Human Factors & Safety Science in the Operating Theatre

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Goal

Think Differently....

To view safety and risk through the lens of safety science

Twitter Discussion: #HFsafty
Why No Change?

Preoccupation with Human Error
Instead of \textbf{reducing HARM}

....Leads to ineffective solutions
What is Human Factors?

...discovers and applies scientific data about human behavior & cognition, abilities & limitations, physical traits, and other characteristics

...to the design of tools & machines, systems, environments, processes, and jobs

for productive, safe, comfortable, and effective human use.

--Sarah Henrickson Parker, PhD
Human Factors Engineering

“We don’t redesign humans; We redesign the system within which humans work”
Example: Defibrillator Case

- Chance of success reduced 7-10% each minute

Graph showing survival from Sudden Cardiac Arrest.
Defibrillator Case

• VF cardiac arrest
• nurse with patient
• charges unit...
• clears patient...
  ➔ presses “on” button
  ➔ Machine powers down
    – 2-3 minute delay in shock
Huh?

Medical Professionals: Just don’t make errors
<table>
<thead>
<tr>
<th>Knowledge-Based</th>
<th>Rule-Based</th>
<th>Skill-Based</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improvisation in unfamiliar environments</td>
<td>Protocolized behavior Process, Procedure</td>
<td>Automated Routines Require little conscious attention</td>
</tr>
</tbody>
</table>

Figure adapted from: Embrey D. Understanding Human Behaviour and Error, Human Reliability Associates
Based on Rasmussen’s SRK Model of cognitive control, adapted to explain error by Reason (1990, 2008)
Slips and Lapses: Common

Policies, Inservices, Signage, Discipline, Training, Vigilance, etc
Tale of two anesthesiologists
Indiana: 5 nurses
We See...
What We **Expect** To See

According to research at Cambridge University, it doesn't matter in what order the letters in a word are, the only important thing is that the first and last letter be at the right place. The rest can be a total mess and you can still read it without a problem. This is because the human mind does not read each letter by itself, but the word as a whole.
US Airways Non-Reprisal Policy

“US Airways will not initiate disciplinary proceedings against any employee who discloses an incident or occurrence involving flight safety...”

“This policy excludes events known or suspected to involve criminal activity, substance abuse, controlled substances, alcohol, or intentional falsification.”
Airline Safety Approaches

“It is vastly more important to identify the hazards and threats to safety, than to identify and punish an individual for a mistake.”

“We exchange the ability to reprimand an individual for the ability to gain greater knowledge.”

--Jeff Skiles, Miracle on Hudson first officer, On airline safety philosophy
Why is a culture of safety so important?

- 1 serious or major injury
- 10 minor injuries
- 30 property damage injuries
- 600 incidents with no visible damage or injury

1,753,498 accidents from 297 companies, 21 different industries

*Slide acknowledgment: Robert Panzer, MD*
Human Factors in the Operating Theatre

2006: “Behavioural aspects of performance in the operating room which underpin medical expertise, use of equipment and drugs:

Cognitive (e.g. situation awareness, decision making)

Social (e.g. communication & teamwork, leadership) skills”

Communication

“The activity of conveying information”

Human-Human

Human-Machine
Communication: BIG problem

• Top contributor in sentinel events
  – 60% of sentinel events reported to TJC
    Arora, Johnson et al 2005 (Qual Saf Health Care)
  – 70% of litigation: poor communication
    Beckman 2005; Hickson 2002 (JAMA)

• Impacts teamwork, handoffs, active patient care, patient understanding

• Particularly important in surgical setting: busy, time pressure,
Surgical Malpractice Claims

• 80 communication breakdowns
  – Preoperative, operative, and postoperative
• >70% single communication failure
• Most breakdowns involve attending surgeons
• 50% have ambiguity in communicated roles
• Recommend:
  – structured handoffs transfer protocols
  – standard use of read-backs

A team of experts does not make an expert team...
# NOTSS skills taxonomy v1.2

<table>
<thead>
<tr>
<th>Categories</th>
<th>Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Situation Awareness</td>
<td>Gathering Information, Understanding Information, Projecting and anticipating future state</td>
</tr>
<tr>
<td>Decision Making</td>
<td>Considering options, Selecting and communicating option, Implementing and reviewing decisions</td>
</tr>
<tr>
<td>Communication and Teamwork</td>
<td>Exchanging information, Establishing a shared understanding, Co-ordinating team</td>
</tr>
<tr>
<td>Leadership</td>
<td>Setting and maintaining standards, Coping with pressure, Supporting others</td>
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</tbody>
</table>

“Surgeons must be proficient in leadership” No word on what this means or how to do it.

