Are You Connected? Get Ready to Reduce Alarms, Avoid Alarm Fatigue and Improve Patient Safety

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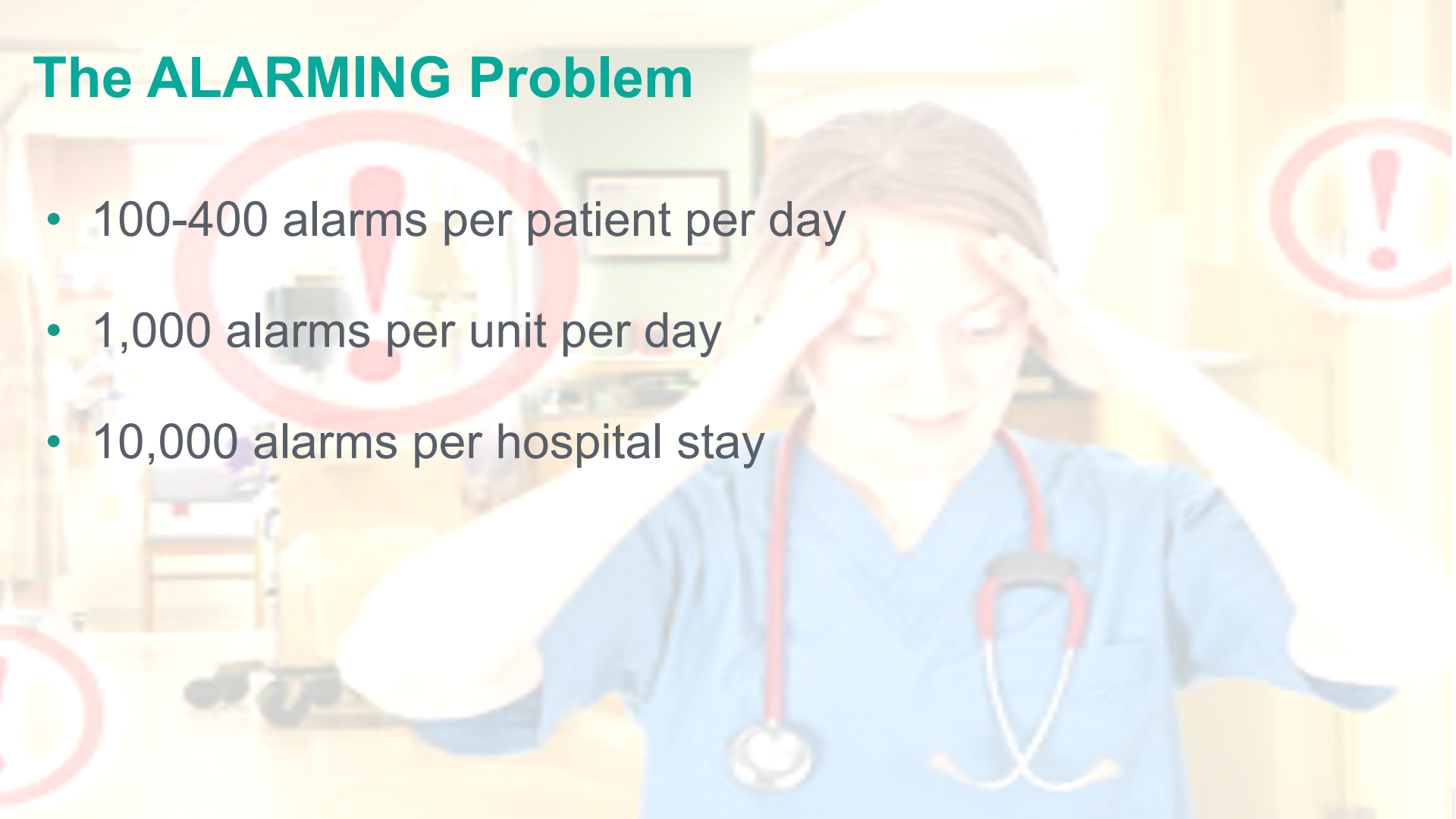
The ALARMING Problem

- 100-400 alarms per patient per day
- 1,000 alarms per unit per day
- 10,000 alarms per hospital stay



