Human Error in Emergency Medicine: Developing a Research and Teaching Agenda

Robert L Wears, MD, MS  University of Florida
Kathleen M Sutcliffe, PhD  University of Michigan
Gregory Jay, MD, PhD  Brown University
Overview

- Introduction
- How errors happen
- Errors and organizations
- Applications and education
Goals

- Introduce modern theory of human performance
- Contrast traditional and systems approaches to error in emergency medicine
- Understand influence of organizations and culture
- Introduce “high reliability organizations”
- Share experience in teaching settings
History of Healthcare Errors

- 20 years -- ethnographic studies (Bosk)
- 15 years -- Anesthesia Pt Safety Foundation
- 10 years -- Harvard Medical Practice Study
- 5 years -- National Pt Safety Foundation, Annenberg I, Bogner
- 2 years -- Annenberg II
- Not on the radar screen
Extent of Medical Injury

- HMPS: 3.7%
  - 69% preventable

- QAHCS: 16.6%
  - 51% preventable

- Colorado / Utah: 2.9%

- London (BMJ): 6.7%
Adverse Drug Event Rates

- Self-report: 0.2%
- Population record review: 0.7%
- Computerized screening: 3.8%
- Chart review and report: 6.5%
- Combined CR and comp.: 10.0%
Culture of Medicine

■ Theory of the “Bad Apples”
  ◆ Error is a character flaw

■ Cult of Personal Responsibility
  ◆ Focus on the incident and the individual
  ◆ Punishment and remediation
Why are We so Quick to Blame?

- Value personal judgment, responsibility, autonomy
- Attribution / causality
- Illusion of autonomy
- Similarity bias
Dysfunctional Error Management

- Post hoc analysis
  - Caplan RA. *JAMA* 1991; 265:1957-60

- Repression
  - Don’t air our dirty laundry

- Projection
  - The nurse didn’t tell me . . .

- Denial
  - It was the patient’s disease
Results

- Hide errors, if possible
- If not, blame someone else
- “Near misses” ignored
Every system is perfectly designed to produce precisely the results it gets.

Donald Berwick
Another Approach to Error

- Context of error more important than perpetrator
- Assume ability, motivation and knowledge are optimized
- Humans are human and will err despite their best efforts, knowledge and motivation
- Design work around these assumptions
Navy/Marine Class A Aviation Flight Mishap Rates

Fiscal Years

Rates/100,000 hrs
General Principles

- 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
General Principles

- Care given by interacting subsystems
- View “error” as imperfect approximations to a goal
- No change has isolated effects
- Sharp end, blunt end
Systems Design Goals

- Make errors difficult to commit
- Make errors visible if committed
- Absorb errors that are committed
No system can be fool-proofed, because fools are so ingenious
We can’t change the human condition, but we can change the conditions under which humans work.

James Reason
Latent failures
Management decision
Organisational processes

Conditions of work (current)
Background factors
- workload
- supervision
- communication
- equipment
- knowledge/ability

Active failures
Unsafe acts
- omissions
- action slips/failures
- cognitive failures (memory lapses and mistakes)
- violations

Barriers/defences

Accident
Error Generating Factors

- Complexity and volume
- Psychological precursors
- Systems design
Complexity and Volume

- Number of steps
  - 1
  - 5
  - 10
  - 20
  - 30
  - 50

- Prob error @ 99.5%
  - 0.5%
  - 2.5%
  - 4.9%
  - 9.5%
  - 14.0%
  - 22.2%
Complexity and Volume

- Typically 25 steps in getting drug to pt
- Med error rate of 1% per order implies each step executed at 99.96% accuracy
- “Be careful” won’t work
Cognitive Mechanisms

- **Automatic**
  - Unconscious
  - Rapid
  - Parallel
  - Effortless
- **Slips, lapses**

- **Problem solving**
  - Conscious
  - Slow
  - Sequential
  - Difficult
- **Mistakes**
Slips

- Capture
- Description
- Association activation
- Loss of activation
Causes of Slips

- Habit
- Interruptions
- Hurry
- Fatigue
- Anger
- Anxiety
- Boredom
- Fear
Mistakes

- Misinterpretation
  - Right rule, wrong pattern
- Lack of knowledge
  - Right pattern, wrong rule
- Habits of thought
Causes of Mistakes

- Biased memory
- Overemphasis on discrepant
- Availability heuristic
- Confirmation bias
- Overconfidence
- Coning of attention
- Reversion under stress
Who said . . .

The lamps are going out all over Europe; we shall not see them lit again in our lifetime.
My prediction

Most of you thought . . .

