Designing a residency curriculum for safety?

March 21, 2004

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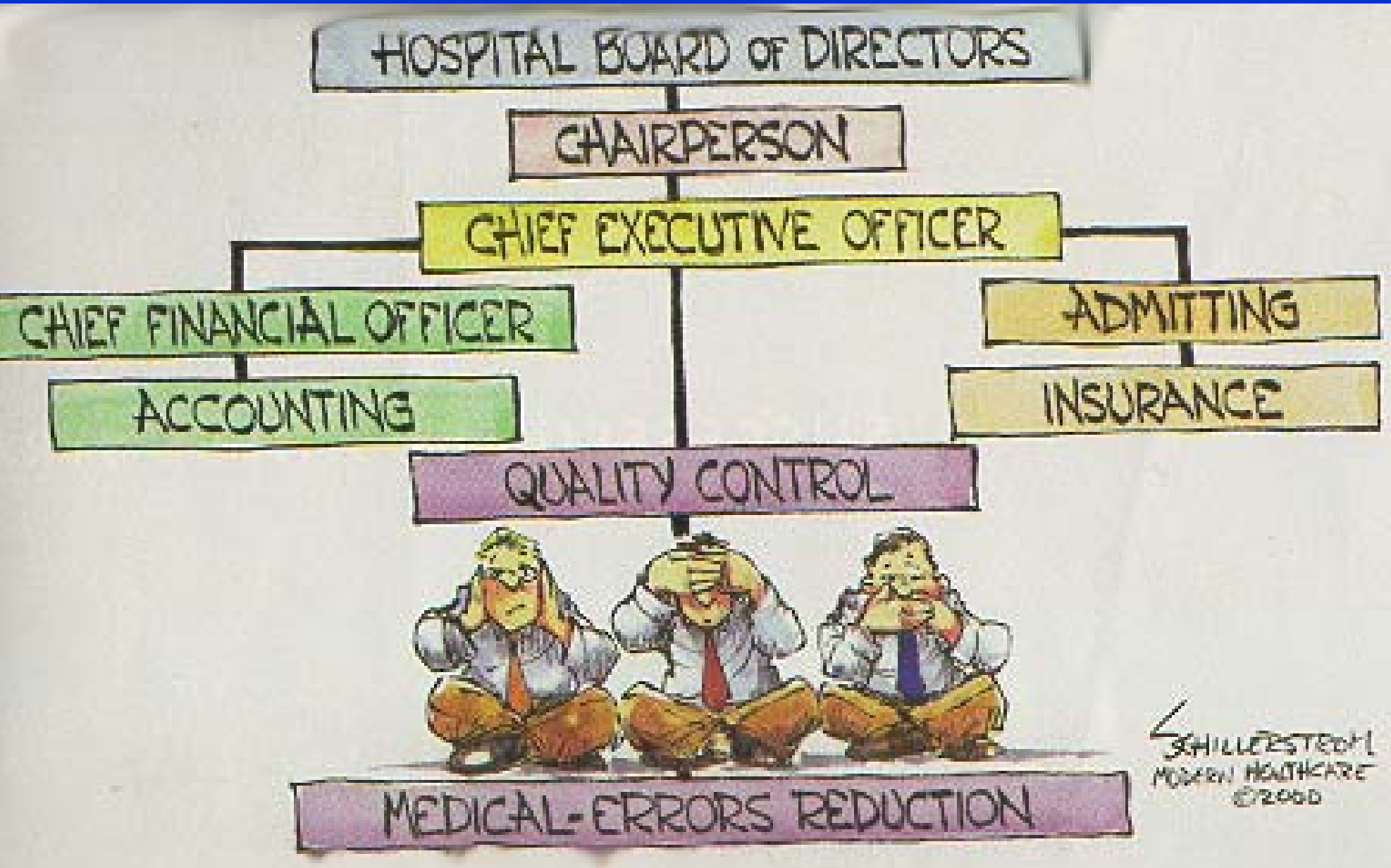
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CHAIRPERSON
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MEDICAL-ERRORS REDUCTION
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MODERN HEALTHCARE
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How Big is the Problem?

- 3-38% of hospitalized patients are affected by iatrogenic injury or illness
- 44,000-98,000 hospital deaths/year (IOM)
- >7000 ADE's year
- 2 million nosocomial infections/year
- 10-35% suffer adverse drug events
- Death and serious disability in 2% (0.3, 1.7%)
- Cost: 5-10% of health expenditure or $13-29 billion estimated yearly cost
- Not counting primary care, mental health, office practice, day care and access problems
- USA, Australia, UK, NZ, Denmark

Institute of Medicine – "Crossing the Quality Chasm" Aims for the 21st Century Health Care System

Healthcare that is:

- Safe
- Timely
- Effective
- Efficient
- Patient-centered
- Equitable

Physician Competencies and Patient Safety

- Patient Care
- Medical knowledge
- Interpersonal and communication skills
- Professionalism
- Practice based learning and improvement
- System based practice

Professionel competence

Ebstein and Hundert (JAMA 2002): **Competence is a habit of action**
The habitual and judicious use of knowledge, skills, reasoning, emotions, values, and reflection in daily practice for the benefit of the individual and community being served.

Approach to the tasks
- Academic competence
- Emotional competence
- Organisational competence

Professionalism
- Personal development
- Relation to the patient and the 'community'

Harden, 1999

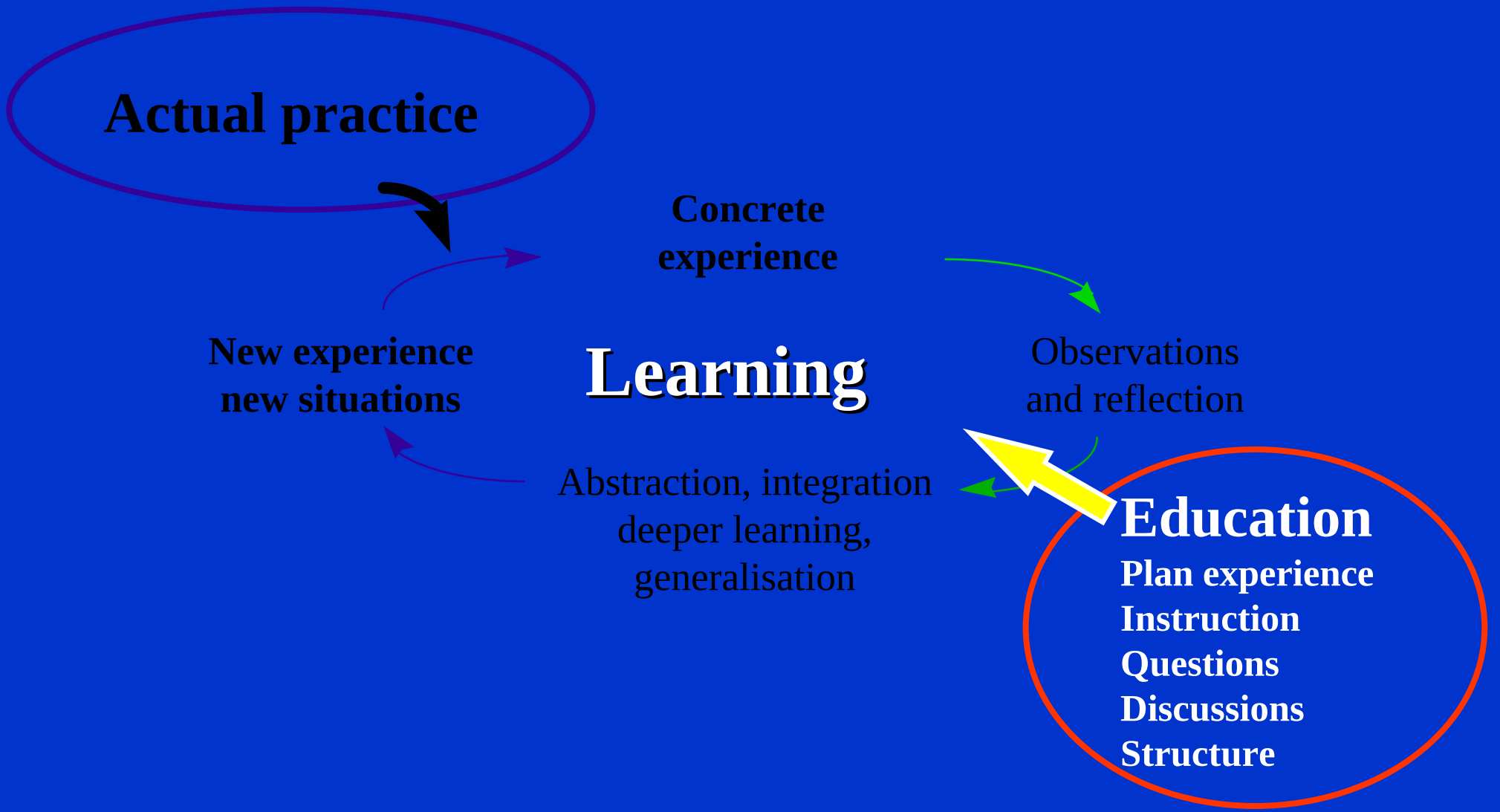
Stages of Development (The Dreyfus Model)

