INTRODUCTION TO PATIENT SAFETY AND HUMAN ERRORS

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CLINICAL QUALITY FELLOWSHIP PROGRAM

Disclosure of Conflict(s) of Interest

- Robert Panzer, MD reports no relevant financial interests/relationships.

Learning Objectives

- Review the epidemiology of error
- Define types of performance-based sources of error
- Explain how random factors drive the consequences of errors
- Relate the Swiss Cheese Model to system complexity
- Describe normalization of deviance

Key Concepts

- **Quality of care**
  - Care that results in desired health outcomes and is consistent with best professional practice
- **Patient Safety**
  - Implies patients will be free from accidental injury while receiving medical care

Topics

- Epidemiology of Error
- To Err is Human
- Consequences of Errors
- Swiss Cheese Model
- Understanding Errors
- “Safety-I” and “Safety-2”
- Normalization of Deviance

TOPIC 1

Epidemiology of Error

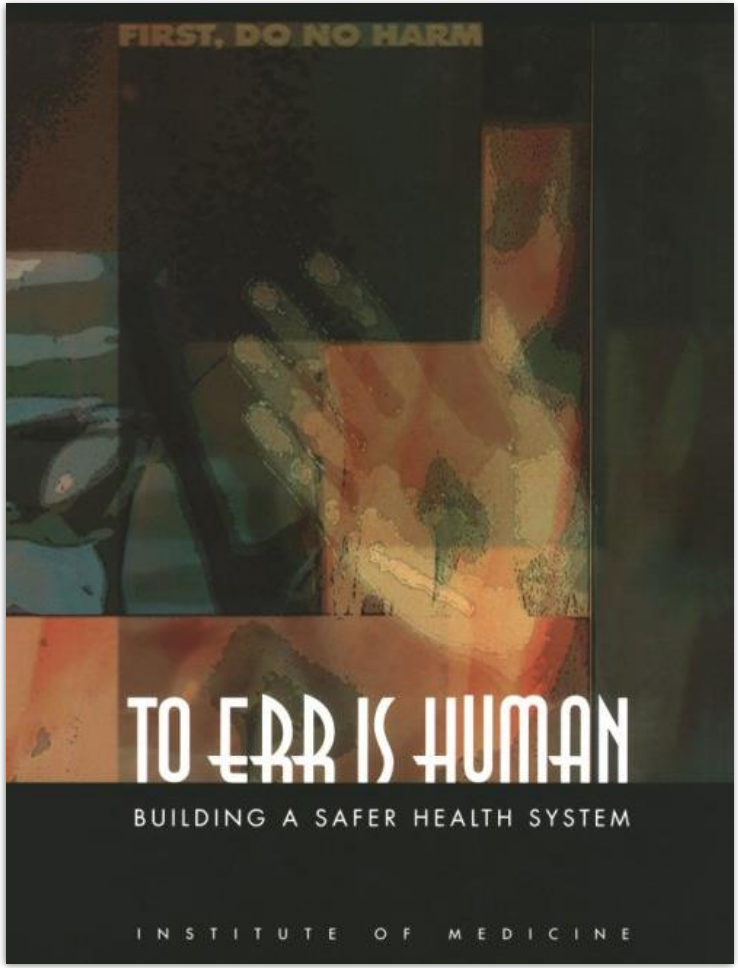
Epidemiology of Medical Error

- Harvard and Australian studies of medical error provided population data on the rates of injuries of patients in hospitals, and they identified a substantial amount of medical error
- From 1999 IOM report - in the United States, medical error results in 44,000 to 98,000 unnecessary deaths each year and 1 million excess injuries
- Other more recent estimates that include hospital acquired conditions raise the death estimate to 440,000 or the 3rd leading cause of death in the US
- Error rate is higher when clinicians are inexperienced and new procedures are introduced
- Extremes of age, complex care, and a prolonged hospital stay are associated with more errors

Estimate of 98,000 deaths in US is an extrapolation from NYS funded study of 1984 errors & deaths published in 1991, Harvard's Lucian Leape lead author, prompted by death of Libby Zion in NYC

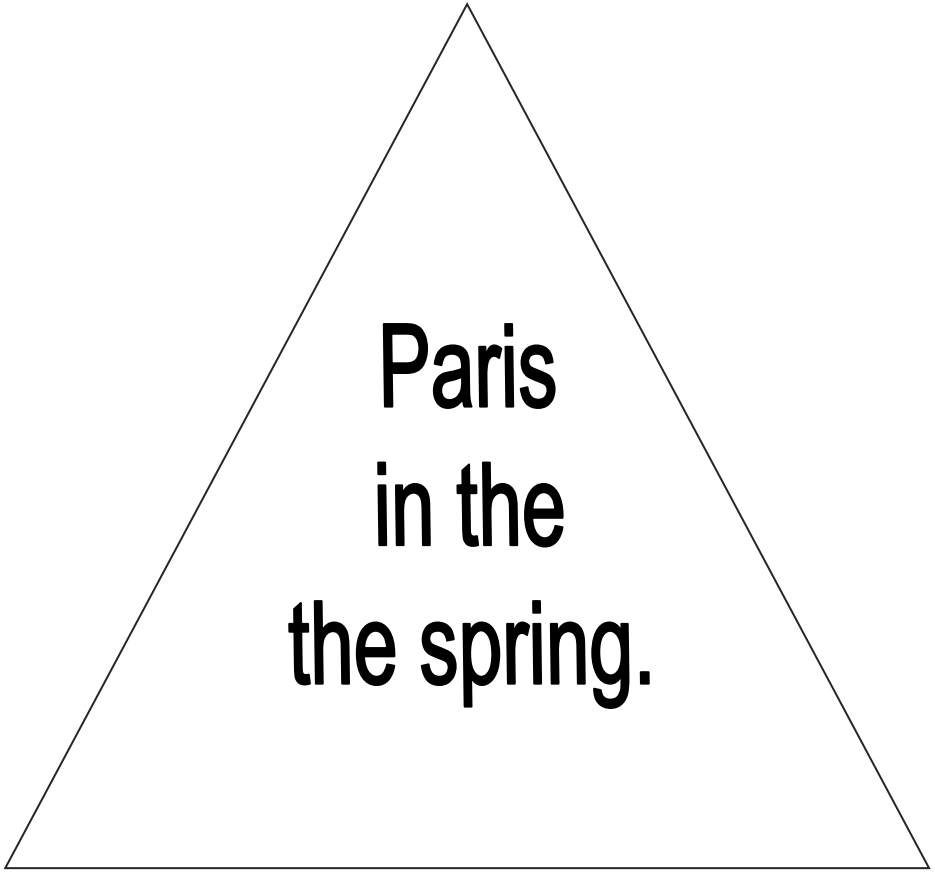
TOPIC 2

To Err is Human


FIRST, DO NO HARM
TO ERR IS HUMAN
BUILDING A SAFER HEALTH SYSTEM
INSTITUTE OF MEDICINE

TEST

Read the next slide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TEST

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Errors

- "A slip, mistake, unsafe practice or omission during the normal course of operation."
- **Active errors** - Usually referred to as 'human' errors, are inevitable, and occur more often when
  - there are environmental distractions
  - fatigue is a factor
  - the person lacks knowledge of how the process should be done
- **System latent faults** - Usually referred to as 'system errors', and occur more often when
  - the system is poorly designed
  - routine maintenance is not performed
  - failures are 'band-aided'; not fixed

