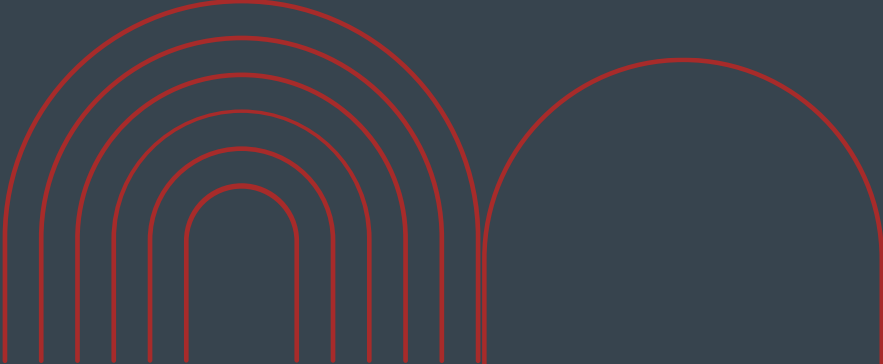




Medication Safety Metrics: Turning Data into Action

Emily Messing, PharmD, BCPS, CPPS
Medication Safety Officer
September 30, 2025



Objectives



Describe medication safety metrics relevant to the hospital setting



Explain how to effectively use technology and medication event reporting systems to collect medication safety metrics

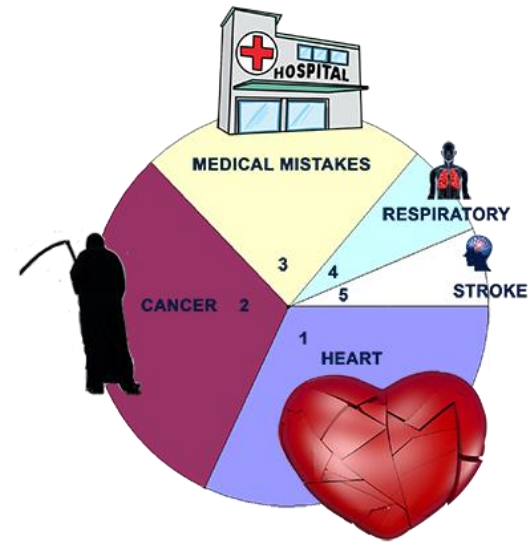


Interpret medication safety data to identify trends and areas for improvement



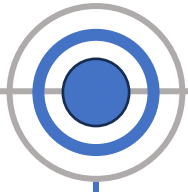
Develop action plans based on medication safety metrics

Background



MEDICAL MISTAKES
3rd LEADING CAUSE OF DEATH IN THE U.S.A.

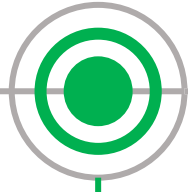
1999



2001

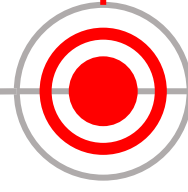


2005

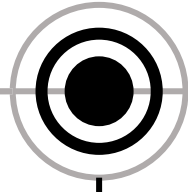


Patient Safety & Quality Improvement Act

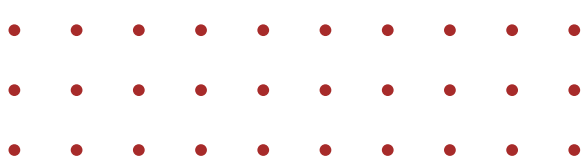
2016



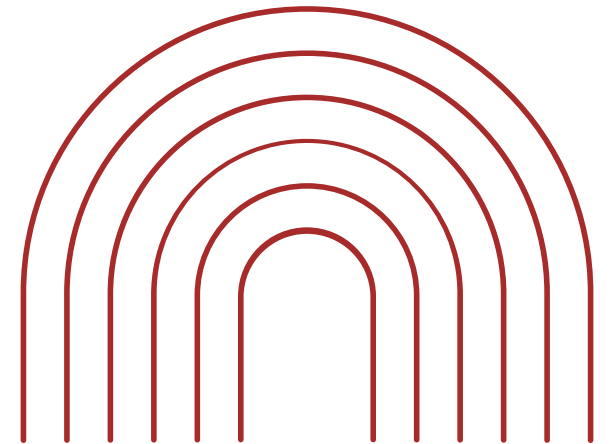
2025



Institute of Medicine, 2000.
Institute of Medicine, 2001.
Sandweg & Ager, 2016.



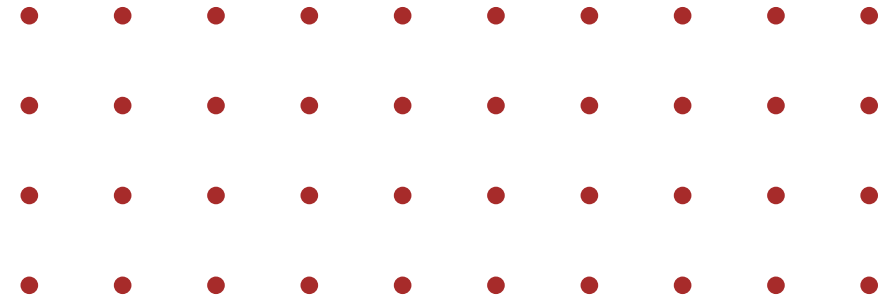
“You can't improve
what you don't
measure.”



Medication Safety Metrics

- **Metric**: a system or standard of measure
 - Structure, process, outcome measures
- Different ways to approach identifying metrics.
- Metrics should be used to initiate specific changes to systems to improve safety.
- Goal should be to promote a culture of openness.

Medication Safety Metrics



Reactive



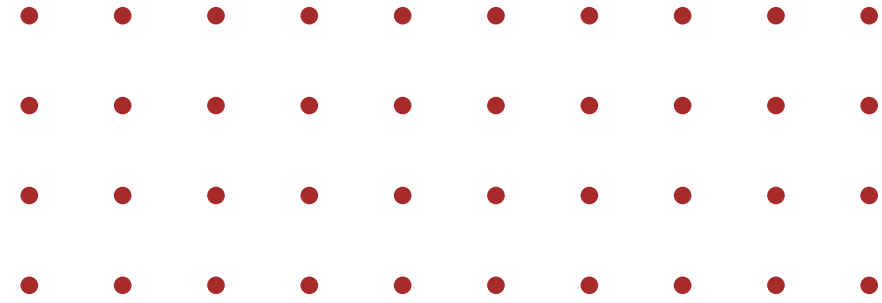
Proactive

Selecting Metrics

- Availability of data
- Need to transform data
- Intended use or audience of the data



Medication Safety Metrics



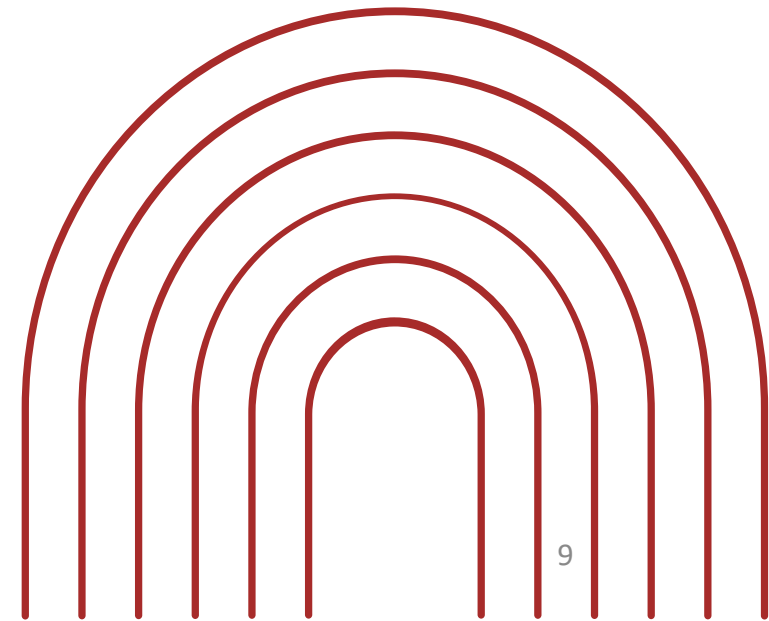
Reactive



Proactive

Voluntary Medication Error Reports

- Medication error reporting and trending are vital for raising awareness, identifying system failures, and implementing preventive solutions.



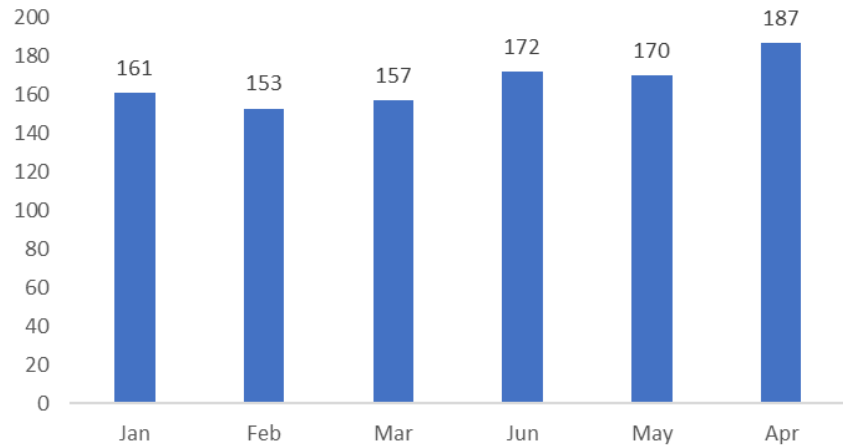
Voluntary Medication Error Reports

- Medication error reporting and trending are vital for raising awareness, identifying system failures, and implementing preventive solutions.

