

Understanding Human Error

Leigh Hamby, MD , MHA

Chief Medical Officer

Objectives for Today

- Quick Overview of Patient Safety
- Understand Where Human Error fits into the context of patient safety
- Deep Dive into the Science behind human performance
 - Types of Errors
 - Probability of Errors
 - Error Producing Conditions
 - Generic Violation Behaviors and Nominal Probabilities
- Have a little fun

Acknowledgements

- Nothing I present is uniquely mine
- I have no conflicts to disclose
- Borrowed heavily from:
 - James Reason “Managing the Risks of Organizational Accidents”
 - HPI consulting
 - The VA Center for Patient Safety
 - Jim Bagian
- Some of the examples are real

Terms We Use in Response to an Error

- “It was an Honest Mistake”
 - What is a “dishonest” mistake?!
- “Going forward, please do not do that again!”
 - You assume they intended to do what they did (? Malicious)
 - You are asking someone to NOT do something, that they never intended to do in the first place OR
- “People just need to be held accountable”
 - Are you stupid or you just don’t care?
- “The beatings will continue until morale improves”
- In response to an event , “Please try harder or be more careful”

Do Men Make More Mistakes Than Women?

An insight into Human Error

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Do Men Make More Mistakes Than Women?

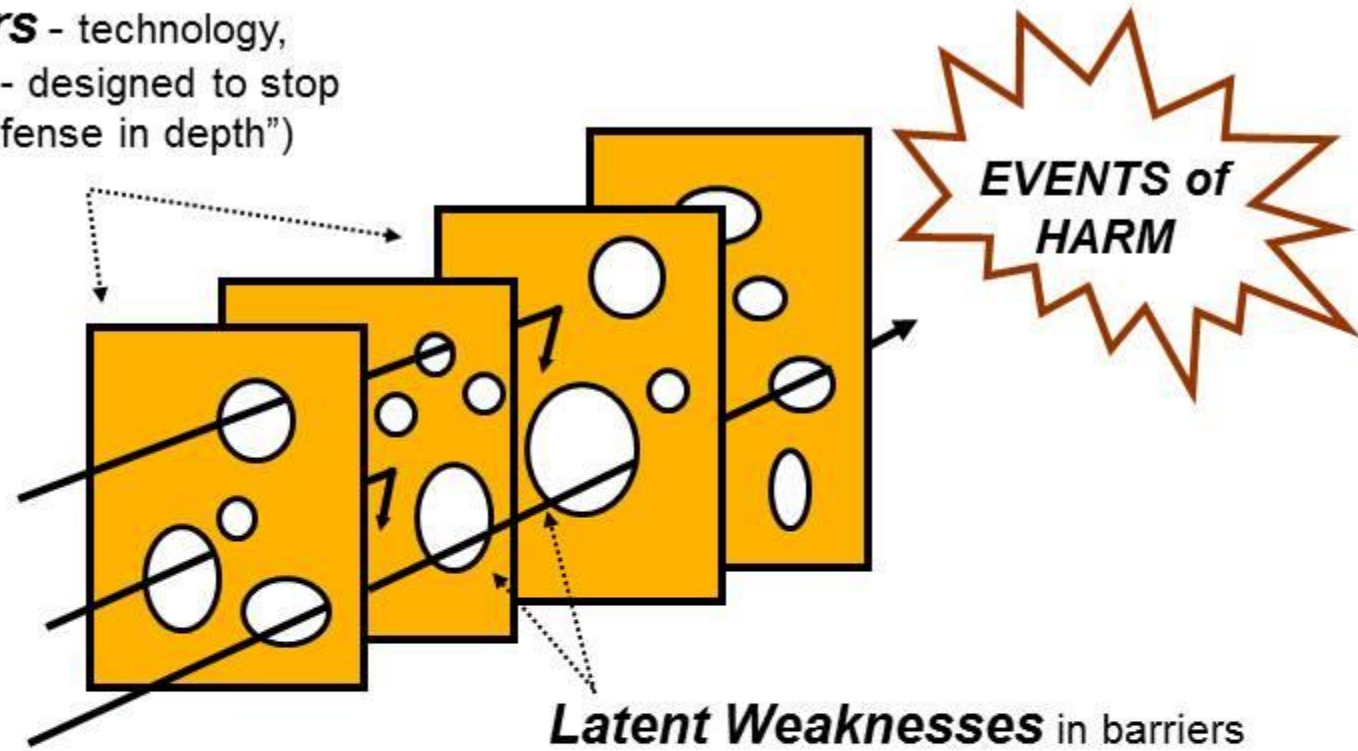
An insight into Human Error

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Multiple Barriers - technology, processes, and people - designed to stop active errors (our “defense in depth”)

Active Errors
by individuals result
in initiating action(s)