- Novice
- Advanced beginner
- Competent
- Profecient
- Expert
- Master

» Dreyfus and Dreyfus, 1992

(modified by Batalden and Leach et al, Health Affairs, 2002)

Kolb's learning cycle



Maintenance of Certification

- Professional standing
- Lifelong learning and self-assessment
- Cognitive expertise
- Practice performance

The Science of Training

- Why should we care about training in organizations
- What we know about training
- What are the challenges
- What simulation offers

The Research..

- 60’s
  - Learning principles (Gagne, 1962)
- 70’s
  - Dormant: little empirical work
  - Theoretical, dull irrelevant and faddist (Campbell, 1971)
- 80’s
  - Goldstein, Wexley (1984) Method based
  - Cognitive psychology and expertise
  - Tannenbaum (1992)
  - Dreyfuss—expertise model

The Research…

- 90's
  - Technology influences how we learn
  - More theories of context, systems view
  - Training vs. learning
  - Focus on transfer of training, motivation to learn
  - Evaluation methodologies
  - Competencies must drive training objectives (e.g., ACGME 6 competencies)
  - Briefing and debriefing are essential components of learning
  - Reflection as the basis of all learning

Theoretical Advancements

- Organizational frameworks (Tannenbaum, 1993)
- Climate to transfer (Thayer, 1995)
- Training motivation (Colquit et al, 2000)
- Pre training context (Quiones, 1995)
- Individual/situational characteristics (Mathieu, 1997)
- Participation and development (Noe, 1992)
- Little learning without capturing performance (Salas, 1997)

Training Needs Analysis

- Organizational analysis
  - Outline components
  - Situational cues, climate (Tracey, et al, 1995)
- Job/task analysis
  - Uncovering KSA's
  - Arvey et al (1992)
  - Cognitive task analysis
  - Need to design/develop a methodology

Antecedent Training Conditions

- Cognitive ability
  - Practical intelligence
- Self Efficacy
- Goal Orientation
  - Mental framework use to interpret behavior in learning
  - Mastery vs. performance
  - Mastery better
- Training Motivation
- Pre training conditions and climate
  - Past experiences

Training Methods

- Instructional strategies
  - Tools, method, content
- Team Training
  - ACRM
- Simulation—micro and macro
- Learning technologies
  - Distance
  - Web

Post Training Conditions

- Training evaluation
  - Expanded (Kraiger, 1993)
- Transfer of Training
  - Transfer “climate” matters
  - Opportunity to perform
  - Success embeds learning better than failure
- Training as part of an organizational system

Metrics to evaluate knowledge

- Knowledge—decision making is sin que non
  1. Declarative
  2. Procedures
  3. Strategic - given the cues of the environment –reactive, branching, applying, conditional, dynamic measures

Is the science of training affecting organizational training practices?

- Debunking the Myths……

Myth 1

- Unskilled worker→training→skilled worker

- Reality:
  - Uninformed about the science
  - Erroneous assumptions

Myth 2

- Task experts can articulate their training needs

  - Reality: experts do not have access to their own expertise—knowledge becomes compiled
  - Task experts do not necessarily understand the learning process or how learning progresses
  - Task experts are crucial but must be paired with learning experts

Myth 3

- Learning without feedback is adequate

- Reality:
  - Feedback must be diagnostic and direct trainee's attention and give them an indication of how to improve

Myth 4

- High fidelity of training environments is better

  – Reality :

    . It depends on the learning task

    - It is imperative to identify the cues in the task environment that drive performance

Myth 5

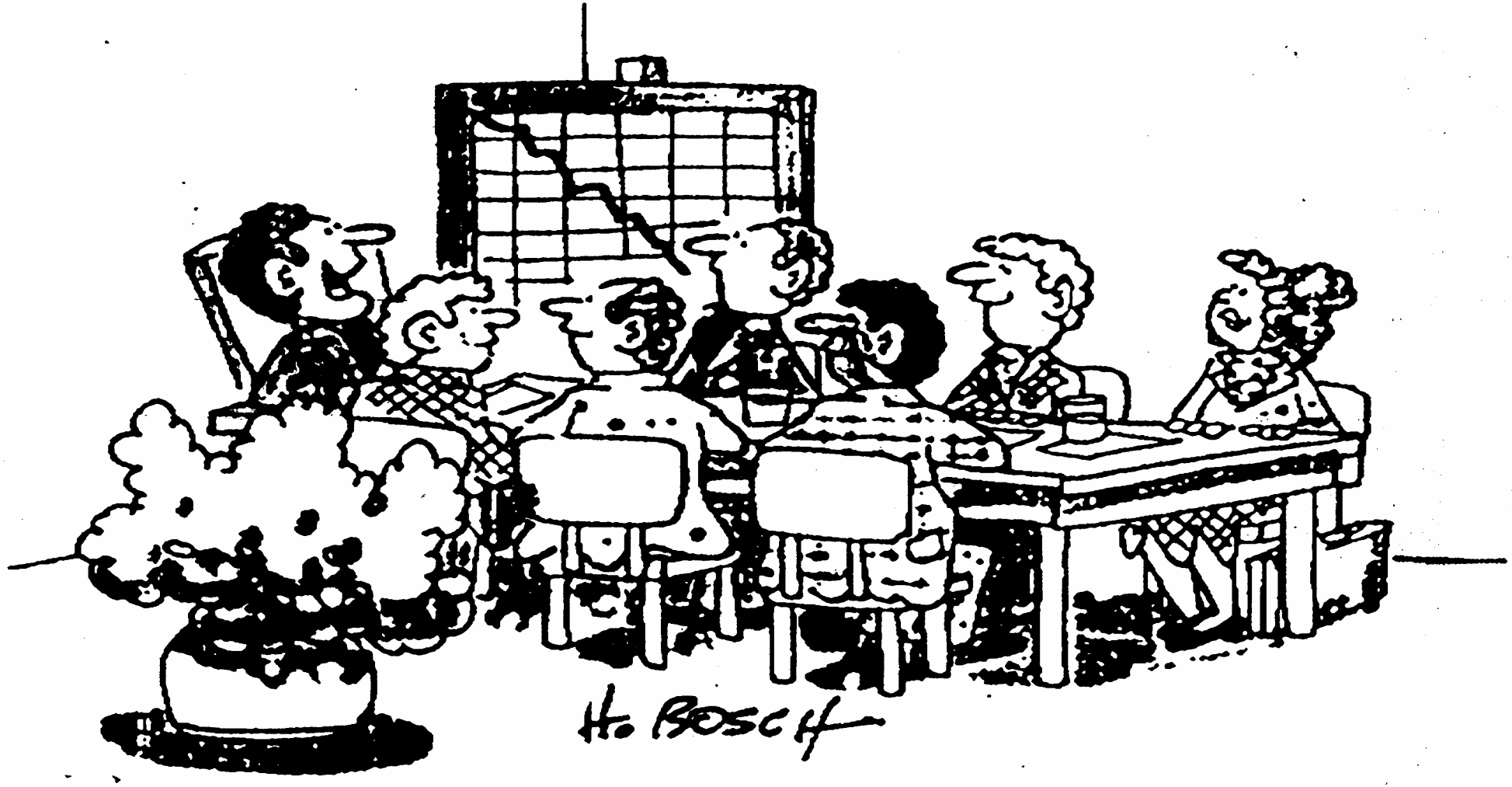
- Practice, practice, practice—makes perfect

