Title: Learning from Defects
Learning from and Preventing adverse events

Armstrong Institute for Patient Safety and Quality

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Title: Associate Professor
Comprehensive Unit-based Safety Program (CUSP)

1. Educate staff on science of safety (www.safercare.net)
2. Identify defects
3. Assign executive to adopt unit
4. Learn from one defect per quarter
5. Implement teamwork tools
Annual US Health Research Funding

<table>
<thead>
<tr>
<th>Type of Research</th>
<th>Millions of Dollars Spent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic</td>
<td>12,957</td>
</tr>
<tr>
<td>Clinical</td>
<td>17,800</td>
</tr>
<tr>
<td>Health Services</td>
<td>1508.8</td>
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</table>

Federal

Pharma
Assessing Defects

• Staff Safety assessment
  o Please describe how you think the next patient in your unit/clinical area will be harmed.
• Adverse event reporting systems
• Sentinel events
• Complications
• Infection rates
• Mortality and morbidity conference
• Claims data
A Medication Error Story

- 63 year old man with sternal infection transferred to the ICU
- Allergy to Penicillin noted in chart
- Treatment includes Piperacillan
- 25 minutes after dose, patient arrests
- Antibiotic reaction regarded as likely trigger
A Medication Error Story

Nurse borrows medication from another patient

Tube system for obtaining medications is broken

Fax system for ordering medications is broken

ICU nurse staffing

Nurse gives the patient a medication to which he is allergic

Patient arrests and dies
Epinephrine

Vitamin E
Impact of ICU Nurse Staffing on Outcomes*

- Fewer ICU nurses associated with increased LOS risk of pulmonary complications
  - Pulmonary insufficiency
  - Reintubation of trachea
  - Pneumonia

Impact of Pharmacist on Outcomes*

- Pharmacist participation on daily rounds in the ICU associated with
  - 66% reduction in adverse drug events (ADEs)
  - ADEs reduced 10.4/1000 pt days to 3.5
  - Prevent one ADE every 143 patients

Example: Improve Pain Management

1. Educate Staff
2. Put VAS card at bedside
3. Have residents report pain scores
4. Define defect as pain score > 3.
Percent of ICU Patients per Week where Pain was Measured with a Modified VAS Scale
Improve Pain Management

% with VAS < 3

week 1  week 2  week 3  week 4  week 5
Problem Solving*

• First Order
  – Recovers for that patient yet does not reduce risks for future patients
  – Example: You go get the supply or you make do

• Second Order
  – Reduces risks for future patients by improving work processes
  – Example: You create a process to make sure line cart is stocked

What is a Defect?

Anything you do not want to have happen again.
4 Questions That we use to Learn from Defects

• What happened?

• Why did it happen?

• What will you do to reduce the chance it will recur?

• How do you know that you reduced the risk that it will happen again?
What Happened?

• Reconstruct the timeline and explain what happened

• Put yourself in the place of those involved, in the middle of the event as it was unfolding

• Try to understand what they were thinking and the reasoning behind their actions/decisions

• Try to view the world as they did when the event occurred

Reason J. Human Error. Cambridge, UK: Cambridge Univ Pr; 1990.
What Happened?

- Talk about and understand what happened
- Complete the “What Happened?” section of the Learning from Defects tool.

Group Exercise: 5 Minutes
Why did it Happen?

- Develop lenses to see the system (latent) factors that lead to the event
- Often result from production pressures
- Damaging consequences may not be evident until a “triggering event” occurs

Reason J. Human Error. Cambridge, UK: Cambridge Univ Pr; 1990.
Why did it Happen?

- Review the list of factors that contributed to the incident and check off those that negatively contributed and positively contributed to the defect

  - **Negative contributing factors** are those that harmed or increased risk of harm for the patient

  - **Positive contributing factors** limited the impact of harm
Why did it Happen?

• Complete the contributing factors section

• Items may positively contribute, negatively contribute, or not apply (n/a)

• These are examples but you may identify factors that are not listed, if so, write down
Why did it Happen?