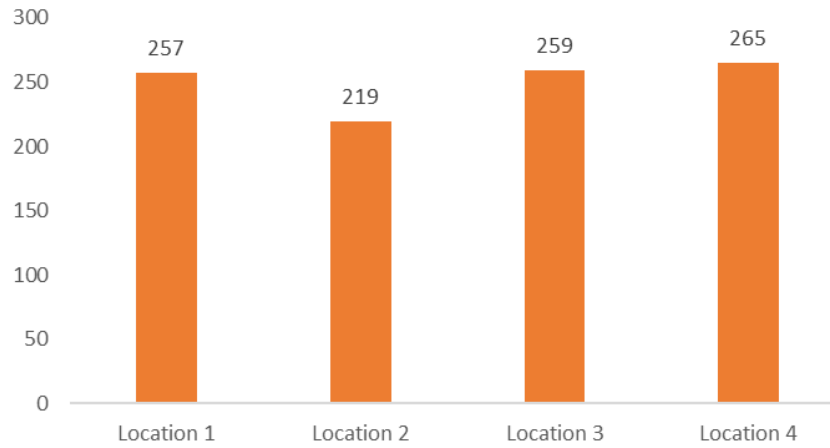
- Voluntary nature of reports
- Non-standardized nomenclature
- No benchmarking
- Difficulty creating a meaningful rate

Voluntary Medication Error Reports

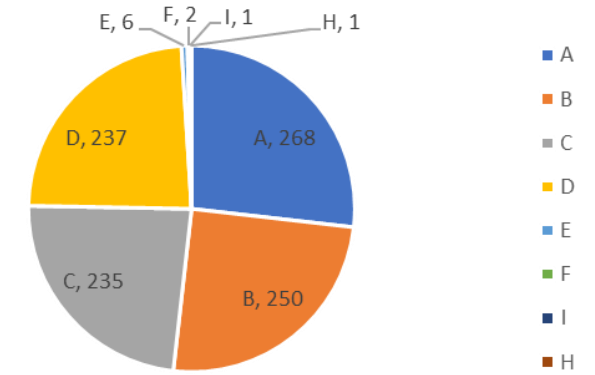
Number of Reported Events by Month



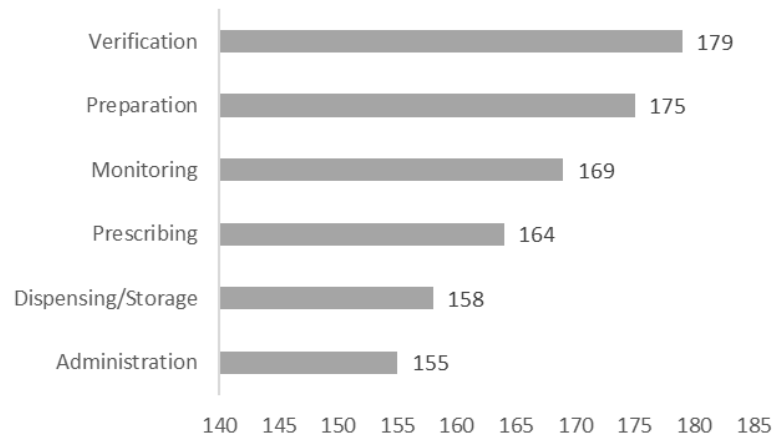
Number of Reported Events by Location



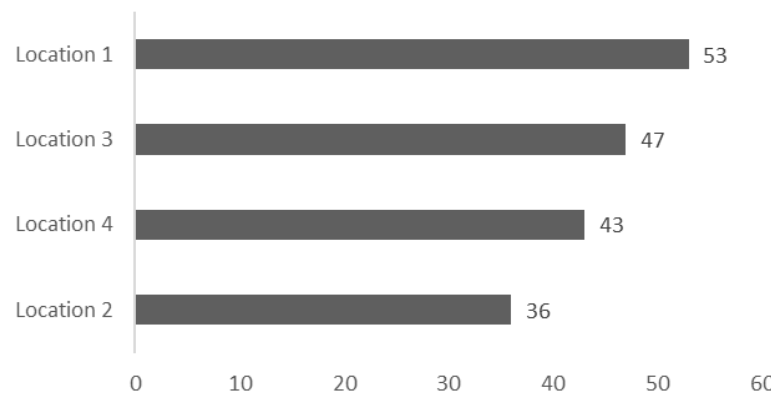
NCC MERP Medication Error Index



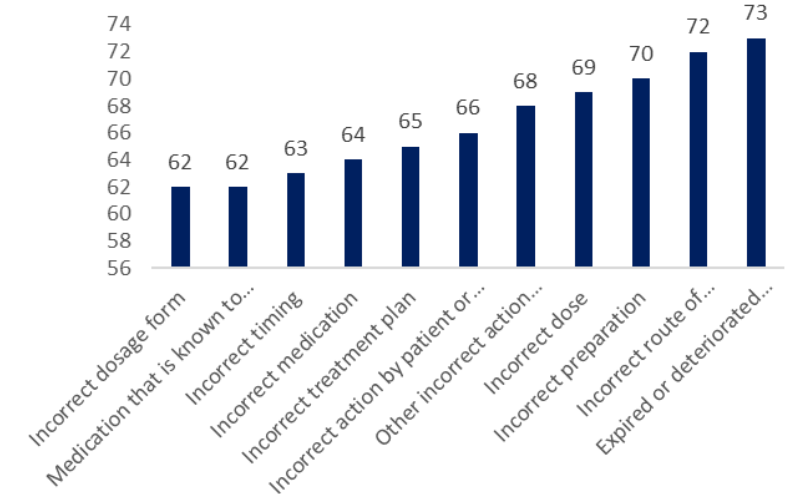
Number of Reported Events by Phase



Number of Verification Reports by Location



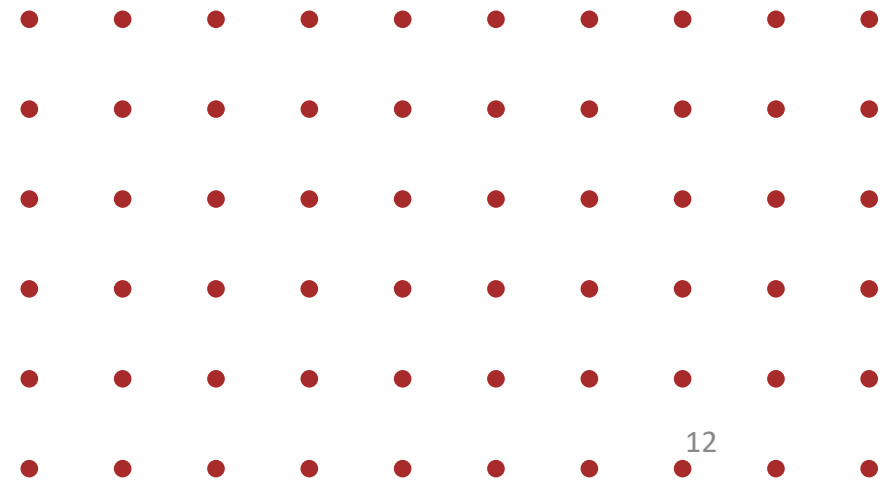
Top 10 - AHRQ Common Formats Event Type



Disclaimer: The information presented on this slide is generated from test data and is intended for illustrative purposes only.

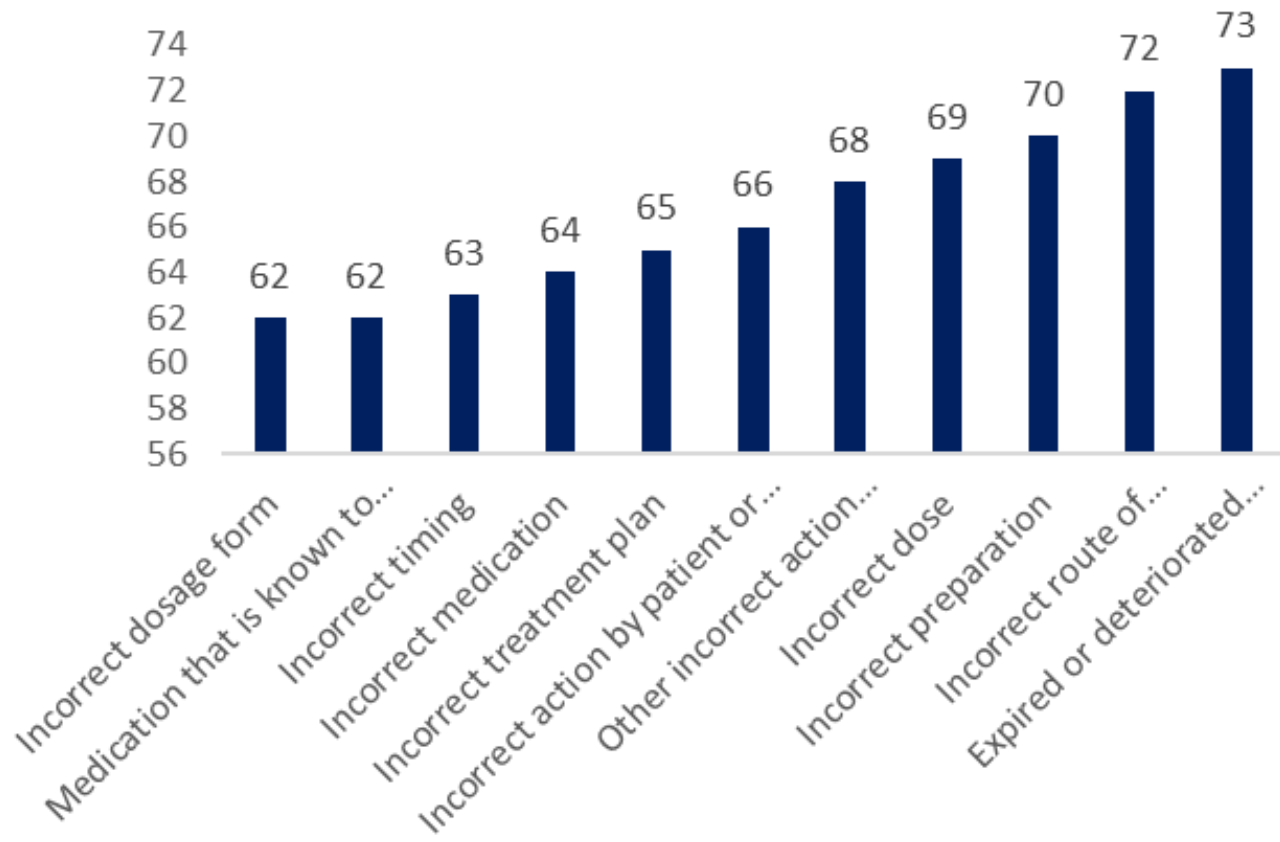
Voluntary Medication Error Reports

- Accompany visual data with narrative reports
- Apply context to the data
 - Denominator
 - Changes
- Consider tracking specific event type as
 - Days since event
 - Never events