Humans Work in Three Modes

Knowledge-Based Performance
"Figuring It Out Mode"

Rule-Based Performance
"If-Then Response Mode"

Skill-Based Performance
"Auto-Pilot Mode"

Lack of Knowledge-Based Performance

What You're Doing at the Time:

Problem solving in a new, unfamiliar situation. You come up with the answer by:

- Using what you know (parts of different Rules)
- Taking a guess
- Figuring it out by trial-and-error

ERRORS WE EXPERIENCE	ERROR-PREVENTION STRATEGY
Came up with the wrong answer (a mistake)	Stop and find an expert who knows the correct answer

30-60 of 100 decisions – that's *30% to 60%* – made in error

(yikes!)

Rule-Based Performance

What You're Doing at the Time:

Responding to situations by recalling and using rules learned either through education or experience

ERRORS WE EXPERIENCE	ERROR-PREVENTION STRATEGY
Used the wrong rule – You were taught or learned the wrong response for the situation	Educate about the right rule
Misapplied a rule – You knew the right response but picked another response instead	Think a *second* time
Non-compliance – Chose not to follow the rule (usually, thinking that not following the rule was the better option at the time)	Reduce burden, increase risk awareness, improve coaching

1 in 100 (1%) choices made in error
(not too bad!)

Skill-Based Performance

What You're Doing at the Time:
Routine, frequent tasks in a familiar environment that you can do without even thinking about it – like you're on auto-pilot

ERRORS WE EXPERIENCE	ERROR-PREVENTION STRATEGY
Slip – *Without intending to*, you do the wrong thing **Lapse** – *Without intending to*, you fail to do what we meant to do **Fumble** – *Without intending to*, you mishandle or blunder an action or word	Stop and think before acting

1 in 1,000 (0.1%) acts performed in error
(as good as it gets for a human working on their own!)

The Power of the Pause

Say the color…

RED	BLUE	GREEN	BLUE	BLACK
YELLOW	GREEN	ORANGE	GREEN	RED
PINK	BLACK	BROWN	YELLOW	GRAY
BLUE	RED	GREEN	PINK	BROWN
ORANGE	BLACK	BLUE	GREEN	RED

Source: Stroop, J.R. Studies of interference in serial verbal reactions. *J. Exp. Psychol.*, 18:643-662, 1935.


FEDERAL
EXPRESS


EL
10/22/2000

IT WON'T HAPPEN TO ME!

"WHEN ANYONE ASKS ME HOW I CAN BEST DESCRIBE MY EXPERIENCE IN NEARLY FORTY YEARS AT SEA, I MERELY SAY, UNEVENTFUL. OF COURSE THERE HAVE BEEN WINTER GALES, AND STORMS AND FOG AND THE LIKE, BUT IN ALL MY EXPERIENCE I HAVE NEVER BEEN IN AN ACCIDENT OF ANY SORT WORTH SPEAKING ABOUT. I HAVE SEEN BUT ONE VESSEL IN DISTRESS IN ALL MY YEARS AT SEA....I NEVER SAW A SHIPWRECK AND HAVE NEVER BEEN SHIPWRECKED, NOR WAS I EVER IN ANY PREDICAMENT THAT THREATENED TO END IN DISASTER OF ANY SORT."

E.J. SMITH

ON 14 APRIL 1912 RMS TITANIC SANK WITH THE LOSS OF 1500 LIVES - ONE OF WHICH WAS IT'S CAPTAIN..... E.J. SMITH

Typical Human Error Rates

0.3%	Error of commission, e.g. misread label
1%	Error of omission without reminders
3%	Simple arithmetic errors
10%	Inspector fails to recognize error
25%	Error rates under very high stress with dangerous activities occurring rapidly

From Park K. Human Error, in Salveny G, ed. Handbook of human factors and ergonomics

TOPIC 3

Consequences of Errors

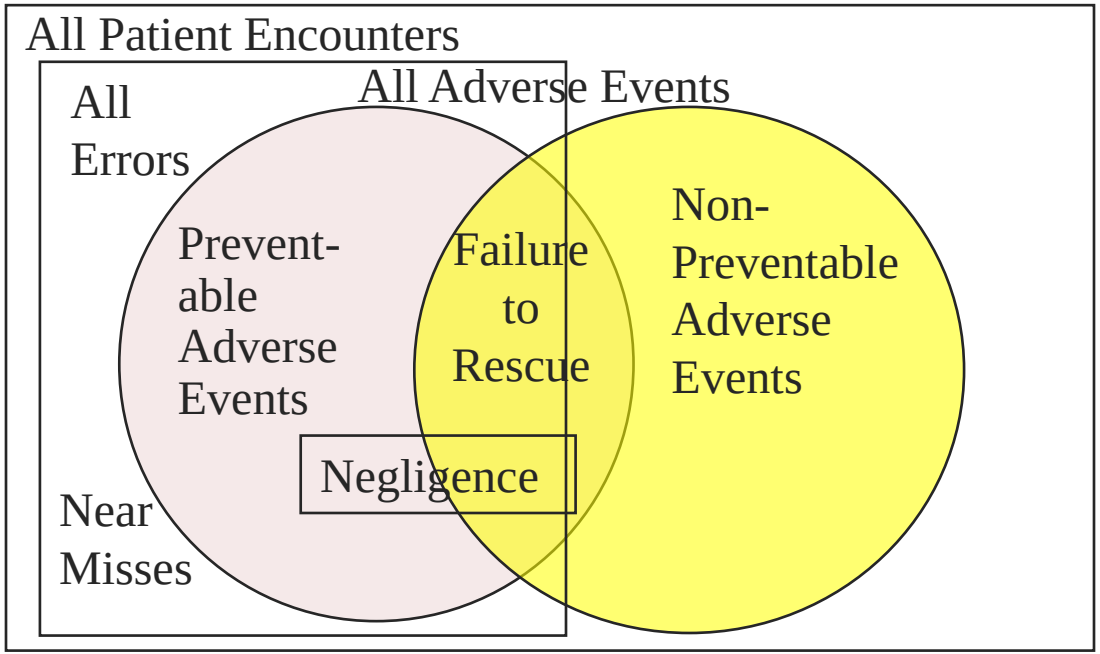
3 Simple Errors

- YouTube - BBC - Guy Goma
- Virginia hospital blood transfusion
- Rochester hospital blood transfusion

(Guy Goma Video)

