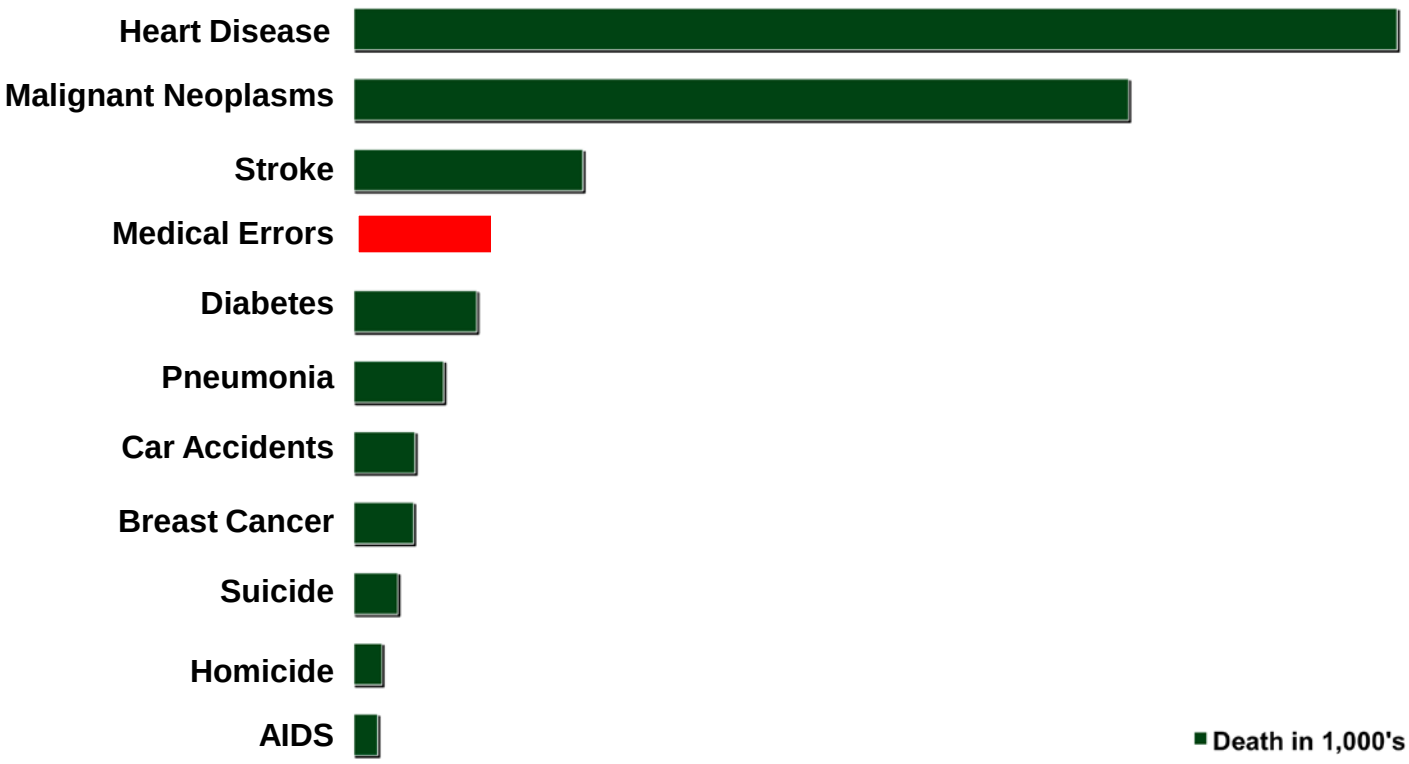
Eliminating Healthcare Associated Infections:

Strategies for Success

Jerome E. Granato MD, MBA

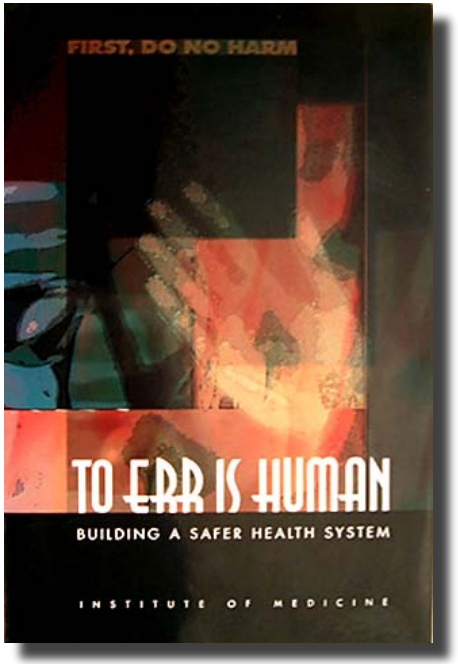
Medical Director, Coronary Care Unit
Allegheny General Hospital
Pittsburgh, Pennsylvania

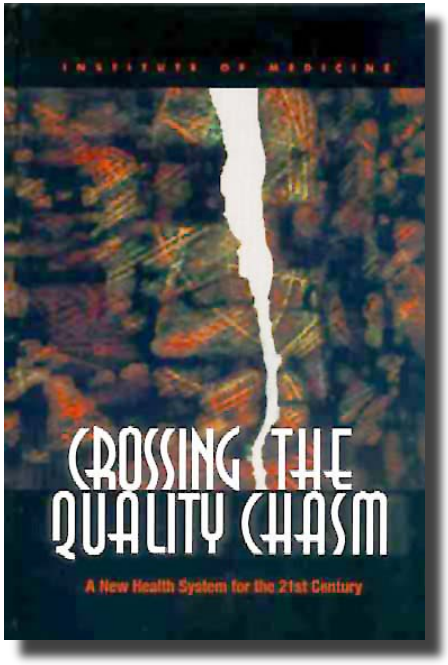
Leading Causes of Death in the U.S 1997



Source: CDC mortality data 1997

Where It All Started

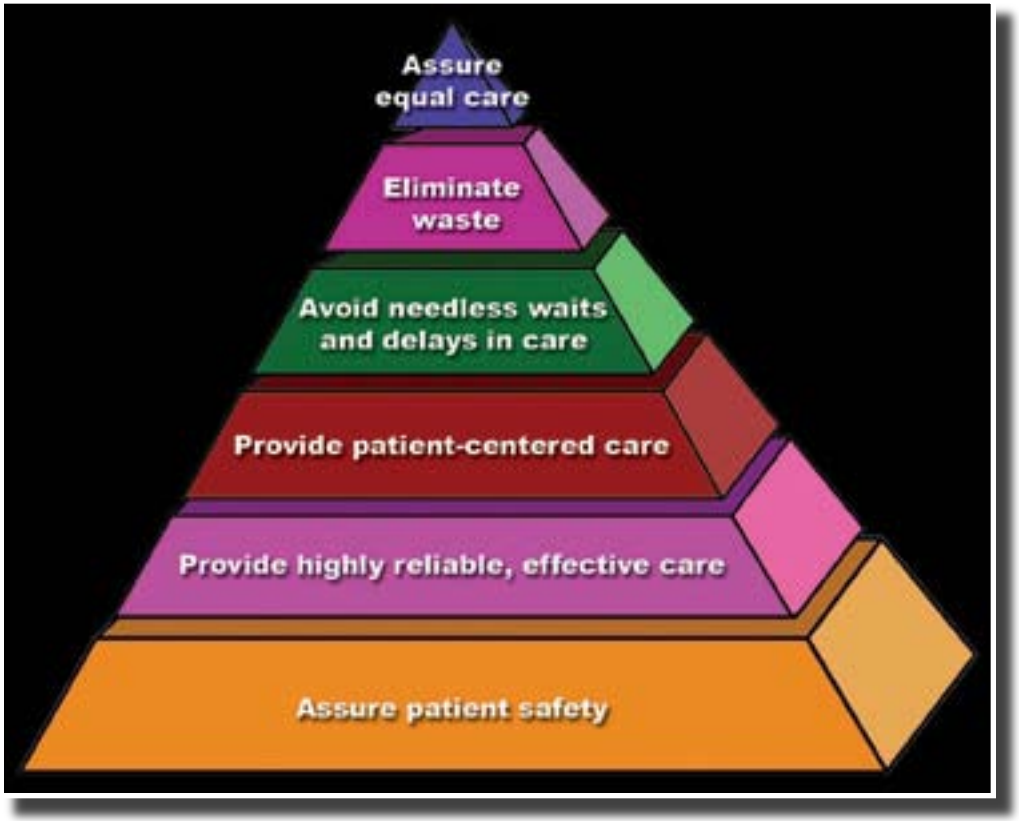




Poorly Organized Delivery System

- Failure to provide planned care.
- Failure to reorganize care.
- Failure to supply information and education.
- Failure to facilitate access to care.
- Failure to create supportive infrastructure.

Institute of Medicine: Healthcare Imperatives



Enter the Watchdog Agencies

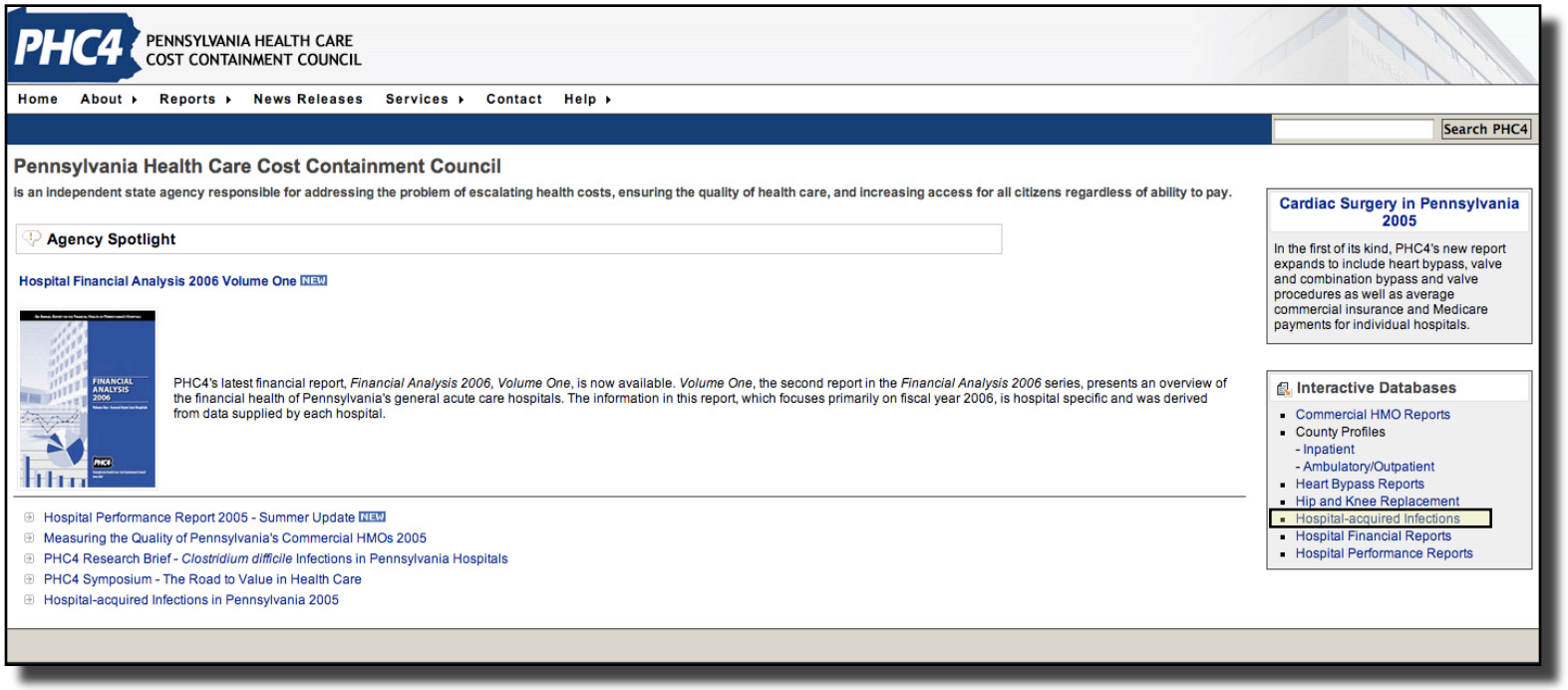
ASSOCIATION FOR PROFESSIONALS IN INFECTION CONTROL AND EPIDEMIOLOGY

APIC

PRHI
Spreading Quality

PHC4 PENNSYLVANIA HEALTH CARE COST CONTAINMENT COUNCIL

The Advent of Public Reporting



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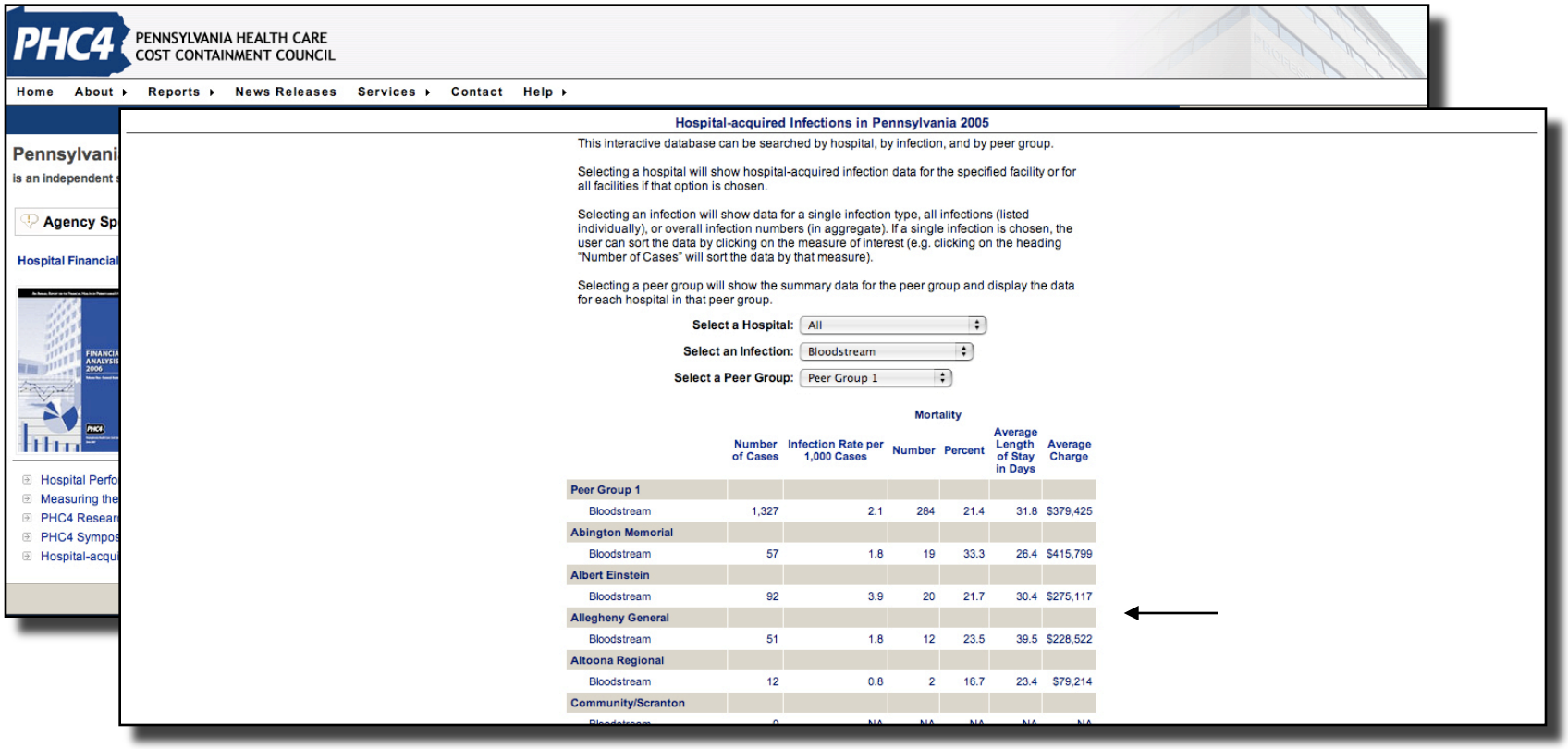

