Barriers to Change: Why is it so hard to Change Clinician's Behavior

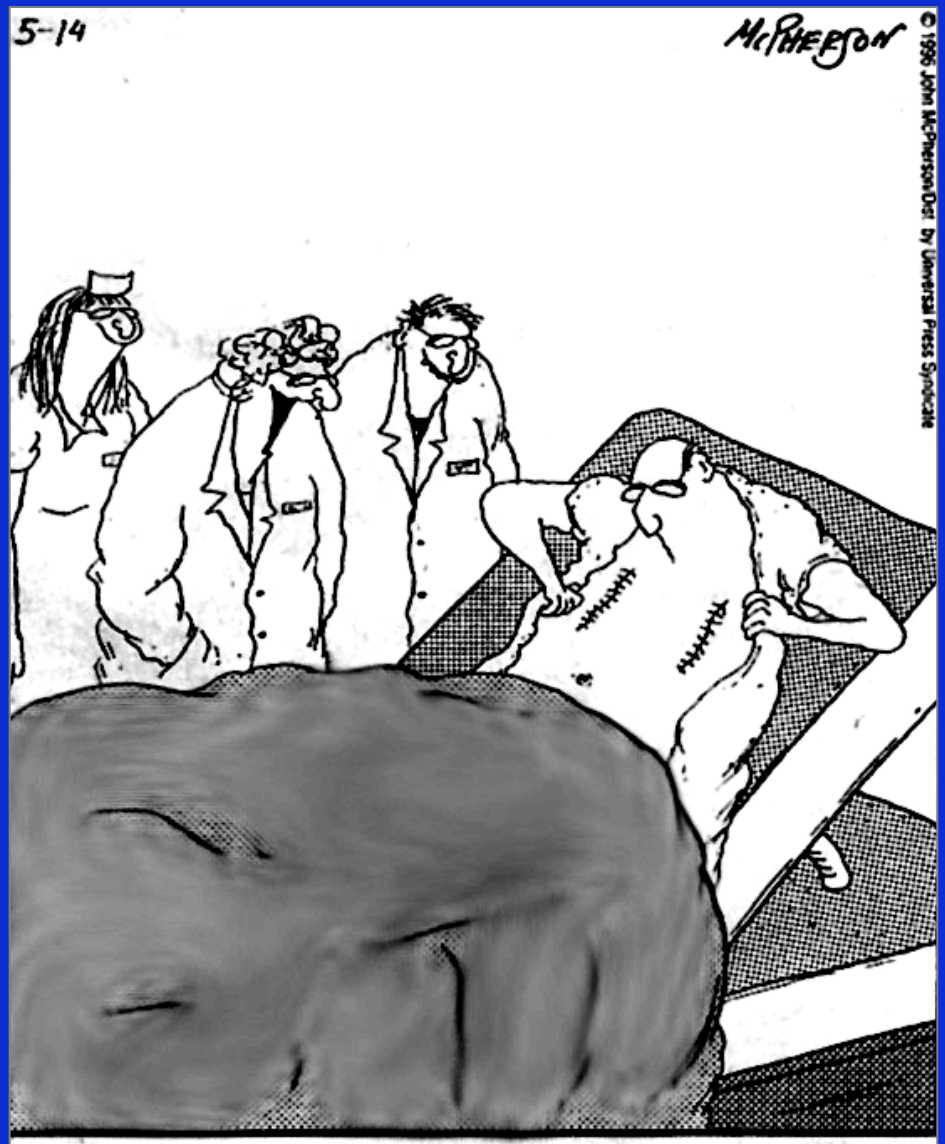
Paul Barach, MD, MPH

Where are we from?

Who are we?

- We are an overloaded system
- We cannot keep up with complex diagnostic and therapeutic technologies
- We have not changed workflows and roles in the past couple of centuries
- We have placed most emphasis on sickness control, not on health promotion
- We face the same challenges everywhere, but are tackling them independently

Reason #1:
Mental Models



"You should've seen the look on our faces when we realized that we'd been looking at the x-rays backward for the first hour of surgery."

Mental Models

- The images, assumptions, and stories we carry in our minds of ourselves, other people, institutions, and every aspect of the world
- They determine what we see, and most importantly, *how we act*

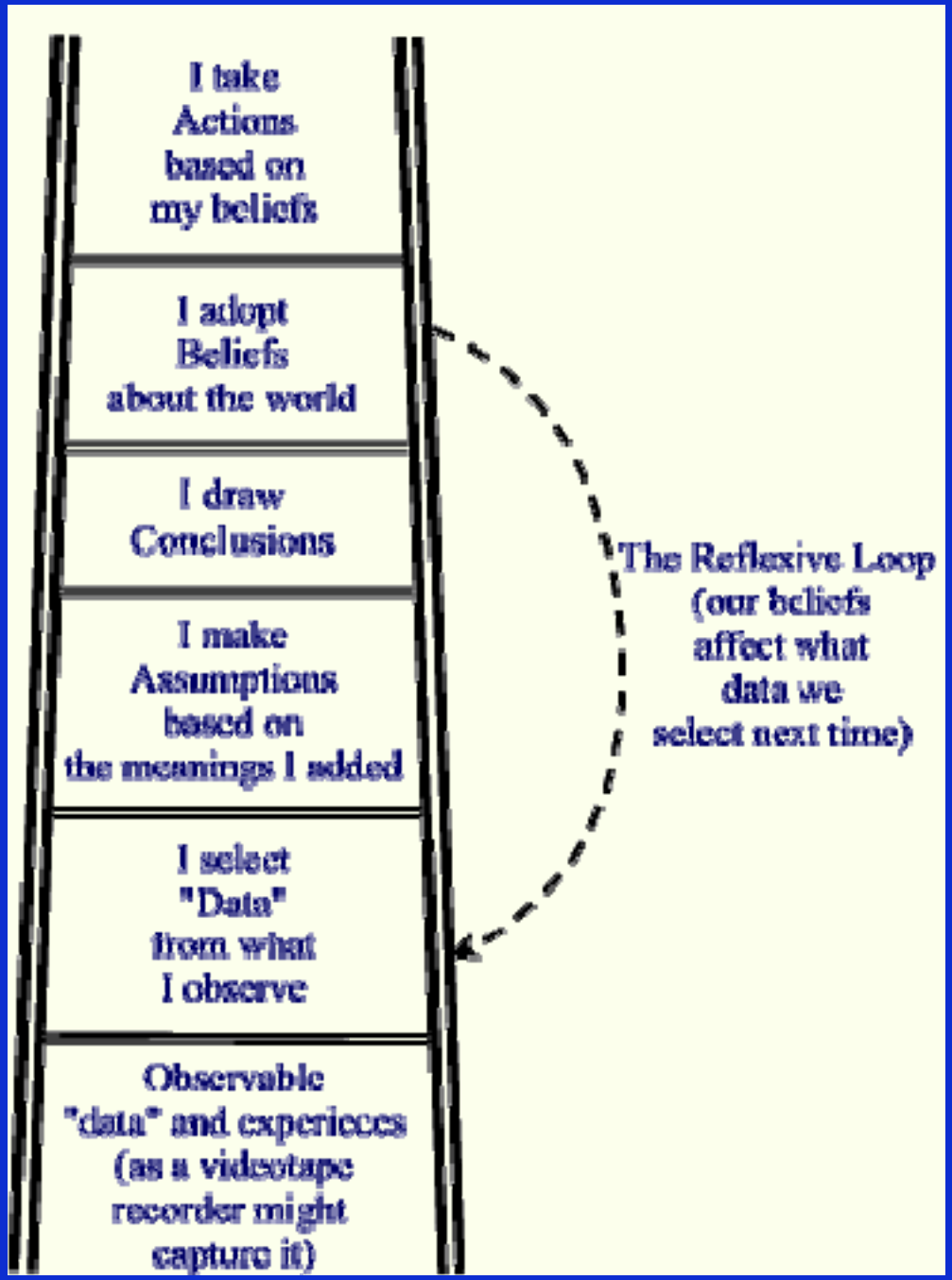
What Might this Mean for Our Work?

- Examples from clinical care, education
  - Drug seeking behavior
  - Patient non-compliance
  - “Difficult” patient/family
  - Born surgeon
  - Anesthesia--reading the newspaper, having coffee
  - Bean counter
- How about from our non professional life?
  - Illegal immigrants
  - Women in combat
  - Marriage

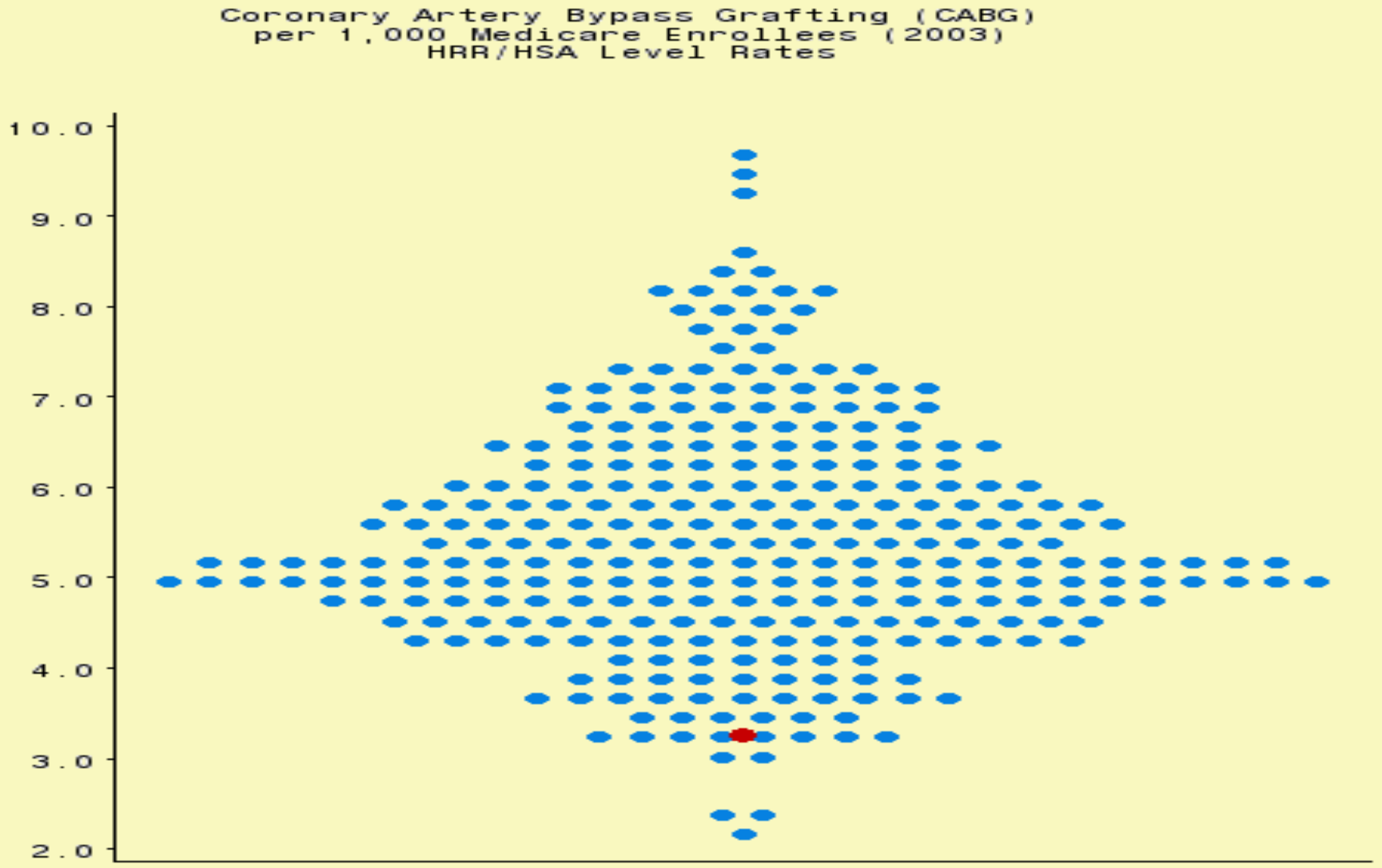
Mental Models

- None are perfectly accurate
- Differences in mental models explain how two people can understand the same event differently
- Are generally invisible to us – until we look for them

The Ladder of Inference



Variation in CABG rates per 1000 Medicare Enrollees



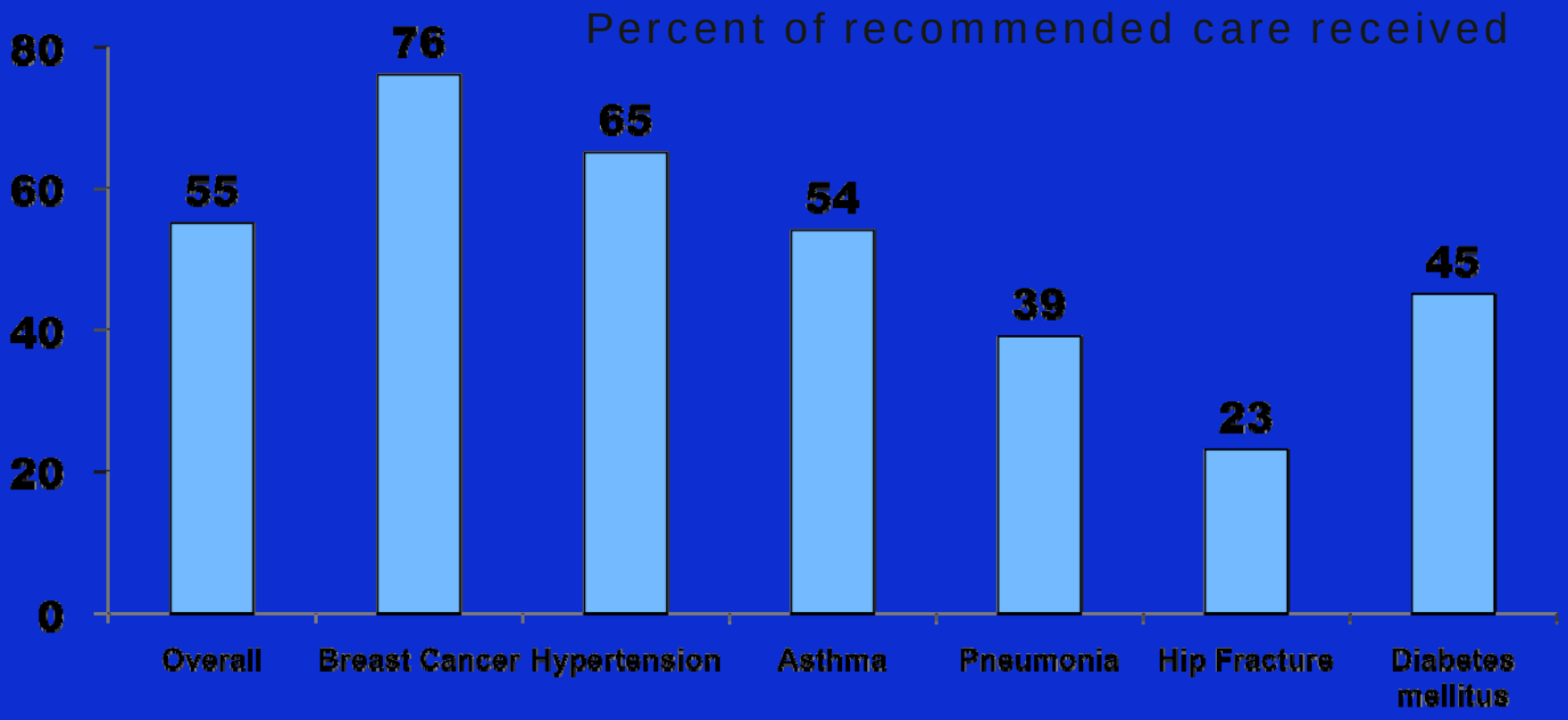
CPR Quality during Cardiac Arrest

Two companion studies of CPR quality:

- Chest compressions were not delivered half of the time and compressions were too shallow (“out-of-hospital”).
- Quality of multiple CPR parameters was inconsistent and often did not meet published guidelines (“in-hospital”).

