

# Medication Order Error Rate After Computerized Prescriber Order Entry in the NICU

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# Disclosure Statement & Speaker's Non-Commercialism Agreement

## **Matt Gebarski, PharmD**

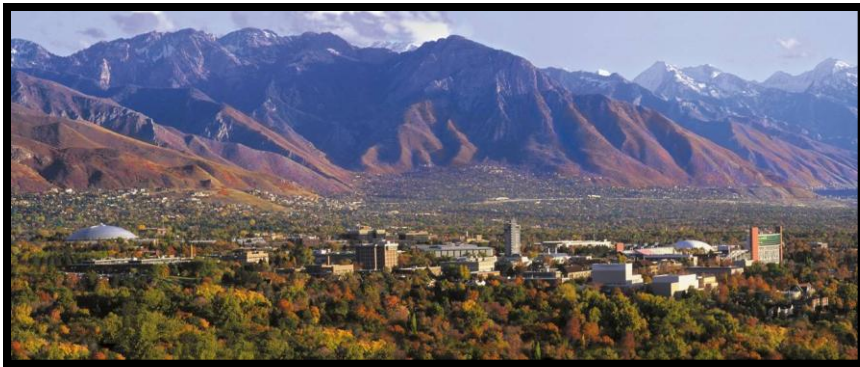
- Investigators have no conflicts of interest to disclose.
- This study was not funded.
- No proprietary information or results of ongoing research that may be subject to different interpretations.
- Presentation of this slide indicates my agreement to abide by the non-commercialism guidelines provided on the CE Requirements page.



# University of Utah Hospital



- 450 bed academic medical center
- Level 1 trauma center
- Pediatric Services:
  - NICU (48 beds)



# Pre-Test Assessment

1. Neonatal intensive care patients are \_\_\_\_\_ to suffer a potentially harmful ADE from a medication error as adult patients.
  - A. about half as likely
  - B. up to twice as likely
  - C. just as likely
  - D. up to 3x as likely
  
2. Use of Computerized Prescriber Order Entry (CPOE) does **NOT** introduce new errors to the medication-use system.

True                      False
  
3. After implementation of CPOE in the neonatal intensive care unit (NICU), a significant **decrease** in prescriber class order errors was observed.

True                      False

# Medication Safety: Terms

- Medication error:

A preventable event that may cause or lead to inappropriate medication use or patient harm

- Adverse Drug Event (ADE):

Patient injury as a result of medical intervention with a drug



# Medication Safety

- Medication errors significant source of preventable Adverse Drug Events (ADEs)
- More vulnerable patient populations more likely to experience severe ADEs



# Medication Safety

- Medication errors significant source of preventable Adverse Drug Events (ADEs)
- More vulnerable patient populations more likely to experience severe ADEs
- Neonatal Intensive Care (NICU) patients *three* times more likely to experience ADEs



# Computerized Prescriber Order Entry (CPOE)

- Supports the medication-use process
  - Legibility
  - Completeness
  - Decision Support



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  - CPOE-specific errors
  - **Increased mortality**



