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# Intravenous medication errors related to smart infusion pumps: multi-hospital observational study


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Advancing Safety in Medical Technology

# Agenda

- Background
- Project overview
- Methods
- Interventions
- Results
- Barriers and solutions of Implementing intervention plans
- Next steps

# Background

- Intravenous(IV) medication errors
  - Frequent, dangerous, harmful to patients
- Association for the Advancement of Medical Instrumentation(AAMI)/FDA Infusion Device Summit in 2010
  - 56,000 reported incidents related to IV infusions, and the FDA has increased scrutiny of infusion safety because of these reports
- Expectations for smart IV pumps
  - Computerized patient infusion devices that include features for administration error prevention and data collection

# Background

## Previous Study 1

- Evaluation of smart pumps by Rothschild et al*[1]
  - "Smart pumps did not reduce the rate of serious medication errors. The issues around usages of smart pumps including alert overrides and violation of safety procedures prevented realization of the potential medication safety benefits"
  - Lesson Learned
    - Culture of competence and safety among staff is needed
    - Reviewing current practice issues, common errors, and assessing the organization's readiness for adoption are key
    - Institutions must maintain continuous and ongoing relationships and a dialogue with vendors as the technology upgrades occur

* Rothschild J, Keohane C, Cook E, Orav E, Burdick E. A controlled trial of smart infusion pumps to improve medication safety in critically ill patients. Crit Care Med. 2005;33(3):533Y540.

# Background

## Previous Study 2

- Study by Husch, et al*[2] assessed the frequency of intravenous medication errors and impact of potential smart infusion pump technology on the frequency of intravenous medication errors in Northwestern Memorial Hospital
  - Observed errors associated with orders, documentation, labeling and patient identification
  - This study was conducted in one medical facility with one vendor, making the generalizability of these results uncertain

* Husch M, Sullivan C, Rooney D, Barnard C, Fotis M, Clarke J, Noskin G. Insights from the sharp end of intravenous medication errors: implications for infusion pump technology. Qual Saf Health Care. 2005 Apr;14(2):80-6.

# Overview of Study

- Duration: April 2012-March 2015
- Title: National Study of Intravenous Medication Errors, Understanding How to Improve Intravenous Safety with Smart Pumps
- Nationwide multi-institutional study (10 hospitals in the U.S)

# Project Goal

- To conduct a national, 10-site study using the general methodology described by Husch et al*, which allows a rapid assessment of the frequency and types of medication errors
- To identify the key issues related to the use of smart pumps
- To develop broadly applicable strategies that will improve the prevention of intravenous errors
- To improve safety related to the use of smart pumps in hospitalized patients

*Husch M, Sullivan C, Rooney D, Barnard C, Fotis M, Clarke J, Noskin G. Insights from the sharp end of intravenous medication errors: implications for infusion pump technology. Qual Saf Health Care. 2005 Apr;14(2):80-6.

# Research Questions

1. What are the frequency and types of IV medication errors?

2. How much variability is there by frequency and type among settings?

3. After review of the initial data, what strategies appear to have the greatest potential for reducing IV medication error frequency?

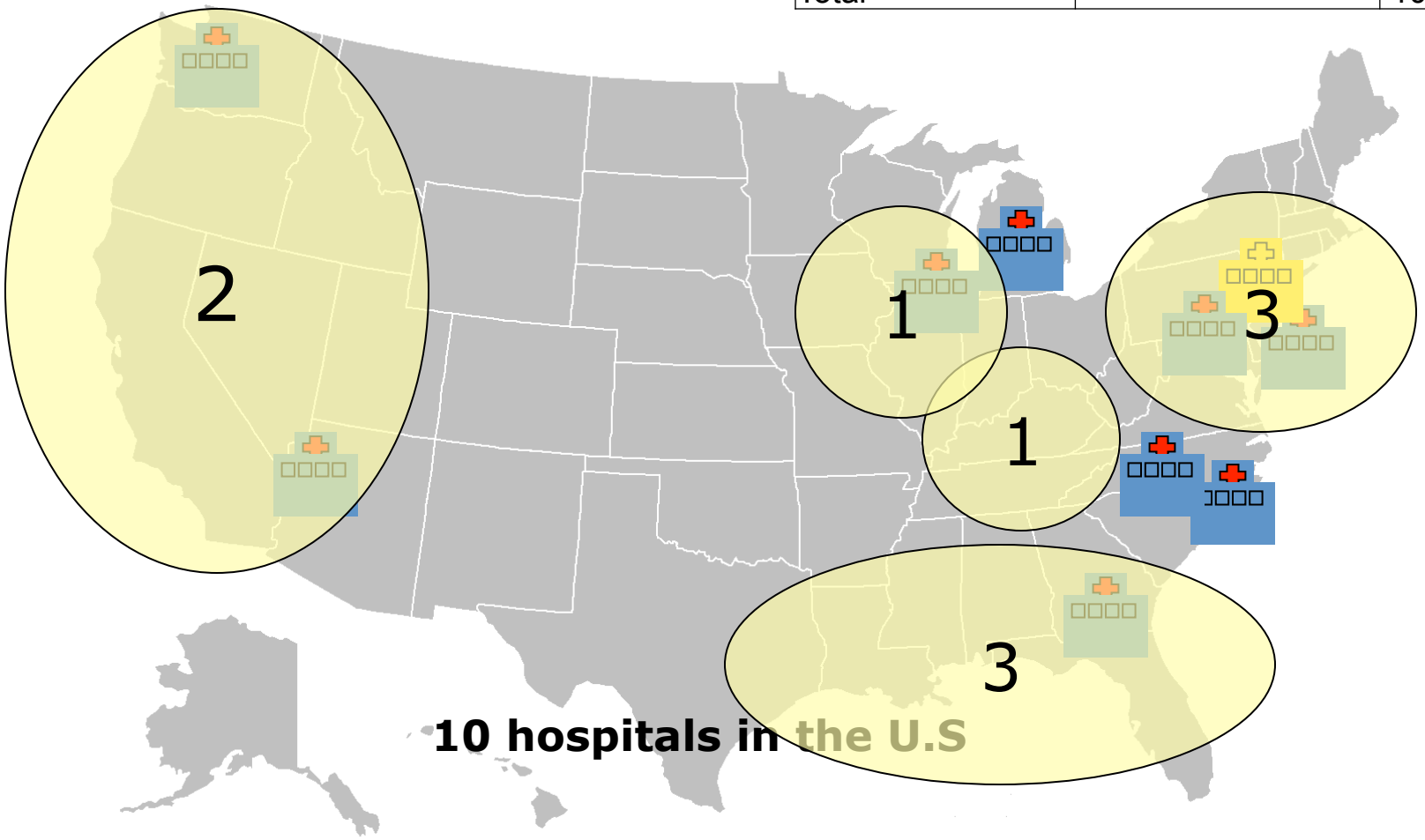
4. How effective is an intervention including a bundle of these strategies at multiple sites?