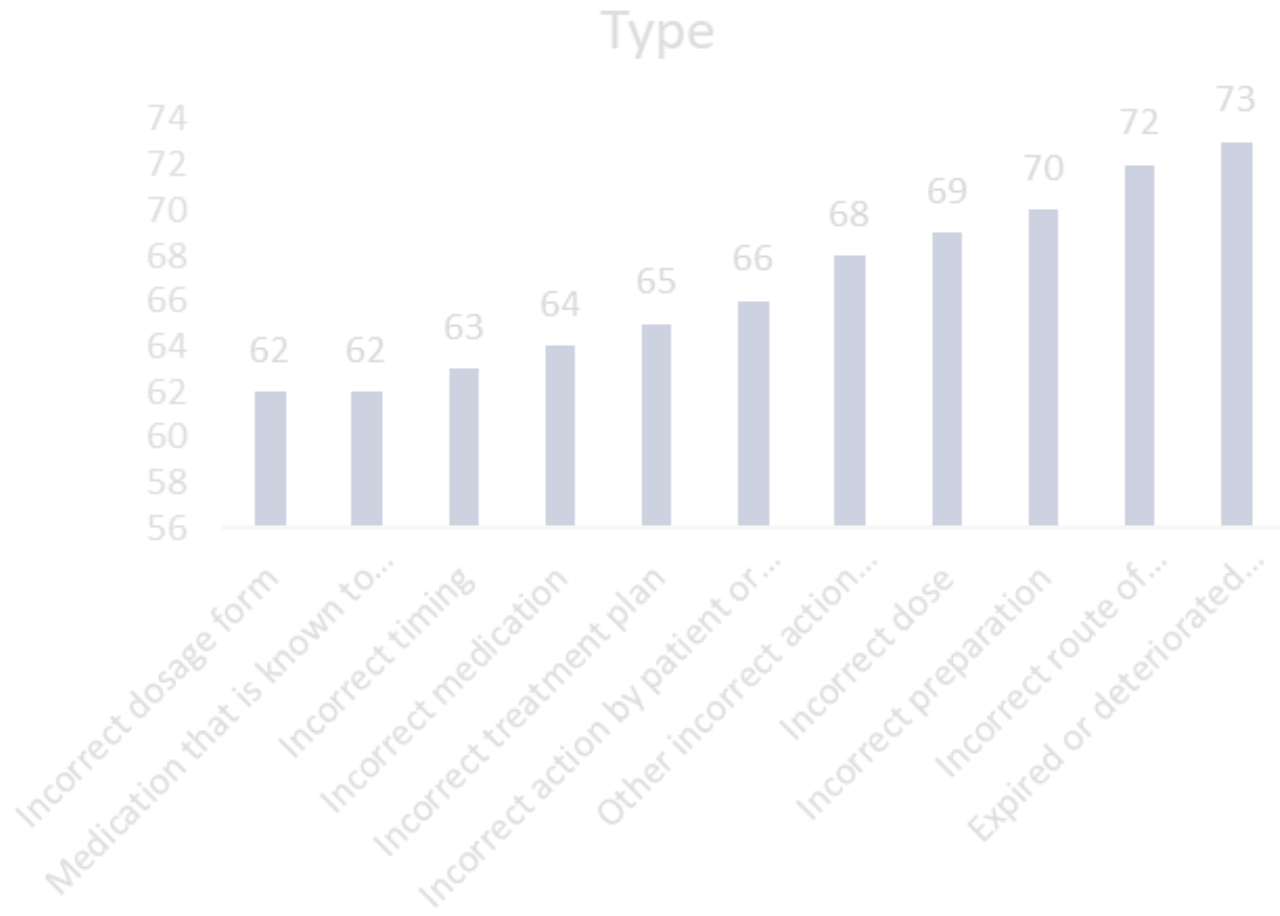
Voluntary Medication Error Reports

Top 10 - AHRQ Common Formats Event Type

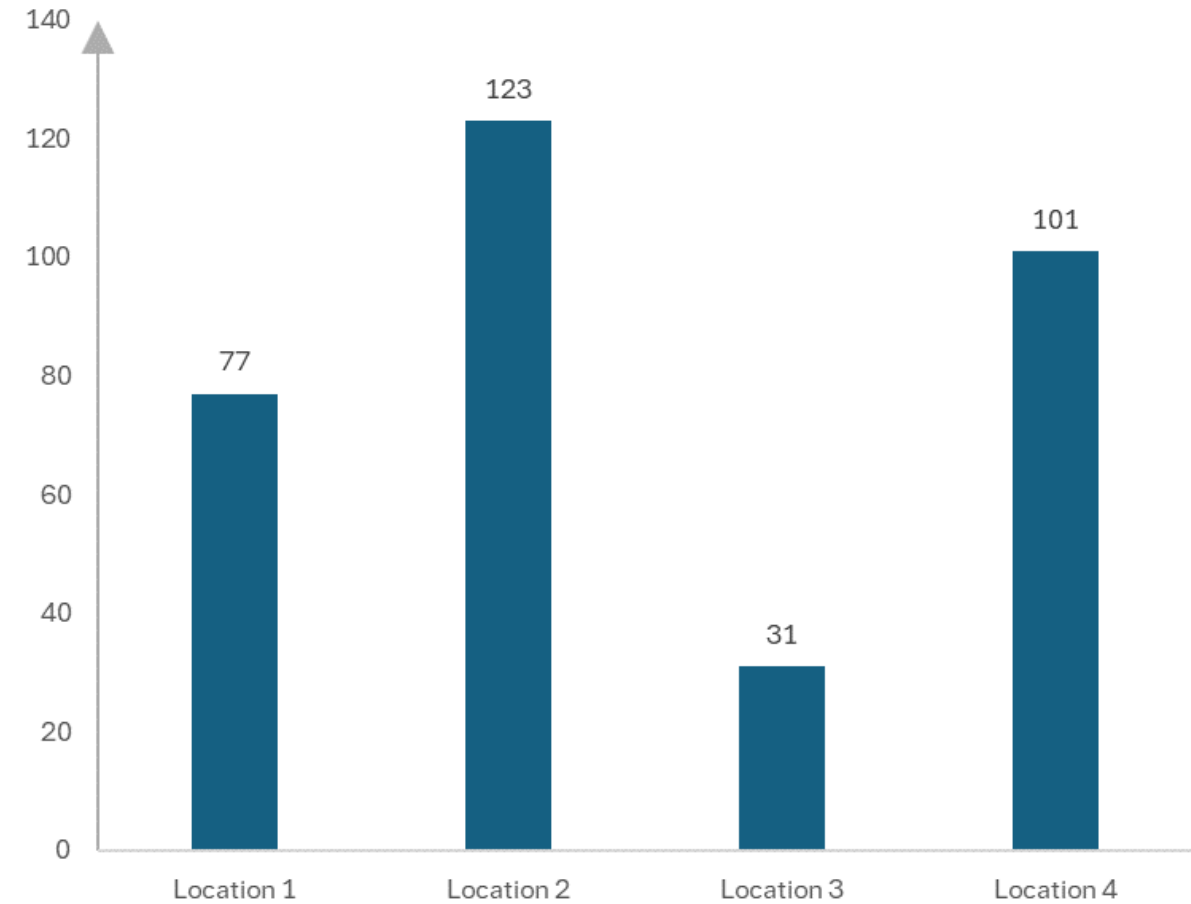


Voluntary Medication Error Reports

Top 10 - AHRQ Common Formats Event



Days Since Incorrect Patient Event



Voluntary Medication Error Reports



Measure of safety culture



Identify a risk in the system that warrants a deeper investigation



Identify a new metric

Voluntary Medication Error Reports



Measure of safety culture

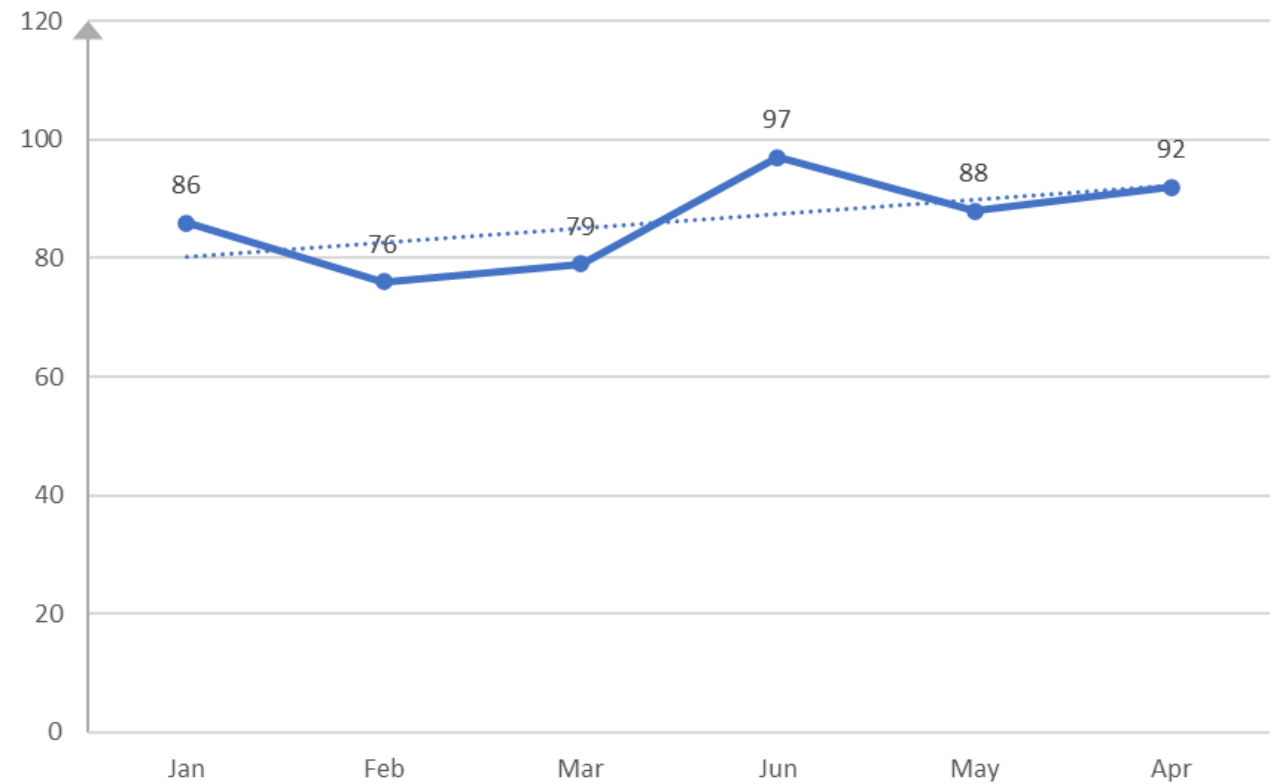


Identify a risk in the system that warrants a deeper investigation



Identify a new metric

Number of Near-Miss Reports



Voluntary Medication Error Reports



Measure of safety culture

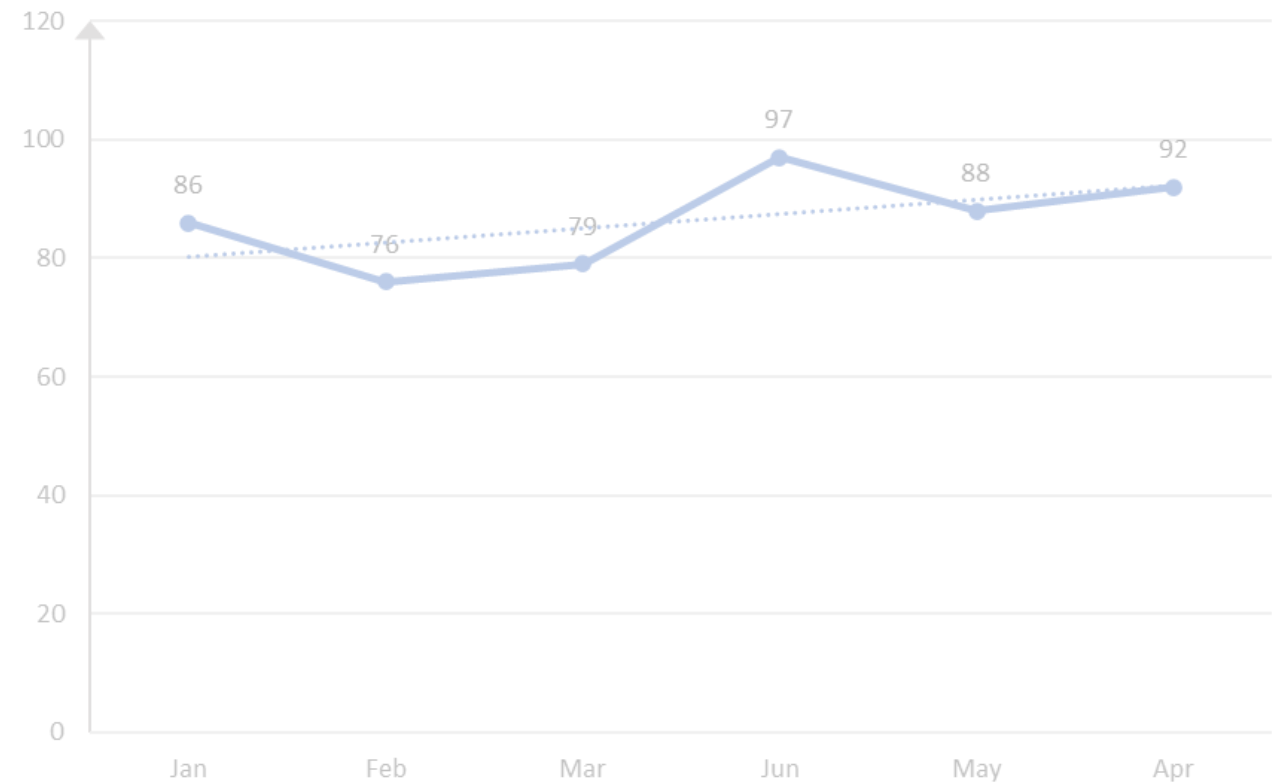


Identify a risk in the system that warrants a deeper investigation



Identify a new metric

Number of Near-Miss Reports



Identifying a New Metric

i Plan on Hold (Other – see comments; Research Eligibility) Since 4/2/2025 12:00 PM

The plan was put on hold by BeaconBatchjob on 4/2/2025 12:00 PM

