

Introduction to Errors in Medicine



Agenda

- Definitions
- Epidemiology of errors
- Approach to error - The Medical Model
- Etiology - The Reason Latent Factors Model
- Diagnosing errors - Root Cause Analysis

Medical Error

“...failure of a planned action to be completed as intended (error of execution) or the use of a wrong plan to achieve an aim (error of planning)”

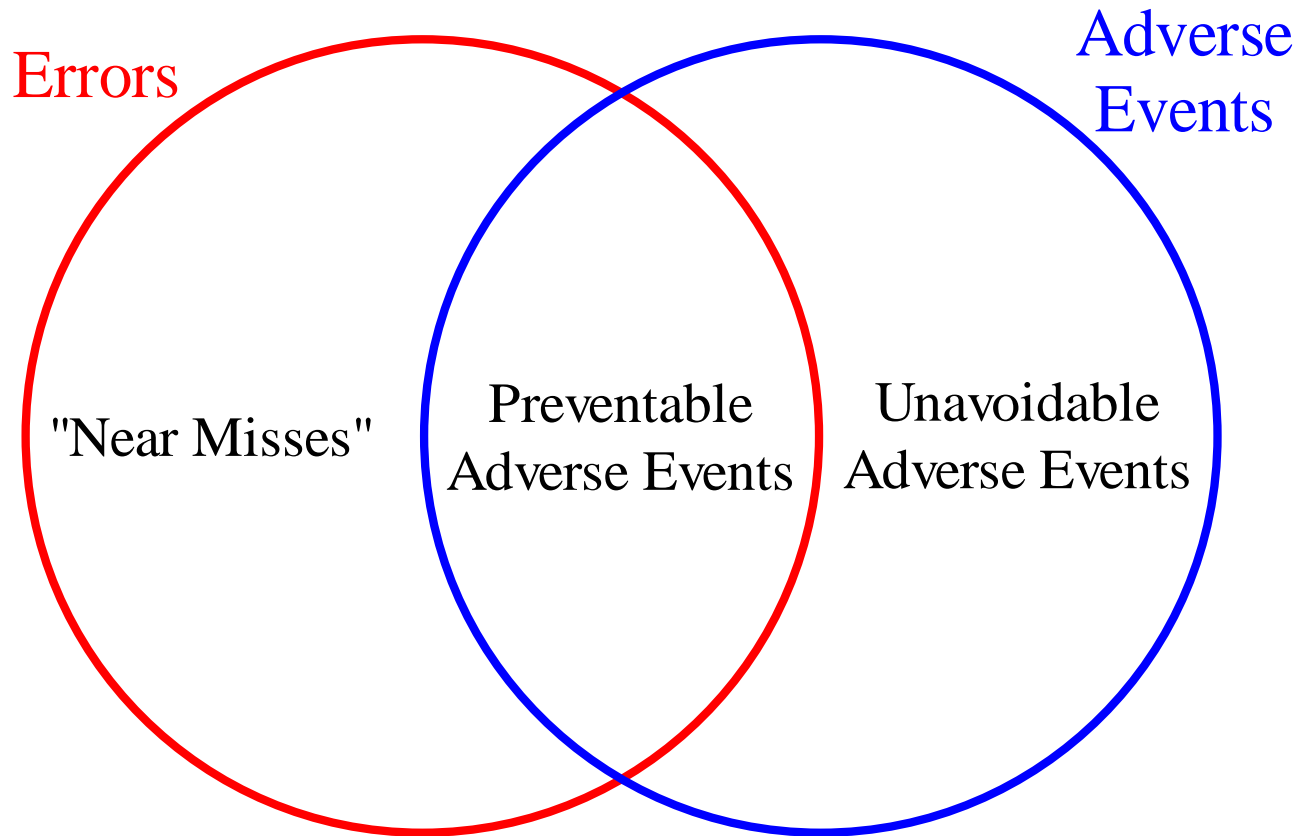
Adverse Event

“An injury caused by medical management rather than the underlying condition of the patient.”

