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Use of Medical Education to Improve Patient Care Quality

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Conflict of Interest

Partnership Between Northwestern University and Simulab

- MERCI Educational Grant to Northwestern University
- Inventor Royalties

Preparing Residents to Provide High Quality Care

- ABC's
- Monitor
- AED
- ACLS algorithms

Objectives

- Review how medical education rates as a quality improvement tool
- Explain the advantages of mastery learning with deliberate practice over traditional educational strategies
- List translational science studies that use education to improve patient outcomes

How Medical Education Rates as Quality Improvement Tool

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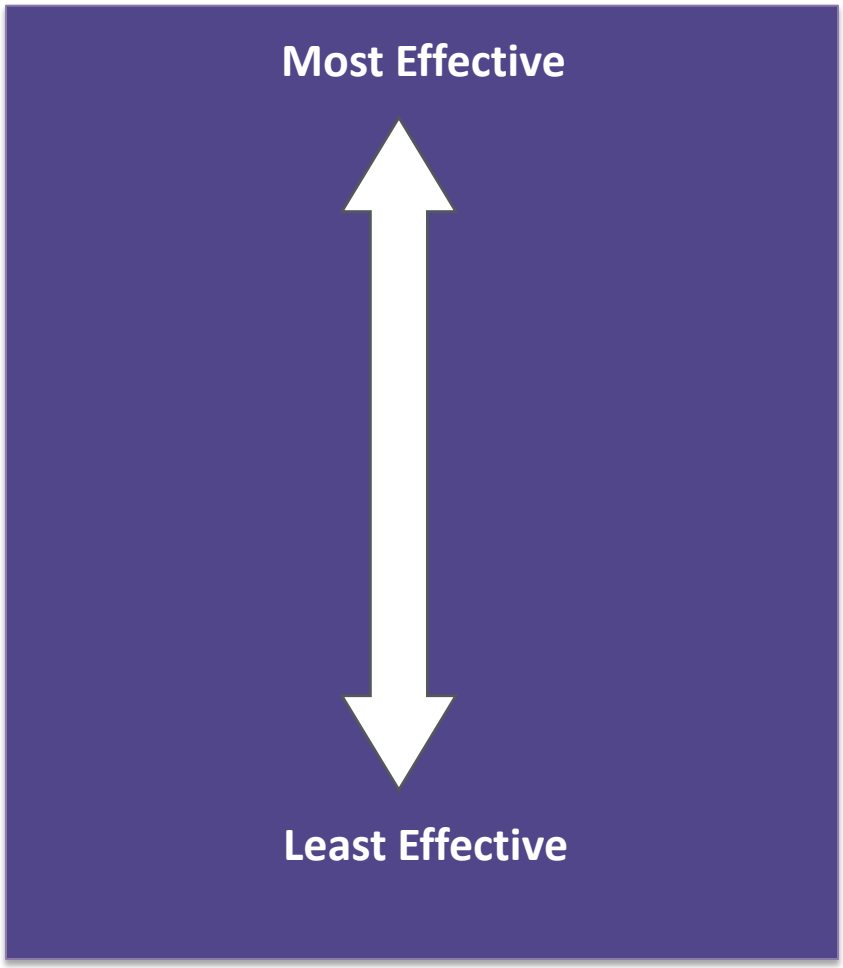
Ranking the Effectiveness of Error-Reduction Strategies



- Forcing function and constraints
- Automation and computerization
- Standardization and protocols
- Checklists and double-check systems
- Rules and policies
- **Education and information**
- Exhortation: “Be careful”

Joint Commission Resources 2005

Recommended Hierarchy of Actions

Veterans Health Administration
Office of Quality

Stronger actions

- Architectural/physical plant changes
- New device with usability testing before purchasing
- Engineering control or interlock (forcing functions)
- Standardize equipment or process or caremaps
- Tangible involvement and actions by leadership

Simplify the process and remove unnecessary steps

Intermediate actions

- Increase staffing/decrease in workload
- Software enhancements/modifications
- Eliminate/reduce distractions
- Checklist/cognitive aid
- Eliminate look and sound alikes
- Read back
- Enhanced documentation/communication
- Redundancy

Weak actions

- Double checks
- Warnings and labels
- New procedures/memorandum/policy
- **Training**
- Additional study/analysis

http://www.patientsafety.gov

All Education Is Not the Same

- 3 hours of traditional lecture - experienced instructor
- 3 hours of instruction using DP - inexperienced instructor
- Deliberate practice –challenging questions and tasks requiring students to practice reasoning and problem solving with frequent feedback
- Increased student attendance, higher engagement and more than twice the learning using research-based instruction

Deslauriers L, Improved learning in a large-enrollment physics class. *Science* 2011
Freeman S. Active learning increases student performance in science engineering, and mathematics. *PNAS* 2014

