A14/B14: Covert Dynamics of Medication Administration Errors

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#27FORUM

Session Objectives

- Identify the covert as well as visible threats to the medication administration safety net that is ordinarily in place.

- Develop strategies for success in reducing medication administration errors both in the immediate situation and the long-term plan for your institution.
2017 Vision for the ISRN

Success of the Improvement Science Research Network (ISRN) is built on a shared vision which takes into account the unique knowledge needs in healthcare delivery science across our wide array of

More...

Collaboration Opportunities and Benefits

The Improvement Science Research Network (ISRN) offers members a unique opportunity to collaborate with colleagues from around the country on improvement science research projects based on the ISRN Priorities for Improvement Research. Through collaboration, ISRN members will leverage an unprecedented potential to improve patient outcomes and healthcare delivery, both locally and nationally. More...
**ISRN Mission:** To advance the scientific foundation for quality improvement, safety and efficiency through transdisciplinary research addressing healthcare systems, patient-centeredness, and integration of evidence into practice

**Unique infrastructure for conducting improvement research—a collaboratory for research**

**NINR/NIH-supported improvement infrastructure for a research network**

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Research Priorities

A. Coordination and transitions of care
B. High-performing clinical systems and Microsystems approaches to improvement
C. Evidence-based quality improvement and best practice
D. Learning organizations and culture of quality and safety

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Medication errors are the most frequent type of errors in hospitals

- Most interrupted nursing care activity
- Interruptions during medication administration identified as the main reason for medication errors

(Biron, Loiselle and Lavoie-Trombley, 2009)
Complexity Of Nursing Work

- Cognitive stacking used as a measure to quantify Cognitive load of nurses;
  Time weighted average = 11 activities
- Nursing work is non-linear and complex
- Average 9 cognitive shifts an hour
  (Potter et al., 2005)

Results

Each interruption

- 12.1% procedural failures
- 12.7% clinical errors
**Association of Interruptions with an Increased Risk and Severity of Medication Administration Errors**

- **Not checking patient’s ID** - most frequent procedural failure
- **Wrong timing of medication administration** - most frequent clinical error
- **Nurse experience** provided no protection against clinical error

Westbrook, J.T. et.al (2010) Archives of Internal Medicine

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**Factors Contributing to Medication Errors**

- Complexity of Nurses’ Work
- Interruptions
- Distractions
- Cognitive Load
**COGNITIVE OVERLOAD!!!!!!!??????**

- Care Coordination
- Interruptions
- Distractions
- Fatigue

**FUNCTIONAL COMPONENTS OF MEMORY**

- **SHORT TERM MEMORY**
- **LONG TERM MEMORY**
  - **WORKING MEMORY**
  - **RETROSPECTIVE MEMORY**
  - **PROSPECTIVE MEMORY**

Parker & Coiera, 2000; Potter, 2005
Nursing Work: Task Load

Cognitive Work
Prioritization
& Reprioritization

Rapid
Cognitive Shifts

Increases
Cognitive Load

Interruptions

Increase
Demands on
Prospective
Memory

Loss of
Attention

Vulnerability
of Task Loss

Distraction

Procedural
Failures & Errors

Summary of Literature Review
Knowledge and Gaps

Refinement of terminology
Lack of theoretical framework

Methodological Issues
Confounding variables (knowledge translation not uniform, definitions and measures not standardized, culture of safety)
1/3rd of errors harming patients occur at the medication administration stage.

Nurses safeguard 86% of all medication errors (Leape).

Medication administration has few safeguards because it is at the end of process.

“Second Victim Phenomenon” (Trieber & Jones 2010).

Same sensory process used for both the interruption and the primary task.

Two inputs requiring the same physiological mechanisms.

Results in:

- Need to respond to interruptions
- Greater demands on cognitive processing resources
- Loss of memory contents or confusion among information cues (Speier, et.al.)

Theoretical Underpinnings

Cognitive processing of Interruptions
Theoretical Underpinnings

Failures of Prospective Memory

- Reason (1990) identified the interval between the formation of an intention to act and the moment planned for its execution.
- The intention has to be held in prospective memory, a vulnerable part of memory system.

Reason’s Swiss Cheese Model

- Each slice of cheese - a layer of defense.
- Each layer has a hole or gap.
- Hole or gap is created by active failures and latent conditions.
- Holes are in continuous flux.
- Line up of holes to permit brief trajectory.
Brixey’s Concept Analysis of Interruption

- Human experience
- Intrusion of a secondary, unplanned and unexpected task
- Discontinuity
- Externally or Internally Initiated
- Situated within a context

Study Purpose

PHASE 1
To identify the impact of cognitive load, interruptions, and distractions on procedural failures and medication administration errors

PHASE 2
To develop effective interventions for preventing medication errors
# Inclusion Criteria