Understanding Patient Safety

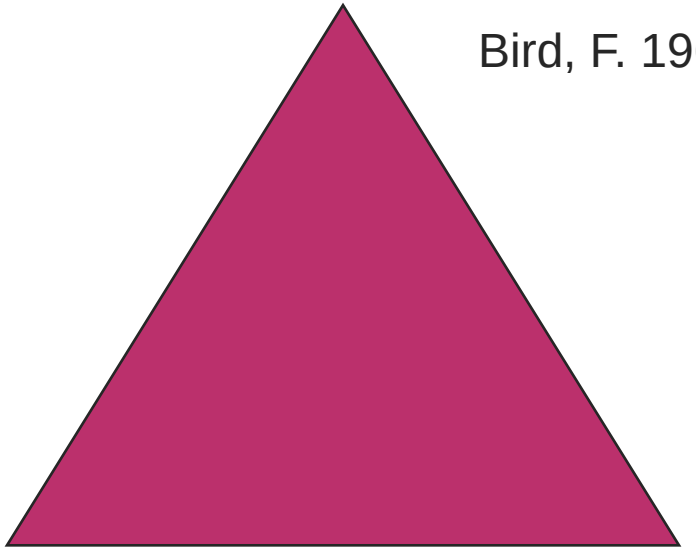
Chance may affect combinations



Pyramid View of Accident Causation

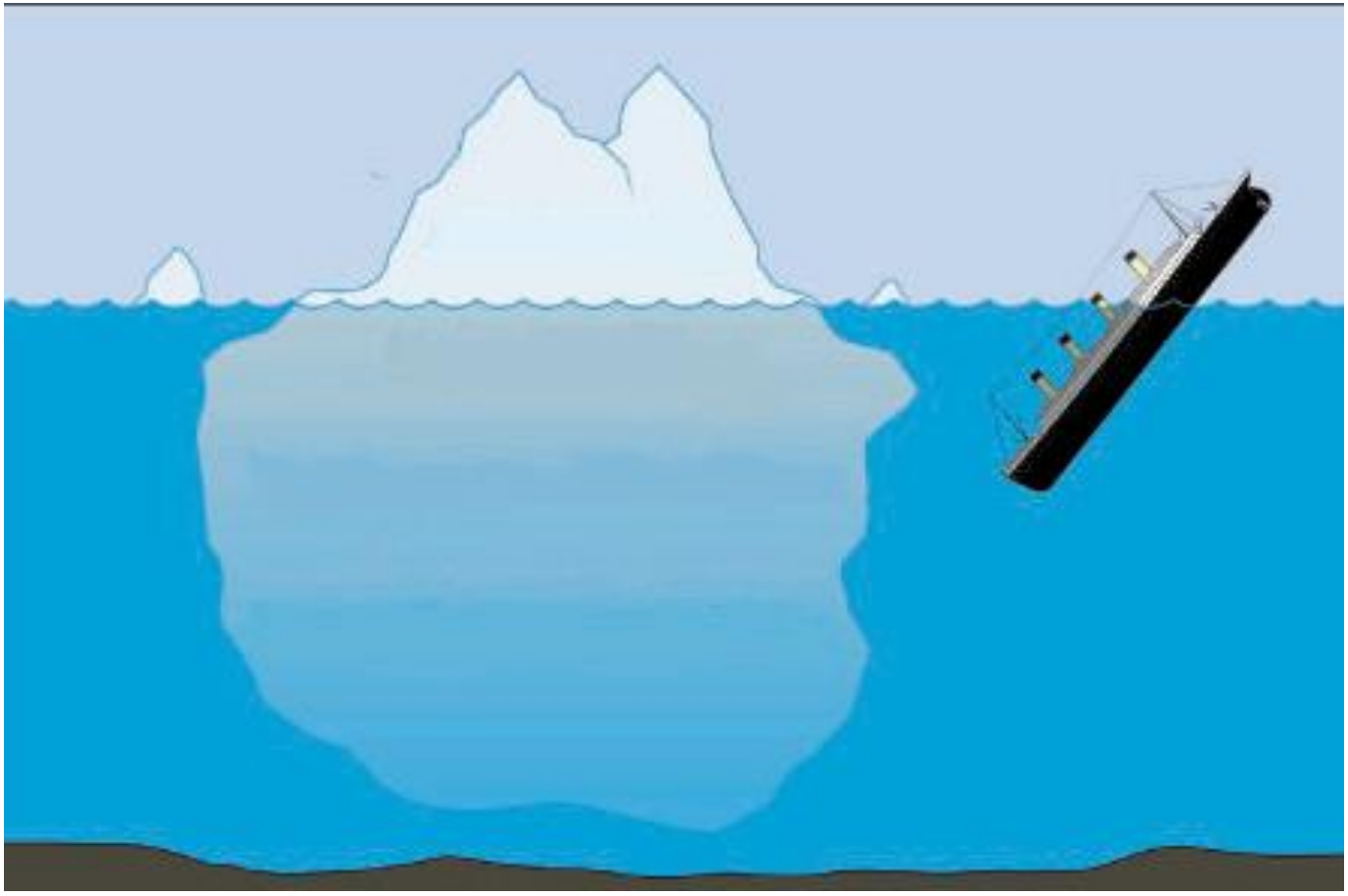
- 1 serious or major injury
- 10 minor injuries
- 30 property damage injuries
- 600 incidents with no visible damage or injury

