Introduction to Patient Safety

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January 13, 2016

Objectives

1. Define patient safety
2. Describe the scope of harm caused by medical error
3. Describe Swiss Cheese model of human error
4. Discuss Culture of Safety
5. Define High Reliability Organizations
6. Understand how Human Factor Engineering can be applied to health care
7. Understand Cognitive Errors
8. Name National Patient Safety Goals applicable to medical students

DEFINITION of patient safety

• Freedom from accidental injury caused by medical care or medical error, preventing harm to the patient.

Institute of Medicine
Medical Error

- An unintended act, either omission or commission; or an act that does not achieve its intended outcome. Joint Commission
  - Excludes acts that did not achieve their desired outcomes because of underlying illness or additional patient comorbidities and outcomes known to be risks of specific procedures, i.e. an adverse outcome does not require an error
- Conversely an error does not always lead to an adverse outcome: error caught; pt resilient
- Errors can include problems in practice, products, procedures, and systems

SAFETY DATA

HISTORY

"The physician must...have two special objects in view with regard to disease, namely, to do good or to do no harm"

Hippocrates, Epidemics, ~400 BC
Dr. Ignaz Semmelweis

- Obstetrician in 1847 Vienna
- Noted midwives had 1/3 mortality of MD's
- He felt was related to washing hands, but others disagreed
- He kept arguing unsuccessfully and died in insane asylum

1991 Harvard Medical Practice

NEJM Brennan et al.1991; 324:370-6

- 30,121 random charts, 51 acute care NY hospitals
- 3.7% of hospitalizations had disabling adverse events
  - 27.5% due to negligence
  - 70.5% led to > 6 month disability
  - 13.6% led to death

To Err Is Human

1999 IOM

- Estimate the deaths from medical errors in hospitals ranged from 44,000 to 98,000 per year.
- one jumbo jet airplane crash every day, per year!
**To Err is Human**

- 18% of hospitalized patients are affected by an error
- 2,000 patients/year in each large teaching hospital will experience an injury related to medication administration
- Hospital patients represent only a small fraction of total population at risk.

**The OIG Looks At Safety:**

- 2008 still with significant issues (with Medicare only):
  - 13.5% (1 out of 7) had an adverse event
  - 1.5% had an event that contributed to their death (180,000/year)
  - 0.6% had an NQF Serious Reportable Event (72,000/yr)

**National Quality Forum**

Serious Reportable Events [72K/yr!]

- Wrong site surgery
- Retained foreign object
- Elopement
- Suicide
- Death or serious injury related to:
  - Device malfunction
  - Medication error
  - Fall
  - Ulcers
  - Failure to communicate results
BASIC SCIENCE OF SAFETY

Healthcare is…

- incredibly complex
- lacking in one “right” way
- a constantly changing environment

“Healthcare errors are rarely caused by simple failure of healthcare professionals.”

National Quality Forum (NQF)
Why Errors Happen
“SWISS CHEESE” Model

Individual actions may result in errors

Multiple Safety Barriers in place 
(technology, processes, and people) 
designed to stop errors

Weaknesses in barriers

Harmful Event

Adapted from Dr. James Reason, Managing the Risks of Organizational Accidents, 1997

Timeline analysis

- Culture: error has happened before; no one questions
  1200 mg in IV bag rather than irrigation
- Nurse doesn’t check dose closely in rush to get all 5D doses
  in at 8 am
- Rx Computer system accepts “1200 mg IV”
- Pharmacist clicks 1200 rather than 1200
  120 mg on computer picklist

1200 mg Tobramycin IV

ROOT CAUSE ANALYSIS

- Intensive effort to find what is the underlying, or “root” cause of bad outcome.

- Latent/ Proximate/
  Blunt/ Sharp
CULTURE OF SAFETY

“Bad Apple” Theory of Error
“Culture of Blame”

- Error is due to a character flaw in the individual
- Get rid of the “Bad Apples” and you’ll get rid of errors
- Focuses on the incident and the individual
- Punishment and remediation
  - Unfortunately only ~5% of medical harm is caused by incompetent or poorly intended care
Results of traditional approach

• Hide errors, if possible
• If not, blame someone else
• “Near misses” ignored
• Tacit tolerance for flawed system

Obstacles to a “Culture of Safety”