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# NICU Medication Orders

CPOE start  
May 2009

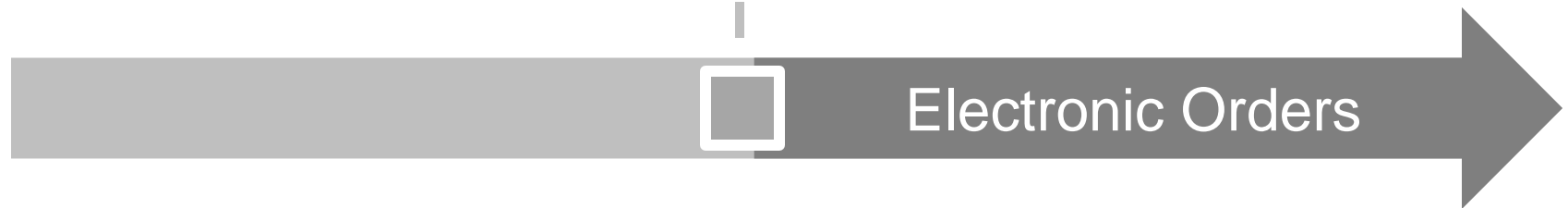


**Handwritten Orders**



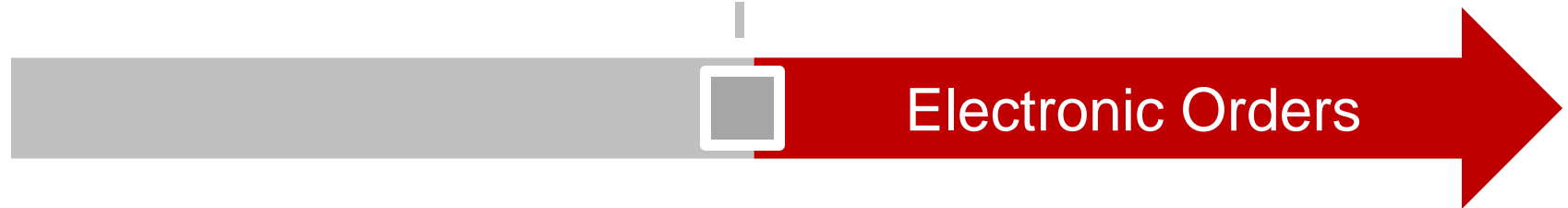
# NICU Medication Orders

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# NICU Medication Orders

CPOE start  
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# Purpose

- Observe whether a change in medication order error rate has occurred in the NICU
- Classify captured errors and determine whether a change in error type has occurred
- Propose system modifications



# Methods

50 days

Pre-CPOE data collection\*

Feb-Apr 2008



CPOE Implementation



# Methods

50 days

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Feb-Apr 2008



CPOE Implementation

May 2009



# Methods

50 days

Pre-CPOE data collection\*

Feb-Apr 2008



CPOE Implementation

May 2009



60 days

Post-CPOE data collection

Jan-Mar 2011



Comparison of Outcomes



# Methods

- Prospective medication profile review by NICU pharmacy specialist
- Medication errors encountered classified according to protocol
- Total # of orders obtained via query
- Review of medication errors by primary investigators



# Definitons

## Medication order errors (MOEs)

- Prescribing MOEs
  - Introduced by prescriber
    - ex: Wrong drug/dose/route ordered



# Definitons

## Medication order errors (MOEs)

- Prescribing MOEs
  - Introduced by prescriber
    - ex: Wrong drug/dose/route ordered
- Transcription MOEs
  - Introduced by pharmacist
    - ex: Wrong product/dose/timing selected



# Definitons (cont.)

## Medication order errors (MOEs)

- “Distribution” MOEs
  - Introduced by complex NICU distribution system  
ex: No label printed to NICU satellite



# Definitons (cont.)

## Medication order errors (MOEs)

- “Distribution” MOEs
  - Introduced by complex NICU distribution system  
ex: No label printed to NICU satellite
- CPOE-specific MOEs
  - Introduced by design of CPOE system  
ex: Physician modified route of IV order