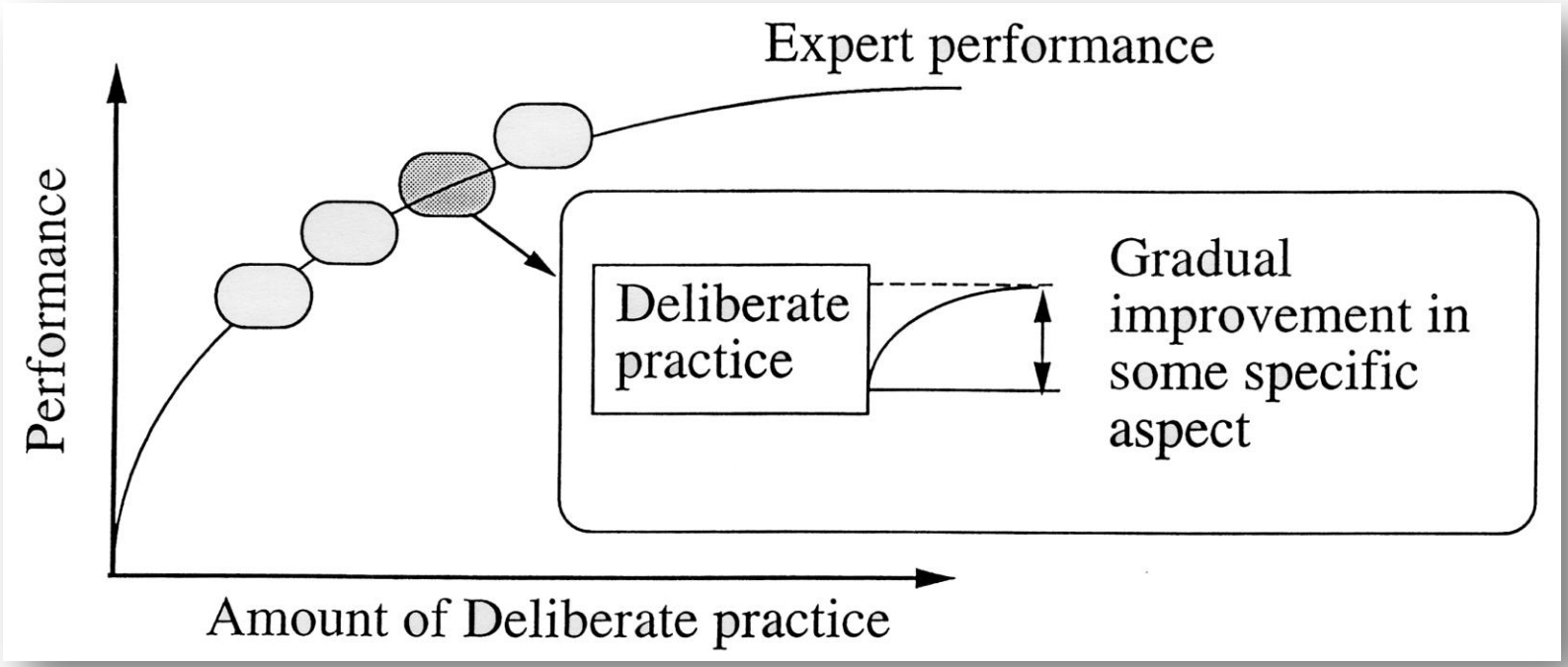
Deliberate Practice

1. Highly **motivated** learners with good concentration;
2. Engagement with a **well-defined learning objectives** or tasks; at an appropriate level of difficulty; with
3. Focused **repetitive practice** that leads to
4. Rigorous, **precise measurements**; that yield
5. Informative feedback from educational sources (e.g., simulators, teachers); and
6. Trainees also monitor their learning experiences and correct errors
7. Evaluation to reach a ***mastery*** standard; and then
8. Advance to another task or unit

Goal: Constant Improvement

Ericsson *Acad Med.* 2004; McGaghie*, Chest* 2009

Design and Sequencing of Training Activities



A. Ericsson 2007

Mastery Learning

1. Baseline, i.e., diagnostic testing;
2. Clear learning objectives, units ordered by difficulty;
3. Educational activities (e.g., deliberate skills practice) focused on objectives;
4. Minimum passing *mastery* standard (MPS) for each unit;
5. Formative testing → *mastery* of each unit;
6. Advancement if performance ≥ MPS; or
7. Continued practice or study until MPS is reached
8. Time varies, outcomes are uniform

Excellence for all

McGaghie et al., *Chest* 2009
Acad Med Nov 2015

Simulation-Based Mastery Learning (SBML)

Cardiac Auscultation

Code Status Discussion

Paracentesis

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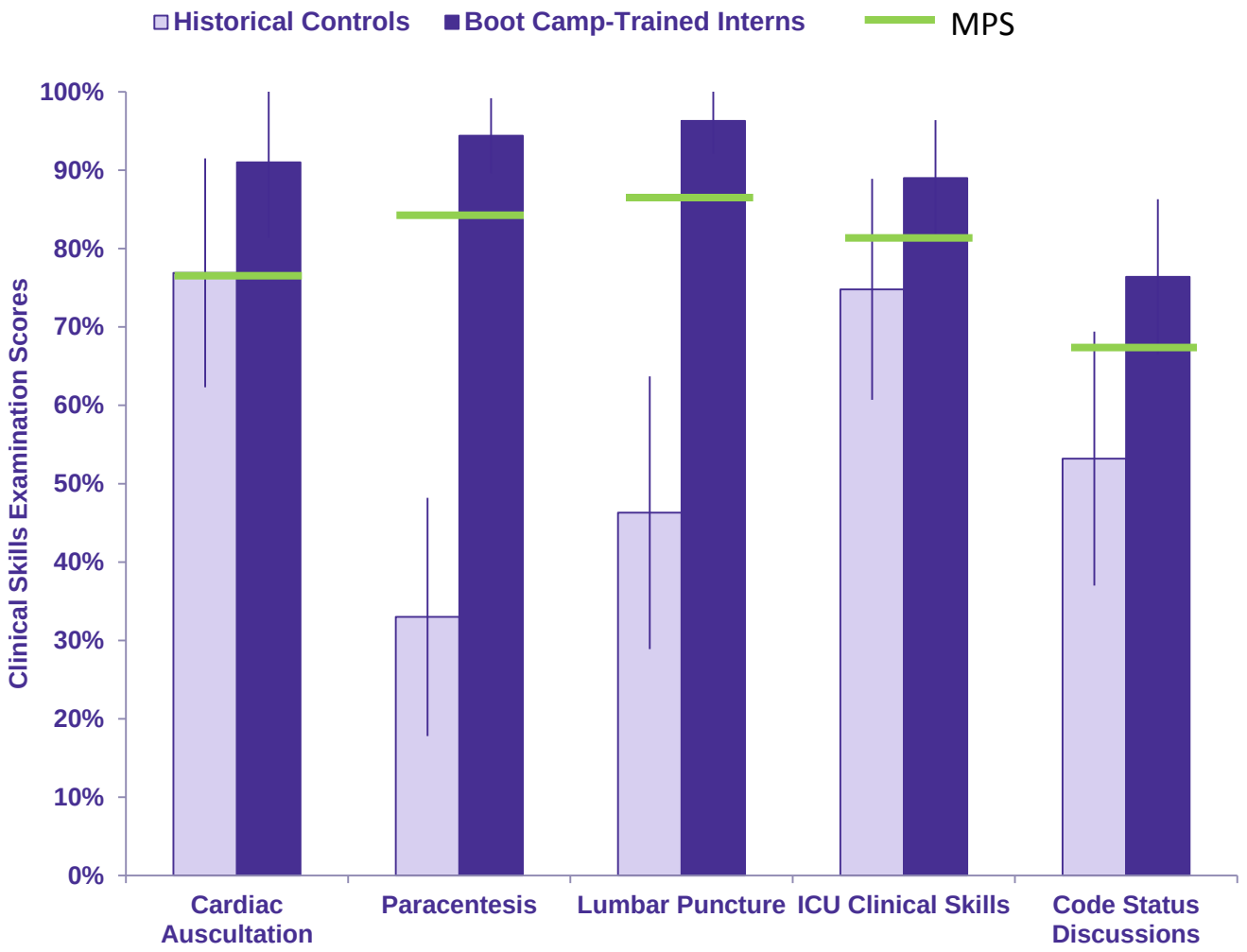
SBML in Action: Intern Boot Camp

Includes:

- Internal Med.
- Neurology
- Emerg. Med.
- Anesthesiology
- Gen. Surgery



Cohen E, et al. *Acad Med* 2013

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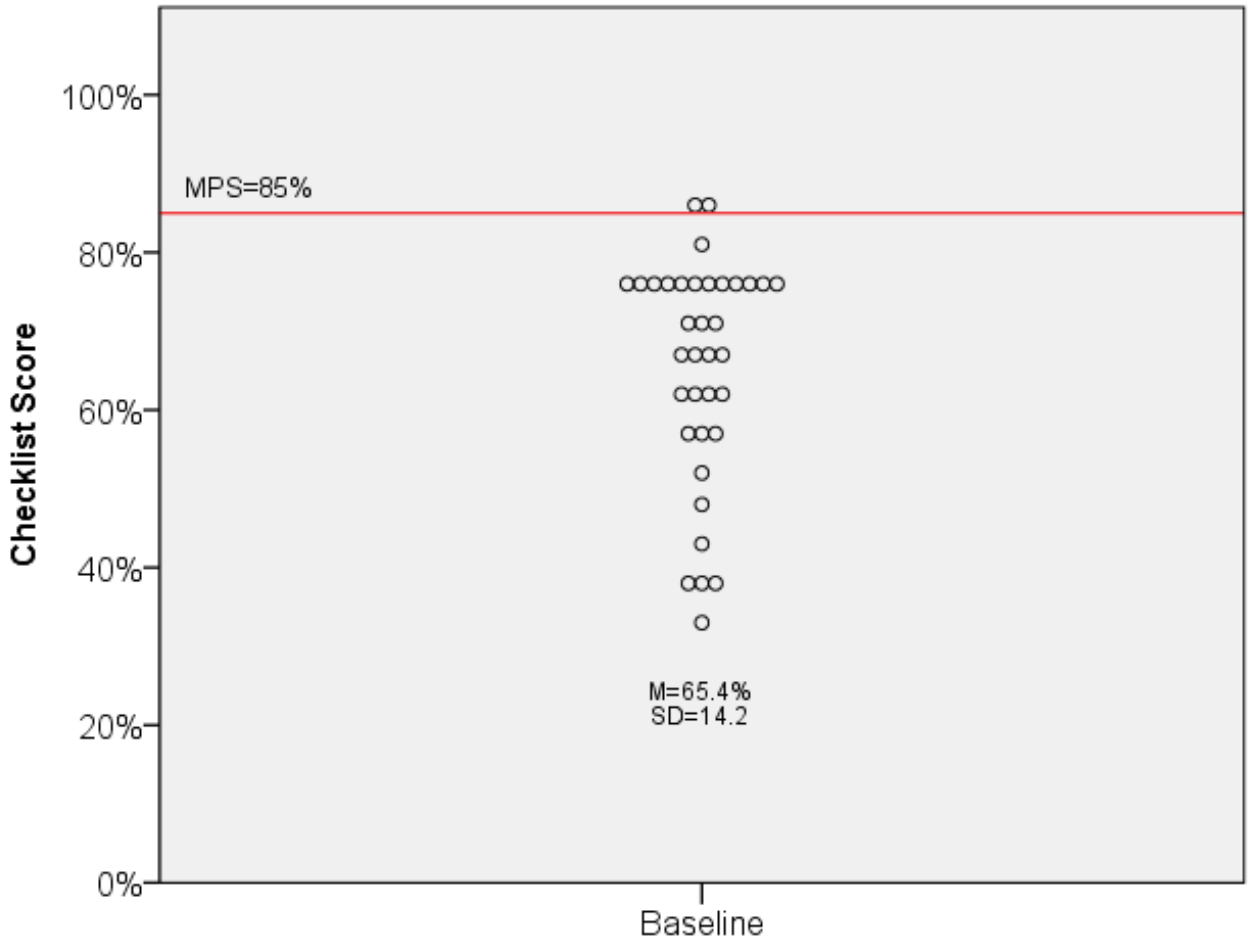
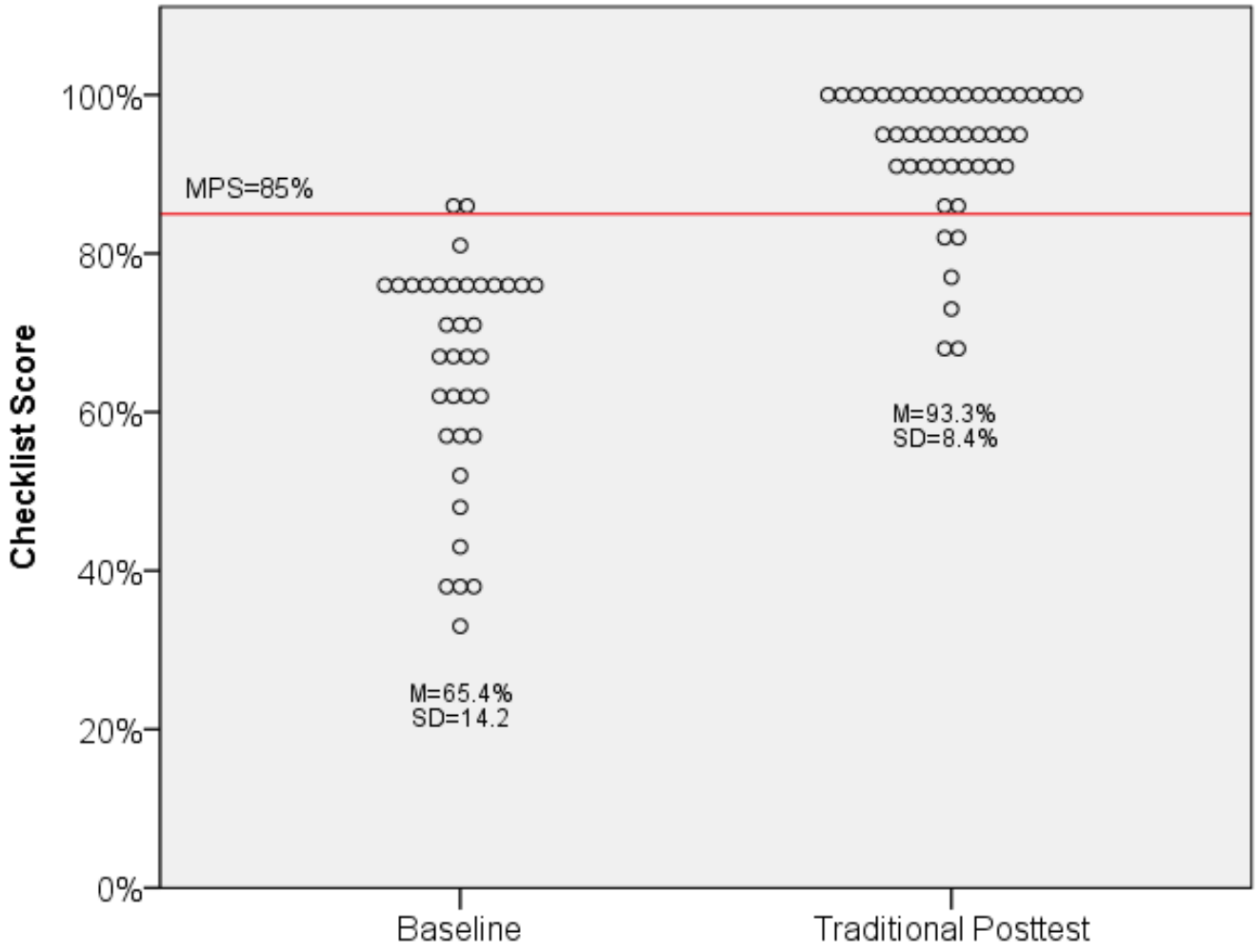
Explain the Advantages of Mastery Learning with Deliberate Practice over Traditional Educational Strategies

