MSOS Member Briefings
February 2018

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Moderated by: E. Robert Feroli, PharmD, FASHP

Supported by educational grants from Novartis and Fresenius Kabi

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Expanding the Use of Capnography to Monitor High Risk Opioid Patients

Paul E Milligan, Pharm D
System Medication Safety Pharmacist
BJC HealthCare (Diverse, Midwest 15 Hospital System)
St. Louis, Missouri

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

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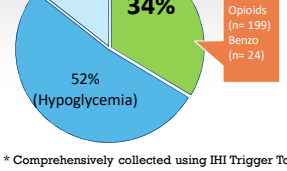
Problem Identified

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

What is Capnography?

Capnography measures exhaled carbon dioxide, known as end title CO_2 ($EtCO_2$)

- Allows for **early identification of oversedation** and can reduce the incidence and severity of oversedation events when used on high-risk patients (Waugh et al, 2011)
- Resulted in **greater detection of respiratory depression** than pulse oximetry in 54 opioid-naive post-op patients (Hutchison, 2008)
- Provided **early warning of ventilatory abnormalities**, alerting physicians to respiratory depression before onset of hypoxic event (Deitch et al, 2010)

More Case Building:

- Regulatory
  - The Joint Commission Sentinel Event Alert #49 (August 8, 2012) … ***not to rely on pulse oximetry alone…***
  - Joint Commission Pre-publication Standards on Pain Management for Jan. 2018 -*monitor* ***patients identified as being high risk*** *for adverse outcomes related to opioid treatment.*
- Literature
  - Between 2004 and 2011, 29% of opioid related ADEs related to improper monitoring[1]
  - 58% had a "last check" greater than 2 hours prior to event[2]

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
2. T. Lee, et.al. Anesthesiology. 2015 Mar;122(3):659-65

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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.

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

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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.**
  - 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 (≤14 YO or any age at our academic pediatric hospital)
    - Implementation of an alternative continuous EtCO2 monitoring / alarm system
    - Initiation of End-of- Life Care or Palliative Care provider's orders deferring EtCO2 monitoring

* Core Policy is minimum requirements for BJC hospitals.

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Capnography Effectiveness

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

Capnography works on our high-risk patients!

Oversedation Event		On Capnography: Yes	On Capnography: No	Total
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

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Lessons Learned From Rollout

- Application of policy in **ICU** settings may not be of benefit
- Hospitals are modifying policy to allow nurses to begin capnography **at their own discretion**
- Capnography **usage spread quickly** to other areas of the hospitals- ER, PACU, etc.
- **Engage all stakeholders** as early as possible
- **High prescriber, and patient acceptance**
- Need to **work on nursing acceptance**

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Conclusion & Suggestions

- Continuous monitoring of $EtCO^2$ in high-risk patients is effective at reducing Opiate Induced Respiratory Depression requiring emergent reversal.

HOW TO TAKE ACTION?

Get attention! *Measure your events!* → Build your case *Literature and National Recommendations* → Identify highest risk patients or start with ours. → Implement!

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Questions?

paul.milligan@bjc.org

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Safe use of epinephrine

Steven Meisel, Pharm.D., CPPS
System Director of Medication Safety
Fairview Health Services & Healtheast Care System
Minneapolis, Minnesota

FAIRVIEW

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Fairview Health Services

- 7 hospitals, including the University of Minnesota Medical Center
- 22,000+ employees
- 2,300 aligned physicians
- Insurance company, PBM
- 45+ primary care clinics, 55+ specialty clinics
- 47 senior housing locations
- Home care, home medical and hospice
- 38 retail plus specialty, compounding, long term care pharmacies

- Unified electronic health record across all hospitals and clinics

2017: acquired HealthEast & Grand Itasca with its 5 hospitals and 12 clinics

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Epinephrine known problems

- **Dose designation**
  - 1:1,000 vs 1:10,000 vs 1:100,000
  - 0.1 mg vs 1 mg
- **Route confusion (IM vs IV)**
- **Look alike vials**
- **Errors are commonly single point failures**

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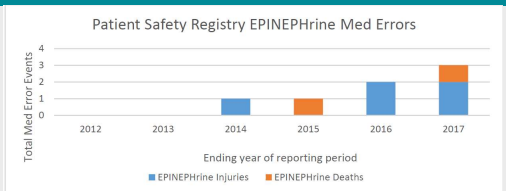
Minnesota Patient Safety Registry



- **All events occurred in the ED or operating room**
- **3 events where the drug was given IV instead of IM**
- **4 events (2 fatal) involved the wrong concentration**