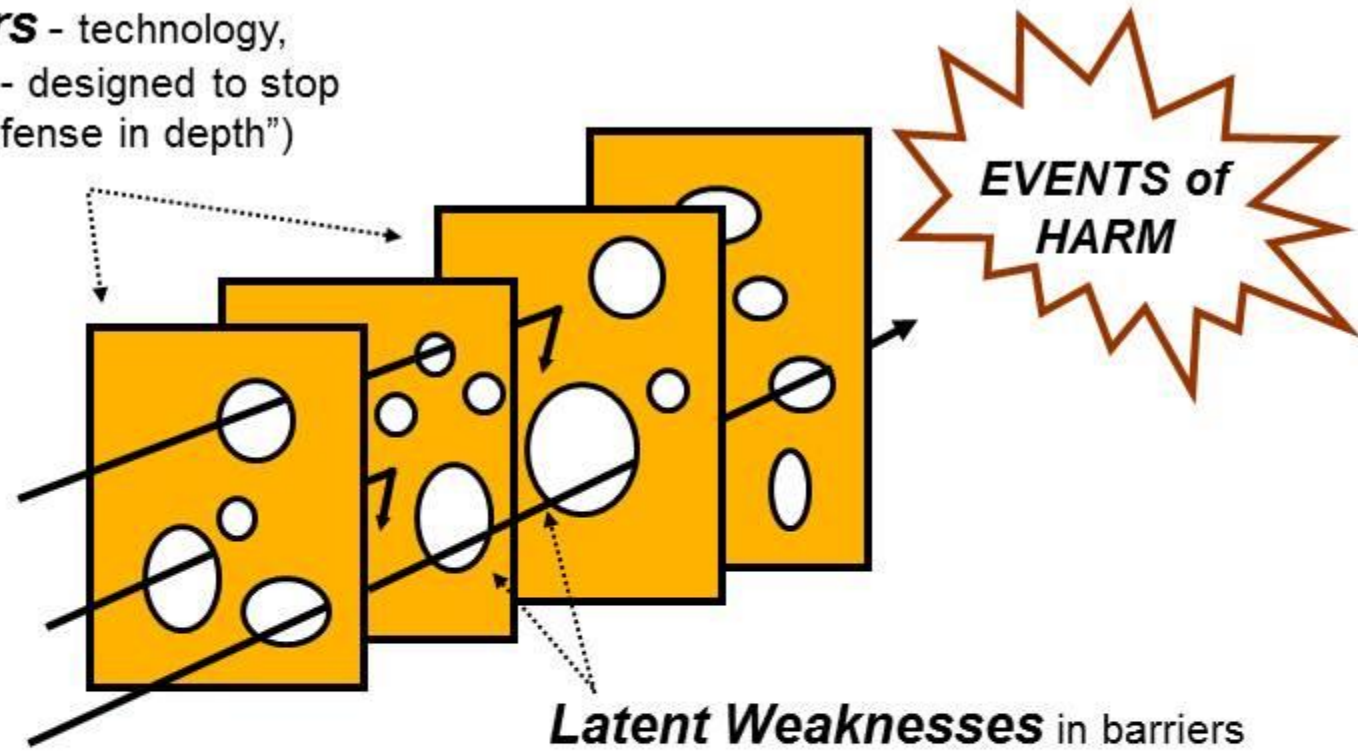
Latent Weaknesses in barriers

PREVENT
The Errors

DETECT & CORRECT
The System Weaknesses

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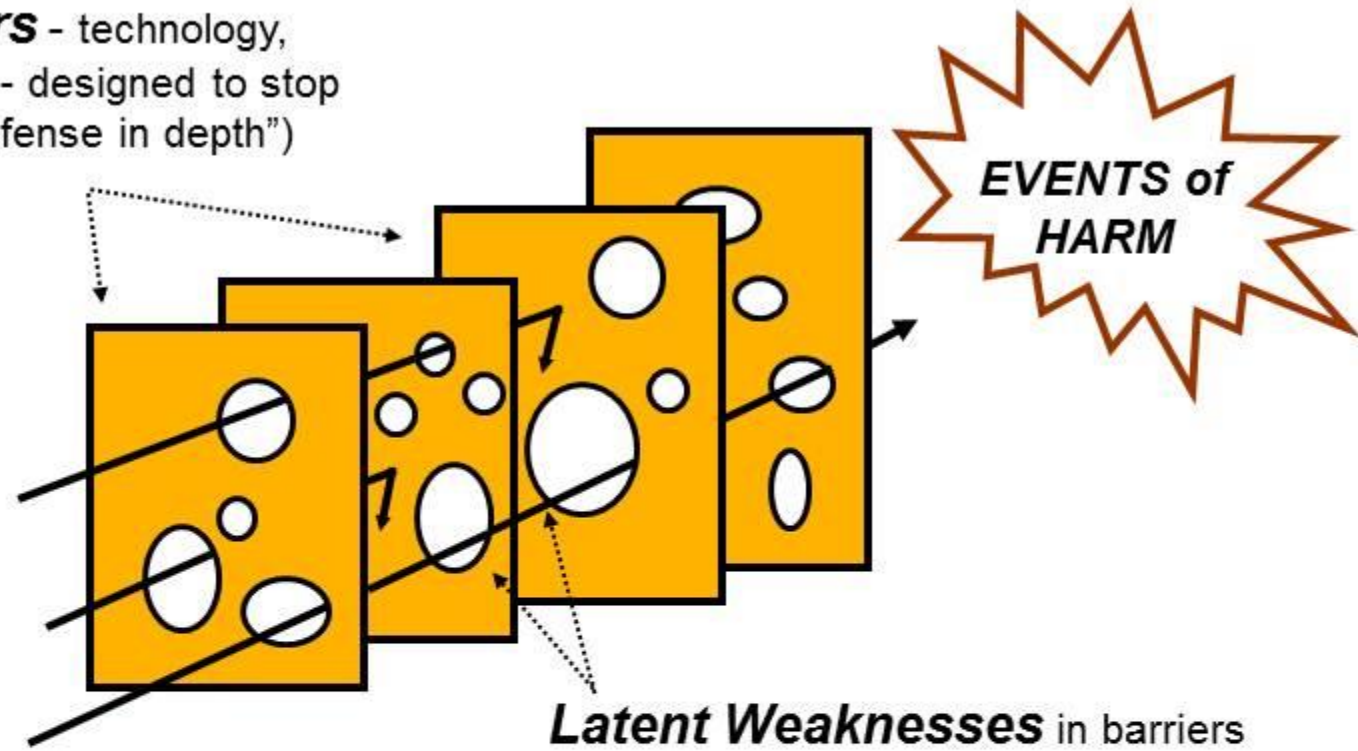
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Safety Behaviors