Research Protocol: NYSCHP-212

- ❯ Cycle 1 – Perform: 1 time. Length: 28 days.
- ❯ Cycle 2 – Perform: 1 time. Length: 28 days.
- ❯ Cycles 3,4 – Perform: 2 times. Length: 28 days.
- ❯ Cycles 5,6 – Perform: 2 times. Length: 28 days.
- ❯ Cycle 7 - Perform: 1 time. Length: 28 days.
- ❯ Cycle 8 - Perform: 1 time. Length: 28 days.

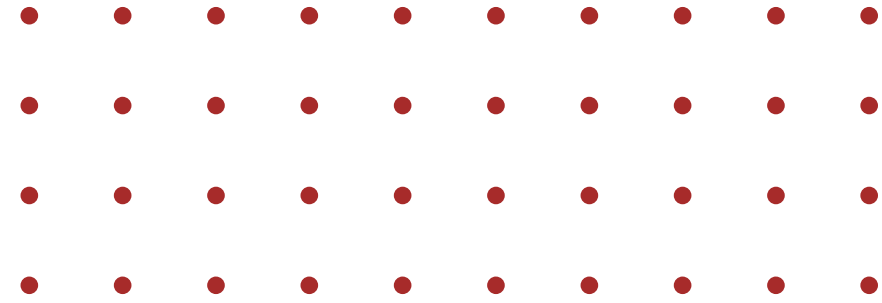
Identifying a New Metric

① **Plan on Hold (Other – see comments; Research Eligibility) Since 4/2/2025 12:00 PM**

The plan was put on hold by BeaconBatchjob on 4/2/2025 12:00 PM

Metric	Impact	Number	Percentage	Target
Number plans placed on hold from this BatchJob	-	271	-	-
Number of plans discontinued following BatchJob Hold	Desired action	165	61%	↑
Number of plans where BatchJob Hold was removed & plan continued	Safety concern	35	13%	↓
Number of plans with no action (remain on hold)	Safety concern	71	26%	↓

Medication Safety Metrics

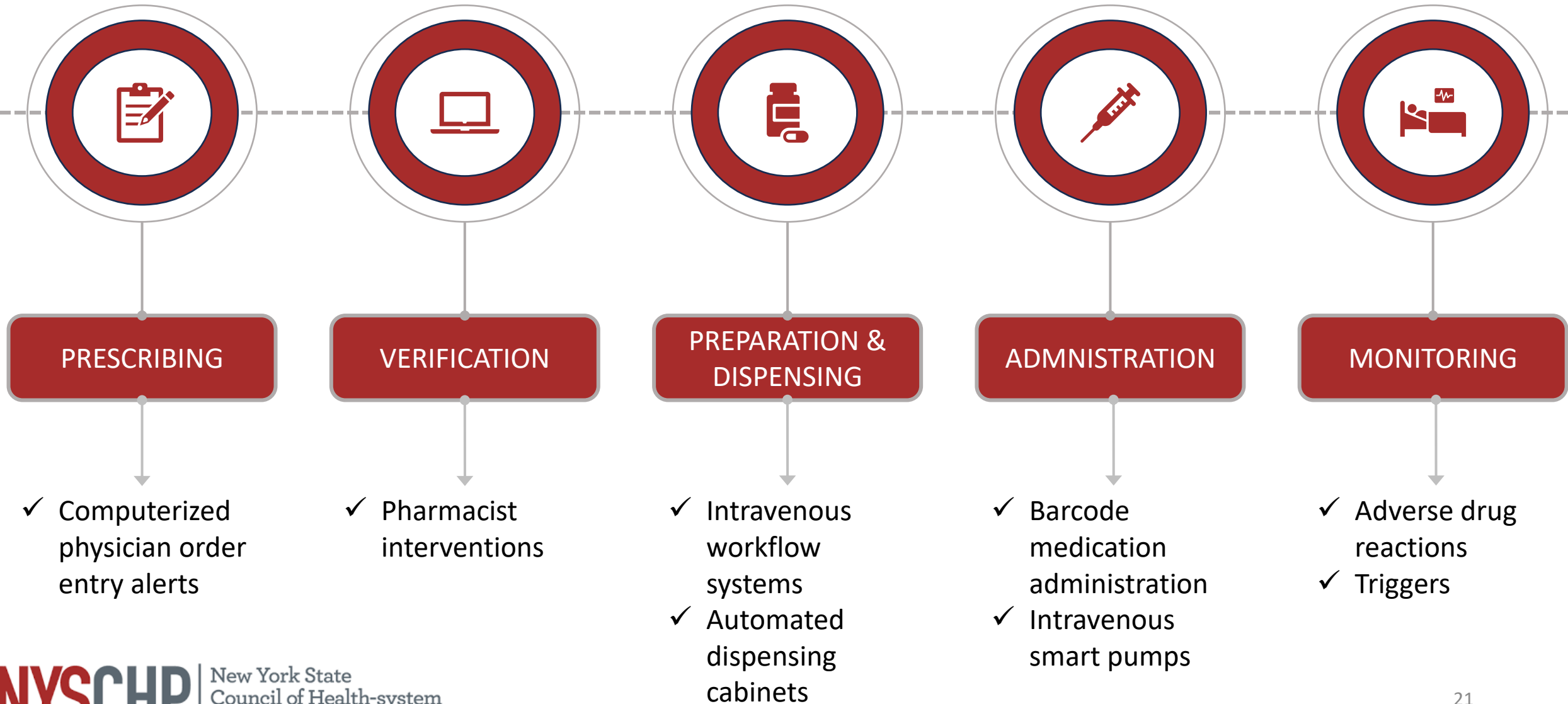


Reactive



Proactive

What data is available to be used as metrics?

