



Are Your Inpatients On Opioids Safe? Don't Bet On It!

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St. Louis, Missouri

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Faculty Disclosure



- The speaker has an educational consulting agreement with Covidien LP, a manufacturer of capnography devices
- There are many capnography monitors and the speaker makes no claim of preference of any device

Learning Objectives

- Learning Objective 1: At the end of this presentation, the participant will be able to identify a patient population at high-risk of Opioid Induced Respiratory Depression(OIRD) requiring emergent reversal.
- Learning Objective 2: At the end of this presentation, the participant will be able to explain the key components of a program to implement capnography at the bedside.



Name: Amanda Abbiehl

Age: 18

Diagnosis: Severe pain from throat infection

Monitoring: Intermittent SpO2 and vitals

Faces of OIRD

Thursday July 15 – Amanda was admitted to the hospital for **severe sore throat**. Treatment with oral analgesics was not relieving pain.

Friday evening, July 16 - Put on a PCA pump with opioids and to be monitored intermittently by spot-check oximetry and vitals.

Saturday morning, July 17 – Amanda was found unresponsive and resuscitation efforts were unsuccessful.

Amanda's parents encourage all hospitals to monitor patients receiving opioids with oximetry and capnography to eliminate the possibility of respiratory depression and death.

WWW.PROMISETOAMANDA.ORG/AMANDAS-STORY/



Name: Leah Coufal

Age: 11

Diagnosis: Pectus carinatum (convex projecting sternum) repair

Faces of OIRD

After successful surgery, Leah complained of considerable pain and fentanyl was repeatedly increased- becoming less alert, she was given Ativan for “anxiety”.

Monitoring was spot-check oximetry and vitals.

About 1 AM, her mother Lenore, exhausted, took a nap.

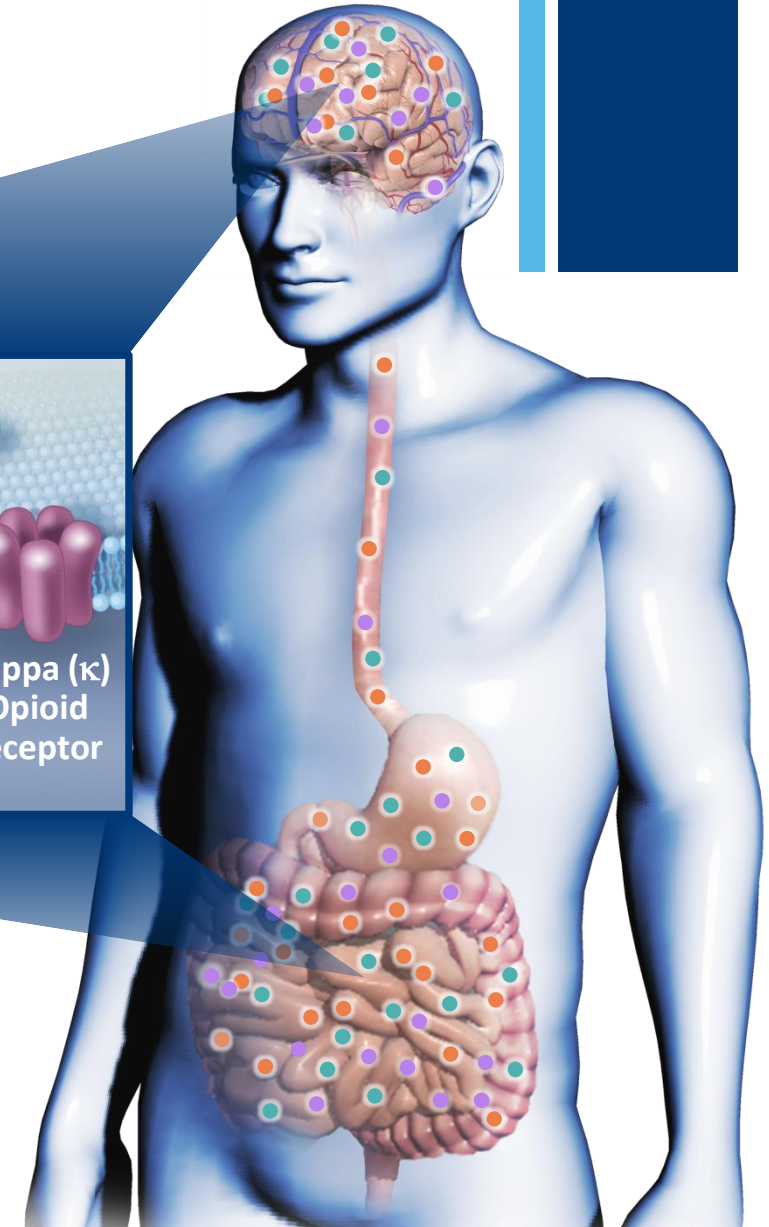
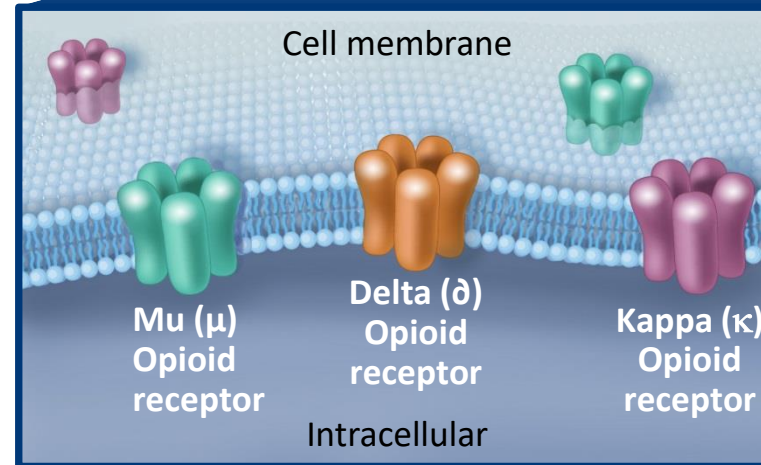
3 AM – Lenore awoke and found her daughter Leah was ‘dead in her bed.’