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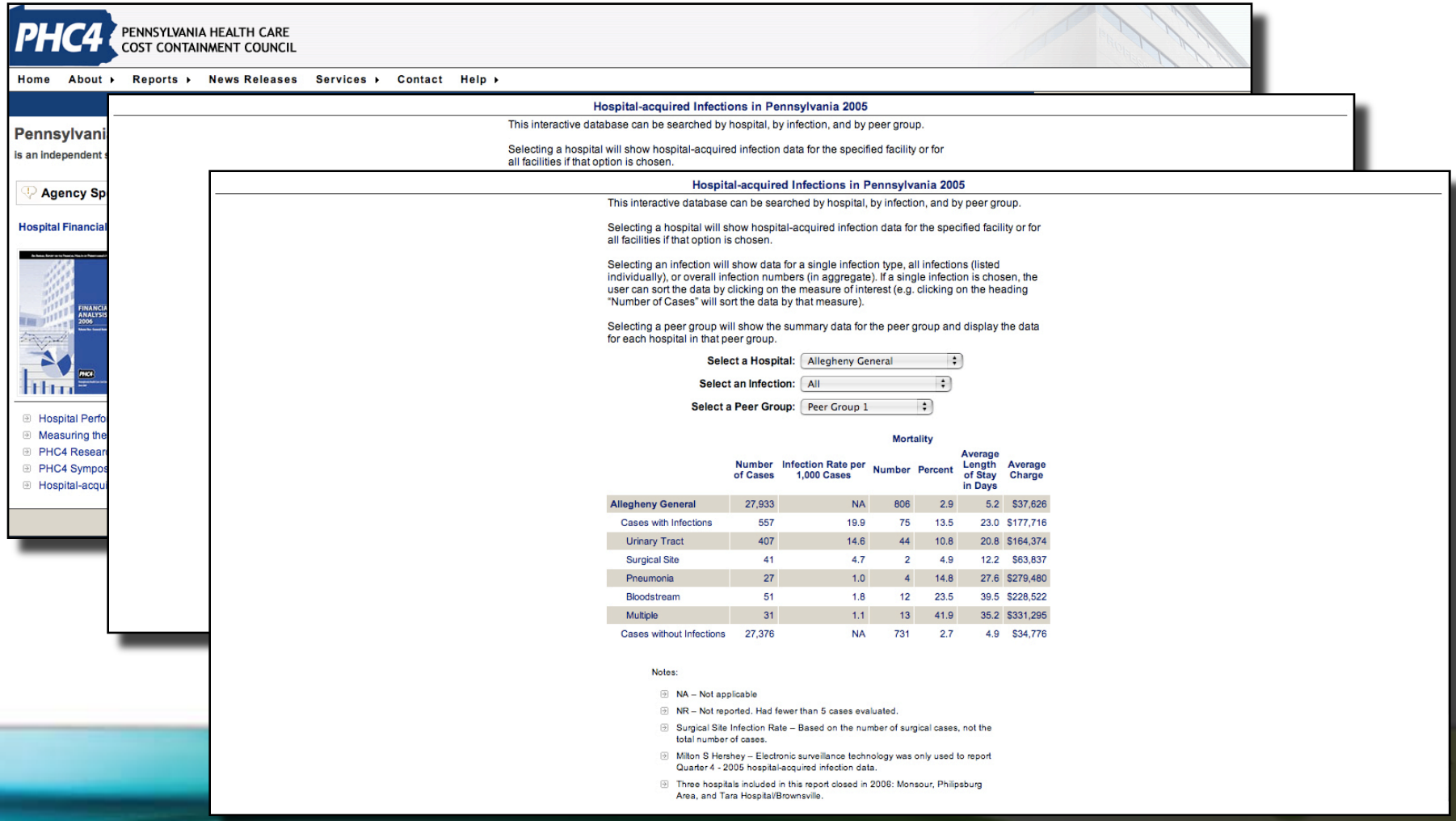


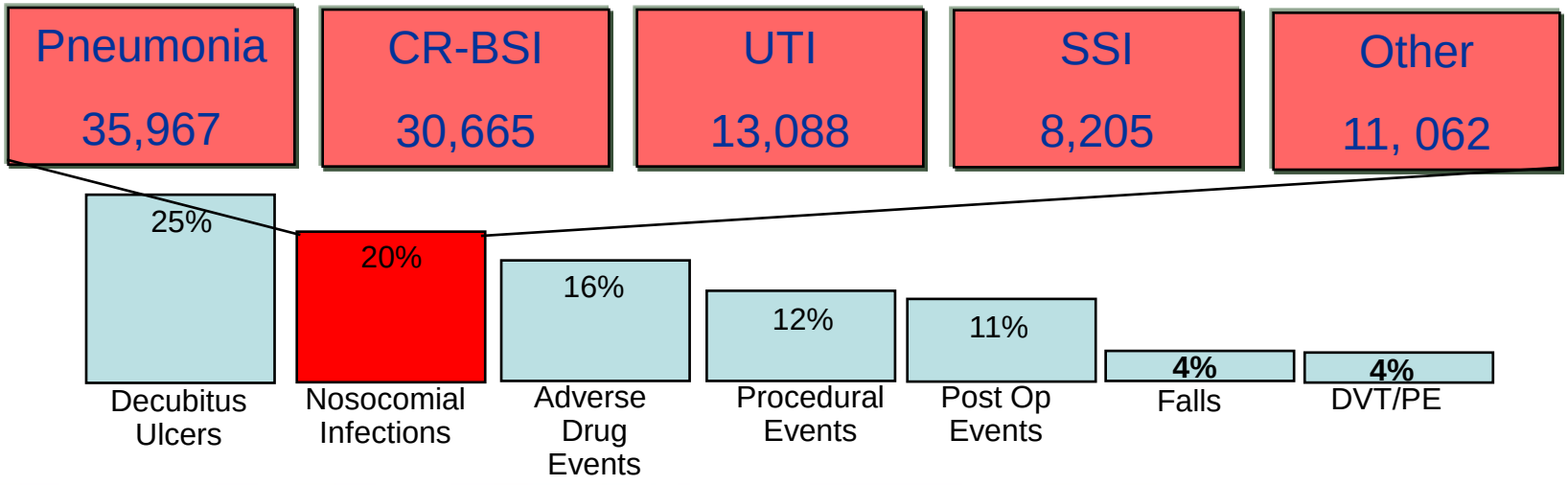
Estimating The Burden of Healthcare Associated Infections

Annual HAI ~1.7 million

(4.5 infections per 100 admissions

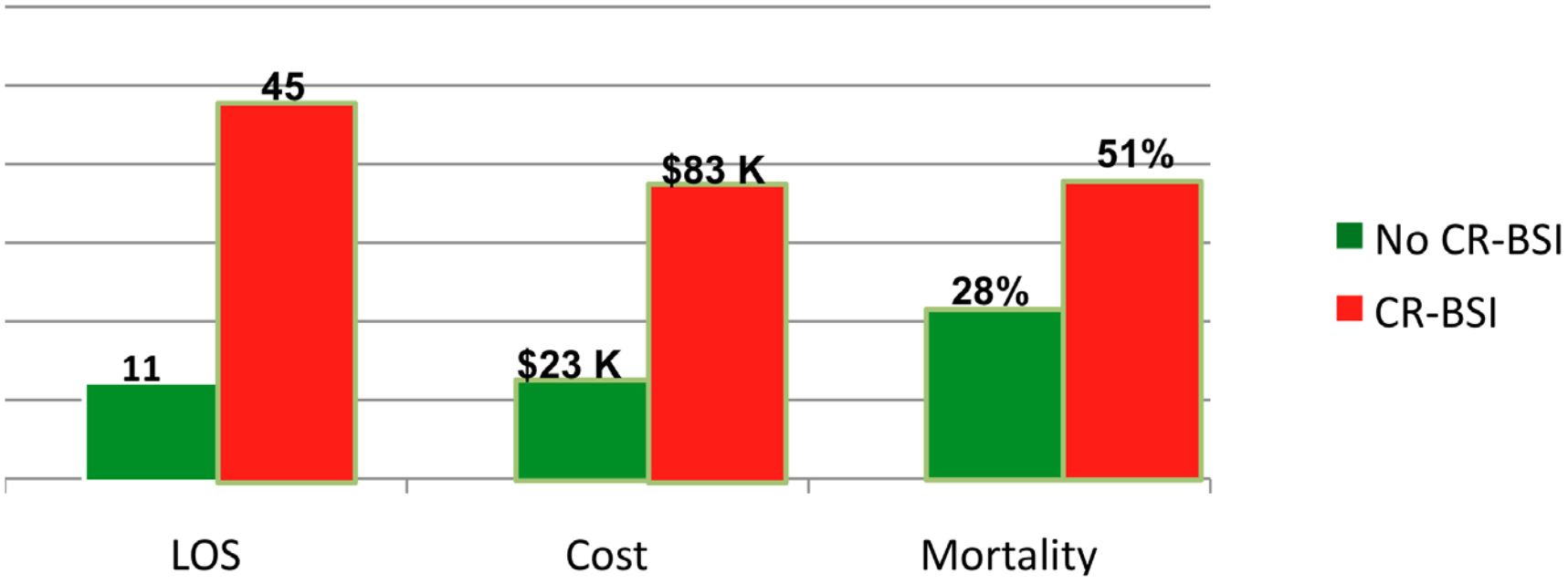
Deaths associated with HAI:

98,987



Klevens RM et al. Public Health Reports, 2007 160-166

CR-BSI Multiples The Cost of Care

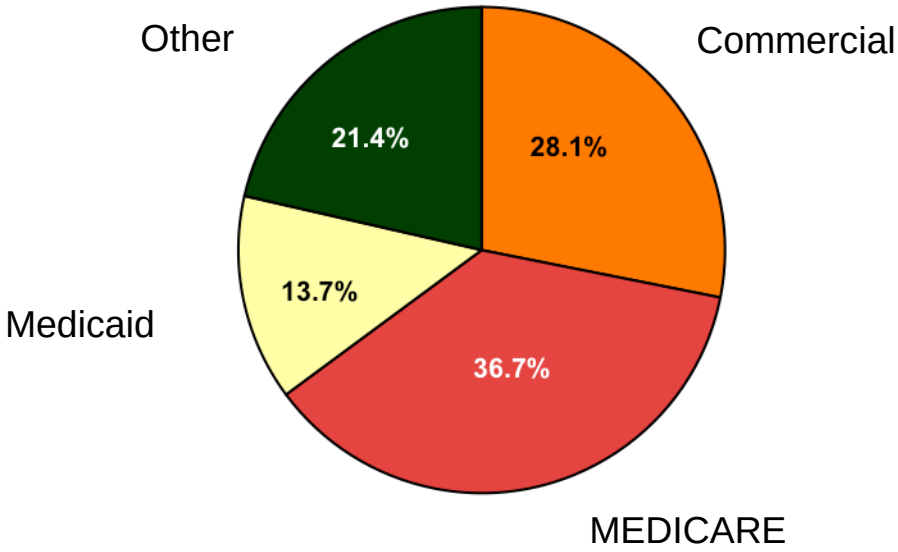


Jerome E Granato MD 2010

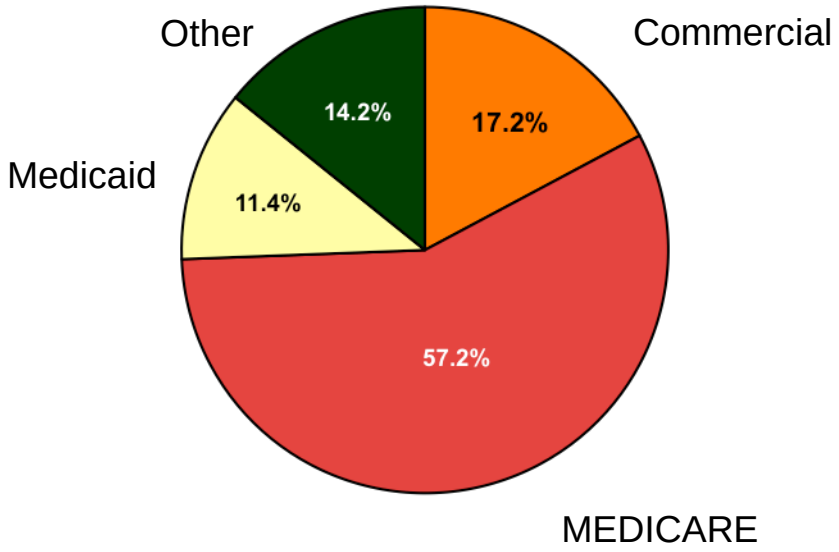
Warren DK Critical Care Med 2006:2084

The Burden Is Disproportionate

Patients Without Infection



Patients With Infection



Murphy D et al. "Dispelling the Myths: The True Cost of Health care-Associated Infections"
APIC Briefing 2007

The Healthcare Delivery Model Has Changed

The New York Times

Medicare Says It Won't Cover Hospital Errors

By ROBERT PEAR
Published: August 19, 2007

The new policy raises the possibility of changes in medical practice as doctors hew more closely clinical guidelines.