# Participating Sites

| | Hospital Name/Location | Smart pump Vendor | # Beds | Magnet Designation | Nursing Union | CPOE | eMAR |
|---|---|---|---|---|---|---|---|
| **Community Hospital** | | | | | | | |
| 1 | **St Joseph/Candler Hospital, Savannah, GA** | Carefusion | 331 | Yes | No | Phase 1 No, Phase 2: yes(implemented since Feb 2012) | Yes |
| 2 | **Winchester Medical Center, Winchester, VA** | Bbran | 411 | Yes | No | Yes | Yes |
| 3 | **Central DuPage Hospital, Winfield, IL** | Carefusion | 350 | Yes | No | Yes | Yes |
| **Academic Medical Center(AMC)** | | | | | | | |
| 4 | **Vanderbilt University Medical Center, Nashville, TN** | Carefusion | 1000 | Yes | No | Yes | Yes |
| 5 | **Brigham and Women's Hospital, Boston, MA** | Carefusion | 793 | No | Yes | Yes | Yes |
| 6 | **Massachusetts General Hospital, Cambridge, MA** | General IV:Sygma PCA/Syringe:Smith medical | 1057 | Yes | No | Yes | Yes |
| 7 | **UC San Diego Health System, San Diego CA** | Carefusion | 511 | Yes | Yes | Yes | Yes |
| 8 | **Johns Hopkins Hospital, Baltimore, MD** | Carefusion | 982 | Yes | No | Yes | Yes |
| 9 | **Maricopa Medical Center, Phoenix, AZ** | Carefusion | 449 | No | No | Yes | Yes |
| 10 | **Western Connecticut Health Network/Danbury Hospital, Danbury, CT** | General IV:Sygma PCA/Syringe: Smith medical | 371 | No | Yes | Yes | Yes |

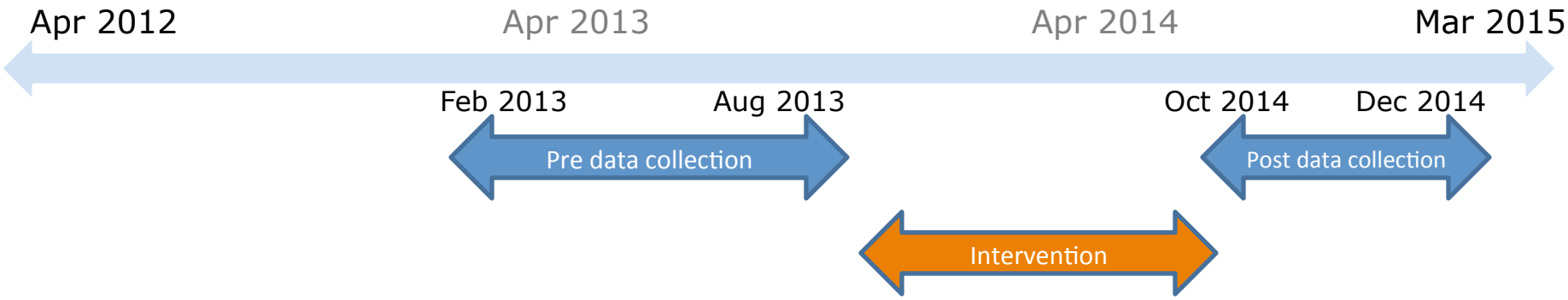
# Demographics

| Hospital Type | Bed size Range | # of sites |
|---|---|---|
| AMC | 371-1057 | 6 |
| Community | 331-411 | 4 |
| Total | | 10 |



# Study Plan

## Timeline




**Year 1**

1. Development of data collection form
2. Observer training
3. Initial measurement of IV medication errors

**Year 2**

1. Observation data analysis
2. Face-to-face-meeting for developing recommendations
3. Interventions to reduce IV medication errors

**Year 3**

1. Second measurement of IV medication errors
2. Data analysis
3. Face-to-face-meeting for developing final recommendations
4. Publication of final report

# Methods

| Study Procedure | |
|---|---|
| Study Design | A prospective point prevalence approach |
| Study Units | 4 units (including medical and surgical wards, medical and surgical ICUs) in 10 hospitals |
| Inclusion Criteria | 1. Large IV (exclude TPN, blood products)<br>2. Syringe<br>3. PCA (exclude PCEA) |
| Types of Errors | 1. Wrong patient<br>2. Wrong IV fluids/medications<br>3. Wrong concentration<br>4. Wrong dose<br>5. Wrong rate<br>6. Delay(between 2-4 hours)<br>7. Omission of IV fluids/meds(after 4 hours)<br>8. Wrong channel/wrong pump setting<br>9. Wrong information on label<br>10. Missing information<br>11. Oversight allergy<br>12. Smart pump/drug dictionary was not used<br>13. Unauthorized medication |

# Development of Data Collection Form

- Develop electronic standardized data collection form
  - REDCap (Research Electronic Data Capture) :
    a secure, web-based application designed to support data capture for research studies
- To classify the severity of each incident/error

National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) index*

(A) Capacity to cause error

(B) Error occurred but did not reach the patient

(C) Error reached the patient but did not cause harm

(D) Error occurred that reached the patient and required monitoring to confirm that it resulted in no harm to the patient and/or required intervention to preclude harm

(E) Error occurred that may have contributed to or resulted in temporary harm to the patient and required intervention

(F) Error occurred that may have contributed to or resulted in temporary harm to the patient and required initial or prolonged hospitalization

