

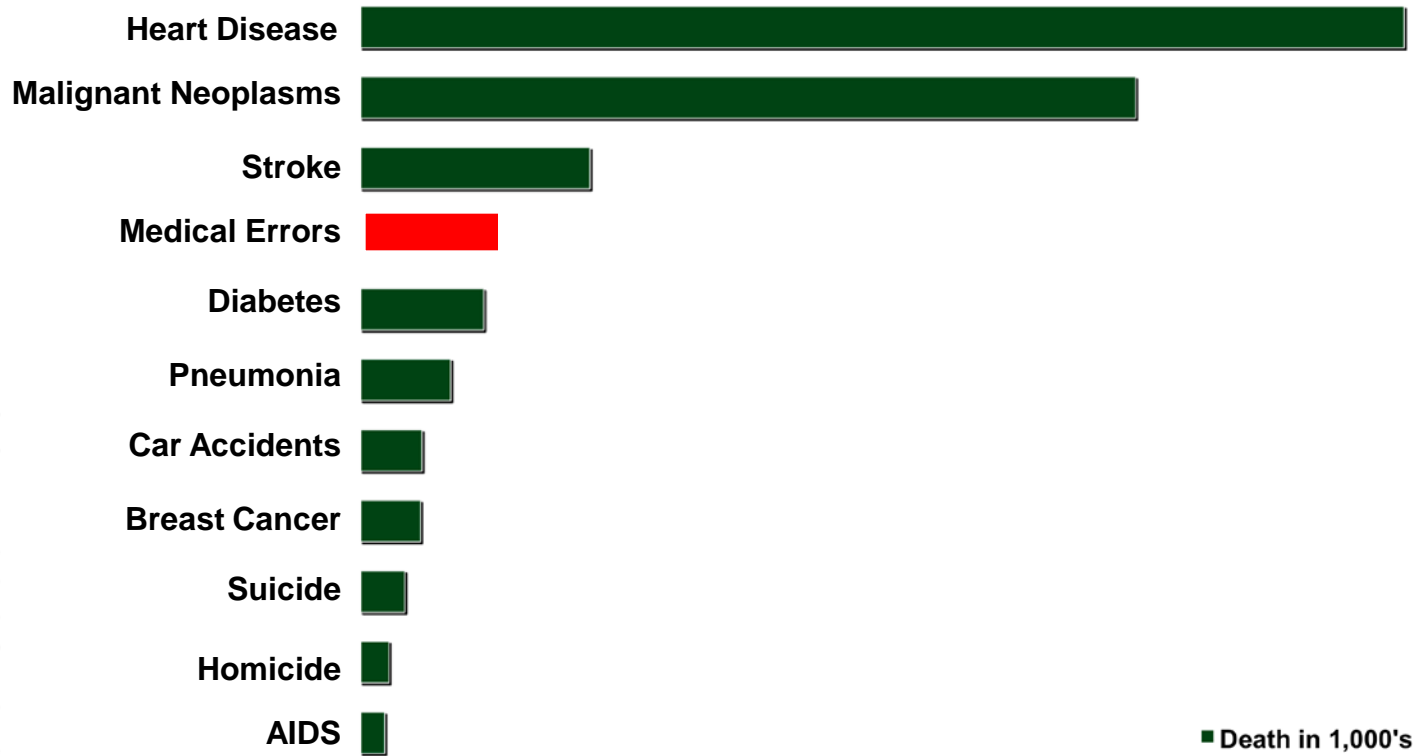
Eliminating Healthcare Associated Infections:

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



American Heart Association® 

Learn and LiveSM

MENTAL HEALTH AWARENESS WEEK

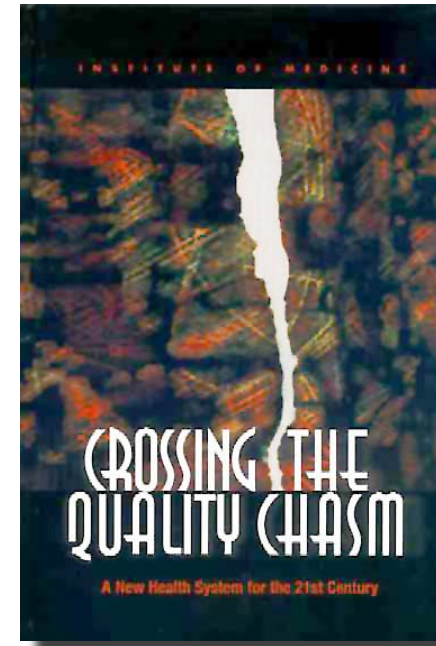
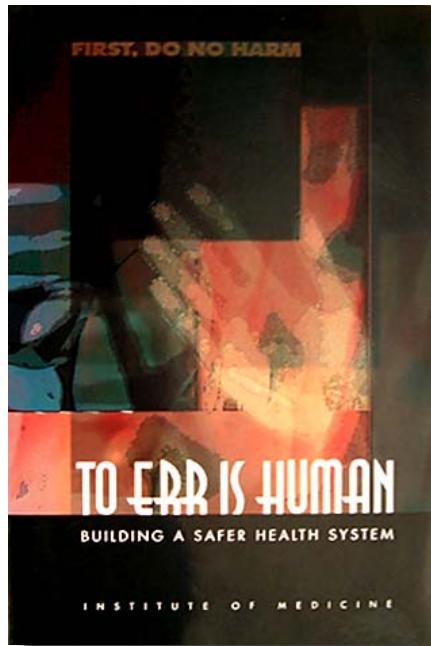
GUN CONTROL = CRIME CONTROL