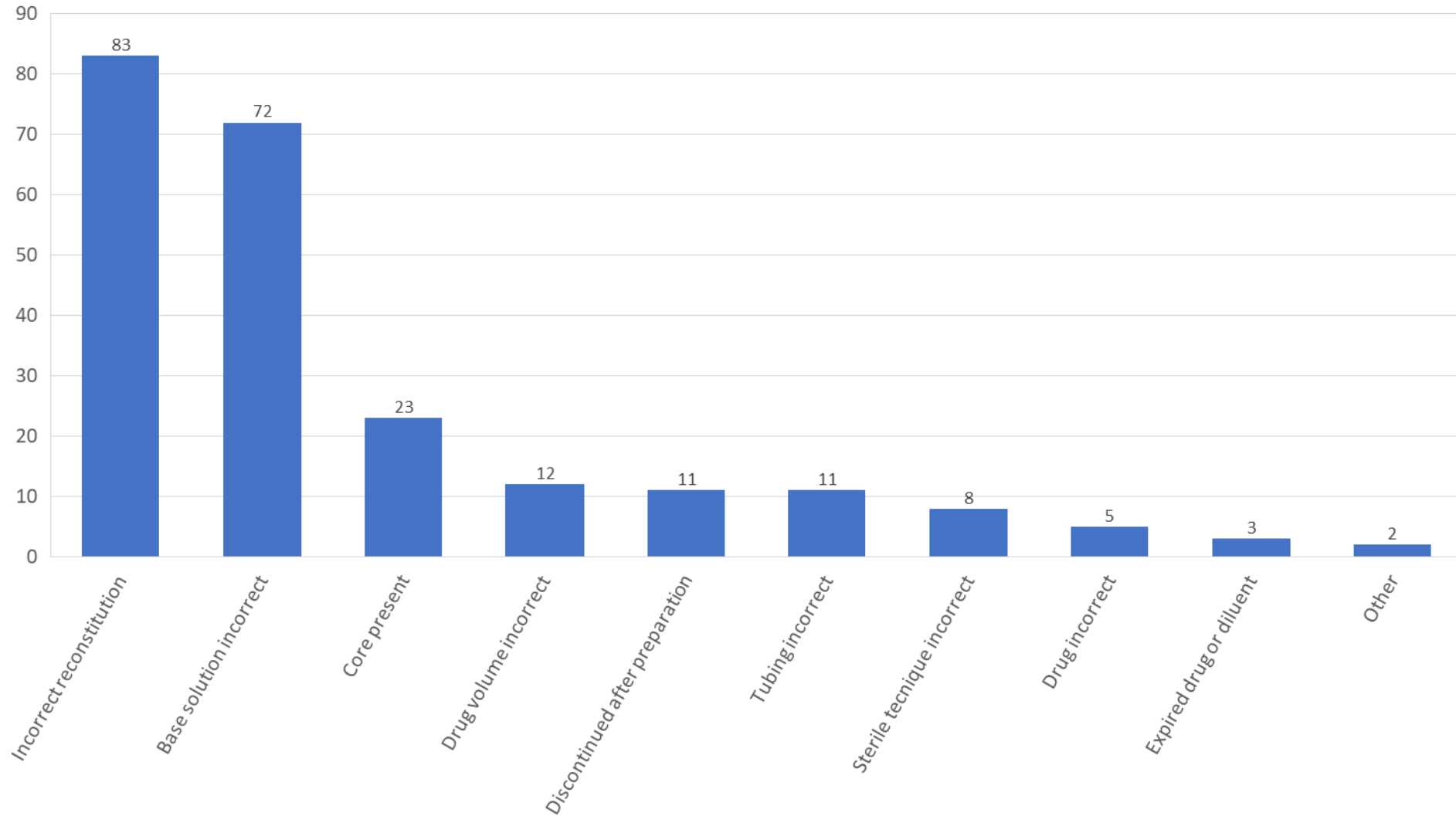




Intravenous (IV) Workflow Systems

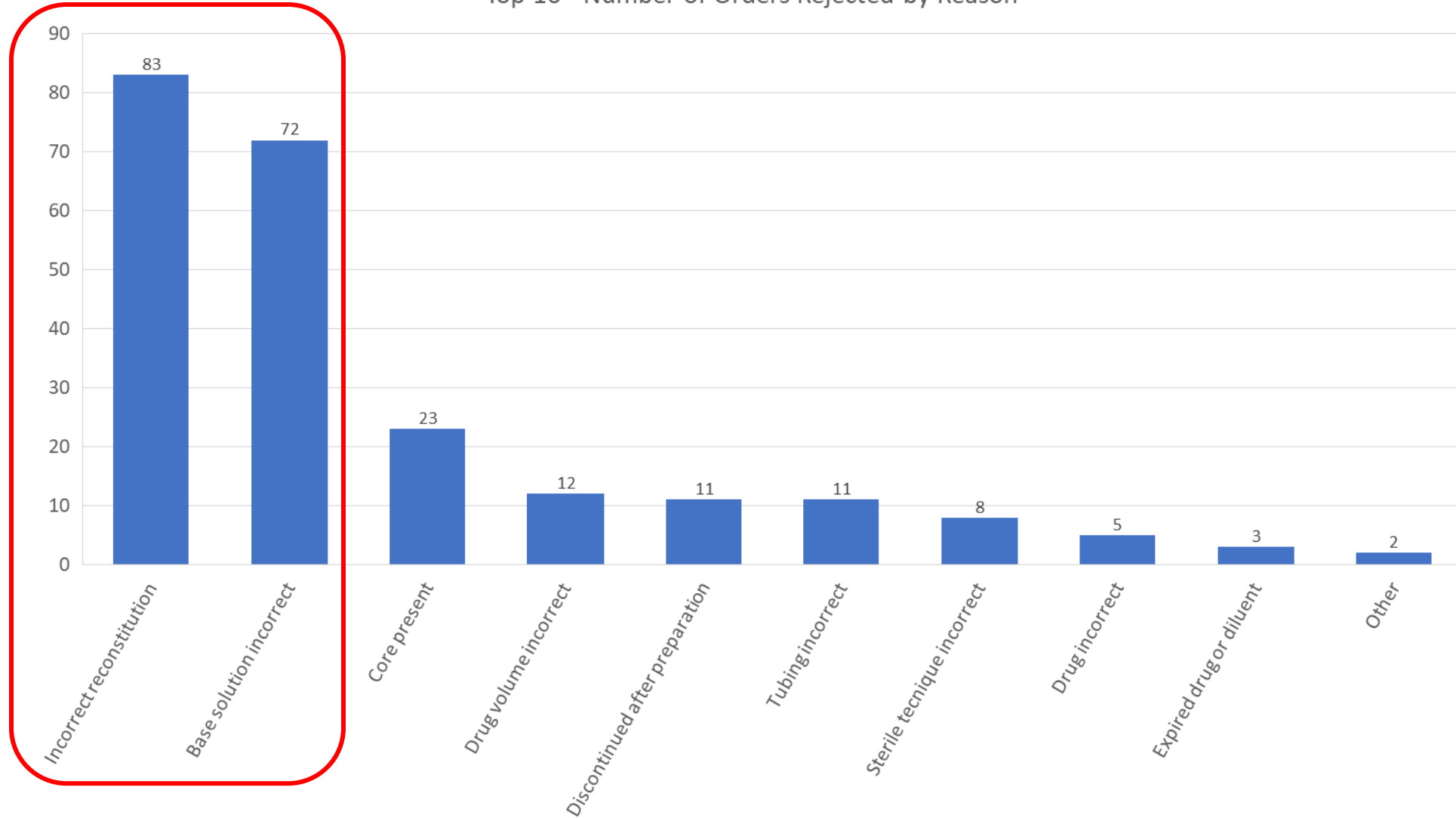
IV Workflow Systems

Top 10 - Number of Orders Rejected by Reason



IV Workflow Systems

Top 10 - Number of Orders Rejected by Reason



Disclaimer: The information presented on this slide is generated from test data and is intended for illustrative purposes only.

Dispense Preparation

Scan Order or Resume a Prep in Progress

oxaliplatin (ELOXATIN) 186 mg in D5W 307.2 mL IVPB
Dose: 186 mg Route: Intravenous Due Time: 12/13 1730 Priority: Routine

Order Report

Scan Ingredients

✓ oxaliplatin 100 mg/20 mL injection (IV)

Packages used: 63323-750-20, 63323-750-20

Dose: 186 mg = 37.2 mL
Total needed: 186 mg = 37.2 mL
Total scanned: 200 mg = 40 mL
Total amount used: 186 mg = 37.2 mL

D5W 5 % infusion (IV)

Dose: 270 mL
Total needed: 270 mL
Total scanned: 0 mL
Total amount used: 0 mL

✓ Diluent: sodium chloride 0.9% infusion (IV)

Packages used: 0990-7983-02

Comments

Insert SmartText

Take a Picture

Complete Preparation or Send for Review

Save Work

Final Review

Cancel

Dispense Preparation

Scan Order or Resume a Prep in Progress

oxaliplatin (ELOXATIN) 186 mg in **D5W** 307.2 mL IVPB
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✓ Diluent: **sodium chloride 0.9% infusion (IV)**

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Comments

Insert SmartText 100%

Take a Picture

Complete Preparation or Send for Review

Save Work

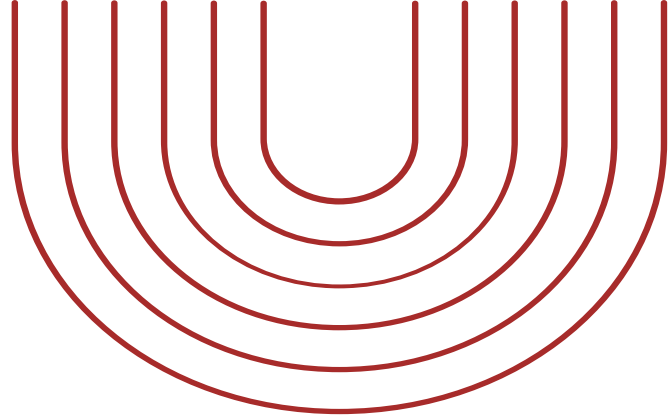
Final Review

Cancel

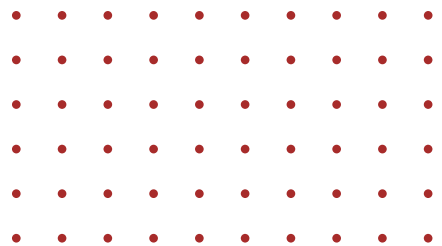
Ordered diluent
= D5W

Scanned diluent
= NS

Oxaliplatin is INCOMPATIBLE with NS



Intravenous (IV) Smart Pumps





Dose Error Reduction Systems (DERS)



With Guardrails

Without Guardrails

IV Smart Pumps

Institute for Safe Medication Practices (ISMP) recommends smart infusion pump compliance rates of **95% or greater**

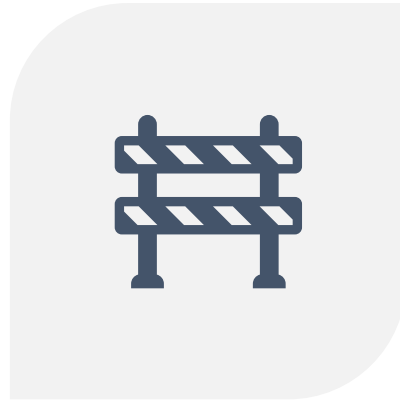


IV Smart Pumps

Institute for Safe Medication Practices (ISMP) recommends smart infusion pump compliance rates of **95% or greater**



MONITOR HOW OFTEN THE PUMP'S LIBRARY IS USED.



