

# Human Error: learning objectives

- To understand
  - Nature of risk
  - Lessons learned from disasters in other industries
- To learn and define
  - Definitions and classification of errors;
    - Skill-/rule-/knowledge-based errors
    - Slips/lapses, mistakes, active and latent errors
    - Violations
  - Perspectives on error and error reduction
    - Psychological, individual/person, engineering, organizational/system

## The nature of risk

Field of endeavour	Encounter/fatality
Bungee jumping	1/100
Healthcare	1/500
Airlines	1/8 million
European railroads	1/10 million

# Lessons learned from aviation safety

- Risk of fatality 1/8 million overall
  - 1 in 12.4 million in top 25 airlines
  - 1 in 251,000 in bottom 25 airlines
- Examples of airline crashes
  - Avianca 707 crash New York City Jan 1990
    - Low fuel, hierarchical crew system, failure of automatic pilot, pilot fatigue, communication problems

## Lessons learned from other industries

- Chernobyl April 1986
  - 1000 MW reactor number 4 exploded releasing radioactivity over much of Europe
  - Soviet investigation team admitted ‘deliberate, systematic and numerous violations of safety procedures’

## Lessons learned from other industries

- Piper Alpha 1988
  - Major explosion on an oil rig leading to fire and deaths of 167 people
  - Cullen enquiry 1990 found many technical and organizational causes rooted in culture, structure and procedures of Occidental Petroleum
  - Maintenance error that led to initial leak was result of inexperience, poor maintenance procedures and deficient learning mechanisms

# Lessons learned from other industries

- Space Shuttle Challenger Jan 1986
  - Explosion after lift-off killed all astronauts on board
  - An O ring seal on one of the solid rocket boosters split after take off, releasing a jet of ignited fuel
  - Causes
    - Rigid organizational mindset
    - Conflicts between safety and keeping on schedule
    - Effects of fatigue on decision making

# Lessons learned from other industries

- Paddington rail accident 1999
  - Train went through a red light onto the main ‘up line’ from Paddington where it collided head-on with an express train approaching the station
  - Causes
    - Failures in training of drivers
    - Serious and persistent failure to examine poor signal visibility
    - Safety culture that was slack and inadequate
    - Failures of communication in the various organizations

## Definition of error

- Error means something has been done that
  - Was not desired by a set of rules or an external observer
  - Led the task or system outside acceptable limits
  - Was not intended by the actor

Senders and Moray 1991

# Perspectives on Safety and Error

- Psychological perspective
- Individual perspective
- Engineering perspective
- Organizational perspective

# Perspective on error; psychological work of James Reason

- Mental functioning consists of 2 main modes
  - Automatic rapid and effortless
    - e.g. driving a car
  - Attentional control mode or conscious thought
    - slow, sequential, effortful, difficult to sustain

# Perspective on error; psychological work of Rasmussen and Jensen

- Classification of human performance
  - Skill-based
    - Mostly unconscious, governed by stored schemata
  - Rule-based
    - Governed by ‘if x then y’
  - Knowledge-based
    - Conscious analytical process and use of stored knowledge

# Perspective on error; psychological

- Classification of errors
  - Slips or lapses
    - Skill-based errors
    - Failure of execution
    - Slips=observable and are associated with attentional failures
    - Lapses= internal and are associated with failures of memory
    - Occur during automatic functions and when distracted

# Perspective on error; psychological

- Mistakes
  - Failure with mental processes in planning, formulating intentions, judging and problem solving
  - Rule-based error= wrong rule chosen
  - Knowledge-based error= new situation and lack of knowledge or misinterpretation of problem

# Perspective on error; psychological

- Active error
  - Outcome almost immediate
- Latent error
  - Error waiting to happen
  - Effects can be delayed for months or years
- Accidents are usually the result of a combination of latent and active errors

# Perspective on error; psychological

- Violations
  - Deliberate deviations from safe operating practices, procedures, standards or rules
  - Linked to attitudes, motivation or work environment
    - Routine
      - Cutting corners, “workarounds”
    - Optimizing
      - To further personal goals, for fun
    - Necessary or situational
      - Where rules or procedures inappropriate

# Perspectives on safety and error; individual

- Individual perspective or the person model (Reason 2000)
  - Errors occur as described
  - Errors can be decreased by ‘exhortation, retraining or new rules/procedures/policies’
  - Errors with serious consequences lead to shame/blame/disciplinary action/media condemnation etc
  - May discourage reporting and learning from error

# Perspectives on safety and error; individual

- Important factors (professionalism)
  - Motivation and attitude
  - Personal responsibility
  - Accountability
  - Belief in and attitude towards safety issues
  - Consideration of effect of
    - stress, workload, fatigue
    - Medical illness, alcohol and drug addiction

# Perspectives on safety and error; engineering

- Focus on technical aspects of system
- Humans are unreliable components to be 'engineered out' of the system
- Realistically recognition of complex systems with interaction of humans and technology
- Automation can lead to problems
- Elimination of errors is not realistic nor necessarily desirable- should aim for elimination of harm and work within safe boundaries

## Perspectives on safety and error; organizational/system model

- Human behaviour and errors have to be understood in the context in which they work
- Active failures are committed by those at the sharp end of care working with the patient
- Latent conditions /failures are created in the work environment as a result of decisions made by management, policy writers and others