Leah’s mother believes that real-time monitoring would have saved her daughter’s life.

<http://www.leahslegacy.org/leahs-story/>

Why Do We Give Opioids?

- Works great on moderate to severe pain
- Actions:
 - Pain relief— raise pain threshold
- How?
 - Bind to Mu (μ) receptors in brain
 - Mu (μ) receptors are not only in the brain
 - Also in smooth muscle
 - **Respiratory depression**
 - Sedation (CNS) / Hypotension
 - Nausea/Vomiting
 - Constipation (treatment for diarrhea)



Why Do We Have a Problem?



OPIOIDS
involved in
almost
ONE-HALF
of all deaths from
Medication
Errors¹



ONE-THIRD
HOSPITAL CODES
due to respiratory
depression²



20,000
post-op patients
receive naloxone
annually³



US Healthcare
costs associated
with post-op
respiratory failure
total
\$2 Billion⁴

**More Opioids
=
More Risk**

Inpatient:
In 2013, opioids were
used in more than half
of hospital admissions
of *non-surgical* patients,
ranging from 33% to
64%.⁵

1 Colquhoun M, Koczmara C. Canadian Journal of Hospital Pharmacy. 2005;58:162-4.

2 Fecho K, Freeman J, Smith FR, et al. In-hospital resuscitation: opioids and other factors influencing survival. Therapeutics and Clinical Risk Management 2009;5:961-8.

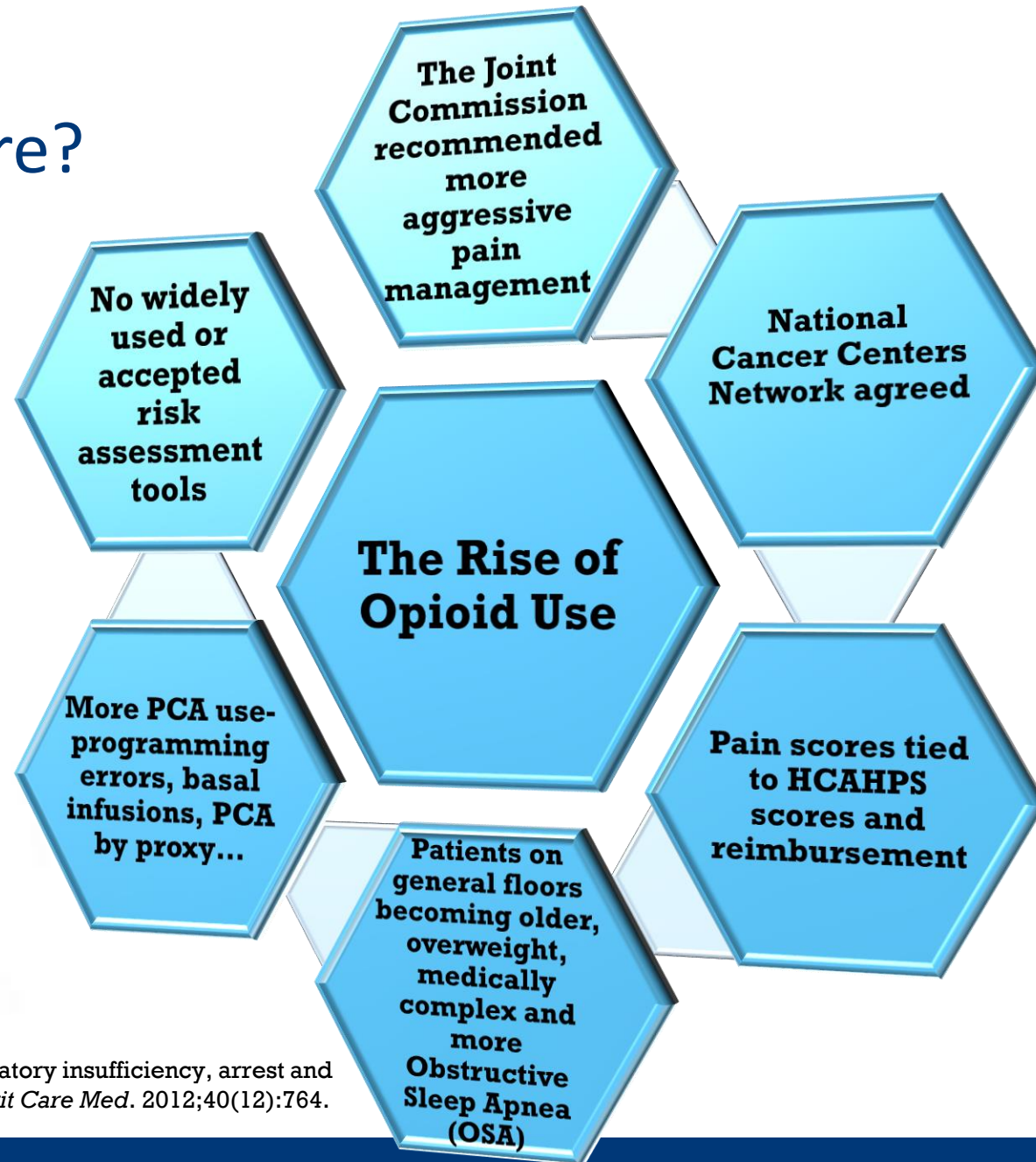
3 Rothman, Brian AAMI Foundation. American Dental Association, Chicago, IL. 14 November 2014

4 <https://www.cpmhealthgrades.com/CPM/assets/File/HealthGradesPatientSafetyInAmericanHospitalsStudy2011.pdf>. Accessed Dec. 2, 2014

5 Herzig SJ, Rothberg MB, Et. (2014), Opioid Utilization And Opioid-related Adverse Events In Nonsurgical Patients In Us Hospitals. J Hosp Med. 9: 73-81.