 National Black HIV/AIDS Awareness Day

Get Educated | Get Tested | Get Involved | Get Treated

Source: CDC mortality data 1997

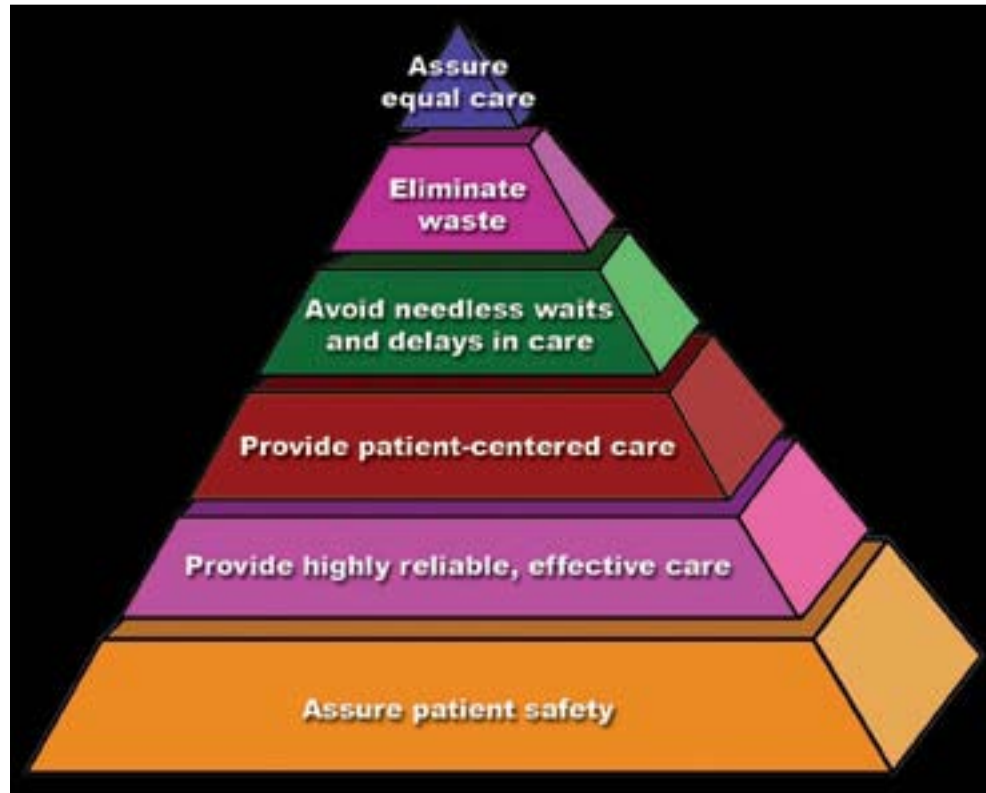
Where It All Started



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



PHC4

PENNSYLVANIA HEALTH CARE
COST CONTAINMENT COUNCIL

The Advent of Public Reporting

PHC4 PENNSYLVANIA HEALTH CARE COST CONTAINMENT COUNCIL

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Pennsylvania Health Care Cost Containment Council

is an independent state agency responsible for addressing the problem of escalating health costs, ensuring the quality of health care, and increasing access for all citizens regardless of ability to pay.

Agency Spotlight

Hospital Financial Analysis 2006 Volume One **NEW**

PHC4's latest financial report, *Financial Analysis 2006, Volume One*, is now available. *Volume One*, the second report in the *Financial Analysis 2006* series, presents an overview of the financial health of Pennsylvania's general acute care hospitals. The information in this report, which focuses primarily on fiscal year 2006, is hospital specific and was derived from data supplied by each hospital.

Cardiac Surgery in Pennsylvania 2005


In the first of its kind, PHC4's new report expands to include heart bypass, valve and combination bypass and valve procedures as well as average commercial insurance and Medicare payments for individual hospitals.