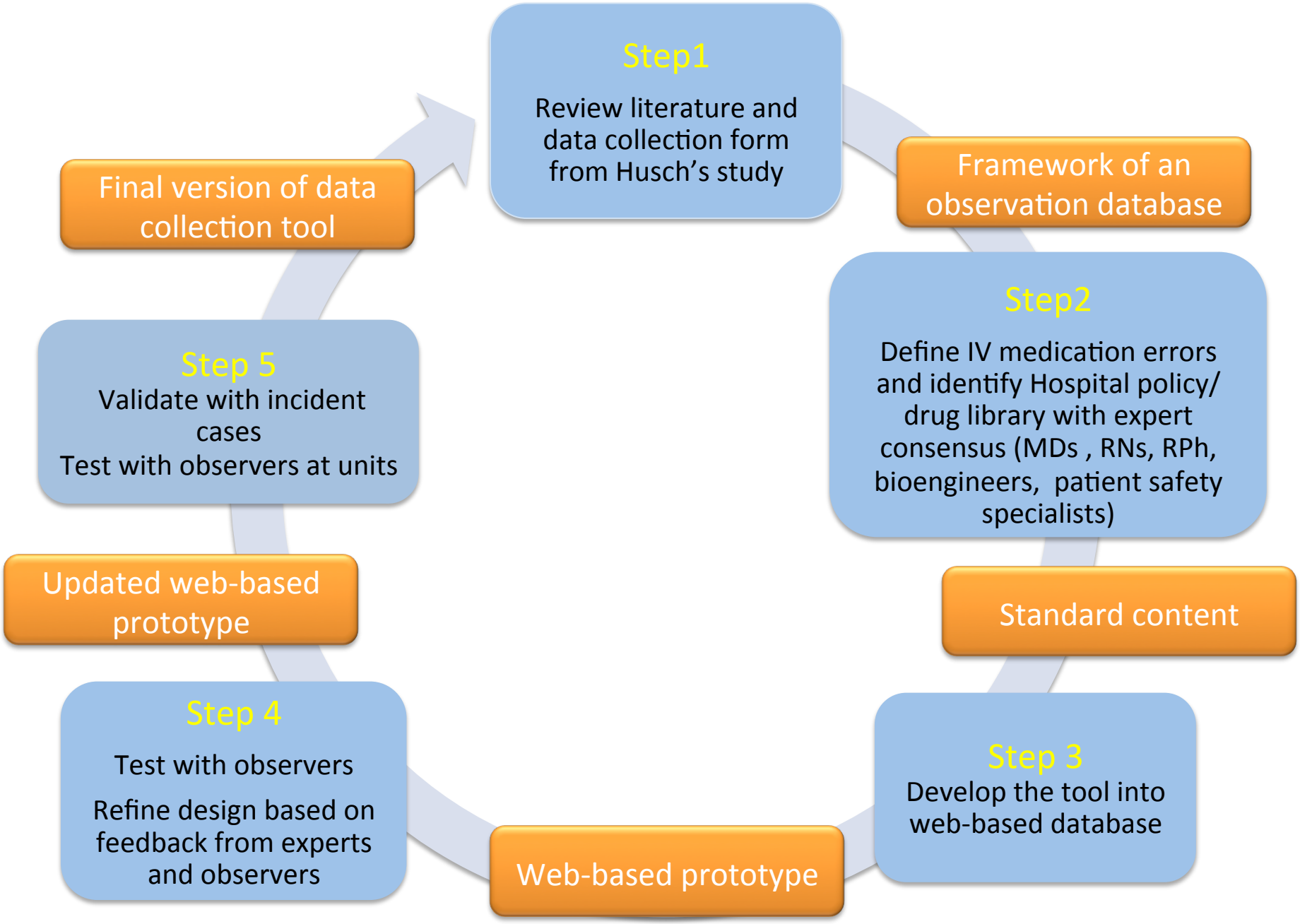
(G) Error occurred that may have contributed to or resulted in permanent patient harm

(H) Error occurred that required intervention necessary to sustain life

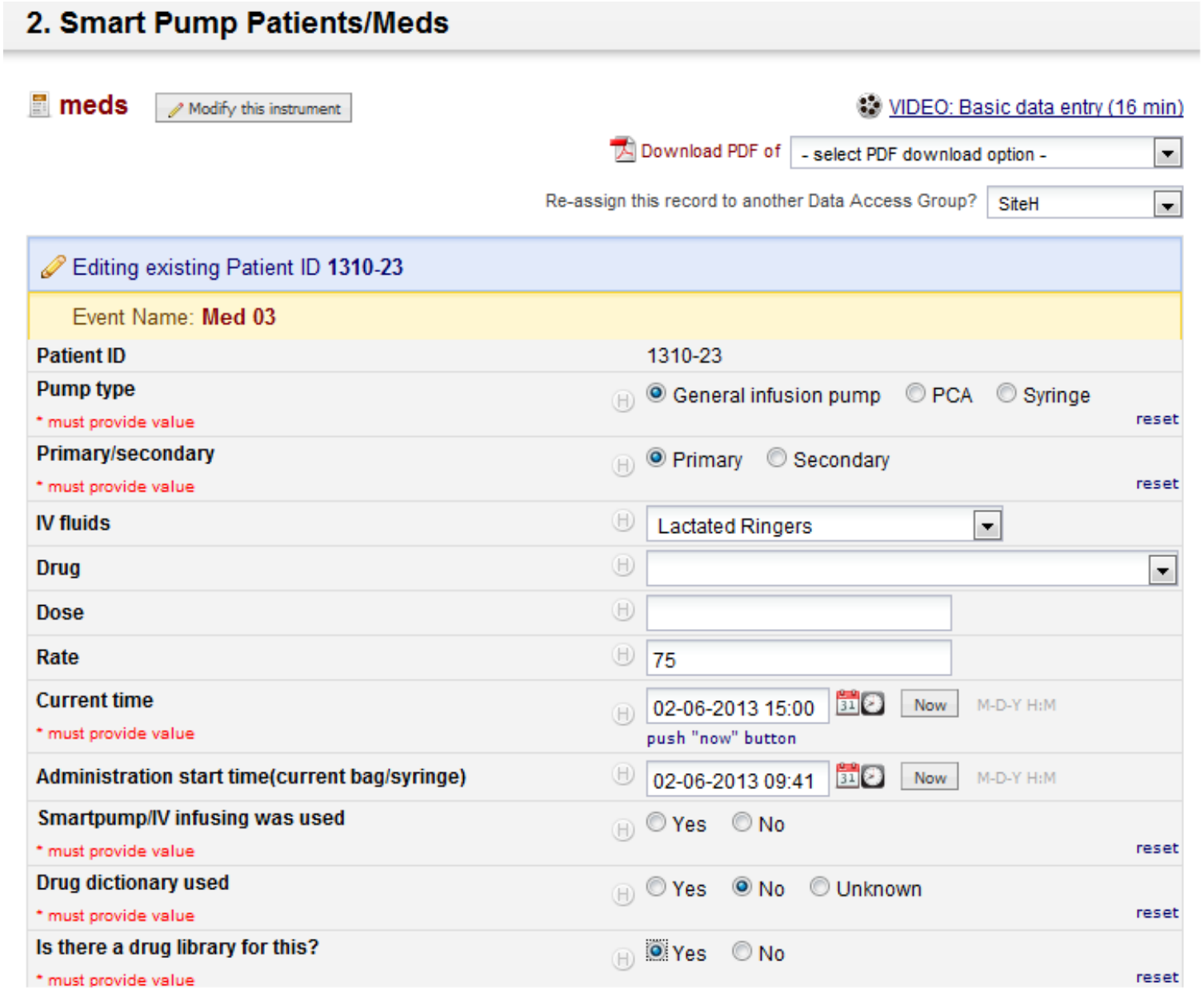
(I) Error occurred that may have contributed to or resulted in the patient's death