How Did We Get Here?

OIRD on general care floors had higher mortality rates (34.6% vs. 1.2%) and longer length stays (11.5 vs 4.1 days).¹



1. Kelley SA, Agarwal S, Parikh N, Erslon M, Morris P. Respiratory insufficiency, arrest and failure among medical patients on the general care floor. *Crit Care Med*. 2012;40(12):764.

Polling Question



How many cases of OIRD do you have a year at your hospital?

- A. I wish I knew
 - B. None
 - C. 3 or less
 - D. 6 or less
 - E. More than 6
-

Why pharmacists?

Pharmacist's Oath

“... relief of suffering my primary concerns.”

“Assure optimal outcomes ...”

“... embrace and advocate changes that improve patient care.”

“... prepare the next generation of pharmacists.”

Our entire job is Medication Safety!

Importance of Measurement



What gets measured gets managed!

- BJC: We Are Evidenced Based!



Take the time to collect your causative factors



Stakeholder Acceptance

- Increases buy-in of leaders and staff.



Project Prioritization

- Decreases the number of candidate interventions.
- Saves time and money
- Targeted interventions do not waste time!

Problem Identified



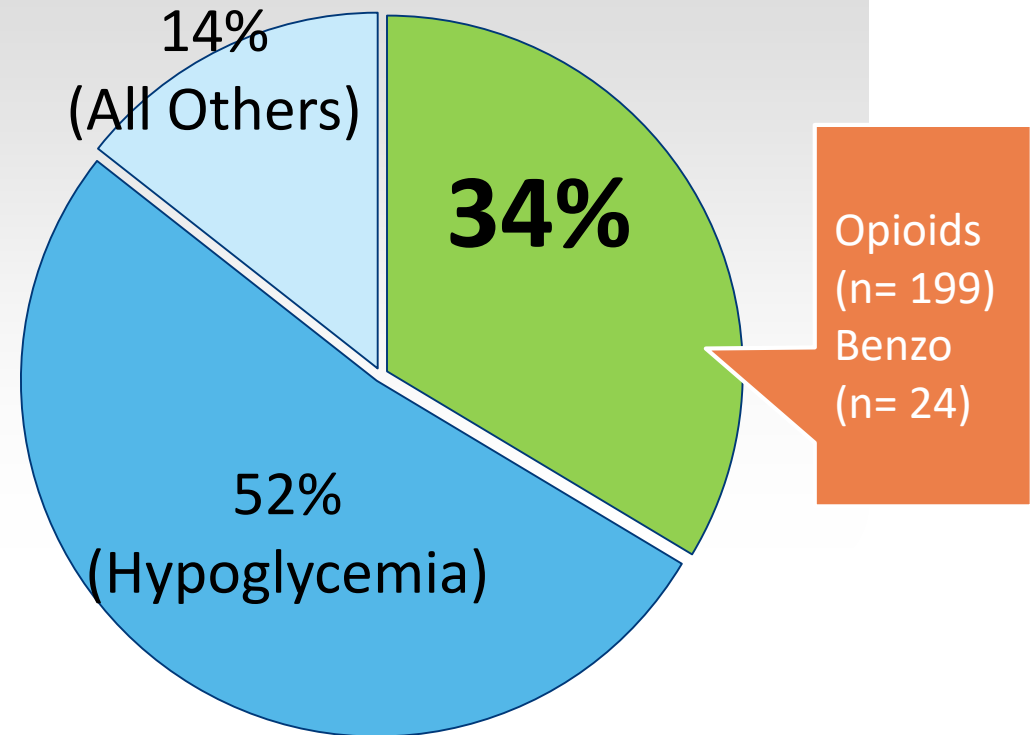
Do you know the **Opiate
Induced Respiratory
Depression Rate**
at your hospital?

Our Measure:

1. Narcan Given
2. Opioid Given Prior
3. Dual chart review
4. Symptoms Improved
Count It!



2015 Percent of Measured ADEs at BJC*



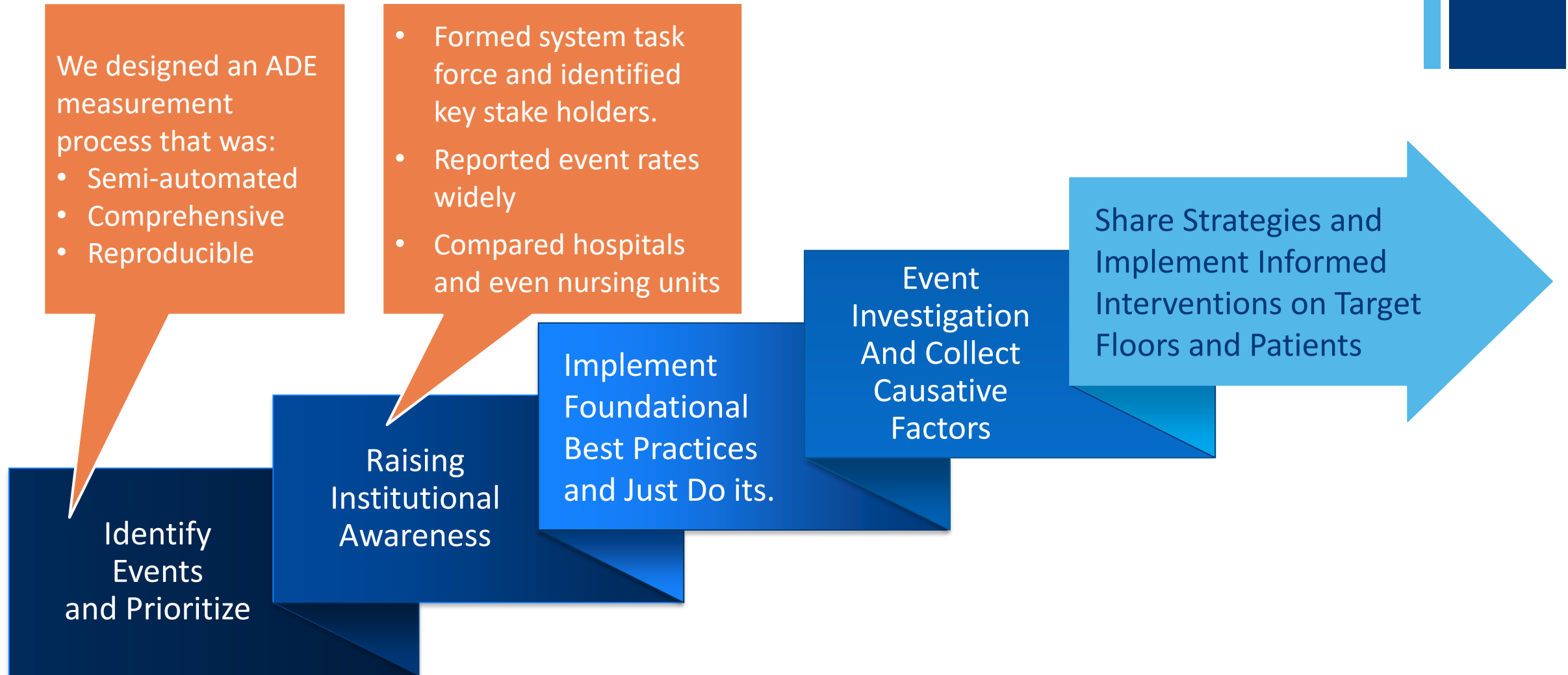
* Comprehensively collected using IHI Trigger Tool

Oversedation Harm Definition

If patient's respiratory depression, hypotension, or prolonged sedation responds after naloxone administration and narcotic given previously.