(a.k.a “see one, do one, teach one”)

  - Reality:
    - Simple task or device exposure is not training
    - Practice needs to be guided
    - Practice needs to be embedded within clear objectives
    - “Free play” may lead to incorrect assumptions
    - Does not ensure that important associations are made

Myth 6

- Reactions to learning=Training
  - Reality:
    - Just because trainees are having fun does not mean they are learning
    - Instrumentality, motivation does help
    - Training outcome measures are insufficient to judge training quality



"All those in favor of blaming this on Watson, here please signify by saying 'aye!'"

Myth 7

- Learning will translate into behavior change
  - Reality:
    - Training transfer is very complex phenomenon
    - Some of the factors
      - Peer support
      - Climate for transfer=culture (Reason, Westrum)
      - Opportunity to practice/perform
      - Train the alpha males

Myth 8

- Anyone who has ever learned anything is a training expert
  - Reality:
    - Training is a behavioral cognitive event that can be structured to empirical investigation
    - There is a science of training that should be exploited

Definitions

SIMULATION

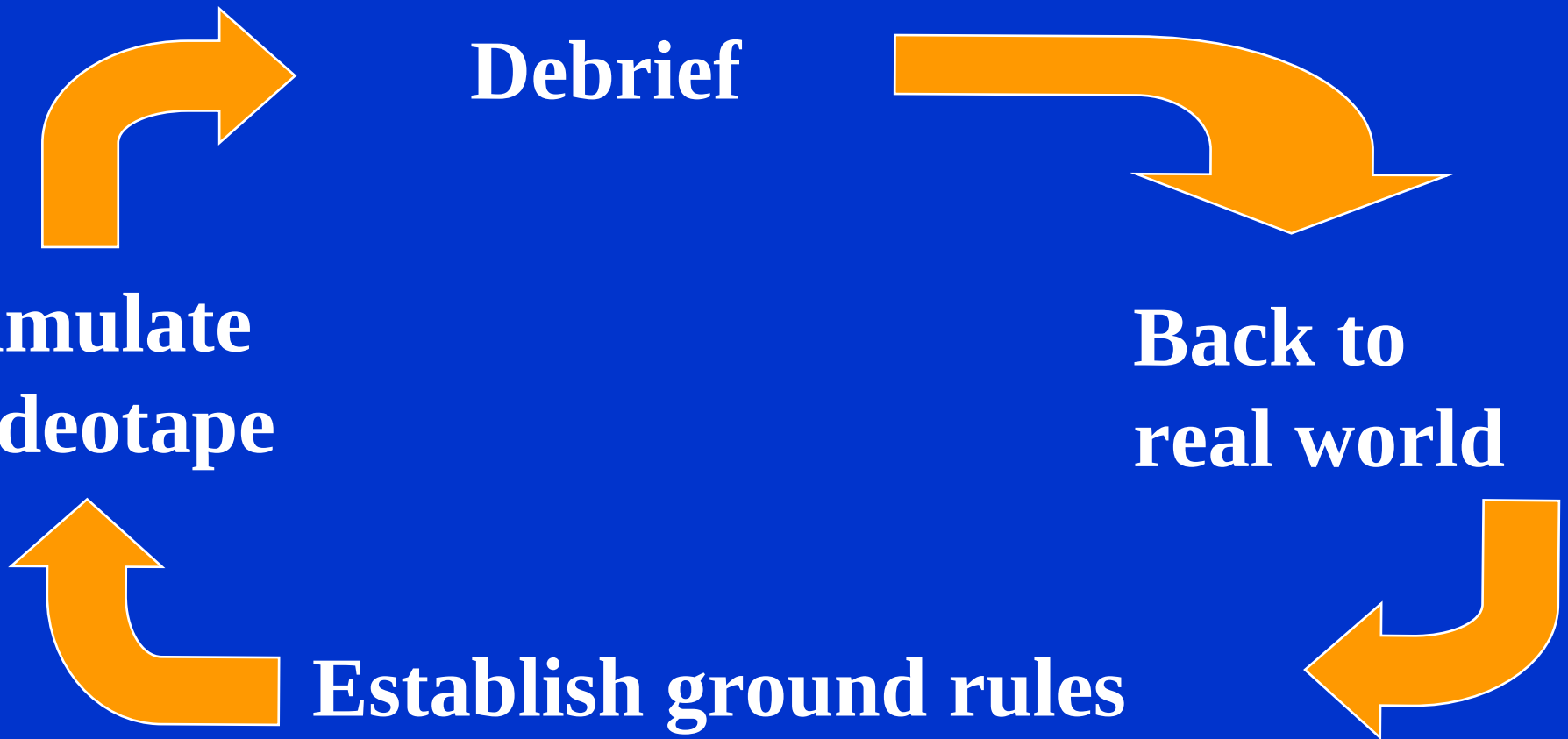
- Representation of the operation or features of one process or system through the use of another

SIMULATOR

- An apparatus that generates test conditions approximating actual or operational conditions

Procedural Simulators

Patient Simulators


Debrief
Back to real world
Establish ground rules
Simulate Videotape

Challenges to Medical Education Addressed by Simulation

- Training clinicians in risky procedures on real patients is less acceptable
- Limited opportunities to experience rare events and crises
- Apprenticeship means you have to wait for something to happen
- Training for teamwork is rare
- Simulation offers summative and formative evaluation
- Simulation is less costly
- Phronesis-knowing which rules to break—and how far—to address the reality one is facing
- Cognitive aspects

Simulation: Experiential & Reflective Learning

- Emotional, cognitive, psychomotor synthesis
- Understanding complexity and problem solving
- Behavior change
- Culture change
- Metacognitive skills
- Systems thinking
- Teamwork
- Nourishing safety culture
- Phronesis---knowing which rules to break—and how far—to address the reality one is facing

Simulation and Debriefing Process

- Immersion in the flow of a realistic event
- Triggering actual behaviors
- Participant buy-in:
  "what I *would* have done in actuality"
- Unpacking the event:
  Perception, integration, decision, action
- What would you do next time?