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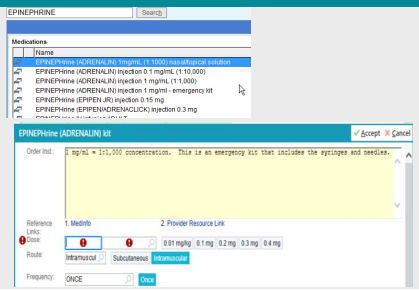
Fairview's Approach

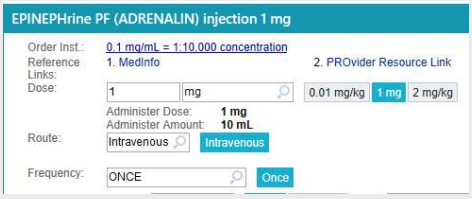
- Eliminate 30 ml vials from patient care areas
- Limit orderable routes in electronic health record
- Default dose designation to "mg"
- Utilize bar-code assisted drug preparation checking in the IV room
- Create "anaphylaxis kits" for most areas
  - Epi-Pens in selected departments and all clinics

Search and order screens



 Order screens for 1 mg/ml and 1 mg/ml kit are identical

Order screen for IV Formulation



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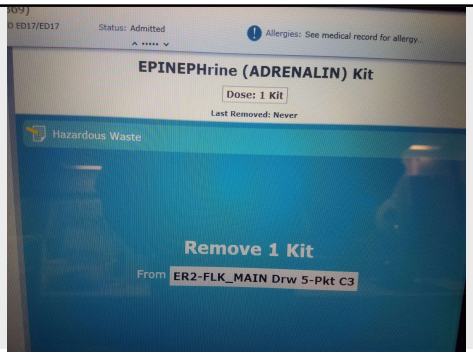

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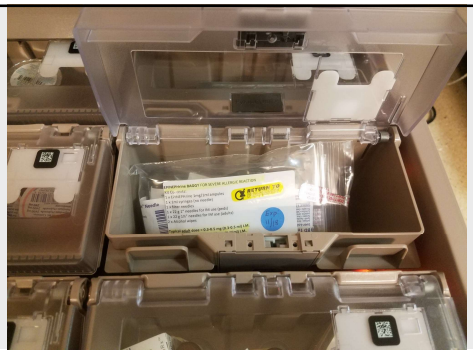

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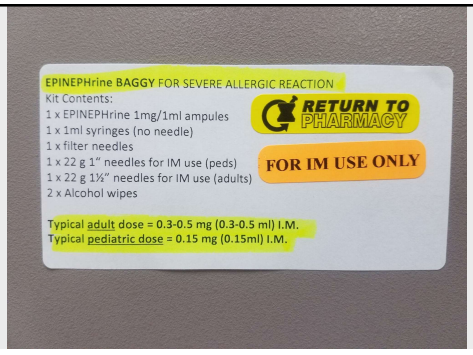

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Final thoughts

- **While Epi-Pens may be the safest formulation and prices have fallen, they are still prohibitively expensive for broad use. Further, inpatient nurses would require training in how to properly use them; this could create delays and errors.**
- **Constraints and forcing functions will always be imperfect.**
  - It is always possible to misread a label
  - Someone may choose to over-ride or ignore a computer alert

smeisel1@FAIRVIEW.ORG

Meeting the New ISMP Best Practice: *Eliminating Injectable Promethazine*

Kelly Besco, PharmD., FISMP, CPPS
Medication Safety Officer I OhioHealth Pharmacy Services

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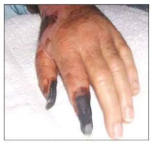
- 10 Hospital Family (Critical Access →Large Acute Care)

ISMP MedicationSafetyAlert!

Action needed to prevent serious tissue injury with IV promethazine



2006 Watershed ISMP Article:

- Known vesicant (pH between 4 and 5.5)
- Injuries after infiltration or inadvertent intra-arterial injection.