Adverse Events & Errors

- Not all errors lead to adverse events (“near-misses”)
- Preventable adverse events are due to errors
- Not all adverse events are due to errors

Adverse Events & Errors



An Example: Methotrexate

- Useful in inflammatory disorders (RA, asthma)
 - Usual dose: 7.5-25 mg po every week
 - Alternate: 2.5-7.5 mg po q12h x 3 doses per week
- Narrow therapeutic window
- Used in outpatient settings with low supervision
- Patients are often older with comorbidities (low vision, dementia, etc.)

Methotrexate Fatalities

- One patient took methotrexate 2.5 mg every 12 hours (for six consecutive days), instead of 2.5 mg every 12 hours for three doses each week.
- Another took 10 mg every “morning” instead of every “Monday.”

These are Preventable Adverse Events

More on Methotrexate

- One patient took extra doses of methotrexate “as needed” to relieve arthritic symptoms.
- Three elderly patients took the medication daily despite clearly written instructions to take it weekly.

If they survived, these are “Near Misses”

A note on the examples...

- We chose examples to highlight teaching points
- Errors occur
 - in all specialties
 - in all settings
 - at all levels of training
- The examples are generic

All doctors in all specialties make mistakes

Epidemiology of Error

- Adverse events are common
- In hospital
 - 3-17% of all hospital admissions
 - 51-69% are due to error (preventable)
- Outpatient
 - Unknown
 - Fewer safeguards
 - Less monitoring

Cost of Errors

- The death rate might be very high
 - 44,000-98,000 per year in hospital (maybe)
 - More than car crashes (43,458) or breast cancer (42,297) or AIDS (16,516)
- Disability rates unknown
- Fiscal costs:
 - \$2,595 and 2.2 hospital days per error

Who is at Risk?

- All patients
 - Especially older, sicker, more medications
- All providers
 - Especially trainees or those learning new techniques
- All settings
 - Especially surgery, emergency care, ICU, prolonged care

Thinking about error

- Etiology - Why do errors happen?
- Response - What should we, as a system or profession, do when we discover an error?
- Two schools of thought:
 - The person approach
 - The system approach

The Person Approach - Etiology

- Individuals make mistakes because they are:

The Person Approach - Etiology

- Individuals make mistakes because they are:
 - Forgetful
 - Inattentive
 - Stupid
 - Evil
 - Weak
- People are at fault

Work on the “sharp end”

The Person Approach - Response

- Identify the culprits
- Discipline them
- Watch them
- Retrain them
- Eliminate them

Name, Blame & Shame

The System Approach - Etiology

- Humans are fallible!
- Errors are expected
- Errors are consequences, not causes
- Latent factors in the environment set up the person to “make” a mistake
- Organizational processes create the conditions for error

The System Approach - Response

- Identify the event
- Repair the damage
- Look for the underlying mechanism
- Find the root causes in the system
- Redesign the system to defend against the root causes

Learn from errors

Why Name, Blame & Shame?

- Face validity
- Revenge feels good
- If one individual culprit is at fault, the rest of us don't have to change
- Avoids institutional responsibility
- Tradition
- Litigiousness and legal profits

Why *Not* Name, Blame & Shame?

- When people are fearful, they tend to:

Why *Not* Name, Blame & Shame?

- When people are fearful, they tend to:
 - Hide errors
 - Pass the blame
 - Avoid doing risky (but valuable) tasks
 - Fight rather than cooperate
- These actions prevent meaningful analysis and lasting solutions

Errors must be exposed to teach us

The Trajectory of Error

An error will not cause damage, unless there are simultaneous:

- Latent factors or conditions, perhaps never before recognized,

AND

- Failures in one or (usually) more defenses,

AND

- A vulnerable patient

Medical Gas Mix-up

- Two patients died in January 2002 in a teaching hospital in Connecticut because they received nitrous oxide instead of oxygen during cardiac catheterization.
- The first was old and sick.
- The second, four days later, was young and generally healthy.

Latent Factors

- Re-design of building allowed anesthetic gasses to be delivered to a location that was no longer using them
- Couplings and flow-meters were behind the operators and obscured by equipment

Failed defenses

- Pin on coupling damaged
- The usual response to hypoxia (administer more oxygen), of course, only made things worse
- The first death was not considered a sentinel event and did not trigger an investigation

Patient Vulnerability

- Cardiac patients do not tolerate hypoxia
- The second patient was vulnerable because the first one was so sick that her death was not disturbing

Learning from Disasters Is Hard

- Everyone is upset
- Some participants may have good reasons to try to influence our ideas about what happened
- The patient may be dead
- Legal concerns may prevent full participation

What do you think the mood was like after those two patients died?