Bird, F. 1969



1,753,498 accidents from 297 companies, 21 different industries

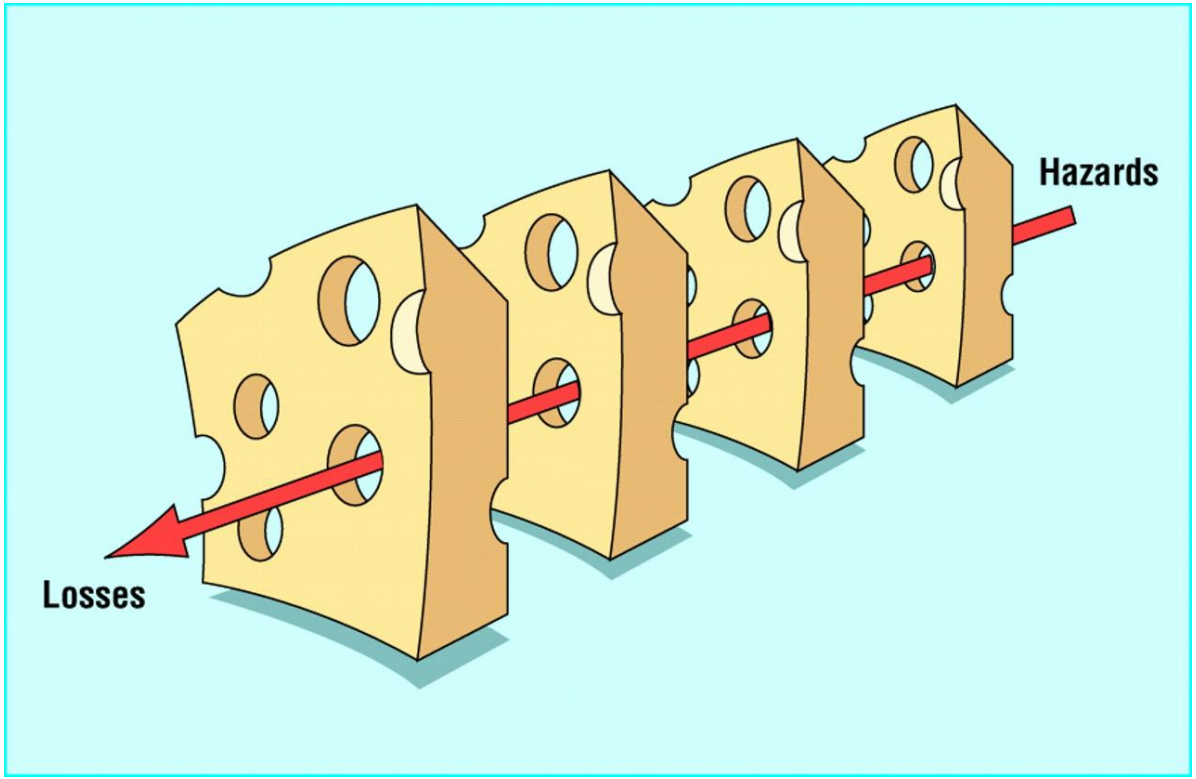
Iceberg Model of Accidents and Errors

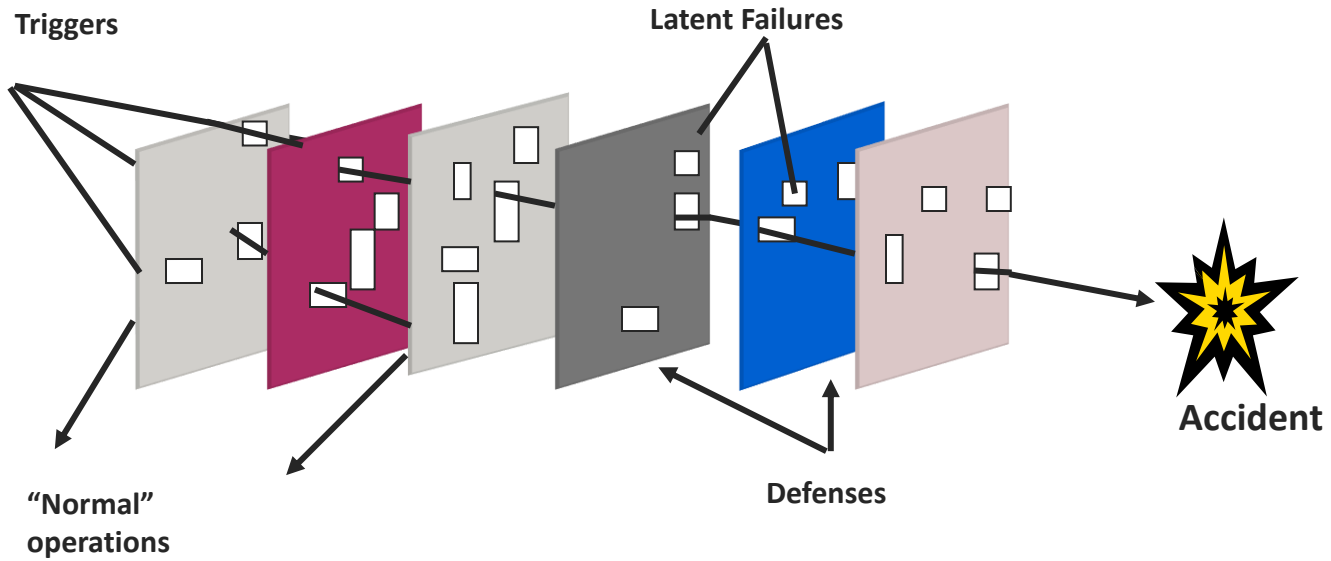


TOPIC 4

Swiss Cheese Models Enhanced

The Reason Model

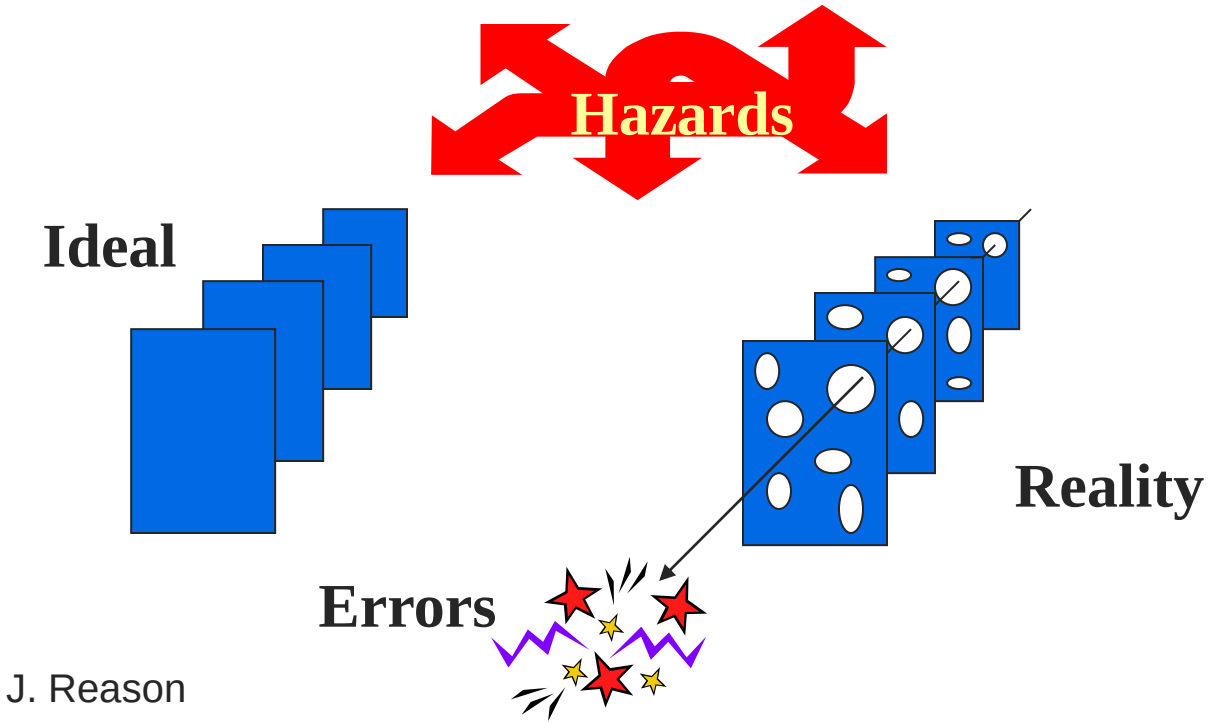




Complex systems fail because of the combination of multiple small failures, each individually insufficient to cause an accident. These failures are *latent* in the system and their pattern changes over time.