Abella BS, Alvarado JP, Hyklebust H, et. al. Quality of Cardiopulmonary Resuscitation During In-Hospital Cardiac Arrest. JAMA, January 19, 2005, 293(3):305-310

U.S. Adults Receive Half of Recommended Care



Source: McGlynn et al., "The Quality of Health Care Delivered to Adults in the United States," *The New England Journal of Medicine* (June 26, 2003): 2635–2645.

Hospital acquired infections

- Top quality problem in US.
- 1 in 136 patients~ 2 million patients
- 1 in 5 patients: Morocco, Albania, Tunisia
- Annual direct patient costs @$45 billion
- 19% perioperative hand compliance rate—NL 2007-2008 (BMJ, under review)
- JCAHO expects>90%

Human Error Rates

- Error of commission (misreading a label) **3/1000**
- Error of omission (item embedded in procedure) **3/1000**
- Error of omission (without reminders) **1/100**
- Error in simple arithmetic (with self check) **3/100**
- Personnel on different shift fail to check conditions unless directed by a checklist **1/10**
- Errors under very high stress when dangerous activities are occurring rapidly **25/100**

Adapted from: Park, K. Human Error. In Salvendy, G, ed. "Handbook of Human Factors and Ergonomics", New York. John Wiley & Son, Inc. 1997: 163.

Wrong Site Procedures—Identification Problems

No cases of wrong side anesthesia in the literature

40-70 cases/ year in Florida reported

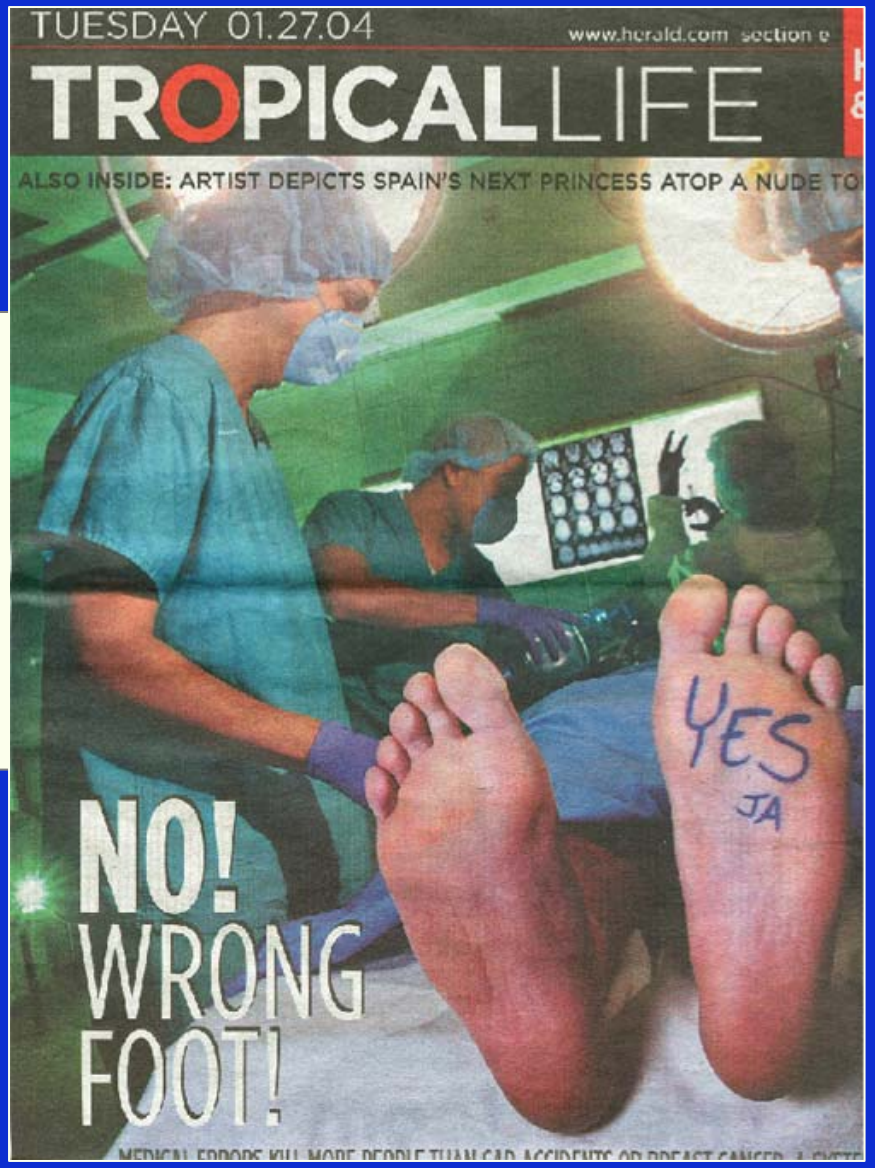
JCAHO 300 cases ALL of US 1997-2003

6000 cases NPDB 1990-2003

1300-2600 cases/US/year

Seiden, S, Barach P, Archives of Surgery, 2007.

www.Wrong-side.org



Miami Herald, 1.27.04

Why Do They Occur?

Human factors	• High workload environment • Fatigue • Multiple team members • Diffusion of authority/lack of accountability • Team communication • Change of personnel • Haste • Inexperience • Incompetence • Other cognitive factors
Patient factors	• Older, lower mental function, psychiatric • Sedation or anesthesia • Patient not consulted before anesthesia • Patient confusion of side/site/procedure • Inability to engage patient (e.g., young child or decreased competence) • Patient ignorance • Patient has common name or same name as another patient in hospital
Procedure factors	• Wrong side draped/prepped • Similar or same procedures back to back in same room • Patient position or room changed prior to initiating procedure • Site Salience
Attempts to prevent WSPE	• Not observing marked site/not marking wrong site • Not cross checking for consistency in consent form, patient chart, and OR booking form.

Seiden, S, Barach, P. Wrong-side, wrong procedure, and wrong patient errors. Are they preventable? Archives of Surgery, 2006; Barach, Anesthesia and Analgesia 2007.

Left-Right Blindness?

Physicians were more likely to have difficulties in distinguishing left from right than university professors and college students

- 8.8% physicians
- 6.0% university professors
- 3.5% college students

Storfer MD.
Problems in left-right discrimination in a high-IQ population.
Percept Mot Skills 1995; 81(2):491-7.

Risk Factors for Wrong Sided Surgery

- Emergencies (19%)
- Obesity and Physical deformity (16%)
- More than one surgeon in case (13%)
- Performing multiple procedures on multiple parts during single encounter (10%)
- Time pressure to start/end and/or emergency (13%)
- Illegible handwriting
- Exclusion of some team members
- Failure to include patient and family in process
- Unusual OR set-ups
- Inadequate patient assessment
- Lack of institutional policy
- Reliance on surgeon solely to determine site
- Cultural or language barriers

Ensuring Correct Surgery. AORN Journal 2002;76: 770-780.

D'Ambrosia R, Kilpatrick J. Medical Errors and wrong site surgery. Orthopedics 2002;25:288.

Barach P, et al, 2005.

What would you do? JFK International Terminal Men's Restroom...

- A) Hire an attendant to monitor and reprimand "less hygienic" users
- B) Periodically plot spillage area on a control chart, look for special causes
- C) Double the size of the fixtures
- D) Etch the image of a fly on the porcelain

Source: Wall Street Journal

Answer: Etch the image of a fly on the porcelain...

Peter Mansell - NHS

Reason #2

Current improvement methods in healthcare are highly dependent on vigilance and hard work and ignore the system

Exercise: Vigilance and Hard Work

1. Recall an experience – in any setting – in which the request that you “try harder,” “be careful,” or “stay alert” improved your performance.

   Why did that work?

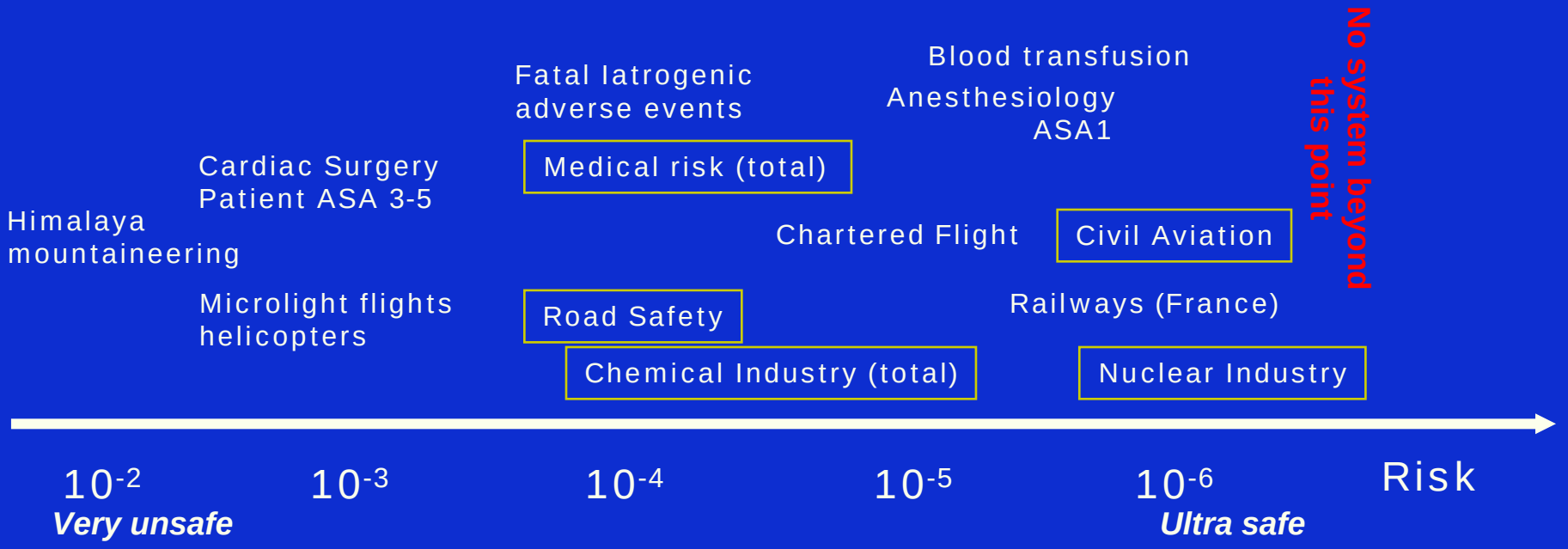
2. Identify a process in your organization that relies on vigilance.

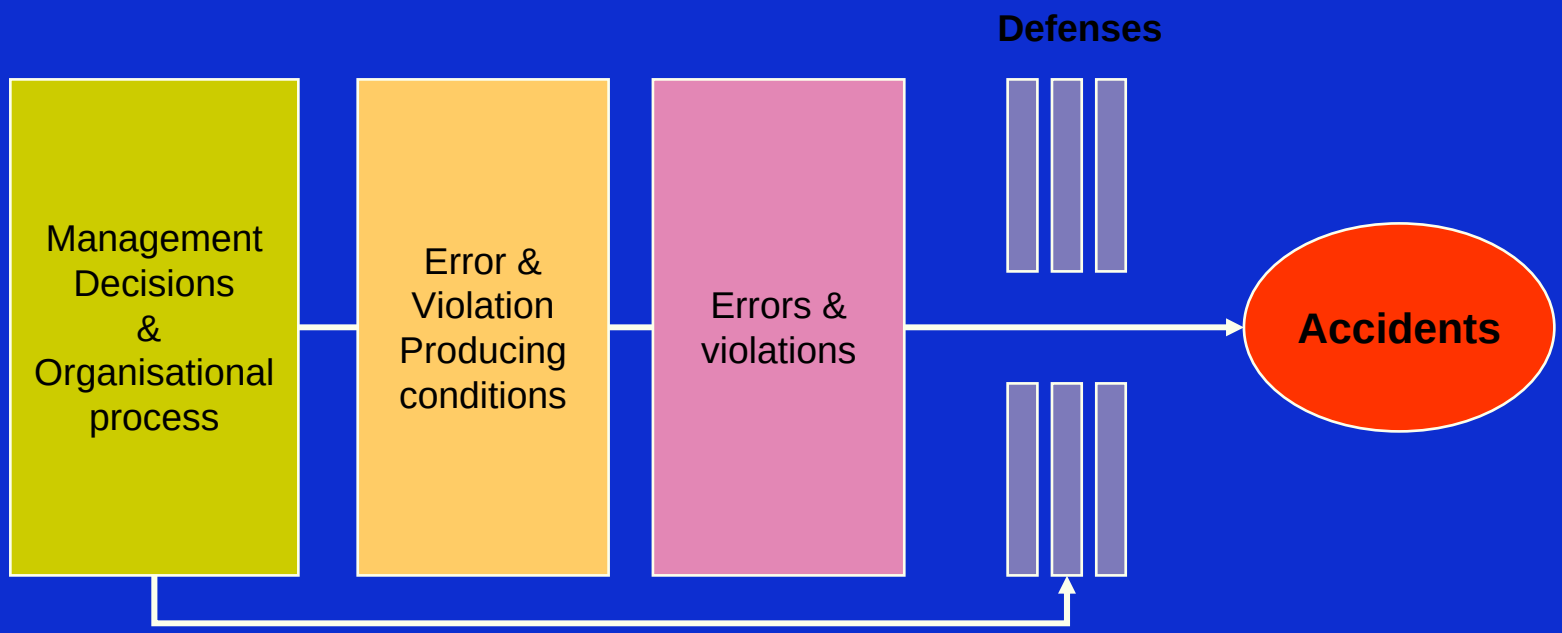
   What would you estimate its reliability to be?

The focus on outcomes tends to exaggerate the reliability within healthcare giving clinicians and executives a false sense of security.

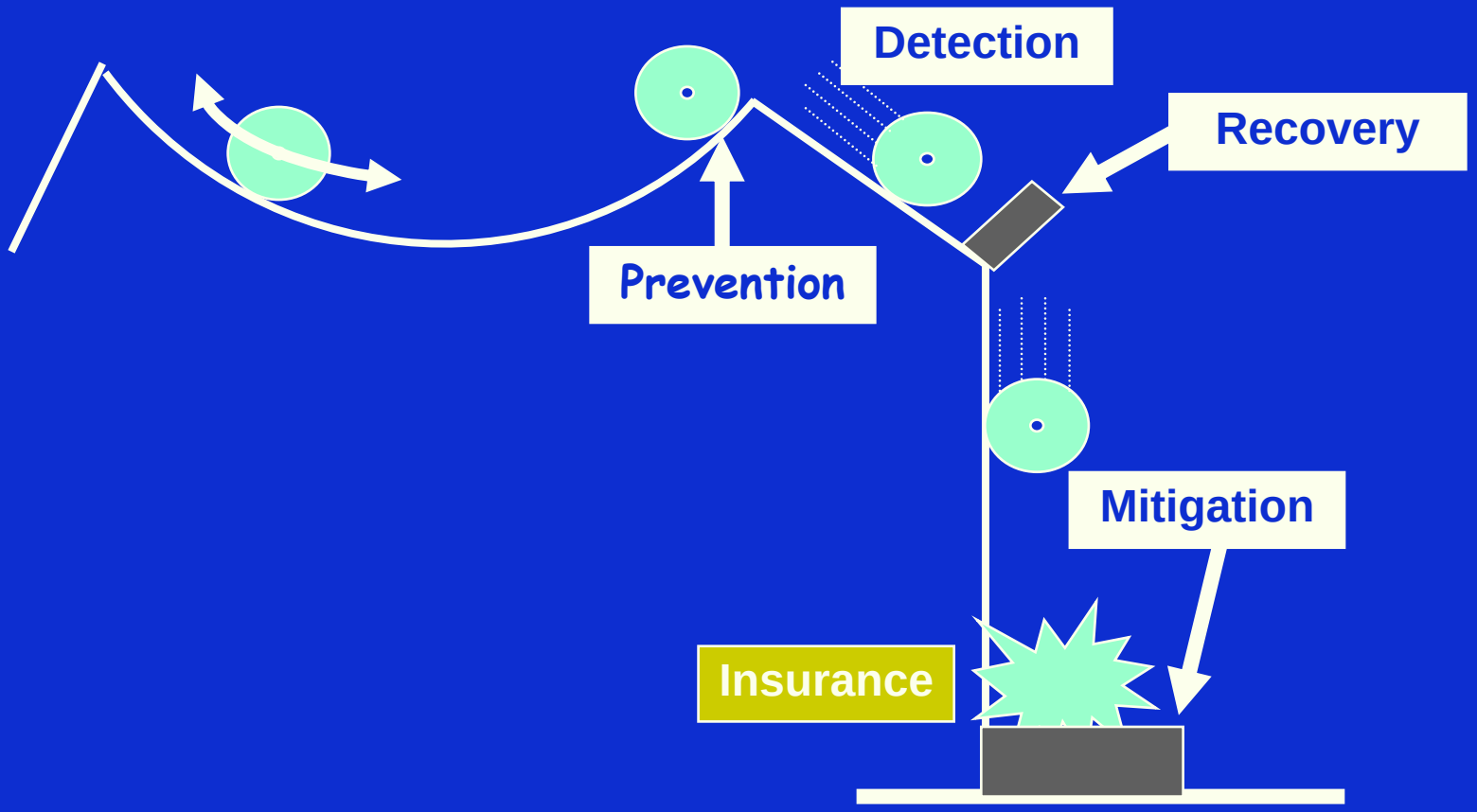
Adverse Event Rates in Healthcare

Amalberti, R, Auroy, Y, Berwick, D, Barach, P. Five System Barriers To Achieving Ultra-safe Health Care. Annals of Internal Medicine, 2005;142:756-764.