# Outcomes

## Primary

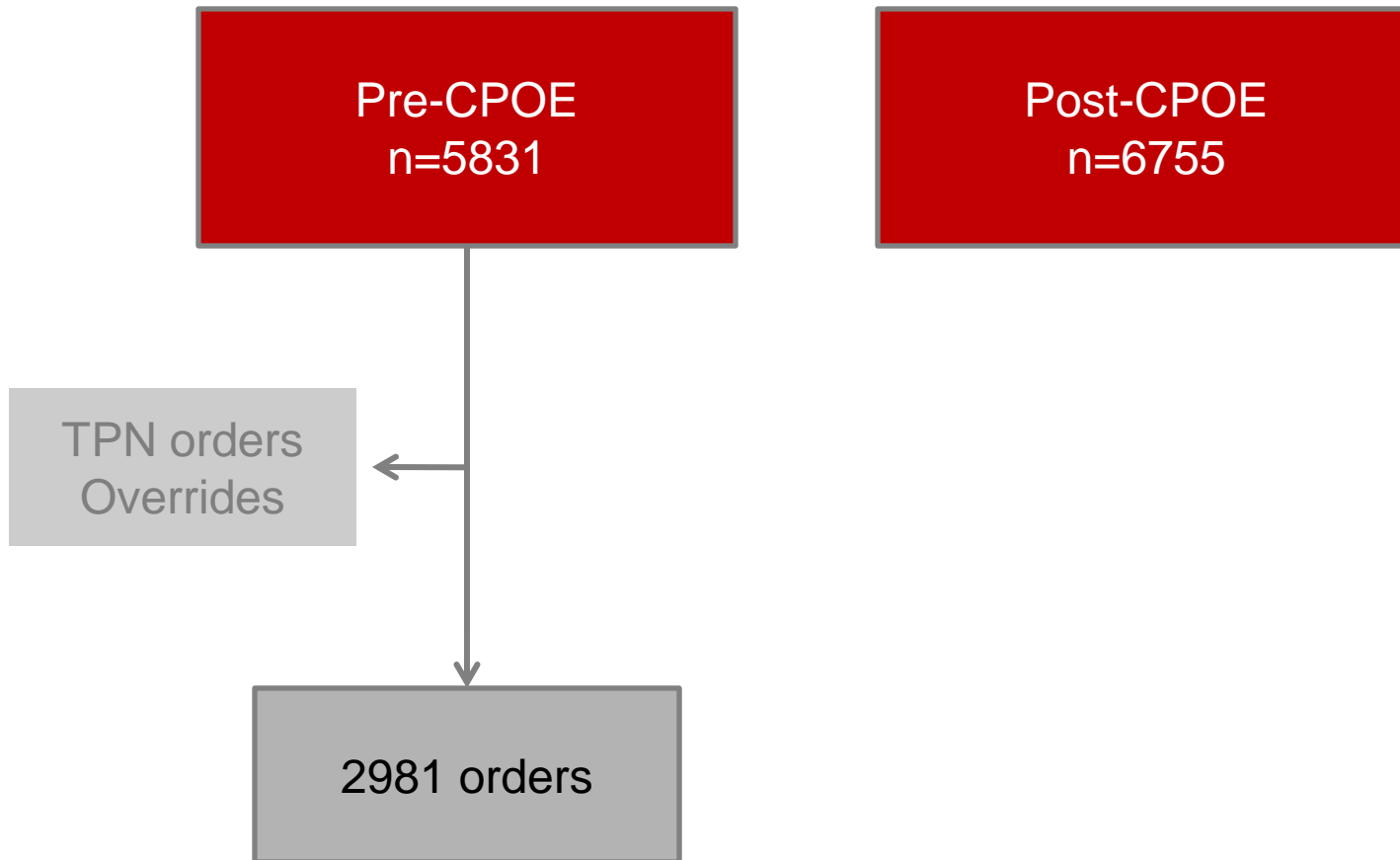
- Change in MOE rate
  - # MOEs / Total # Orders