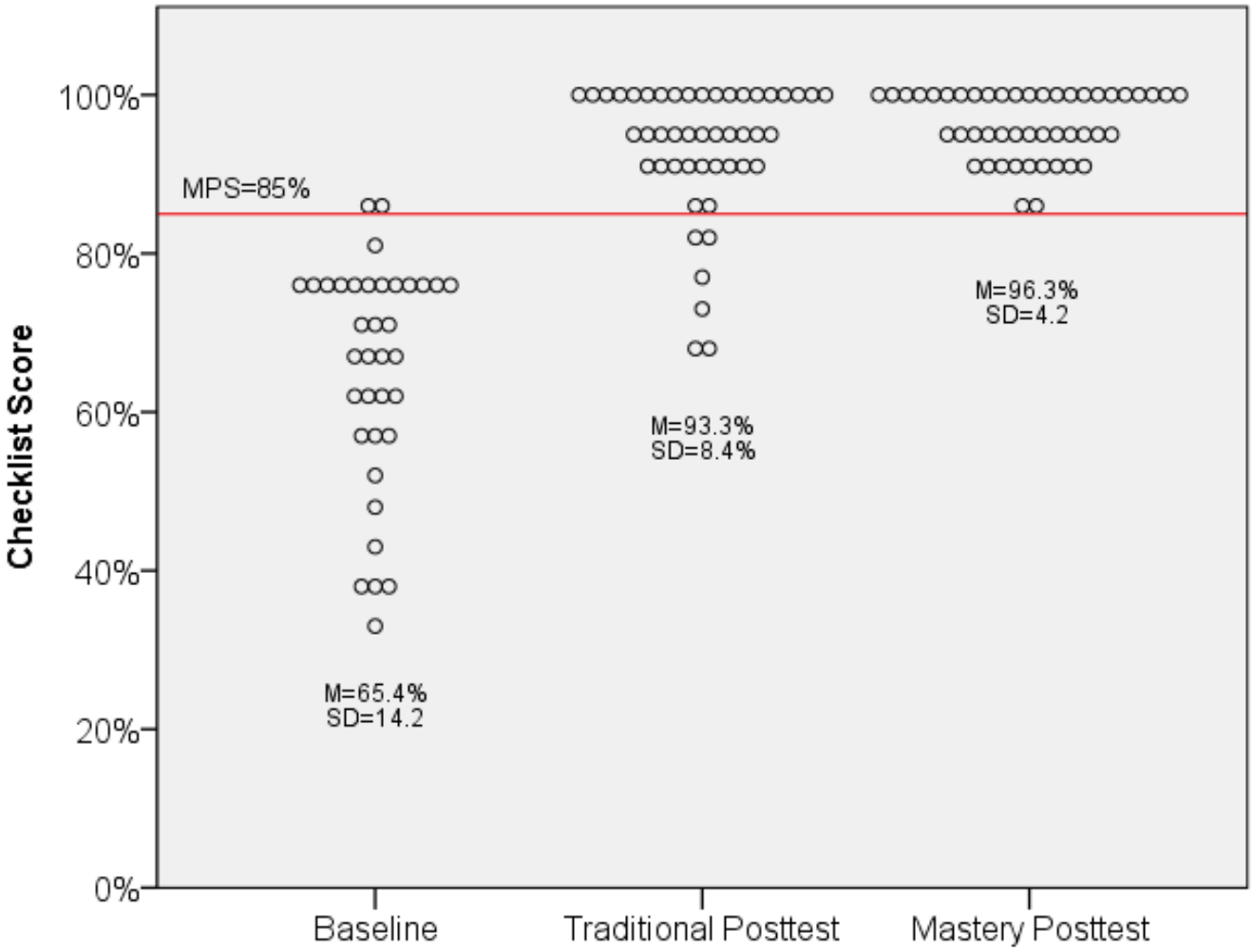
Traditional Training ≠ Competence



Typical Educational Outcomes



Mastery Learning Educational Outcomes



Barsuk, et al *Neurology* 2012

List Studies that Use Deliberate Practice and Mastery Learning to Improve Patient Outcomes

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Extending the Endpoint: Medical Education as Translational Science

Table 1. Contributions of medical education interventions to T1, T2, and T3 outcomes.			
Medical education interventions	**T1**	**T2**	**T3**
Increased or improved	Knowledge, skill, attitudes, and professionalism	Patient care practices	Patient outcomes
Target	Individuals and teams	Individuals and teams	Individuals and public health
Setting	Simulation lab	Clinic and bedside	Clinic and community

Kirkpatrick Level	**1. Reaction** **2. Learning**	**3. Behavior**	**4. Results**

McGaghie WC. *Science Translational Medicine*.

Education “Best Practices” Improve Patient Care

A Chain of Evidence

CVC Insertion Checklist

PRETEST POSTEST RETEST (CIRCLE 1)

Central Line Insertion (IJ)

Skill Key: A = Done Correctly B = Done Incorrectly/Not Done

Informed consent obtained Benefits (medicines, fluids; (1)) Risks (infection, bleeding; (2)) Consent given (1)	A	B
Call "time out" and site mark if appropriate	A	B
Wash hands	A	B
Place the patient in slight Trendelenburg position	A	B
Test each port and flush the lines with sterile saline	A	B
Clamp each port (ok to keep distal port open)	A	B
Keep distal port open to accommodate guidewire	A	B
Area is cleaned with chlorhexadine (30 seconds if use one, ok to use 3)	A	B
Don sterile gown, gloves, hat and mask	A	B
Area is draped in usual sterile fashion (must be full body drape, must remove bottom sticky sheet)	A	B
The US probe is properly set up, draped and sonographic gel is used on inside and outside of sheath (sterile sheath)	A	B
The vein is localized using anatomical landmarks with the ultrasound machine	A	B
The skin is anesthetized with 1% lidocaine in a small wheal	A	B
The deeper structures are anesthetized	A	B
Using the large needle (or catheter) syringe complex cannulate the vein while aspirating	A	B
Remove the syringe from the needle or advance the catheter into the vein (must be hubbed) removing both the syringe and needle	A	B
Using the guidewire advance the guidewire into the vein no more than about 12cm-15cm	A	B
Make sure to knick the skin to advance the dilator (scalpel)	A	B
Advance the dilator over the guidewire and dilate the tissue tract	A	B

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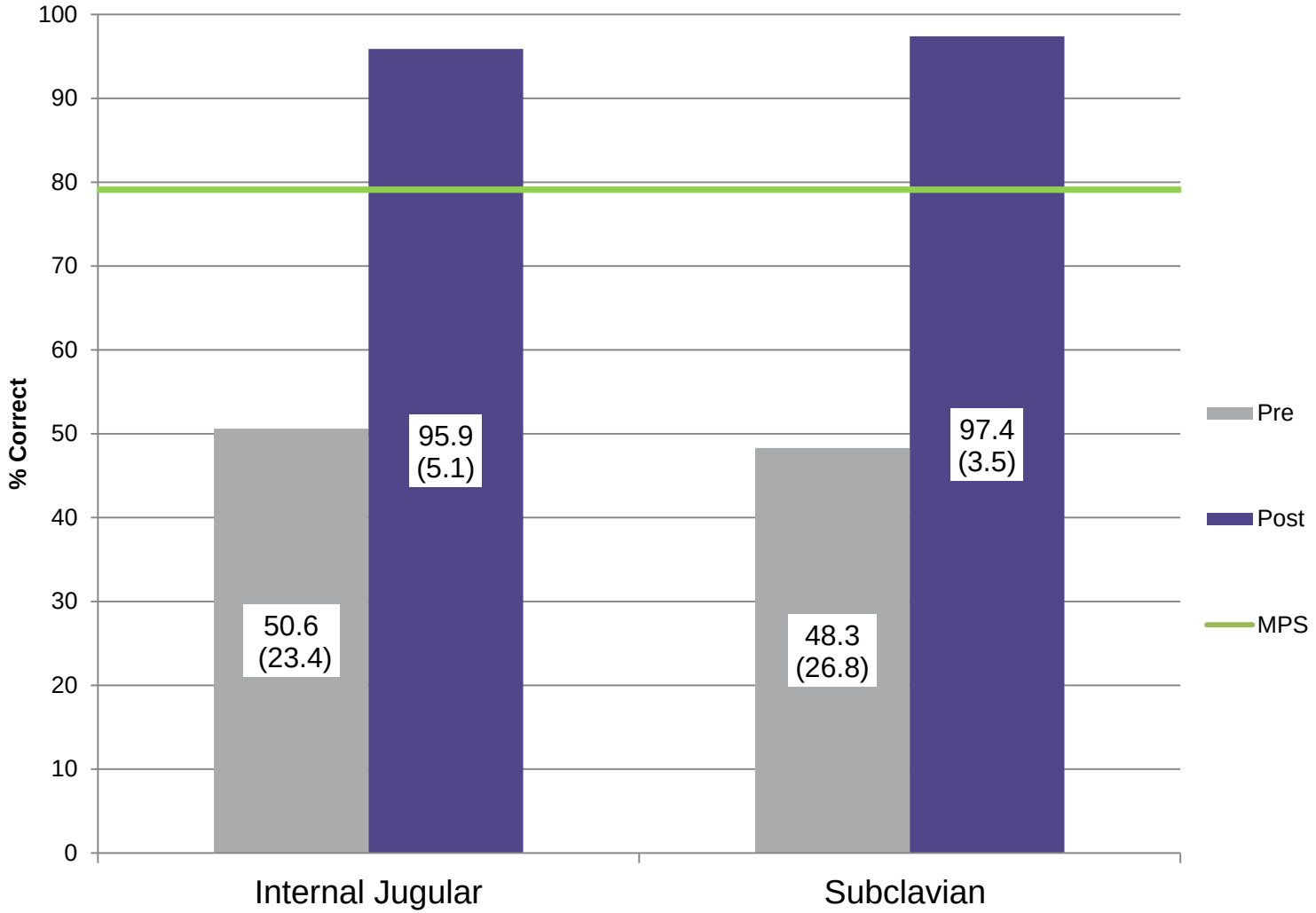
T1 Mastery Learning Education Outcomes