*http://www.nccmerp.org/types-medication-errors

# An iterative participatory development process



# Redcap Data Collection Form



## 2. Smart Pump Patients/Meds

**meds** Modify this instrument

VIDEO: Basic data entry (16 min)

Download PDF of - select PDF download option -

Re-assign this record to another Data Access Group? SiteH

Editing existing Patient ID **1310-23**

Event Name: **Med 03**

| | |
|---|---|
| **Patient ID** | 1310-23 |
| **Pump type** * must provide value | General infusion pump / PCA / Syringe — reset |
| **Primary/secondary** * must provide value | Primary / Secondary — reset |
| **IV fluids** | Lactated Ringers |
| **Drug** | |
| **Dose** | |
| **Rate** | 75 |
| **Current time** * must provide value | 02-06-2013 15:00 Now M-D-Y H:M push "now" button |
| **Administration start time(current bag/syringe)** | 02-06-2013 09:41 Now M-D-Y H:M |
| **Smartpump/IV infusing was used** * must provide value | Yes / No — reset |
| **Drug dictionary used** * must provide value | Yes / No / Unknown — reset |
| **Is there a drug library for this?** * must provide value | Yes / No — reset |

# Interventions

## Smart Pump Safety Intervention Bundle

| |
|---|
| **Labeling/Tubing** |
| **A-1: Implement standardized labeling toolkit** |
| Implement Standardized labeling toolkit** that is compliant with the Joint commission standards (large IV, syringes, PCA) |
| **A-2: Implement standardized IV tubing change labels** |
| Implement standardized IV tubing change labels*** |
| **Unauthorized Medications** |
| **B-1: Implement standardized discontinuation policy** |
| Implement standardized discontinuation policy statement related to: discontinuation of medications within X* min of time the order was discontinued (*each site defined) |
| Implement alert related to discontinued medications(time critical medications) |
| Sign off required when medications are discontinued (documentation) |
| **B-2: Implement standardized KVO rates and KVO order sets** |
| Implement standardized policy statement related to KVO rate |
| Implement standardized KVO rates and KVO order sets |
| Example standardized KVO rates: Specified in order: following to the ordered rate, Standard rate (Central or peripheral line):10mL/h, Patients with concern about fluid overload:5mL/hr, PICC(Peripherally inserted central catheter) or Mediport:20ml/hr |
| **B-3: Implement standardized verbal orders practice recommendation** |
| Investigate frequency of verbal order at each site<br>Identify verbal order policy at each site |
| **B-4: Implement medication barcode scanning compliance rate report** |
| Implement monthly scanning compliance rate improvement report with individualized (or unit level) feedback |
| **Smart Pump & Drug Library Use** |
| **C-1: Implement drug library use compliance report with individual feedback** |
| Implement drug library use compliance report (use of basic infusion mode, override data, per medication/solution data) - Unit level, individual level |
| **C-2: Implement standardized drug library list** |
| Update drug library, minimize drug library list (ex. collapse fluids list, use “IV fluids” for KVO solutions, ) or improve search functions |

# Standardized Labeling Toolkit*

*Compliance with The Joint Commission standard

| | Immediate use medications | Non-procedural, Non-Perioperative areas | | Procedural, Perioperative areas( in procedure room) | IV product removed from a medicine cabinets(no medication added on unit) |
|---|---|---|---|---|---|
| **Label information** | A **single medication** immediately administers to that patient **without any break** in the process | Patient care prepared | Pharmacy prepared | Labeling requirements include all medication containers | IV solutions are in this category(check 24hr>expiration time medications) |
| **Medication name** | | √ | √ | √ | |
| **medication strength/concentration** | | √ | √ | √ | |
| **Medication amount(if not apparent from container)** | **No labeling** | √ | √ | √ | |
| **Expiration time(if expires< 24 hours)** | **required** | √ | √ | √ | √ |
| **Expiration date** | | √ | √ | √ | √ |
| **Date prepared(if IV bag)** | | √ | √ | | |
| **Diluents(if IV bag and not apparent from container)** | | √ | √ | √ | |
| **Patient's name** | | | √ | | |
| **Location for medication delivery** | | | √ | | |
| **Directions for use** | | | √ | | |
| **Cautionary/Accessory instructions(if applicable)** | | | √ | | |

# Standardized IV Labels

## Medications Prepared on Units

Medication name_____

Medication concentration_____

Medication amount_____

Date prepared**_____

Expiration date/time*_____

Diluents_____

## Pre-prepared IV solutions

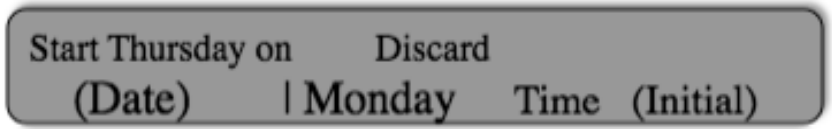
Expiration date_____

Expiration time*_____

* If expires<24 hours ** exclude procedural preoperative areas

# Standardized IV Tubing Change Labels

| | 96 hours tubing change label | 12 or 24 hours tubing change label |
|---|---|---|
| **Start date** | √ | √ |
| **Discard date** | √ (preprinted) | √ |
| **Time** | √ | √ |
| **RN initial** | √ | √ |




I.V. Set Change
Start Date_____ HR___
Discard Date_____ HR___
Initial_____

# Implemented Interventions per Site

***Legend**

| ✔ Implemented | ▼ Already in place/implemented |
|---|---|

| Site | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|
| **Bundle 1: Labeling/Tubing** | | | | | | | | | |
| Implement Standardized labeling toolkit that is compliant with the Joint commission standards | ✔ | ▼ | ▼ | ✔ | ▼ | ✔ | ✔ | ▼ | ✔ |
| Implement standardized IV tubing labels | ▼ | | ✔ | ✔ | ▼ | ✔ | ▼ | ✔ | ✔ |
| **Bundle 2: Unauthorized Medication** | | | | | | | | | |
| Implement standardized discontinuation policy statement related to: discontinuation time | | ✔ | | | | ✔ | ✔ | | ✔ |
| Implement standardized KVO rates and KVO order sets | | ▼ | ▼ | ✔ | ✔ | ✔ | | ✔ | |
| Implement the best verbal order practice recommendation | ▼ | ▼ | ▼ | ▼ | ▼ | ▼ | ▼ | ✔ | ▼ |
| Implement monthly scanning compliance rate improvement report with individualized (unit level) feedback | ▼ | ▼ | | ▼ | ▼ | ▼ | ✔ | ▼ | ▼ |
| **Bundle 3: Smart Pump & Drug Library Use** | | | | | | | | | |
| Implement drug library use compliance report (basic infusion, override data, interview) – Unit level, individual level | ▼ | ✔ | | ▼ | | ✔ | ✔ | ✔ | ✔ |
| Minimization of drug library (ex. Collapse fluids list, use "IV fluids" for KVO solutions, )Improve search functions | ✔ | ▼ | ▼ | ▼ | ▼ | | ▼ | ▼ | ▼ |