## Secondary

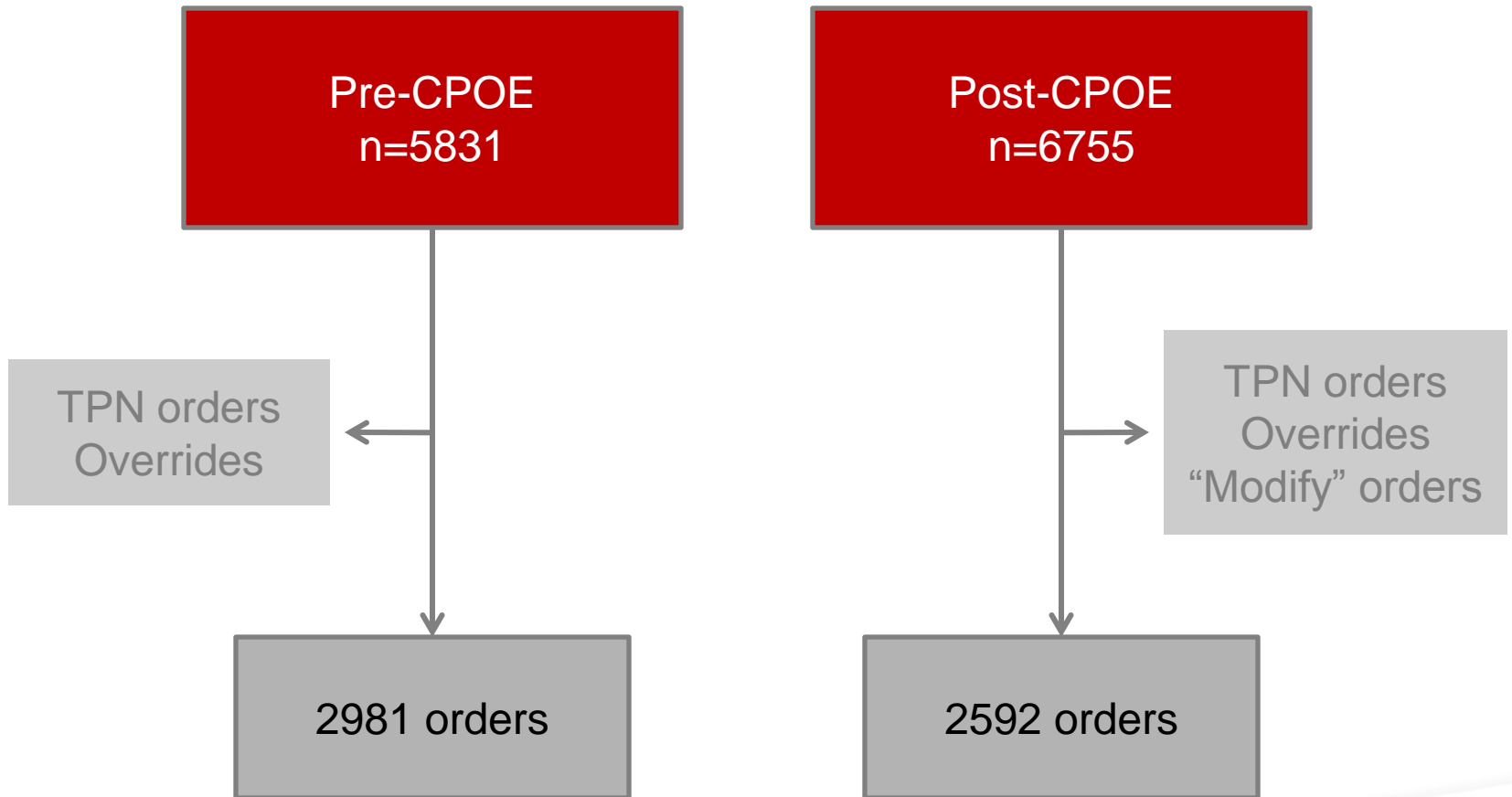
- Change in frequency of certain MOE types



# Study Design



# Study Design



# Results

Error	Pre-CPOE	Post-CPOE	p
Total # MOEs	174	72	<0.01
-Prescribing	13	34	<0.01
-Transcription	97	2	<0.01
-Distribution	64	26	<0.01
-CPOE	0	10	<0.01
Total # Orders	2981	2592	<0.01