Modified from Reason, 1990

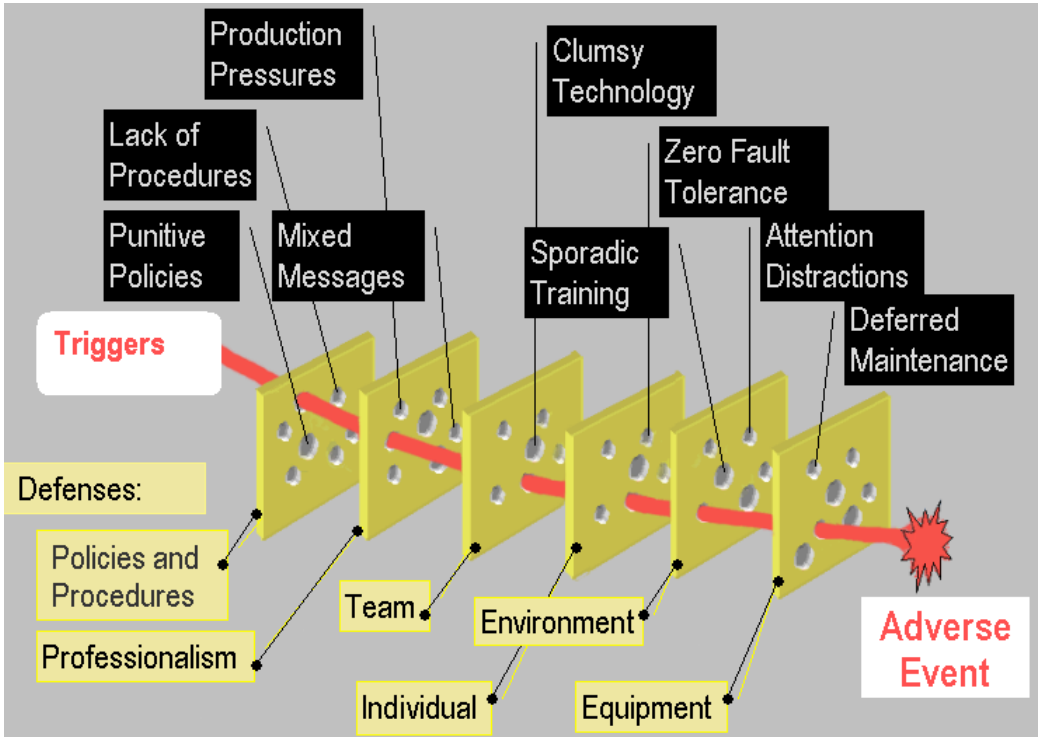
Swiss Cheese Model Defenses Against Errors



J. Reason

Multi-Causal "Swiss Cheese" Diagram

(Reason, 1991)



Sometimes single errors can lead to severe harm

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TOPIC 5

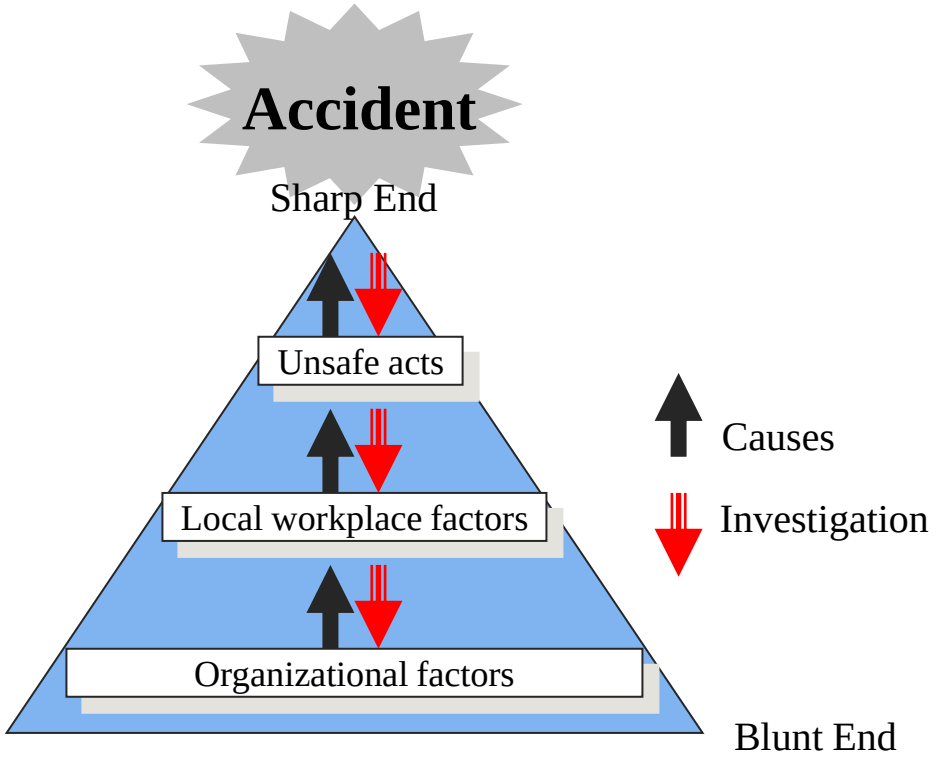
Understanding Errors

(it’s more complex than the Swiss Cheese Model)

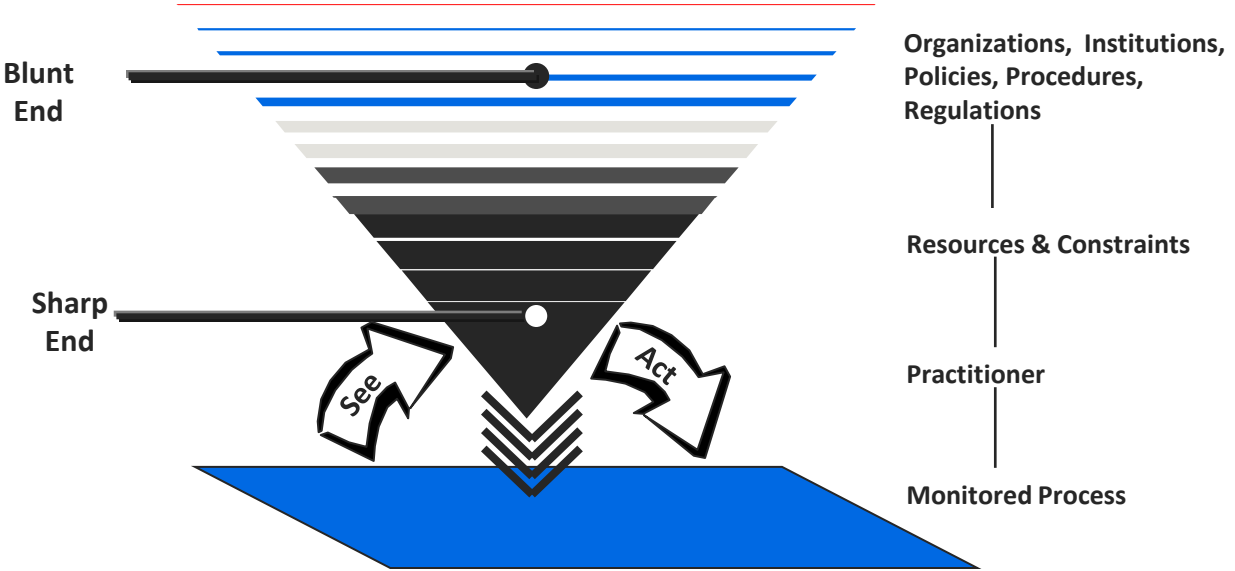
Development of Reason model in healthcare