--Sarah Henrickson Parker, PhD
Leadership, Communication & Team Training in the Operating Theatre

“It is possible to improve patient outcomes by focusing on intraoperative non-technical skills”

“Simulation is the perfect way to deliberately practice and improve non-technical skills”

-Steven Yule, PhD
Director of Education & Research, STRATUS Center for Medical Simulation, Brigham and Women's Hospital
Assistant Professor, Harvard Medical School
Preoperative Briefings
**Results - It actually changes things...**

<table>
<thead>
<tr>
<th>Outcome Measures</th>
<th>% change in outcome measure after briefing was implemented</th>
</tr>
</thead>
<tbody>
<tr>
<td>CN trips to core</td>
<td>40% Decrease</td>
</tr>
<tr>
<td>Procedural Knowledge Issues</td>
<td>34% Decrease</td>
</tr>
<tr>
<td>Equipment Preparation Issues</td>
<td>25% Decrease</td>
</tr>
<tr>
<td>Miscommunication Events</td>
<td>51% Decrease</td>
</tr>
<tr>
<td>Waste</td>
<td>100% Decrease</td>
</tr>
</tbody>
</table>

**Barriers** - Logistics, conducting the briefing at a time convenient for all staff.
ED Shift Huddle

https://www.youtube.com/watch?v=Jz7YknfYduU
Teamwork & Brief Huddle

• “When introductions were made before a surgery, the average number of complications and deaths dipped by 35 percent.” Atul Gawande (checklist)

• "The person, having gotten a chance to voice their name, let speak in the room — were much more likely to speak up later if they saw a problem

The Checklist Manifesto: How to Get Things Right, Atul Gawande, 2009
What about Debriefs?

• Consensus that debrief is critical
• Impact on performance improvement
• Impact on outcomes
• Mixed results on the importance of video
• Mixed results on which type of debrief is best

Practical Considerations

• Plan debrief before the task is done
• What are the objectives of the task that will be covered
  – Technical
  – Team
• Not every action needs a 30 min debrief
Practical Considerations

• Doesn’t work right the first time
• Building psychological safety
• Building a common goal
  – Learning or performance
  – Is it decrease variation? Increase flexibility?
  – Anticipatory mechanisms
• Time
Crew Resource Management

• Focus on the Team....
  – Aviation: FAA checkride
    • the team only fails if both miss something—otherwise, no ding

• Authority Gradient
  – “When I started 20 years ago, in crew rooms the captains sat in one corner complaining about their FOs, the FOs sat in another corner complaining about the captains, and the flight attendants in another corner complaining about everyone. Now everyone sits together.” --J. Skiles
  – Where is healthcare now?
Developing Teams

• Team Training
  – Teaches knowledge & skills
  – AND improves relationships and attitudes
  – But...

• Leadership is critical
  – Modeling
  – Debriefing
  – Creating a safe team environment
Developing Teams

• Accepting accountability
  – Rather than blaming others
  – Starts with leadership
  – Cross monitoring
    • Difficult unless expected by all
    • Across authority gradients

• Structure of team
  – Roles must be well-defined
    • Clear despite variation of individual in roles
Situation Monitoring
(Individual Skill)

The process of *actively scanning* behaviors/actions to assess elements of the situation or environment.

- Fosters mutual respect and team accountability
- Provides a safety net for the team and the patient
- Includes cross monitoring

...Remember, engage the patient whenever possible.
Cross Monitoring Is…

The process of monitoring the actions of other team members for the purpose of sharing the workload and reducing or avoiding errors.

- Mechanism to help maintain accurate situation awareness
- A way of “watching each other’s back”
- Ability of team members to monitor each other’s task execution and give feedback during task execution

*Mutual performance monitoring has been shown to be an important team competency.*

*(McIntyre and Salas 1995)*
Skill Example:
Cross Monitoring
“Fallibility is part of the human condition;

We *cannot* change the human condition;

But we *can* change the conditions under which people work”

--James Reason, PhD
Putting it to work

• Facilitate culture change
• Open lines of communication
• Prebrief, debrief
• Employ system safety analysis techniques
• Enact protective system changes
• No “name, blame, shame, & train”
Patient Safety is Everyone’s Job

Winner of the "Not My Job" Award - ADOT
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