The Allegheny General Hospital Story

- Dr. Richard Shannon
  - Chairman, Department of Medicine
- Drs. Michael Brown , Glen Miske, Amy Schuett
  - Cardiology fellows
- Joy Peters RN, MBA
  - Nursing Director, Coronary Care Unit
- Kimberly Curry BSN
  - Unit Facilitator , Coronary Care Unit
- Anne Behers RN, Christine Ciocco RN, Amy Snyder RN, Chris Zanone RN, Cher Schmude RN
  - Unit Charge Nurse- Coronary Care Unit
- Cheryl Herbert RN, Veronica Andrews RN
  - Nursing Director, Infection Control
- Diane Frdnak
    - **Vice President Quality and Patient Safety**
- **…….And a cast of hundreds working 24/7 !**

CR-BSI ***Had*** Standard" Rates……..

Type of ICU	No. of units	Central line-days	Infection rate
Coronary	60	116,546	3.5
Cardiothoracic	48	182,407	2.7
Medical	94	312,478	5.0
Major teaching	100	430,979	4.0
All others	109	486,115	3.2
Neurosurgical	30	56,645	4.6
Pediatric	54	161,314	6.6
Surgical	99	358,578	4.6
Trauma	22	70,372	7.4
Burn	14	43,002	7.0

National Nosocomial Infections Surveillance (NNIS) System Report, data summary from January 1992 through June 2004, issued October 2004

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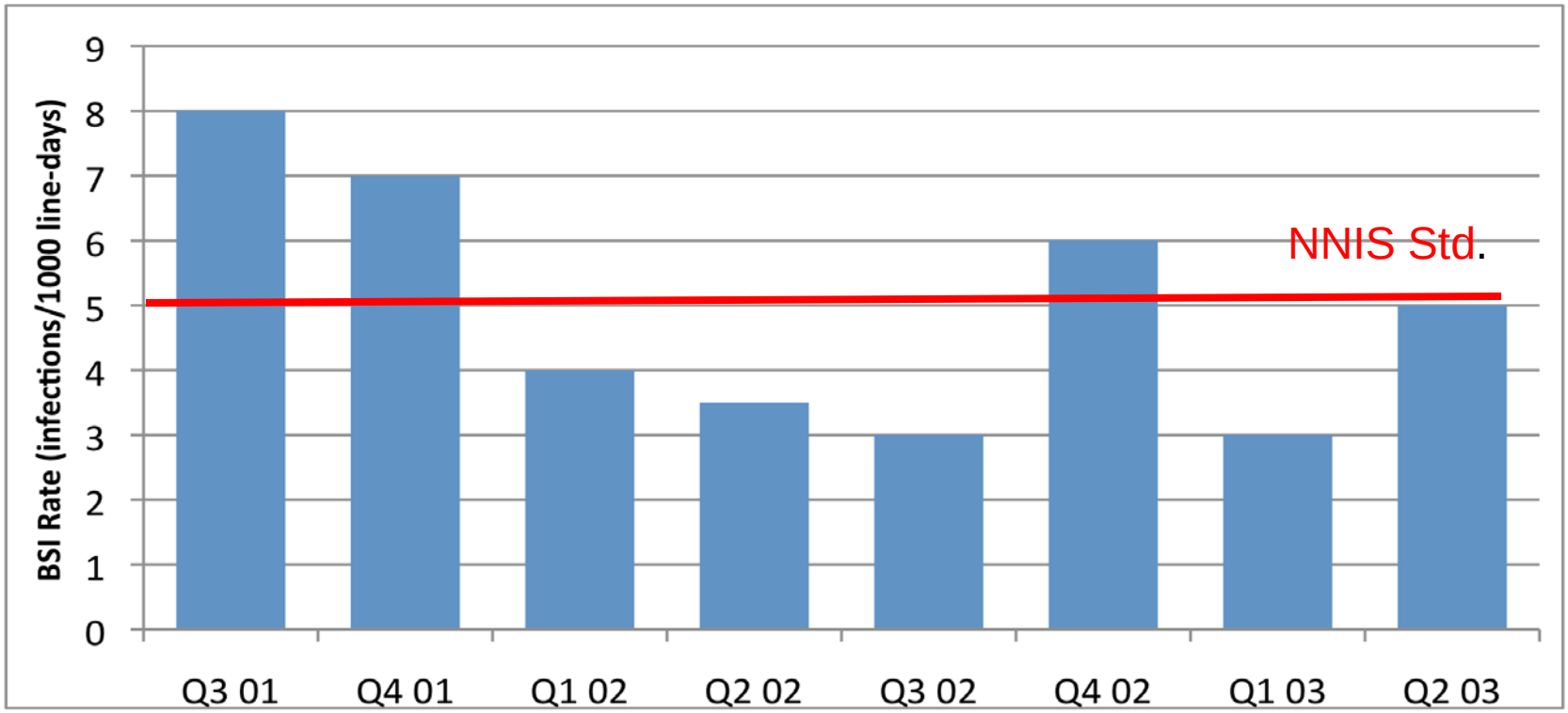
CCU Quarterly CR-BSI Surveillance



What Did We Conclude?

- Our results were average and average is ok.
- CR-BSI's are inevitable. It is the price you pay for sophisticated, complex care.
- CR-BSI's are readily treated with antibiotics.
- CR-BSI's are a common accompaniment of complex care and covered in outlier payments.

What Concerned Us ?

- 5.1 infections per 1000 line days meant that nearly ***40 people*** were infected in the department of medicine alone.
- Central lines had a 4-5% chance of blood stream infection.
- Two-thirds of the infections involved virulent organisms . Twenty percent were MRSA.
- CR-BSI was associated with 50% mortality

We were obligated to better…….But how?

2003: What Was Happening?

- No [illegible]ified role of personnel.
- [illegible]rdized definition of [illegible].
- [illegible]rd inse[illegible]niques
- [illegible]oyed.
- No st[illegible]ndardiz[illegible]re for dre[illegible]g
- [illegible]ard for documentati[illegible]y
- [illegible]nce.

"I know how to do this"

"No!"

#!&%#

"It's how they care for the lines

"This is how I like it"

"I can do it faster this way"

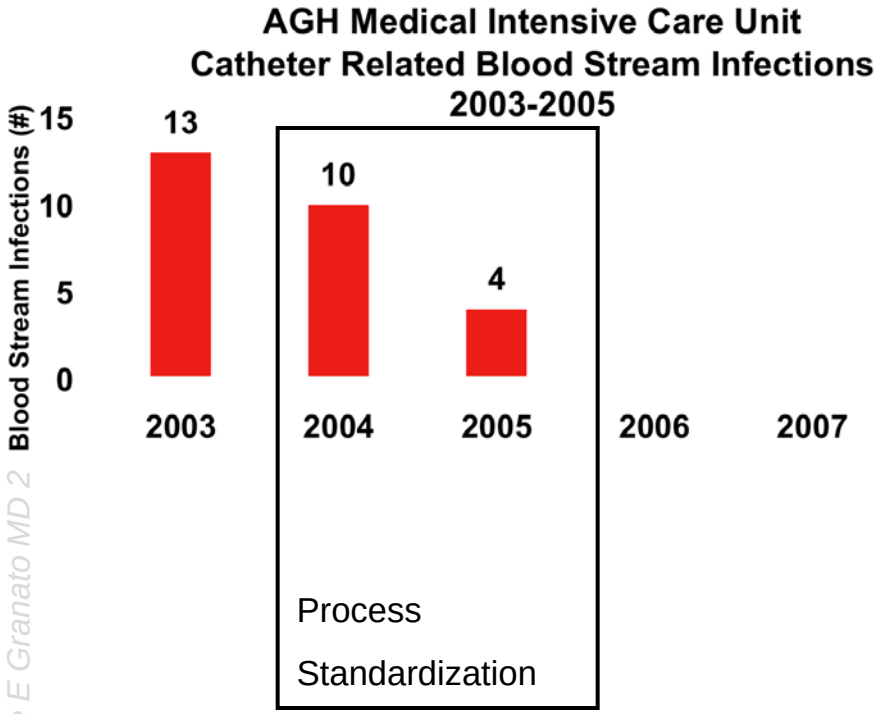
What Did We Do?

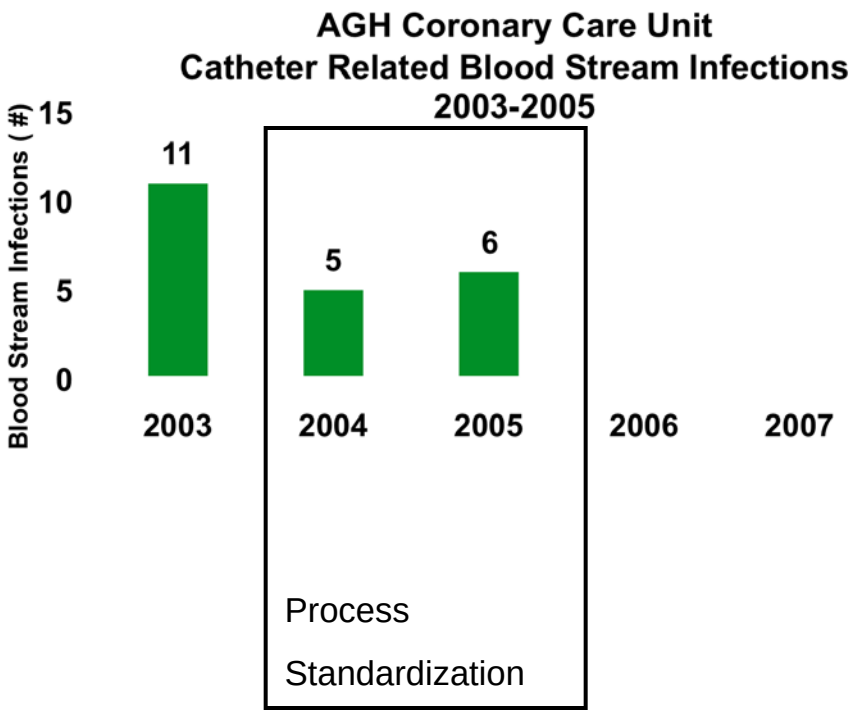
Perfecting Patient Care/Toyota Production System

Step 1: Set ambitious goals
Step 2: Observe variations in work
Step 3: Real time problem solving
Step 4: Implement countermeasures

Step 5: Reassess and revise

Process Standardization Worked……..
……..but didn't get us to **ZERO**!



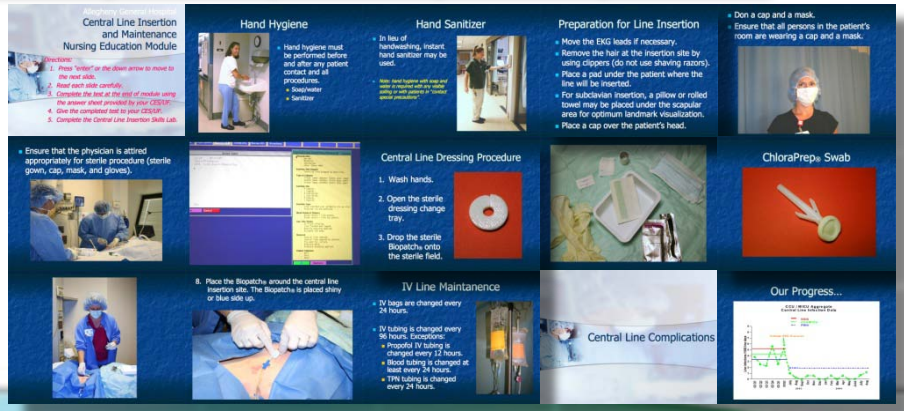


Why Not Zero ?

We Were Poor Managers

- Didn’t articulate the message clearly.
- Didn’t establish priorities.
- Didn’t provide training
- Didn’t ensure compliance

We Invested In People and Programs



Central Line Self-Learning Module Test

1. Which statement is TRUE?
   A. The internal jugular vein lies medial to the carotid ar
   B. The internal jugular vein lies posterior to the carotid artery.
   C. The internal jugular vein lies lateral to the carotid artery.
   D. The internal jugular vein lies adjacent to the trachea.

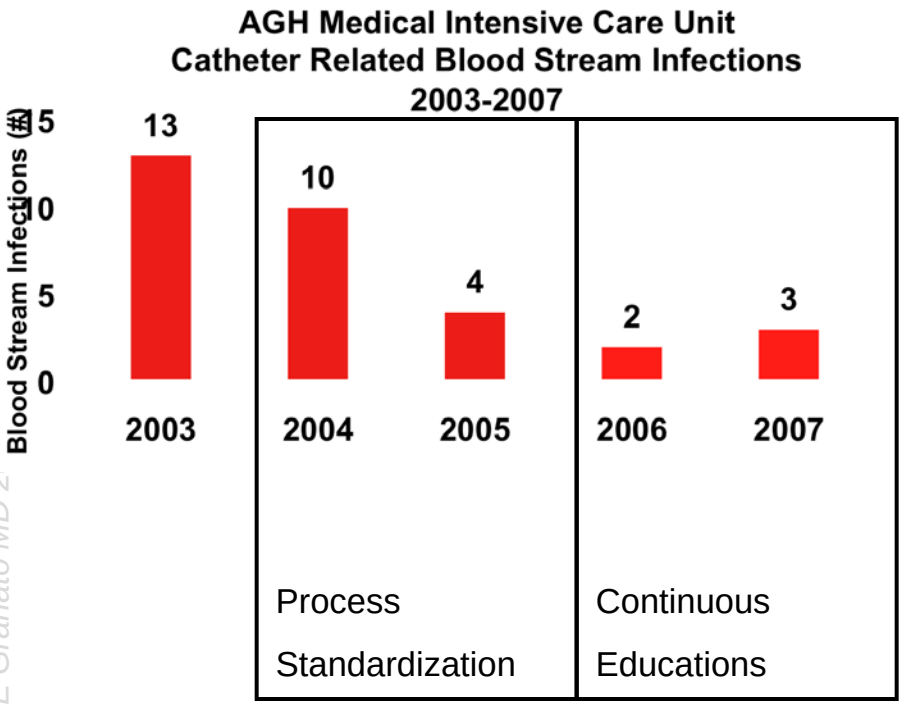
2. Which statement is TRUE?
   A. The subclavian vein lies beneath the first rib.
   B. The subclavian vein lies beneath the medial 1/3 of the clavicle.
   C. The subclavian vein lies behind the subclavian artery.