Medical Simulators in 2001

- Resuscitation and airway management
- PALS, ACLS, ATLS
- Bronchoscopy
- IV catheter insertion
- Microsimulators
- Cognitive decision making
- Laprascopic skills training
- Surgical skills training
- Cardiology invasive and noninvasive

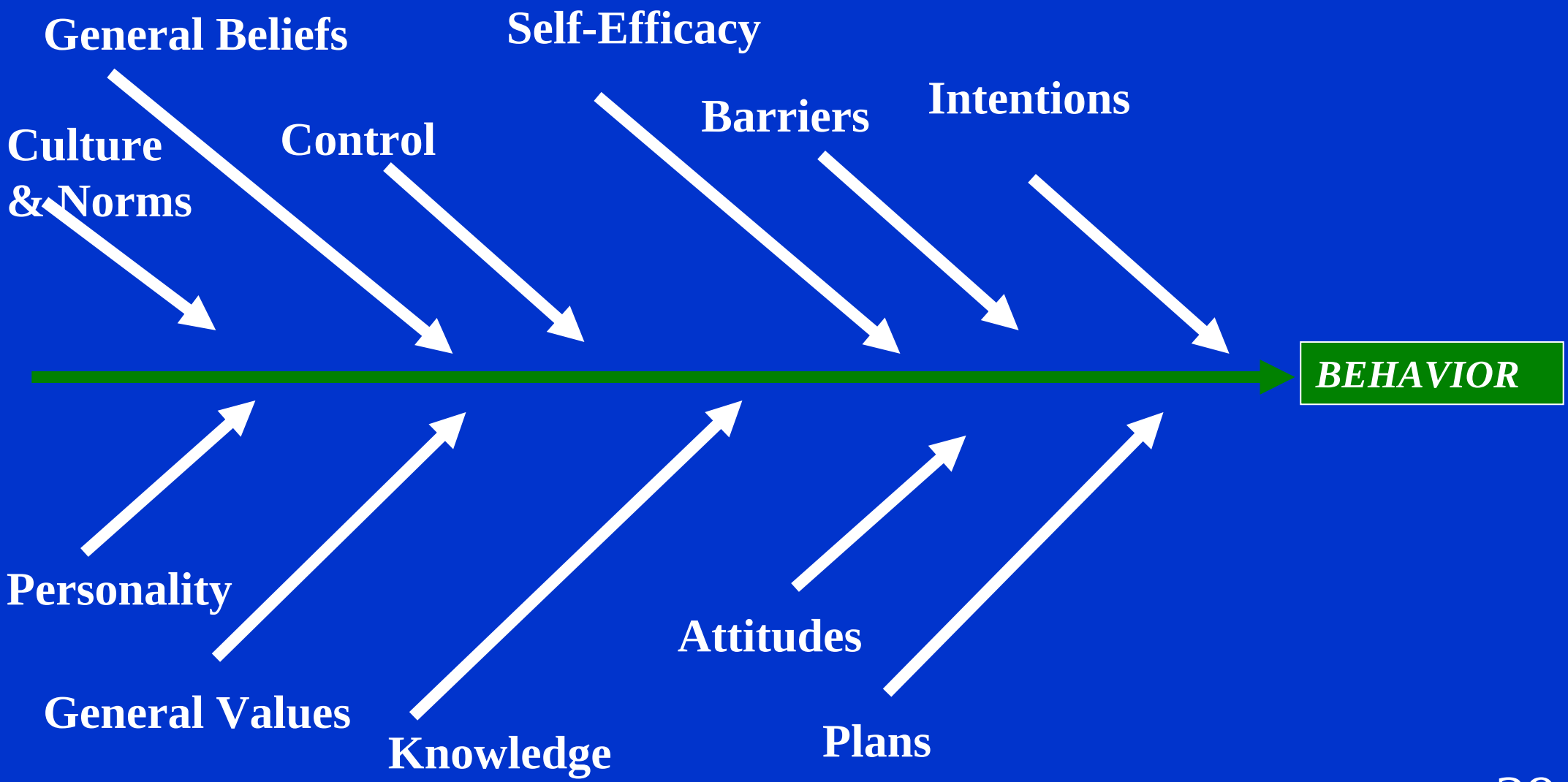
Simulation Applications

- House officers-crisis management skills, clinical skills, resuscitation codes training
- Procedure skills training-i.e., conscious sedation (JCAHO mandate), cardiac catherization
- Critical care and emergency medicine
- Patient Safety and risk management curriculum
- Medical School—i.e. Pharmacology, physiology, teamwork and clinical skills
- CME-docs, nurses, pharmacists, technicians
- Performance and education research
- Tool and model development

Team Competencies (Salas)

- Adaptability
- Shared situational awareness
- Performance monitoring/feedback
- Mutual accountability
- Leadership/team management
- Interpersonal relations
- Coordination
- Communication
- Decision making

Motivational Theories: Behavior Change



Organizational Culture

- Pathologic
  - *Shoot the messenger*
- Bureaucratic
  - *Write a new rule*
- Learning (Generative)
  - Understand broader implications - opportunities for growth and generalizability

Ron Westrum, 1992

How a Just Culture is Different

- Acknowledges that mistakes (human errors) do not equal *intent to harm*
- Applies reckless conduct standard
- Disciplines individuals who knowingly put patient's safety at risk

Marx, 2001

Evaluation of Housestaff and Medical Student Attitudes towards Adverse Medical Events

- Pam Vohra, MS II
- Julie Mohr
- Paul Barach
- Chris Dougherty
- Ming Wen

. . . yet little research on attitudes and behaviors of house- staff and adverse medical events.

- Wu et al. (1991): Do house officers learn from their mistakes?
  - Accepting responsibility leads to constructive practice changes, but also increases emotional distress
  - Accepting responsibility approach has lost favor
- No studies about medical students, and none about learning from others' errors

Research Projects

- Wrong sided medical interventions
- Assessing attitudes of healthcare professionals and patients using
  - Focus groups of patients, nurses
  - Attitudes of medical students and residents towards error and adverse events using surveys, focused interviews
- Human factors in pediatric cardiac surgery
- Exploring the interface between education, people and technology using the microsystem tools
- Simulation to assess resident competency
- Designing effective reporting systems

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Research Goals

- To assess physicians-in-training's:
  - knowledge about patient safety improvement
  - beliefs in their ability to reduce medical errors and improve safety
  - experiences with sentinel events that affect patient safety behavior
- Hypothesis: Patient Safety awareness varies based on experience with a sentinel event, level of training, and department.