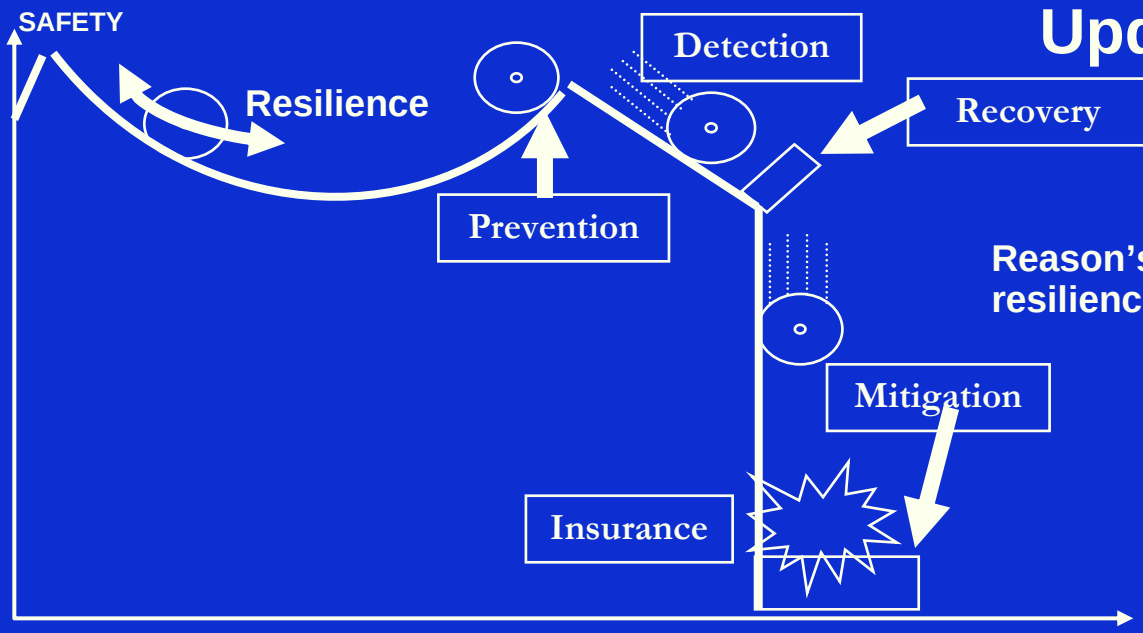



Defenses
Management Decisions & Organisational process
Error & Violation Producing conditions
Errors & violations
Accidents

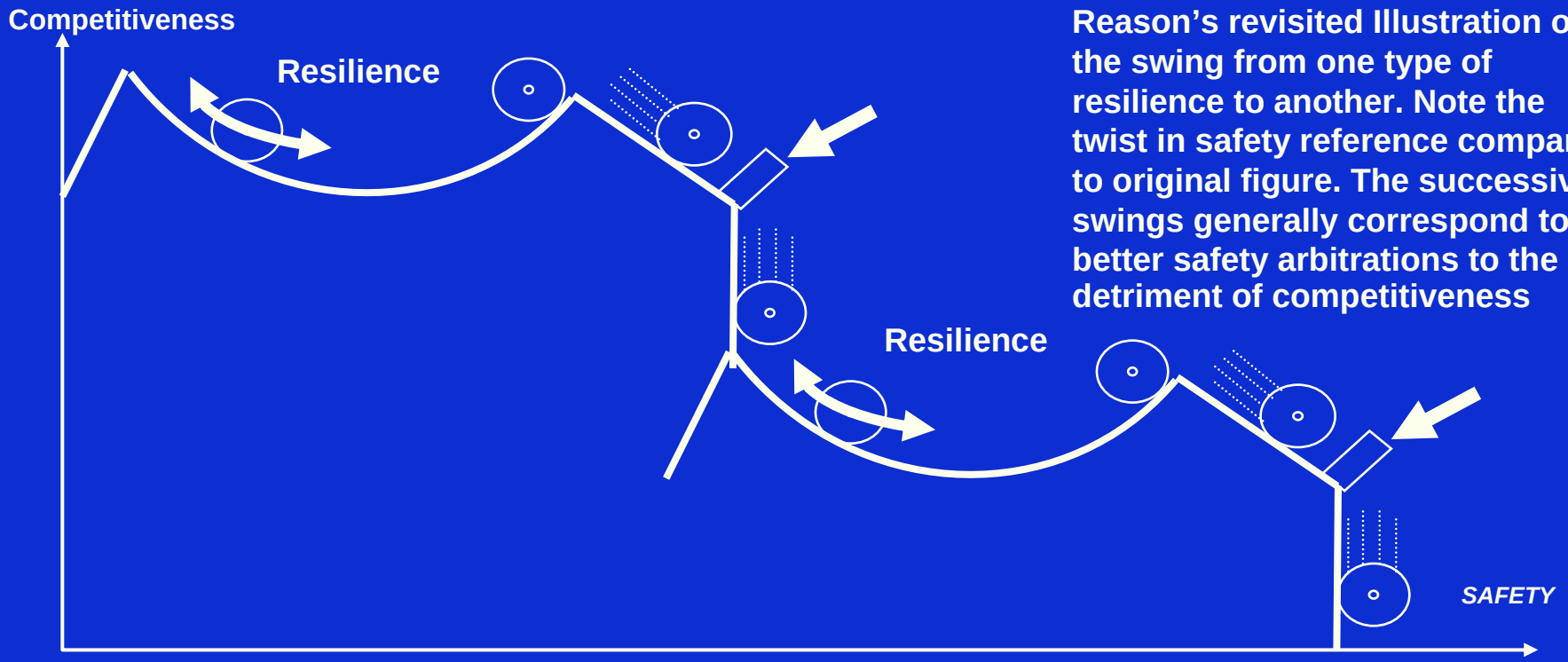
Guiding principles
Three strategies to reduce risk



Update resilience



Reason's original illustration of resilience



Reason's revisited Illustration of the swing from one type of resilience to another. Note the twist in safety reference compared to original figure. The successive swings generally correspond to better safety arbitrations to the detriment of competitiveness

"Not enough money is being spent on safety, so be careful."

Reason #3
Ignore Role of Human Factors

Paris in the the Spring.

THE DESIGN OF EVERYDAY THINGS

previously published as
THE PSYCHOLOGY
OF EVERYDAY THINGS

DONALD A. NORMAN

DOES THE DAY OF WEEK MATTER?

Annals of Surgery • Volume 246, Number 5, November 2007

ORIGINAL ARTICLES

Mortality After Nonemergent Major Surgery Performed on Friday Versus Monday Through Wednesday

Marc M. Zare, MD,† Kamal M. F. Itani, MD,*† Tracy L. Schifftner, MS,‡*
William G. Henderson, PhD,‡ and Shukri F. Khuri, MD§*

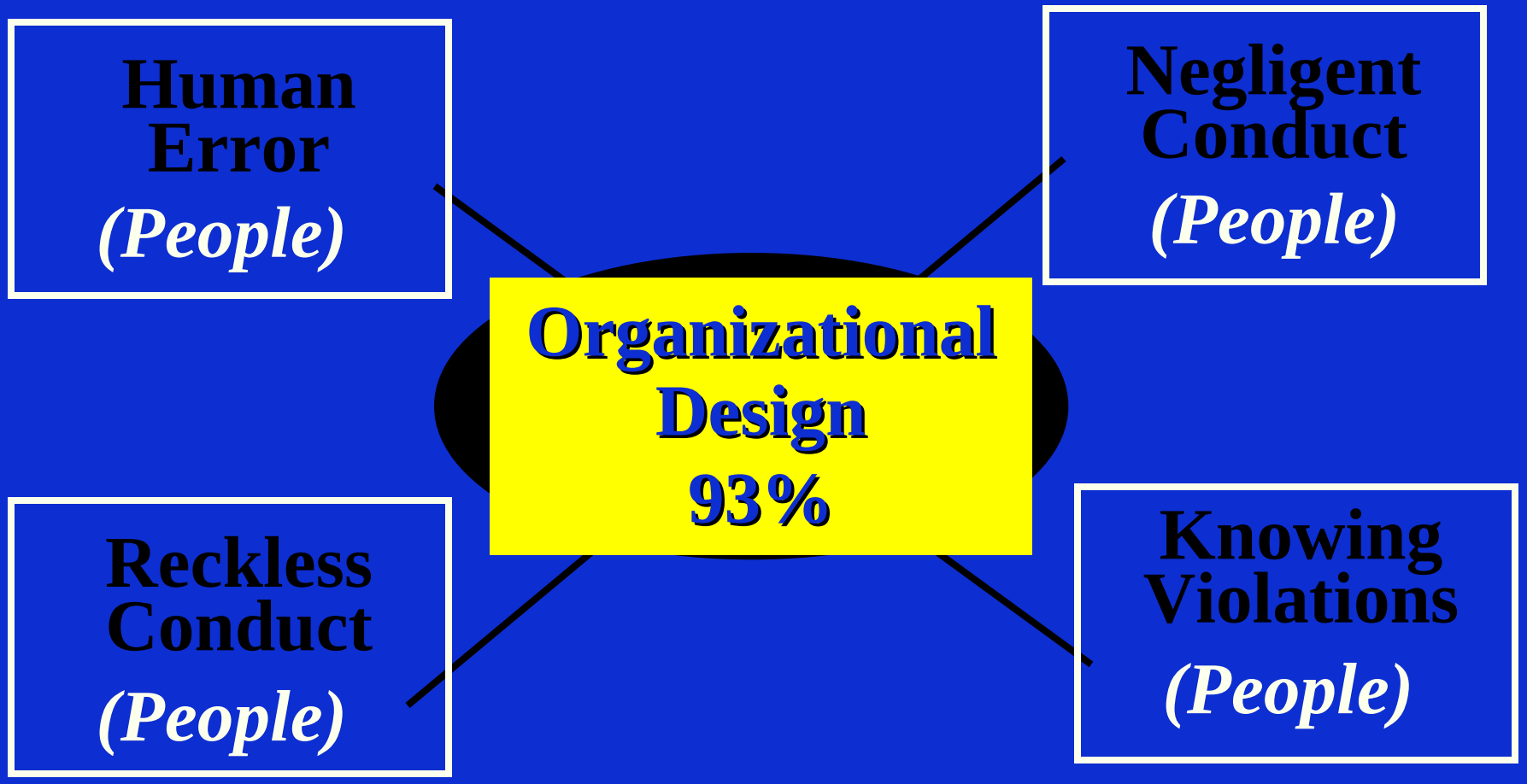
operations performed on Fridays were associated with a higher 30-day mortality rate than those performed on Mondays through Wednesdays:
2.94% vs. 2.18%;
Odds ratio, 1.36; 95% CI, 1.24–1.49)


IVP
CF
Paralyzing
Agent

Medication Cart Drawer—does Your Cart Look different?


Men
Women

The 93% vs. 7% Rule



Performance Shaping Factors Affecting Human Vigilance

- Fatigue
- Environmental Conditions/Built Environment
- Task Design
- Psychological Conditions
- Competing Demands
- Hand offs/Sign outs

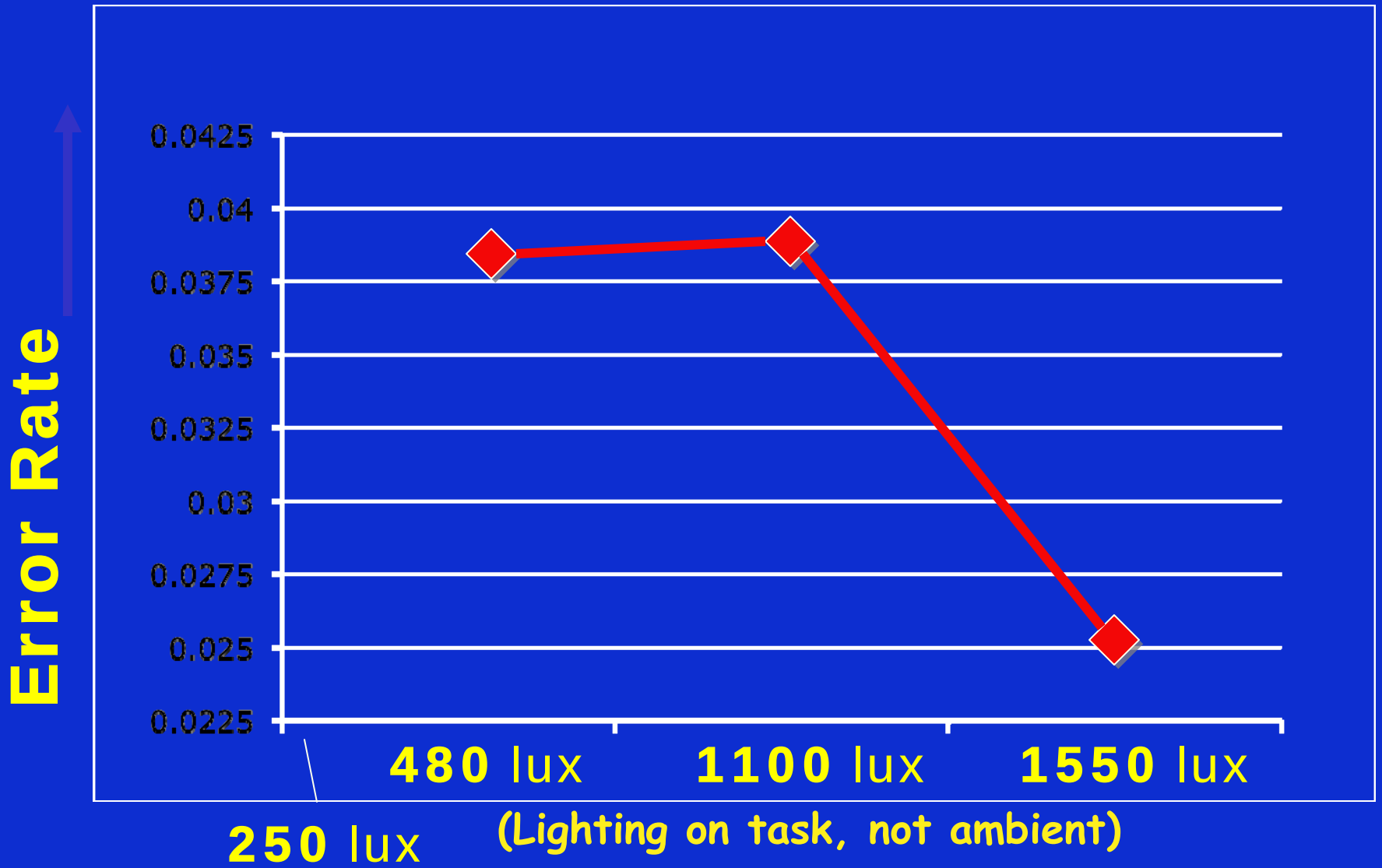
The Built Environment and Patient Safety

- The physical environment has behavioral side effects
- The designed, built environment determines the setting in which care is delivered
  - Air quality and ventilation
  - Color, texture, reflectance
  - Lighting character, quality, amount
  - Layout and space
  - Noise and vibration
  - Friction/traction

Ulrich R, Zimmer C, 2005; Dickerman K, Barach P, 2005; Ulrich R, Barach P, 2006 .