• Review the list of contributing factors and identify the most important factors related to this event.

• Rate each contributing factor on its importance to this event and future events.

Group Exercise: 5-10 Minutes
What will you do to reduce the risk?

• Safe design principles
  – Standardize what we do
    – Eliminate defects
  – Create independent checks
  – Make it visible

• Safe design applies to technical and team work
Rank Order of Error Reduction Strategies

Forcing functions and constraints

Automation and computerization

Standardization and protocols

Checklists and double check systems

Rules and policies

Education / Information

Be more careful, be vigilant
# Strength of Interventions

<table>
<thead>
<tr>
<th>Weaker Actions</th>
<th>Intermediate Actions</th>
<th>Stronger Actions</th>
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<tbody>
<tr>
<td>Double Check</td>
<td>Checklists/ Cognitive Aid</td>
<td>Architectural/physical plant changes</td>
</tr>
<tr>
<td>Warnings and labels</td>
<td>Increased Staffing/Reduce workload</td>
<td>Tangible involvement and action by leadership in support of patient safety</td>
</tr>
<tr>
<td>New policy, procedure, or memorandum</td>
<td>Redundancy</td>
<td>Simplify the process/remove unnecessary steps</td>
</tr>
<tr>
<td>Training and/or education</td>
<td>Enhance Communication (read-back, SBAR etc.)</td>
<td>Standardize equipment and/ or process of care map</td>
</tr>
<tr>
<td>Additional Study/analysis</td>
<td>Software enhancement/modifications</td>
<td>New device usability testing before purchasing</td>
</tr>
<tr>
<td></td>
<td>Eliminate look alike and sound-a-likes</td>
<td>Engineering Control of interlock (forcing functions)</td>
</tr>
<tr>
<td></td>
<td>Eliminate/reduce distractions</td>
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</table>

Remember sometimes a weaker action is your only option.

Adapted from John Gosbee, MD, MS Human Factors Engineering
What will you do to reduce the risk?

- Review the 2-5 most important contributing factors
- Brainstorm Interventions
  - Develop an intervention to defend against the 2-5 most important contributing factors
  - Identify the strongest interventions that are feasible.
  - Identify a metric that you can use to measure the impact of the intervention
- Rate each intervention for its ability to mitigate the contributing factor and the teams belief that the intervention will be implemented and executed
What will you do to reduce the risk?

• Select top interventions (2 to 5) and develop intervention plan

• Assign person and task follow-up date

Group Exercise: 10 Minutes
How do you know risks were reduced?

• Did you create a policy or procedure (weak)?

• Do staff know about policy or procedure?

• Are staff using the procedure as intended?
  – Behavior observations, audits

• Do staff believe risks were reduced?
How do you know risks were reduced?

• Once interventions have been implemented complete the “Describe Defect” and “Interventions” portion of section IV of the Learning from Defect Tool.

• Distribute to staff to rate:
  – The effectiveness of the implementation
  – How effective the intervention has been at reducing reoccurrence of the defect
Summarize and Share Findings

- Summarize findings (Case Summary)
- Share within your organizations
- Share de-identified findings with others in collaborative (pending institutional approval)
**Safety Tips:**
- Label devices that work together to complete a procedure
- Rule: stock together devices need to complete a task

**CASE IN POINT:** An African American male ≥ 65 years of age was admitted to a cardiac surgical ICU in the early morning hours. The patient was status-post cardiac surgery and on dialysis at the time of the incident. Within 2 hours of admission to the ICU it was clear that the patient needed a transvenous pacing wire. The wire was threaded using an IJ Cordis sheath, which is a stocked item in the ICU and standard for PA caths, but not the right size for a transvenous pacing wire. The sheath that matched the pacing wire was not stocked in this ICU since transvenous pacing wires are used infrequently. The wire was threaded and placed in the ventricle and staff soon realized that the sheath did not properly seal over the wire, thus introducing risk of an air embolus. Since the wire was pacing the patient at 100%, there was no possibility for removal at that time. To reduce the patient’s risk of embolus, the bedside nurse and resident sealed the sheath using gauze and tape.