Step 1:
Questionnaire Development

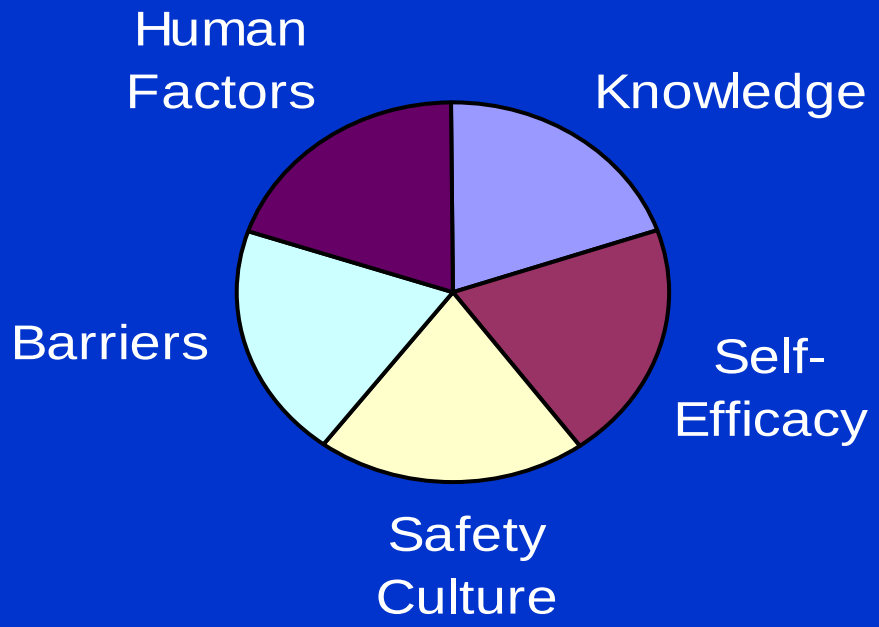
- Developed questionnaire and interview tool
- Performed an affinity sort to cluster items
- Pilot tested questionnaire
- Created anonymous web interface
- IRB approval

Definitions for affinity sort

- *Knowledge:* awareness of the need for patient safety improvement.
- *Self-efficacy:* belief in their ability to reduce errors and improve patient safety.
- *Awareness of safety culture:* error-reporting behaviors (such as willingness to discuss or take responsibility for own errors) and willingness to adopt new safety practices.
- *Beliefs about barriers/facilitators* of patient safety: belief in entrenched systemic barriers to patient safety improvement.
- *Awareness of human factors:* perception of how education/training, communication, and other organizational factors affect patient safety.

Step 2: Outcome Measure Development

- Patient Safety Score (1-100 for each scale; total score 0-500)



- Tool Reliability

Scale	No. of Items	Cronbach's alpha	Mean (SD)
Knowledge	7	0.64	66 (14.2)
Self-Efficacy	5	0.76	60 (20.5)
Safety Culture	10	0.71	77 (12.9)
Barriers/Facilitators	6	0.66	46 (17.8)
Human Factors	6	0.58	54 (14)

Results 1

Demographics

- Cohort: 452 residents, 99 medical students
- 28.7% response rate (n=155)
  - 39% (n=33) of the respondents were women.
  - 35% (n=49) of the respondents were medical students and 63% (n=56) were residents.
  - Respondents had a mean age of 28.9 years and a mean of 3.3 years of post-graduate medical experience.
  - The majority of the residents were in the Surgery program (n=15), Medicine, Pediatrics (n=10), Radiology (7).
- 33.8% exposed to a sentinel event (n=45)

Results 2

- Overall Patient Safety Score
  - Mean score = 303 (SD 56)
  - Positive correlations between scales
  - The safety culture scales were positively correlated with knowledge ($r=0.23$, $p=0.034$), self-efficacy ($r=0.44$, $p<0.0001$), and barriers ($r=0.36$, $p=0.0008$).
  - The barriers scale was also correlated with the self-efficacy ($r=0.44$, $p<0.0001$) and human factors scales ($r=0.29$, $p=0.0078$).

Results 3 – Differences in PSS

- Multivariate regression demonstrated no differences in PSS based on department, level of training, or length of GME.
- Two sample t-tests demonstrated that those exposed to a sentinel event report had a lower awareness of human factors in safety (p=0.0016)

↓

perception of how education/training, communication, and other organizational factors affect patient safety

Narratives Results

- Knowledge
  - "There have been so many, but here is one:"
    - » "I've written many wrong doses of medications and rely on pharmacy to double-check me."
- Self-Efficacy
  - "If I had seen him sooner, or at least notified the chief resident sooner, we could have gotten him to the OR sooner for repair of his leak, and he may have survived."
- Safety Culture - statements of blame
  - "And he told me to pay more attention to the patient. Yes, I made the mistake, but hands-down I still and always did know that patient better than he did."
- Barriers
  - "Most errors which I have been involved with have been related to inadequate staffing, and systems inadequacies so that drugs were not administered in a timely fashion, or critical nursing functions were not performed (trash care) which may have led to a adverse outcome".
- Human Factors
  - "The equipment was not designed with residents in mind"

Discussion

- Exposure of physicians-in-training to medical errors affects their attitudes and behavior toward patient safety
  - "Our hospital system is so defunct; most residents find little reason to report errors."
- Lack of awareness of hospital support systems
  - 35% of subjects did not know how to report errors.
  - 29% of those exposed to errors were unaware of the hospital's counseling services.
- Lack of formal safety curriculum training
  - Lack of awareness about human factors and barriers to safety and quality improvement

Adverse Consequences of a Punitive Culture

- Obscures opportunity to identify underlying (latent) conditions
- Focus on individual blame makes re-training the typical corrective action
  (blame & train)
- Encourages people to hide their mistakes

Safety Curriculum
Core Content Areas

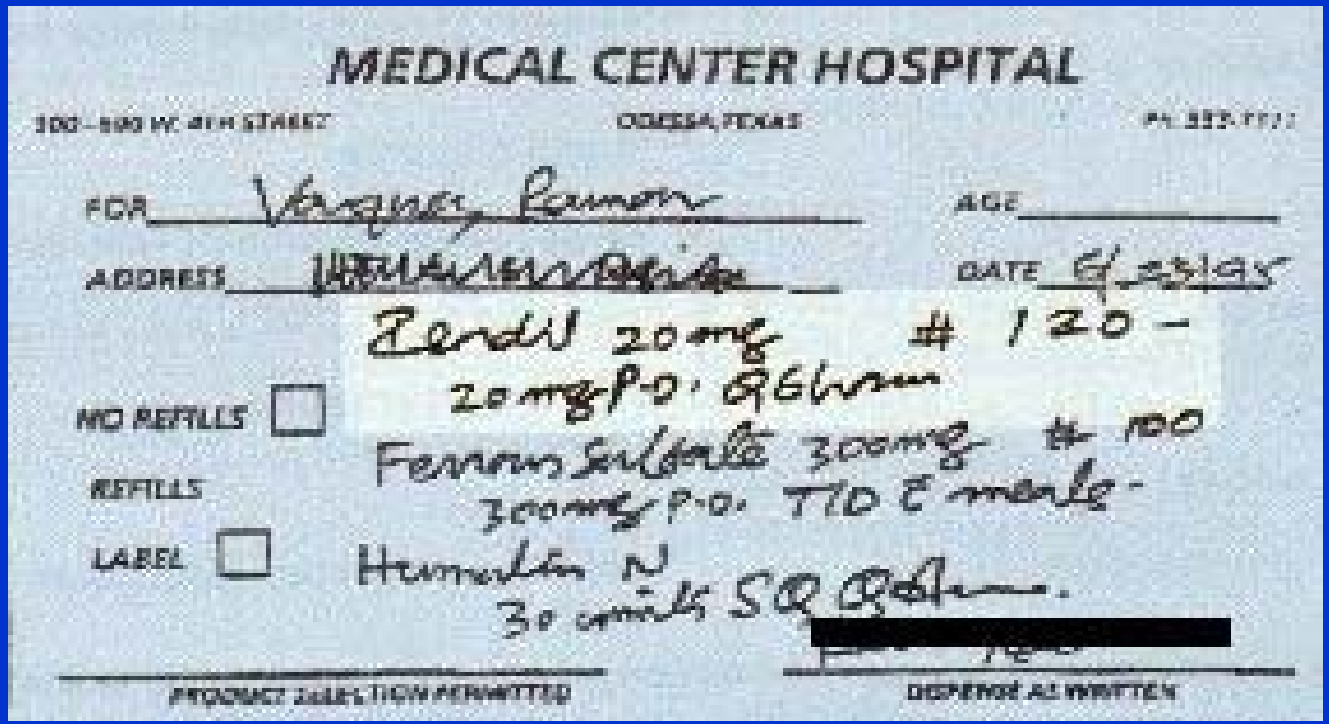
- Knowledge of the needs and preferences of those we serve ("customer knowledge")
- Health care as a process, system
- Variation and measurement
- Human Factors
- Team training
- Developing new locally useful knowledge
- Social context & accountability
- Professional subject matter