Barsuk et al. *Crit Care Med* 2009

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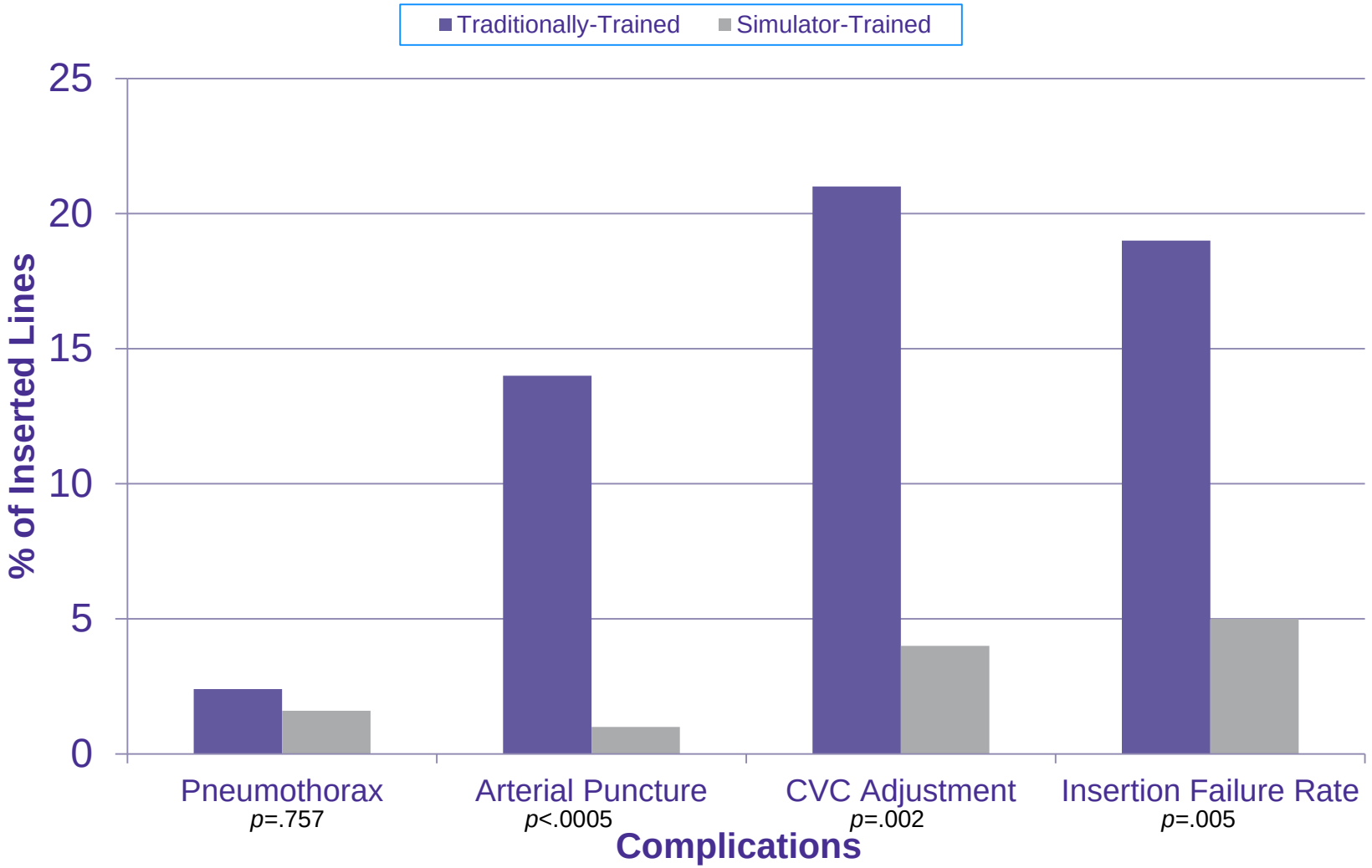
T2/T3 Patient Outcomes



Barsuk et al. *Crit Care Med* 2009

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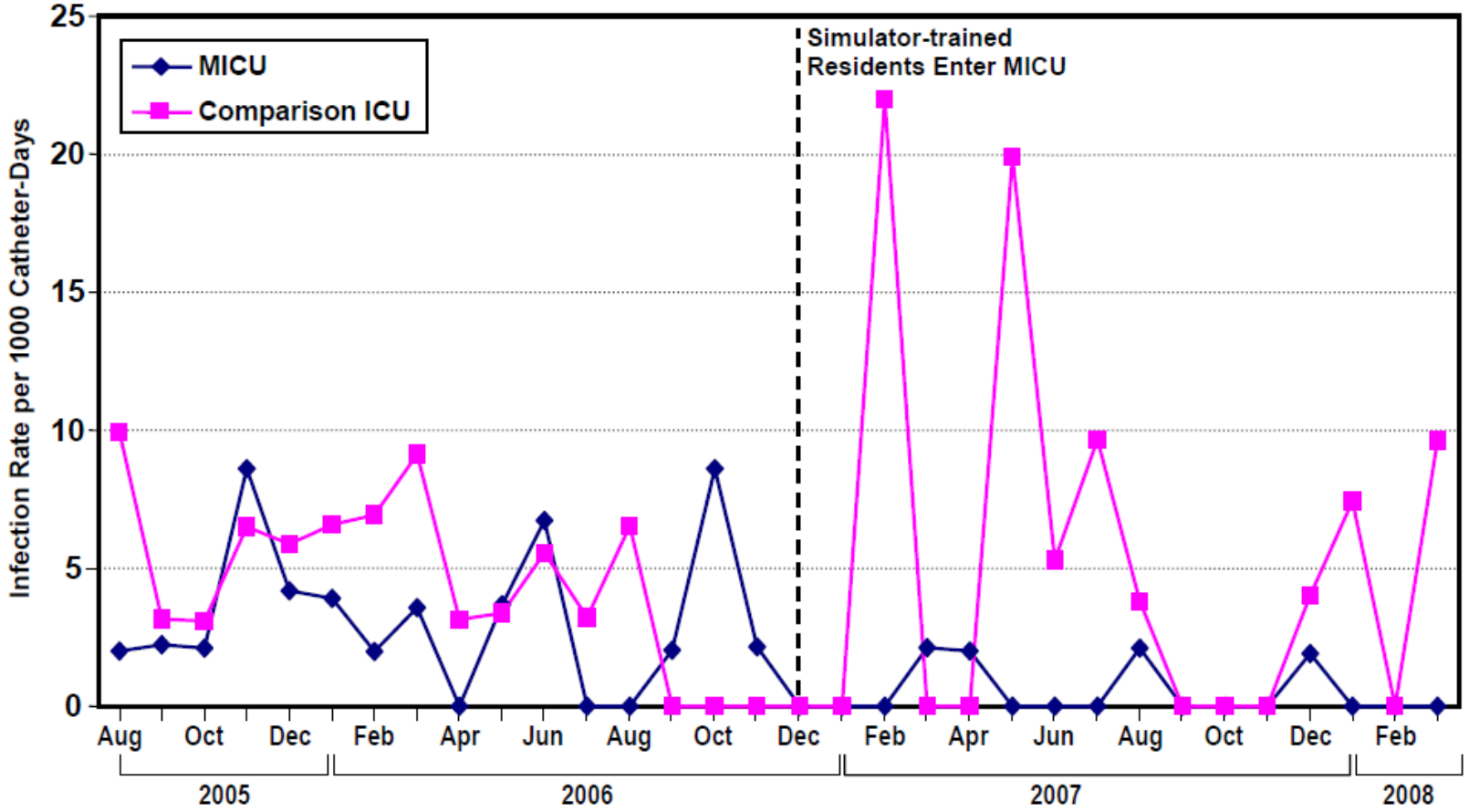
T3 Outcomes: 85% Reduction in CLABSI