Round One: January 2007

OhioHealth

Summary of Strategies to Reduce IV Promethazine Adverse Events

Short-term Actions	Galion	Doctors	RBH	SOMC	GMC	Marion	Nelsonville	Grady
Limit concentration in stock to 25 mg/ml	Yes	Yes	Yes	Yes			Yes	
Limit starting dose to 6.25 - 12.5 mg IV	Yes	Yes	Yes	Yes			Yes	
Dilute the drug in 10-20 ml NS	Must be diluted in 50 ml mini-bag NS & administered over 15 mins	Yes	Yes	N/A			Yes	
Do not allow administration via hand or wrist veins	Yes	Yes	Yes	Yes			Yes	
Inject the drug through a running IV line	Yes	Yes		N/A			Yes	
Inject the drug through running IV line at the port furthest from the patient's vein	Yes	Yes	Yes	N/A			Yes	
Require the person administering the drug to remain with the patient to assess the IV site during the entire injection/infusion	No	Yes (IVP)	Yes (IVP)	N/A			Yes (IVP)	
Standing orders for promethazine IV reflect the current safety requirements	Yes	Yes	Yes	N/A			In progress	
Patients are advised to report burning or pain	Yes	Yes	Yes	N/A			Yes	
An alert appears on MARs reminding staff of safety precautions	Yes	Yes	Yes	Yes			Yes	
An alert appears on automated dispensing cabinet screens reminding staff of safety precautions	Yes	Yes	Yes	Yes			N/A	
Use alternative rescue antiemetics	Yes	No	Yes	Yes			Yes	
Intermediate-Term Actions (3-12 mths)								
Run use of IV promethazine	No	No	No	Yes			No	
Long-Term Action (12-24 mths)								
Remove parenteral promethazine from formulary	No	No - still have IM available	No	No - still have IM available	Yes	Yes	No	No - still have IM available

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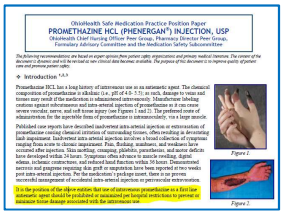
Round Two: 2009


OhioHealth Safe Medication Practice Position Paper

PROMETHAZINE HCL (PHENERGAN®) INJECTION, USP

OhioHealth Chief Nursing Officer Peer Group, Pharmacy Director Peer Group, Formulary Advisory Committee and the Medication Safety Subcommittee

- Position paper developed detailing published trials comparing IV promethazine to other anti-emetics that showed no additional benefit over comparative agents.
- Decision made to remove from existing and proposed pre-printed order forms and in Computer Physician Order Entry (CPOE) outlines.
- Additional hospitals added "IM Use Only" restriction.

Round Three: 2012

High Leverage

Low Leverage

Hospital	Formulary Status/Restrictions
Grant	Non-Formulary
Marion	Formulary Restriction (Hyperemesis in Pregnancy; diluted in 1 liter of IV fluid)
Grady	Restricted to IM use only
Doctors	Restricted to IM use only
Dublin	Formulary: Maximum dose restriction of 12.5 mg (PACU excluded)
Riverside	Formulary: No restrictions

- System-wide "IM Use Only" restriction approved by OhioHealth P&T Committee.
- Hospitals with non-formulary status/additional restrictions maintained.

Round Four: April 2017

Physician Guidance Council Meetings
Proposal Presentations & Peer Influence

Off-Cycle
P&T Committee Formulary Removal

- New Physician Clinical Guidance Council Structure Developed
  - Peer Influence (AKA: Peer Pressure)
- Formulary throughout 10 hospital health-system!

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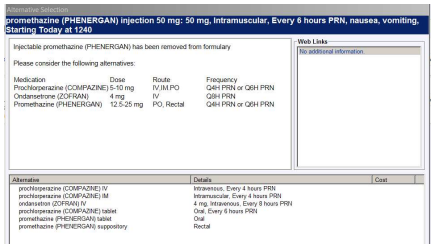
Ordering IV Promethazine Today at OhioHealth



Sequence of Strategies

- 2007
  - Adopted ISMP's initial 2006 recommendations
- 2009
  - Removed from order sets
- 2012
  - IM Use Only restriction
- 2017
  - Formulary removal

QUESTIONS

BELIEVE IN WE™ OhioHealth

A FAITH-BASED, NOT-FOR-PROFIT HEALTHCARE SYSTEM

RIVERSIDE METHODIST HOSPITAL + GRANT MEDICAL CENTER + DOCTORS HOSPITAL
GRADY MEMORIAL HOSPITAL + DUBLIN METHODIST HOSPITAL + HARDIN MEMORIAL HOSPITAL
MARION GENERAL HOSPITAL + REHABILITATION HOSPITAL + O'BLENESS HOSPITAL + MANSFIELD HOSPITAL
SHELBY HOSPITAL + WESTERVILLE MEDICAL CAMPUS + HEALTH AND SURGERY CENTERS
PRIMARY AND SPECIALTY CARE + URGENT CARE + WELLNESS + HOSPICE
HOME CARE + 28,000 PHYSICIANS, ASSOCIATES & VOLUNTEERS

Kelly.Besco@ohiohealth.com

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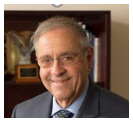