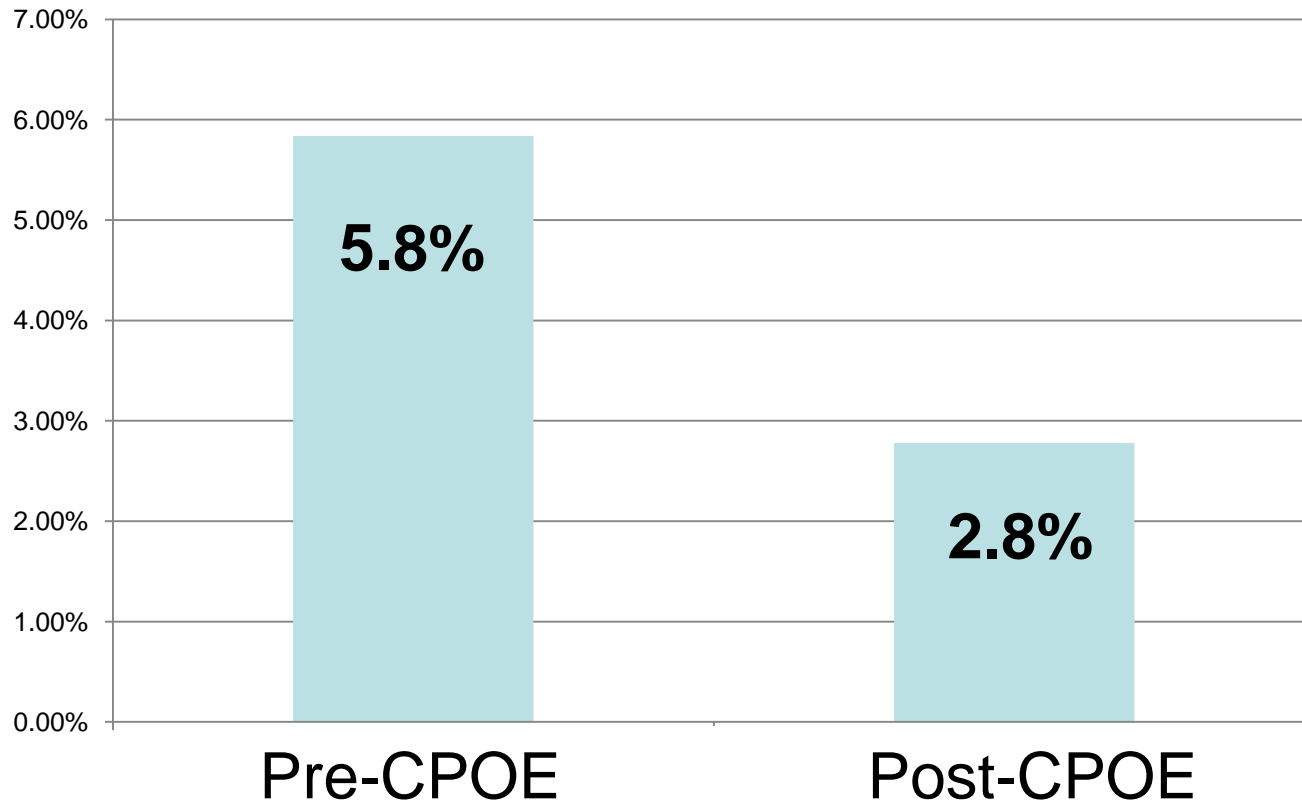
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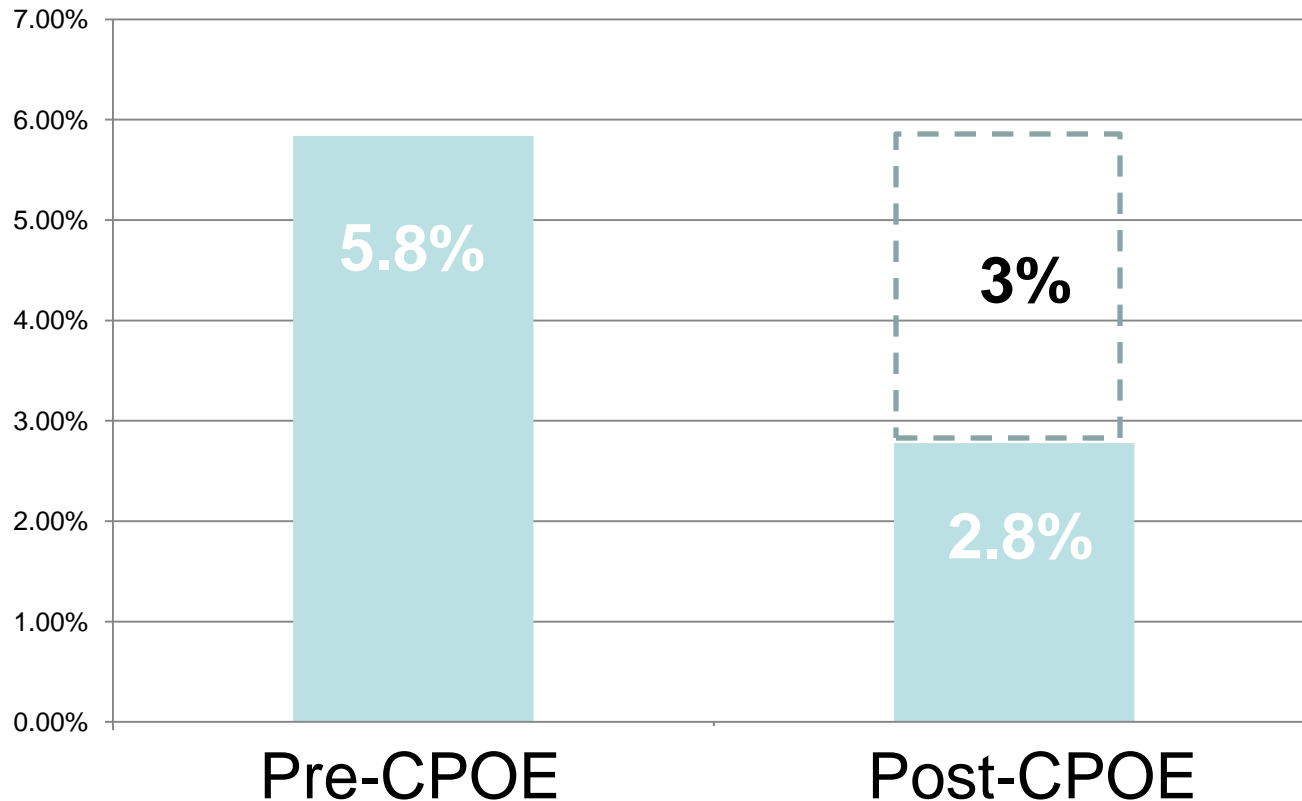
# Primary Outcome