– Blame and Shame Culture
– Finger-pointing (blame the individual)
– Creates defensiveness
– Punishment of the practitioner/institution
– Profession demands perfection
– Hierarchical structure
– “We have always done it this way” mentality
– Profession has learned to “tolerate” errors
  • “No blood, no foul”
– Little understanding of systems
– Lack of sufficient resources to make changes
– Resistance to change

BACTERIA CAUSE ULCERS

Barry Marshall and Robin Warren
2005 Nobel Prize in Medicine
“Culture of Safety”

- Errors are a system property
- Safety is a management function
- Multiple causes
- Levels of analysis
  - Individual, work team, work place, organization
- Avoid guilt and blame
- Fix systems, not people

- It is no longer enough to think of yourself as a doctor like an independent entity.
- Remember, you are an individual but you are also part of a team.
- Quality and Safety really are EVERYBODY’S job.

HIGH RELIABILITY TEAMS
"Imagine that it’s a busy day and you shrink San Francisco Airport to only one short runway and one ramp and gate. Make planes take off and land at the same time, at half the present time interval, rock the runway from side to side and require that everyone who leaves in the morning returns that same day. Then turn off the radar to avoid detection, impose strict controls on radios, fuel the aircraft in place with their engines running. Now wet the whole thing down with salt water and oil and man it with 20-year-olds, half of whom have never seen an airplane close up.”

From “To Do No Harm” Morath JM and Turnbull JE

High Reliability Organizations

- Aircraft carriers and nuclear submarines
- Nuclear power plants
- NASA (?): failure to change enough between Challenger and Columbia
- The same technology that has been used to improve safety with aviation has been used in maritime industry without improvement.
  - Suggests need for behavioral and socio-cultural changes in addition to technological fixes
HRO's

• Organizational commitment to:
  – seek knowledge
  – reward safe practice
  – communicate effectively

• FAA (Federal Aviation Administration) requires “Crew Resource Management” which is sophisticated team training
  – Although there are still very frequent errors on flights, these are interrupted by these techniques before harm occurs
  – Huge improvement in aviation safety related to CRM, checklists, technical back-ups, simulation

HRT BEHAVIORS

1. Sensitivity to operations
   a. Closed loop communication
   b. Shared situation awareness
2. Commitment to resilience
3. Deference to expertise
4. Reluctance to simplify
5. Preoccupation with failure
   a. Learn from errors
   b. Voluntary reporting systems
   c. Stop to fix problem

HEALTHCARE EXAMPLES

• 16 hospitals with new cardiac surgery technique
  – Best outcome seen with dedicated team members and extensive debriefing each time technique performed
  – Relatively inexperienced surgeon with strong team dynamic had best record

• Anesthesia mortality
  – 1/15,000 in 1980 → 1/200,000 in 1990’s
  – Other technical enhancements as well
  – Yet continued improvement using team training
Team STEPPS

- **Team Strategies & Tools to Enhance Performance & Patient Safety**
- Developed by AHRQ and Dept of Defense
- Emphasizes communication and teamwork
- 4th year simulation with Dr. Trent Reed

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*"I lift, you grab... Was that concept just a little too complex, Carl?"*

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Healthcare factors which increase the likelihood of human errors

- **Personal physiology**: fatigue, disease, drugs...
- **Distracting environments**: interruptions, noise, pagers...
- Autonomy and lack of standardized processes: every doctor has their own set of orders
- **Cumbersome technology**: doctor must answer 57 questions on computer in order to use a protocol
- **Cultural features**: Heroic individual effort
When are errors likely to occur?

- Reliance on memory
- Multiple hand-offs
- Many individuals involved in care
- High acuity of illness or injury
- Need for rapid decisions
- High volume, unpredictable patient flow
  - SATO: Speed Accuracy Trade Off

"Solutions that amount to admonitions to ‘be more careful’ or to ‘have a high index of suspicion’ are simply guarantees that the same bad outcome will occur again, only with different people next time”

– Wears RL. Acad EM 2000;7:1175-76
HUMAN FACTORS ENGINEERING

• To mistake proof what we do by
  – Standardize: limit unwanted variability
  – Simplify processes and reduce unnecessary steps
  – Error-proof the process

• Provide added benefit: reduced work; improved care

Comprehensive use of surgical safety checklists reduced complications by 39%, and cut mortality rate in half


System design goals

• Make errors difficult to commit
• Make errors visible if committed
• Absorb errors that are committed
Anesthesia
Diameter Index Safety System