Aviation Safety Reporting System

- When a harmful accident occurs, NTSB investigates
 - Personnel are at professional and legal jeopardy
 - Similar to malpractice litigation
- When a no-harm accident occurs, the staff (pilots, flight crew, ground crew, etc) are encouraged to report to ASRS
 - Voluntary and confidential
 - Protected from professional or legal consequences

ASRS Examples

- Two airports have similar call letters
 - A flight crew was briefly confused, but recovered before they got lost
 - Their report to ASRS stimulated a change in the call letters
- A door latch failed in flight
 - The crew landed the plane safely
 - The report to ASRS stimulated a design change

Near Misses

- Often, the trajectory of error stops when it hits a barrier or defense
 - Quick intervention by a team member
 - Automatic safeguard
 - Alert patient or family
 - Resilient patient
 - Dumb luck

Most errors don't cause damage

Learning from Near Misses is Easier

- Misses are much more common than hits
- Everyone is less upset
- The patient is often still around to contribute
- The participants are less afraid
- The legal stakes are lower

Near Miss Reporting Systems

- Non-medical systems
 - Aviation Safety Reporting System
 - Nuclear power plants
- Transfusion Medicine
- Clinical Information Systems
 - Lab values suggest impending harm
 - Unanticipated admissions

Trigger Event

- An event that suggests that an important remedial error is present.
- The starting point of a root cause analysis
- Examples
 - The *Challenger* explosion
 - A JCAHCO sentinel event (*e.g.*: stolen baby)
 - Unexpected deaths
 - A near miss

What is a Root Cause?

- Root cause is that most basic reason for a problem which, if eliminated or corrected, would have prevented the problem
- Causes are:
 - latent factors
 - failed defenses
 - vulnerable patients

A good root cause is fixable.

Root Cause Analysis

- Goal: Find the root cause of the problem
- Research meets management
 - We don't know the answers when we start!
- Qualitative *vs.* Quantitative analysis
- Multiple viewpoints
- Systematic data gathering
- Analysis within a framework

Usually, there is no single root cause.

Case Example: Mr. D.M.

- 58 year old man
- Type II Diabetes for at least 15 years
- Married with two adult children
- Lives with wife of 30 years
- Employed as warehouse manager
- Good access to care