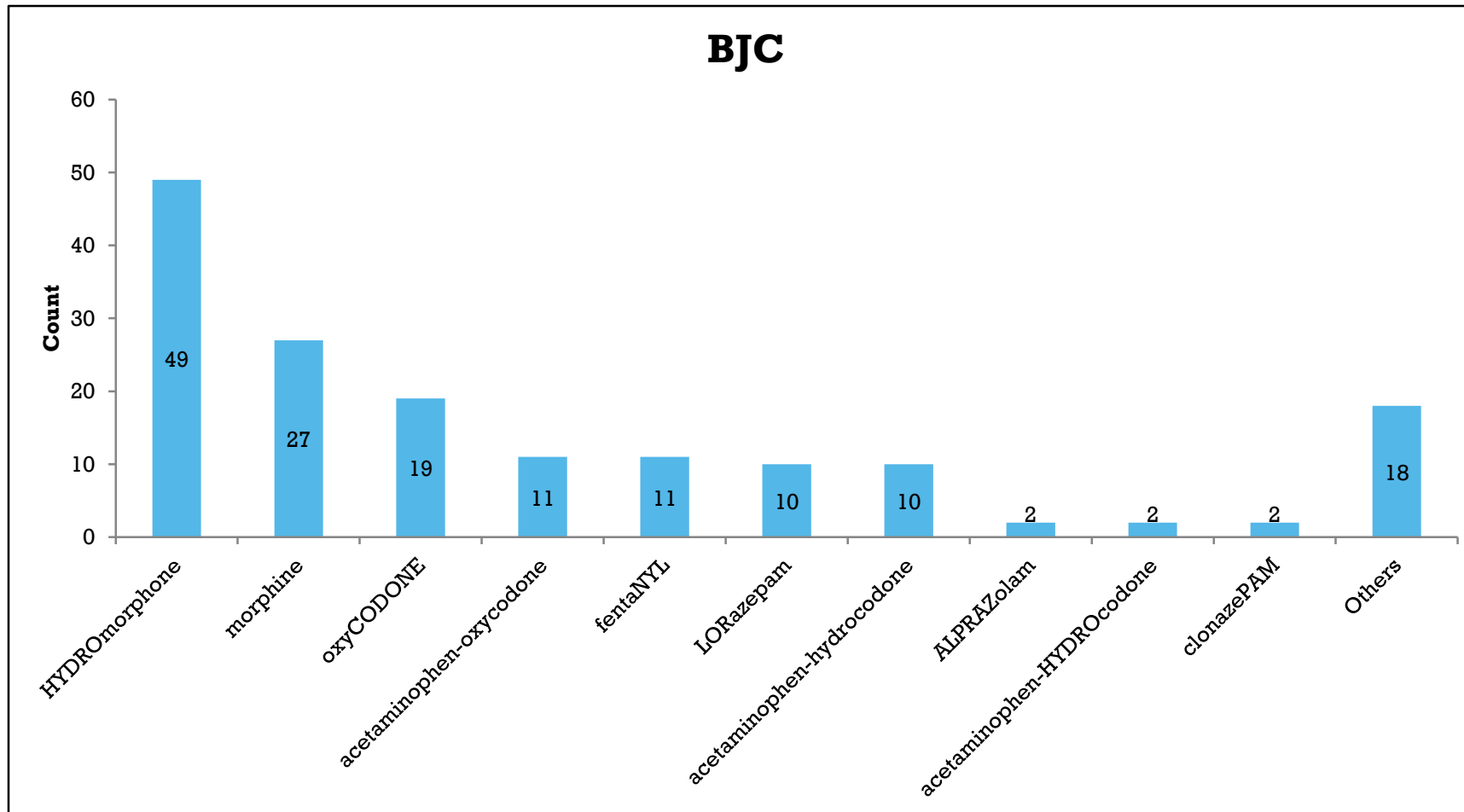
BJC's Improvement Process



Identify stakeholders needed to support project

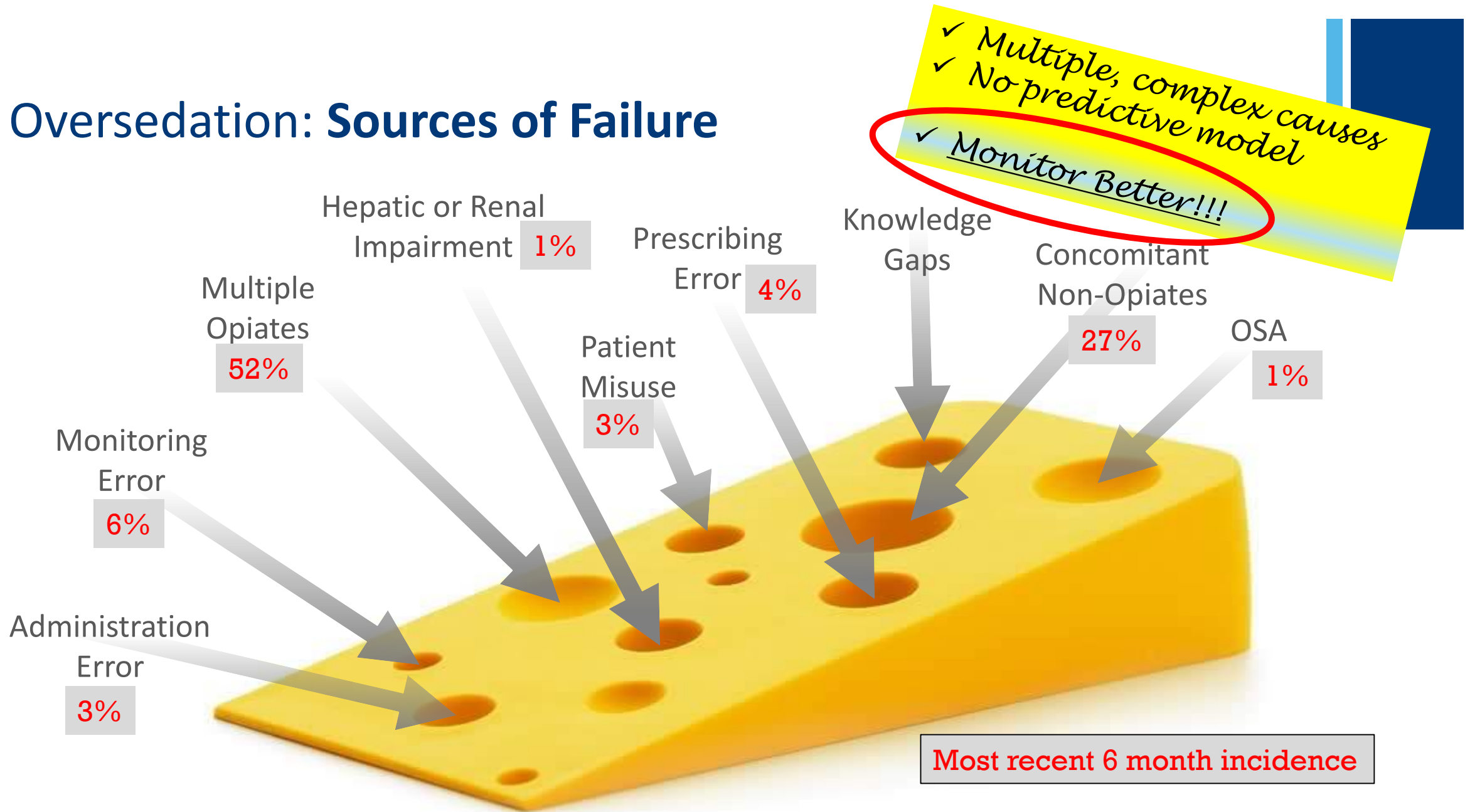


BJC Contributing Drugs-Rolling 6 Months: February 2017 – July 2017



Updated on 9/22/2017

Oversedation: Sources of Failure



Is Continuous Monitoring the Answer?

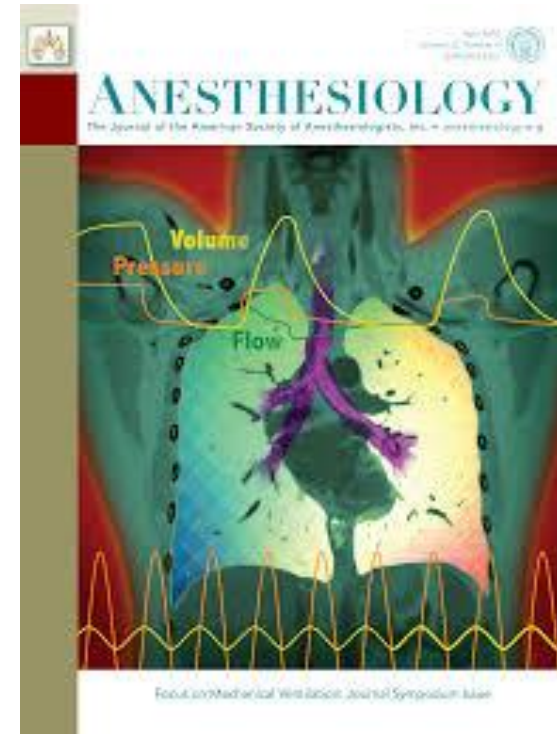
Postoperative Opioid Induced Respiratory Depression: a closed claims analysis¹