Barsuk et al. *Arch Intern Med* 2009

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T4 Outcomes: Cost Effectiveness

Economic or Health Policy Articles

Cost Savings From Reduced Catheter-Related Bloodstream Infection After Simulation-Based Education for Residents in a Medical Intensive Care Unit

Elaine R. Cohen, BA;
Joe Feinglass, PhD;
Jeffrey H. Barsuk, MD;
Cynthia Barnard, MBA, MSJS;
Anna O'Donnell, RN, BSN;
William C. McGaghie, PhD;
Diane B. Wayne, MD

- The total annual estimated savings were approximately was $820,000, 139 patient hospital days, and 120 MICU days
- When compared with the cost of our intervention ($112,000), the net savings was approximately $708,000

7:1 ROI

Cohen et al. *Simul Healthc.* 2010

Tracking Hospital Infections

Some hospitals excel, others perform poorly in protecting patients from dangerous catheter problems, new numbers show:

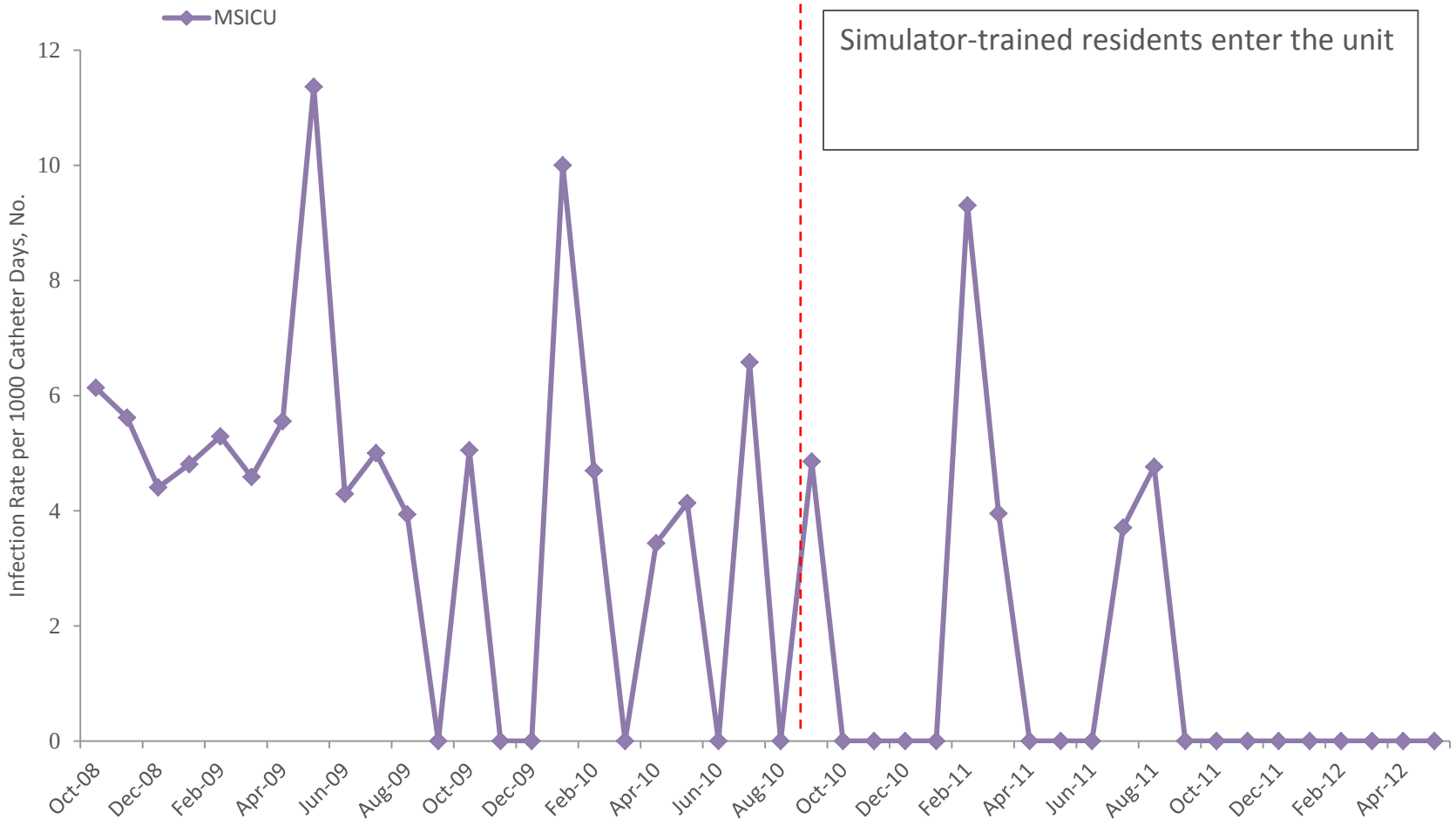
- The state uses infection ratios to track performance; calculated by dividing the number of infections that occurred in a year by the number that might be expected to occur
- A ratio of 1 means that actual infections equaled expected infections

    - Northwestern Memorial Hospital, Chicago: 2009 infection ratio 0.41
    - Mercy Hospital and Medical Center, Chicago: 2009 infection ratio 2.27