Components of Healthcare Design Quality

Medication Dispensing Error Rates by Illumination Level (Buchanan et al., 1991)



The Impact of Design on Patient Outcomes

TABLE 1:
SUMMARY OF THE RELATIONSHIPS BETWEEN DESIGN FACTORS AND HEALTHCARE OUTCOMES

Healthcare Outcomes \ Design Strategies or Environmental Interventions	Single-bed rooms	Access to daylight	Appropriate lighting	Views of nature	Family zone in patient rooms	Carpeting	Noise-reducing finishes	Ceiling lifts	Nursing floor layout	Decentralized supplies	Acuity-adaptable rooms
Reduced hospital-acquired infections	**										
Reduced medical errors	*		*				*				*
Reduced patient falls	*		*		*	*			*		*
Reduced pain		*	*	**			*				
Improved patient sleep	**	*	*				*				
Reduced patient stress	*	*	*	**	*		**				
Reduced depression		**	**	*	*						
Reduced length of stay		*	*	*							*
Improved patient privacy and confidentiality	**				*		*				
Improved communication with patients & family members	**				*		*				
Improved social support	*				*	*					
Increased patient satisfaction	**	*	*	*	*	*	*				
Decreased staff injuries								**			*
Decreased staff stress	*	*	*	*			*				
Increased staff effectiveness	*		*				*		*	*	*
Increased staff satisfaction	*	*	*	*			*				

* Indicates that a relationship between the specific design factor and healthcare outcome was indicated, directly or indirectly, by empirical studies reviewed in this report.

** Indicates that there is especially strong evidence (converging findings from multiple rigorous studies) indicating that a design intervention improves a healthcare outcome.

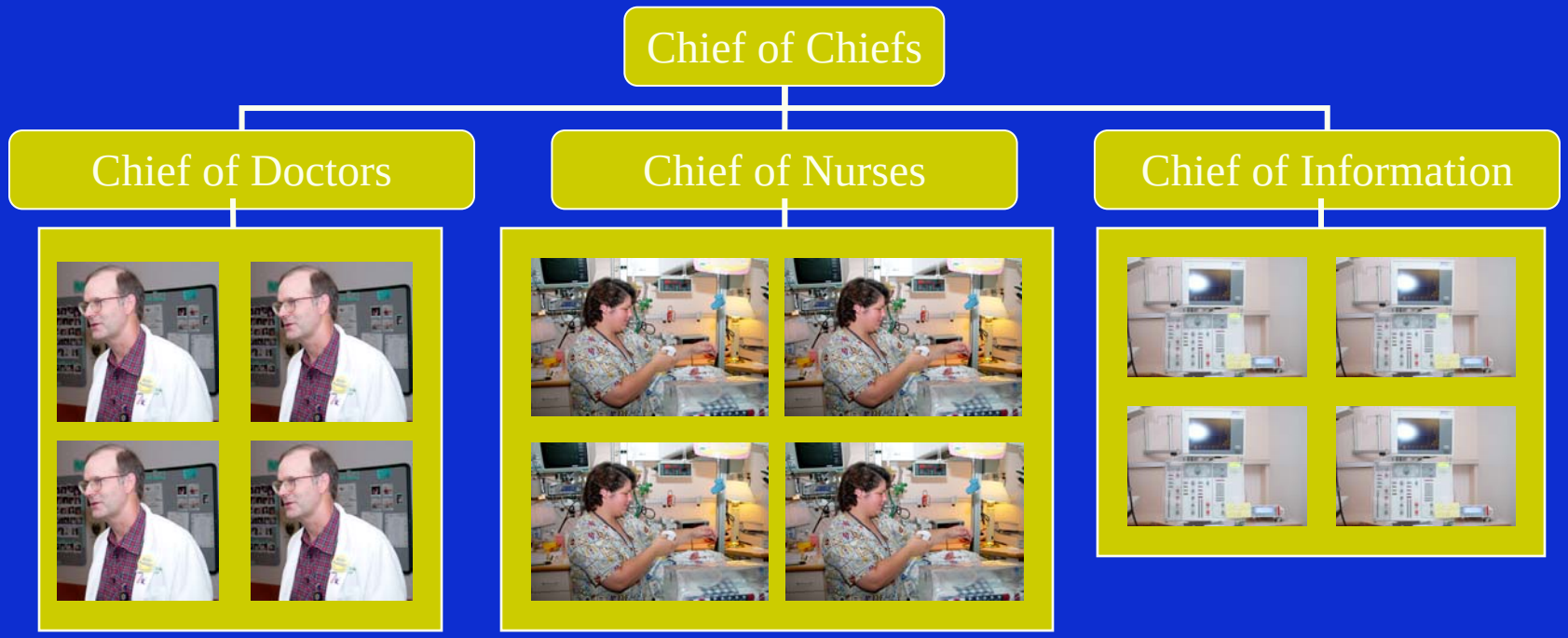
Source: Healthcare Leadership white Paper: Ulrich, Zimring, Zhu, DuBose, Seo, Choi, Quan, Joseph (2008)
http: //www.healthdesign.org/hcleader/HCLeader 5 LitReviewWP.pdf

Reason #4: Ignore the Microsystems

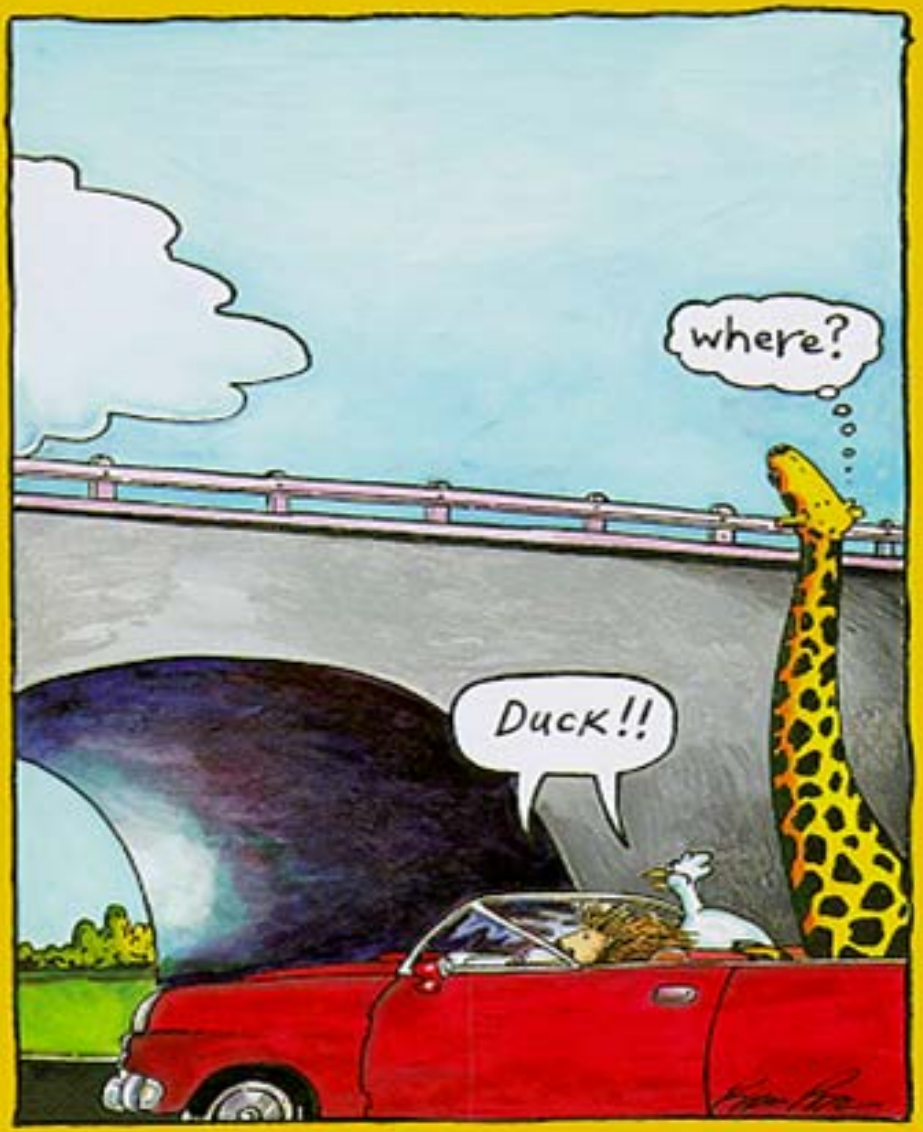
- Small group of clinicians and staff working together with a shared clinical purpose to provide care for a defined set of patients
- The clinical purpose defines the essential parts of the microsystem
  - Clinicians and support staff
  - Information and technology
  - Care processes
- Broader than simple teams, larger context with which providers work, a context that is characterized by: procedures, regulations, management, performance based rewards and penalties.
- Complex but poorly understood impact on the performance of individuals/teams.

Mohr J, Batalden P, Barach P. Qual Saf Health Care 2004;13 Suppl 2:34-8. ; Mohr J, Barach P, 2006; Barach P, Mohr, 2007.

A Common View of a Clinical Organization



Reason #5 Role of Communication



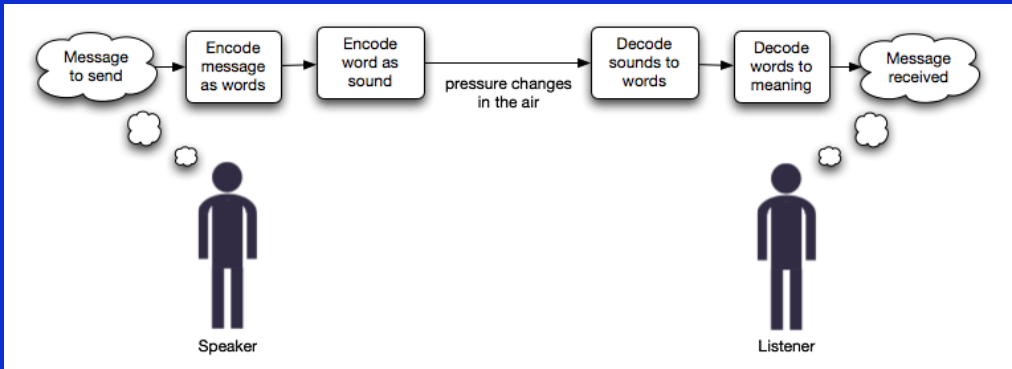
Unfortunately, animals sometimes lack the necessary skills to communicate with each other.

Role of Hand-offs

- Exchange of vital information
- Shared mental models and cognition of patient status
- Exchange and uptake of responsibility
- Part of the microsystem life-cycle
- Vital to Unit, patients, and workers survival

Psychology of Miscommunication

- Speakers systematically overestimate how well their messages are understood by listeners



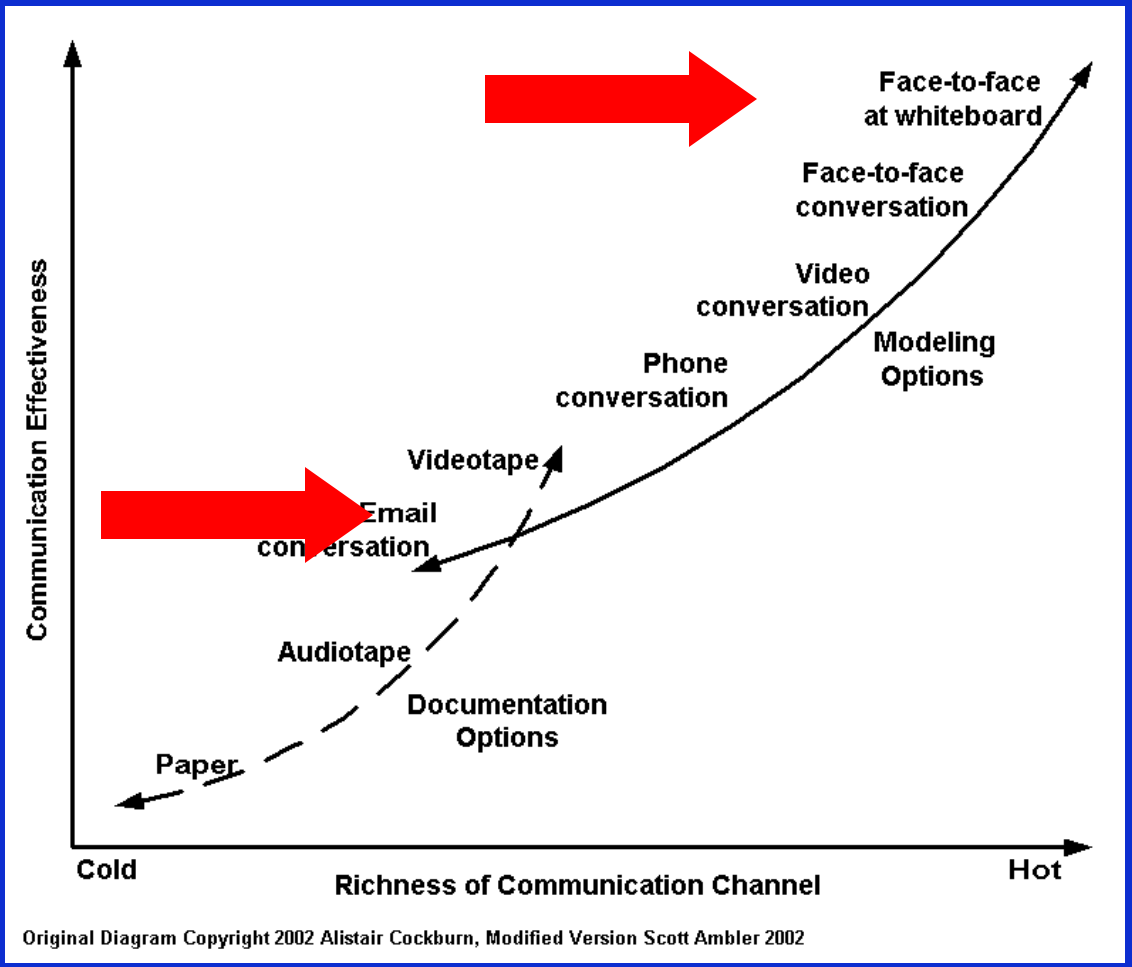
Model of Speech Communication

- *Egocentric heuristic*– Senders assume that receiver has all the same knowledge that they do
  - Worsens for those familiar with each other

- *Study of pediatric handoffs*
  - *The most important piece of information was not successfully communicated 40% of the time despite the sender believing it had been*