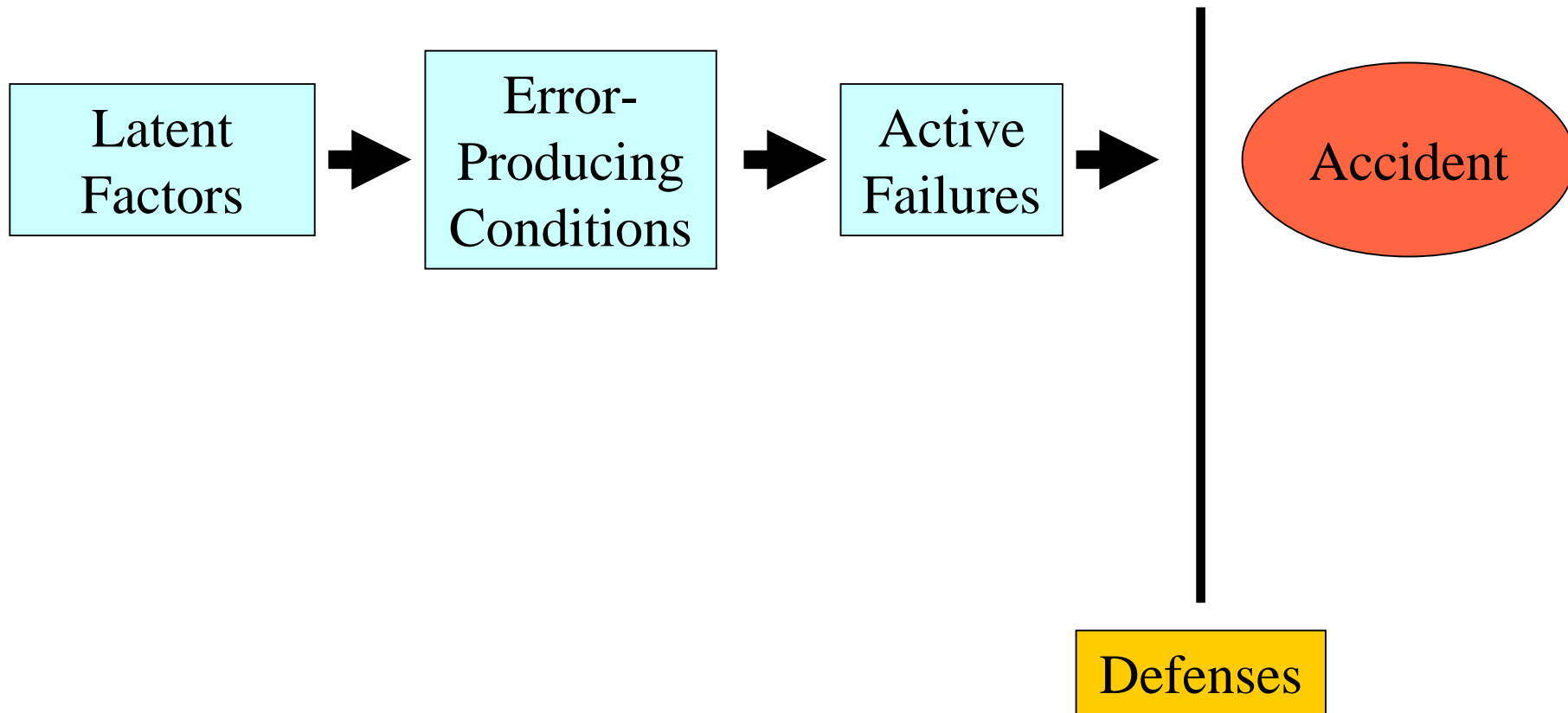
Event Chronology

Date	Event
March 1, 1999	Patient injures his foot
May 10, 1999	Patient seen by PCP, but his feet are not examined.
August 15, 1999	Patient misses appointment with PCP.
October 12, 1999	Patient notes some dull leg pain and calls his PCP. The next available appointment is December 2nd.
November 14, 1999	Patient notes increasing leg pain.
November 16, 1999	Patient goes to Urgent Care.
November 20, 1999	Patient scheduled for amputation.

What errors are apparent?

What causes?

Latent Factor Model of Accident Causation



Latent Factors

- Organizational processes and management decisions
 - Scheduling systems
 - Purchasing protocols
 - Design choices
 - Cultural norms

Error-producing Conditions

- Environmental, team, individual, or task factors that affect performance
 - Knowledge, skills or attitudes of staff
 - Knowledge, skills or attitudes of patients
 - Ambient conditions
 - Equipment shortages
 - Competing demands

EPCs are the products of latent factors.