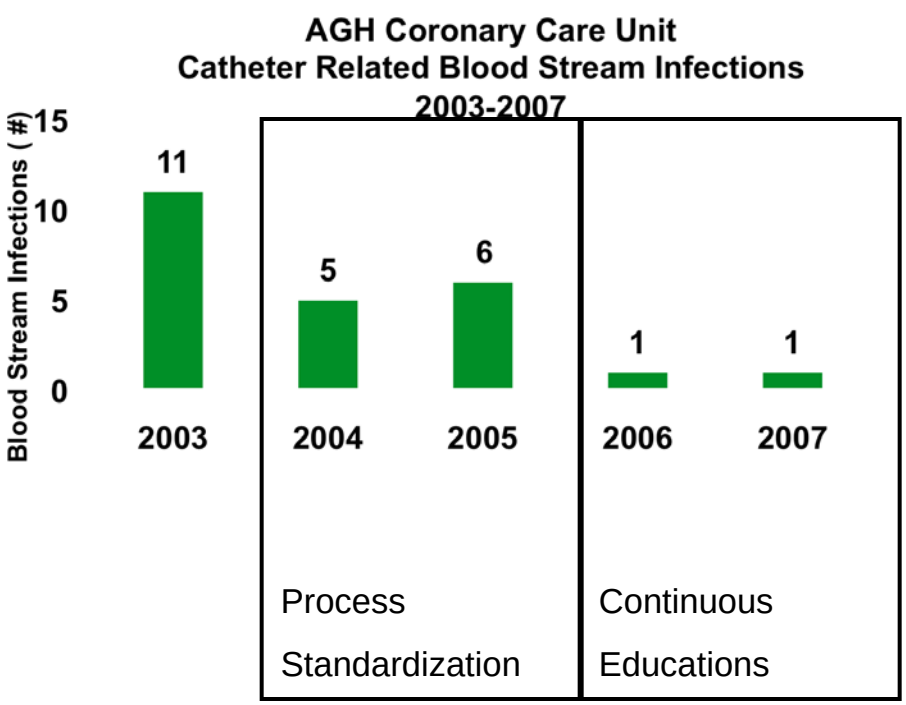
3. Which activity is NOT required prior to central line insertion?
   A. Compliance with hospital “time out” policy.
   B. Obtaining informed consent.
   C. Reviewing pertinent lab data.
   D. Advising the nursing staff of equipment needs.
   E. Antibiotic prophylaxis.

4. Strict sterile technique requires all of the following EXCEPT:
   A. Vigorous hand washing.
   B. Surgical mask, gown and gloves for all participants.
   C. Skin preparation with chlorhexidine.
   D. Removal of any nasogastric or endotracheal tubes.
   E. Sterile drape of entire patient.