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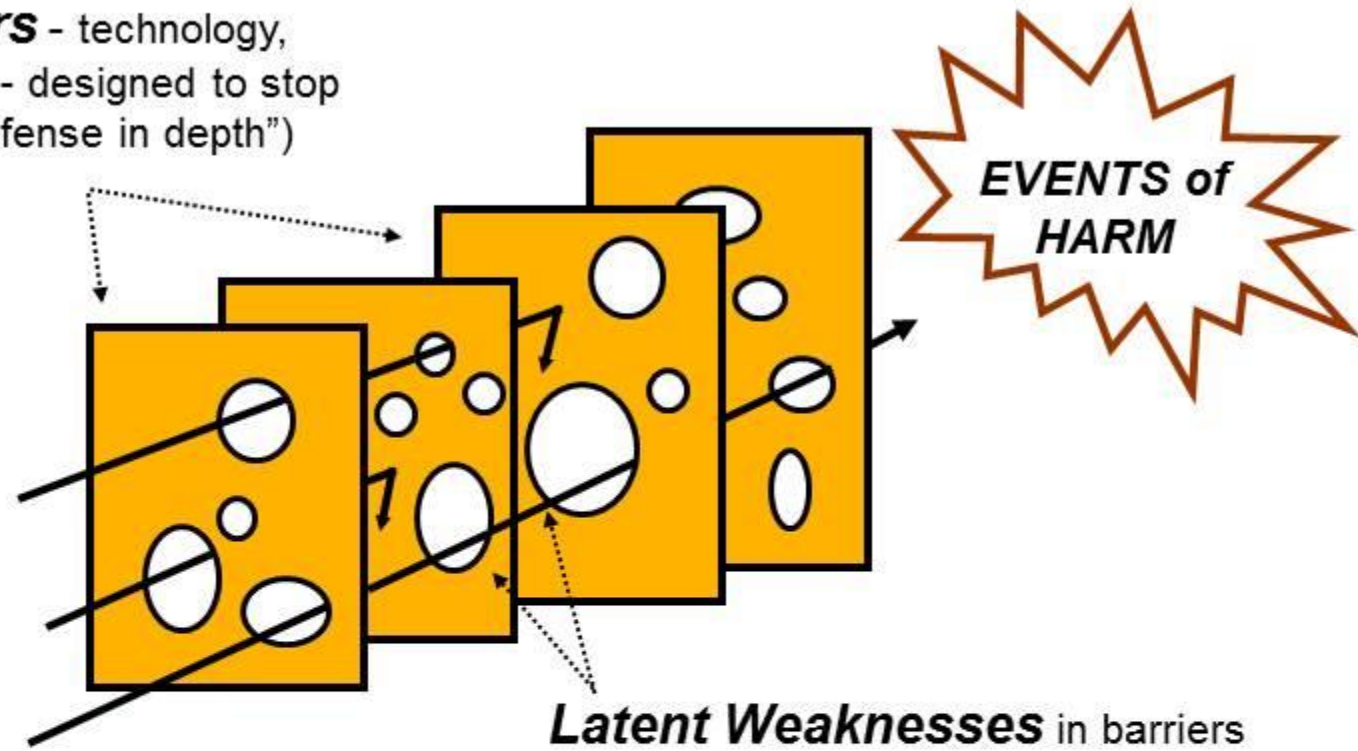
PREVENT
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Variance / Reporting

Multiple Barriers - technology, processes, and people - designed to stop active errors (our “defense in depth”)