- Source: A collection of closed anesthesia malpractice claims
- Reviewed 9799 acute pain claims between 1990 and 2009 for likelihood of **OIRD**
- Found 92, 77% resulted in severe brain damage or death
- **58% had a “last check” greater than 2 hours prior to event**
- **Only 16% had an emergency response rate of within 15 minutes!**

Authors concluded:

- 97% were preventable with better monitoring and response

1. Lee, et.al. [Anesthesiology](#). 2015 Mar;122(3):659-65



Polling Question



Where do you continuously monitor ventilation in your inpatients?

- A. I wish I knew
- B. ICUs
- C. ICUs, PACUs, and ?other treatment areas
- D. ICUs, PACU, and PCA patients
- E. All high-risk patients on opioids and sedatives

Case Building: Capnography Growing at an Accelerated Rate



Joint Commission Pre-publication Standards on Pain Management for Jan. 2018



- Standard LD.04.03.13: 7. Hospital leadership works with its clinical staff to identify and acquire the **equipment needed to monitor patients who are at high risk** for adverse outcomes from opioid treatment.
- Standard PC.01.02.07: 6. The hospital **monitors patients identified as being high risk** for adverse outcomes related to opioid treatment.
- Standard PI.02.01.01: 19. The hospital **monitors the use of opioids** to determine if they are being used safely
 - (for example, **the tracking of adverse events** such as respiratory depression, naloxone use, and the duration and dose of opioid prescriptions).



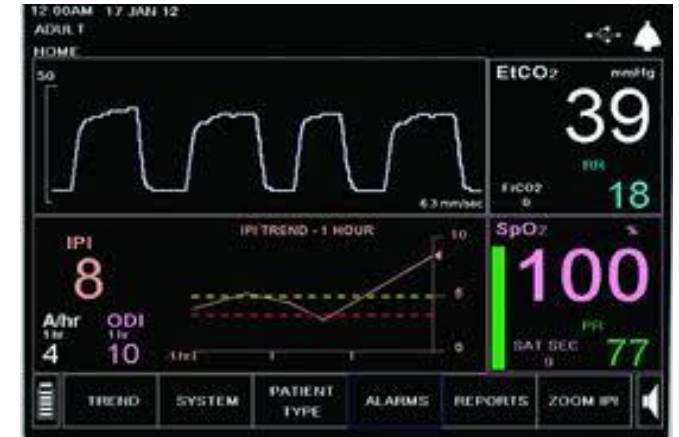
Case Building:

The Joint Commission Sentinel Event Alert #49 (August 8, 2012)

- ... pulse oximetry can be used to monitor oxygenation, and capnography can be used to monitor ventilation. Staff should be educated ***not to rely on pulse oximetry alone*** because pulse oximetry can suggest adequate oxygen saturation in patients who are actively experiencing respiratory depression, ***especially when supplemental oxygen is being used*** – thus the value of using capnography to monitor ventilation.
- **Between 2004 and 2011, 29% of opioid related ADEs related to improper monitoring¹.**

1. Pasero C, M McCaffery: Pain assessment and pharmacologic management. Chapter 12 – Key Concepts in Analgesic Therapy, and Chapter 19 – Management of opioid-induced adverse effects. St. Louis, Mosby Elsevier, 2011

Who do we monitor?



- ❖ Capnography on patients receiving opioids by **PCA** was our community bedside standard.
- ❖ Question: Is that our target population?



Identifying The Highest Risk Population

Leadership asked: Where will you start?

Community Standard: At least 7 other local hospitals are utilizing capnography at the bedside only on patients receiving a PCA.

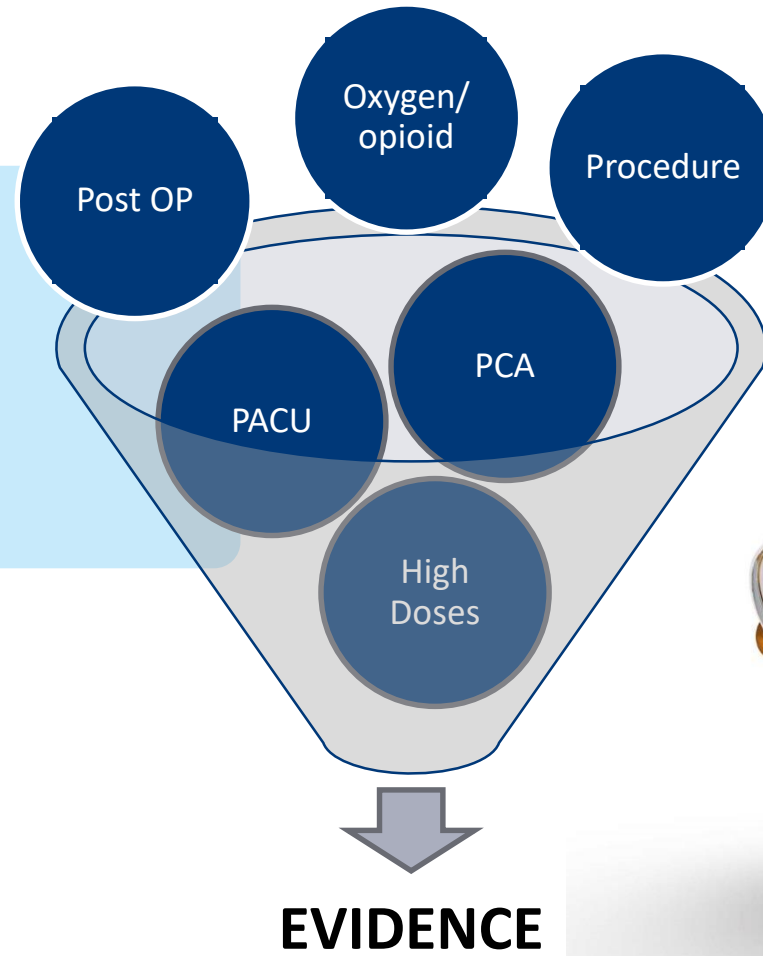
- All patients on opioids- Too Big
- PCA patients- Too Small (80% of our events were NOT on PCA!)