Active Failures

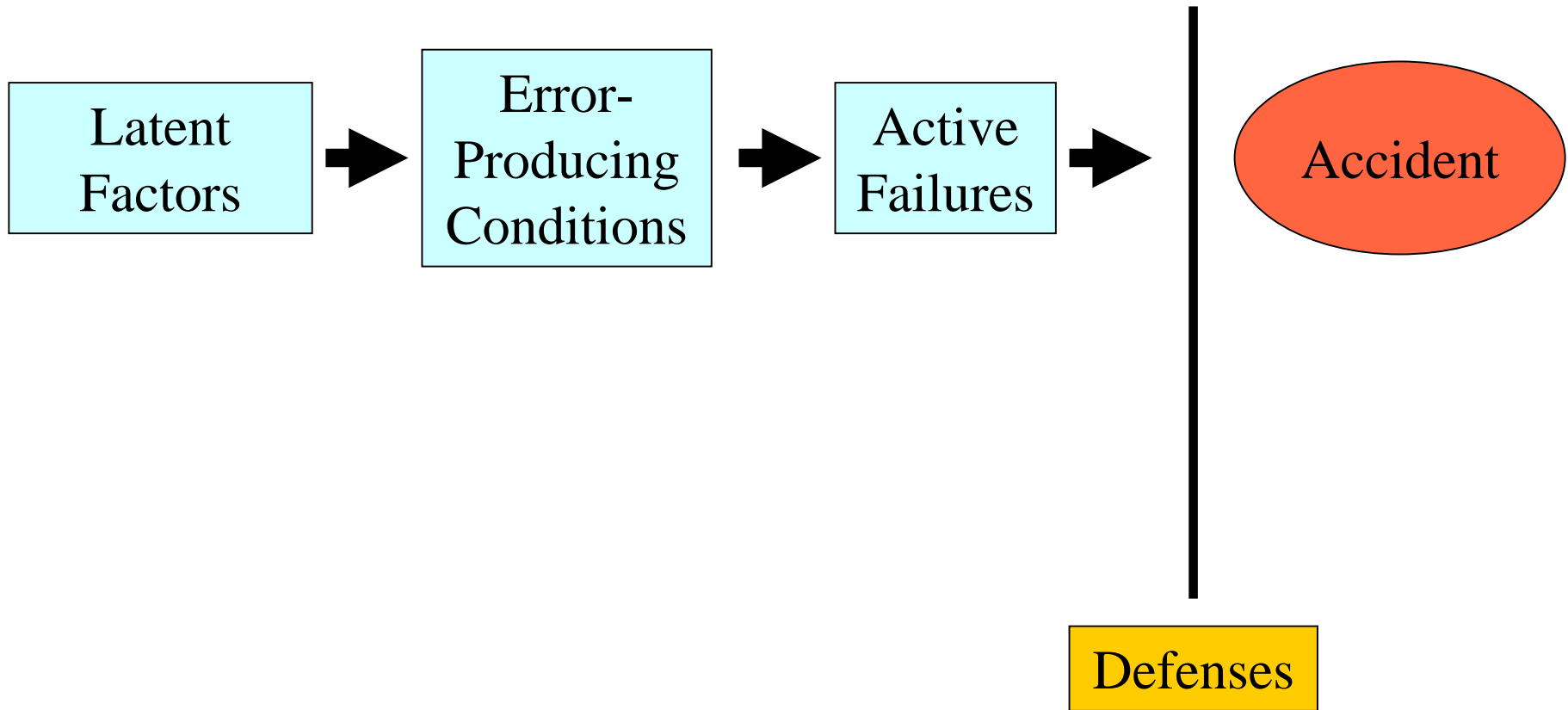
- Active failures are the things that happen immediately prior to the accident
 - Slips - recognition or selection failures
 - Lapses - of attention or memory
 - Mistakes - in judgement
 - Violation - conscious defiance of the rules

The “Sharp End”

Defenses

- Systems or factors that protect against hazards or mitigate consequences of failure
 - Instrument counts
 - Flow sheets
 - Practice guidelines
 - Consultation
 - Education
 - Practice

Latent Factor Model



Mr. D.M.: Active Failures

- Slips - Oops!
- Lapses - Huh?
- Mistakes - Duh!
- Violation - Me, Me, Me!

What active failures occurred in this case?

Mr. D.M.: Active Failures

- Not examining feet (lapse)
- Missed appointment (lapse)
- Patient didn't respond to injury (mistake)
- Office staff did not triage properly (mistake)

Mr. D.M.: Error-Producing Conditions

- Environmental, team, individual, or task factors that affect performance

*What error-producing conditions existed in
this case?*

Mr. D.M.: Error-Producing Conditions

- Cold exam room
- Short appointments
- Poorly informed patient
- Harried staff

Mr. D.M.: Latent Conditions

- Organizational processes and management decisions

What latent conditions contributed in this case?

Mr. D.M.: Latent Conditions

- No reminder system for missed appointments
- No use of treatment protocols
- Patient educational system less than adequate (LTA)
- Staff training LTA
- Productivity pressures: shorter visits

Mr. D.M.: Failed Defenses

- Office triage
- Patient education
- Flow sheets or check lists

- Surgery prevented further loss

Often, failed defenses are the inverse of latent factors, error-producing conditions or active failures.

Conclusions

- Errors are common, unavoidable, devastating, non-random and emotionally charged.
 - *These problems have an epidemiology.*
- Blame hinders understanding and action.
 - *Use the Medical Model to guide your attitude.*
- Active errors have antecedents.
 - *Use the Latent Factors Model to diagnose*
- There problems are treatable.
 - *Take a systematic approach and persevere!*