Barach P , et al , MJA, 2009; Keysar, et al, 2006

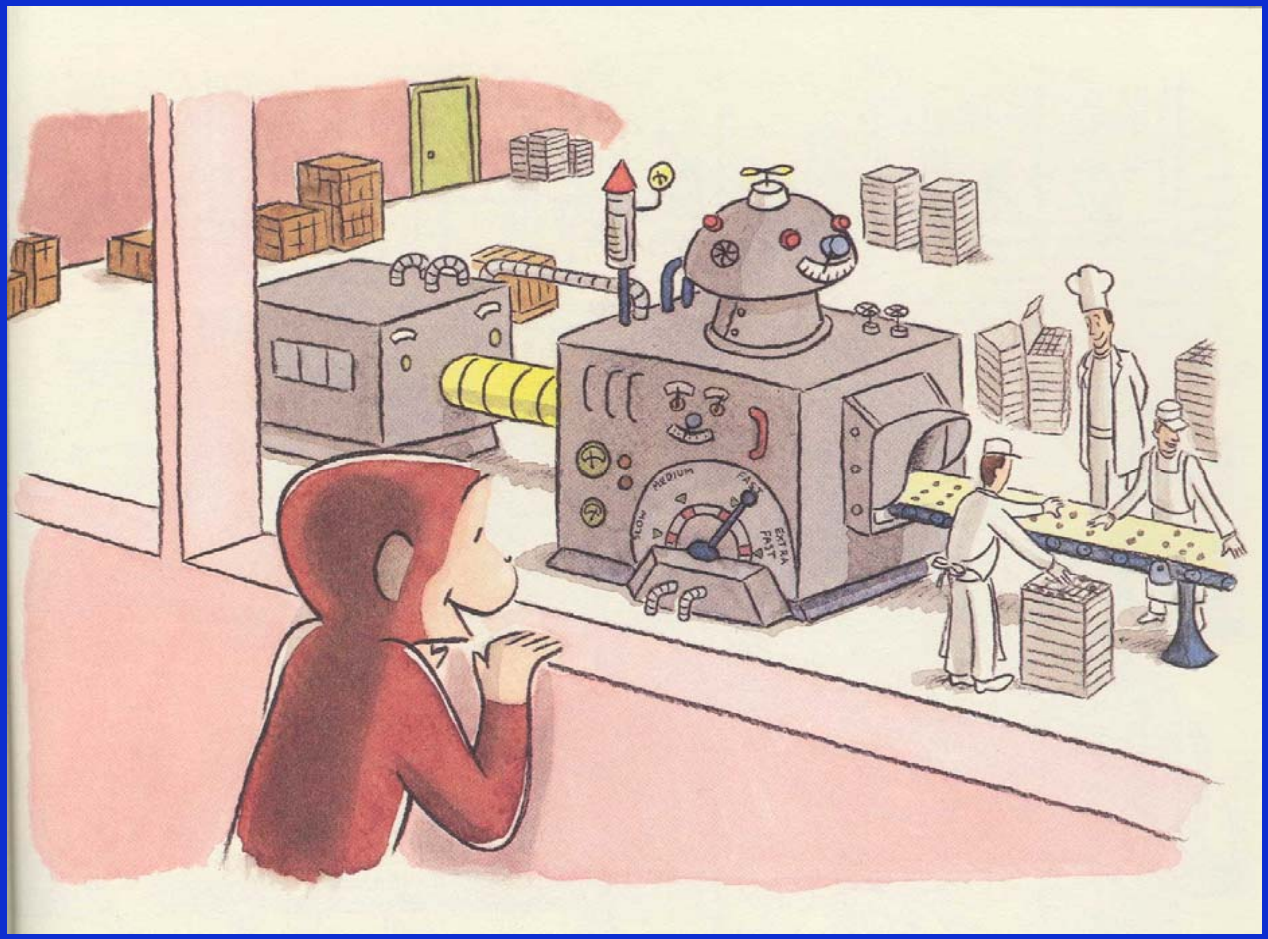
Hand-off as a Form of Communication



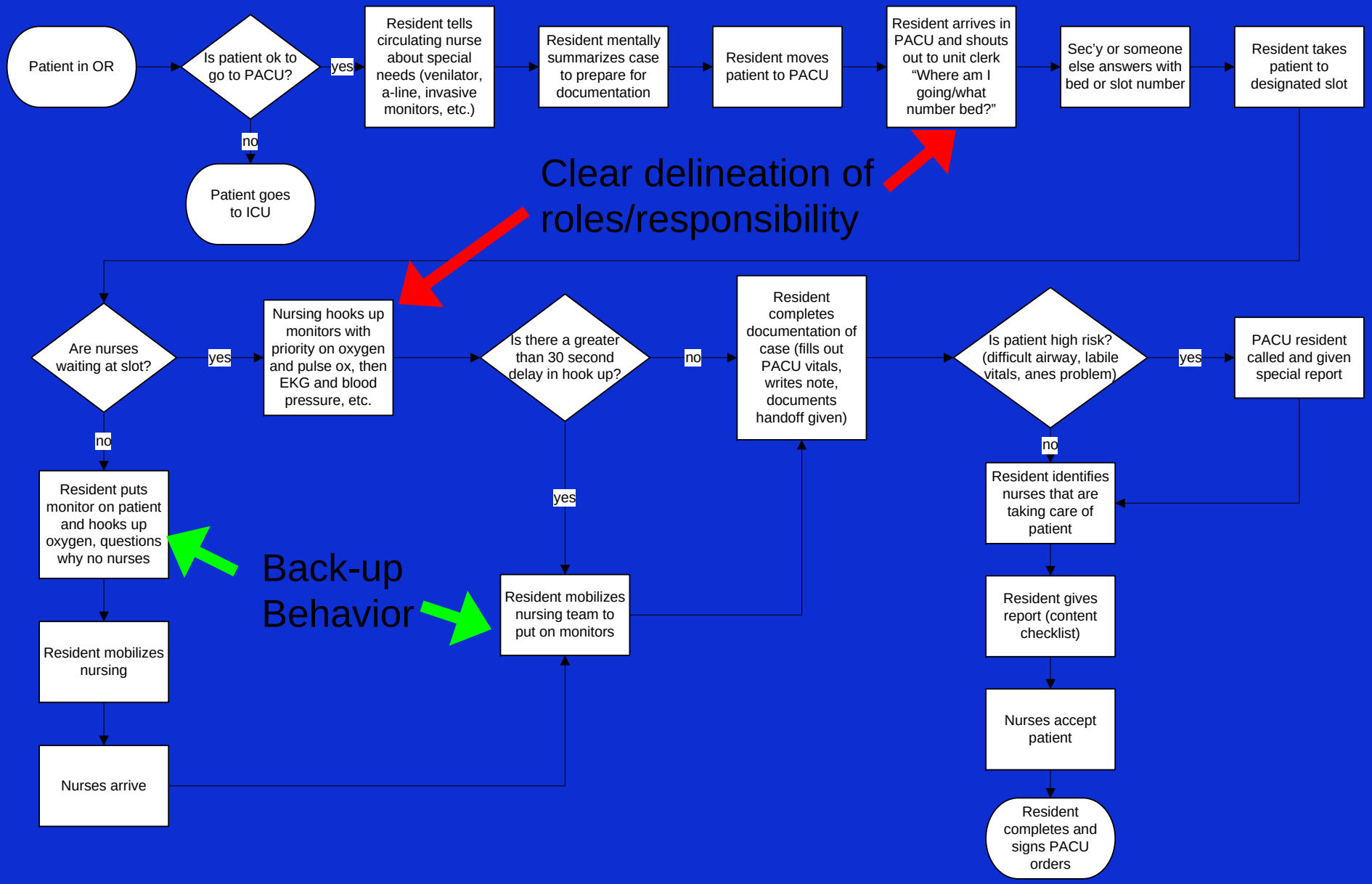
"When you move from right to left, you lose richness, such as physical proximity and the conscious and subconscious clues. You also lose the ability to communicate through techniques other than words such as gestures and facial expressions. The ability to change vocal inflection and timing to emphasize what you mean is also lost…Finally, the ability to answer questions in real time, are important because questions provide insight into how well the information is being understood by the listener."