Chicago Tribune

May 16, 2010
By Judith Graham, Trine Tsouderos and Deborah L. Shelton

T3/T4 Outcomes: Mercy Hospital CLABSI Fall by 74%



Barsuk et al. *BMJ Quality and Safety,* 2014

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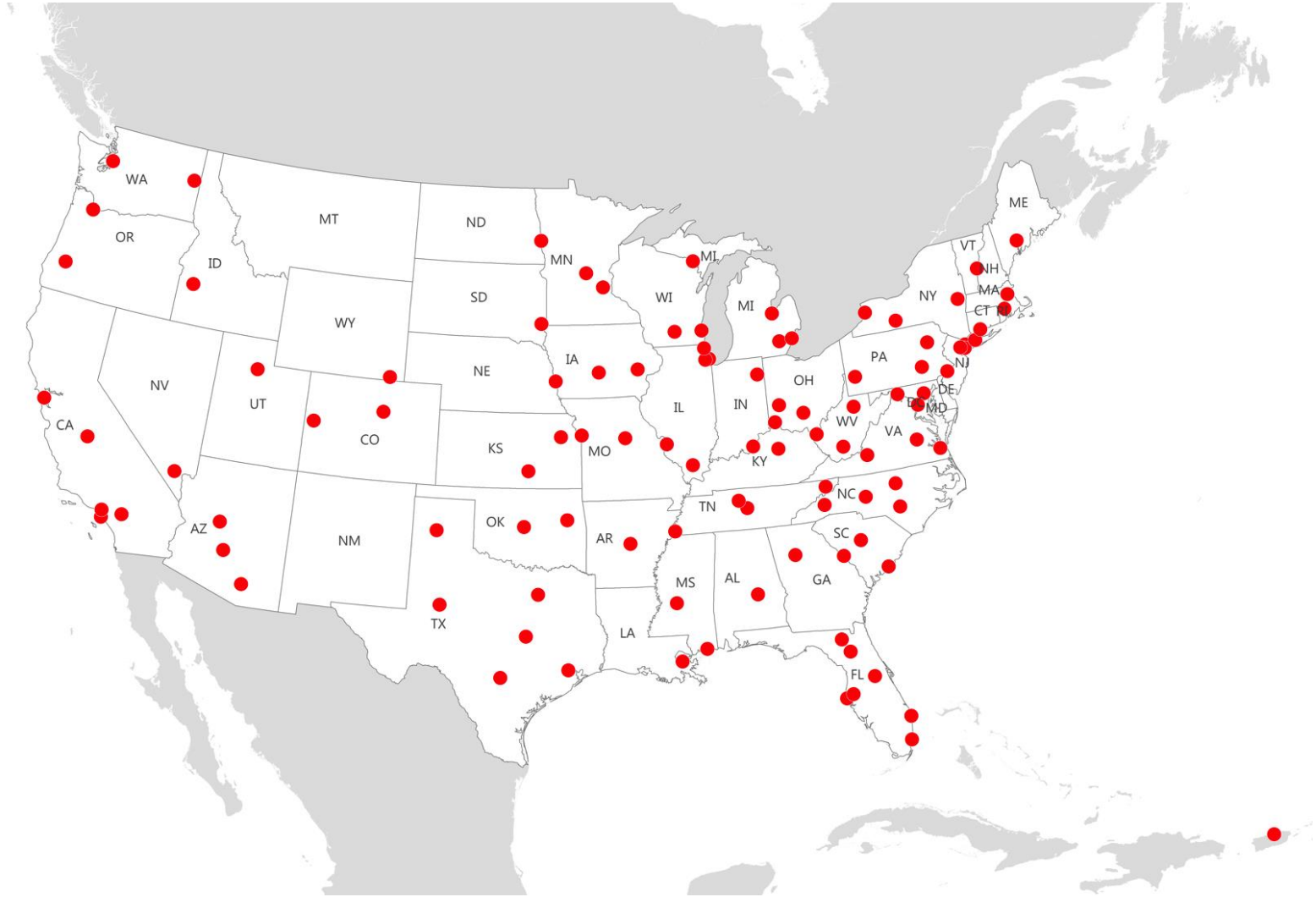
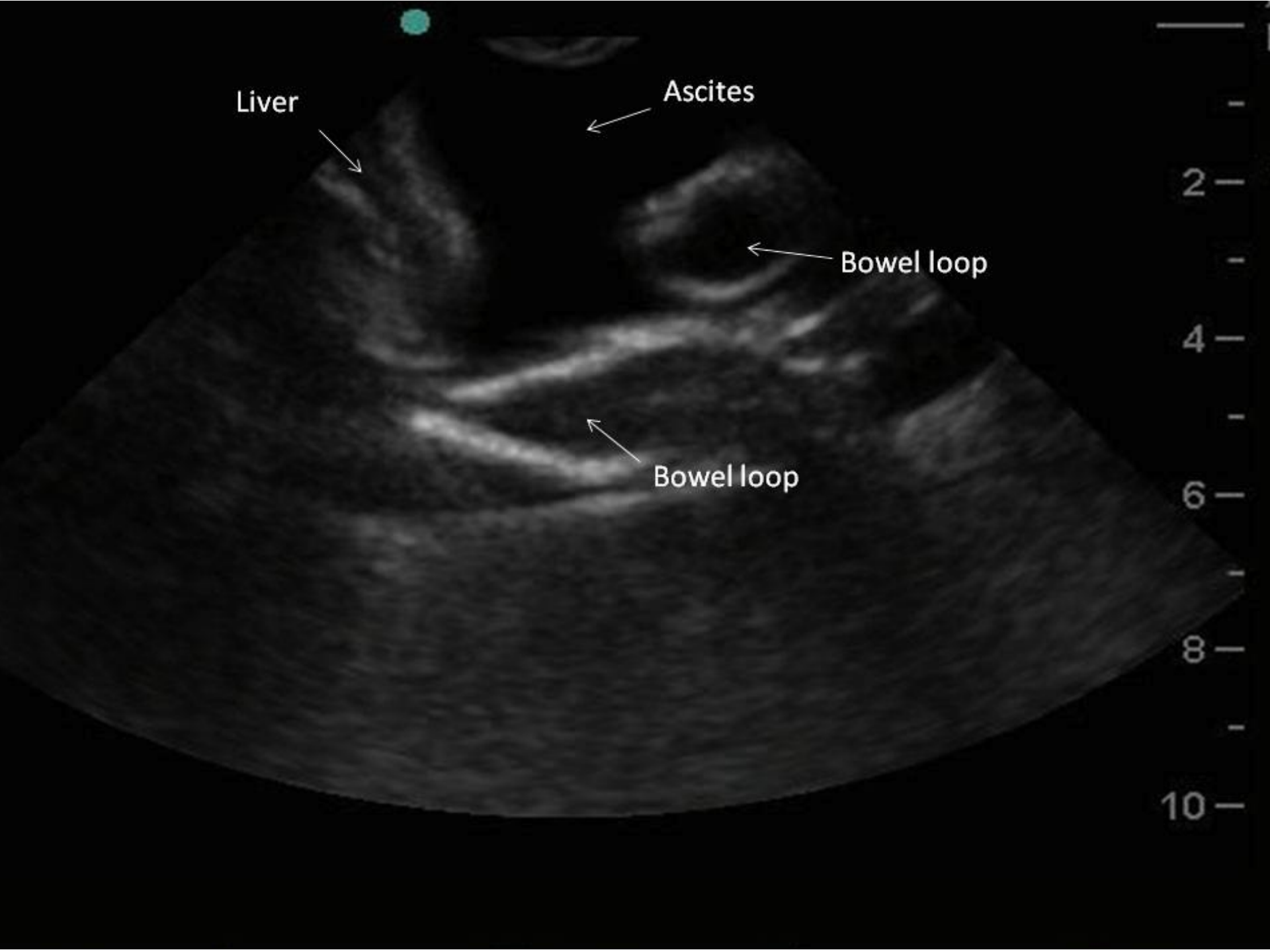
Dissemination to 105 VA Hospitals