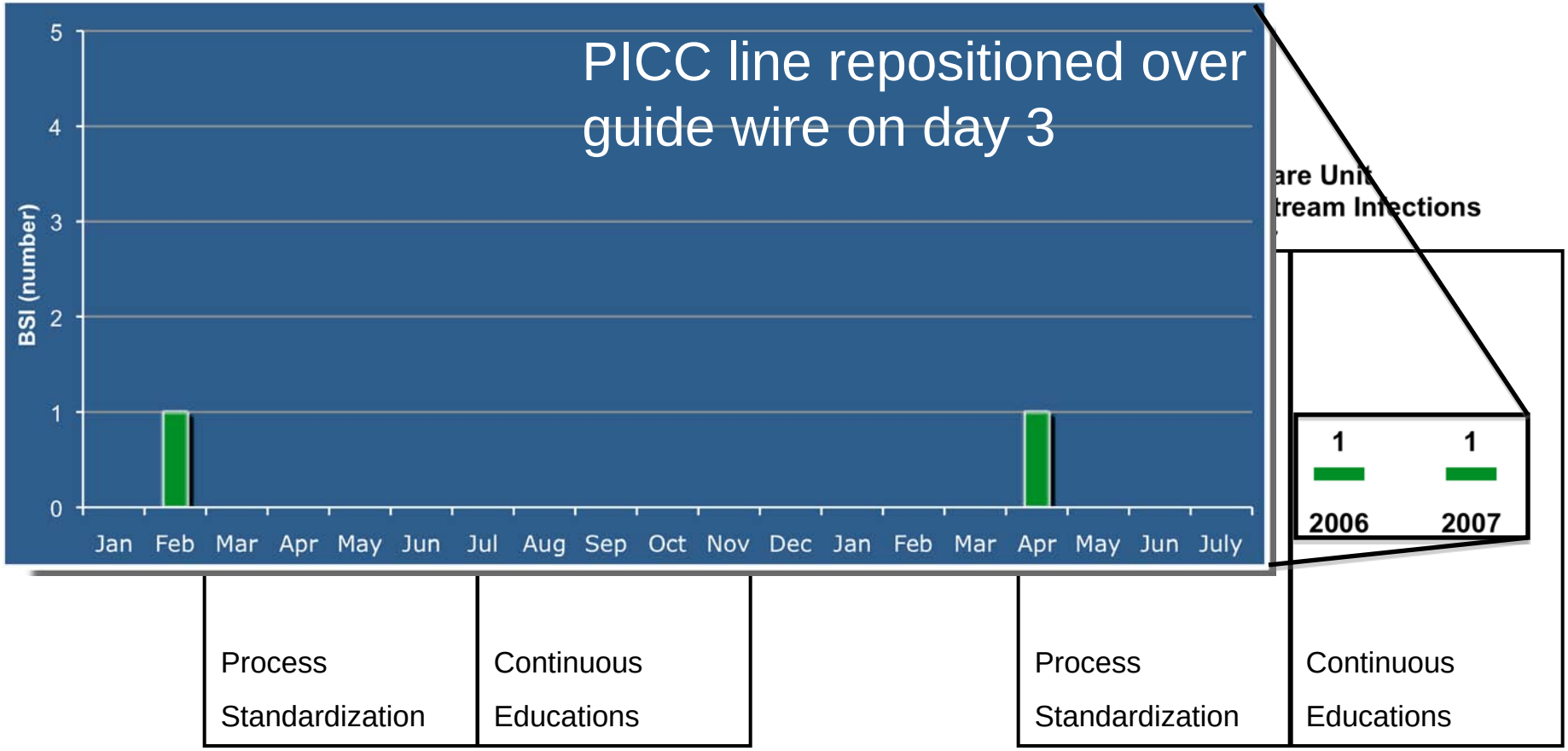
APIC

Continuous Education Enhances Process Standardization



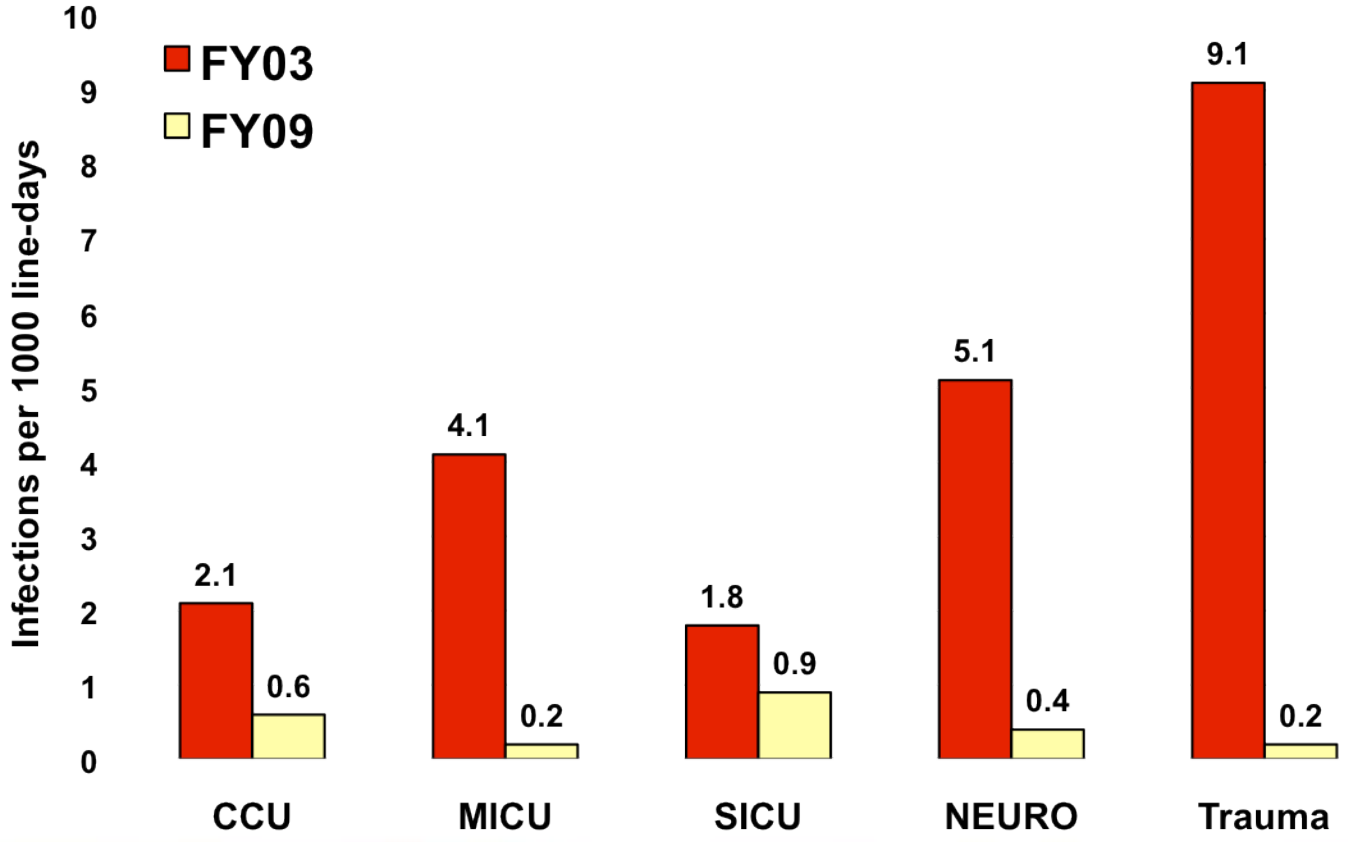


Continuous Education Enhances Process

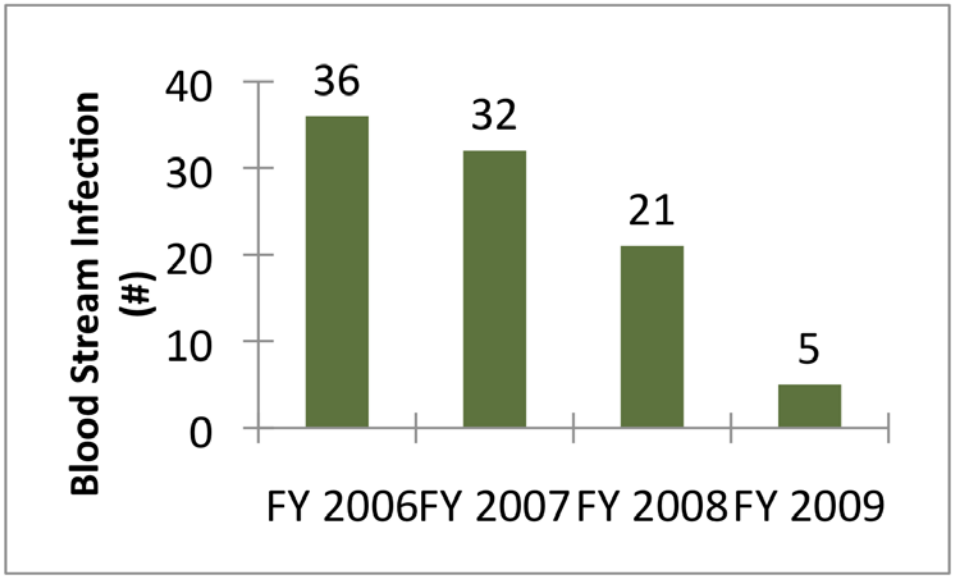


These lessons were readily transferrable to other units

The Message Has Spread…..
To the Other ICU's

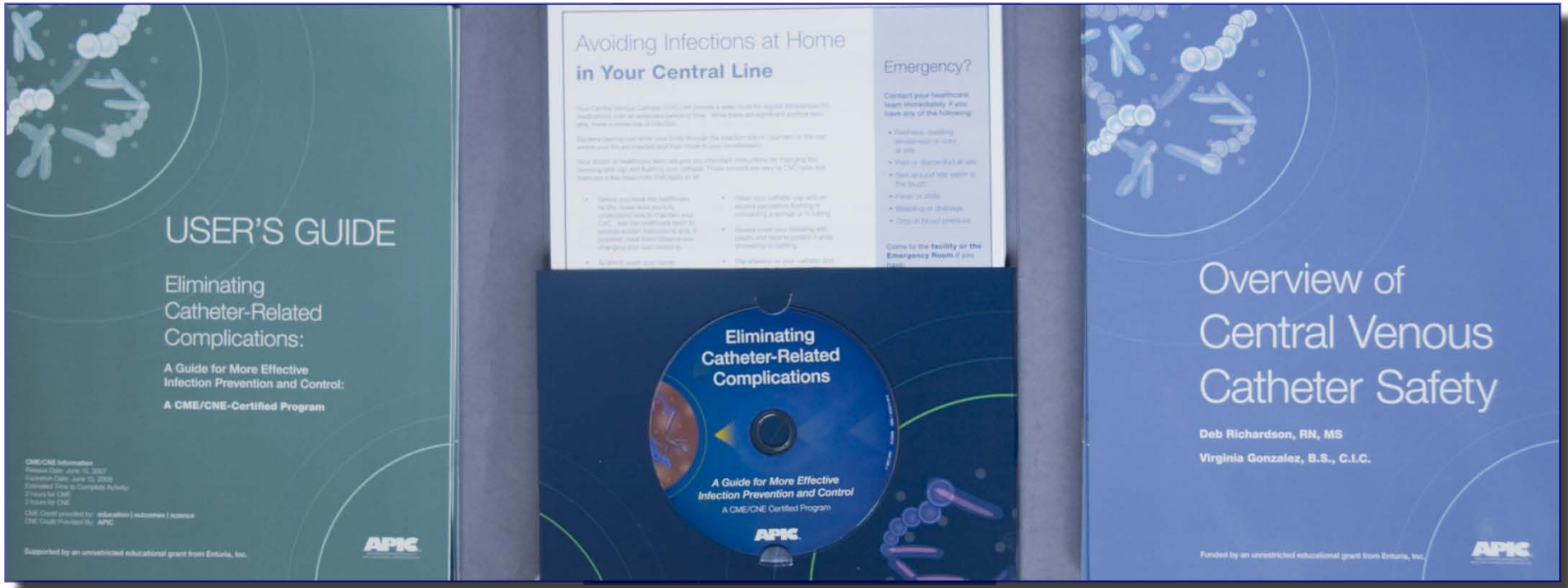


The Message Has Spread…..
Outside of the ICU

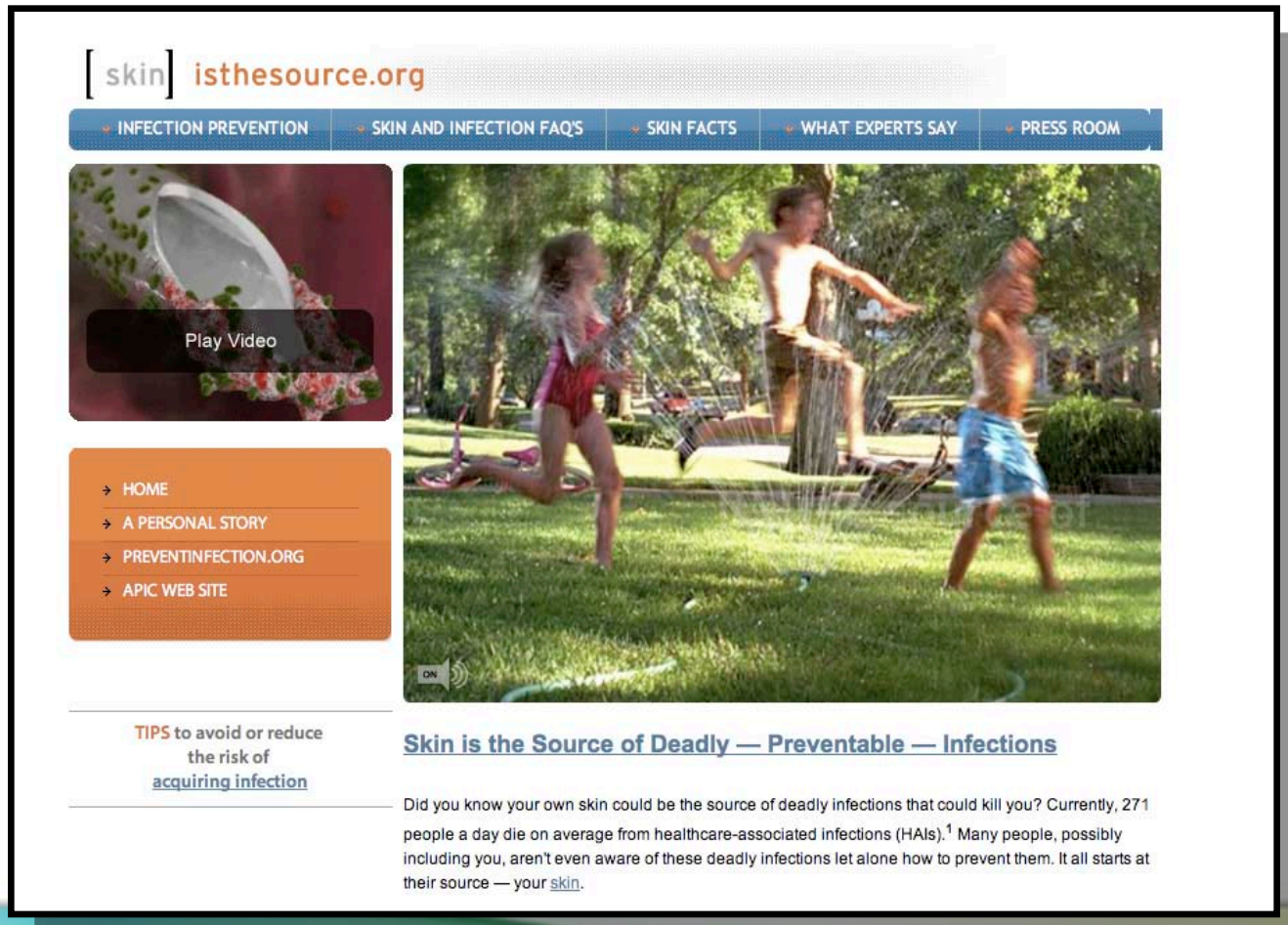


- Seven fold decrease in BSI over four years
- Non ICU BSI rate of 1.2 BSI/1000 line-days
- The majority of central lines are now PICC

The Message Has Spread……
Across the Country



The Message Has Spread……
Into the Community



The Message Has Spread……
Across the Ocean

Process Standardization and Continuous Training Leads to the Elimination of Catheter Related Blood Stream Infections (CR-BSI)

Jerome E. Granato MD MBA, Kimberly Curry RN BSN , Joy Peters RN MSN MBA, Julie Gerstrbein RN MSN CCRN, Veronica Andrews RN, Cheryl Herbert RN CIC, Richard P Shannon MD.
Allegheny General Hospital Pittsburgh, Pennsylvania, USA

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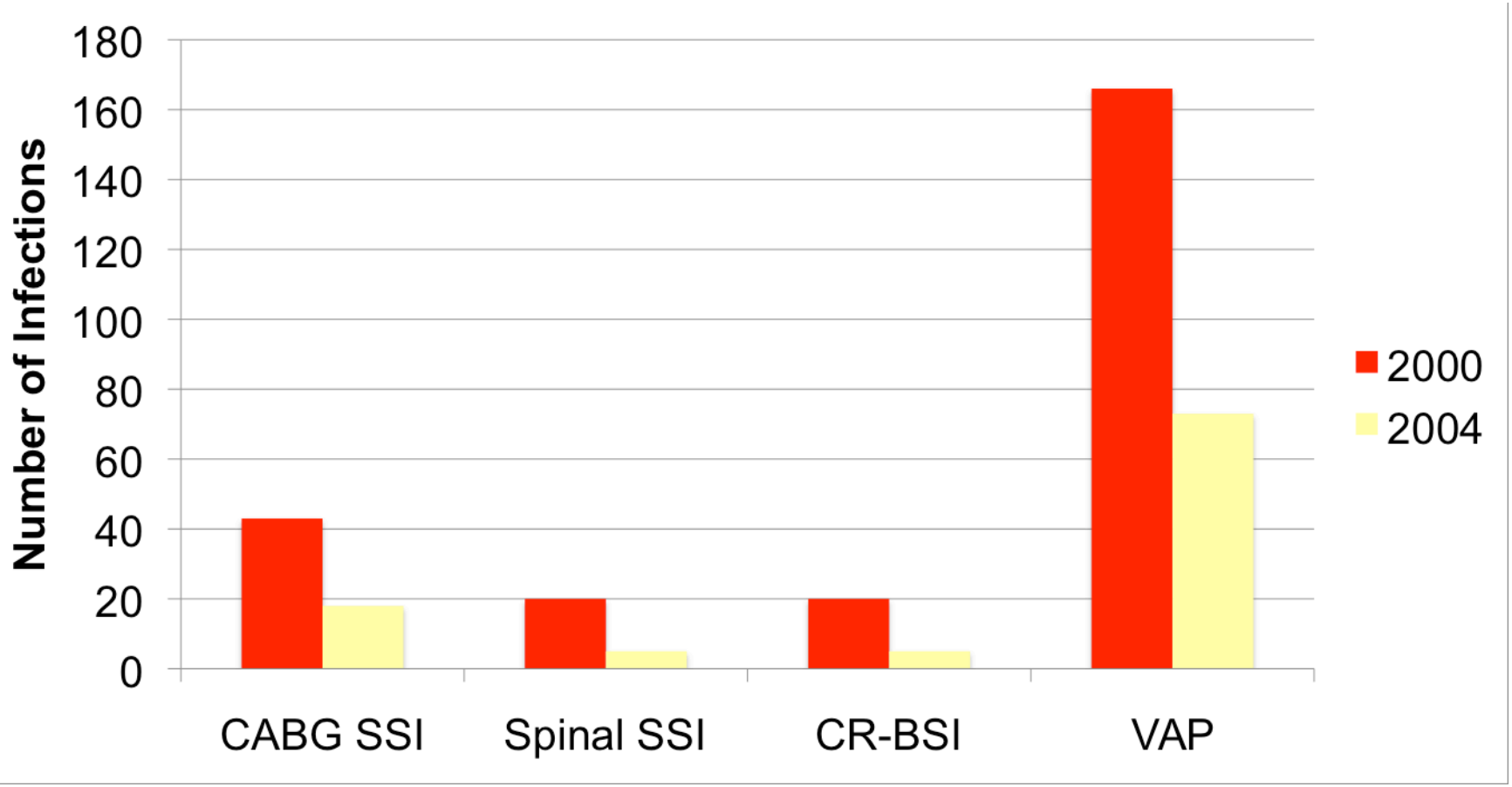
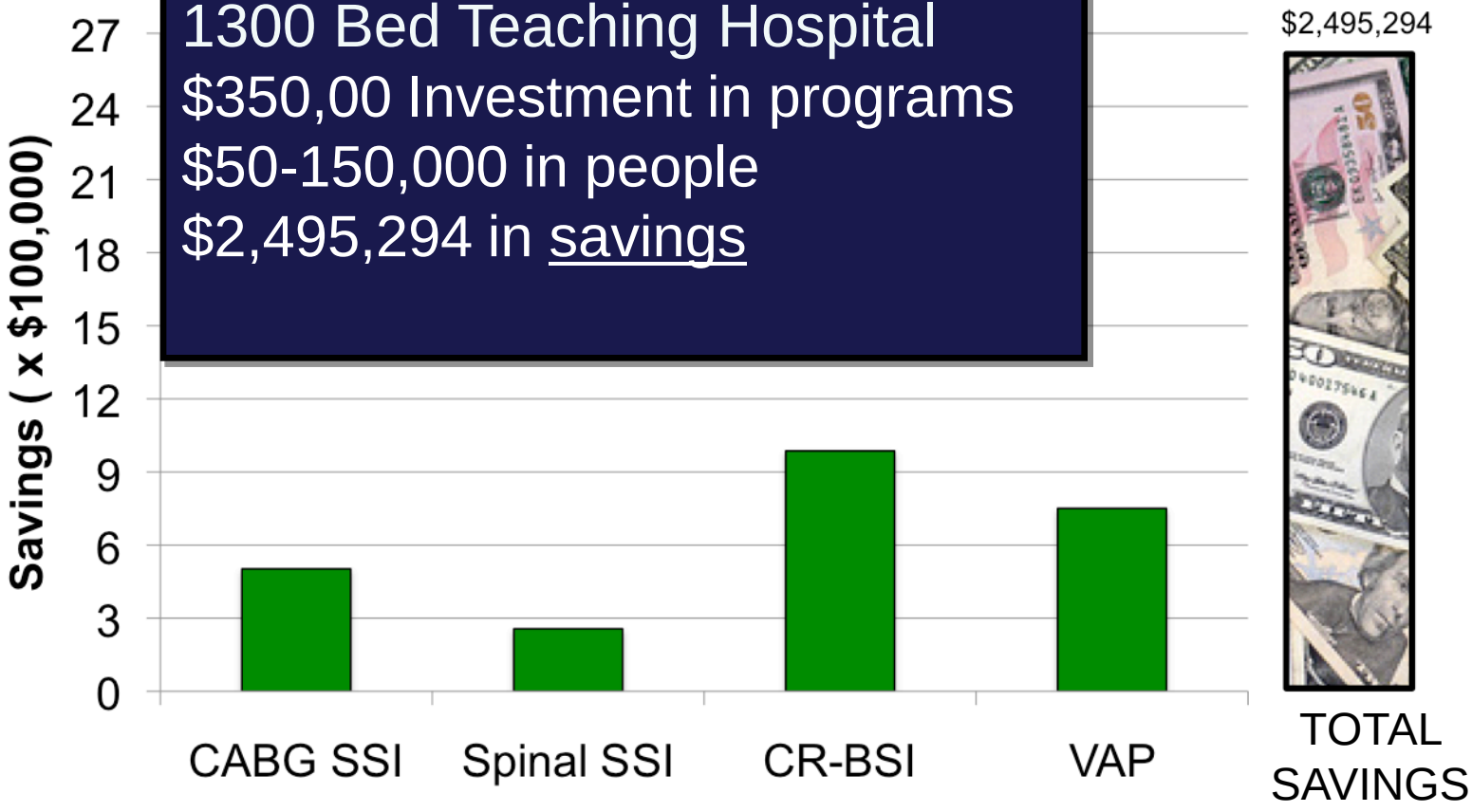
Barnes-Jewish Healthcare HAI Elimination Efforts



Murphy DM. Dispelling the Myths: The True Cost of Healthcare APIC Briefing Feb 2007