- Focus on identifying chain of events
- Identification of `care management problems' - often a series of `unsafe acts'
- Development of framework of factors that provide the conditions for safe/unsafe practice

Errors Development and Investigation



J. Reason

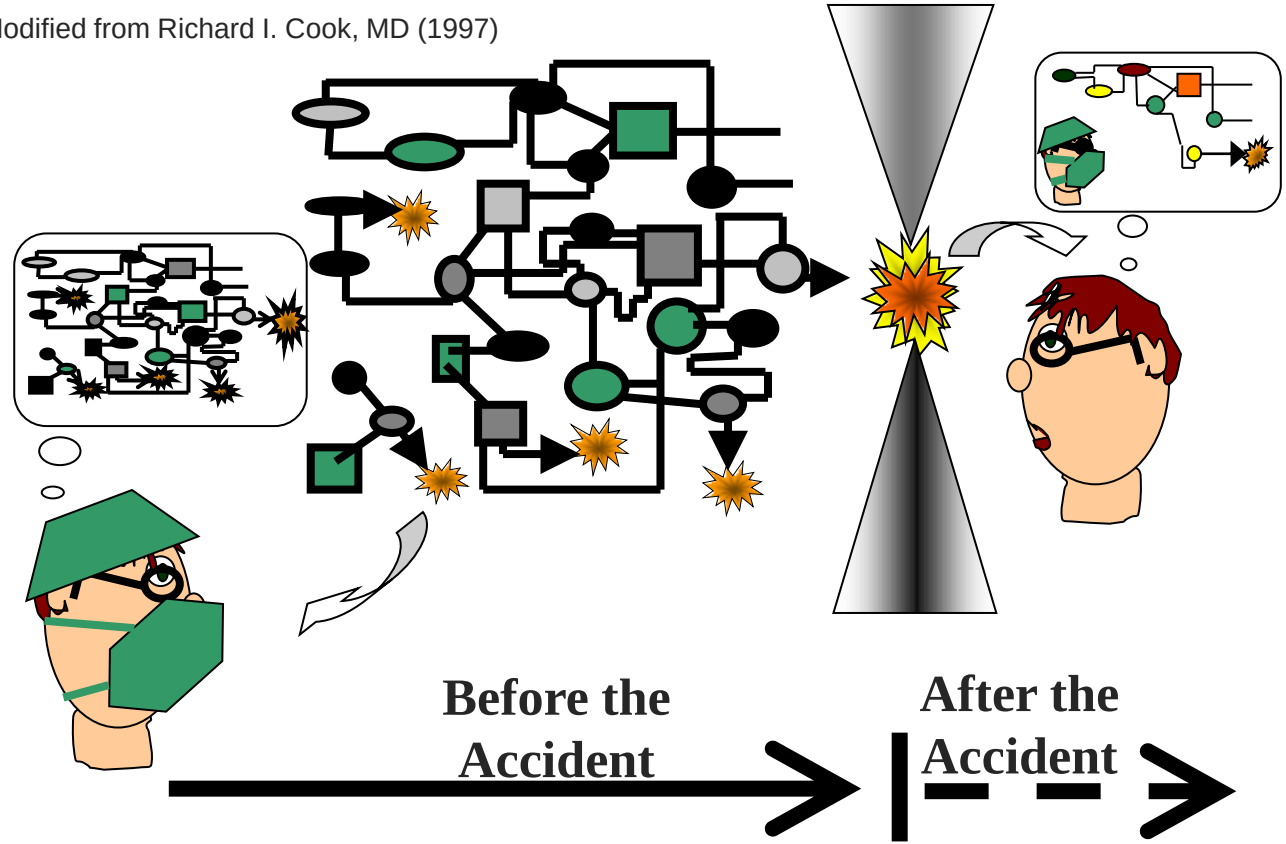


Practitioners at the *sharp end* of the system interact directly with the hazardous process. The resources and constraints on their technical work arise from institutional, management, regulatory and technological *blunt end* factors.

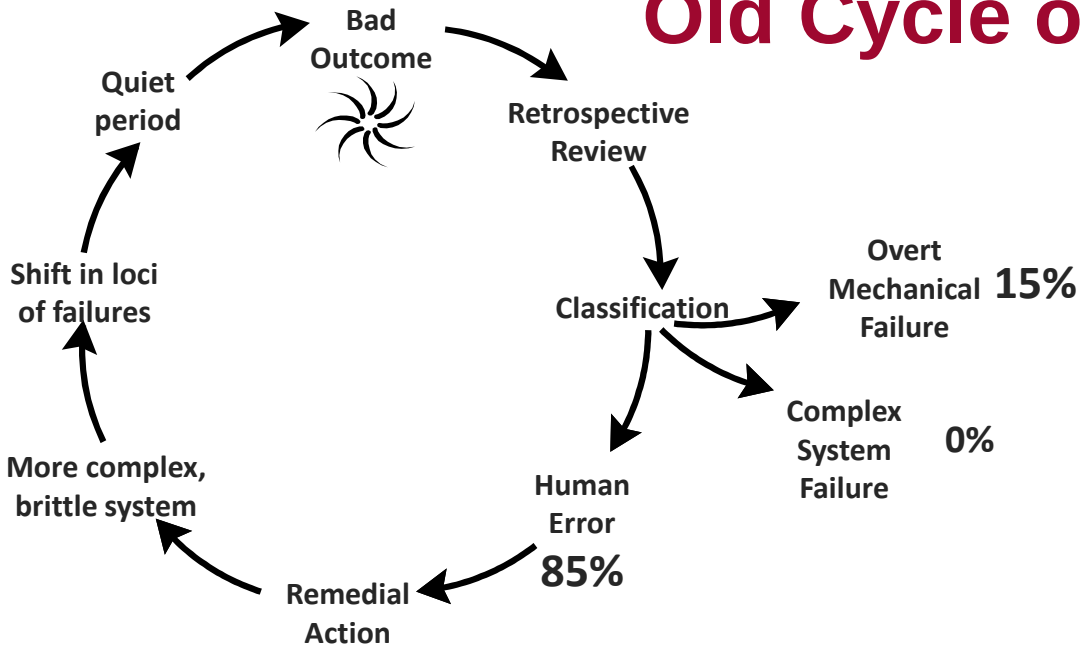
Modified from Woods, 1991

Hindsight Bias

Modified from Richard I. Cook, MD (1997)