# Results

## Counts and Frequency of Errors

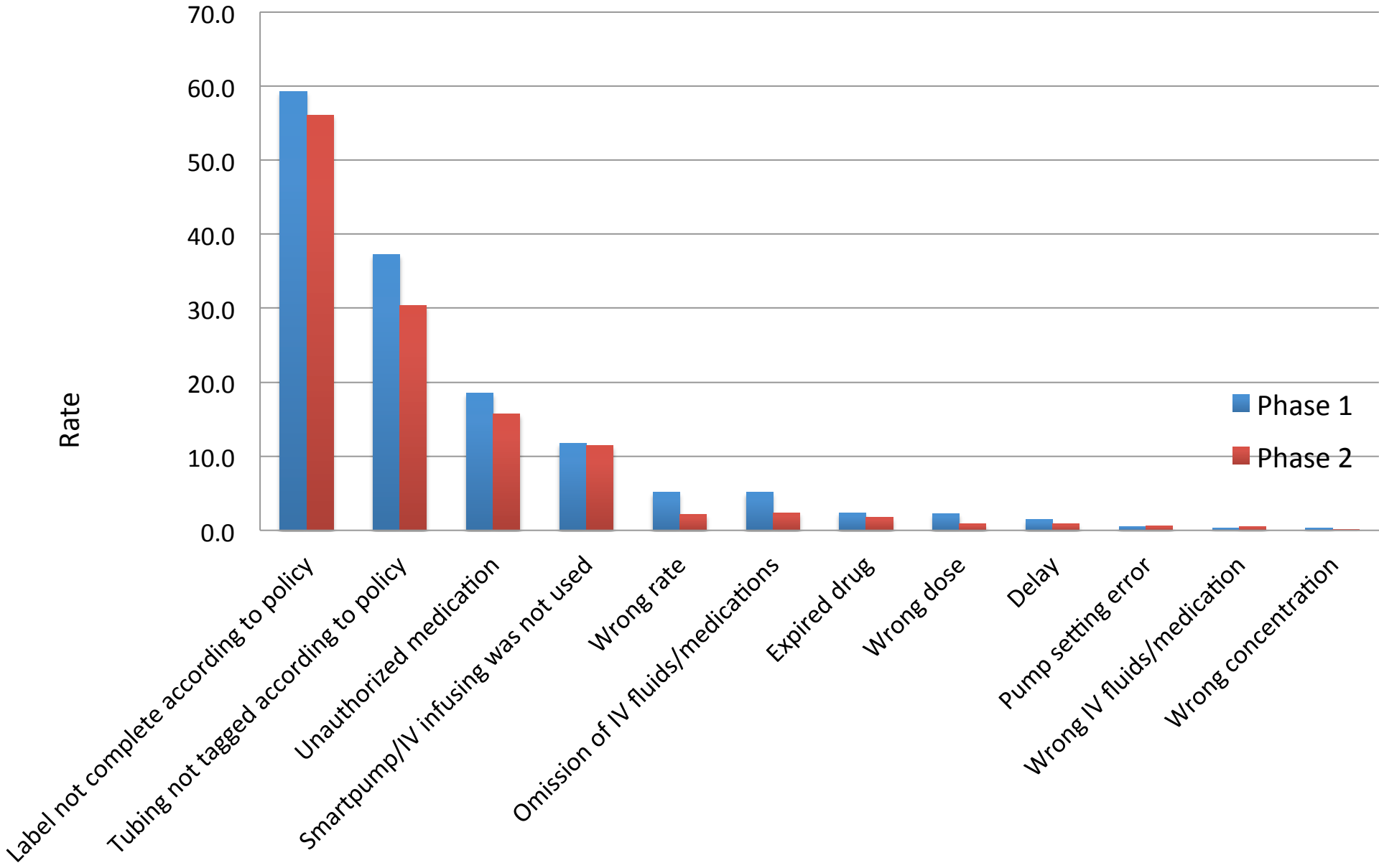
| | Phase 1 | | Phase 2 | | p |
|---|---|---|---|---|---|
| | N | Rate per 100 meds | N | Rate per 100 meds | |
| **Patients** | 418 | | 422 | | |
| **Medications** | 972 | | 1059 | | |
| **Total errors** | 1402 | 144.2 | 1296 | 122.4 | <.0001 |
| **Serious errors** | 359 | 36.9 | 307 | 29.0 | 0.001 |

# Frequency and Type of Errors

| Error categories* | Phase 1 | | Phase 2 | |
|---|---|---|---|---|
| | n | Rate per 100 meds | n | Rate per 100 meds |
| Labeling error | 576 | 59.3 | 594 | 56.1 |
| Tubing error | 362 | 37.2 | 322 | 30.4 |
| Unauthorized medication | 180 | 18.5 | 167 | 15.8 |
| Smart pump wasn't used | 114 | 11.7 | 121 | 11.4 |
| Wrong rate | 50 | 5.1 | 23 | 2.2 |
| Omission | 50 | 5.1 | 25 | 2.4 |
| Expired Drug | 23 | 2.4 | 19 | 1.8 |
| Wrong dose | 22 | 2.3 | 9 | 0.9 |
| Delay | 14 | 1.4 | 9 | 0.9 |
| Pump setting error | 5 | 0.5 | 2 | 0.2 |
| Wrong IV/medication | 3 | 0.3 | 5 | 0.5 |
| Wrong concentration | 3 | 0.3 | 1 | 0.1 |
| **Total** | **1540** | | **1296** | |