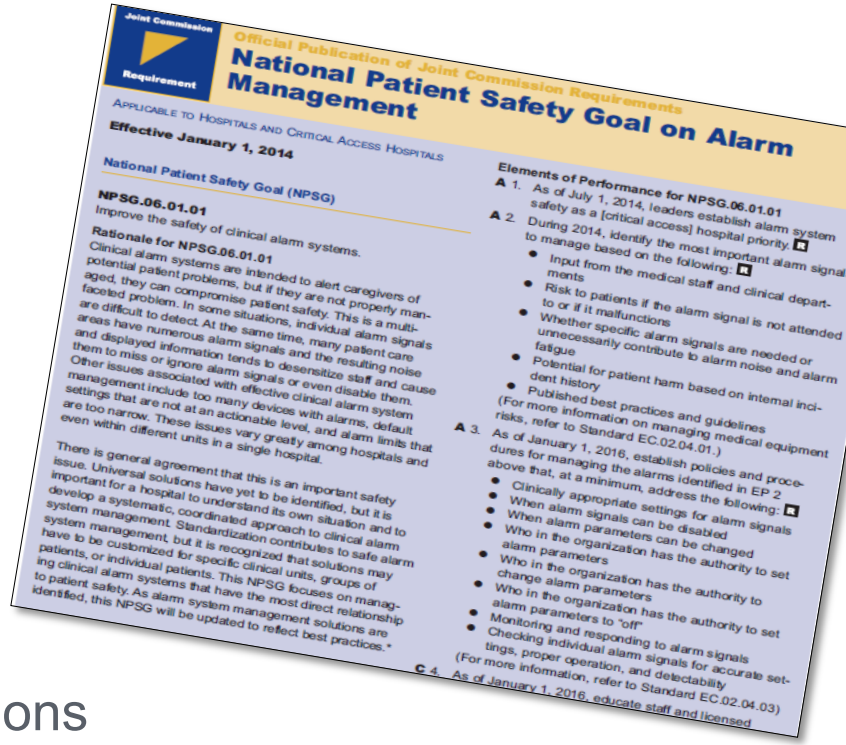
The Joint Commission NPSG – Alarm Management

Phase 1 Jan 2014

- Establish alarms as priority

Phase 2 Jan 2016

- Implement policies/procedures
- Clinically appropriate settings
- Monitoring and response expectations



Joint Commission Requirement

Official Publication of Joint Commission Requirements

National Patient Safety Goal on Alarm Management

APPLICABLE TO HOSPITALS AND CRITICAL ACCESS HOSPITALS

Effective January 1, 2014

National Patient Safety Goal (NPSG)

NPSG.06.01.01
Improve the safety of clinical alarm systems.

Rationale for NPSG.06.01.01
Clinical alarm systems are intended to alert caregivers of potential patient problems, but if they are not properly managed, they can compromise patient safety. This is a multifaceted problem. In some situations, individual alarm signals are difficult to detect. At the same time, many patient care areas have numerous alarm signals and the resulting noise and displayed information tends to desensitize staff and cause them to miss or ignore alarm signals or even disable them. Other issues associated with effective clinical alarm system management include too many devices with alarms, default settings that are not at an actionable level, and alarm limits that are too narrow. These issues vary greatly among hospitals and even within different units in a single hospital.

There is general agreement that this is an important safety issue. Universal solutions have yet to be identified, but it is important for a hospital to understand its own situation and to develop a systematic, coordinated approach to clinical alarm system management. Standardization contributes to safe alarm system management, but it is recognized that solutions may have to be customized for specific clinical units, groups of patients, or individual patients. This NPSG focuses on managing clinical alarm systems that have the most direct relationship to patient safety. As alarm system management solutions are identified, this NPSG will be updated to reflect best practices.*

Elements of Performance for NPSG.06.01.01

A 1. As of July 1, 2014, leaders establish alarm system safety as a [critical access] hospital priority.

A 2. During 2014, identify the most important alarm signals to manage based on the following:
- Input from the medical staff and clinical departments
- Risk to patients if the alarm signal is not attended to or if it malfunctions
- Whether specific alarm signals are needed or unnecessarily contribute to alarm noise and alarm fatigue
- Potential for patient harm based on internal incident history
- Published best practices and guidelines

(For more information on managing medical equipment risks, refer to Standard EC.02.04.01.)