Active Errors
by individuals result
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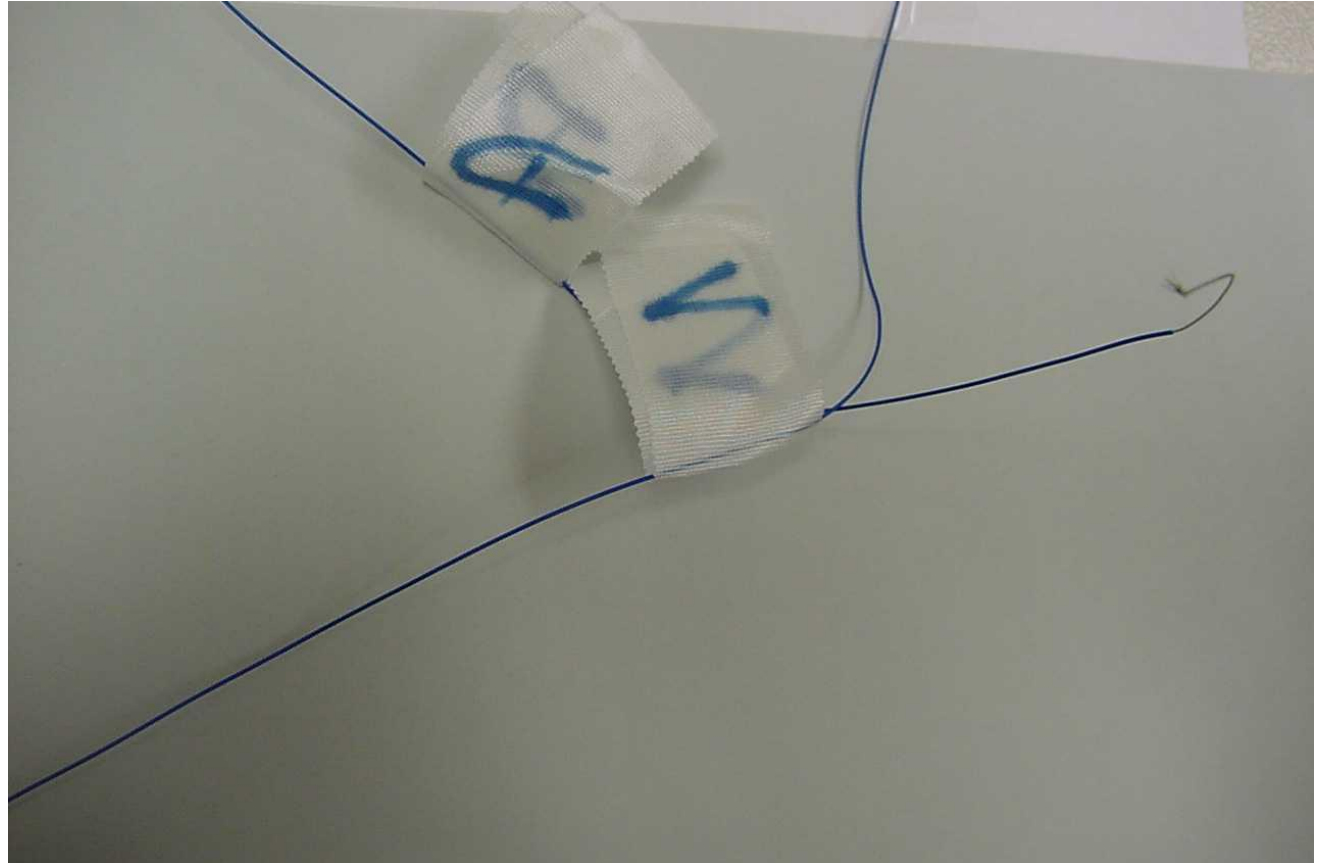


PREVENT
The Errors

DETECT & CORRECT
The System Weaknesses

RCA

Example: CV patient has AV pacer placed during CABG with external leads. Hooked Up Backwards

