The U.S. Institute of Medicine Report

`To Error is Human` recommended that medicine adopt aviation’s approaches to safety and error management
Medicine and Aviation

Safety is primary goal

- But cost drives decisions
- Technological innovation
- Multiple sources of threat
- Second guessing after disaster
  - Air crashes
  - Sentinel events
- Teamwork is essential
Why Teamwork Matters

Most endeavors in medicine, science, and industry require groups to work together effectively – teamwork.

Failures of teamwork in complex organizations can have deadly effects.

More than 2/3 of air crashes involve human error, especially failures in teamwork.

Professional training has focused on technical, not interpersonal, skills.
Context Influences Team Performance and Error

- Individual knowledge and skill
- Organizational characteristics
- Team composition
- Culture
The Importance of Culture

Culture is the values, beliefs, and behaviors that we share with other members of groups

- Culture binds us together as a group
- Culture provides cues and clues on how to behave in normal and novel situations

*Culture is implicated in accidents and incidents in aviation and medicine*
Organizational Culture

An organization’s culture reflects:

- Values regarding error, blame, and punishment
- Openness of communications between management and pilots
- Level of adherence to regulations
- Level of commitment to safety
- Level of trust between pilots and management
Organizational Culture and Safety

Investigation of air crashes shows flawed organizational culture to be a precursor of disaster

- Lack of safety concerns
- Operational pressures
- Poor leadership
- Conflict with management
- Negative organizational climate
Professional Culture

- Pilots and doctors have strong professional cultures with positive and negative aspects

- Positive:
  - Strong motivation to do well
  - Pride in profession

- Negative:
  - Training that stresses the need for perfection
  - Sense of personal invulnerability
Medical culture contributes to sparse error disclosure, study finds

08/18/2006
Physicians' reluctance to report medical errors stems from practice environments that foster cultures of perfectionism, suggesting that a cultural shift may be the most promising means of improving disclosure rates, according to two studies published Monday in the Archives of Internal Medicine. For the studies, researchers at the University of Washington School of Medicine-Seattle surveyed 2,637 physicians in Canada, Washington state, and Missouri in an effort to gauge how differing malpractice climates affected physicians' attitudes toward error disclosure. Both Canadian and U.S. physicians said that the threat of litigation did not color their decision to disclose medical errors to their patients, a finding that led researchers to conclude that the malpractice environment is not a major factor in error disclosure. However, physicians reported that they were considerably less likely to disclose a serious error if it was unlikely that patients would otherwise discover it. In an accompanying study that evaluated physician responses to several medical error scenarios, researchers found that although physician attitudes vary widely on how best to disclose an error, the majority agreed that each medical error scenario was serious and that the physician was responsible; nonetheless, only 42% would explicitly admit that an error had occurred. Based on their findings, the researchers concluded that stringent disclosure standards and training programs would foster greater professional responsibility among physicians. The study co-authors also note that perfectionist cultures may prevent discussion of mistakes, noting that a "conspiracy of silence does not work for reducing errors" (Gallagher et al., Archives of Internal Medicine, 8/14; Gallagher et al., Archives of Internal Medicine, 8/14; Ostrom, Seattle Times, 8/17; HealthDay, 8/14).
Personal Invulnerability

The majority of pilots and doctors in all cultures agree that:

- their decision-making is as good in emergencies as in normal situations
- their performance is not affected by personal problems
- they do not make more errors under high stress
- true professionals can leave behind personal problems

All of these statements are blatantly wrong, pilots and doctors must be educated
Pilots’ and Doctors’ Attitudes

- Decision making as good in emergencies as normal
- Effective pilot/doctor can leave behind personal problems
- Performance the same with inexperienced team
- Perform effectively when fatigued
Threats to Safety in Medicine

Events and errors outside the individual or team that require active management for safety
Threats to Safety in Medicine

**Patient**
- Primary illness
- Secondary illness
- Risk Factors
- Atypical response to treatment
- Ongoing management

**Professional**
- Proficiency
- Fatigue
- Motivation
- Culture (Invulnerability)

**Organizational**
- Organizational Culture
- Scheduling & Staffing
- Experience levels
- Work Load
- Error policy
- Equipment issues

**System - level**
- National culture
- Health-care policy and regulation
- Payment modalities
- Medical coverage

**Expected Events and Risks**
- Well known and expected

**Unexpected Events and Risks**

**Well known and expected**
Other Threats to Safety in the Professional Culture

- Suppressing discussion of medical errors
- Tolerance of detrimental behaviors
  - Handwriting, nurse-physician conflict
- Variability of practice standards
- Individual variation in medical procedures
More threats to safety
Monitoring and Boredom

- Humans are not good at monitoring stable systems – airplanes, ships, patients
- Maintaining vigilance in stable, unchanging environments is very difficult
  - Anesthesia during long operations
  - Trans-oceanic flight on autopilot
- Boredom sometimes leads to dangerous strategies
- Aviation and medicine have not solved this problem.
  - In multi-person crews training and simulated emergencies can help maintain alertness
  - With a single person crew, the challenge is greater
Fatigue as Threat

- 24 hours of sleep deprivation have performance effects comparable to a blood alcohol content of 0.1%*
  Drew Dawson – *Nature, 1997*

- Aviation flight time limits
  - 8 hours in one day
  - 30 hours in one week
  - 100 hours in one month
  - 1,000 hours per year

- U.S. Resident work rules (July 2003)
  - 24 hours in one shift (+6)*
  - 80 hours in one week (+8 – 4 week average)
  - No limit for month or year

- But who will staff the hospitals? – older staff physicians
Fatigue Contributed
Error
44,000-98,000 deaths/year due to medical error