Patient Safety:
The Other Side of the Quality Equation
Seven Modules

- Systems
  - The influence of systems on the practice of medicine
- Cognitive Capacity
  - Coping mechanisms under information overload and time pressures
- Communication
  - Communication barriers, lack, and unclear communication
- Medication Errors
  - Uniform dosing, look- and sound-alikes, forcing functions

Patient Safety:
The Other Side of the Quality Equation
Seven Modules

- The Role of Patients
  - Patients as allies in patient safety
- The Role of Electronics
  - Supportive products and processes
- Idealized Office Design
  - Medical practice design to support patient safety



MEDICAL CENTER HOSPITAL

300–500 W. 4TH STREET ODESSA, TEXAS PH. 332-7711

FOR Virginia Romero AGE

ADDRESS [redacted] DATE 6/23/95

Zantac 20 mg # 120 -
20 mg P.O. Q6Hrs prn

NO REFILLS ☐

Ferrous Sulfate 300mg # 100
300mg P.O. TID c meals -

REFILLS

LABEL ☐

Humulin N
30 units SQ Q6Hrs.

[redacted]

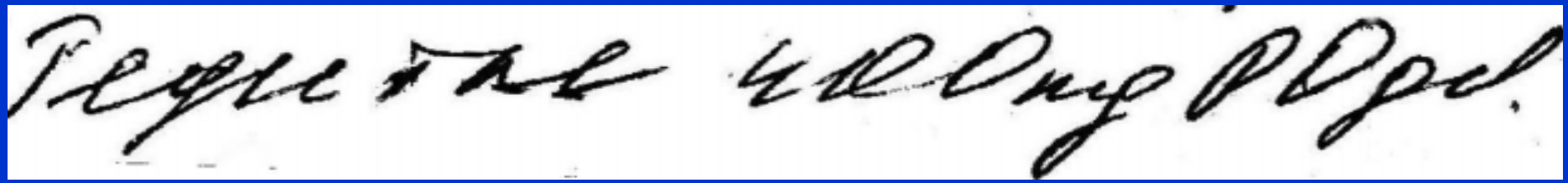
PRODUCT SELECTION PERMITTED

DISPENSE AS WRITTEN

Written Medication Orders: Drug Names

- "Look-Alike" or "Sound-Alike" Drug Names
- "Confirmation Bias"
- Addition of Suffixes

Cohen MR. *Medication Errors. Causes, Prevention, and Risk Management;* 8.1-8.23.
Cohen MR. *Am Pharm* 1992; NS32: 21-2.



Models for Resident Learning in PBL&I

- Workshops/seminars (Schillinger et al 2000)
- Personal improvement projects (Neuhauser et al 1999, Morrison et al, submitted)
- Residents on improvement committees & teams (Ashton 1993, Parenti 1994)
- Resident teams to improve the residency itself (Ellrodt 1993)
- Resident projects to improve care (Weingart 1998, Farquhar et al 2001)

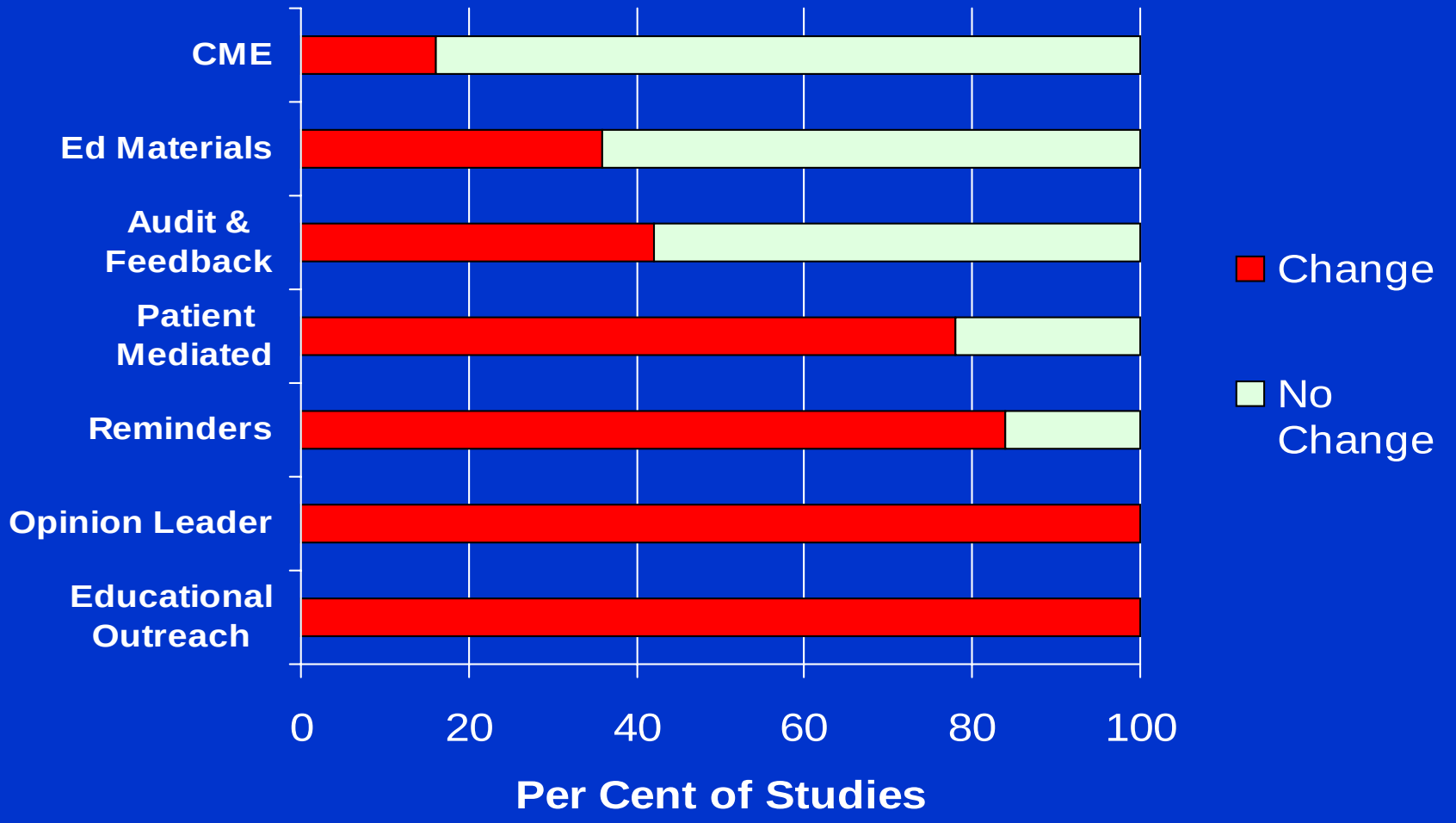
Two questions

- **How Do We Know What We Do Works?**
- **How Can We Improve What We Do?**

Paradigm *shift*

- The adoption of the concept of general competencies for physicians and residents-in-training represents a profound shift in the approach to addressing quality in healthcare in the US.

