Medication Safety: Where Do We Work to Reduce the Risk

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Chief Medical Officer
Piedmont Healthcare
Objectives for the Session

• Understand Important Vulnerabilities in Medication Safety
• How to mitigate Human Errors in Medication Safety
• What can each of us do to improve medication safety?
Some Data for Context

- Across PHC, about 700K medications are processed each MONTH.
- We have an average of 5743 medication “variances” per YEAR (.068%).
- The number of serious safety events (SSE) was 6 over 6 months (<1 per 1,000,000)- so called “6 Sigma” performance.
- The only other process in healthcare that SAFE is general anesthesia.
The Five Stages of the Medication Process

1. Ordering / Rx
2. Transcribe / Verify
3. Dispensing and Delivering
4. Administering
5. Monitoring / Reporting
Human Error can occur at ANY step...

*Data from analysis of PHC variances related to medications / fluids*
Human Error can occur at ANY step...

~40%

Ordering / Rx, Transcribe / Verify, Dispensing and Delivering (10%), Administering

~50%

Monitoring / Reporting

The “Promise of CPOE”

*39% of EHRs testing failed to detect harmful drug orders, 13% could be fatal*
To Understand SAFETY, We Must Talk about Errors

**ERRORS**
When actions are intended but not performed

**MISTAKES**
Errors in planning actions

1. Knowledge-based errors
   2a. Good rules misapplied
   2b. Bad rules or failure to apply good rules

2. Rule-based errors

**SKILL-BASED ERRORS** (slips and lapses)
Errors in executing correctly planned actions

3. Action-based errors (slips)
   3a. Technical errors

4. Memory-based errors (lapsed)

Lets Start with the END in Mind

Action Hierarchy

**Weak Actions**
- Double-checks
- Warnings
- New Policy
- Training

**Intermediate**
- Redundancy
- Decrease workload
- Eliminate distraction
- Educate using simulation
- Cognitive Aids
- Eliminate look alike
- Standardize communication tools

**Stronger**
- Physical Plant changes
- New devices with usability testing
- Simplify process
- Standardize equipment or process
- Tangible involvement by leadership
## Skill Based Human Failures (Slip & Lapse)

*Errors Rare (3/1000) Made by experienced and highly trained, well motivated staff: Additional training NOT valid*

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<tr>
<th>Characteristics</th>
<th>Error Prevention Interventions</th>
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| **Slip** – A frequently performed physical action goes wrong | • Automation  
  • Checklists and reminders  
  • Verification check points  
  • Visual cues and reminders |
| • Familiar tasks that require little conscious attention  
  • Error could happen when attention is momentarily diverted  
  • Repetition                                                                 |
| **Lapse** – Short-term memory lapse | • Self checks and 2\textsuperscript{nd} person checks  
  • Removal of distractions and interruptions  
  • Sufficient time available to complete task  
  • Warnings and alarms to help detect errors |
| • Not doing what you meant to do  
  • Omissions following interruptions  
  • Perceptual Confusion                                                      |
Skill Based Activity

Calculate Dose Based on Weight

Todd, the cat, has been prescribed a drug that should be given 2mg per kg of his weight. Todd is a solid 24 lb cat. Calculate Todd's dosage.

\[
2.2 \text{ lb} = 1 \text{ kg}
\]

\[
\frac{2 \text{ mg}}{1 \text{ kg}} \rightarrow \frac{2 \text{ mg}}{2.2 \text{ lb}} = \quad 
\]
Example of Skill Based Slip

• Omission associated with interruption
  – “I picked up my coat to go out when the phone rang. I answered it and then went out the door without my coat.”