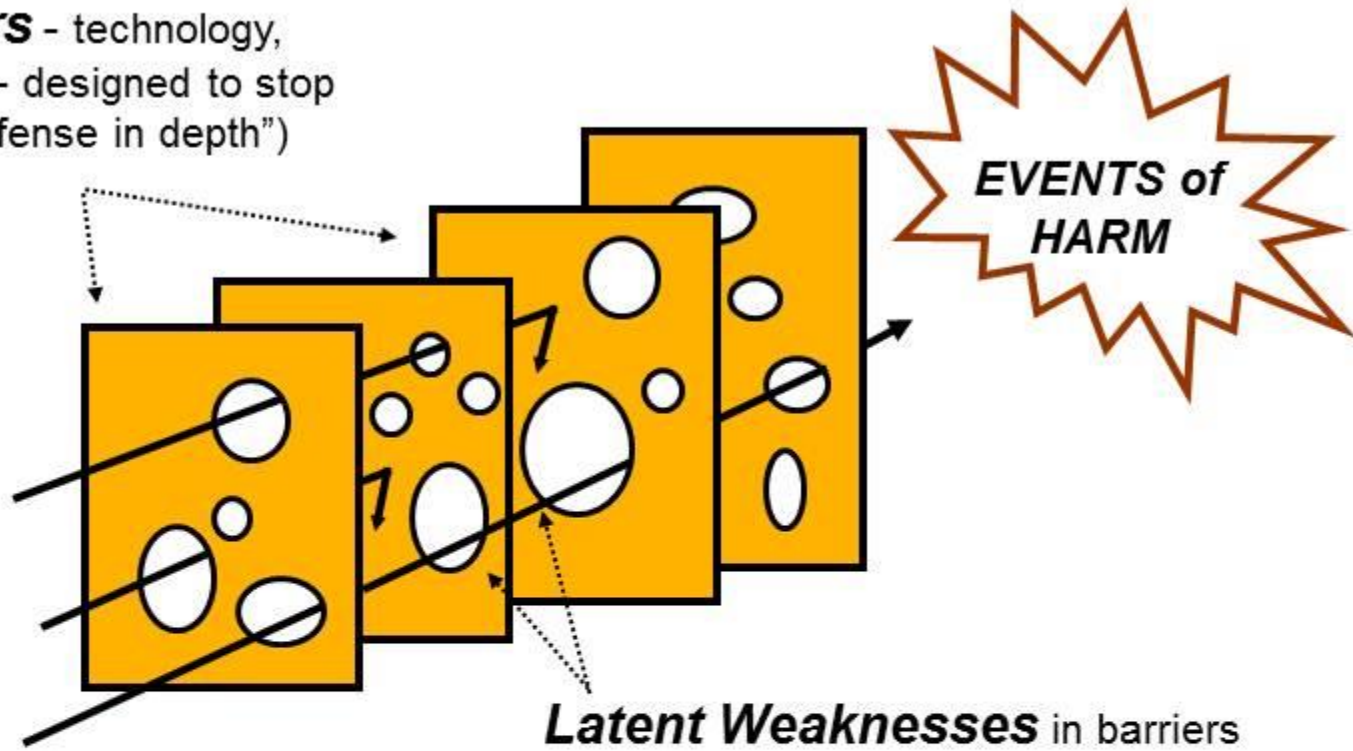


Multiple Barriers - technology, processes, and people - designed to stop active errors (our "defense in depth")

Hooked up wires Backwards



Active Errors
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PREVENT
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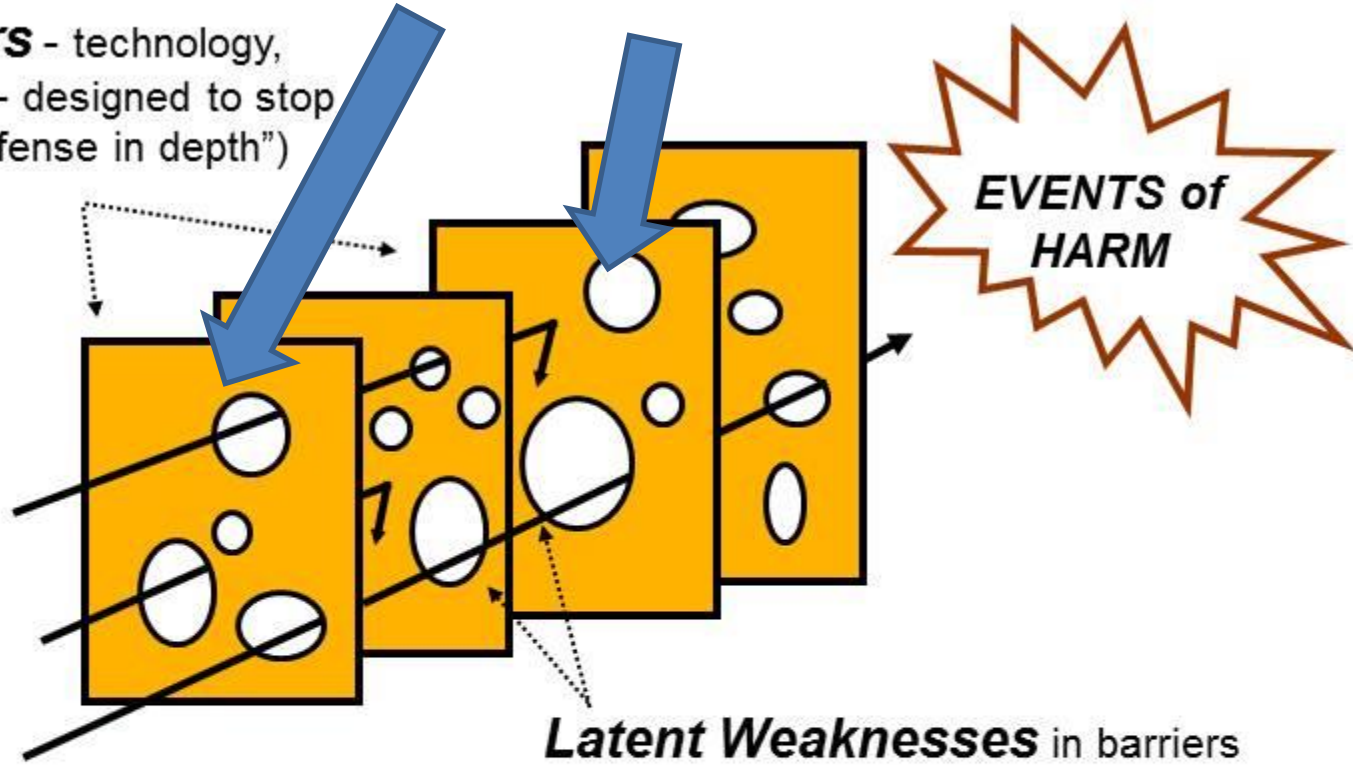
But What about These?

Multiple Barriers - technology, processes, and people - designed to stop active errors (our "defense in depth")

Hooked up wires Backwards



Active Errors
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PREVENT
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But to understand failure

- Questions are not
 - Where did they screw up?
 - Why didn't they notice what we find important now?
- Question is:
 - Why did it make sense for them to do what they did?



Sidney Dekker

Associate Professor
Centre for Human Factors in Aviation
Linköping Institute of Technology, Sweden



Why did it make sense?