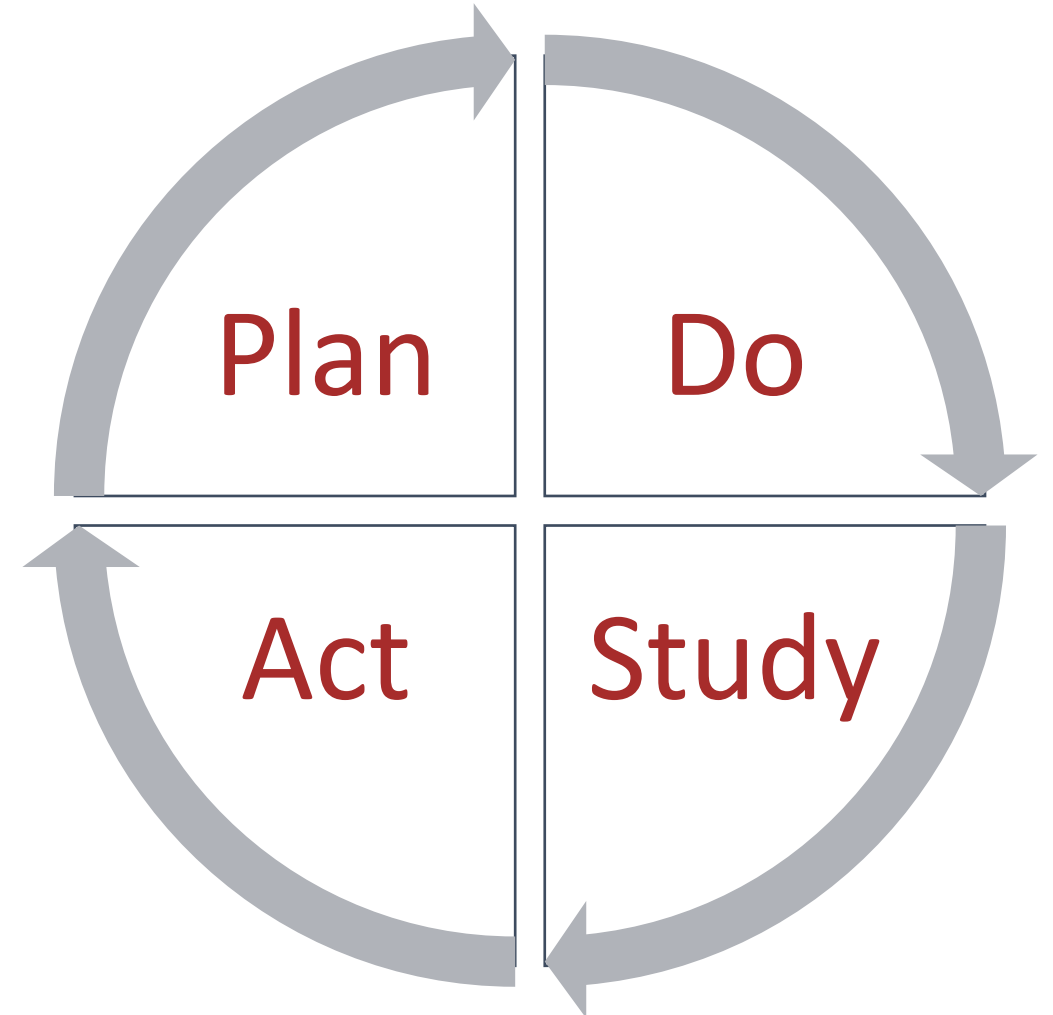
IDENTIFY AND ADDRESS ANY OBSTACLES PREVENTING LIBRARY USE.



CONDUCT WALK ROUNDS TO OBSERVE HOW THE PUMPS ARE USED IN REAL-LIFE SITUATIONS.

IV Smart Pumps

Increase the percentage of infusions being run using DERS across the medical center from 77% to 95% over two years.



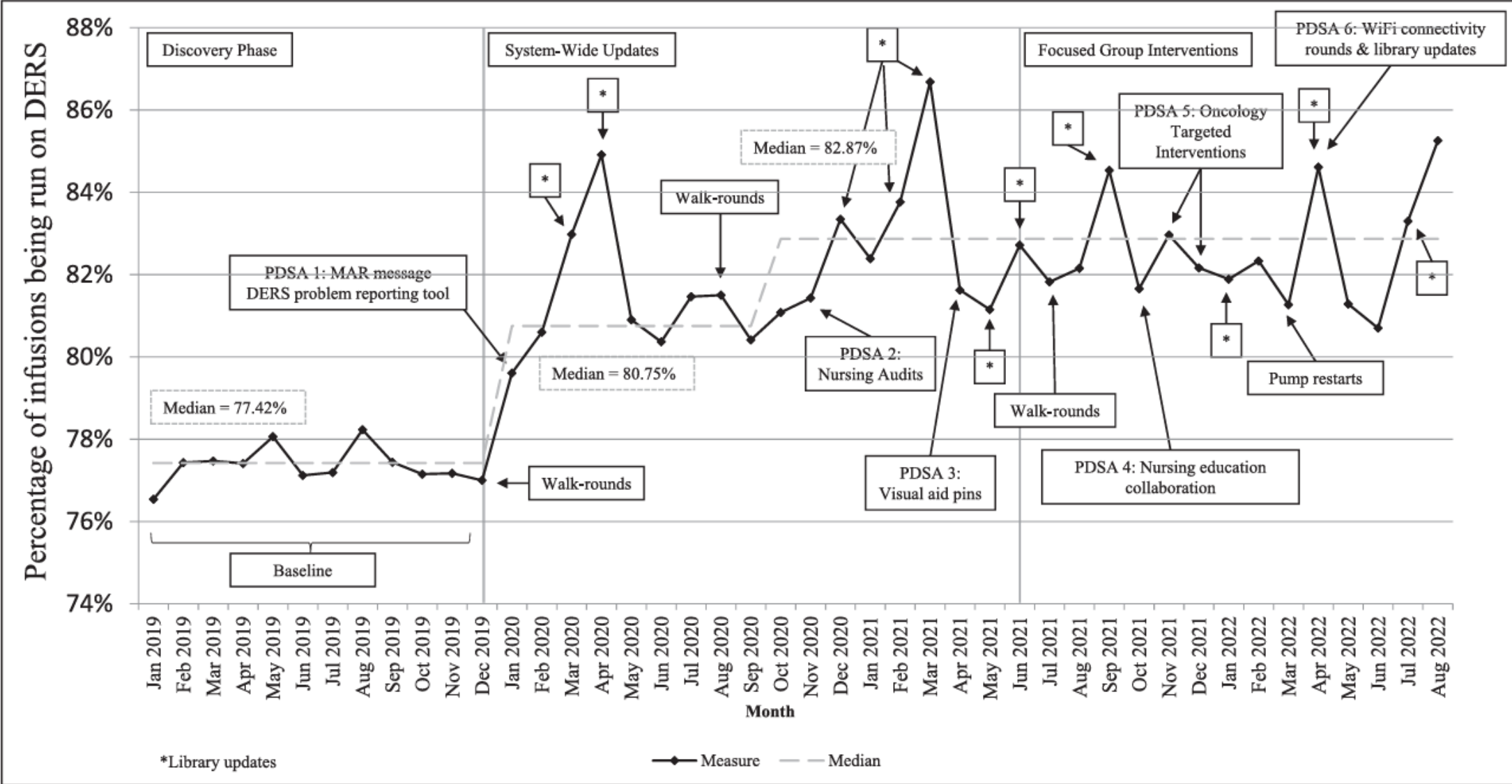
IV Smart Pumps

Table 1. Barriers to DERS Use With Associated Change Concepts

Category	Barriers to DERS use	Response to barrier (PDSA cycle)
DERS library	<ul style="list-style-type: none"> • Medications or concentrations missing from the library • Medication orders (dose, rate, concentration) falling outside of DERS settings due to EHR defaults or provider preferences • Difficulty communicating library discrepancies to those responsible for maintaining the library • Inability to provide real-time DERS usage feedback to nurses 	<ul style="list-style-type: none"> • MAR DERS problem reporting tool and corresponding library updates (PDSA cycle 1) • Oncology-specific intervention (PDSA cycle 5)
Data	<ul style="list-style-type: none"> • Unit-specific data not available • Poor Wi-Fi connectivity preventing pump updates to the most recent library 	<ul style="list-style-type: none"> • DERS audits (PDSA cycle 2) • Oncology-specific intervention (PDSA cycle 5) • Wi-Fi connectivity rounds and updated library teaching (PDSA cycle 6)
Library updates	Lack of understanding of importance of DERS	<ul style="list-style-type: none"> • Wi-Fi connectivity rounds and updated library teaching (PDSA cycle 6) • DERS audits (PDSA cycle 2)
Training	<ul style="list-style-type: none"> • Inconsistent training on the use of DERS • Perceived amount of additional time it takes to program the pump using DERS vs basic infusion 	<ul style="list-style-type: none"> • Awareness visual aid (PDSA cycle 3) • Collaboration with nursing education (PDSA cycle 4)

Abbreviations: DERS, drug error reduction systems; EHR, electronic health record; MAR, medication administration record; PDSA, Plan-Do-Study-Act.