*IOM Report*

“Deaths Due to Medical Errors Are Exaggerated in Institute of Medicine Report”
-McDonald et. Al., JAMA 5 Jul 2000

“Institute of Medicine Medical Error Figures Are Not Exaggerated”
- Leape, JAMA 5 Jul 2000
Error is Inevitable Because of Human Limitations

- Limited memory capacity
- Limited mental processing capacity
- Negative effects of stress
  - Tunnel vision
  - Can no longer multi-task
- Negative influence of fatigue and other physiological factors
In both aviation and medicine, dealing with technology is a source of threat and error.
Third world – couldn’t be replicated in U.S.
Newer technology doesn’t eliminate error
An old airplane – couldn’t happen in 2000
Nor does even newer technology
Problems at the Interface Between Teams

We have observed many instances of conflict between surgical and anesthesia teams.
Doctors Fined for Fight in Operating Room

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A state medical board has fined a surgeon and an anesthesiologist $10,000 each for brawling in an operating room while their patient slept under general anesthesia.

After their fight, the anesthesiologist, Dr. Kwok Wei Chan, and the surgeon, Dr. Mohan Korgaonkar, successfully operated on the elderly female patient.

In addition to imposing the fines, the state board of Registration in Medicine last week ordered the doctors to undergo joint psychotherapy. It also directed officials at the Medical Center of Central Massachusetts, who had already put the doctors on five years' probation, monitor Drs. Chan and Korgaonkar for five years.

The medical board said that on Oct. 24, 1991, Dr. Korgaonkar was about to begin surgery when he and Dr. Chan began to argue. Hospital officials would not provide the nature of their disagreement.

Dr. Chan swore at Dr. Korgaonkar, who threw a cotton-tipped prep stick at Dr. Chan, the board said. The two then raised their fists and scuffled briefly, at one point wrestling on the floor. A nurse monitored the anesthetized patient as the doctors fought.
WORST CASE OF MALPRACTICE EVER!

EASY DOES IT!
Dr. Herman Wiederman removes Arnold Kreissel's heart — just minutes before dropping it on the floor.

Surgeon drops patient's heart — and nurse steps on it!

MUNICH, Germany — A fumble-fingered surgeon botched a delicate heart operation when he accidentally dropped the patient's vital organ — and one of his nurses stepped on it!

The unlucky patient, 55-year-old Arnold Kreissel, died slippery with blood.

By GEORGE SANFORD
Weekly World News
The University of Texas
Threat and Error Management
Model (TEMM)

- Template for analysis of superior and flawed performance
- Conceptual framework for formal training in threat and error management
- Used in analysis of air crashes, adverse events and close calls
Threats:
Latent and Overt

- Threat Management
- Errors
- Undesired Patient State
- Undesired Patient State Management
- Inconsequential

- Error Management
- Adverse Event
- Spontaneous Errors
Simulation
The Evolution of Simulation

- Today’s aviation simulators have great fidelity
  - Full instrumentation
  - Sounds
  - Motion including effects of turbulence
  - Traffic
  - Radio communication including background talk from ATC to other flights
  - Day and night visual displays from cockpit windows
Simulation for Evaluation

- Initial qualification based on individual simulator performance
- Continuing (recurrent) qualification also based on performance of specified maneuvers in the simulator
- Line Operational Evaluation (LOE) Under more recent aviation standards, full crew performance is assessed on a simulated mission that includes various challenges or malfunctions
Social psychologists recognized the enormous potential of the flight simulator as a venue for studying group dynamics among professionals and a variety of interpersonal issues under realistic, challenging conditions.

- A dramatic change from the use of bored undergraduate research subjects.
Team Oriented Medical Simulation (TOMS - 1994-5):
The University of Basel/Kantonsspital

- Focal point of the Human Factors program
  a full Operating Room simulator

- The simulator allows the full OR team
  (anesthesiologists, surgeons, nurses, technicians) to work together

- The instrumented mannequin (Wilhelm Tell) allows laparoscopic surgery as well as anesthesia.
Using the Simulator to Its Potential

- Technical training -- practice procedures
  - Less risk for patients (Intubation, bleeding, etc)
- Integrated human factors training
  - Allow a full OR team to work together under realistic conditions
    - Participants can receive feedback and reinforcement regarding their behavior
Training Topics Associated with Simulation

- Human limitations as sources of error
- The nature of error and error management
- Culture and communications
- Expert decision-making
- Training in using specific behaviors and procedures as countermeasures against threat and error
  - Briefings
  - Inquiry
  - Sharing mental models
- Fatigue and alertness management
- Conflict resolution
Safety is the Fourth Culture
What is a Safety Culture?

- A culture committed to proactive safety activities
- A culture that recognizes the inevitability of error and learns from it
- A culture that is non-punitive
Building a Safety Culture
What Organizations Can Do

1. Define a clear policy regarding human error
   - Accept error but not intentional non-compliance
2. Institute formal procedures, where appropriate
3. Recognize the dangers in fatigue
4. Use confidential reporting systems to uncover threats and sources of error
5. Analyze near miss/adverse/sentinel events using the Threat and Error Management Model
6. Provide formal training in threat and error management – CRM adapted to medicine and based on local culture and data
Procedures

- Standard Operating Procedures (SOP) were aviation’s first countermeasures against threat and error
- Aviation is arguably over-proceduralized
  - Tombstone regulation
  - Too many procedures invite non-compliance
- Medicine is under-proceduralized
  - Example: Checklists are critical error countermeasures
The University of Texas
Human Factors Research Project

www.psy.utexas.edu/HumanFactors