- The threaded connector for the oxygen outlet is much smaller than that needed for the air outlet, making it physically impossible to attach the oxygen hose to the air outlet
- Oxygen green; Air yellow; and Nitrous blue

HFE Solutions

From weaker to stronger
- Exhortation: be more careful
- Training/education: don’t do that
- Rules and policies
- Warnings and labels: watch out!
- Checklists/protocols
- Forcing functions and constraints: let me design it so you can not do that

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3 Types of Error

1. **Skill based**: act on autopilot. Not intended
   - **Slips**: an action e.g. inadvertently nick the bowel
   - **Lapse**: mental inaction e.g. missed heart murmur
   - **Rx**: Stop Think Act Review

2. **Rule based**: action intended but wrong rule
   - **Mistake**: inadvertently choose the wrong rule or misapply a rule
   - **Violation**: intentionally choose not to follow a rule
   - **Rx**: algorithms; ready access to rules

3. **Knowledge based**: Problem solving in new situation. When bias occurs
   - **Rx**: get help; do more tests

Raise your hand to give answer

- **How many animals of every kind did Moses take with him into the Ark?**
  - None. It was Noah who took animals into the Ark.

- **How many animals of every kind did Obama take with him into the Ark?**
The eyes won’t see what the mind doesn’t think of

--Confucius

Cognition Errors

• Lack of knowledge about the disease
• Important information is not obtained
• Biases
  – Premature closure: conclude dx early and fail to be inclusive of other differentials. The most frequent cognitive error.
  – “Zebra retreat”: don’t consider unusual diagnosis
  – Anchoring: unduly persuaded by early features such as triage notes, pt’s or PCP’s perception
BIAS EXAMPLES
Anchoring
Zebra retreat
Premature closure

1. Blood in urine, flank pain: kidney stone CT
   - Radiologist: “Hey doc, your pt has dissecting AAA”
2. “Don’t worry, that patient has post-pericardiomy syndrome”
   - Patient had pulmonary embolus
3. 68 year old diabetic with chest pain reproducible by palpation. Dx: costochondritis
   - 5% of acute MI have reproducible chest pain by palpation

2015 Hospital JC (Joint Commission)
National Patient Safety Goals

- Identify pts correctly – name & DOB
- Preventing infections
  - Hand hygiene (student rate = 90%, overall = 96%)
  - Use proven guidelines to prevent central line, urinary catheter and postoperative infections
- Using medications safely
  - Update medication lists at each transition of care
  - Take extra care with anticoagulants
- Prevent mistakes in surgery
  - Correct surgery on correct pt and correct site (preop verification)
  - Site marked by MD BEFORE
  - Time out prior (correct pt, site, procedure, equipment)
- Get important test results to the right staff person on time
- Prevent pt suicide

SUMMARY

- Medical errors occur very frequently
- Swiss cheese model of multiple barriers breached before error reaches patient
- Culture of safety recognizes systems cause most errors
- High Reliability Teamwork and Human Factor engineering reduce errors
- Cognition errors are caused by natural human bias
"We look for medicine to be an orderly field of knowledge and procedure. But it is not. It is an imperfect science, an enterprise of constantly changing knowledge, uncertain information, fallible individuals, and at the same time lives on the line. There is science in what we do, yes, but also habit, intuition, and sometimes plain old guessing. The gap between what we know and what we aim for persists. And this gap complicates everything we do."


**REFERENCES**

8. [http://www.ucdenver.edu/academic/colleges/medicalschool/departments/medicine/GIM/ClinicalCare/HospitalMedicine/EdOps/YoungHospitalist/Pages/YoungHospitalistHome.aspx](http://www.ucdenver.edu/academic/colleges/medicalschool/departments/medicine/GIM/ClinicalCare/HospitalMedicine/EdOps/YoungHospitalist/Pages/YoungHospitalistHome.aspx) The Health Innovations Scholars Program (HISP) is a 5-week (6/27-7/29 2016) in-residence M1 experience, which emphasizes practical skills development for future health leaders who aspire to transform healthcare delivery systems. The HISP is based in Denver, CO. $2,000 stipend and airfare.

**Resource**

- Institute for Healthcare Improvement
  - Private organization instrumental in patient safety. Prior head Don Berwick, was head of CMS.
  - [www.ihi.org](http://www.ihi.org) → Log in/register → Register now → complete info → let them know you’re a student either at registration or at time of taking course. (May need to wait couple of day to go through)