<table>
<thead>
<tr>
<th>Hospitals</th>
<th>Clinical Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has on staff at least one ISRN research associate</td>
<td>Provides acute care to medical surgical patients</td>
</tr>
<tr>
<td>Beds = 200 or more</td>
<td>Has been in operation for at least a year</td>
</tr>
<tr>
<td>Has a defined medical surgical unit</td>
<td>Have a minimum of 30 beds</td>
</tr>
<tr>
<td></td>
<td>Average LOS on the unit is 2 to 7 days</td>
</tr>
</tbody>
</table>

## Inclusion and Exclusion Criteria for Registered Nurses

### Inclusion Criteria
- Work part time or full time as employees of the hospital
- Have completed orientation on the study unit
- Worked at least six months on the study unit
- Provides direct patient care on the study unit

### Exclusion Criteria
- Registered nurses who work as travelers and per diems
- Registered nurses on orientation
The unit of study = an episode of medication administration to one patient by an RN; included single or multiple medications.

Definitions: Cognitive Load

- Cognitive Load is a multidimensional construct representing a the load that performing a particular task imposes on the learner’s cognitive system (Paas & Van Merrienboer, 1994a).
Definitions: Interruption

A break in the performance of a human activity initiated by a source internal or external to the recipient with occurrence situated within the context of a setting or location. This break results in the suspension of an initial task to perform an unplanned task with the assumption that the initial task be resumed. (Brixey et al, 2007)

Definitions: Distraction

Distractions include anything that draws away, diverts, or disturbs attention from achieving a goal (Pape, 2003).
Definitions: Medication Administration Errors (MAEs)

MAEs are specific to the period of administration and Medication administration accuracy is defined as administration of a dose of medication exactly as it was ordered by the physician.

Errors

- Wrong Patient
- Wrong Drug
- Wrong Dose
- Wrong Route
- Wrong Time
- Omission
- Error in documentation

Definition: Procedural Failures

The process of medication administration is based on six rights: Right Patient, Right Drug, Right Dose, Right Route, Right Time and Accurate and Timely Documentation
### Data Tool Method

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Demographics Form</th>
<th>RN participant will complete.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive Load</td>
<td>NASA Task Load Index</td>
<td>RN participant will complete.</td>
</tr>
<tr>
<td>Interruptions</td>
<td>Structured Observation Sheet</td>
<td>Direct Observation and Medical Record Review will be completed by Trained Observers</td>
</tr>
<tr>
<td>Distractions</td>
<td>Self-Report: Distraction experienced during medication</td>
<td>RN participant will complete.</td>
</tr>
</tbody>
</table>

### Results

#### Demographics

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>93.67% F</td>
<td>6.33% M</td>
</tr>
<tr>
<td>Employment Status</td>
<td>87.34% FT</td>
<td>12.66% PT</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Mean</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Std Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>78</td>
<td>38.149</td>
<td>22.00</td>
<td>65.00</td>
<td>12.13</td>
</tr>
<tr>
<td>Yrs Exp RN</td>
<td>79</td>
<td>9.59</td>
<td>0.00</td>
<td>36.00</td>
<td>9.54</td>
</tr>
<tr>
<td>Yrs Exp RN unit</td>
<td>79</td>
<td>6.27</td>
<td>0.00</td>
<td>33.00</td>
<td>6.76</td>
</tr>
</tbody>
</table>
Demographics

Educational Preparation

<table>
<thead>
<tr>
<th>Degree</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Masters</td>
<td>5.56%</td>
</tr>
<tr>
<td>Bachelors</td>
<td>63.33%</td>
</tr>
<tr>
<td>Associates</td>
<td>30%</td>
</tr>
<tr>
<td>Diploma</td>
<td>1.11%</td>
</tr>
</tbody>
</table>

Shift Sequence

<table>
<thead>
<tr>
<th>Shift</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shift 1</td>
<td>56.96%</td>
</tr>
<tr>
<td>Shift 2</td>
<td>31.65%</td>
</tr>
<tr>
<td>Shift 3</td>
<td>8.86%</td>
</tr>
</tbody>
</table>

Demographics

<table>
<thead>
<tr>
<th>Nurse to Patient Ratio</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/8</td>
<td>2</td>
<td>2.53</td>
</tr>
<tr>
<td>1/7</td>
<td>1</td>
<td>1.27</td>
</tr>
<tr>
<td>1/6</td>
<td>27</td>
<td>34.18</td>
</tr>
<tr>
<td>1/5</td>
<td>15</td>
<td>18.99</td>
</tr>
<tr>
<td>1/4</td>
<td>7</td>
<td>8.86</td>
</tr>
<tr>
<td>1/3</td>
<td>14</td>
<td>17.72</td>
</tr>
<tr>
<td>1/2</td>
<td>1</td>
<td>1.27</td>
</tr>
</tbody>
</table>
Specific Aim 1

- Describe cognitive load, interruptions, and distractions experienced by registered nurses during administration of medications.