**SYSTEM FAILURES:**

- **Knowledge, skills & competence.** Care providers lacked the knowledge needed to match a transvenous pacing wire with appropriate sized sheath.
- **Unit Environment: availability of device.** The appropriate size sheath for a transvenous pacing wire was not a stocked device. Pacing wires and matching sheaths packages separately... increases complexity.
- **Medical Equipment/Device.** There was apparently no label or mechanism for warning the staff that the IJ Cordis sheath was too big for the transvenous pacing wire.

**OPPORTUNITIES for IMPROVEMENT:**

- Regular training and education, even if infrequently used, of all devices and equipment.
- Infrequently used equipment/devices should still be stocked in the ICU. Devices that must work together to complete a procedure should be packaged together.
- Label wires and sheaths noting the appropriate partner for this device.

**ACTIONS TAKEN TO PREVENT HARM IN THIS CASE**
The bedside nurse taped together the correct size catheter and wire that were stored in the supply cabinet. In addition, she contacted central supply and requested that pacing wires and matching sheaths be packaged together.
### Critical Care Fellowship Program*

<table>
<thead>
<tr>
<th>Fellow</th>
<th>Defect</th>
<th>Interventions</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Unstable oxygen tanks on beds</td>
<td>Oxygen tank holders repaired or new holders installed institution-wide</td>
</tr>
<tr>
<td>2</td>
<td>Nasoduodenal tube (NDT) placed in lung</td>
<td>Protocol developed for NDT placement</td>
</tr>
<tr>
<td>3</td>
<td>Medication look-alike</td>
<td>Education, physical separation of medications, letter to manufacturer</td>
</tr>
<tr>
<td>4</td>
<td>Bronchoscopy cart missing equipment</td>
<td>Checklist developed for stocking cart</td>
</tr>
<tr>
<td>5</td>
<td>Communication with surgical services about night coverage</td>
<td>White-board installed to enhance communication</td>
</tr>
<tr>
<td>6</td>
<td>Inconsistent use of Daily Goals rounding tool</td>
<td>Gained consensus on required elements of Daily Goals rounding tool</td>
</tr>
<tr>
<td>7</td>
<td>Variation in palliative care/withdrawal of therapy orders</td>
<td>Orderset developed for palliative care/withdrawal of therapy</td>
</tr>
<tr>
<td>8</td>
<td>Inaccurate information by residents during rounds</td>
<td>Developing electronic progress note</td>
</tr>
<tr>
<td>9</td>
<td>No appropriate diet for pancreatectomy patients</td>
<td>Developing appropriate standardized diet option</td>
</tr>
<tr>
<td>10</td>
<td>Wrong-sided thoracentesis performed</td>
<td>Education, revised consent procedures, collaboration with institutional root-cause analysis committee</td>
</tr>
<tr>
<td>11</td>
<td>Inadvertent loss of enteral feeding tube</td>
<td>Pilot testing a ‘bridle’ device to secure tube</td>
</tr>
<tr>
<td>12</td>
<td>Inconsistent delivery of physical therapy (PT)</td>
<td>Gaining consensus on indications, contraindications and definitions, developing an interdisciplinary nursing and PT protocol</td>
</tr>
<tr>
<td>13</td>
<td>Inconsistent bronchoscopy specimen laboratory ordering</td>
<td>Education, developing an order set for specimen laboratory testing</td>
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Key Lessons

• Focus on systems… not people
• Prioritize
• Use safe design principles
• Go mile deep and inch wide rather than mile wide and inch deep
• Pilot test
• Answer the 4 questions
Action Plan

• Review the Learning from Defect tool with your team

• Review defects in your unit

• Select one defect per month/quarter to learn from

• Post the stories of risks that were reduced

• Share with others
References

- Reason J. Human Error. Cambridge, UK: Cambridge Univ Pr; 1990.