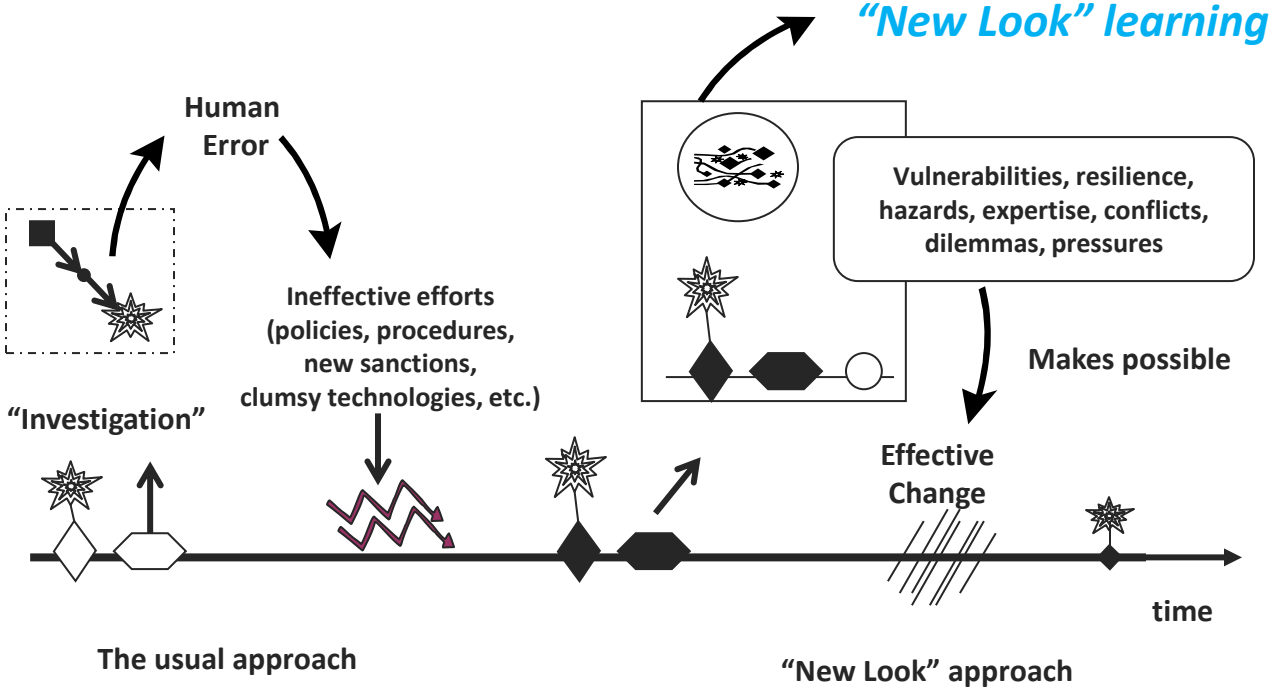


Old Cycle of Error



Organizational *reactions to failure* focus on human error. The reactions to failure are: blame & train, sanctions, new regulations, rules and technology. These interventions increase complexity and introduce new forms of failure. Cycle repeats.

Modified from Cook, 1999



People make safety. Improving safety depends on understanding the details of technical work, how success is usually achieved, and how failure sometimes occurs. Effective change follows.

Modified from Cook, 1999

Analytic Frameworks

- Root cause analysis (RCA) – primarily looks backward with focus on errors that occurred
- Failure modes & effects analysis – primarily looks forward at risk frequency, severity, & preventability with focus on errors
- Safety 2 – looks at what creates conditions for success

Safety-II

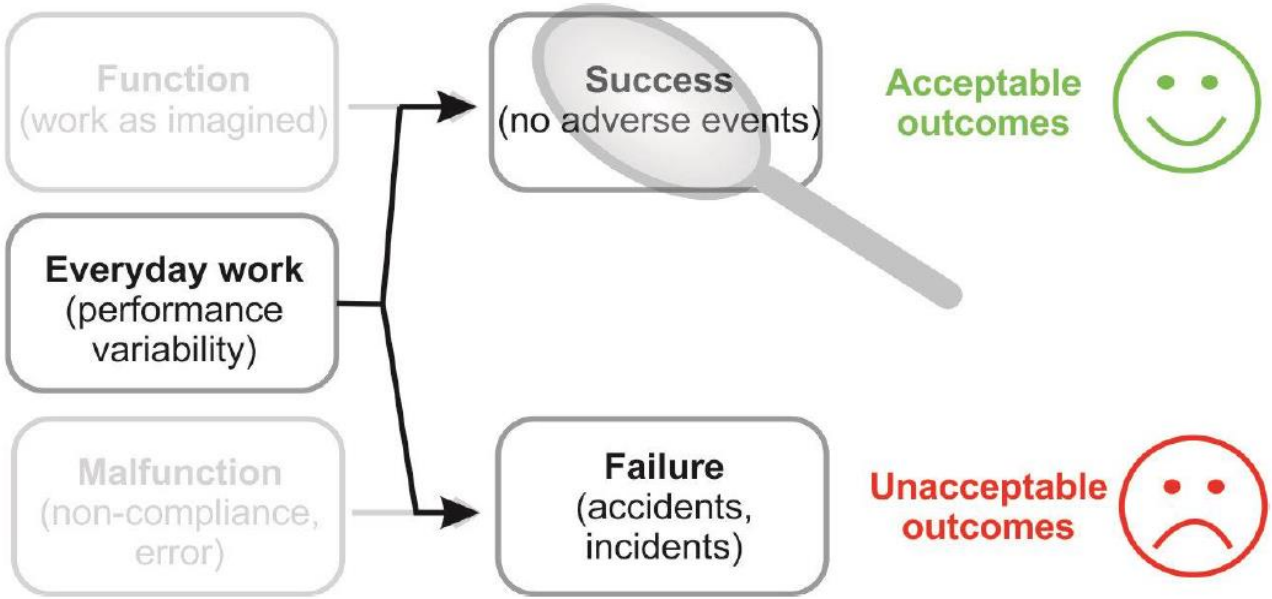


Figure 6: The basis for safety is understanding the variability of everyday performance

Table 1: Overview of Safety-I and Safety-II

	Safety-I	Safety-II
Definition of safety	That as few things as possible go wrong.	That as many things as possible go right.
Safety management principle	Reactive, respond when something happens or is categorised as an unacceptable risk.	Proactive, continuously trying to anticipate developments and events.