What Changes Clinical Care?



After Davis, JAMA 1995; 274: 700-705

Effectiveness of interventions in improving physician behavior or health outcomes

- **Little effect**
  - Didactic lecture-based, mailed unsolicited materials
- **Moderately effective**
  - Audit and feedback, especially if delivered by peers or opinion leaders
- **Relatively strong**
  - Reminder systems, academic detailing, and multiple interventions

What increases effectiveness of GME?

- Active (interactive) learning opportunities
- Longitudinal or sequenced learning
- Enabling methods to facilitate implementation in the practice setting (e.g., tools, strategies)

(Davis, 1999, JAMA)

Every system is perfectly designed to achieve the results it gets.

Key Attributes of Successful Programs to Improve Care

Measure to identify opportunities for improvement

Identify and work with a *team*

Identify *evidence-based strategies* that could improve care delivery

Test and implement new approaches

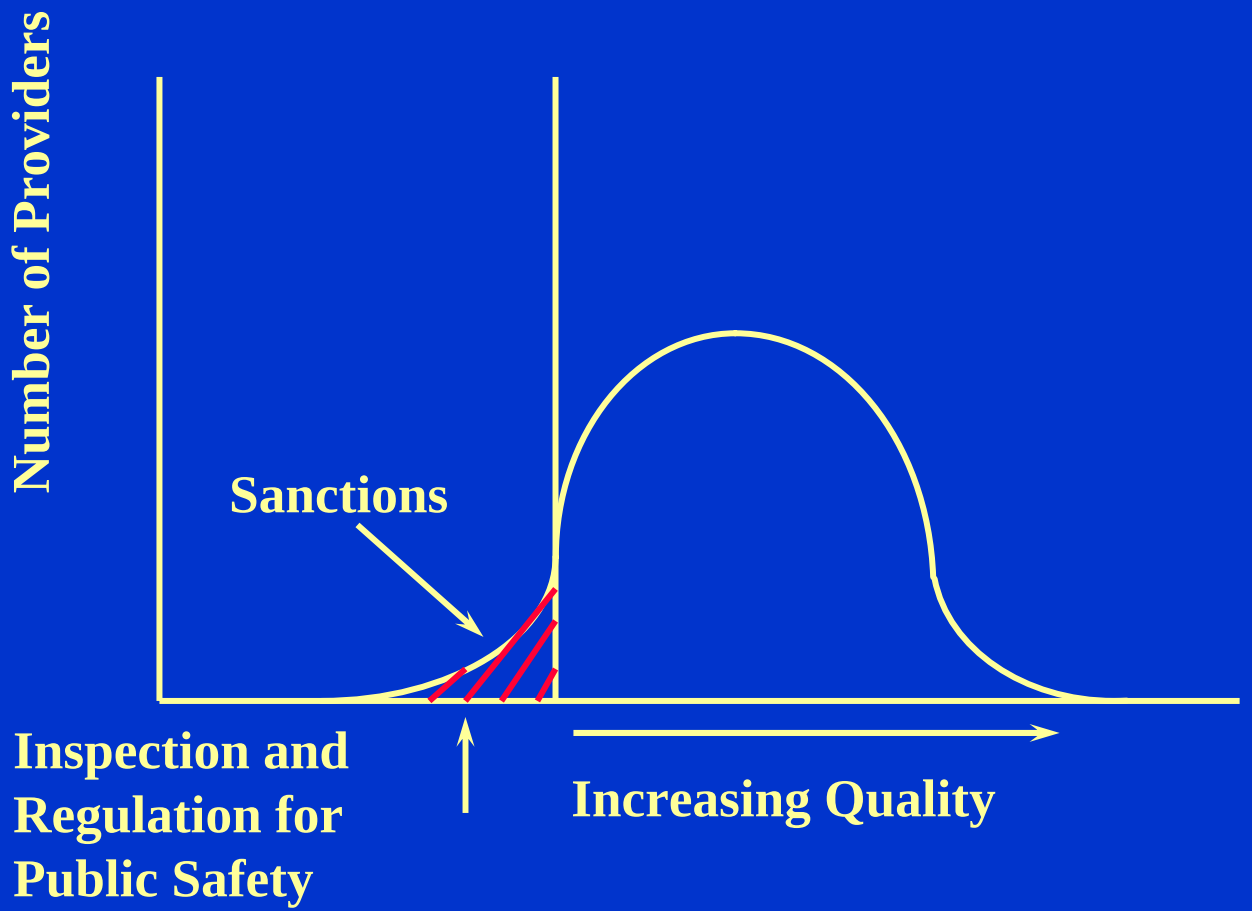
Continue to monitor and adjust

Physician Practice for 21st Century

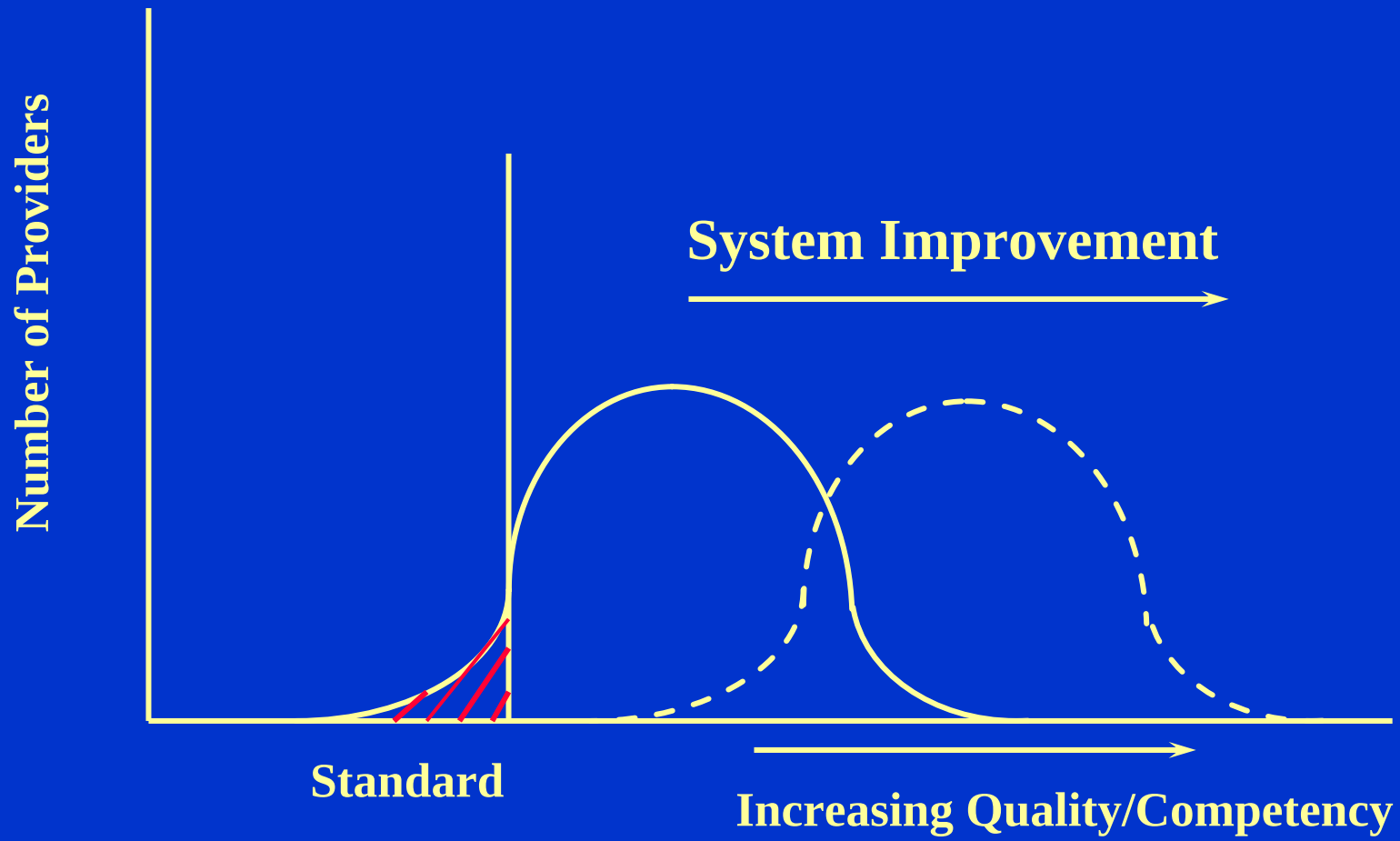
Physicians who can find joy and pride in:

1) Assessing and systematically improving the Quality of the care they and their care teams deliver at any point in time around the six IOM dimensions of Quality – Care that is:
   - Safe
   - Timely
   - Effective
   - Efficient
   - Patient Centered
   - Equitable