## MOE Rate



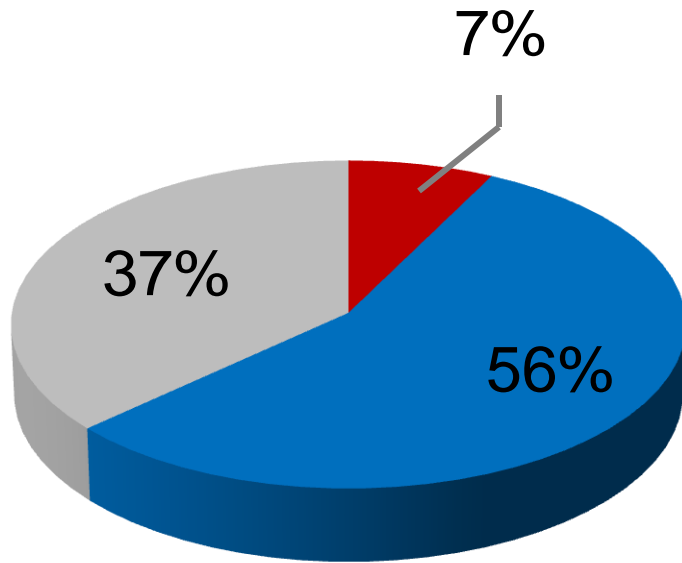
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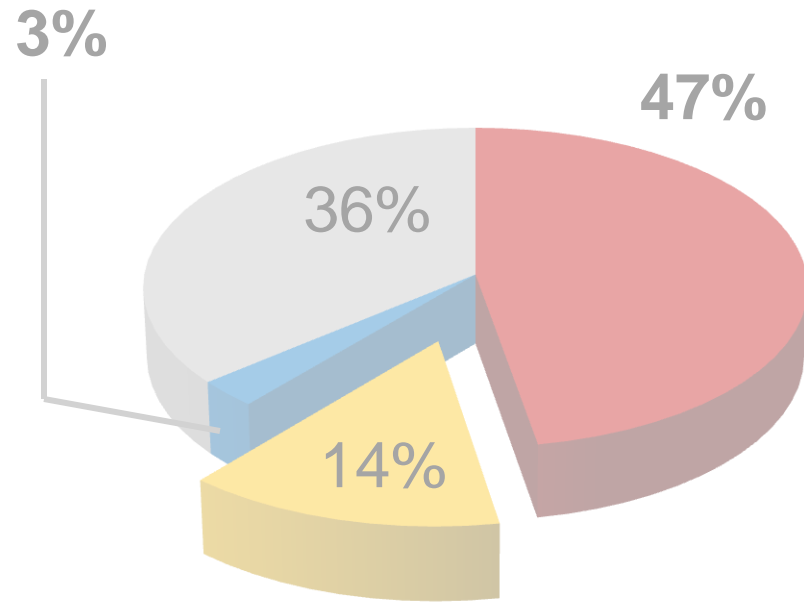