*There were no wrong patient and oversight allergy errors

# Comparison of the Distribution of Errors

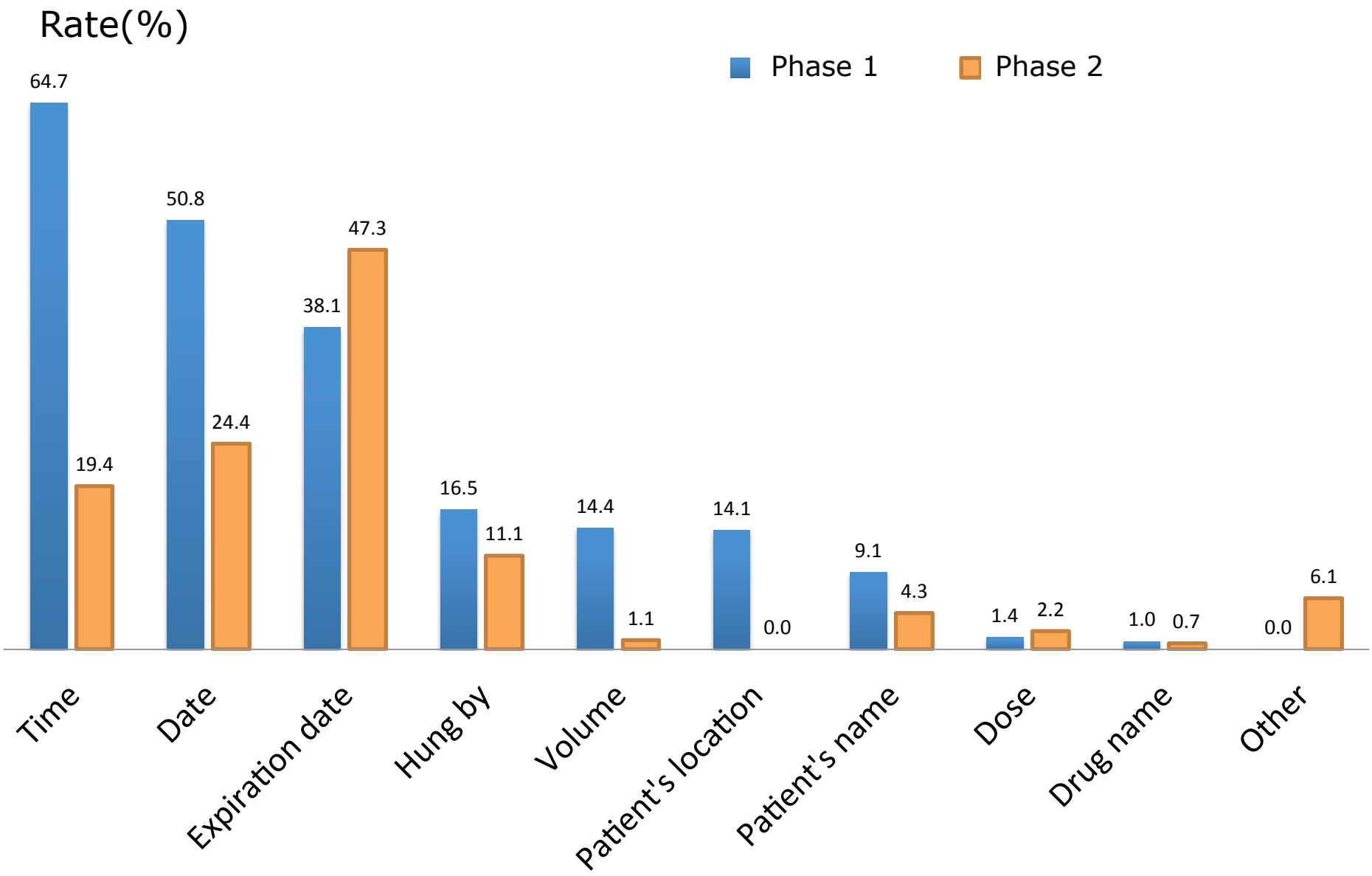


# Potential Harm of Errors

| | Phase 1 | | Phase 2 | | Potential harm (Phase 1\|Phase 2) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | N | Rate | N | Rate | F | | E | | D | | C | |
| Label not complete according to policy | 576 | 59.3 | 594 | 56.1 | | | | | | | 486 | 466 |
| Tubing not tagged according to policy | 362 | 37.2 | 322 | 30.4 | | | | | | | 330 | 284 |
| Unauthorized medication | 180 | 18.5 | 167 | 15.8 | | | | | | 4 | 129 | 121 |
| Smart pump/IV infusing wasn't used | 114 | 11.7 | 121 | 11.4 | | | | 1 | | 2 | 109 | 107 |
| Wrong rate | 50 | 5.1 | 23 | 2.2 | | 1 | | 2 | 2 | 1 | 45 | 18 |
| Omission of IV fluids/medications | 50 | 5.1 | 25 | 2.4 | | | | 1 | 1 | 1 | 29 | 21 |
| Expired drug | 23 | 2.4 | 19 | 1.8 | | | | | 1 | 4 | 19 | 7 |
| Wrong dose | 22 | 2.3 | 9 | 0.8 | | | | 1 | | | 19 | 8 |
| Delay | 14 | 1.4 | 9 | 0.8 | | | 1 | 1 | | | 13 | 8 |
| Wrong IV fluids/medication | 3 | 0.3 | 5 | 0.5 | | | | | 3 | | | 5 |
| Wrong concentration | 3 | 0.3 | 1 | 0.1 | | | | 1 | 3 | | | |

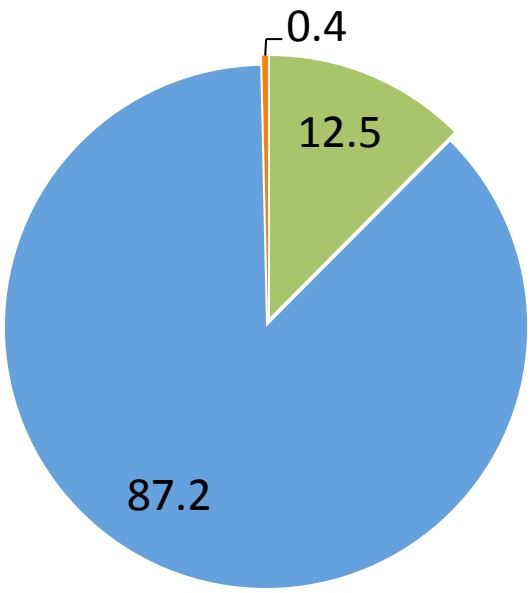
* No wrong patient or allergy errors were found