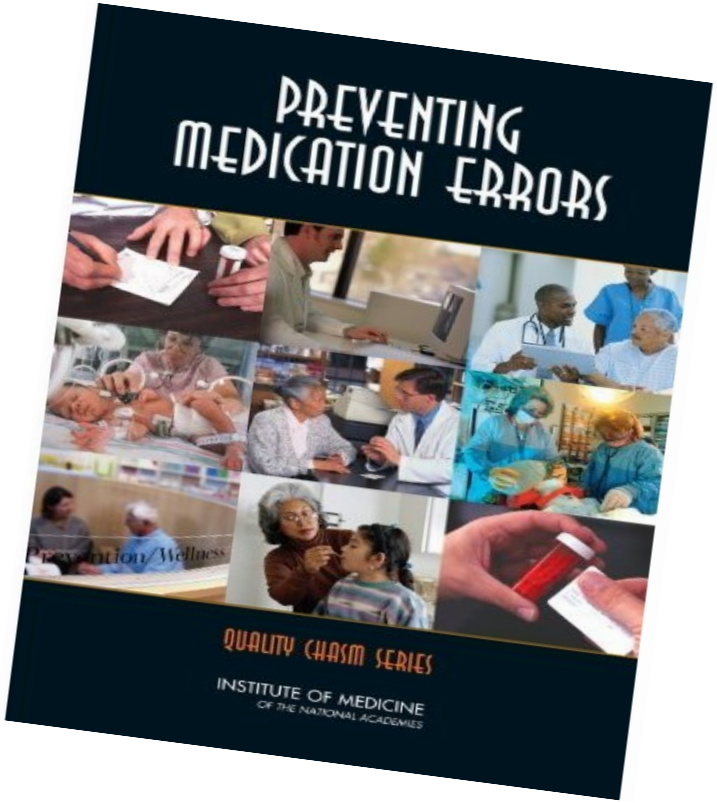
A 3. As of January 1, 2016, establish policies and procedures for managing the alarms identified in EP 2 above that, at a minimum, address the following:
- Clinically appropriate settings for alarm signals
- When alarm signals can be disabled
- When alarm parameters can be changed
- Who in the organization has the authority to set alarm parameters
- Who in the organization has the authority to change alarm parameters
- Who in the organization has the authority to set alarm parameters to "off"
- Monitoring and responding to alarm signals
- Checking individual alarm signals for accurate settings, proper operation, and detectability

(For more information, refer to Standard EC.02.04.03)

C 4. As of January 1, 2016, educate staff and licensed

Institute of Medicine Report

- 1.5 million preventable medication ADEs per year
- Parenteral medication errors **3x** more likely to cause death