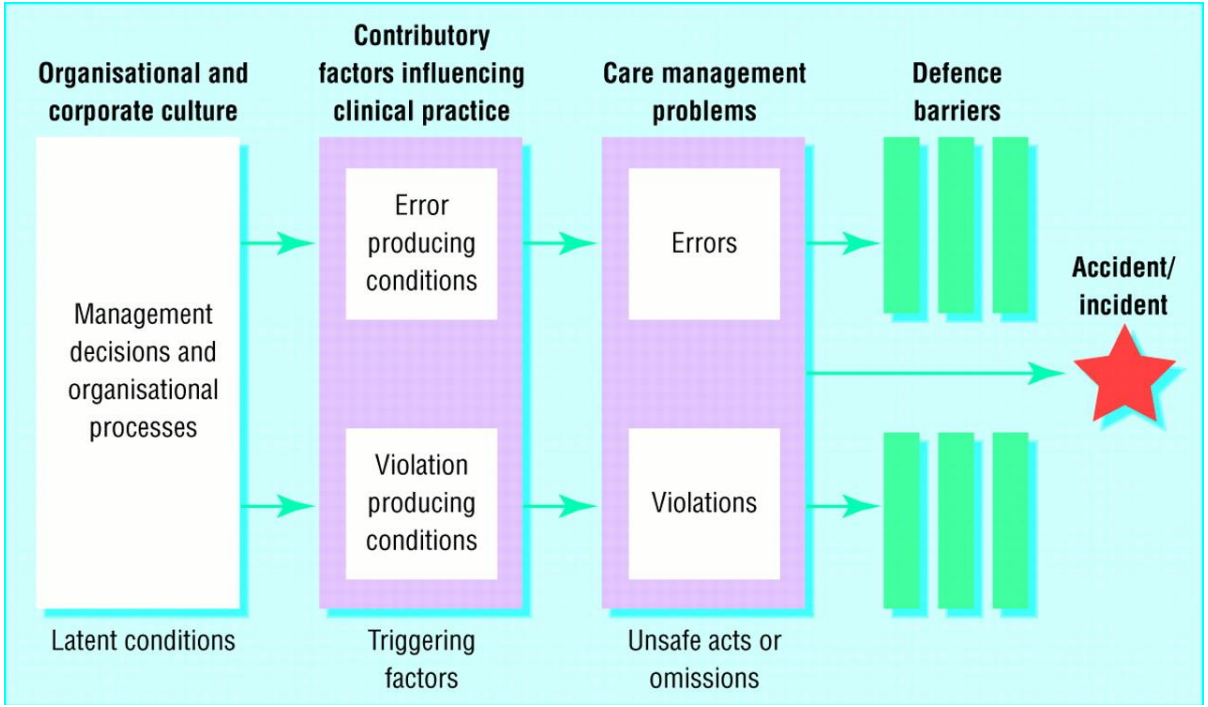
Overview of Safety-I and Safety-II (cont.)

View of the human factor in safety management	Humans are predominantly seen as a liability or hazard. They are a problem to be fixed.	Humans are seen as a resource necessary for system flexibility and resilience. They provide flexible solutions to many potential problems.
Accident investigation	Accidents are caused by failures and malfunctions. The purpose of an investigation is to identify the causes.	Things basically happen in the same way, regardless of the outcome. The purpose of an investigation is to understand how things usually go right as a basis for explaining how things occasionally go wrong.
Risk assessment	Accidents are caused by failures and malfunctions. The purpose of an investigation is to identify causes and contributory factors.	To understand the conditions where performance variability can become difficult or impossible to monitor and control.

TOPIC 6

Normalization of Deviance

Reason - complex systems

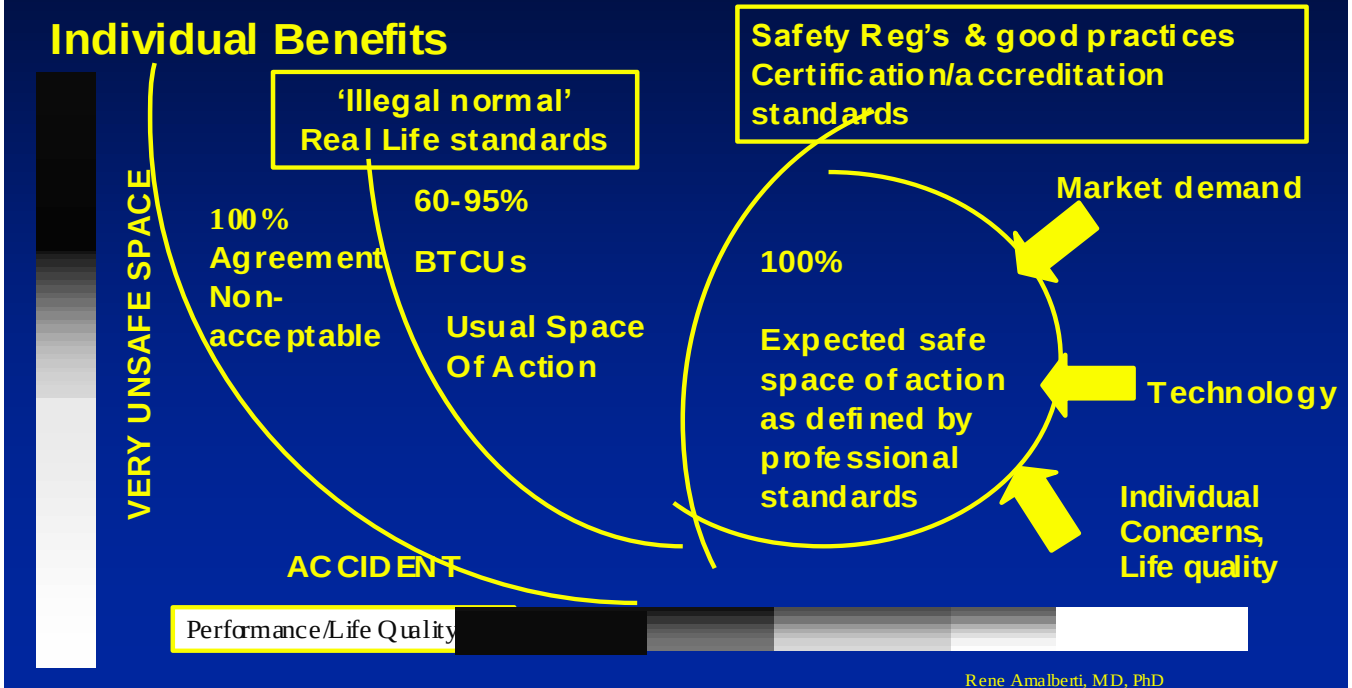


Borderline Tolerated Conditions of Use

Amalberti

- To function, people go beyond literal rules and regulations
- Value = They get better performance, individual benefits, and still usually have acceptable safety
- Risks
  - inexperienced people coming into the environment more likely to go beyond the existing area of relatively safe violations
  - Experienced people can get in trouble too
- Similar to “normalization of deviance”

Systemic Migration to Boundaries



Rene Amalberti, MD, PhD

Transition to Human Factors Topic

- If to err is human, what can we do about it to reduce the rate of errors and increase the chance of success?

- Human Factors Engineering is part of the answer.

Questions?