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Update

Michael R. Cohen, RPh, MS, ScD (hon.), DPS (hon), FASHP
President, ISMP
mcohen@ismp.org

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Recently reported medication errors and other announcements

Michael R. Cohen, RPh, MS, ScD (hon.), DPS (hon), FASHP
President, ISMP
mcohen@ismp.org

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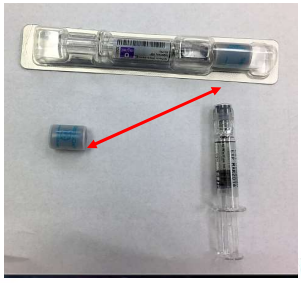
MRI and Simplist prefill syringe with StabilOx cannister



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MRI and Simplist prefilled syringe with StabilOx cannister

- Unusual incident involving an unopened **DILAUDID** (**HYDRO**morphone) prefilled syringe (**SIMPLIST**, Fresenius Kabi).
- Brought into room housing a magnetic resonance imaging (MRI) scanner.
- Simplist package contains a **STABILOX** canister that holds iron oxide, which is ferromagnetic.
- Objects that are ferromagnetic and near scanner room become magnetized and can act as a projectile.
- No one harmed but the enclosed glass Dilaudid syringe shattered.
- Both Dilaudid and morphine syringes in Simplist packaging have this StabilOx canister.

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MRI zones

- MRI facilities restrict access to the scanner by establishing four nearby safety zones (http://mriquestions.com/acr-safety-zones.html).
- Zone 1 allows unsupervised access to the public, such as the hallway outside the MRI suite.
- Zone 2 is public waiting area. Patients and visitors prescreened via questionnaire and interview. Metal objects identified and prevented from passing to Zone 3.
- Zone 3 restricted to approved MR personnel, patients and visitors. Serves as final checkpoint to prevent ferromagnetic materials from entering the scanner room. Has ferromagnetic detectors in doorway. Allows access to zone 4 through normally locked single portal.
- Zone 4 is the scanner room.

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MRI and Simplist prefilled syringe with StabilOx cannister

- ISMP has not tested the scenario but has informed ECRI Institute
- It's the iron oxide in the StabilOx that is ferromagnetic. Nothing about syringe or its components is ferromagnetic.
- Inform MRI technicians regarding this issue so items are prevented from entering zone 3 or 4
- For inpatients, medication doses should be administered prior to the patient being transported to the MRI suite

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Brideon (sugammadex) vial label issue

- Brideon (sugammadex) labels say 100 mg/mL even though a 2 mL or 5 mL vial.
- The 100 mg/mL is a peel off label for the syringe but may be seen as the vial label until it is peeled off.

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Brideon (sugammadex) vial label use

- When peel-off is removed, vial is properly labeled as 200 mg/2 mL or 500 mg/5 mL

Figure 2 - Brideon label with peel off label removed, exposing 200 mg/2 mL strength.

- Anesthesiologist drew up 1.5 vials from 2 mL vials (3 mL total) but saw "100 mg" and thought he was giving only 150 mg when he actually gave 300 mg

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Look-alike outsourced syringes made by Nephron

- Incident reported to ISMP where anesthesia personnel gave a hypotensive patient succinylcholine instead of the phenylephrine.
- Nephron notified by ISMP; said they have revised. On day of webinar, ISMP received photos of the new labeling and they appear on next slide.

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Revised phenylephrine and succinylcholine syringe labeling

- The above revised labels address the previous look-alike situation and are now in use.

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Also …

- Additional announcements from ISMP
- Topical epinephrine vs parenteral (ratio expression too)
- Very pleased with use of the listserv
- Plead again for med safety incidents to be reported to us. Particularly things that would BE educational and useful for your MSOS colleagues. We'll consider for the newsletter and follow up with FDA and product vendors where appropriate.
- We are always looking for speakers and topics for the member briefings. All about helping one another by sharing information. If you have implemented a "high leverage" solution to a specific medication safety issue that you would like to share with the MSOS members on an upcoming Briefings webinar, please contact E. Robert Feroli at bob@jhmi.edu. Be sure to include a brief description of the 10-minute presentation topic.
- Mention that our new ISMP website will be launched very soon.
- Will Mention Darryl retiring. Bob will continue and Chris Michalek will take over for Darryl.

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Questions

- A copy of today's slides will be posted on our website: www.medsafetyofficer.org
- Don't forget to mark you calendar:
  - Our next MSOS Briefings webinar is on Thursday, April 26, 2018, 1-2pm EDT.

Supported by educational grants from Novartis and Fresenius Kabi

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