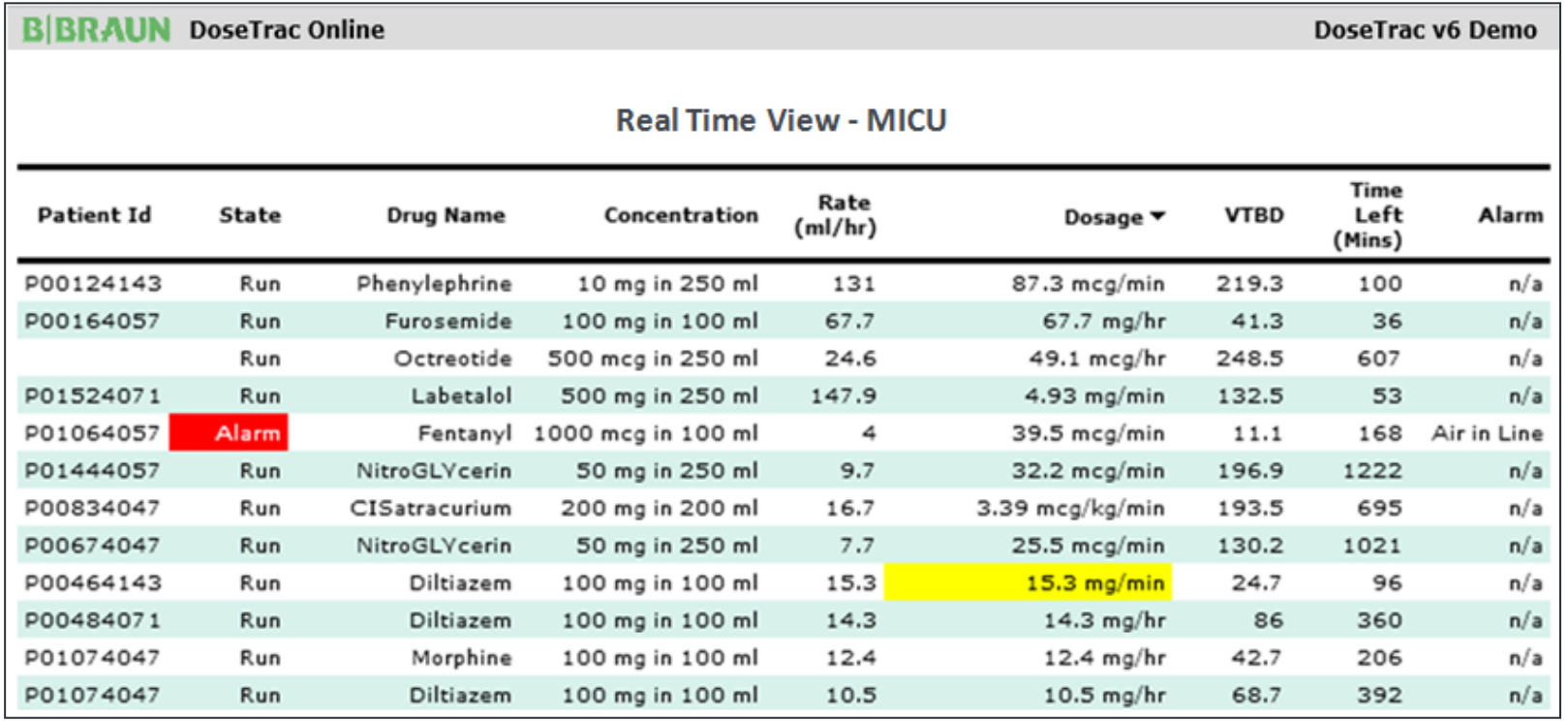
How can smart pumps with real-time view and reporting help?

- Reduce pumps alerts & associated alert fatigue
- Improve compliance with drug library use
- Address practice issues
- Improve patient safety

Process

- Multidisciplinary team to standardize formulary and COPE (pharmacy, LIPs, nursing, administrators)
- Single, uniform drug library across 4 hospitals (2000 beds)
- Implemented wireless B.Braun smart pumps with DoseTrac® Real Time View and Reporting

DoseTrac® Real Time View



B|BRAUN DoseTrac Online — DoseTrac v6 Demo

Real Time View - MICU

Patient Id	State	Drug Name	Concentration	Rate (ml/hr)	Dosage	VTBD	Time Left (Mins)	Alarm
P00124143	Run	Phenylephrine	10 mg in 250 ml	131	87.3 mcg/min	219.3	100	n/a
P00164057	Run	Furosemide	100 mg in 100 ml	67.7	67.7 mg/hr	41.3	36	n/a
	Run	Octreotide	500 mcg in 250 ml	24.6	49.1 mcg/hr	248.5	607	n/a
P01524071	Run	Labetalol	500 mg in 250 ml	147.9	4.93 mg/min	132.5	53	n/a
P01064057	Alarm	Fentanyl	1000 mcg in 100 ml	4	39.5 mcg/min	11.1	168	Air in Line
P01444057	Run	NitroGLYcerin	50 mg in 250 ml	9.7	32.2 mcg/min	196.9	1222	n/a
P00834047	Run	CISatracurium	200 mg in 200 ml	16.7	3.39 mcg/kg/min	193.5	695	n/a
P00674047	Run	NitroGLYcerin	50 mg in 250 ml	7.7	25.5 mcg/min	130.2	1021	n/a
P00464143	Run	Diltiazem	100 mg in 100 ml	15.3	15.3 mg/min	24.7	96	n/a
P00484071	Run	Diltiazem	100 mg in 100 ml	14.3	14.3 mg/hr	86	360	n/a
P01074047	Run	Morphine	100 mg in 100 ml	12.4	12.4 mg/hr	42.7	206	n/a
P01074047	Run	Diltiazem	100 mg in 100 ml	10.5	10.5 mg/hr	68.7	392	n/a

Monitor drug library compliance, alarms & dosing alerts

Achieving 100% Compliance

- Unit based audits
- Match order in eMAR to pump
- “Triple Crown”