Barsuk et al *Critical Care Medicine* 2016

Paracentesis SBML


Liver
Ascites
Bowel loop
Bowel loop
2
4
6
8
10

T2/T3 Outcomes after Paracentesis SBML

Variable	Bedside Procedure n=294 patients	IR Procedure n=208 patients	Odds ratio	*P* value
Length of Stay (SD), *days*	7.19 (6.91)	8.63 (8.66)	NA	.003
ICU transfer (%), *n*	28 (9.5%)	32 (15.4%)	2.21	.02
Red Blood Cell transfusion (%), *n*	95 (32.3%)	72 (34.6%)	1.11	.62
Platelet transfusion (%), *n*	18 (6.1%)	37 (17.8%)	4.56	<0.001
Fresh Frozen Plasma transfusion (%), *n*	19 (6.5%)	38 (18.3%)	4.07	<0.001
Death (%), *n*	14 (4.8%)	13 (6.2%)	1.39	.47
30-day readmission (%), *n*[a]	123 (43.9%)	84 (43.1%)	1.00	.99
Emergency department visit within 30 days (%), *n*[a]	10 (3.6%)	8 (4.1%)	0.95	.93

Abbreviations: ICU, intensive care unit

[a]N=475 patients surviving to discharge

5:1 ROI Compared to IR Procedures

Barsuk et al. *Am J Med*. 2013

Additional Evidence: Simulation-based Education Improves Patient Care

Study	Skill	Outcome
Andreatta et al.	Laparoscopic Skills	T1 Skills on porcine model
Seymour et al.	Lap Cholecystectomy	T2 Skills, burning wrong tissue, faster
Cohen et al.	Colonoscopy	T2 Ability to reach cecum, identify abnormal
Sedlack et al.	Colonoscopy	T2 Mucosal visualization, depth inserted
Mayo et al.	Airway	T2 Checklist performance actual emergency
Blum et al.	Bronchoscopy	T2 Visual cutes and subjective thoroughness
Draycott et al.	Shoulder dystocia	T2, T3 Neonatal injury
Zendejas et al.	Lap Hernia Repair	T3 Complications
Britt et al.	Central Line Insertion	T2, T3 Overall complications
Kessler et al.	Infant Lumbar Puncture	T2 Procedure success

Communication Skills and Outcomes

Association Between Implementation of a Medical Team Training Program and Surgical Mortality

Julia Neily, RN, MS, MPH
Peter D. Mills, PhD, MS
Yinong Young-Xu, ScD, MA, MS
Brian T. Carney, MD
Priscilla West, MPH
David H. Berger, MD, MHCM
Lisa M. Mazzia, MD
Douglas E. Paull, MD
James P. Bagian, MD, PE

Context There is insufficient information about the effectiveness of medical team training on surgical outcomes. The Veterans Health Administration (VHA) implemented a formalized medical team training program for operating room personnel on a national level.

Objective To determine whether an association existed between the VHA Medical Team Training program and surgical outcomes.

Design, Setting, and Participants A retrospective health services study with a contemporaneous control group was conducted. Outcome data were obtained from the VHA Surgical Quality Improvement Program (VASQIP) and from structured interviews in fiscal years 2006 to 2008. The analysis included 182 409 sampled procedures from 108 VHA facilities that provided care to veterans. The VHA's nationwide training program required briefings and debriefings in the operating room and included checklists as an integral part of this process. The training included 2 months of preparation, a 1-day conference, and 1 year of quarterly coaching interviews

Main Outcome Measure The rate of change in the mortality rate 1 year after facilities enrolled in the training program compared with the year before and with nontraining sites.

Results The 74 facilities in the training program experienced an 18% reduction in annual mortality (rate ratio [RR], 0.82; 95% confidence interval [CI], 0.76-0.91; $P=.01$) compared with a 7% decrease among the 34 facilities that had not yet undergone training (RR, 0.93; 95% CI, 0.80-1.06; $P=.59$). The risk-adjusted mortality rates at baseline were 17 per 1000 procedures per year for the trained facilities and 15 per 1000 procedures per year for the nontrained facilities. At the end of the study, the rates were 14 per 1000 procedures per year for both groups. Propensity matching of the trained and nontrained groups demonstrated that the decline in the risk-adjusted surgical mortality rate was about 50% greater in the training group (RR,1.49; 95% CI, 1.10-2.07; $P=.01$) than in the nontraining group. A dose-response relationship for additional quarters of the training program was also demonstrated: for every quarter of the training program, a reduction of 0.5 deaths per 1000 procedures occurred (95% CI, 0.2-1.0; $P=.001$).

Conclusion Participation in the VHA Medical Team Training program was associated with lower surgical mortality.

JAMA. 2010;304(15):1693-1700 www.jama.com

ADVERSE EVENTS RELATED TO surgery continue to occur despite the best efforts of clinicians.[1] Teamwork and effective communication are known determinates of surgical safety.[2-6] Previous efforts at demonstrating the efficacy of patient safety initiatives have been limited because of the inability to study a control group.[7] For example, the use of the World Health Organization Safe Surgery checklist has been evaluated, but its overall efficacy remains uncertain because no control group was studied to clearly demonstrate this instrument's effectiveness.[6]

The Veterans Health Administration (VHA) is the largest national integrated health care system in the United States, with 153 hospitals, 130 of which provide surgical services. The

- Training
- Debriefing
- Checklists

Facilities in the program experienced an **18% reduction in surgical mortality**

Unpacking "The Michigan Project": Beliefs, Norms, Culture, Teams and Education

"This study found that peer and public pressure toward hospitals and their MICUs to participate and conform, reframing CVC-BSIs as a social problem, "using several interventions [including strong doses of medical and nursing education] that functioned in different ways to shape a culture of commitment to doing better in practice," using data on infection rates as a disciplinary focus, and reliance on the 'hard edges' of accountability and professional sanction are the reasons why the statewide Michigan intervention produced strong results."

Education

Motivation

Teamwork

Culture

Dixon-Woods M, Milbank Quarterly 2011
McGaghie WC, Chest 2012

Why Does This Matter? Aren't We Already Meeting Our QI Goals?

Khullar D et al. Diagnostic errors are clinically and financially more costly today than ever before. NEJM 2015

Shulkin DJ. The aging population of veterans, their changing expectations, infrastructure limitations, and application of emerging therapies and technologies have all contributed to a mismatch of demand and capacity. NEJM 2016

Young RC. But the cost of cancer care has been growing rapidly: though it accounts for a relatively small portion of overall U.S. health care expenditures, it is expected to increase from $125 billion in 2010 to $158 billion in 2020. NEJM 2015

Ginsburg PB et al. To coordinate care effectively, providers need to be able to engage patients actively in their care, especially in chronic disease management, and steer them to other providers on their team. But under Medicare, an ACO may not even be able to identify the patients for whom it's responsible until after the contract year ends. NEJM 2015

Preparing Residents to Provide High Quality Care

- Train to mastery
- Communication skills/team training
- In situ-codes
- Add nurses/pharmacists

- Patient preferences
- Readmission rates
- Cost/case
- Patient satisfaction

Thank You

- J. Larry Jameson
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- William McGaghie
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- Elaine Cohen
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