Barnes-Jewish Healthcare HAI Elimination Efforts

1300 Bed Teaching Hospital
$350,00 Investment in programs
$50-150,000 in people
$2,495,294 in savings



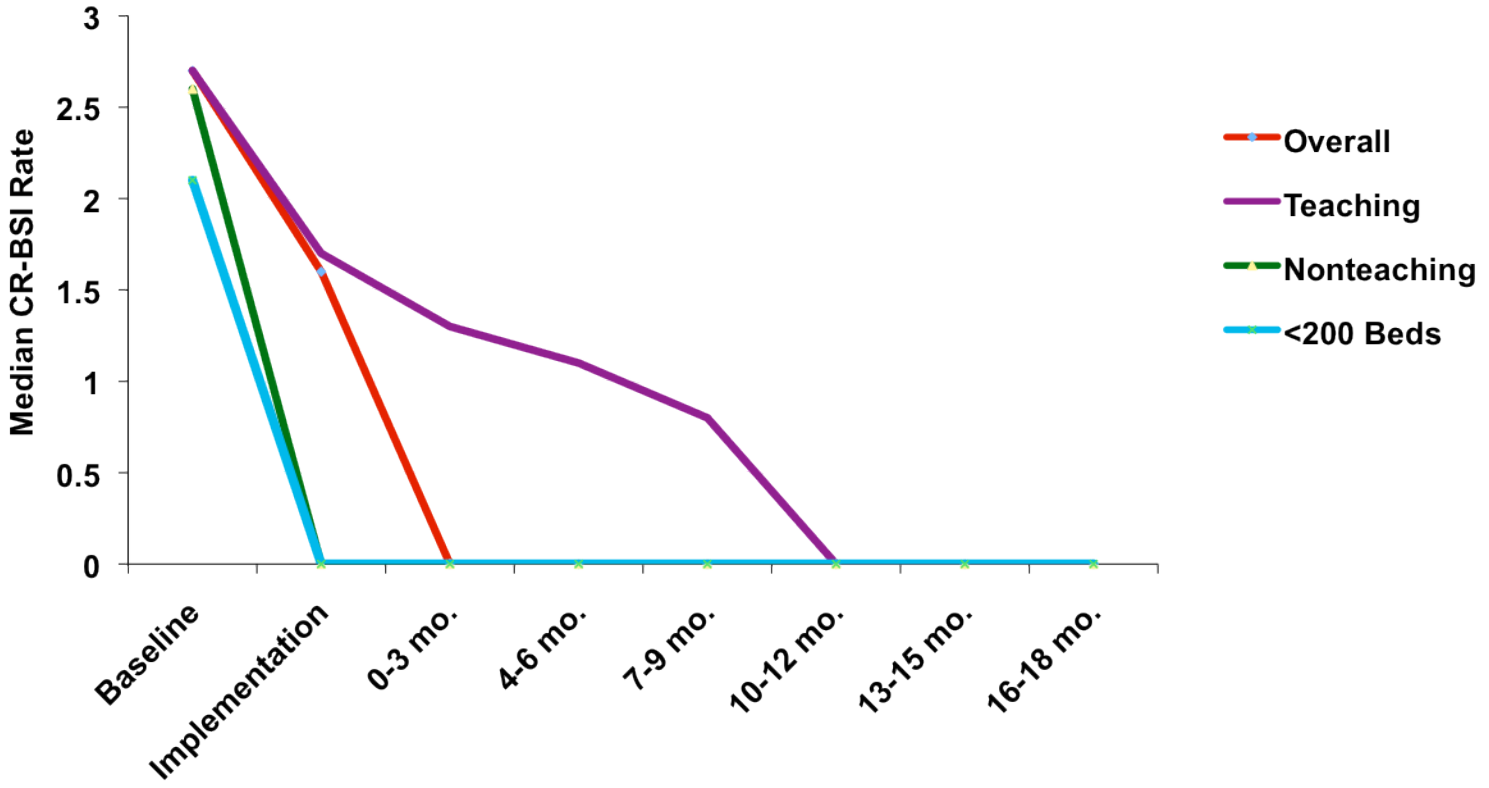
Murphy DM. Dispelling the Myths: The True Cost of Healthcare APIC Briefing Feb 2007

Michigan Health and Hospital Association

- Keystone Project: 108 ICUs across the state of Michigan
- Evidence-based intervention included:
  - Central line bundle
  - Daily goals sheet
  - VAP prevention
  - Safety program
  - Support from hospital administration
- Results: large (66%), sustained reduction in CLABSI

Pronovost P. New Engl J Med 2006;355(26):2725-32

Michigan Health and Hospital Association



Pronovost P. New Engl J Med 2006;355:2725-32.

Where Are We Now With Respect to CR-BSI?

- Pathogenesis
- Evidence based practices
- Process improvement initiatives
- Achieving cultural transformation
- Future Challenges

There Are Multiple Sources of Infection

A

Skin organisms

Endogenous
- Skin flora

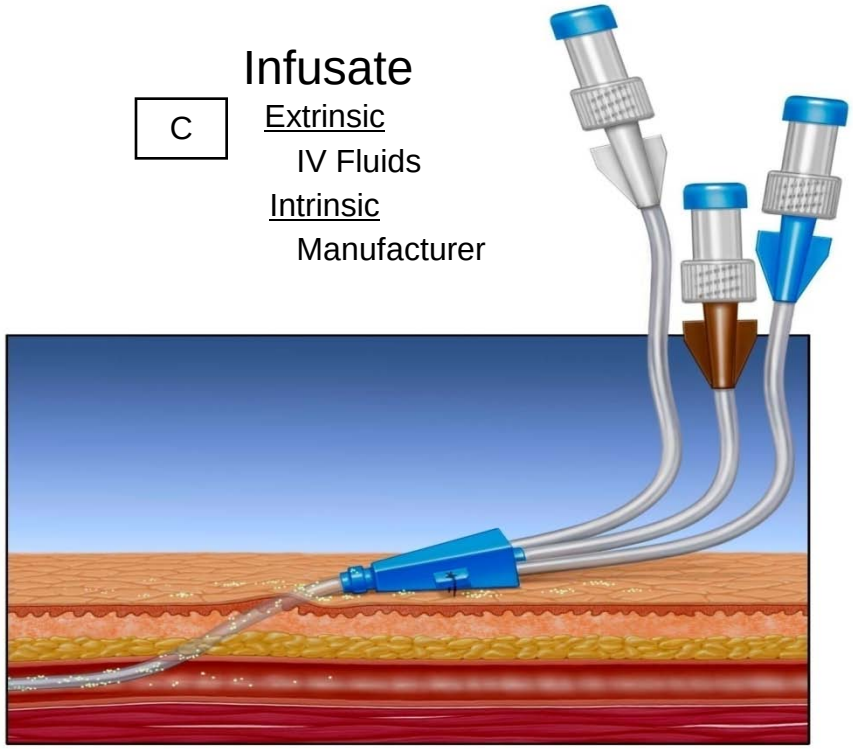
Extrinsic
- HCW hands
- Contaminated disinfectant

C

Infusate

Extrinsic
- IV Fluids

Intrinsic
- Manufacturer



B

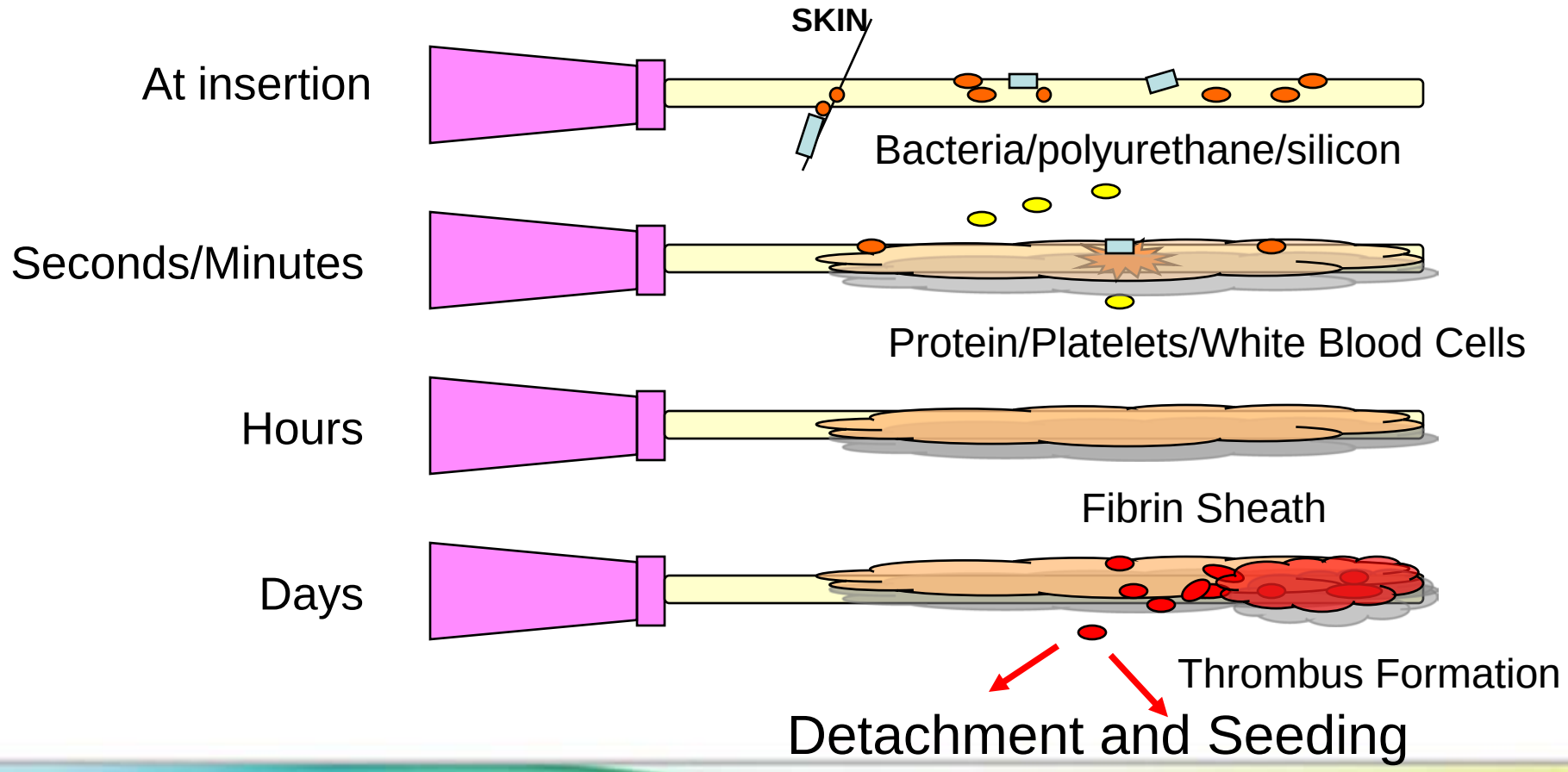
Catheter hub

Endogenous
- Skin flora

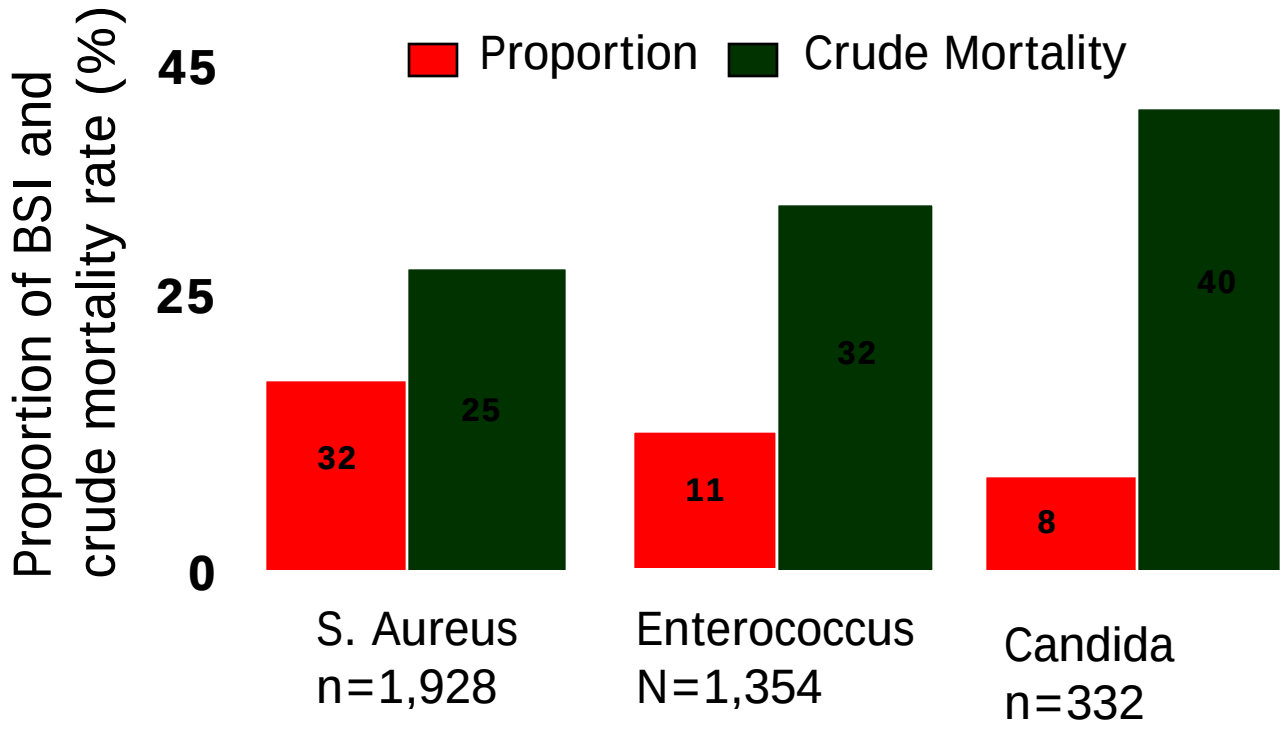
Extrinsic
- HCW hands

Nearly 80% of CR-BSI originate from skin flora

Catheter-Related Blood Stream Infections: Bio-film Formation



Variable Mortality Rate By Organism Causing Nosocomial Infection



Jerome E Granato MD 2010

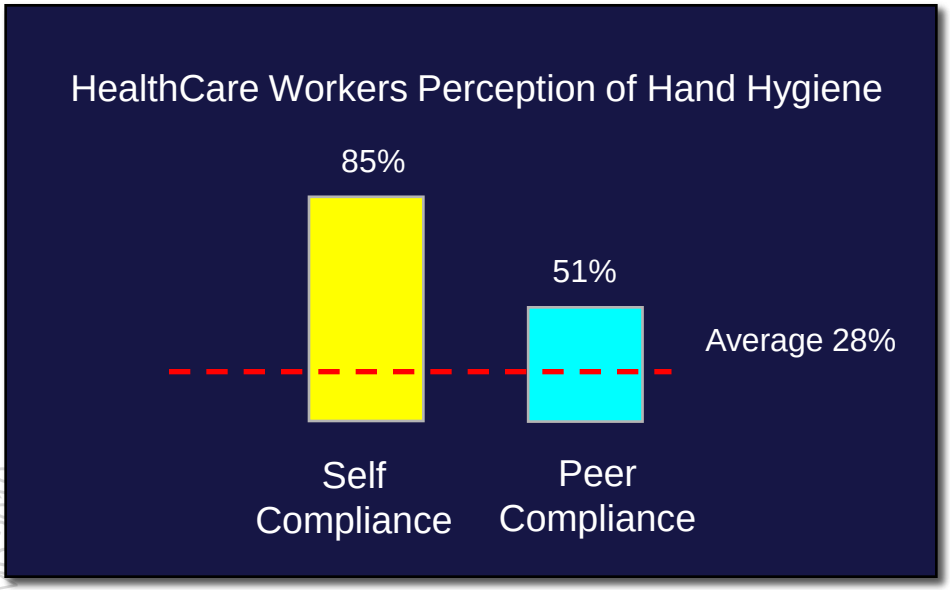
Wenzel. Emerg Infect Dis. 2001;7:174

APIC

Enforcing Hand Hygiene Is Important

- Hand hygiene must be performed prior to insertion or manipulation of any vascular catheter [IA]
- Can be accomplished with soap and water or an alcohol-based hand sanitizer[1]
- Use of gloves during procedure does not remove need for proper hand hygiene