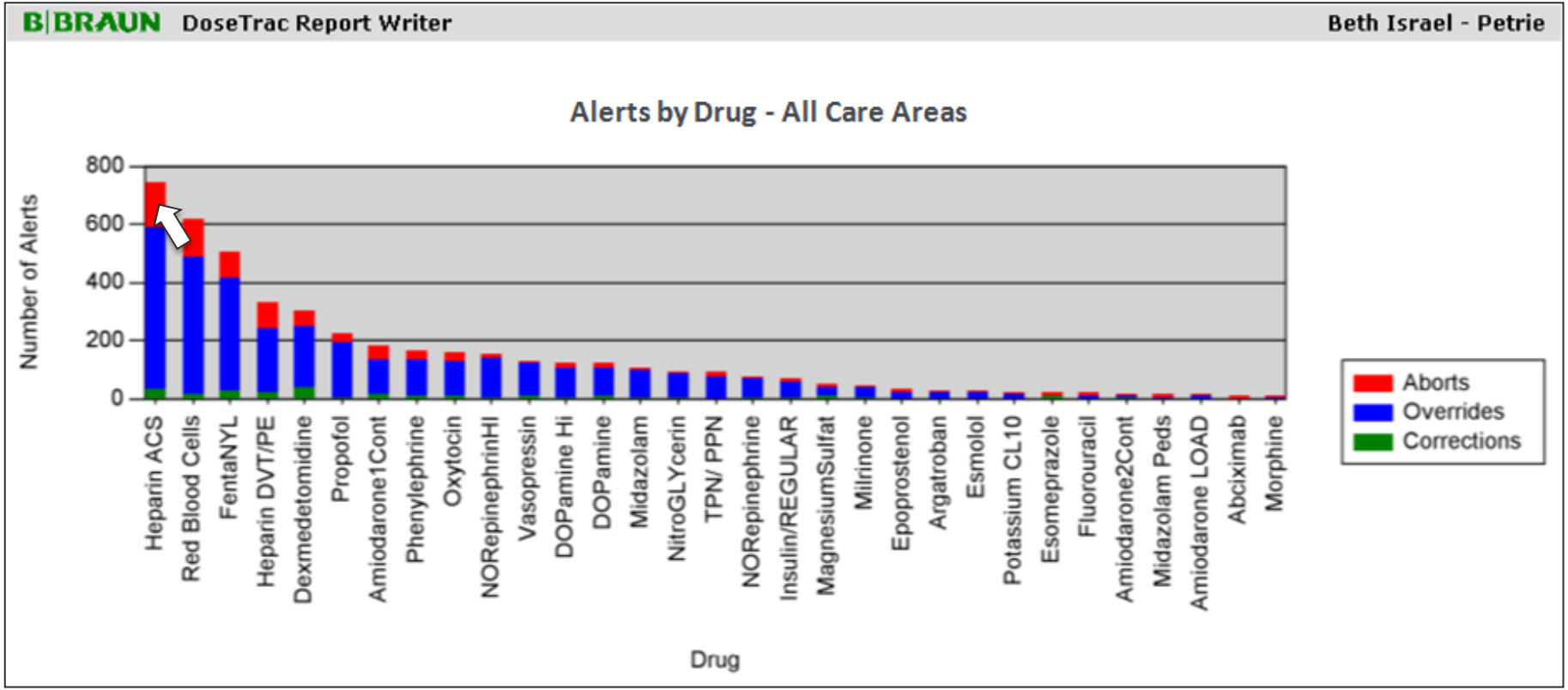
CPOE

Formulary Pumps

Retrospective Reporting

- Weekly emails identifying top alerts by drug (overrides, corrections, aborts)
- Monthly reports on drug library compliance
- 6 month analysis by our vendor