- To understand why people did what they did...
- Reconstruct the world in which they found themselves at the time

A Brief Comment About the Role of Human Error

- We are going to spend the rest of our time today focused on it
- HOWEVER: Human Error is a CONSEQUENCE , Not a cause
- Human Actions are almost ALWAYS constrained by factors beyond an individual's immediate control
- People cannot easily avoid those actions that they did not intend to perform in the first place

Finally

- Errors are a product of a chain of causes in which the precipitating psychological factors – momentary inattention, misjudgment, forgetfulness, preoccupation – are often the last and LEAST manageable links in the chain
- Our challenge is to acknowledge that Humans (even healthcare providers) WILL commit errors. We should understand HOW Human performance will fail so that we can mitigate, through design, these tendencies and TRAP errors (make them visible) before they reach patients or minimize impact of those errors.
- So lets think about Human Performance

Three Ways Humans Perform



Skill-Based Performance

"Auto-Pilot Mode"

Rule-Based Performance

"If-Then Response Mode"

Knowledge-Based Performance

"Figuring It Out Mode"

Situations

*Routine
Expected*



*Familiar/
Trained-for-
Problems*



*Novel,
Difficult,
Dangerous
Problems*

Control Modes

*Mainly
Conscious* ← *Conscious
and
Automatic* → *Mainly
Automatic*

**Skill-Based
Performance**

**Rule-Based
Performance**

**Knowledge-Based
Performance**

Skill-Based Performance

What You're Doing At The Time

Very familiar, routine tasks that you can do without even thinking about it – like you're on auto-pilot



Errors We Experience	Error Prevention Strategy
<p>Slip – <i>Without intending to</i>, you do the wrong thing</p> <p>Lapse – <i>Without intending to</i>, you fail to do what we meant to do</p> <p>Fumble – <i>Without intending to</i>, you mishandle or blunder an action or word</p>	<p>Stop and think before acting</p>

3 in 1,000 acts performed in error
(pretty reliable!)

Failure Modes at Skill-Based

- **Inattention**
 - Double capture slips
 - Omissions following interruptions
 - Reduced Intentionality
 - Perceptual Confusions
 - Interference errors
- **Overattention**
 - Omissions
 - Repetitions
 - Reversals

Examples

- **Double Capture slips**
 - Well practiced activity
 - An intention to depart from custom
 - departure point that is different
 - failure to make attention check
- **“I intended to stop to buy groceries on the way home from work. I ‘woke-up’ to find I had driven past the store”**

Example of Skill based Slip

- **Omission associated with interruption**
 - “I picked up my coat to go out when the phone rang. I answered it and then went out the door without my coat”
- **Reduced Intentionality**
 - “I went into the bedroom to fetch a book. Took off my rings, looked into the mirror and came out again--without book”

Task Description	Nominal Error Probability
Routine, highly practiced, rapid task involving relatively low level of skill	.02

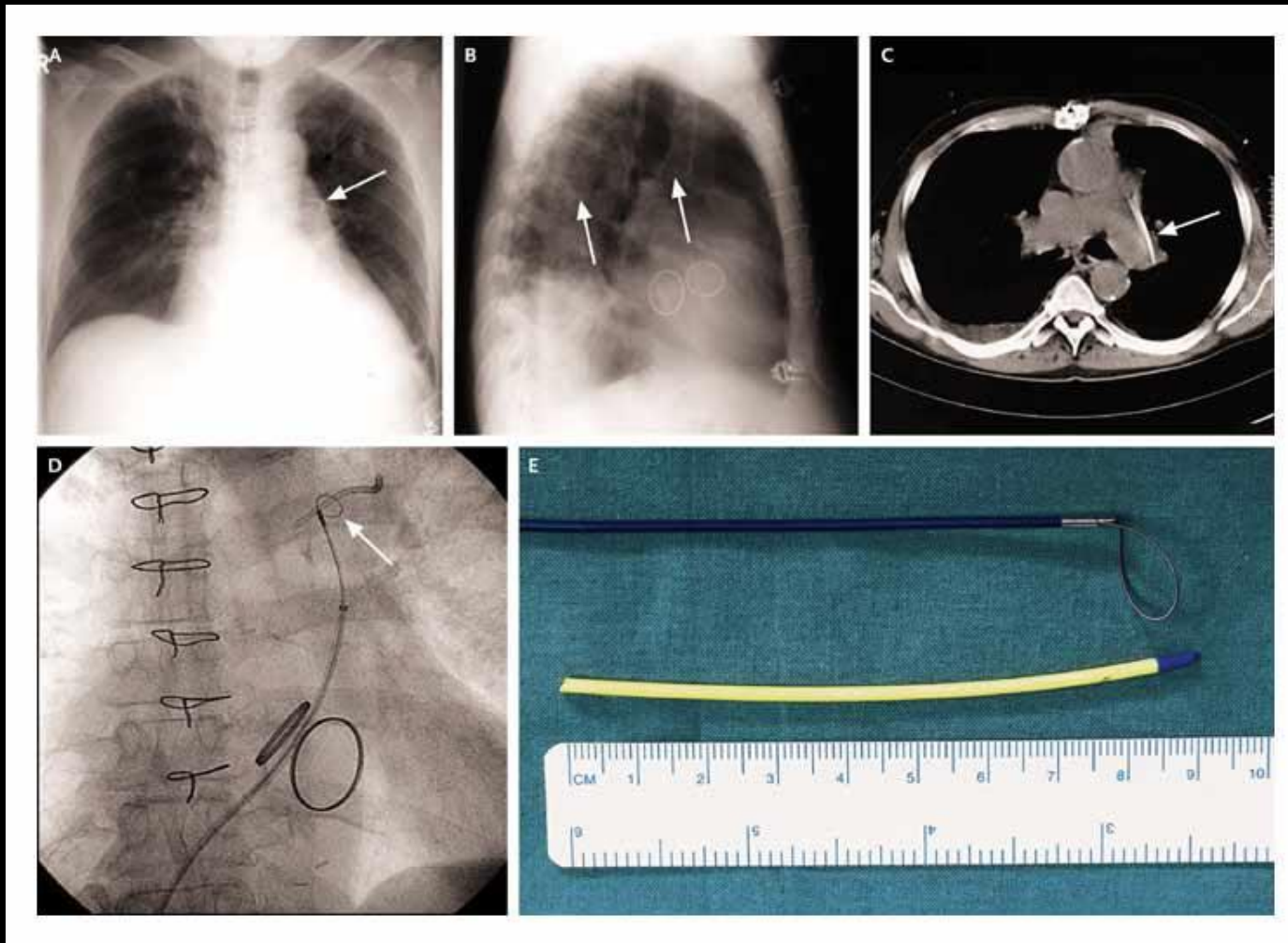
Task Description	Nominal Error Probability
Routine, highly practiced, rapid task involving relatively low level of skill	.02
Completely familiar, well designed, highly practiced routine task, oft-repeated and performed by well motivated, highly trained individual with time to correct failures but without significant job aids	.00004