Winston Churchill

But, actually, it was . . .

Sir Edward Grey
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 Clinton take with him into the Ark?
Errors and Rules

- Followed rule
- Didn’t know rule
- Disregarded - necessary
- Disregarded - convenience
- Disregarded - custom
Auto Traffic Fatalities

![Graph showing auto traffic fatalities over fiscal years from 1950 to 1988, with a significant decrease in rates/100,000 hours over time.](image-url)
Latent Errors

- Design of work
- Conditions of work
- Training
- Design and maintenance of equipment
  - HROs
  - Others
Faulty System Design

- Induces errors
- Makes errors difficult to detect
- Makes detected errors difficult to reverse
Human Factors Lessons

- Many errors are caused by activities that rely on weak aspects of cognition

- Examples
  - Short-term memory
  - Attention
  - Computation
Human Factors Principles - 1

- Avoid reliance on memory
- Simplify
- Standardize
- Use constraints and forcing functions
- Use protocols and checklists wisely
Human Factors Principles - 2

- Improve information access
- Decrease reliance on vigilance
- Reduce handoffs
- Increase feedback
- Decrease multiple entry/look-alikes
- Automate carefully
General Human Factors Violations

- Long work hours
- Excessive work loads
- Spotty feedback
- Variable information availability
... Design of the work system is only half the battle. There is a system above the work system that must be equally carefully designed -- the management system -- and compared to the work system, it may need even more overhauling in American health care if we are to reach the safety goals we ought to.

Donald Berwick
Accountability - Doctors and Nurses

- Provide good care
- Provide safe care
- Deal with patients honestly
- Self-regulation
Accountability - Hospitals

- Provide a safe environment
  - Safe systems
  - Safe people
  - Safe policies
How to Collapse Sensemaking

- Thrust people into unfamiliar roles
- Leave some key roles unfilled
- Make the task ambiguous
- Discredit the role system
- Do it in a context where something small can become monstrous
Accountability - Regulators

- Set standards
- Enforce them
- Be proactive
Accountability - Standards

- Maximum hours
- Staffing ratios
- Skill levels
- Training
- Supervision
When Is Punishment Appropriate?

- Sabotage
- Substance abuse
- Reckless violation
HCOs should make continually improved patient safety a declared and serious aim by establishing patient safety programs with defined executive responsibility. HCOs should implement proven medication safety practices.

(Con’t)
Patient Safety Programs Should:

Provide strong, clear, visible attention to safety
Implement non-punitive systems for reporting and analyzing errors ...
Incorporate well-understood safety principles, such as [standardization and simplification]
Establish interdisciplinary team training programs ... that incorporate proven methods of team training, such as simulation
What Patient Safety Is

- Top - bottom process
  - Leadership, authority, resource, constancy
  - Workplace knowledge, insight, innovation
What Patient Safety Is

- No one model
- Group ownership
- Culture change

- Guerilla war
  - No dramatic victories
  - No end in sight
What Patient Safety Is Not

- Bankable
- Panacea
- Product
- Check-off
- Cost-saving
  - Medication errors cost » $115K / 100 beds
  - Not all safety interventions will save money, but some should still be implemented
Think Globally, Act Locally

- Chief Safety Officer?
- Permanent patient safety program
  - Reporting, monitoring
  - Work redesign
  - Management redesign
- Cultural change
Risks After the IOM

- Thoughtless action
- Reporting
- Aftercare
Thoughtless Action

- Pressure to “do something”
- Law of Unintended Consequences
- Official priorities vs real priorities
False God of Mandatory Reporting

■ “No system of measurement is robust enough to survive the fear of those who are measured”

■ “Ultimately, all reporting is voluntary.”
  – Lucian Leape, BMA Conference on Error, 2000

■ ASRS experience
Aftercare: What Patients Want

- To know what happened
- To hear we’re sorry
- To know what we’re doing to prevent it
- To be compensated for their losses
It must be remembered that every airplane crash is an untoward event, whereas every human being is destined to die, most of us in proximity to medical care.

- David Gaba
Suggestions

- Drop reporting
- Support notification & investigation
  - Cover all adverse events
    - avoided
    - absorbed
    - impacted
- Professional investigation by trusted, non-regulatory organization
- Make the goal learning
The type of thinking that got us into these problems will not be the type of thinking that gets us out.

Einstein
There is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things. Because the innovator has for enemies all those who have done well under the old conditions and lukewarm defenders in those who may do well under the new.

- Machiavelli N. *The Prince* 1532, Chap 6