–Alistair Cockburn

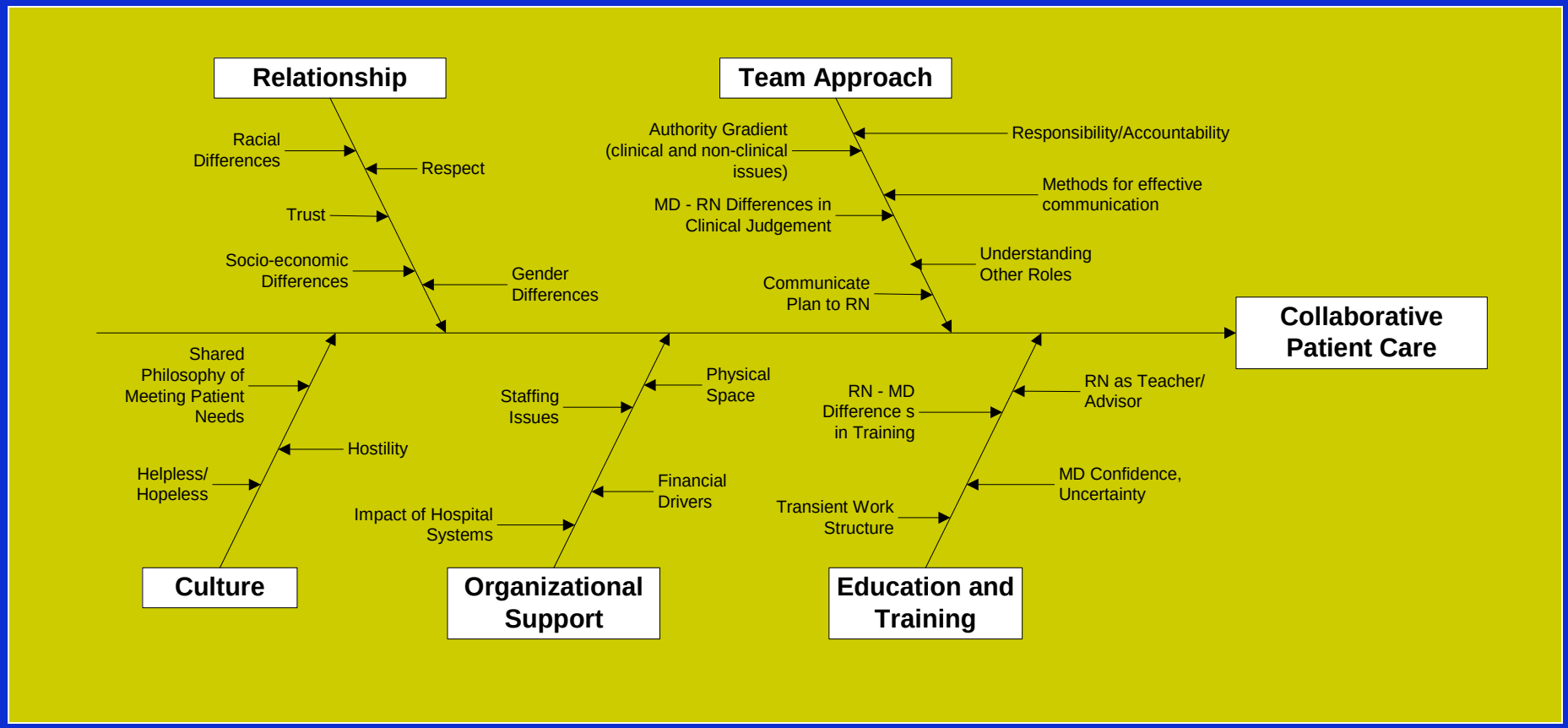
The View from the Catwalk



Anesthesia Resident to Nurse Hand-Off

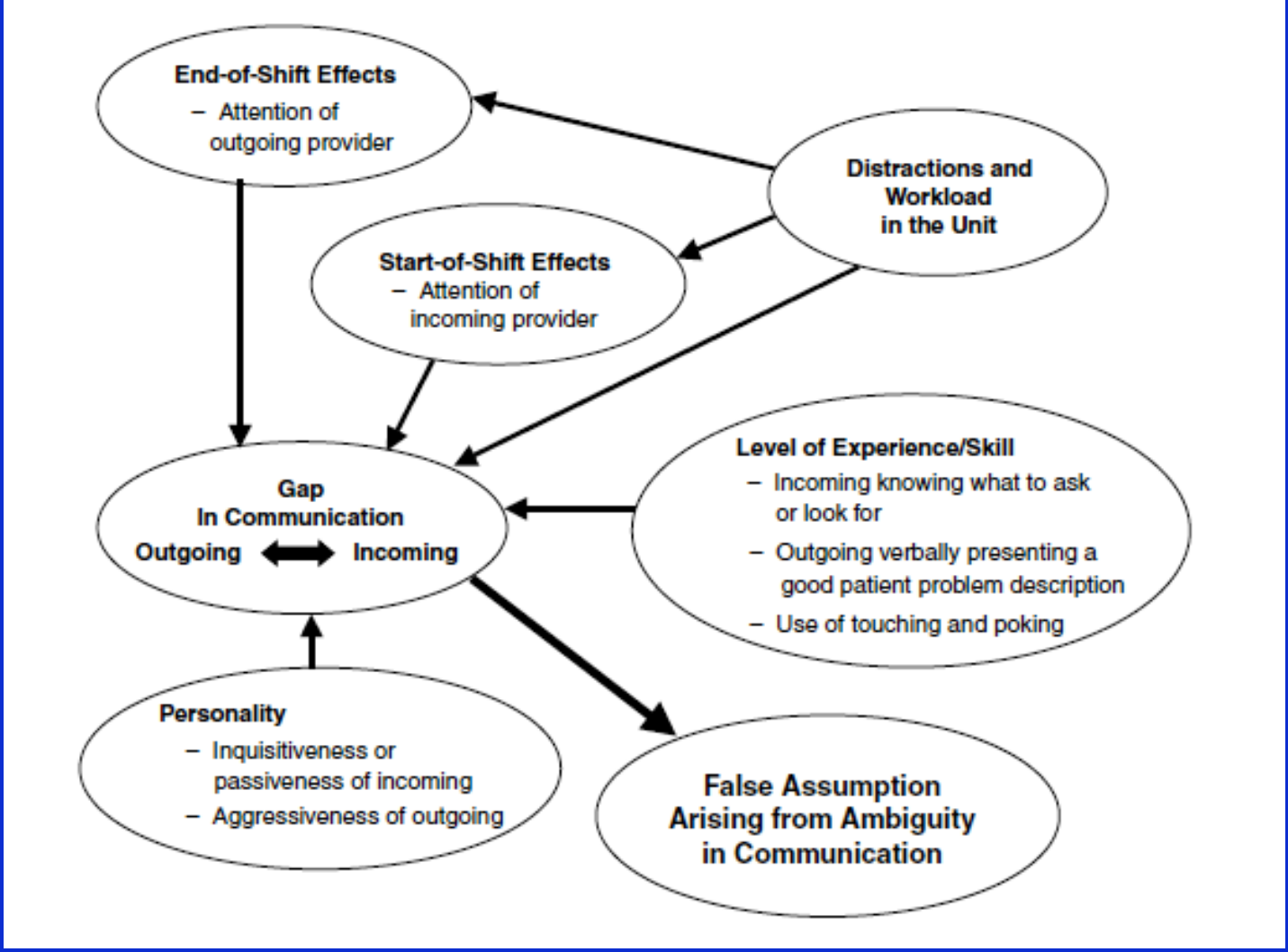


Factors in Nurse-Physician Communication



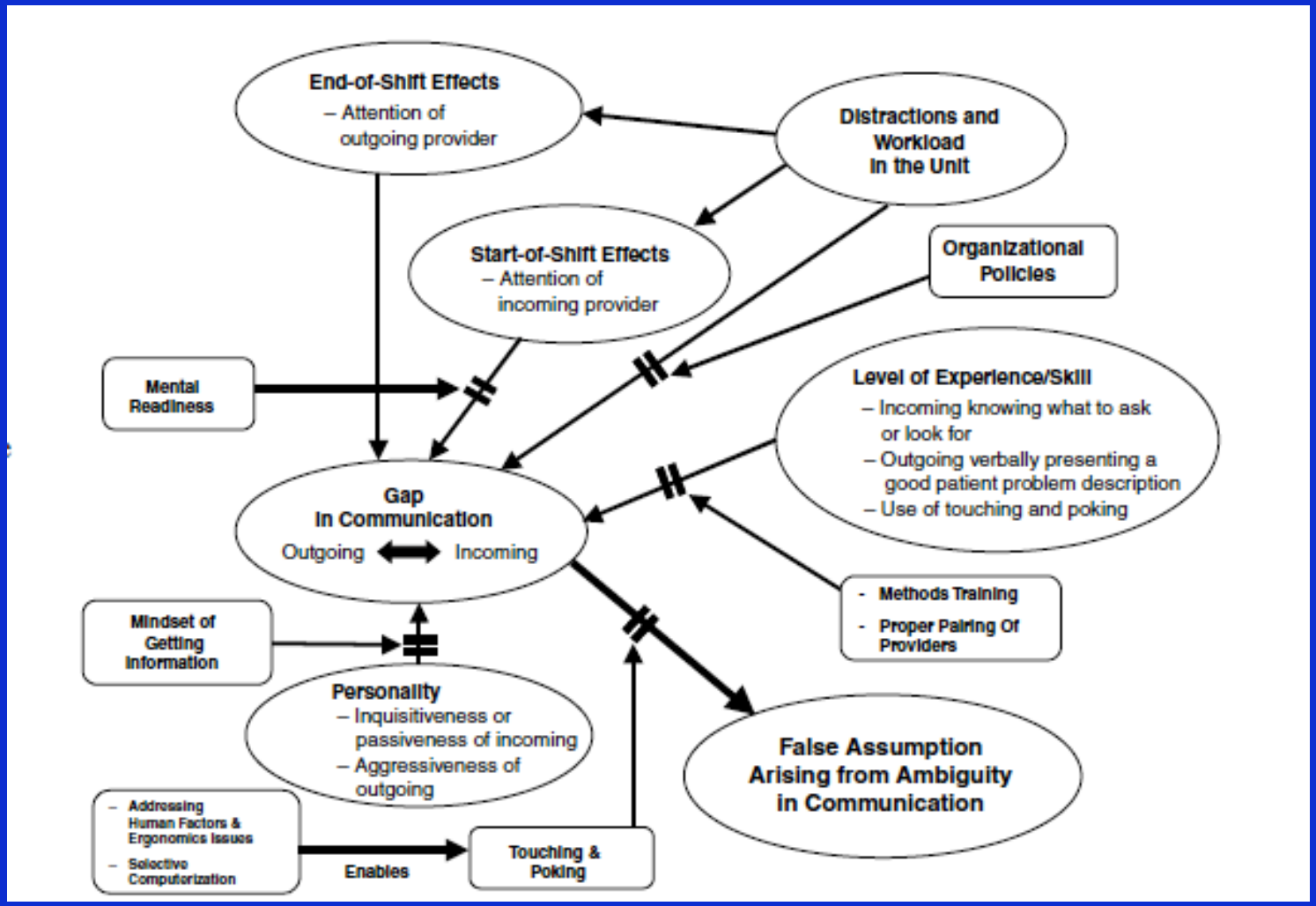
Sharit J, Barach P. Human Factors Proceedings 2005

Influence Diagram



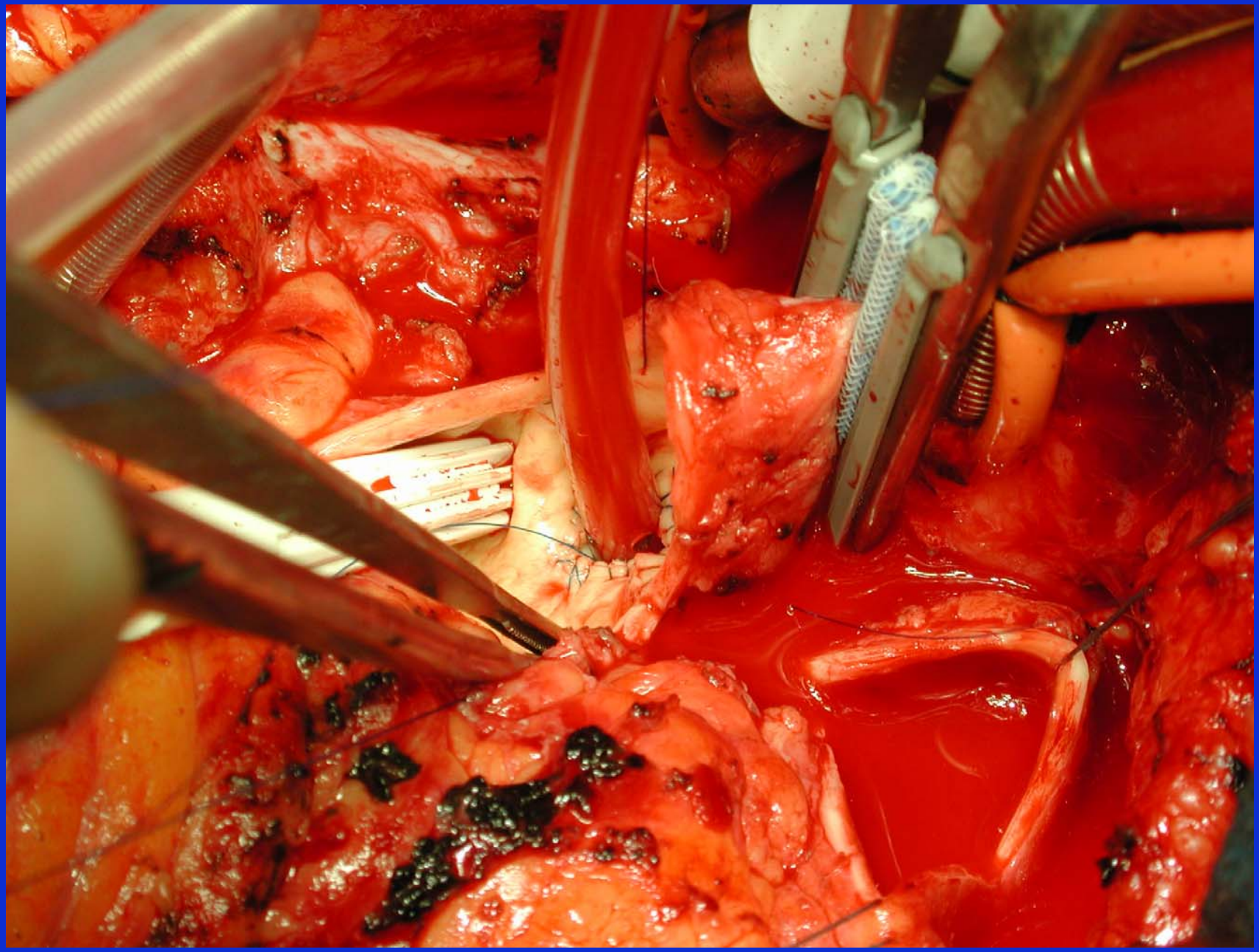
Sharit, McCane, Thevenin, Barach. Risk Analysis. 2008.

Analysis of Interventions



Sharit, McCane, Thevenin, Barach. Risk Analysis. 2008.

Reason # 6--Role of Non technical skills in Team work



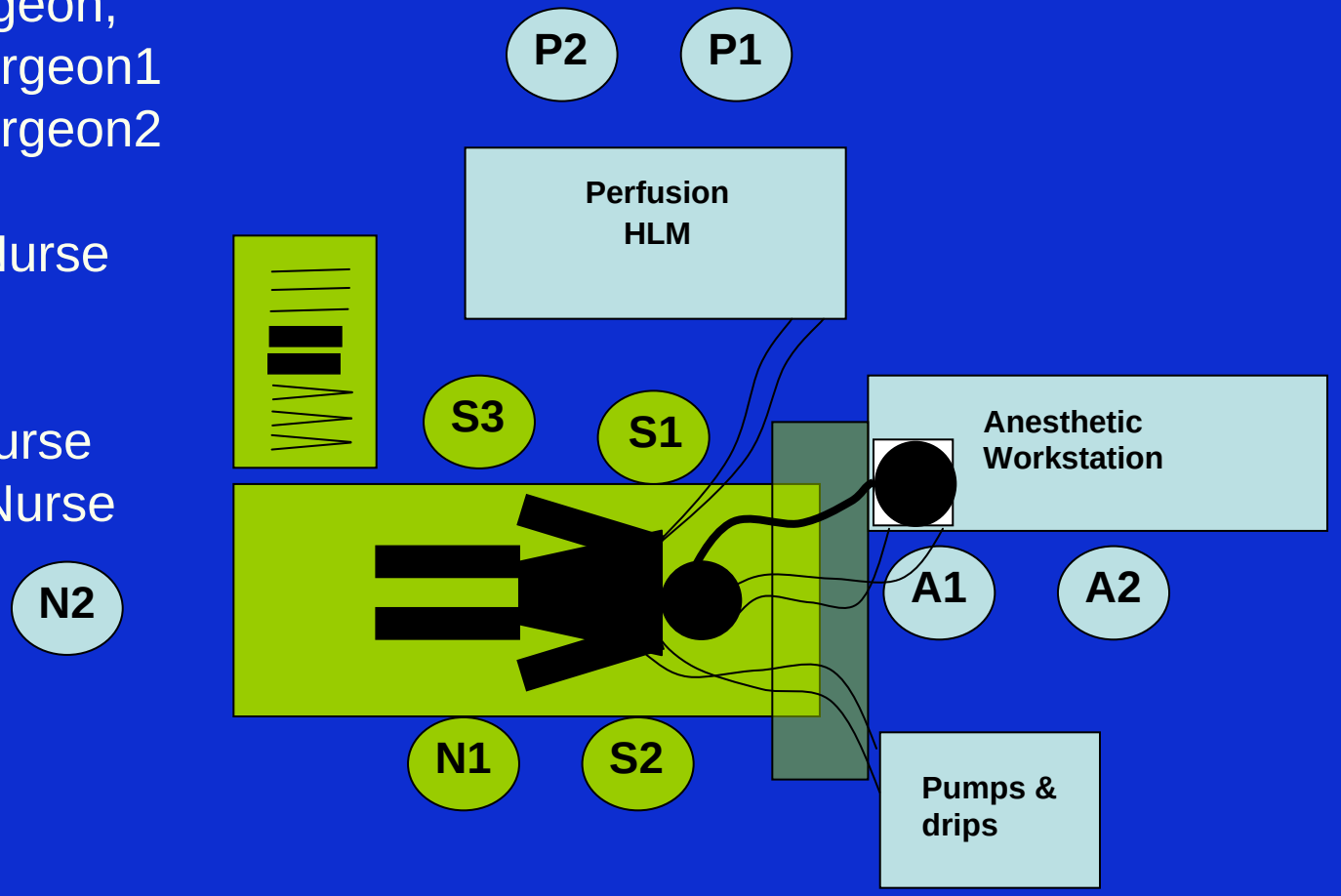
Research questions

- How do some teams perform and recover so well?
- How do adverse conditions, mediated by team and task processes, lead to negative outcomes (non-routine events and negative team outcomes)?
- Can we reduce the negative outcomes by means of an intervention focused at the team level (non-technical skills) or through the adjustment of external conditions?

The Team

Coding for TEAMS:

S1=Primary Surgeon,
S2=Assisting Surgeon1
S3=Assisting Surgeon2
A1=Anesthetist
A2=Anesthetic Nurse
P1=Perfusionist
P2=Perfusionist
N1= Assisting Nurse
N2=Circulating Nurse



Types of non-task related NREs

External distractions (pagers, beepers, phones)	80
Internal sounds (beeps, alarms)	37
Design of OR (‘battle for real estate’, footstools, wires, tubes)	23
Hygiene (improper mask wearing, two doors open simultaneously)	20
Anesthesia-related problems	17
Monitor problems	17
Falling on floor (object and instruments drop on floor)	16
Problems with sterility	16
Remarkable behavior (drinking coffee in OR, taking a picture, bringing in mail)	13
Perfusion-related problems	12
Unintended effects on patient	11
Bleeding	9
Absence (personnel arrive too late, heart-lung machine temporarily unmanned)	6
Equipment failure	4
Unclear	35
Total	**316**

Non Technical skills--NOTECHS Tool – 2 dimensions (total 4)

LEADERSHIP & MANAGEMENT	
Leadership	Involves / Reflects on suggestions / Visible / Accessible / Inspires / Motivates / coaches
Maintenance of standards	Subscribes to standards / Monitors compliance to standards / Intervenes if deviation / Deviates with team approval / Demonstrates desire to achieve high standards
Planning & preparation	Team participation in planning / Plan is shared / Understanding confirmed / projects / changes in consultation
Workload management	Distributes tasks / monitors / reviews / prioritises tasks / Allots adequate time / responds to stress
Authority & assertiveness	Advocates position / Values team input / Takes control / Persistent / Appropriate assertiveness

TEAMWORK & CO-OPERATION	
Team building/ maintaining	Relaxed / Supportive / Open / Inclusive / Polite / Friendly / Use of humour / Does not compete
Support of others	Helps others / Offers assistance / gives feedback
Understanding team needs	Listens to others / Recognises abilities of team / Condition of others considered / Gives personal feedback
Conflict solving	Keeps calm in conflicts / Suggests conflict solutions / Concentrates on what is right

NOTECHS Tool – Part 2

PROBLEM SOLVING & DECISION MAKING	
Definition & Diagnosis	Uses all resources / Analytical decision making / Reviews factors with team
Option Generation	Suggests options / Asks for options / Reviews outcomes / Confirms opinions
Risk Assessment	Estimates risks / Considers risk in terms of team capabilities / Estimates outcome
Outcome Review	Reviews outcomes / Reviews new options / Objective, constructive and timely reviews / Makes time for review / Seeks feedback from others / Conducts post treatment review

SITUATION AWARENESS	
Notice	Considers all elements / Monitors vital signs & progress of operation / Asks for or shares information / Encourages vigilance / Checks and reports changes / Requests reports and updates
Understand	Cross-checks above / Shares mental models / Speaks up when unsure / Updates other team members
Think Ahead	Identifies future problems / Discusses contingencies / Plans for future patient states / Anticipates high workload / Discusses constraints / Uses low workload periods

Distribution of Major and Minor Events (Barach P, et al 2008)

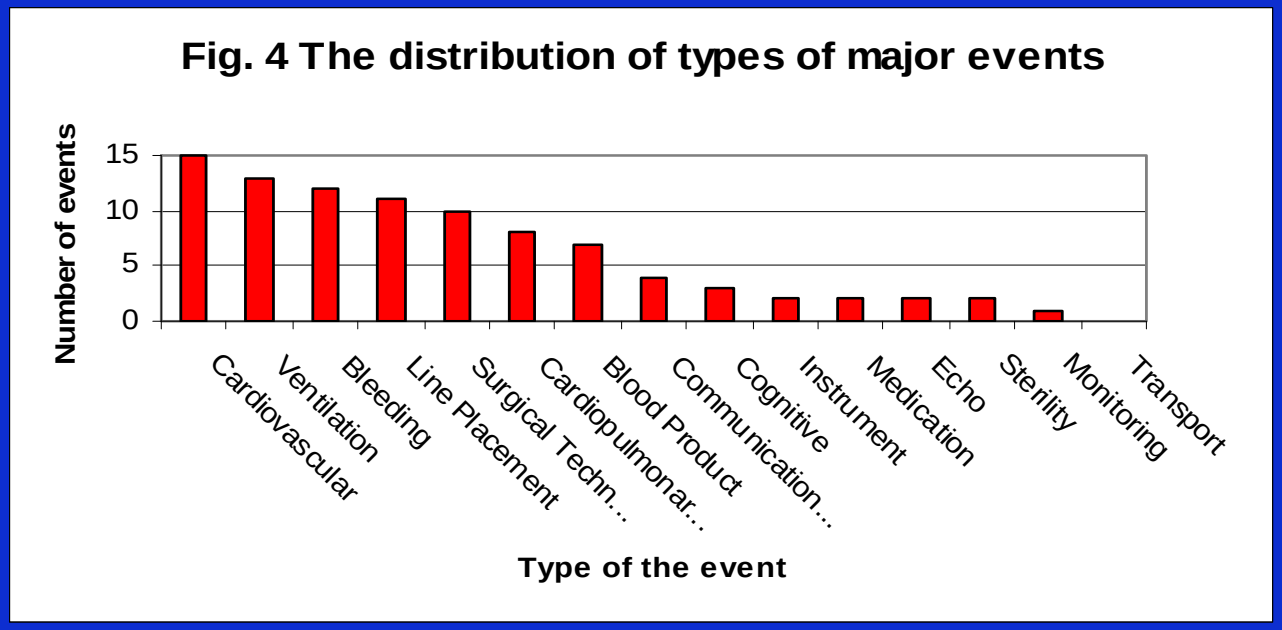


Figure A. 44% of major events were cardiovascular, ventilation and bleeding problems (patient related problems)