IV Smart Pumps





Trigger Tools

Trigger Tools

C. Difficile
positive stool

PTT > 100

INR >6

Glucose < 50
mg/dL

BUN or SCr 2x
baseline

Vitamin K
administration

Diphenhydramine
administration

Flumazenil
administration

Naloxone
administration

Anti-emetic
administration

Over-sedation or
hypotension

Abrupt
medication stop

Trigger Tools

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PTT > 100

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Glucose < 50
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Diphenhydramine
administration

Flumazenil
administration

Naloxone
administration

Anti-emetic
administration

Over-sedation or
hypotension

Abrupt
medication stop

Trigger Tools

Location	Doses of naloxone administered
Location 1	19
Location 2	45
Location 3	57

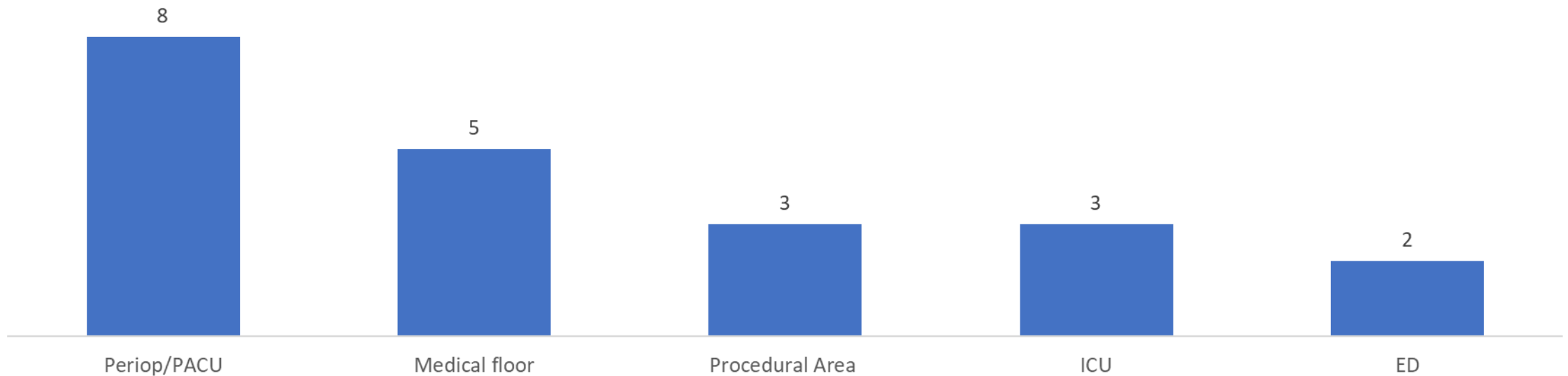
Trigger Tools

Location	Doses of naloxone administered	Doses of naloxone administered within 24 hours of opioid administration
Location 1	19	2
Location 2	45	8
Location 3	57	21

Trigger Tools

Location	Doses of naloxone administered	Doses of naloxone administered within 24 hours of opioid administration
Location 1	19	2
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Location 3	57	21

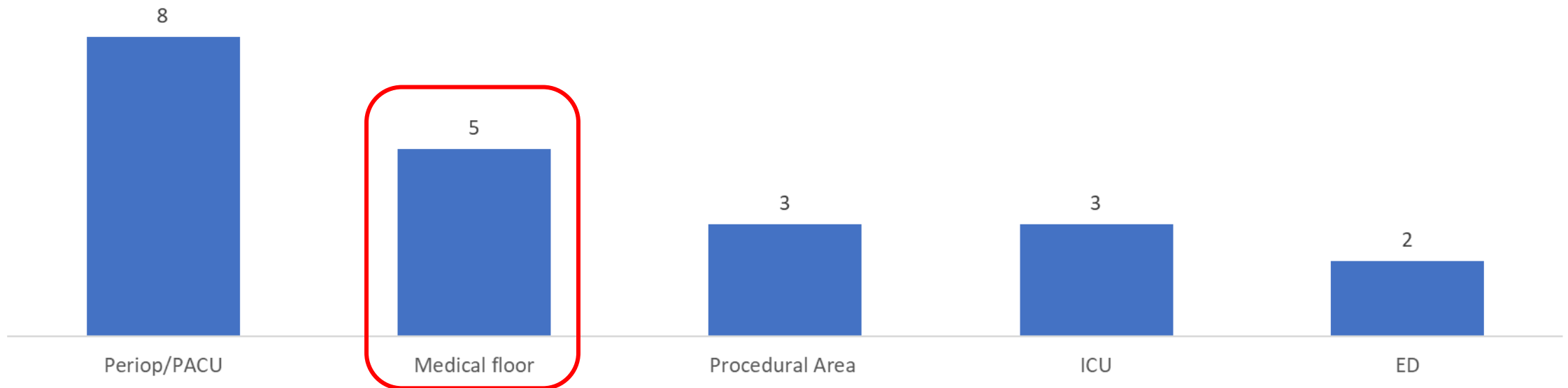
Location 3 - Naloxone Administration Within 24 Hours of Opioid Administration



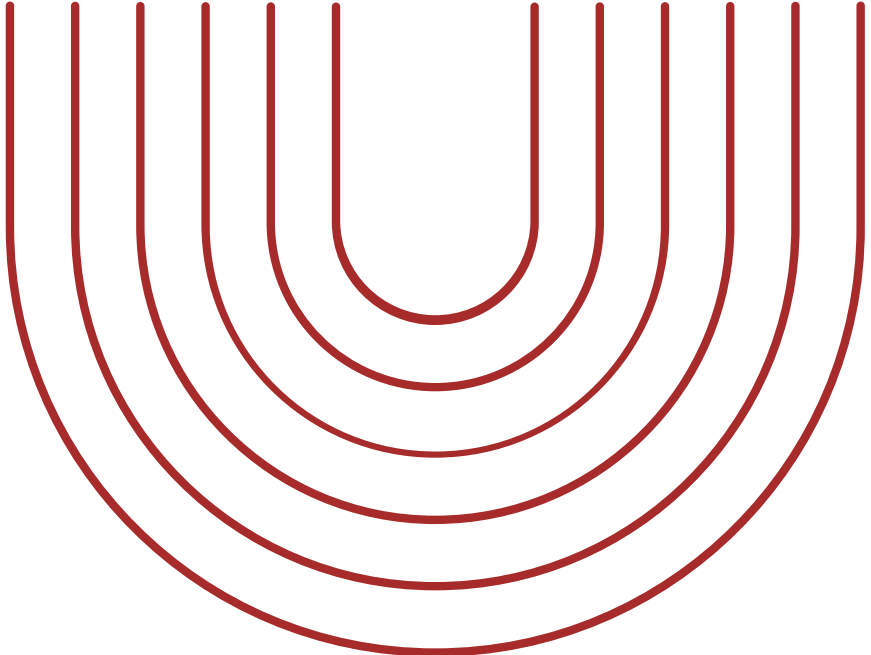
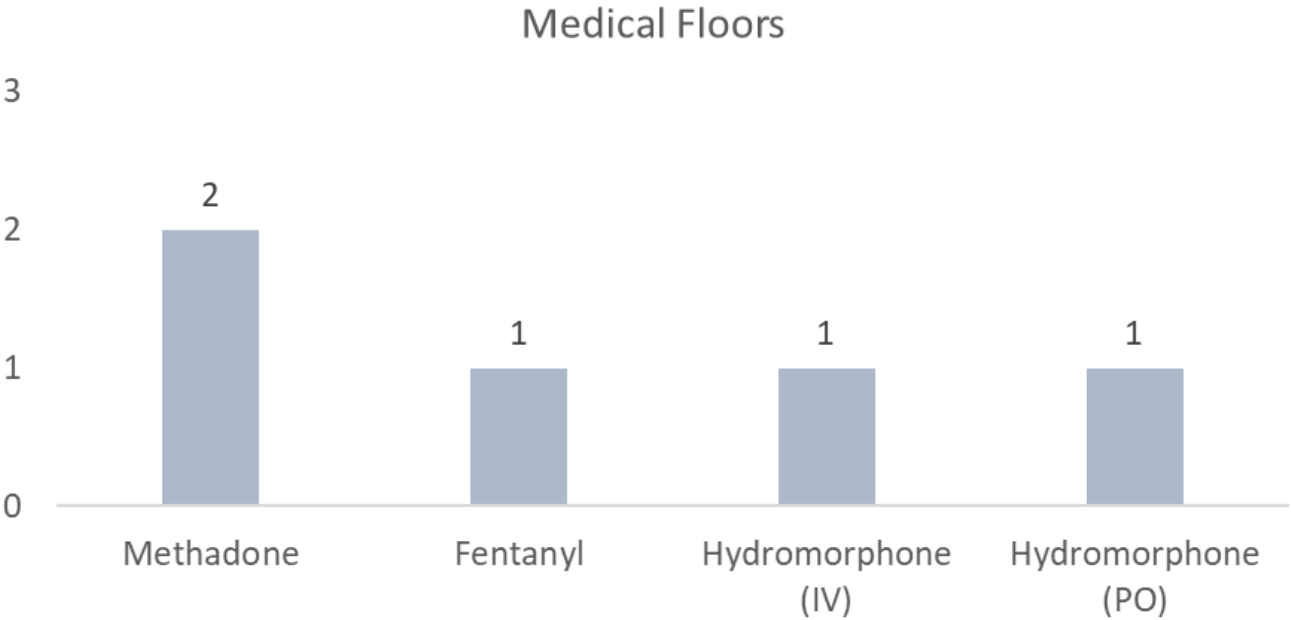
Trigger Tools

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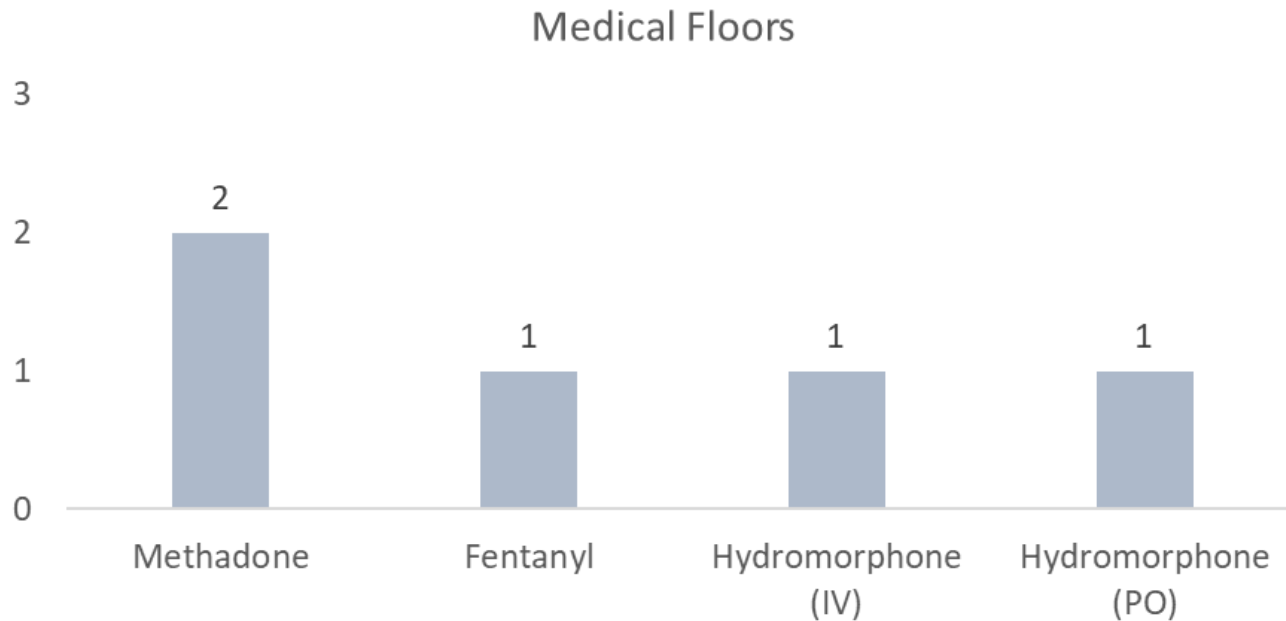
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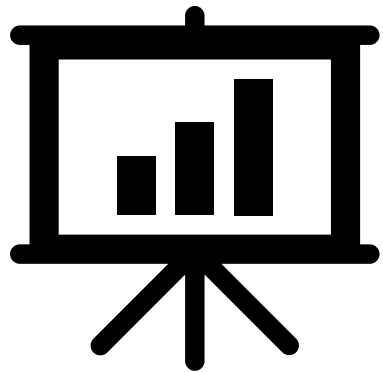
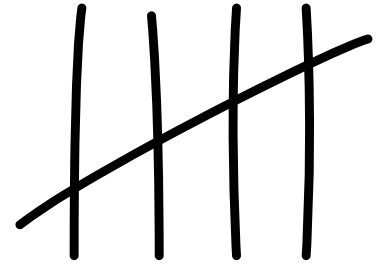
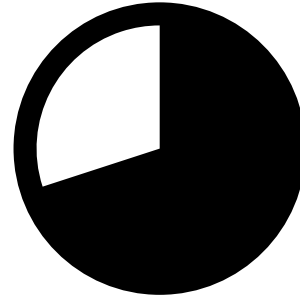
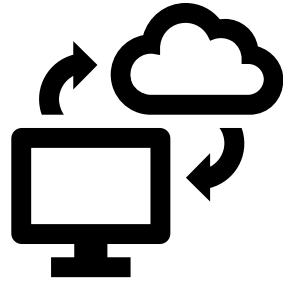
Trigger Tools