• Reduced Intentionality
  – “I went into the bedroom to fetch a book. Took off my rings, looked into the mirror and came out again--without book.”
**General**

- **Diet/Nutrition**
  - Diet NPO
    - Diet effective now starting today at 0915 Until Specified
      - Pre-op, Sign & Hold

- **VTE Risk Assessment**
  - VTE Low Risk
  - VTE Moderate Risk
  - VTE High Risk
    - VTE Risk Score High? Yes
      - Sign & Hold

- **Mechanical VTE Prophylaxis for All Patients - IPC preselected**
  - Intermittent pneumatic compression (IPC)
    - Routine, Until discontinued starting today at 0915 Until Specified
      - Pre-op, Sign & Hold

- **Mechanical Contraindications**

- **Chemo VTE Prophylaxis - select proper medication or a contraindication for this patient**
  - heparin, porcine (PF) injection 5,000 Units
    - 5,000 Units, Subcutaneous, 30 min pre-op, starting today at 0914, Pre-op, Sign & Hold
  - Enoxaparin (LOVENOX) 40 mg injection
    - 40 mg, Subcutaneous, 30 min pre-op, starting 3/28/19, Pre-op
  - Enoxaparin (LOVENOX) 30 mg injection
    - 30 mg, Subcutaneous, 30 min pre-op, starting 3/28/19, Pre-op
  - Orthopedic Patients Only: aspirin tablet
    - 325 mg, Oral, 30 min pre-op, starting 3/28/19, Pre-op

**Medications**

- **Antibiotics**

**Additional SmartSet Orders**
Did I Order Antibiotics?
### VTE Risk Assessment

- **VTE: Low Risk**
- **VTE: Moderate Risk**
- **VTE: High Risk**
  - VTE Risk Score High? Yes
  - Sign & Hold

### Mechanical VTE Prophylaxis for All Patients - IPC preselected

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### Pharmacological Contraindications
- Pharmacological Contraindications

**Medications**

**Antibiotics**

- Cefazolin 2 g dose for patient weighing LESS than or equal 120 kg
- Cephalosporin or PCN Allergy Options for patients weighing LESS than or equal 80 kg

- Additional SmartSet Orders
Can You Imagine That Happening Anywhere?

Ordering / Rx  Transcribe / Verify  Dispensing and Delivering  Administrating  Monitoring / Reporting
Mitigation Strategies for Skill-based errors

- Other workplace design
- Fatigue management
- Checklists
- Independent double checks
- Active supervision

Minimize Distractions
# Rule-Based Performance

## What You’re Doing At The Time

Responding to a situation by recalling and using a rule that you learned either through education or experience

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<thead>
<tr>
<th>Errors You Experience</th>
<th>Error Prevention Strategy</th>
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<tbody>
<tr>
<td><em>Used the wrong rule</em> — You were taught or learned the wrong response for the situation*</td>
<td><em>Educate about the right rule</em></td>
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<td><em>Misapplied a rule</em> — You knew the right response but picked another response instead*</td>
<td><em>Think a second time</em></td>
</tr>
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<td><em>Non-compliance</em> — Chose not to follow the rule (usually, thinking that not following the rule was the better option at the time)*</td>
<td><em>Reduce burden, increase risk awareness, improve coaching</em></td>
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1 in 100 choices made in error (not too bad!)
Example of Rule-Based

• Misapplication of “Good Rule”
  – “Good Rule” is one that has worked in past
  – The more it has worked, the “stronger” it is
  – First exception
    • All patients sleeping throughout night are having a “good” night
Patient with gout no other hx

• Order for pegloticase (Krystexxa)
The importance of similarity and frequency

- When cognitive operations are *under*-specified, they tend to default to contextually appropriate, high frequency responses.

- True both for physical context and semantic
• What to you call the tree that grows from acorns?
  – OAK

• What do we call a funny story?
  – JOKE

• What sound does a frog make?
  – CROAK

• What is another word for cape?
  – CLOAK

• What do you call the white of an egg?
What did you see?
ONCE IN A LIFETIME
Look at the chart and say the **COLOUR** not the word

YELLOW  BLUE  ORANGE  BLACK  RED  GREEN  PURPLE  YELLOW  RED  ORANGE  GREEN  BLACK  BLUE  RED  PURPLE  GREEN  BLUE  ORANGE