# Missing Information on IV Labels

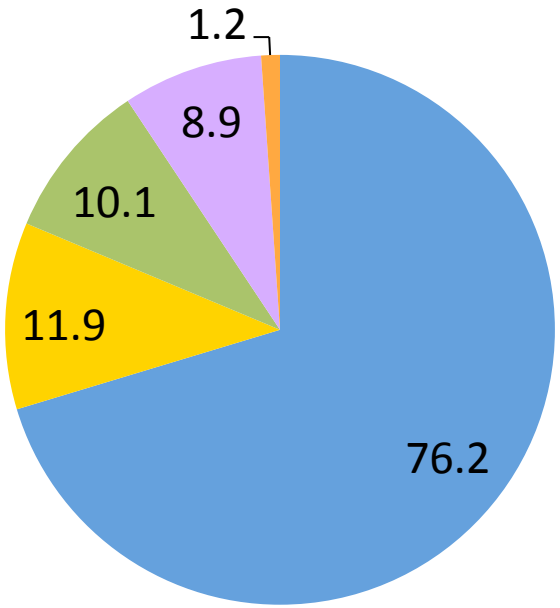


# Unauthorized Medication Error Details

## Phase 1

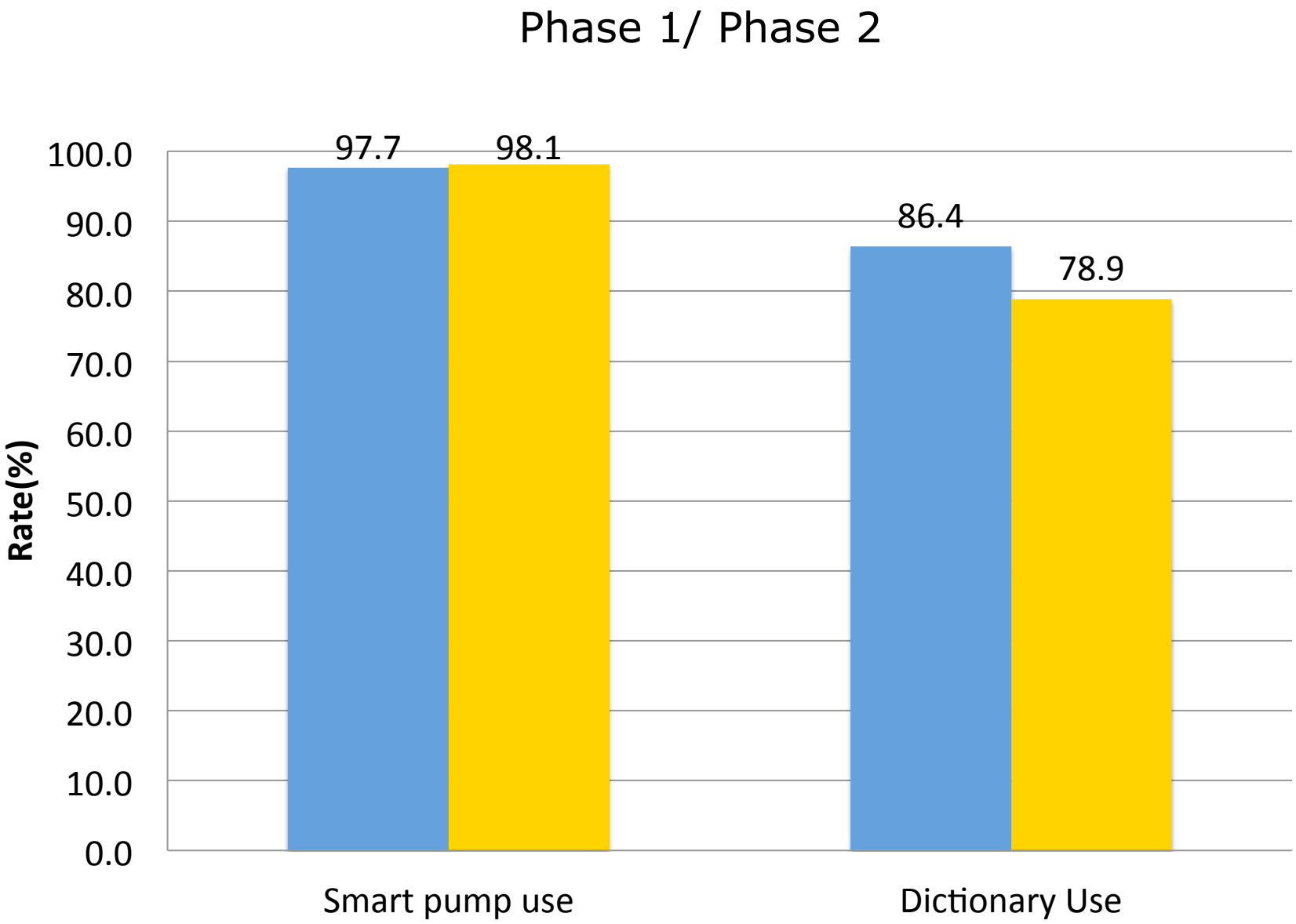



## Phase 2 (%)




- Missing KVO order
- No documentation on eMAR/flow sheet
- Discontinued order
- Unknown
- Verbal order

# Smart Pump Use Compliance Rate



# Example of Unused Drug Library*

| IV fluids | |
|---|---|
| NS | 55 |
| Lactated Ringers | 9 |
| D5W | 4 |
| D5+NS | 3 |
| D5+1/2Normal Saline | 2 |
| D5 1/2NS+KCL20mEq/L | 4 |
| D10W | 1 |
| 1/2NS 100meq Bicarb | 1 |
| 1/2NS | 1 |
| Total | 80 |

| IV medication | |
|---|---|
| DOXOrubicin | 1 |
| Piperacillin | 1 |
| Sodium phosphate | 1 |
| CefTRIAXone | 1 |
| Micafungin (Mycamine) | 1 |
| TOBRAmycin | 1 |
| Sodium phosphate | 1 |
| Cefepime (Maxipime) | 1 |
| Calcium Gluconate | 1 |
| Total | 9 |

*These drug libraries are available at each site

# Evaluation of Labeling Interventions

| | Phase 1 | | Phase 2 | | |
|---|---|---|---|---|---|
| | N | Rate per 100 meds | N | Rate per 100 meds | P value |
| **Labeling intervention plan** | | | | | |
| **All errors** | 900 | 167.1 | 798 | 149.8 | 0.02 |
| **Serious errors** | 209 | 40.2 | 190 | 34.2 | 0.09 |
| label not complete according to policy | 382 | 71.6 | 354 | 65.8 | 0.18 |
| **Tubing intervention plan** | | | | | |
| **All errors** | 647 | 131.9 | 657 | 121.4 | 0.18 |
| **Serious errors** | 162 | 30.8 | 147 | 29.0 | 0.58 |
| Tubing not tagged according to policy | 214 | 43.8 | 209 | 38.5 | 0.11 |
| **Labeling/tubing bundle plan over all** | | | | | |
| **All errors** | 1129 | 145.6 | 1064 | 133.4 | 0.04 |
| **Serious errors** | 249 | 31.2 | 237 | 30.6 | 0.81 |