2) Assessing and improving personal mastery of the six general competencies: patient care, medical knowledge, communication skills, professionalism, practice based learning and improvement and system based practice

Inspection Focus
(Is competency an all or none phenomenon?)



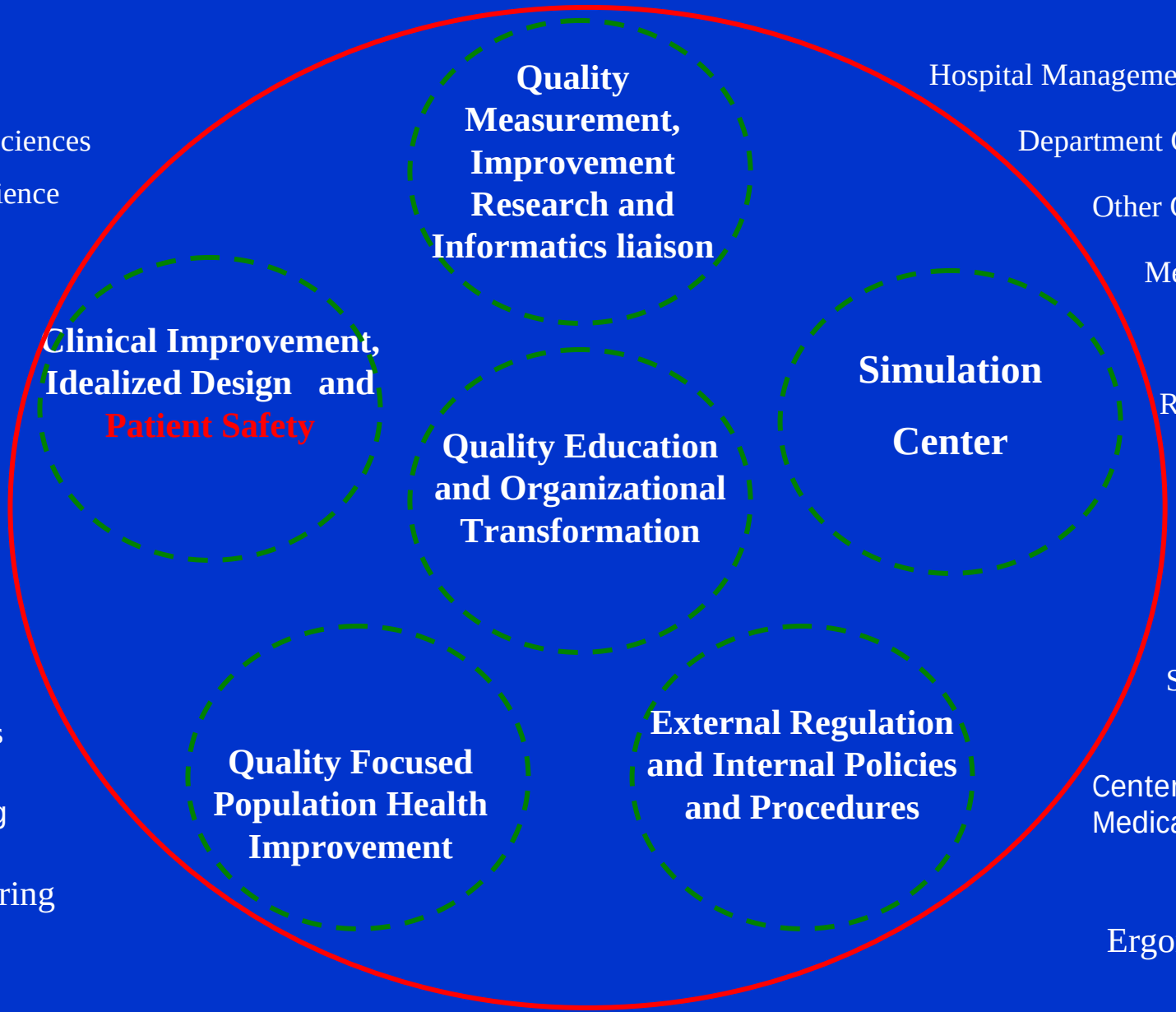
Improvement Focus



Challenges in Teaching Residents

- Most clinical improvement work requires a team working over a period of time, but residents' schedules change month-to-month
- We lack much of what we need for teaching in this area, including faculty expertise

Center for Clinical Improvement and Patient Safety



School of Arts and Sciences

Computer Science

Psychology

Sociology

Economics

Statistics

University Centers

Graduate Schools

School of Law

School of Business

School of Nursing

School of Engineering

Hospital Management

Department Chairs

Other Clinical Leaders

Medical Informatics

Residency Programs

Epidemeology & Public Health

Clinics

Surgery VR center

Center for Research in Medical Education

Ergonomics Lab

Research Projects

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Summary

- Learning vs. training
- Adult learning principles
- Learning centered experiential learning
- How to choose the tools, understanding the tools, embedding competencies in the training
- Train the trainers
- Assessment is key—creates opportunities to learn
- Evaluation
- Perishability
- Training for better phronesis