NASA-TLX

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>N Miss</th>
<th>Mean</th>
<th>Median</th>
<th>Std Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mental Demand</td>
<td>857</td>
<td>0</td>
<td>26.41</td>
<td>20.00</td>
<td>24.74</td>
</tr>
<tr>
<td>Physical Demand</td>
<td>857</td>
<td>0</td>
<td>18.51</td>
<td>10.00</td>
<td>19.75</td>
</tr>
<tr>
<td>Temporal Demand</td>
<td>857</td>
<td>0</td>
<td>25.37</td>
<td>15.00</td>
<td>24.37</td>
</tr>
<tr>
<td>Performance</td>
<td>857</td>
<td>0</td>
<td>78.09</td>
<td>90.00</td>
<td>28.10</td>
</tr>
<tr>
<td>Effort</td>
<td>856</td>
<td>1</td>
<td>29.39</td>
<td>20.00</td>
<td>26.43</td>
</tr>
<tr>
<td>Frustration</td>
<td>857</td>
<td>0</td>
<td>24.31</td>
<td>15.00</td>
<td>25.87</td>
</tr>
</tbody>
</table>

Minimum = 0  Maximum = 100
Interruptions

<table>
<thead>
<tr>
<th>Any interruptions</th>
<th>Frequency</th>
<th>Percent</th>
<th>Cumulative Frequency</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>282</td>
<td>32.91</td>
<td>282</td>
<td>32.91</td>
</tr>
<tr>
<td>1</td>
<td>575</td>
<td>67.09</td>
<td>857</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Interruptions ranged from 1 to 20 per episode

Distractions: Self Report

<table>
<thead>
<tr>
<th>Distractions</th>
<th>Experienced By:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal factors</td>
<td>30.46%</td>
</tr>
<tr>
<td>Illness</td>
<td>12.49%</td>
</tr>
<tr>
<td>Pain</td>
<td>11.2%</td>
</tr>
<tr>
<td>Fatigue</td>
<td>36.17%</td>
</tr>
<tr>
<td>Hunger</td>
<td>35.9%</td>
</tr>
<tr>
<td>Bathroom need</td>
<td>21%</td>
</tr>
<tr>
<td>Worry (Family)</td>
<td>14.70%</td>
</tr>
<tr>
<td>Distracted by noise level</td>
<td>31.04%</td>
</tr>
<tr>
<td>Unresolved issues other patients</td>
<td>49.12%</td>
</tr>
</tbody>
</table>
Specific Aim 2: Examine the Relationship of Interruptions and Distractions on Cognitive Load

- Having an interruption and number of interruptions experienced was significantly associated with MD, TD, Effort and Frustration ($p < .05, PD p = .0517$)
- Nurses experiencing distractions during an MA episode have high perceived MD, TD, PD, Effort and Frustration levels ($p = 0.0024$)

Specific Aim 3

- Investigate the impact of cognitive load on procedural failures and medication administration errors
**Procedural Failures**

- **No**: Frequency 161, Percent 18.79
- **Yes**: Frequency 696, Percent 81.21

**Medication Administration Errors**

- **Frequency**
  - **No**: Frequency 783
  - **Yes**: Frequency 71
- **Percent**
  - **No**: Percent 91.69
  - **Yes**: Percent 8.31
### MEDICATION ERRORS

<table>
<thead>
<tr>
<th>Type of Error</th>
<th>Frequency</th>
<th>Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>2155</td>
<td>92.37%</td>
<td>92.37%</td>
</tr>
<tr>
<td>Wrong dose</td>
<td>2</td>
<td>0.09%</td>
<td>92.46%</td>
</tr>
<tr>
<td>Wrong time</td>
<td>70</td>
<td>3.00%</td>
<td>95.46%</td>
</tr>
<tr>
<td>Inaccurate documentation</td>
<td>86</td>
<td>3.69%</td>
<td>99.14%</td>
</tr>
<tr>
<td>Omission</td>
<td>20</td>
<td>0.86%</td>
<td>100.00%</td>
</tr>
</tbody>
</table>

*Frequency Missing = 10*

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### Results

- **Interruptions**
  - Significant

- **Distractions**
  - Significant

- **Cognitive Load**
  - MD, TD, Frustration, Effort

- **Procedure Failures**
  - Significant

- **Medication Administration Errors**
  - Significant

- **Number of Medications**
  - Significant

- **Nurses’ Age**
  - Significant
7 Strategies to Enable the Safety Net

- SILENCE
- SENSITIZE
- SAFETY
- SIMULATION
- STRIVE
- SENSES
- SOURCES

Silence

- Respect the role of silence
Sensitize

- SENSITIZE others that medication administration is a high-risk activity

Safety

- Leaders articulate that SAFETY around medication administration is an institutional priority
Use **Simulation** to mimic high volume, interruption-driven environments

**STRIVE** for a non-distracted sense of mindfulness
Senses

- Sensory processing or **SENSES** may fail during stress
- Double-check visual processing

Sources

- Use **SOURCES** to manage distractions and interruptions that compete with memory demands
References

- Please see handout

Thank you members of the audience! and Thank You Conference Planning Committee!