# Evaluation of Unauthorized Medication Interventions

| | Phase 1 | | Phase 2 | | |
|---|---|---|---|---|---|
| | N | Rate per 100 meds | N | Rate per 100 meds | P value |
| **Unauthorized medication intervention plan** | | | | | |
| **All errors** | 1229 | 158.6 | 1100 | 130.2 | <.0001 |
| **Serious errors** | 335 | 43.7 | 254 | 29.7 | <.0001 |
| Unauthorized medication errors | 121 | 13.3 | 107 | 13.3 | 0.4 |

# Evaluation of Smart Pump Use Interventions

| | Phase 1 | | Phase 2 | | |
|---|---|---|---|---|---|
| | N | Rate per 100 meds | N | Rate per 100 meds | P value |
| **Smart pump use intervention plan** | | | | | |
| **All errors** | 1134 | 168.3 | 1027 | 146.5 | 0.002 |
| **Serious errors** | 294 | 43.5 | 253 | 36.5 | 0.03 |
| Smart pump/IV infusion device not used | 104 | 15.7 | 107 | 15.0 | 0.65 |

# Barriers of Implementing Intervention Plans

| Labeling/Tubing | Barriers | Solutions |
|---|---|---|
| **A-1:** Implement standardized labeling toolkit | • Needed involvement of all stakeholders and their decisions (nursing, pharmacy, hospital leadership, etc)<br><br>•Needed to consider a process in different areas (prepared by pharmacy dept. vs. nurses)<br><br>•Some sites required medical label supplier changes<br><br>• Needed to consider comparability with existing medical cabinet systems | ➢ Work with different department to obtain consensus<br><br>➢ Work with current medical label suppliers to change labels or look for other new suppliers<br><br>➢ Work with medical cabinet system vendors to see if they can auto-print the recommended labels |
| **A-2:** Implement standardized IV tubing change labels | • Some sites could not use any color labels due to other existing specific medication labels<br><br>• Require tubing change label supplier changes | ➢ Use one color or white label<br><br>➢Work with current medical label suppliers to change labels or look for other new suppliers |

# Barriers of Implementing Intervention Plans

| Unauthorized Medications | Barriers | Solutions |
|---|---|---|
| **B-1:** Implement standardized discontinuation policy | • There was no standardized discontinuation recommendations available in literatures or guidelines | ➢Each site discussed with stakeholders and picked up the discontinuation time (ranging from 30 min to 4 hours) |
| **B-2:** Implement standardized KVO rates and KVO order sets | • There were no standardized KVO rates available in literatures or guidelines.<br>• Adding KVO order set required a modification of CPOE systems and took a long time | ➢Compared all sites' recommended KVO order rates(or coming from nursing manual)<br>➢Work with all stakeholders including system vendors |
| **B-3:** Implement standardized verbal orders practice recommendation | • There were no standardized policies or recommendations available even though most sites had their own verbal order practice policy (e.g. limiting verbal order except certain care areas or situations)<br>• Major reason for verbal order was due to missing/ delay of written orders in CPOE. | ➢ Limit verbal orders as a practice<br>➢ Need to improve an ordering process of medications |
| **B-4:** Implement medication barcode scanning compliance rate report | • This intervention was already implemented in most sites and the compliance rate was already high. However, the report data was only unit level, and not individual level. It was hard to use for quality improvement activities for individual level staff education. | ➢ If the compliance rate is low, should include this intervention<br>➢ It was helpful to work with nursing directors/educators to follow up with individual nurses who had a low compliance rate. |

# Barriers to Implementing Intervention Plans

| Smart Pump & Drug Library Use | Barriers | Solutions |
|---|---|---|
| **C-1**: Implement drug library use compliance report with individual feedback | • The smart pump may not have the capacity to generate a report for this. It would help to see current status of using drug library. | ➢ If there is no capacity to generate a report from a pump, may need to investigate the pump data log or conduct observations to do spot check of drug library use |
| **C-2**: Implement standardized drug library list | • The group could not develop a standardized drug library due to different factors(different care setting, medication, available resources)<br>• Some sites prefer to minimize the list to make it simple whereas others prefer to add more medication lists | ➢ Reviewed and updated an individual site's drug library<br>➢ Either minimizing or adding to the drug library helps to avoid manual infusing |

# Intervention Summary

- Interventions were effective for reducing both error rate overall and serious error rate

1. Labeling Intervention
   - Overall error reduction
   - No significant reeducation for labeling/tubing compliance rate

2. Unauthorized medication intervention
   - Significant reduction for both overall and serious errors

3. Drug library intervention
   - Overall and serious error reduction
   - No significant improvement for use of drug library use

# Next Steps

1. Develop additional intervention plans
   - Titration practice standard
   - Overfill practice
2. International site comparison study
   - UK
   - Canada
   - Finland
3. Other areas
   - Pediatrics
   - PCA/PCEA pumps
   - Interoperability smart pumps
4. Publish research papers and disseminate the smart pump intervention recommendation plans

Phase 1 study results: Schnock KO, Dykes PC, Albert J,et al. The frequency of intravenous medication administration errors related to smart infusion pumps: a multihospital observational study. BMJ Qual Saf. 2016 Feb 23.

Thank you!

Any Questions?

# Definition of Error Type

| Error Type | Definition |
|---|---|
| 1. Wrong Dose | The same medication but the dose is different from the prescribed order. |
| 2. Wrong Rate | A different rate is displayed on the pump from that prescribed in the medical record. Also refers to weight based doses calculated incorrectly including using a wrong weight. |
| 3.Wrong Concentration | An amount of a medication in a unit of solution that is different from the prescribed order. |
| 4.Wrong Medication | A different fluid/medication as documented on the IV bag label is being infused compared with the order in the medical record. |
| 5. Delay of Rate or Medication/ Fluid Change | An order to change medication or rate not carried out within 4 hours of the written order per institution policy. |
| 6. Omission of Medication | The medication ordered was not administered to a patient. |
| 7. Unauthorized Medication | Fluids/medications are being administered but no order is present in medical record. This includes failure to document a verbal order. |
| 8. Patient Identification Error | Patient either has no ID band on wrist or information on the ID band is incorrect. |
| 9. Bypassing Smart pump/drug library | IV change label is not tagged per institution policy. |
| 10. Oversight Allergy | Medication is prescribed/administered to a patient with a known allergy to the drug. |
| 11. Smart pump programing/ setting error | Setting programmed into the pump is different from the prescribed order. |
| 12. Wrong information on Label | Applies both to items sent from the pharmacy and floor stocked items per institution policy. |
| 13. Label not complete according to policy | Documented information on the medication label is different from required information per institution policy. |
| 14. Tubing not tagged according to policy | IV change label is not tagged per institution policy. |