DoseTrac ® Alert Analysis



DoseTrac ® Alert Analysis

B|BRAUN DoseTrac Report Writer — Beth Israel - Petrie

Alert Detail – Heparin ACS

Timestamp ▲	Pump S/N	Patient Id Room - Bed	Care Area Location	Mode	Drug Name	Concentration	Rate	Dosage, Rate, or Volume Attempted
04/15/14 21:23:00	E47414		ICU	DoseGrd	Heparin ACS	25000.0 units in 250 ml	17.6	1760.0 units/hr
04/16/14 03:54:09	E47414		ICU	DoseGrd	Heparin ACS	25000.0 units in 250 ml	18.5	1850.0 units/hr
04/16/14 03:54:26	E47414		ICU	DoseGrd	Heparin ACS	25000.0 units in 250 ml	18.5	1850.0 units/hr
04/16/14 04:11:40	E47393		ICU	DoseGrd	Heparin ACS	25000.0 units in 250 ml	18.5	1850.0 units/hr
04/16/14 08:55:20	E47393		ICU	DoseGrd	Heparin ACS	25000.0 units in 250 ml	18.5	1850.0 units/hr
04/16/14 10:29	E47393		ICU	DoseGrd	Heparin ACS	25000.0 units in 250 ml	20	2000.0 units/hr
04/16/14 15:03:56	E47393		ICU	DoseGrd	Heparin ACS	25000.0 units in 250 ml	20	2000.0 units/hr
05/04/14 15:51:31	E47410		Med Surg	DoseGrd	Heparin ACS	25000.0 units in 250 ml	90	9000.0 units/hr
05/12/14 02:22:28	E47630		ICU	DoseGrd	Heparin ACS	25000.0 units in 250 ml	13.7	1370.0 units/hr

DoseTrac ® Alert Analysis

B|BRAUN DoseTrac Report Writer — Beth Israel - Petrie

Programming Sequence Surrounding Alert

Care Area	Mode	Drug Name	Concentration	Rate	Dosage	Min Limits		Max Limits		Volume Infused
						Hard	Soft	Soft	Hard	
	PowerON									0
ICU	DoseGuard	Heparin ACS	25000 units in 250 ml	21	2100 units/hr	0	0	1000	2000	0
	Basic			21						89

Heparin ACS Aborts

Practice issue: exiting library

Heparin ACS Aborts – Corrective Action

- Adjusted limits according to practice & anticoagulation guidelines
- Reinforced use of heparin DVT/PE entry
- Follow-up analysis:
  - No incidence of exiting library
  - Heparin ACS alerts reduced 88%

Fentanyl Overrides

Practice issue: bolus dosing by increasing rate

Propofol Overrides

Practice issue: bolus dosing by increasing rate

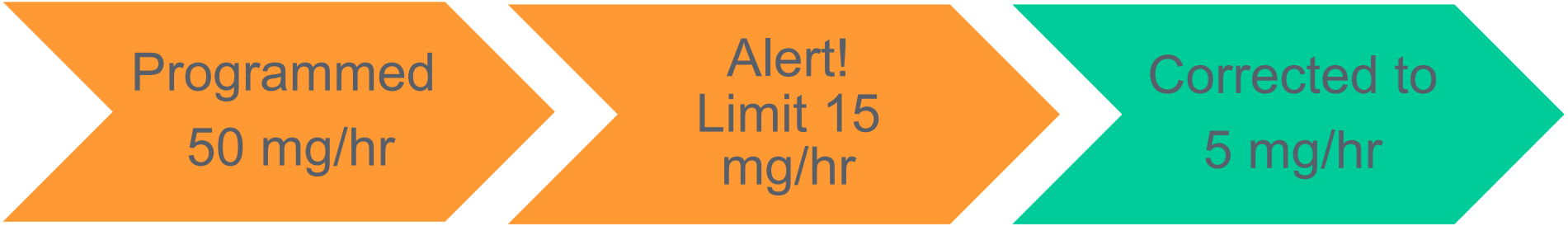
Fentanyl, Propofol, Precedex – Corrective Action

- Added hard max limit
- Reinforced bolus dosing policy/use of pump bolus feature when indicated
- Follow-up analysis:
  - No incidence of bolus dosing by increasing rate
  - Reduced Fentanyl alerts 88%, Propofol 63%, Precedex 82%