# Error Types

## Pre-CPOE



## Post-CPOE



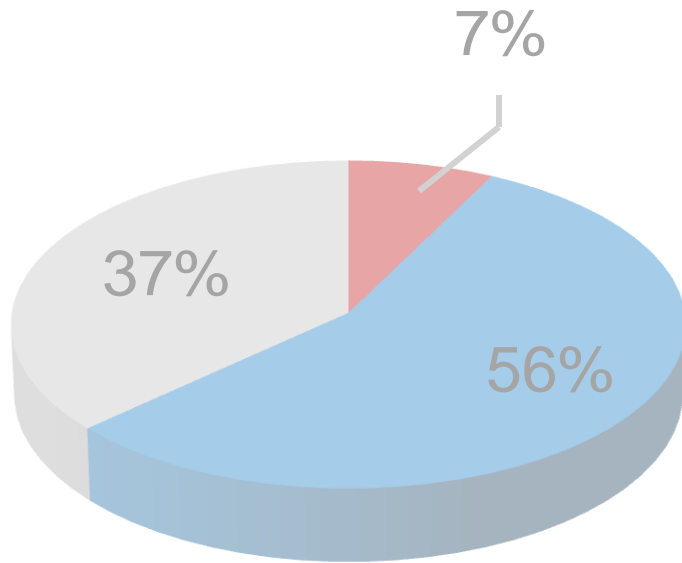
- Prescribing
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Represented as % of total # of MOEs