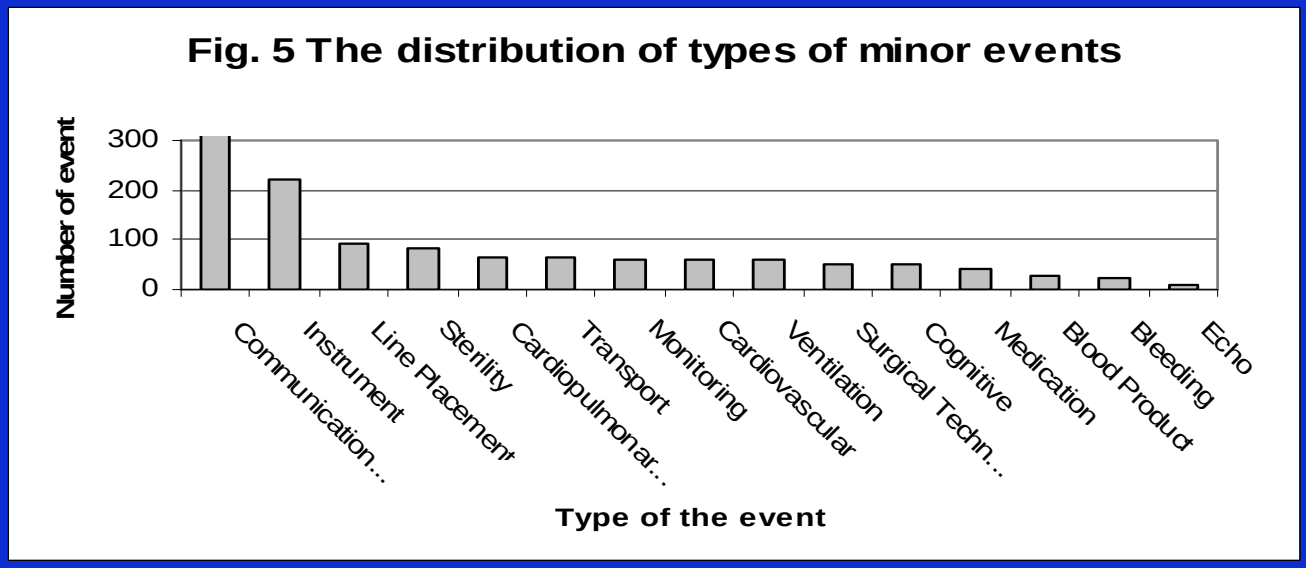
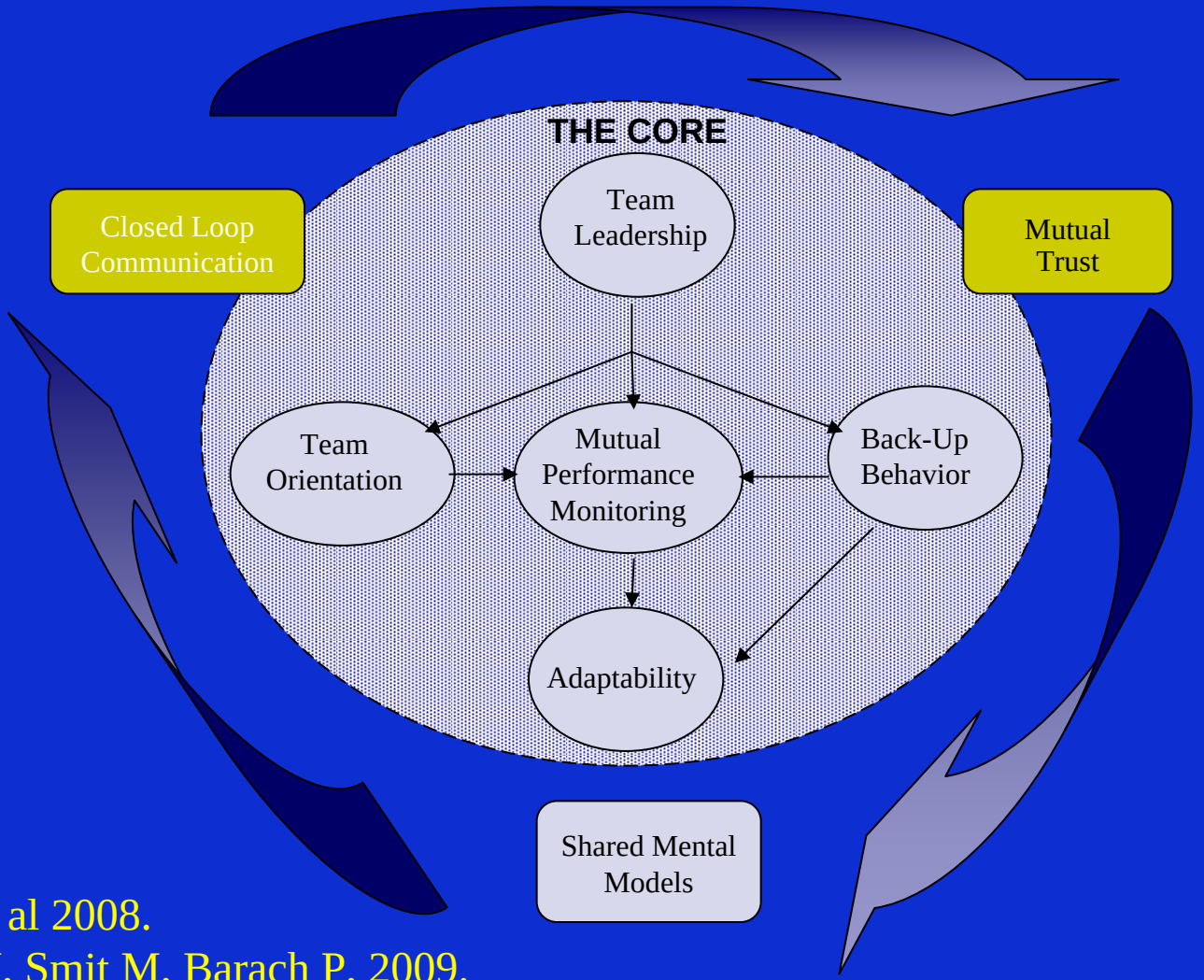


Figure B. 44 % of all minor events communication/

coordination and instrumentation problems were detected (not patient related problems)

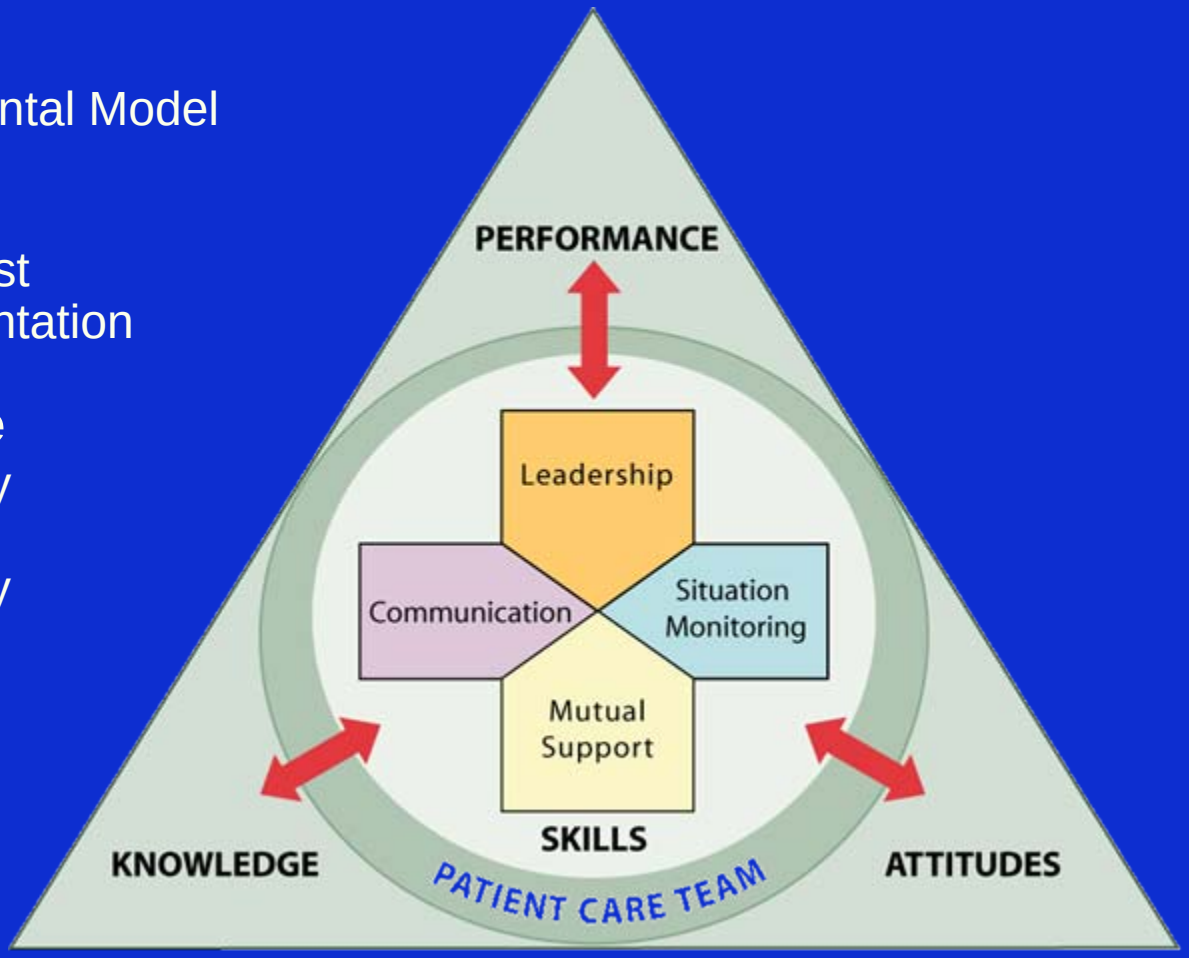
Model of "Big 5" Teamwork



Barach, et al 2008.
Schrager J, Smit M, Barach P, 2009.

The TeamSTEPPS Framework

- **Knowledge**
  - Shared Mental Model
- **Attitudes**
  - Mutual Trust
  - Team Orientation
- **Performance**
  - Adaptability
  - Accuracy
  - Productivity
  - Efficiency
  - Safety



Baker D, Salas E, Battles J, King H, Barach P, 2005; Baker, Barach Salas, King, 2007

Reason #7 Role of the Culture


INSIDE THE WHITE HOUSE SHAKE-UP
PREVIEW: HOT SUMMER MOVIES
TIME
WHAT DOCTORS HATE ABOUT HOSPITALS
An insider's view of what can go wrong—and how you can improve your odds of getting the right treatment
BY NANCY GIBBS & AMANDA BOWER
May 1, 2006

STS-107 Columbia Space Shuttle

Weather

Today: *Some sun, humid, a shower. High 91. Low 71.*
Thursday: *Mostly sunny, humid. High 88. Low 73.*

Details, Page **B8**

126TH YEAR NO. 265 M2 VA

The Washington Post

WEDNESDAY, AUGUST 27, 2003

FINAL

Inside: **Food, Classified**
Today's Contents on Page A2

NEWSSTAND 35¢
HOME DELIVERY 31¢

Report Blames Flawed NASA Culture for Tragedy

Miscommunication, Bungling Halted Bids for Shuttle Photos

By ROB STEIN
Washington Post Staff Writer

NASA never obtained pictures of the space shuttle Columbia in orbit that may have helped prevent the disaster because of a series of misunderstandings, miscommunications and bureaucratic bunglings that exemplify the space agency's problems, investigators concluded yesterday.

Lower-level engineers and officials requested at least three times that the Defense Department use its network of high-powered telescopes and satellites to take pictures of the shuttle's damaged left wing, but the requests were either never acted upon or blocked because of inadequate, imprecise or conflicting follow-ups by the space agency, investigators found.

The requests are among eight "missed opportunities" to obtain images of Columbia in space that might have prevented the shuttle's Feb. 1 destruction, which occurred because a piece of foam insulation hit and damaged a wing during liftoff. The report makes it clear that investigators believe such images could have helped save Columbia and its crew of seven—perhaps by prompting a rescue or repair attempt—and the failure to obtain them underscores leadership failures at the space agency.

While investigators had previously revealed that NASA officials had discussed and even requested that the Pentagon take pictures of the shuttle in space, yesterday's 248-page report by the Columbia Accident Investigation Board for the first time details how those requests arose, were executed and, in the end, were quashed.

See **REPORT**, *A15, Col. 1*

BY RAY LUSTIG—THE WASHINGTON POST

Columbia Accident Investigation Board Chairman Harold W. Gehman Jr. and members John Logsdon and Scott Hubbard discuss their findings.

NASA's Deeper Woes

Behind the technical failings, NASA suffered from a declines in public support and its own scientific edge. *Page A14*

Profit Motive

Investigators found a "potential for conflicts" in the contracting out by NASA of shuttle maintenance and launches. *Page A13*

In Broad Indictment of Practices, Shuttle Panel Says Safety Suffered

By KATHY SAWYER *and* ERIC PIANIN
Washington Post Staff Writers

The shuttle Columbia and a crew of seven were lost on Feb. 1 because NASA, for the second time in its recent history, allowed its engineering to grow careless, its safety system to wither, its communications to become muddled and prudent professional curiosity to become stunted.

Those conclusions were part of a far-reaching indictment issued yesterday by the Columbia Accident Investigation Board, in a comprehensive and unsparing assessment of the human spaceflight program. Laying at least part of the blame for NASA's failings on persistent budget and other pressures flowing from Congress and the White House over several administrations, the plainspoken 248-page report is designed to provide the foundation for an unprecedented national debate on the future of human spaceflight, which the board said is long overdue.

A 1.7-pound chunk of foam insulation that struck Columbia's left wing at more than 500 mph during the Jan. 16 ascent was "the direct, physical action that initiated the chain of events leading to the loss of Columbia and her crew," the board wrote.

But, in chilling echoes of the environment that produced the 1986 Challenger tragedy, the board found that NASA's management and cultural mind-set were as culpable because they paved the way for the foam strike to do its deadly work. Before the mission, managers did not heed foreshadowings of the potential threat; and during the

See **FAILURE**, *A16, Col. 2*

Region

Bush: U.S.

Columbia Accident Investigation Board

"Cultural norms tend to be fairly resilient…the norms bounce back into shape after being stretched or bent. Beliefs held in common resist alteration….This culture acted over time to resist externally imposed changes.

By the eve of the Columbia accident, institutional practices that were in effect at the time of the Challenger accident had returned to NASA."