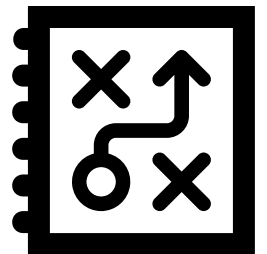
Trigger Tools



- Rate per doses administered
- Expected versus unexpected
- Opioid reversal
- Pain & sedation assessment completed prior to opioid administration



Turning Data into Actionable Metrics

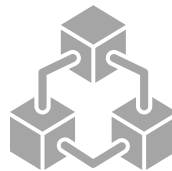


Turning Data into Actionable Metrics

- Determine metrics that are meaningful for your unit, department, institution.
- Establish internal or external benchmarks or goals
- Measure and track progress – process and outcome measures



Key Performance
Indicators



Dashboards



Scorecards

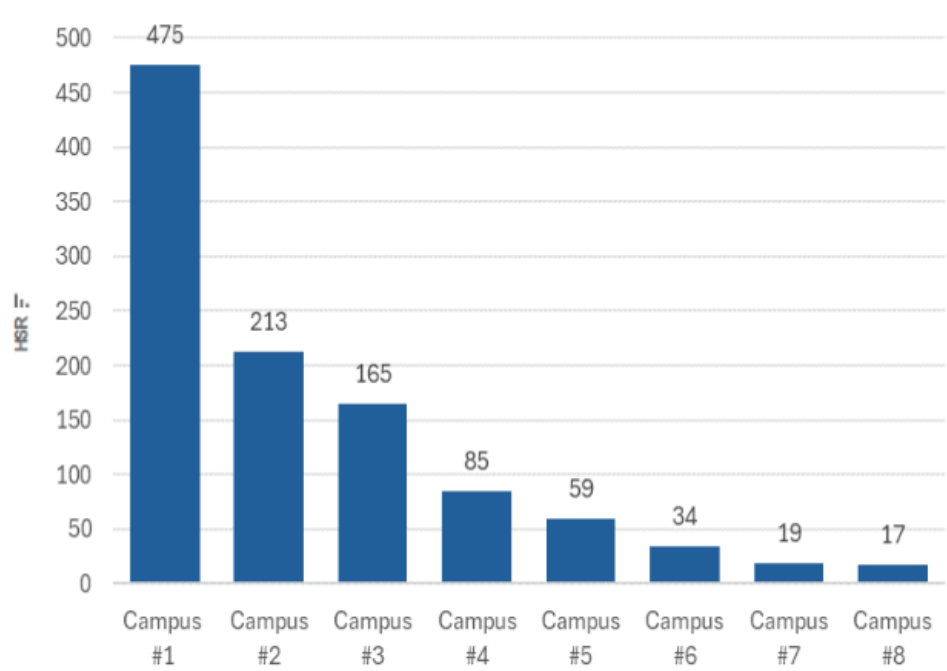
Dashboards

Hypersensitivity and Adverse Drug Reaction Summary

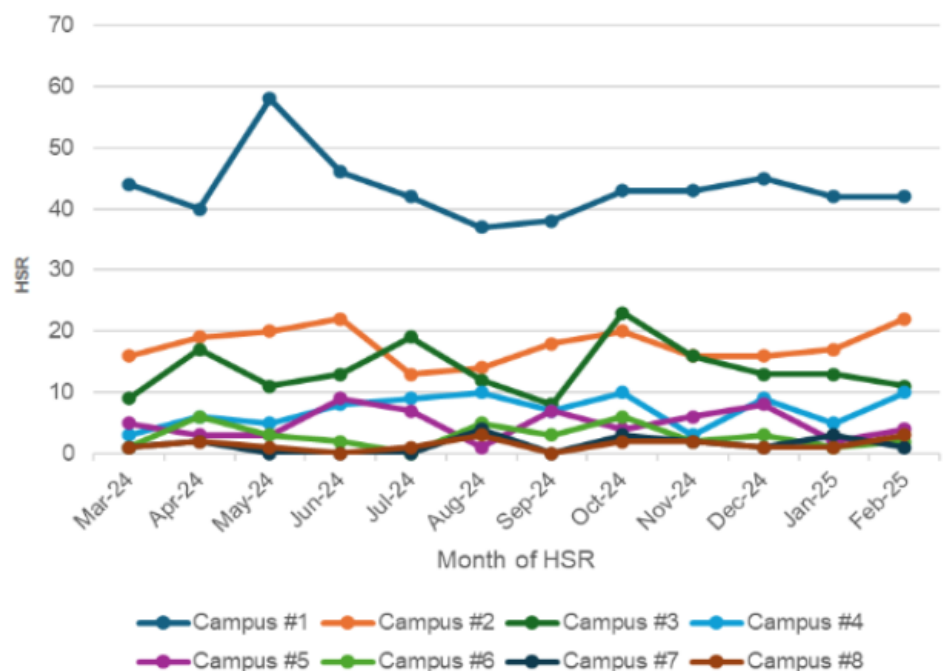
3/1/2024 - 2/28/2025

Messing, Emily G.,PHARM D
Last Refreshed:
Data Last Updated:

HSR Totals



HSR by Month

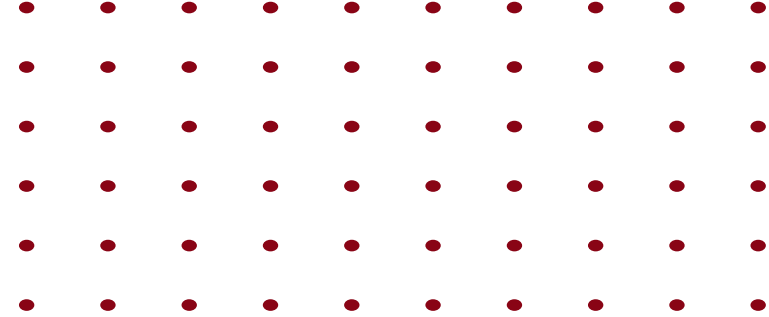


HSR Rate i

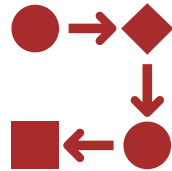
	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
HSR Reactions	87	92	73	108	99	92	83	97	113	91	86	89
Administered Dispenses	47,488	49,912	51,718	45,379	47,781	48,256	48,374	53,485	46,950	49,084	52,187	43,803
Reaction Rate %	0.18%	0.18%	0.14%	0.24%	0.21%	0.19%	0.17%	0.18%	0.24%	0.19%	0.16%	0.2%

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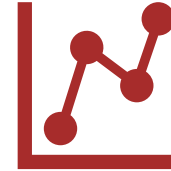
Summary



Medication safety metrics should be customized to reflect and support the specific objectives and priorities of your institution.



Continuously modify and refine data to ensure metrics are meaningful and effectively guide decision-making processes.



Recognize that data provides only part of the picture consider employing additional strategies to gain a comprehensive understanding of the insights.



Emphasize the importance of small, consistent improvements as steps toward achieving larger medication safety goals.

References

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Assessment Question 1

Select all that apply: Why are near misses considered a valuable medication safety metric in the hospital setting?

- A. They help identify system vulnerabilities before harm occurs.
- B. They eliminate the need to report actual medication errors.
- C. They provide insight into areas where process improvements are needed.
- D. None of the above.

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Assessment Question 2

The following technology systems can be leveraged to collect data for medication safety metrics?

- A. Intravenous Smart Pumps
- B. Electronic health record alert rates
- C. Intravenous workflow systems
- D. Event reporting systems
- E. All of the above

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Assessment Question 3

True or False: The number of safety reports submitted on a topic should be used as the sole indicator as to whether a safety risk is widespread.

- A. True
- B. False

Assessment Question 3

True or False: The number of safety reports submitted on a topic should be used as the sole indicator as to whether a safety risk is widespread.

A. True

B. False

Assessment Question 4

A hospital has noticed a decrease in the compliance of the use of IV smart pump dose error reduction software (DERS) in the emergency department. Details of the compliance data shows a high number of continuous infusions being run using DERS but very few other medications. Which of the following action plans would be appropriate following this decline in compliance? Select all that apply.

- A. Do nothing at this time as this was the first month that compliance decreased.
- B. Conduct a Gemba walk to validate what you see in the data is what is happening in the emergency department.
- C. Provide education to the front-line staff on the importance of using DERS for all medications and monitor compliance following the education.
- D. None of these are appropriate actions.

Assessment Question 4

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THANK YOU



Medication Safety Metrics: Turning Data into Action

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September 30, 2025