We tested several hypothesis based on risks found in the literature to identify our highest risk population- balancing sensitivity and specificity.

We Are Evidence Based!

We tested several **hypothesis** to identify our patients at highest risk.



And The Winner Was ...

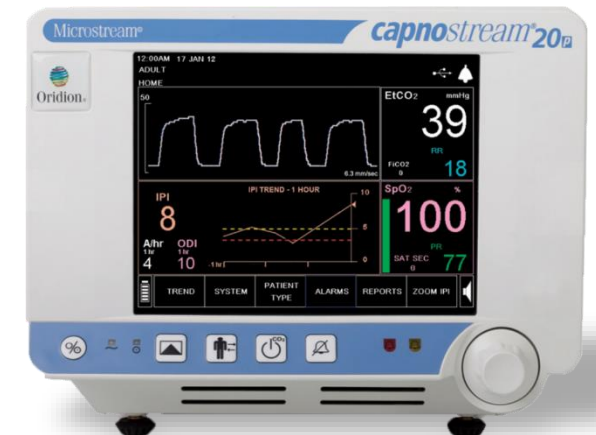
- **Oxygen and Opioids!**
 - **54%** of our patients with Opiate Induced Respiratory Depression had a concurrent order for parenteral narcotic and actively receiving supplemental oxygen prior to the oversedation event. (vs. **18%** on PCA)



Actively receiving
supplemental oxygen



Active order for parenteral
opioid



Continuous capnography
monitoring

Recommendation to Leadership

- Prepared comprehensive justification to system leaders



FYI: Highlights From the Core Policy



- Continuous End Tidal Carbon Dioxide (Capnography, EtCO₂) monitoring is required (unless otherwise determined by provider) for early detection of over sedation in adult hospitalized patients **actively receiving supplemental oxygen along with an active order for a parenteral (IV/PCA, Epidural and IM) opioid.**
 - A provider order is required-Determined by BJC Legal
 - Patients excluded from this policy **(but may be included per provider order)** are:
 - Presence of an order from provider indicating not to implement EtCO₂ monitoring
 - Pediatric patients
 - Implementation of an alternative continuous EtCO₂ monitoring / alarm system
 - Initiation of End-of- Life Care or Palliative Care provider's orders deferring EtCO₂ monitoring
 - Labor and Delivery
 - Postpartum

Bedside Capnography Implementation Process



**Approved
Core Policy**



**Rollout at
Best-Practice
Hospital**



**Readiness
Checklist
Developed**



**Formed
Implementation
Teams at Each
Hospital**



**Systematic
Rollout**

IMPLEMENTATION TEAM

- Respiratory Therapists
- Medical leadership
 - CMO
 - Hospitalists
 - Community MD leader
- Nursing leadership
 - CNE, NM
- Quality Improvement Contact
- Educator
- Clinical Engineering
- Medtronic
- Pharmacy?
- Clinical Practice Council?

Readiness Check List

- ☐ Implementation team formed with all key stakeholders represented
- ☐ IT solution in place for ordering and charting
- ☐ Education plan in place for nurses
- ☐ Education plan in place for prescribers
- ☐ Vendor is engaged, and education schedule in place
- ☐ Adequate devices on site, checked, and barcoded
- ☐ Clinical engineering engaged
- ☐ Bedside Capnography Core Policy adopted

Lessons Learned From Rollout: **People**

- Have **leadership role** on the implementation team
- Engage **all stakeholders** as early as possible
- **Prescriber, nursing, and patient acceptance** has been high
- **Vendor support** has been strong, though repeat education needed in some areas
- **Nurse manager** introduction of vendor educators will help engagement of staff
- **Hospital embraced leadership role** and have been tracking issues which will be shared



Lessons Learned From Rollout: Policy

- Application of policy in ICU settings may have less benefit- recent event.....
- Hospitals are modifying policy to allow nurses to begin capnography at their own discretion
- Capnography usage quickly spread to other areas of the hospitals- ER, PACU, etc.
- One large community hospital monitors all patients on a parenteral opioid (independent of oxygen) and several have added all patients on basal rate PCAs
- Modification of Alarm settings have big impact on nurse and patient satisfaction without compromising safety- policy modified



Progress, So Far....