Person /Team
Individual Unsafe Acts

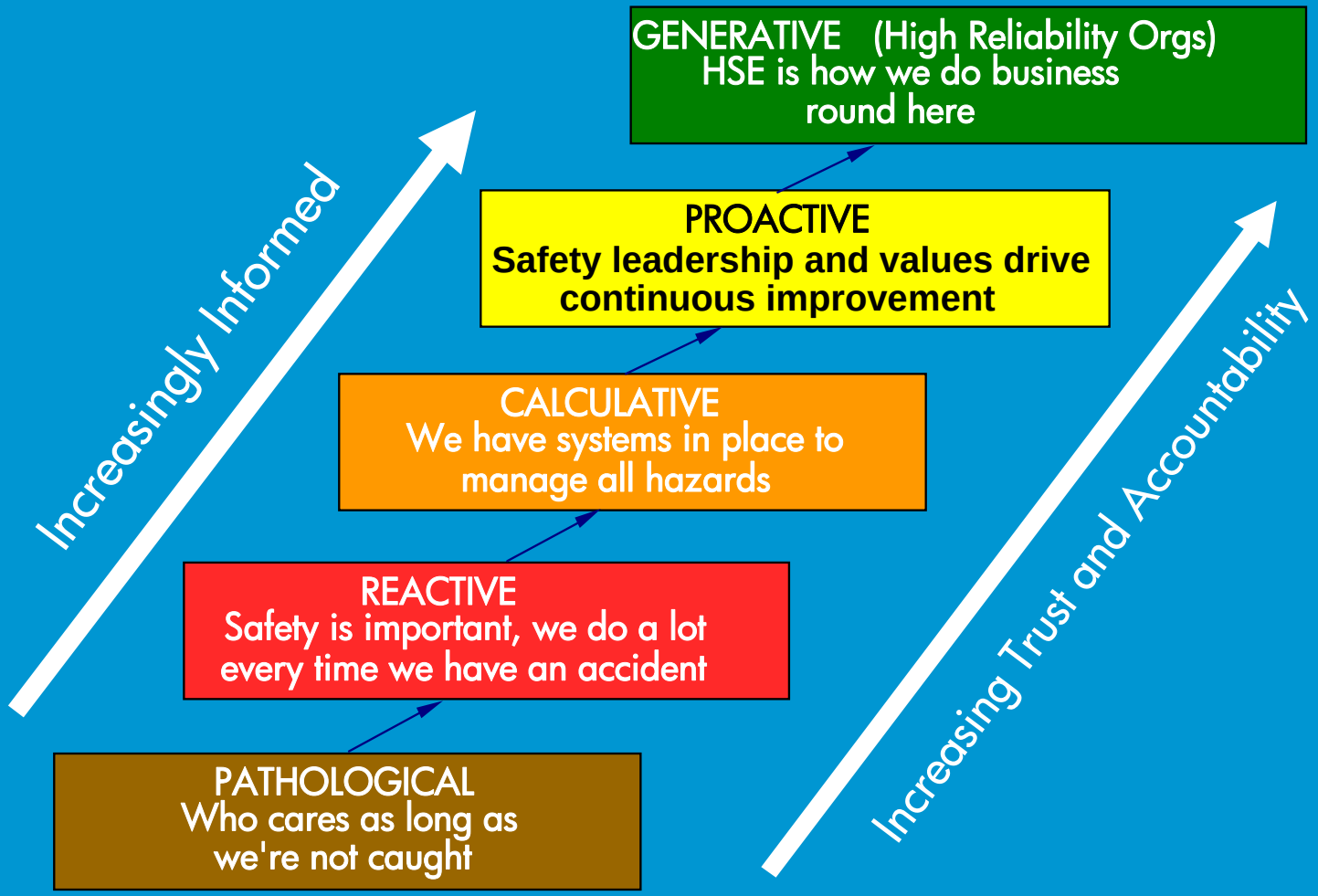
- Errors
  - Attentional Slips and memory lapses (Intrusions, omissions)
  - Mistakes
    - Rule –based
    - Knowledge-based
- Violations(deliberate deviation from regulation)
  - Routine (shortcuts)
  - Optimizing Violations
  - Exceptional
  - Deliberate
- Normalized deviance

Results -Safety Culture in the OR-

- 3 academic PCS teams were “surveyed” on:
  - Adverse event reporting
  - OR management
  - Safety culture
- 72% response rate
- Significant differences ($p<0.001$) between both institutions regarding communication at all levels
- Significant differences between surgeons and perfusionists vs. nurses re. “trained to use equipment”, and “system take into consideration safety”
- Significant differences in sense of empowerment, safety and organizational backing
- 45% felt that outcomes were not safe
- 33% felt that errors of the same kind keep on recurring
- 47% felt that administration was not senstive to patient safety issues

Bognar A et al, Annals of Surgery, 2008

Stages in the development of a safety culture



Reason #8: Secrecy and non transparency

The Cloak

- Painfully incorporated desire not to appear incompetent
- Behaviors conferring a sense of protection are greater:
  - The more terrorizing and fatiguing the training or the greater the possibility of catastrophic error on a moment-to-moment basis
- “The problem is we get so used to cloaking our irrational decisions in the guise of wisdom and experience, we confuse good luck with good judgment, and that’s where diagnostic errors often begin.”

Wachter,RM and Shojania,KG: *Internal Bleeding: The Truth Behind America’s Terrifying Epidemic of Medical Mistakes*. 2004.

"It is incident to physicians, I am afraid, beyond all other men, to mistake subsequence for consequence.“

Samuel Johnson, 1756

When to call for help?

"Nurse, get on the internet, go to SURGERY.COM, scroll down and click on the 'Are you totally lost?' icon."

Disclosing Adverse Events

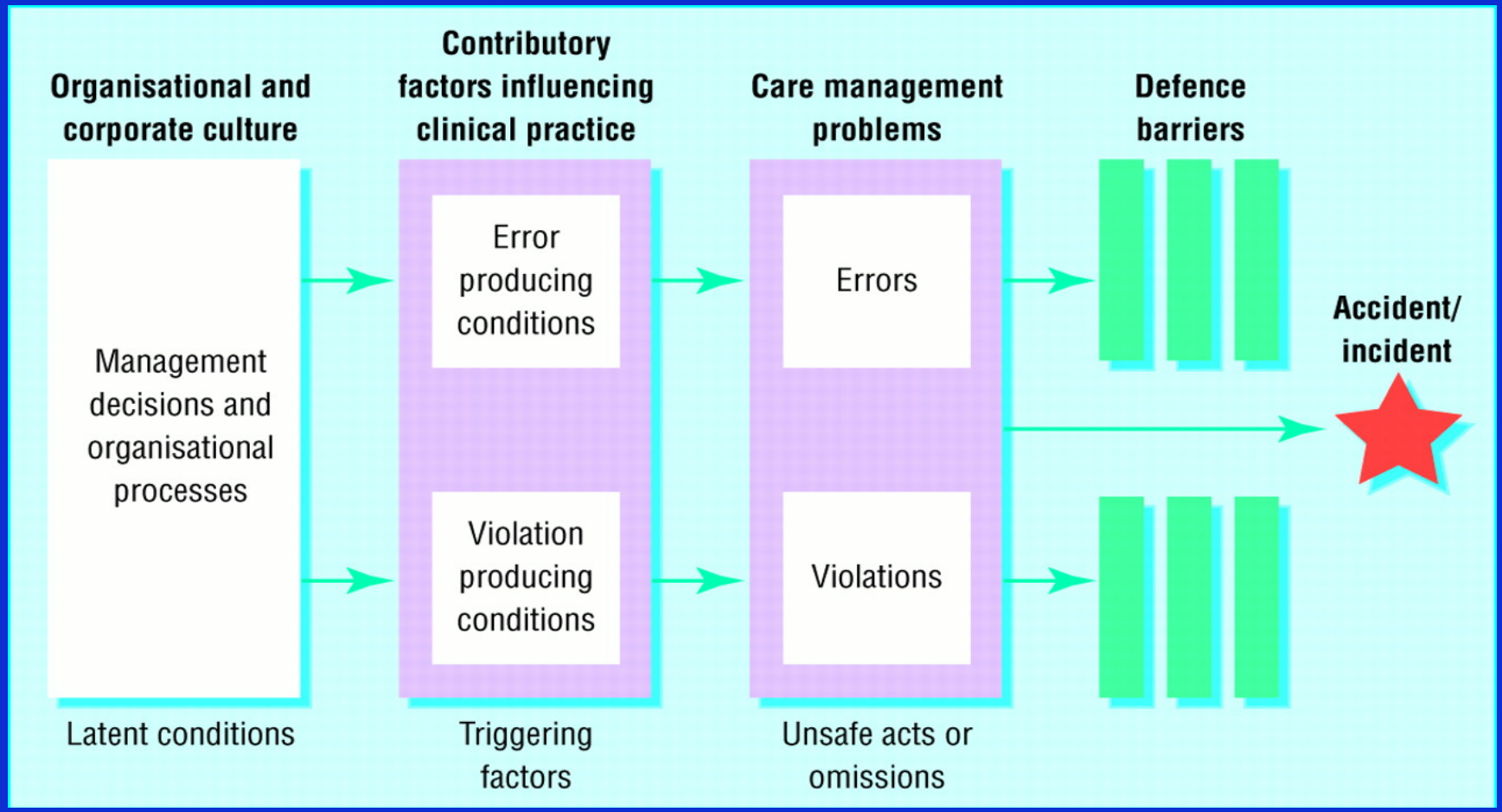
- Disclosure is required when
  - Has a perceptible effect on the patient not discussed in advanced with patient
  - Necessitates a change in patient care
  - Poses risk to patient's future health
  - Involves non-consented treatment or procedure
- Reduces chances of being sued
- Transparency in process helps the team address guilt
- New law in Florida requiring disclosure

Cantor M, Barach P, et al. Jt Comm Qual Patient Saf 2005;31:5-12.
Barach, P, Cantor M, 2007

Conclusions

"At what point does this become our problem?"

Reason – Complex Systems



Key Messages

- Local leadership
  - All change is local
  - The research team can't improve the process that is being studied -- this has to be accomplished by those at the front lines
  - Local champions are necessary to lead and manage the improvement piece
  - Champions need to be nurtured (they won't necessarily know what to do)

Arora, VM; Johnson, J. "Spreading and Sustaining Use of Standardized Handoff Protocols for Residency Training." In: Implementing and Sustaining Improvements in Health Care. USA: Joint Commission Publishing. 2009. pp 88-97.

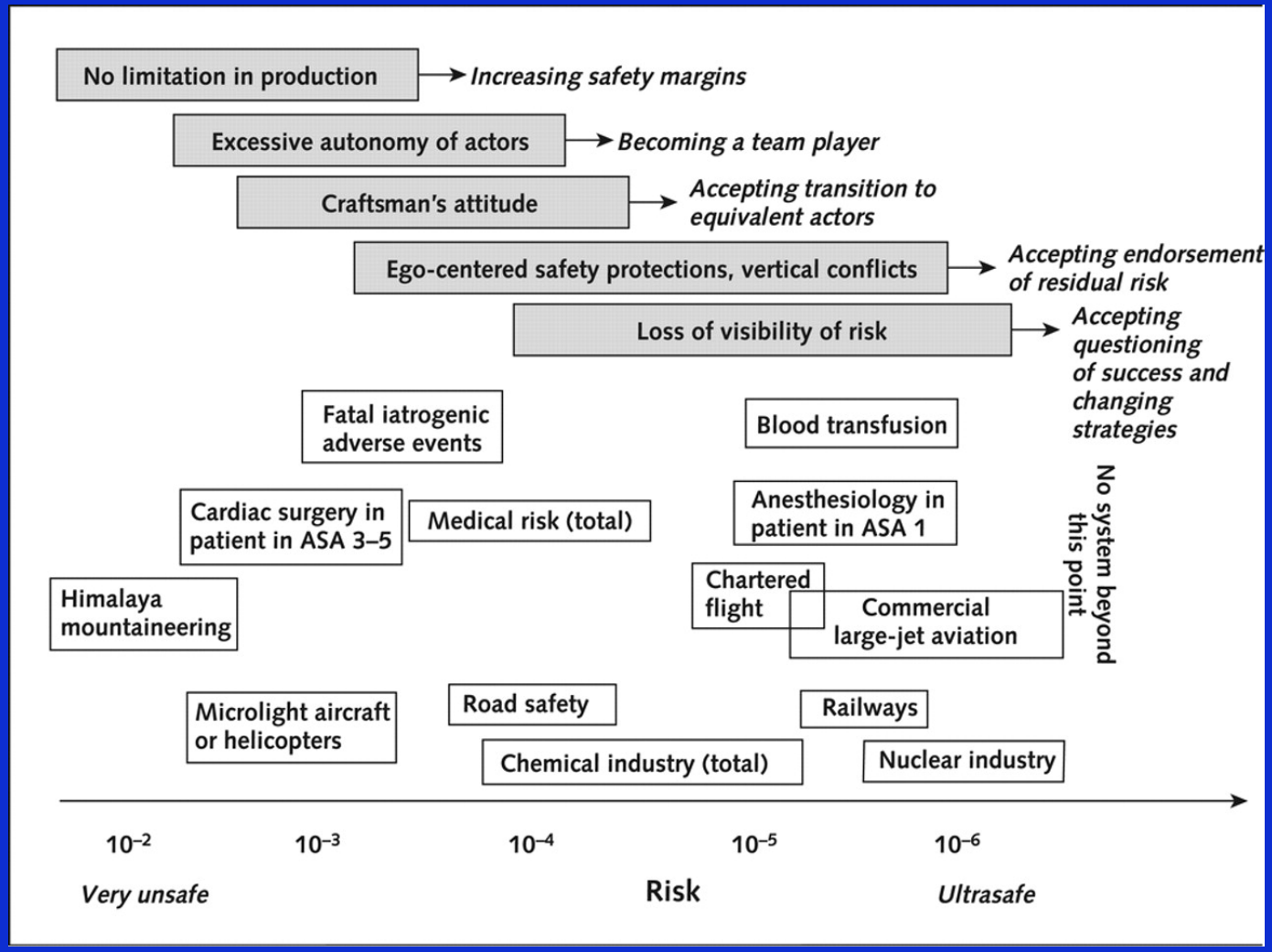
Johnson J, Barach, Medical J of Austraralia, 2009.

Barriers To Achieving Ultra-safe Healthcare

- Acceptance of limitations on maximum performance
- Abandonment of professional autonomy
- Transition from mindset of craftsman to that of an equivalent actor
- Need for system-level arbitration to optimize safety and develop a culture of safety
- Simplify professional rules and regulations

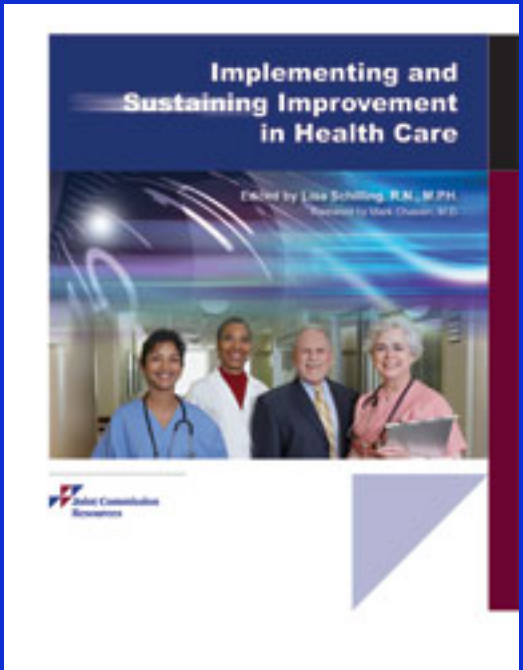
Amalberti R, Berwick D, Barach P. Annals of Internal Medicine 2005;142:756-764.

Average rate per exposure of catastrophes and associated deaths in various industries and human activities



Amalberti, R. et. al. Ann Intern Med 2005;142:756-764

Challenges/Opportunities



- Sustainability
  - What happens when you are “done” with the project?
  - How do you sustain the improvement?
    - *Identify local champions*
    - *Build around microsystem*
    - *Build-in process monitoring and evaluation from the beginning*
    - *Connect to present clinical and organizational processes*

Arora, VM; Johnson, J. “Spreading and Sustaining Use of Standardized Handoff Protocols for Residency Training.” In: Implementing and Sustaining Improvements in Health Care. USA: Joint Commission Publishing. 2009. pp 88-97. ; Johnson J, Barach, Medical J of Austraralia, 2009.

Questions or Ideas?

Contact me:

- Paul Barach PBARACH@UMCUTRECHT.NL

For copies of our Papers and/or Tools in this talk