Enforcing Hand Hygiene Is Difficult



*Pittet D.*Annals Int Med 2004 141:1

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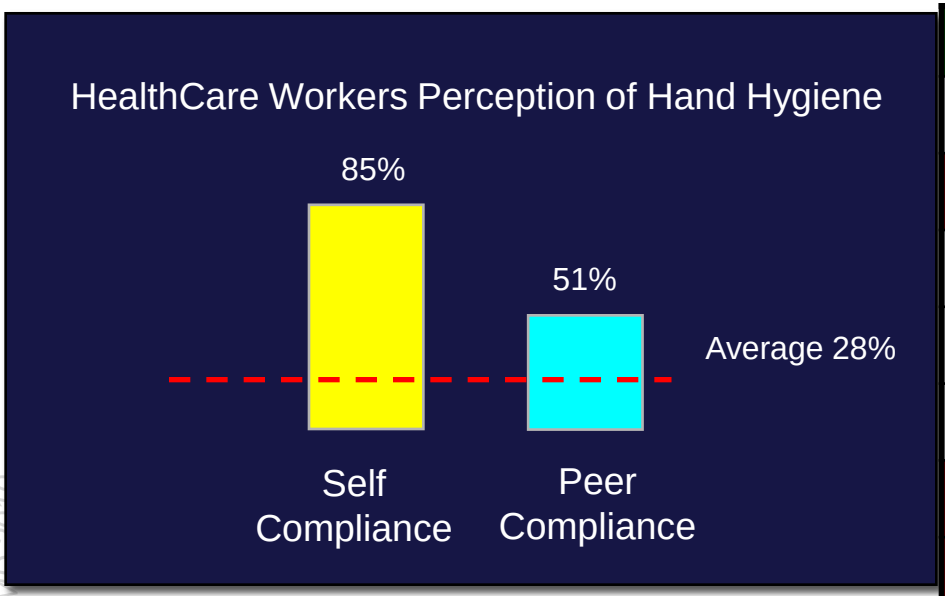


Medical Specialty	Percent Compliance
Internal Medicine	87.3%
Surgery	36.4%
Critical Care	62.6%
Pediatrics	82.6%
Geriatrics	71.1%
Anesthesiology	23.0%
Emergency Medicine	50.0%
Other	57.2%

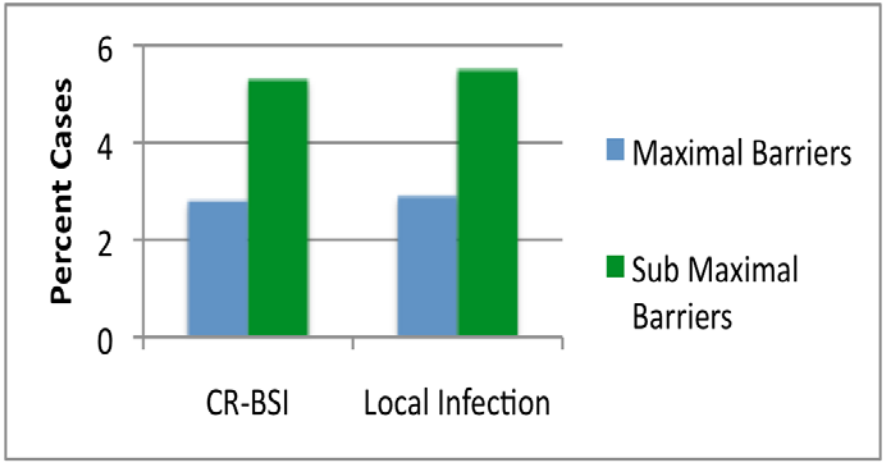
*Pittet D.*Annals Int Med 2004 141:1

Using Maximal Sterile Barriers Matters

- Use of sterile gown, gloves, and large drapes, and non-sterile masks and caps reduces incidence of CR-BSI [IA]

Requiring Maximal Sterile Barriers

- Maximal barrier precautions reduce the incidence of infection



- Maximal barrier precautions are cost effective
- For every 270 catheters placed:
  - Seven CR-BSI *avoided*
  - One death *prevented*
  - $68,000 *saved*

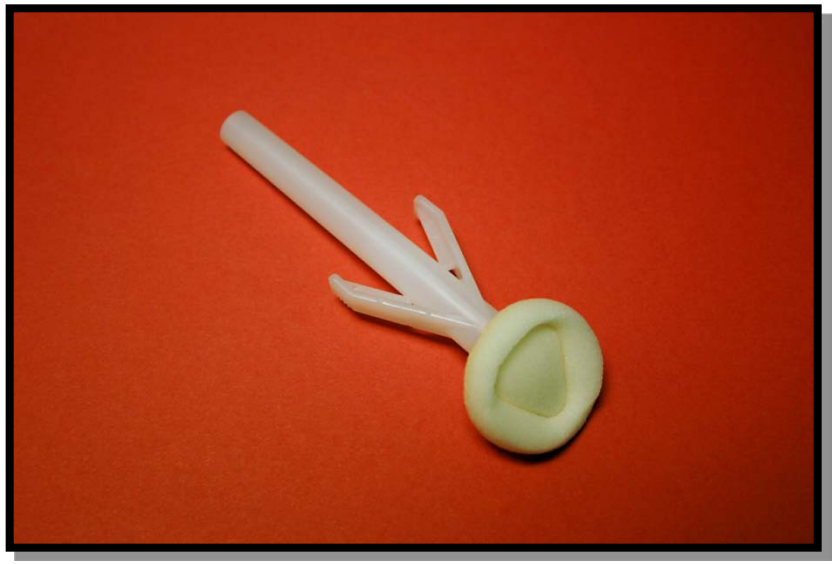
Hu KK, Veensttra DI, Lipsky BA at al.
Clin Infect Dis. 2004;39:1441

Insertion Site Preparation Is Important

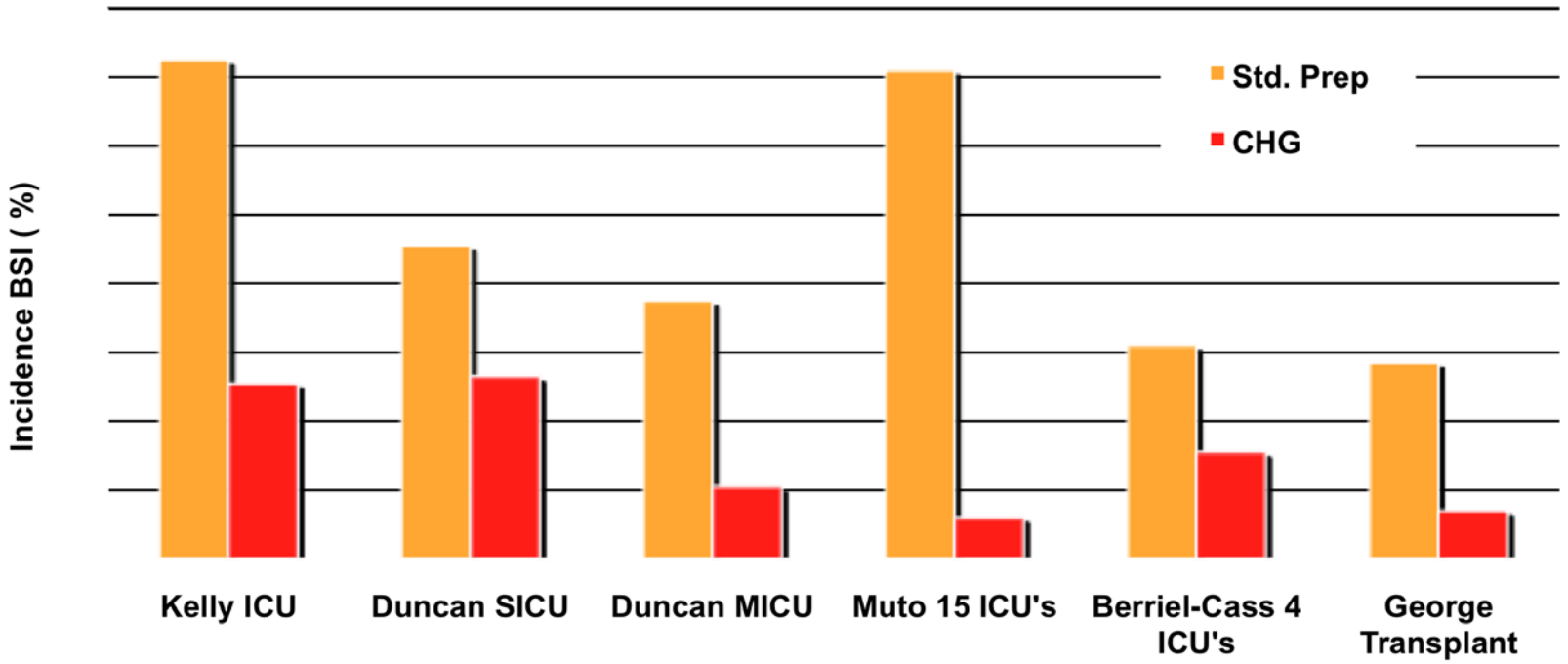
- 2% CHG is preferred antiseptic for prevention of catheter-related infections

  Tincture of iodine, iodophors, 70% alcohol listed as alternatives.

  Use of CHG in infants <2 months of age is unresolved issue but there is question of skin irritation.



Evidence Supporting 2% CHG Use



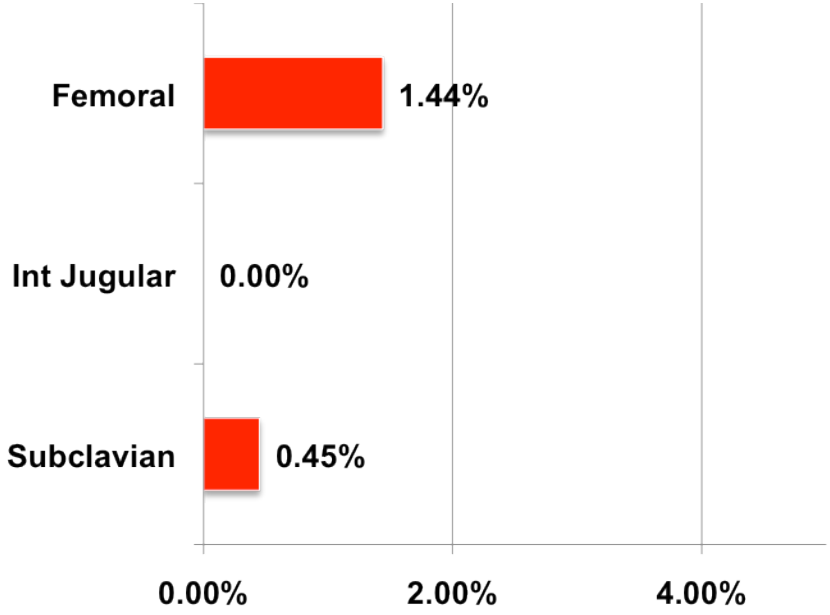
The Site of Insertion Matters

Catheter Location	Overall Infection	Sepsis	Partial Thrombosis	Complete Thrombosis
Subclavian	4.5%	1.5%	1.9%	0%
Femoral	19.8% *	4.4% †	21.5% *	6% ‡

Merrer J De Jonghe et al. JAMA 2001; 286:700

Operator Training and Experience May Matter

831 insertions 4735 line days



- Teaching Hospital
- Minimum of 50 Insertions
- Attending and Fellows only
- Coverage 24/7

