital signs, such as pulse rate, SpO2, respiratory rate, and etCO2.”

Those concerned alarm fatigue is an unmanageable problem:
- more than twice as likely to want a single-indicator assessment tool (OR=2.278; 95% CI 1.073-4.838)
- recommendations for ease of assessment for their nursing staff (OR=2.039; 95% CI 0.992-4.190).
Technological Safety Practices: Smart Pumps

Smart Pump Usage:
• Almost one out of every four hospitals do not use “smart” pumps that contain safety software and medication "libraries" for greater patient safety for all of their patients.
• More than three out of every 20 hospitals are not using “smart” pumps for any of their patients.
Continuous Electronic Monitoring Reduces Adverse Events, Costs, and Expenses

- Of those hospitals that monitor some or all of their patients with pulse oximetry or capnography, more than 65 percent have experienced positive results -- either in terms of a reduction of overall adverse events or of costs and expenses. The other 35 percent of those that monitor say it is “too early to determine or have not determined.”
- Those using smart pumps with integrated end tidal monitoring were almost three times more likely to have had a reduction in adverse events or a return on investment in terms of a reduction in costs and expenses (OR=2.789; 95% CI 1.112-6.996).
Continuous Electronic Monitoring Will Become Standard Procedure

• Of the hospitals that are not electronically monitoring any of their patients, almost nine out of 10 (86.7 percent) say they are considering the use of monitoring.
Our Experience in Successfully using ETCO2 Monitoring During the Usage of PCA Pain Management

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Candler Hospital
Saint Joseph’s/ Candler Health System
Savannah, Georgia
St. Joseph’s/Candler Health System
Savannah, GA

- 2 hospital system, tertiary care, community, referral centers
  - Two of the oldest continuously operating hospitals in the nation
  - Largest healthcare system in SE Georgia; 675 beds
  - Approximately 25,000 annual discharges
BALANCING EFFECTIVE ANALGESIA WITH SAFETY
What caused a change in PCA delivery at SJCHS?

- We experienced three opioid-related events with serious outcomes in the 2 years preceding our embarking on a multiyear process of implementing an advanced IV medication safety system.
The team recognized that safe use of PCA required both correct pump programming and monitoring of patients’ individual respiratory response to opioids.
1st STEPS in our progression to becoming involved in the monitoring of post-operative patients receiving pain management

The pharmacy and nursing staffs were attempting to address safety concerns with regards to PCA pain medication delivery. Respiratory Care was called in to address monitoring options early on in the decision making process.
Beta Testing

- Beta testing revealed the difficulty of predicting which patients actually were high-risk. We did note that capnography, not pulse oximetry, provided the first indication of opioid-related respiratory depression. As a result, the decision was made to require a capnography module for each PCA infusion and to use a pulse oximeter module for selected patients receiving PCA analgesics who have preexisting co-morbidities.
Are we sure that this is an area that we want to take on? What about staffing? I don’t know anything about PCA pumps and pain scales?
Why should Respiratory Care be involved in Pain Management?

- RTs have keen clinical assessment skills
- RTs understand EtCO2 and it’s limitations
- RTs have the ability to use good clinical judgment and to guide the care of patients suffering from Respiratory ailments. Depression.
Development of a Functional EtCO2 Tool

• Early on in the evaluation process a problem was identified, in that the staff noticed that the EtCO2 Monitor would alarm indicating High Respiratory Rate. The patient’s resp. rate would be 20 bpm however the device would read 40 bpm.

• The solution was to achieved by working with the manufacture to decreased the EtCO2 threshold, so that only true breaths and not fluctuations in the respiratory pattern would be counted as breaths. This was done and the problem was resolved.
Another process development was the creation of a new EtCO2 cannula design.

In the PACU unit it was noted that the no breath alarm would be sounding, even with the patient seemingly breathing effectively.

The new cannula was designed to provide increased surface area for CO2 sampling and hence improved accuracy. This action resolve the clinical issues that occurred in the PACU.
What do the RTs do?

- Q shift monitoring of each patient on PCA therapy.
- RTs assess patient’s history and adjust monitoring to meet patient’s status.
- Reviews trended information (EtCO2, SpO2, Respiratory Rate, & PCA medication rates)
- Provide bedside education regarding EtCO2 monitoring
Changes from Baseline – Action Steps for Nursing Staff

Remember the ABC’s (airway, breathing, circulation)
Assess the patient
Follow your normal protocol, which may include:
- Stimulate patient if necessary
  - Ensure open airway
- Check the cannula positioning
- Notify Respiratory Therapy
- Consider decreasing or stopping PCA and starting alternative drug delivery
  - Inform M.D.
- Administer reversal agents as prescribed
Continuous Monitoring During PCA

- May allow clinicians to identify unforeseen risk and undiagnosed clinical conditions that predispose patients to respiratory complications from i.v. opioids
Typical Monitoring of Patients on PCA

- Intermittent assessments of cognition, vital signs, pulse oximetry and pain scores.

- Dangers of overmedication may not be detected.
PCA Monitoring Trend Data:
Opioid Induced Respiratory Depression

**Morphine 1mg/mL**

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**Values:**
- ZOOM: 120 60 30 5 1 minutes
- >Press UP/DOWN Keys to Move Cursor.

**Morphine 1mg/mL**

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**Values:**
- ZOOM: 120 60 30 5 1 minutes
- >Press UP/DOWN Keys to Move Cursor.
Change in the Culture of Care for Our PCA Patients
Improved Pain Management

Clinicians often times use extreme caution during narcotic administration.

**Problem:**

Under medication to prevent respiratory depression resulting in poor pain control.

**Solution:**

Add continuous monitoring to provide clinicians with assessment tools that assist in the detection of respiratory depression and allow adequate administration of analgesics.
Findings Using Continuous Etco2 and Spo2 Monitoring With PCA Therapy

• Multiple “high risk” situations identified including:
  - Narcotic overdose leading to respiratory depression.
  - Apnea alarms.
  - Undiagnosed sleep apnea.
  - Post op pneumonia and Atelectasis.
  - Congestive heart failure.
BPM low <8 7504
EtCO2 high >60 71
Both 9

Aggregated
50 patients SJC January 2006

low BPM versus high EtCO2
in same minute

Intensity Graph

E_tCO2 minute-maximum(%)  
BPM minute-minimum (per minute)

BPM low Alarm if below
RESULT

• Increased likelihood of better sustained pain control, faster recovery and discharge.

• A better patient experience.
SUMMARY OF OUR EXPERIENCE

• EtCO2 provides earliest alert of decline in respiratory function.
• Undiagnosed Sleep Apnea more prevalent than expected.
• Post op respiratory depression unrelated to PCA detected.
• Pain is more effectively controlled in patients with both high and low opioid tolerance.
CONCLUSION

• Changes in respiratory status is a leading indicator of adverse patient response to opioid infusion or other types of clinical deterioration.

• Current respiratory monitoring technology can aid in patient assessments and prevent serious adverse events.
THANK YOU