What did you see?

What happened

Task Description	Nominal Error Probability
Fairly simple task performed rapidly or given scant attention	.09
Principle Error Producing Conditions	Probability Multiplier
Shortage of Time for error detection and correction	X 11
Low Signal to Noise Ratio – when really poor	X 10
A channel capacity overload , particularly one cause by the simultaneous presentation of non-redundant information	X 6
A need to unlearn a technique and apply one that requires the application of an opposing philosophy	X 6

Skill Based Error



Morguet, A. J. et al. N Engl J Med 2005;352:e3



The NEW ENGLAND
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Situations

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↑

*Familiar/
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Control Modes

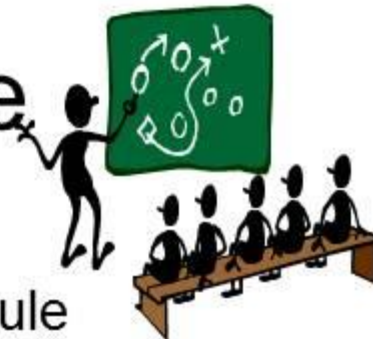
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Rule-Based Performance



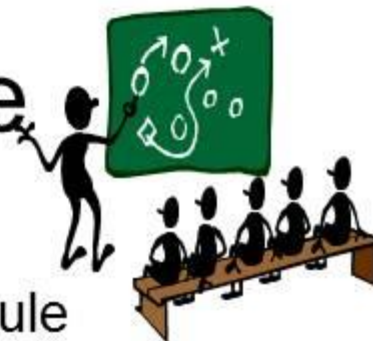
What You're Doing At The Time

Responding to a situation by recalling and using a rule that you learned either through education or experience

Errors You 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 <i>second</i> 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 choices made in error
(not too bad!)

Rule-Based Performance

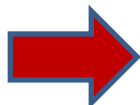


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Will Come back to this



1 in 100 choices made in error
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Rule Based Errors

Principle Error Producing Conditions	Probability Multiplier
No Obvious way to keep track of progress during task	X 1.4
Task-pacing caused by intervention of others	X 1.06
Additional team members over and above those necessary to perform tasks normally and satisfactorily	X 1.03 per additional person

Selective Attention test

❖ Basketball Video









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**Knowledge-Based
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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 we do know
- Taking a guess
- Figuring it out by trial-and-error



Errors You Experience	Error Prevention Strategy
You came up with the wrong answer (a mistake)	STOP and find an expert who or that knows the right answer

30-60 of 100 decisions made in error
(yikes!)

Selection Bias

❖ Count the "F"s in the following text:

FINISHED FILES ARE THE RE-
SULT OF YEARS OF SCIENTIF-
IC STUDY COMBINED WITH THE
EXPERIENCE OF YEARS

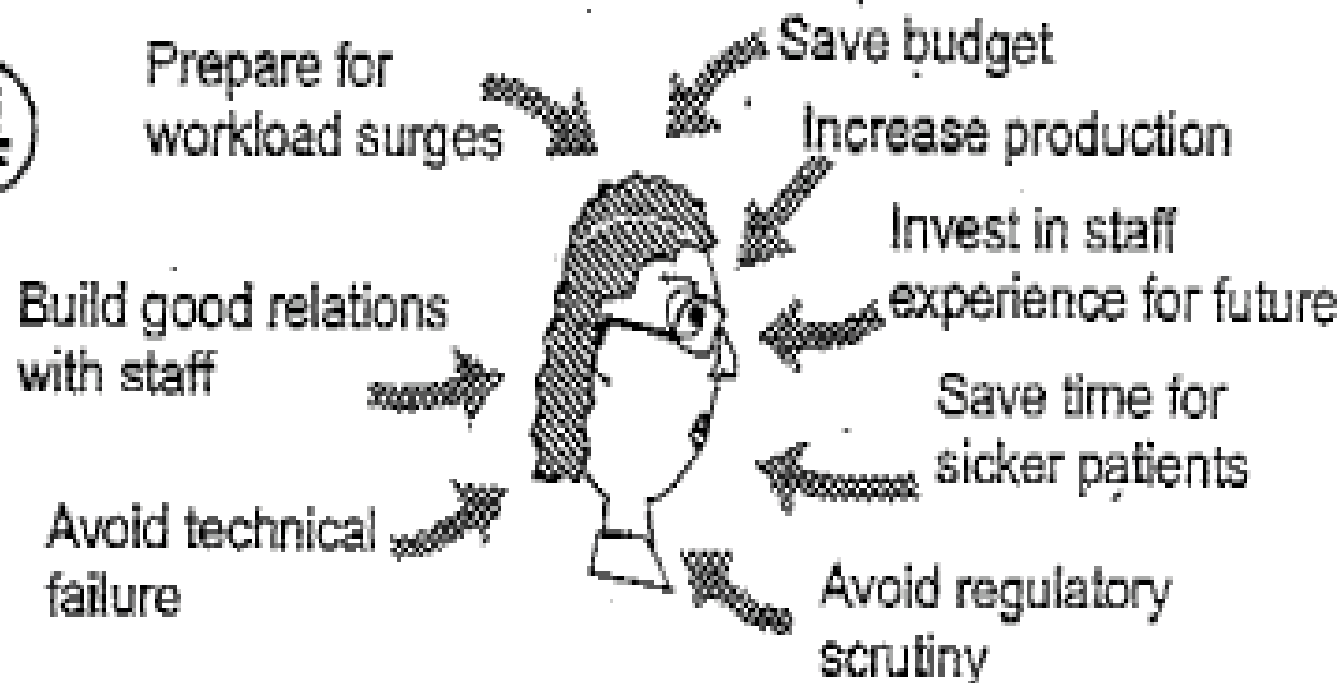
❖ How Many did you See?

❖ 3?

- ❖ Would you believe 6 !
- ❖ **FINISHED FILES ARE THE RESULT OF YEARS OF SCIENTIFIC STUDY COMBINED WITH THE EXPERIENCE OF YEARS**

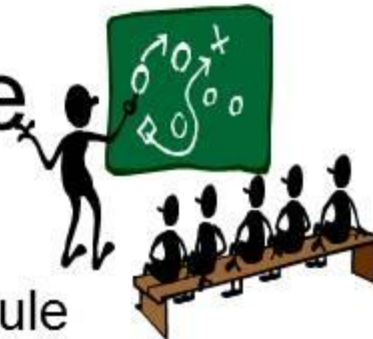
Principle Error Producing Conditions	Probability Multiplier
Ambiguity in the required performance standards	X 5
An impoverished quality of information conveyed by procedures or person-to-person interaction	X 3
Unreliable instrumentation that is recognized as such	X 1.6
A need for absolute judgments which are beyond capabilities or experience of an operator	X 1.6

④



Work at the sharp end inevitably encounters competing demands for production and failure-free performance. Action resolves all dilemmas. Successful operations are the rule. Failure is rare.

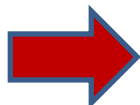
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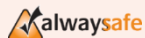


1 in 100 choices made in error
(not too bad!)

Generic Violation Behaviors And Associated Nominal Probabilities (for Females)	Nominal Error for Females (Multiply by 1.4 for males)
Distinctly inconvenient to comply. Potential violator does not feel bound by any implied requirement to comply. Easy to violate, likelihood of detection is low	.42
Compliance may be fairly important, but chances of detecting violation low. Personal benefits of violating are high and direct	.38
Compliance important, usually legally required , but chances of detection are low to moderate	0.03

Safety is Our Core Value

I commit to...		By practicing these error prevention tools...
S	Support the Team	<ul style="list-style-type: none"> • Peer Checking/Coaching • Debrief
A	Ask Questions	<ul style="list-style-type: none"> • <u>ARCC</u>: <u>A</u>sk a question, <u>R</u>equst change, voice <u>C</u>oncern if needed <i>Stop the Line</i> & activate the <u>C</u>hain of Command • Validate & Verify
F	Focus on Task	<ul style="list-style-type: none"> • STAR – <u>S</u>top, <u>T</u>hink, <u>A</u>ct, <u>R</u>eview • ‘NO DISTRACTION’ zones
E	Effective Communication Every Time	<ul style="list-style-type: none"> • Effective Hand-offs • Read and Repeat Backs; request & give Acknowledgement • Ask Clarifying Questions • Using alpha-numeric language • SBAR
Revised 3/3/2017		



Summary

- Human error is PART of our care system
- Human performance failures are categorized into 3 error MODES
 - Skill-based (auto pilot) VERY LOW ERROR RATE (1 per 1000)
 - Rule-based (if this, then this) ERROR RATE 1 per 100
 - Knowledge-based (problem solving) HIGH ERROR RATE (30 per 100)
- The rates of human error are predictable and based on:
 - Task
 - Error Producing Conditions
 - Social Context for Rules Violations
- There are things we can all do everyday (Safety behaviors) that make our patients safer