Rollout complete
at 11 of 14
hospitals (Just
added 2 more
hospitals to our
system)
Academic hospital
wireless testing
alarm
management
technology to
rollout
simultaneously

Nationwide
recall of device
interrupted
rollout.
(Battery issue
discovered at
one of our
hospitals)

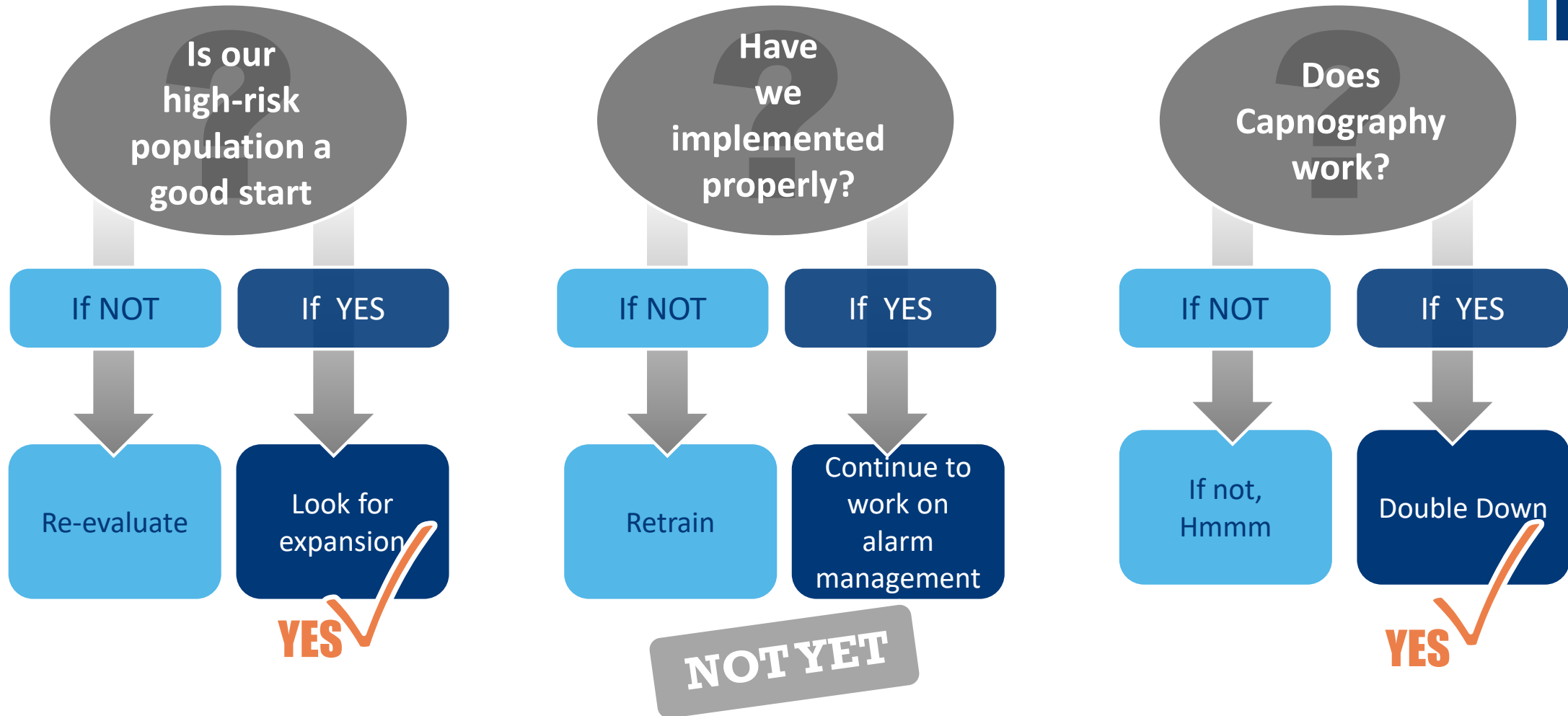
Currently
assessing alarm
modifications
(delays,
settings) that
will filter un-
actionable
alarms

Piloting a
wireless alarm
management
program that
will display
monitor data
remotely

Anticipating
answers to key
questions...



Working On Answers To the Following Questions



Capnography Evaluation Preliminary Results

- Objective: to assess if there is a statistical difference in the proportion of oversedation events between patients on and off capnography, among high-risk patients.
- Methods:
 - Population: high-risk patients, defined as being on oxygen and a narcotic during a hospital stay
 - Inclusion: high-risk patients
 - Date range: 6/10/2015 – 6/4/2016
 - Facilities: all adult acute care BJC facilities (n=10)



PRELIMINARY

Capnography Effectiveness

Population: All Patients Meeting Core Policy, 2 years of data.



		On Capnography		
		Yes	No	Total
Oversedation Event	Yes	19 30.2%	44 69.8%	63
	No	4,623 14.0%	28,302 86.0%	32,925
	Total	4,642 14.1%	28,346 85.9%	32,988

p-value = 0.0002

There is a statistically significant difference in the proportion of oversedation events between high-risk patients on and off capnography.

NCC-MERP **Level F** and **greater** events are trending downward

Wireless Alarm Pilot: Academic Hospital, March 2018

Results from NP led team of Post-Surgical nursing unit:

- **Considerably fewer alarms than first trial:** *“Overall Alarms: **2.1 alarms/hr/patient**, (compared to **12 alarms/hr/ patient** with bed-alarm Pilot)”*
- *“It is highly recommended to announce alarms outside the patient’s room.”*
- **Want it sent to nurses when possible:** *“alarm communication to nurses is also highly recommended”*
- **They like IPI (1-10 scale blending SPO2 and EtCO2) :** *“Using measures which provides integration of data, such as the Integrated Pulmonary Index (IPI), is recommended as a singular indicator of possible patient deterioration.”*
- **They agree with the core policy!:** *“Use of the BJC criteria for use appears to be appropriate as a minimum requirement (patients with oxygen and orders for an IV opioid)”*

Conclusion & Suggestions

- Continuous monitoring of EtCO₂ in high-risk patients is effective at reducing emergency reversal.

HOW TO TAKE ACTION?