Left – Right Conflict

Your right brain tries to say the colour but your left brain insists on reading the word.
Encoding Deficient Rule

- Red top means lidocaine with Epinephrine
Encoding Deficient Rule

- Red top means lidocaine with Epinephrine
- AND red letters on white background means CONTAINS preservative and White letters on RED background NO preservative
Weak Actions
- Double-checks
- Warnings
- New Policy
- Training

Intermediate
- Redundancy
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Stronger
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Lets Start with the END in Mind
Action Hierarchy
Physical Plant Changes
• One tubing ONLY fits Epidural Pump and One ONLY fits IV pump
Action-deficient rule

• Rules in which the consequence is inappropriate, inefficient or otherwise maladaptive
Mitigation Strategies for Rule Based errors

- Train for exceptions
  - What if patient is PCN allergic?
- Good team climate
  - Peer Checking / Coaching
  - Ask a Question / Request a change

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|   | Practice Peer Checking and Peer Coaching  
|   | Example: Incorrect sponge count. Tech notified physician (peer coaching) and together (teamwork) they kept looking until they found the sponge. |

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|   | Practice with a Questioning Attitude: Validate and Verify  
|   | Example: Nurse notices odd amount of fluid in IV, asks pharmacy questions, discovers the mixture is incorrect. |

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|   | Always Stop, Think, Act, Review  
|   | Example: Before sending an email, stop a moment, think about what's in the email, make changes if needed, then review before sending. |

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|   | Notifications – Situation, Background, Assessment, Recommendations/Request  
|   | Example: Validate and verify your steps every day. Communicate everything - if something seems wrong or you did something important others may need to know about, talk about it. |
Where could we USE th 11 Error Prevention Tools?

Ordering / Rx  Transcribe / Verify  Dispensing and Delivering  Administering  Monitoring / Reporting
Lack of Knowledge-Based Performance

What You’re Doing At The Time
Problem solving in a new, unfamiliar situation.
You come up with the answer by:
- Using what we do know
- Taking a guess
- Figuring it out by trial-and-error

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<td>(a mistake)</td>
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30-60 of 100 decisions made in error (yikes!)
Using What We Know to Solve New Problem
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Blunt abdominal trauma ED management

Consider mechanism, presence of extra-abdominal trauma

Hemodynamically stable?

No

US+/-DPT

+ لبن

LAP

Signs of extra-abdominal hemorrhage? (eg, pelvic fracture, long bone fracture, laceration?)

- لبن

Resuscitation then Abd CT (+/-)

Observe/serial exams +/- admit

- لبن

NOM vs. LAP

Alert? Non-intoxicated?

Yes

Management options include:
- Abd CT
- Serial exams +/- admit

No

If Abd CT positive, NOM vs. LAP

If serial exams, continue until patient clinically sober and no distracting injury

Yes

US

- لبن

Abd CT

Serial exams +/- Abd CT

Observe

NOM vs. LAP

Discharge
### Additional Strategies for Knowledge-Based errors

- **Solving unique / complex problems**
- **Do not proceed in face of uncertainty**

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Summary

• Hospital Medication is one of the safest hospital processes
  • (in terms of incident rate)
  • Opportunities remain in each of the 5 stages of Medication Process

• Understanding HOW we fail as Humans helps develop strategies to ANTICPATE and MITIGATE our errors
  • Understand the modality in which the brain is working (Skill-based, Rules-based or Knowledge based)
  • Fit the strategy to the failure modality (recognize that not all strategies are equal; some stronger than others)

• Broad use of the 11 Error Prevention tools is a good “safe bet, no regrets” to mitigate ALL forms of error
I have no idea what I am talking about...

...so here's a bunny with a pancake on its head.
References

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  – Ronda Hughes; Mary Blegen Patient Safety and Quality” An Evidence-Based Handbook for Nurses 2008

• James Reason Human Error Cambridge Press 1990

• PHC Pharmacy Data Scott McCauley PHC pharmacy lead

• Fortune Magazine April 2019 “Death by a 1000 Clicks”