Good Catches - Fentanyl

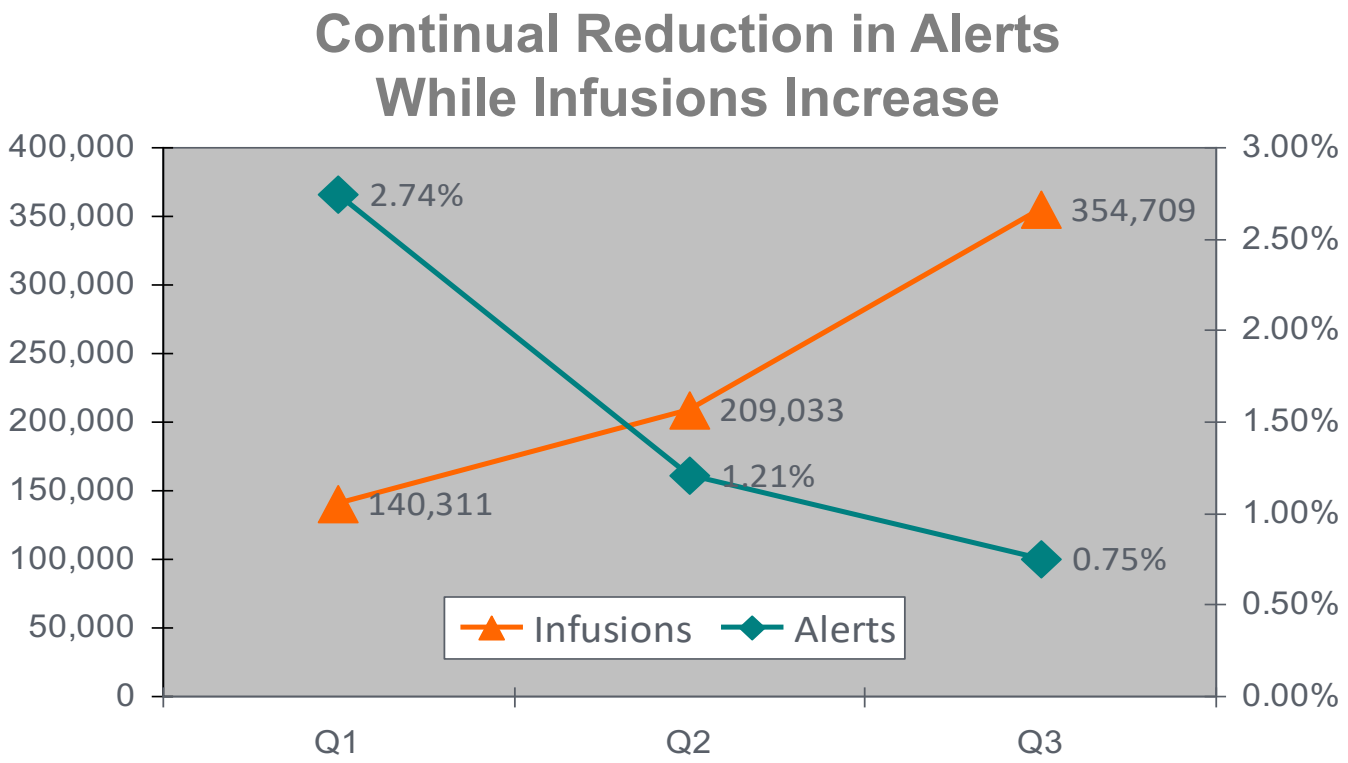
Prevented 2-fold medication error!

Good Catches - Nicardipine



Prevented 10-fold medication error!

Patient Safety Impact



Patient Safety Impact

- 100% Compliance in ICU
- Low incidence of programming error
- For every 10,000 infusions, only 5 dose corrections!

CALCULATIONS FOR IV FLOW RATE:

(3 Formula)

SET I.

$$\frac{\text{amount of fluid}}{\text{\# of hours Administered}} = \textbf{ml/Hr}$$

$$\frac{\text{ml/Hr}}{60 \text{ mins}} = \textbf{ml/min}$$

ml/min X DF = **Drops/Hr**

SET II.

$$\frac{\text{Amount of fluid}}{\text{Hours to consume}} = \textbf{ml/Hr}$$

$$\frac{\text{ml/Hr} \times \text{DF}}{60 \text{ mins}} = \textbf{drops/min}$$

Set III.

Legend:

TIV = Total Intravenous fluid
TTI = Total Time Infused
DF = Drop Factor
cc = ml

Infusion Sets: (Drop Factors)

Macro set or Adult Set – **15 gtts/ml**
Micro set & Soluset - **60 gtts/ml**
Blood Transfusion set – **15 gtts/ml**

$$\frac{\textbf{TIV} \times \textbf{DF}}{\textbf{TTI} \times \textbf{60mins}}$$

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