Deshpande KS, Hatem C, et al. Crit Care Med 2005 33(1):13

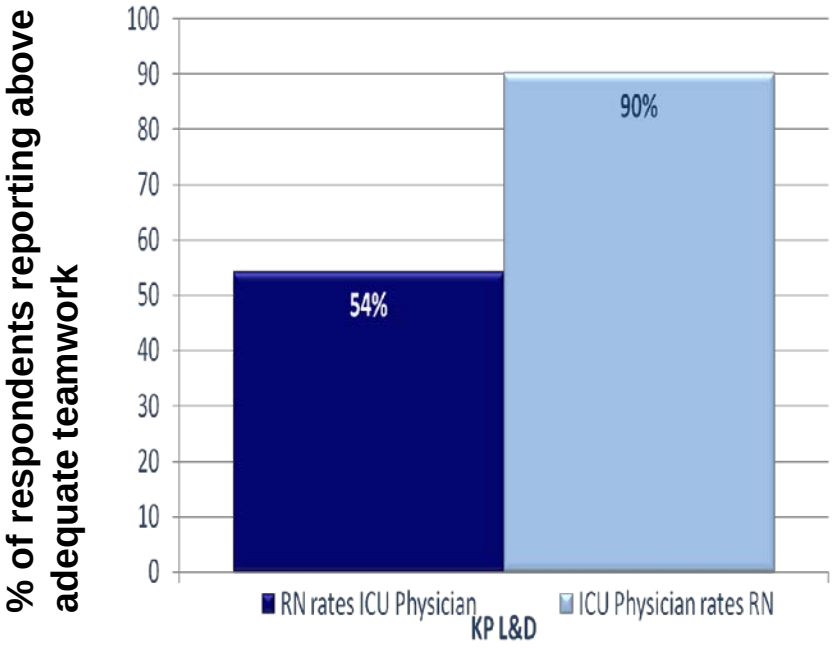
The Importance of Nursing Care

- Doubling hours of float nurses/shift
- Increasing nursing ratio from 1:1 to 2:1
- Floating nurse care > 60% catheter days

- CR-BSI rate 4x
- CR-BSI rate 6x
- CR-BSI rate 2x

Robert J, Fridkin SK, et al. Infect Control Hosp Epidemiol 2000,21:12
Fridkin SJ, Pear Sm et al. Infect Control Hosp Epidemiol 1996,, 17:150
Alonso-Echanove J, Edwards JR et al., Infect Control Hosp Epidemiol 2003; 24:916,21:12

ICU Physicians and ICU RN Collaboration

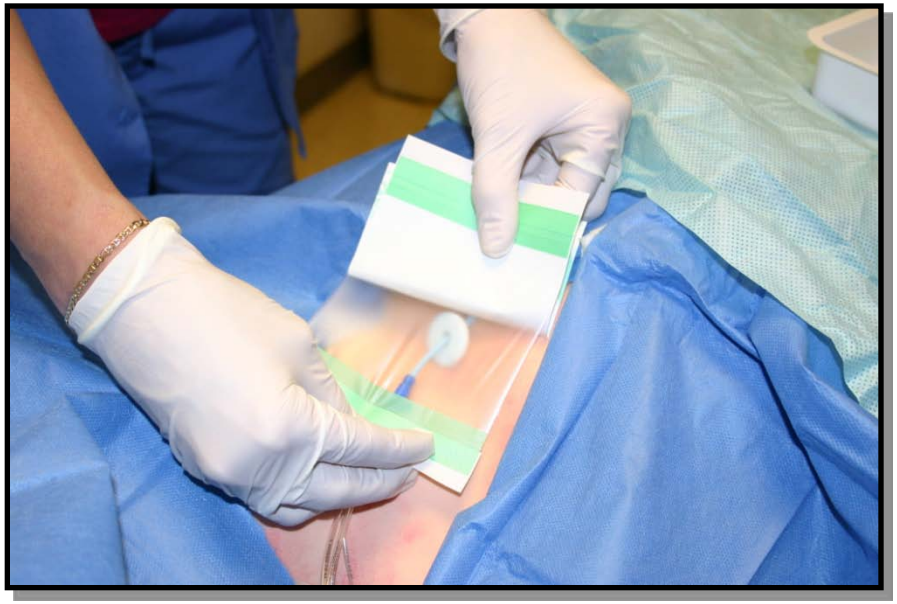


- Many misperceptions
- More nursing empowerment
- Regular meetings and communication

Needham D, Thompson D, Holzmueller C, et al., Crit Care Med, 2004.

Standardized Catheter Site Care

- Use chlorhixidine impregnated patch
- Catheter site remains covered with sterile gauze or a sterile, transparent, semi-permeable dressing [IA]
- Do not routinely change dressing



Standardized Catheter Site Care

- During dressing changes, disinfect skin with chlorhexidine (or other antiseptic) [IA]
- Antibacterial ointments should not be used on insertion sites due to increased risk of fungal infections[1] and antimicrobial resistance [IA]

Evidence-Based Guidelines

- Enforcing hand hygiene
- Maximal barrier precautions
- Insertion site preparation
- Insertion site selection
- Daily review of line necessity, with prompt removal of unnecessary lines

Barriers To Change

- **High staff turn over**

- **New Residents**
- **Medical students**
- **Nursing staff.**

Training

Relevance *Challenging!*

Interest

Barriers To Change

- **High staff turn over**
- **Competing projects**

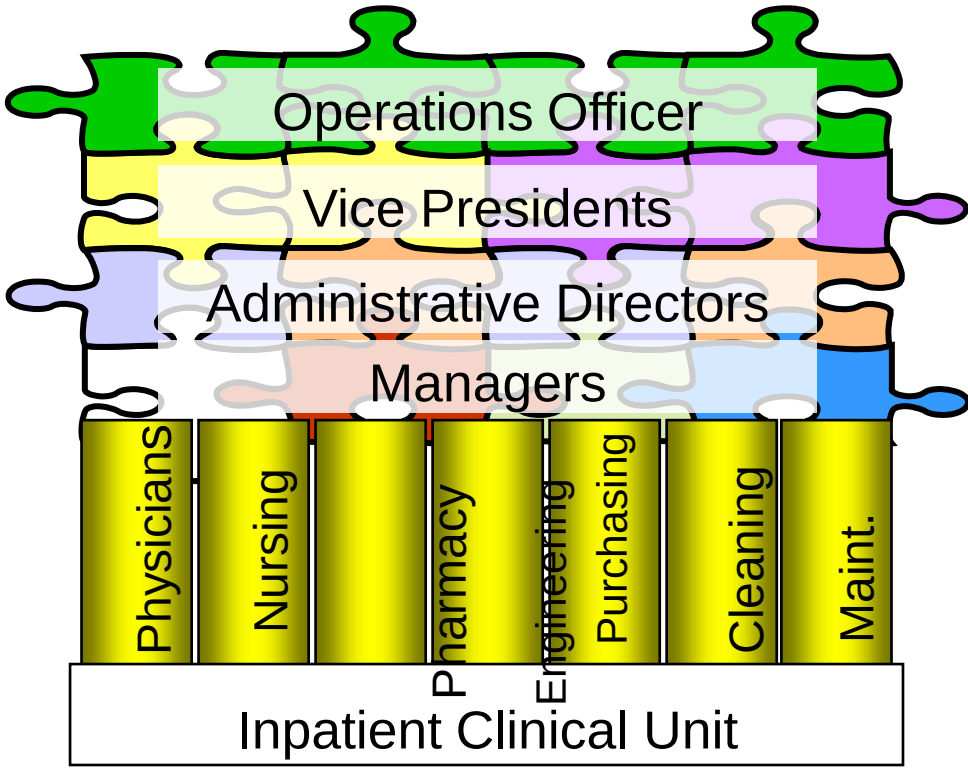
- Reduction in UTI
- MRSA transmission
- Reduction in VAP
- Decubitus ulcer protocol
- Improving patient transport and flow
- Conversion to an electronic medical record

Barriers To Change

- **High staff turn over**
- **Competing projects**
- **Winning a mandate**
- **Hospital administration.**
- **Physician leadership**

Barriers To Change

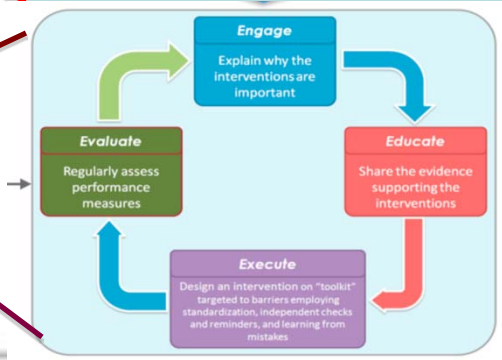
- High staff turn over
- Competing projects
- Winning a mandate
- Challenging organizational structure



Essential Ingredients For Cultural Change

- Frame the problem in a ***larger and more relevant*** context.
- Engage collaborative multidisciplinary teams

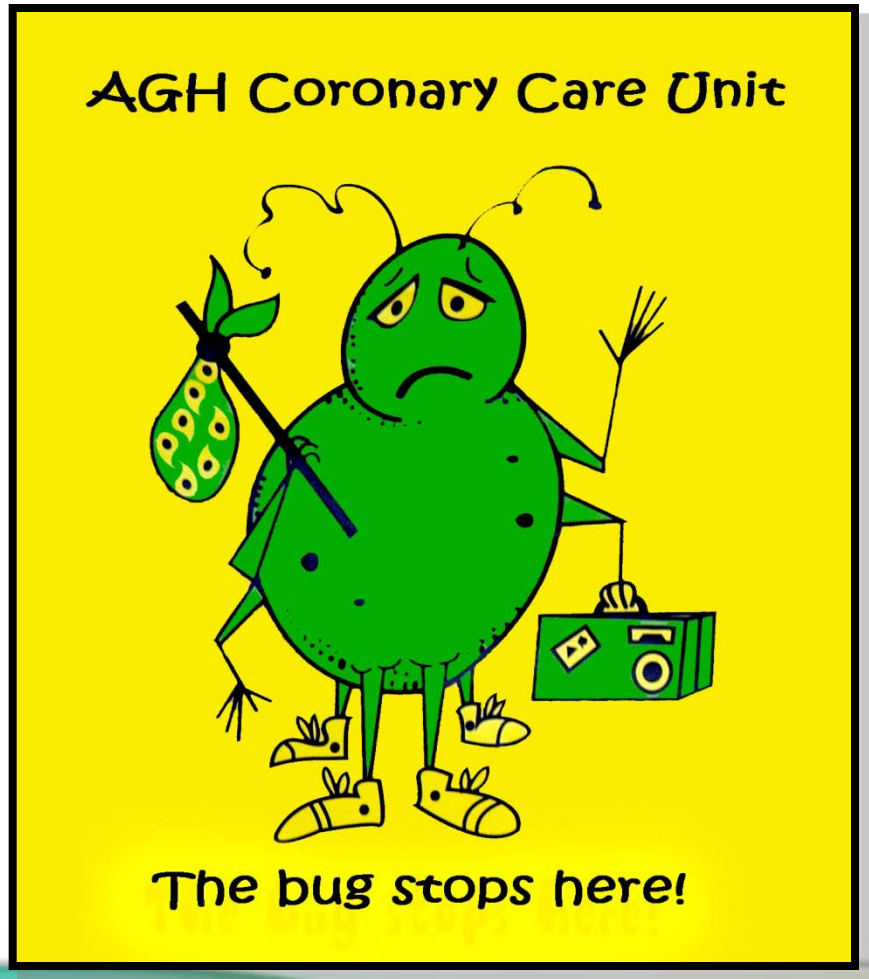
1. ***Know*** The Evidence
   - **Select** interventions clearly associated with improved outcomes.
   - **Implement** interventions that are easiest.
   - **Convert** interventions to behaviors: Training, Testing Promoting
2. ***Identify*** Barriers To Implementation
   - **Observe** staff performing interventions.
   - **Enlist** all of the stakeholders in improving the process.
   - **"Walk the process"** from beginning to end.
3. ***Measure*** Performance
   - ***Real time*** analysis.
   - ***Record*** the right metrics: Process and/or outcome.
   - ***Post*** the information.
4. ***Never*** Stop !



Adapted from Pronovost, Berenholtz, Needham. BMJ 2008

Culture Change Can Be Achieved

We Are Serious About Stopping Infection!



Contact Information

Jerome E. Granato MD

Medical Director, Coronary Care Unit

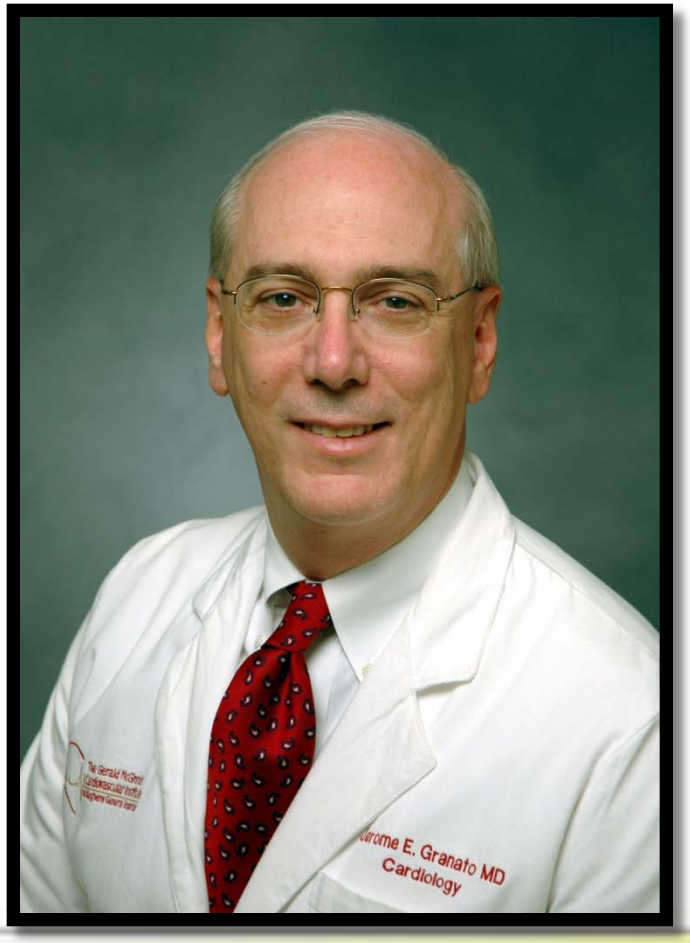
Allegheny General Hospital

320 East North Avenue

Pittsburgh, Pennsylvania 15212

412 359-4997

JGranato@WPAHS.org



Selected Reading

- Murphy D, et al. *Dispelling the Myth: The True Cost of Healthcare Infections*:. APIC briefing 2007 http://apic.org
- Pronovost P. at al. *Intervention to Decrease CVC-related Bloodstream Infections.* New England J Med 2006;355(26):2725-32
- O Grady NP et al. *Guidelines for the Prevention of Catheter Related Infections.* MMWR (RR10) 1-26

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