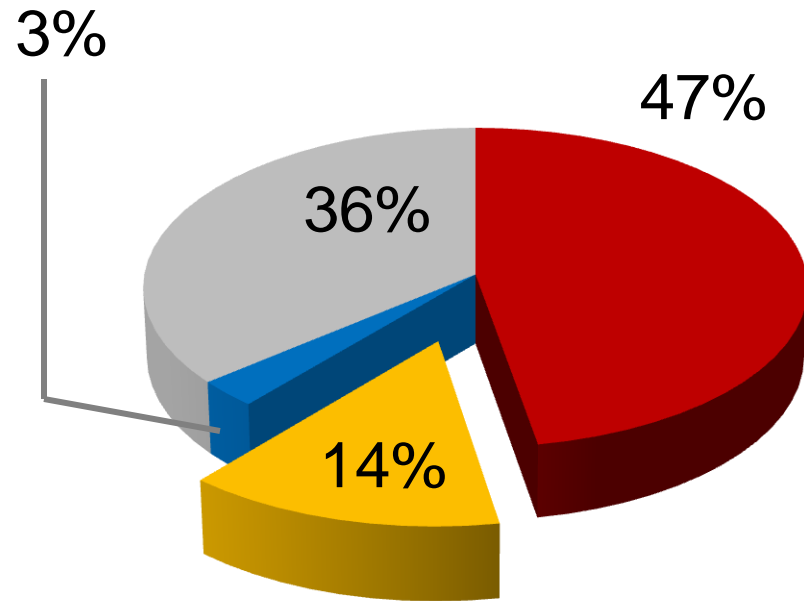


# Error Types

Pre-CPOE



Post-CPOE



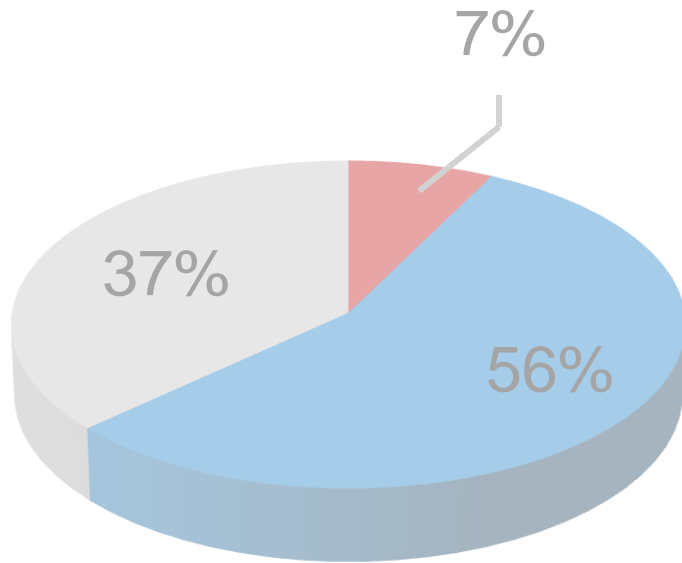
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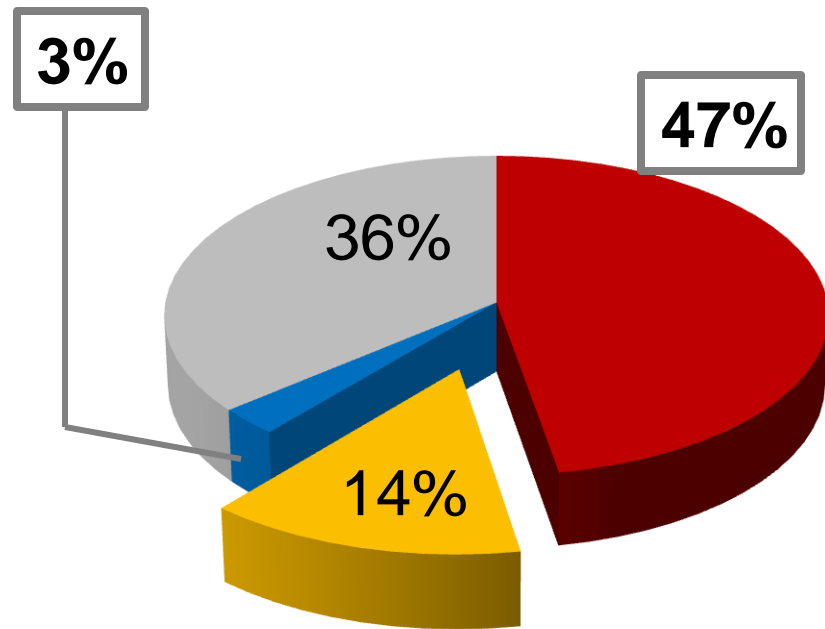


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# Examples: CPOE

- Auto product select link to incorrect product
  - Requires re-entry by pharmacist



# Examples: CPOE

- Auto product select link to incorrect product
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- Minimum divisible quantity insufficient to create correct dose
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# Limitations

- Non-standard definitions of medication error
- Relationship between MOEs and ADEs unclear
- Modified orders excluded post-CPOE
- Before-and-after design cannot prove causation



# Conclusions

- Significant reduction in MOE rate after implementation CPOE



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- Significant reduction in Transcription MOE rate



# Conclusions

- Significant reduction in MOE rate after implementation CPOE
- Significant reduction in Transcription MOE rate
- No change in “distribution” MOE rate
- Significant **increase** in Prescribing MOE rate



# Future Directions

- Error **source** sub-group analysis



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- System modifications (QI phase)
- Prescriber education
  - Targeted vs Generalized



# Future Directions

- Error **source** sub-group analysis
- System modifications (QI phase)
- Prescriber education
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- **Adverse drug event analysis**



# Acknowledgements

- Franklin Huggins, Pharm D, BCPS
- Sara Ridges PharmD
- Craig Herzog RPh, MBA



... and the Neonatal Pharmacy Team!



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# Post-Test Assessment

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