Lucian Leape, “Error in Medicine”

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• Florence Nightingale’s principle: “first, do no harm”
• evidence suggests that a substantial number of patients suffer injuries from treatment in hospitals
• most iatrogenic events are due to errors and are preventable
• most errors do not result in patient injury
• the high error percentage is partially due to the complexity of medical practice but is still problematic

Why is the error rate in the practice of medicine so high?

• generally medical staff are very careful
• it is possible that they don’t understand the magnitude of the problem
  – events are very dispersed
  – serious injuries appear as isolated events or outliers
  – most errors do no harm
• medical staff have difficulty in dealing with human error for cultural reasons
• socialized to strive for error-free practice
• need to be infallible creates intellectual dishonesty
• errors are rarely admitted or discussed
• physicians feel that admission of errors would have adverse consequences
• even if physicians learn from their errors, learning happens in a vacuum
• threat of malpractice litigation
The medical approach to error prevention

- perfectibility model: with proper training and motivation, there would be no mistakes
- training + punishment
- punishment: social opprobrium or peer disapproval
- errors are regarded as someone’s fault, but they are actually systemic problems
- approach to error is reactive and often attempts to prevent the same individual from making a repeat an error rather than exploring the underlying causes

A theory of cognition

- most errors result from aberrations in mental functioning
- schematic control mode: mental functioning is automatic, rapid, and effortless
- attentional control mode: cognitive activities are conscious and controlled
- three levels of human performance:
  - skill-based: governed by stored patterns of preprogrammed instruction (schemata), largely unconscious
  - rule-based: governed by stored rules
  - knowledge-based or synthetic: conscious analytic processing and stored knowledge used in new situations
- departures from routine require rule-based or knowledge-based solutions
- humans prefer pattern recognition so they search for rules before resorting to knowledge-based functioning

Mechanisms of cognitive errors

- slips: skill-based errors
- mistakes: rule-based and knowledge-based errors
- slips occur in automatic skill-based activity because of monitoring failures
- types of slips: capture, description error, associative activation, loss of activation
• internal (busyness, boredom, frustration, fear, etc.) and external (noise, heat, visual stimuli, etc.) can lead to slips because they divert attention

• rule-based mistakes occur usually when the wrong rule is chosen because of a misperception

• knowledge-based mistakes occur because of lack of knowledge or misinterpretation of the problem

• pattern matching is preferred to calculation but sometimes we match the wrong pattern

• some common processes: biased memory, availability heuristic, confirmation bias

• stress can lead to mistakes: coning of attention under stress, reversion under stress

Latent errors

• latent errors have delayed effects, “accidents waiting to happen”

• proximal cause of an accident might be operator error but the root cause is in the system

• latent errors can produce psychological precursors: pathologic situations that create working conditions that predispose to errors

• successful accident prevention must focus on root causes

Prevention of accidents

• multiplicity of mechanisms and causes of errors means that there cannot be a simple or universal means of reducing errors

• need to pay attention at all stages: design, construction, maintenance, resource allocation, training, development of operational procedures

• primary objective of system design for safety: make it difficult for individuals to err
  
  – system should automatically correct errors
  – mechanisms should be in place to detect errors in time for corrective action

• design work environment to minimize psychological precursors

• provide feedback through instruments that provide monitoring functions
- build in buffers and redundancy
- design features to minimize errors:
  - simplification
  - constraints
  - standardization
  - operations reversible or difficult to perform when not reversible
- training should include consideration of safety issues

The aviation model
- similarities between aviation and medicine:
  - carefully selected and highly trained professionals
  - want to maintain externally and internally imposed high standards
  - high technology equipment
  - exercise high level of cognitive skills in complex domain with some unknown factors
- differences between aviation and medicine:
  - substantial measure of uncertainty in medicine
  - number and variety of disease states
  - unpredictability of the human organism
- system design: assume errors and failures inevitable, so design systems to absorb them
- standardized procedures to maximum extent possible
- institutionalized safety with anonymous reporting of errors

The medical model
- accident prevention has not been primary focus
- activities focused on incidents and individuals
- when errors are examined cause of the error is identified and corrected
- root causes, underlying system failures, are rarely sought
- system designers do not assume that errors and failures are inevitable and design systems that prevent or absorb them
• standardization and task design vary widely
• great emphasis on education and training but the idea of periodically testing performance is not accepted
• safety in medicine has not be institutionalized

Systems changes to reduce hospital injuries
• discovery of errors
  – efficient routine identification of errors
  – data collection and investigation
• prevention of errors
  – reduced reliance on memory
  – improved information access
  – error proofing
  – standardization
  – training
• absorption of errors
  – computer programs for error detection
  – duplication of critical systems
• psychological precursors
  – work schedules
  – division of responsibilities
  – task descriptions

Institutionalization of safety
• national hospital safety board to investigate every accident is neither practical nor necessary
• such activities should occur at the hospital level
• risk management activities could be broadened to include all potentially injurious errors and deepened to seek out underlying system failures
• provision of immunity/anonymity
Implementing system changes

- principles fit well in total quality management
- statistical quality control requires data regarding variation in processes
- errors and deviations are opportunities to improve the system
- grassroots participation to identify and develop system modifications to eliminate underlying failures
- commitment of leadership
- most important change is cultural: accept notion that errors are inevitable and are evidence of system flaws not character flaws