Interactive Databases

- Commercial HMO Reports
- County Profiles
 - Inpatient
 - Ambulatory/Outpatient
- Heart Bypass Reports
- Hip and Knee Replacement
- Hospital-acquired Infections**
- Hospital Financial Reports
- Hospital Performance Reports

- Hospital Performance Report 2005 - Summer Update **NEW**
- Measuring the Quality of Pennsylvania's Commercial HMOs 2005
- PHC4 Research Brief - *Clostridium difficile* Infections in Pennsylvania Hospitals
- PHC4 Symposium - The Road to Value in Health Care
- Hospital-acquired Infections in Pennsylvania 2005

The Advent of Public Reporting


PENNSYLVANIA HEALTH CARE
COST CONTAINMENT COUNCIL

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Hospital-acquired Infections in Pennsylvania 2005

This interactive database can be searched by hospital, by infection, and by peer group.

Selecting a hospital will show hospital-acquired infection data for the specified facility or for all facilities if that option is chosen.

Selecting an infection will show data for a single infection type, all infections (listed individually), or overall infection numbers (in aggregate). If a single infection is chosen, the user can sort the data by clicking on the measure of interest (e.g. clicking on the heading "Number of Cases" will sort the data by that measure).

Selecting a peer group will show the summary data for the peer group and display the data for each hospital in that peer group.

Select a Hospital:

Select an Infection:

Select a Peer Group:

	Number of Cases	Infection Rate per 1,000 Cases	Mortality		Average Length of Stay in Days	Average Charge
			Number	Percent		
Peer Group 1						
Bloodstream	1,327	2.1	284	21.4	31.8	\$379,425
Abington Memorial						
Bloodstream	57	1.8	19	33.3	26.4	\$415,799
Albert Einstein						
Bloodstream	92	3.9	20	21.7	30.4	\$275,117
Allegheny General						
Bloodstream	51	1.8	12	23.5	39.5	\$228,522
Altoona Regional						
Bloodstream	12	0.8	2	16.7	23.4	\$79,214
Community/Scranton						
Bloodstream	0	NA	NA	NA	NA	NA



The Advent of Public Reporting

Pennsylvania
is an independent

Agency Sp

Hospital Financial



- ⊕ Hospital Performance
- ⊕ Measuring the Impact
- ⊕ PHC4 Research
- ⊕ PHC4 Symposia
- ⊕ Hospital-acquired Infections

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Selecting a peer group will show the summary data for the peer group and display the data for each hospital in that peer group.

Select a Hospital: Allegheny General

Select an Infection: All

Select a Peer Group: Peer Group 1

Mortality

	Number of Cases	Infection Rate per 1,000 Cases	Number	Percent	Average Length of Stay in Days	Average Charge
Allegheny General	27,933	NA	806	2.9	5.2	\$37,626
Cases with Infections	557	19.9	75	13.5	23.0	\$177,716
Urinary Tract	407	14.6	44	10.8	20.8	\$164,374
Surgical Site	41	4.7	2	4.9	12.2	\$63,837
Pneumonia	27	1.0	4	14.8	27.6	\$279,480
Bloodstream	51	1.8	12	23.5	39.5	\$228,522
Multiple	31	1.1	13	41.9	35.2	\$331,295
Cases without Infections	27,376	NA	731	2.7	4.9	\$34,776

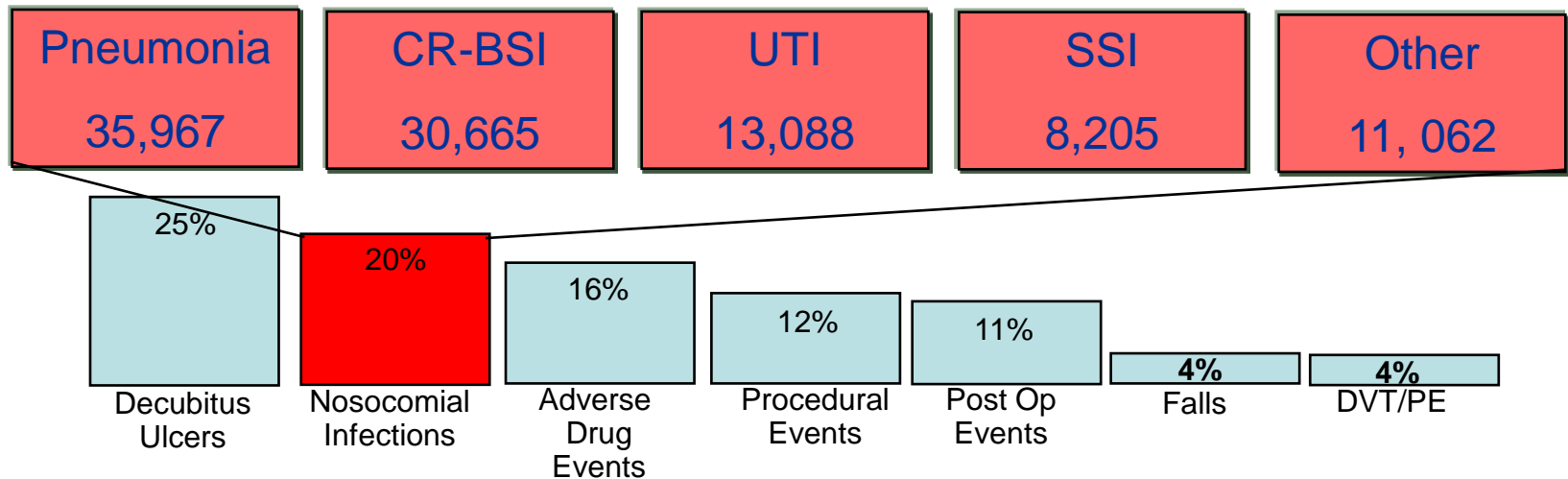
Notes:

- ⊕ NA – Not applicable
- ⊕ NR – Not reported. Had fewer than 5 cases evaluated.
- ⊕ Surgical Site Infection Rate – Based on the number of surgical cases, not the total number of cases.
- ⊕ Milton S Hershey – Electronic surveillance technology was only used to report Quarter 4 - 2005 hospital-acquired infection data.
- ⊕ Three hospitals included in this report closed in 2008: Monsour, Philipsburg Area, and Tara Hospital/Brownsville.

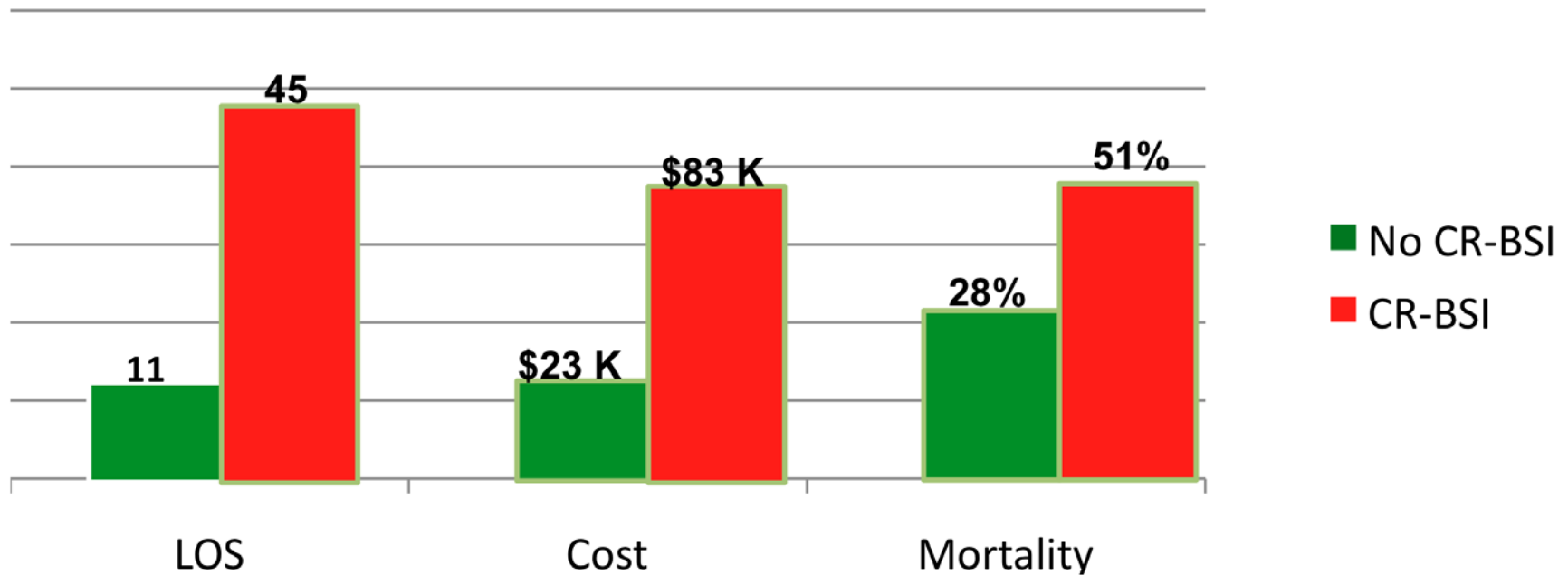
Estimating The Burden of Healthcare Associated Infections

Annual HAI ~1.7 million
(4.5 infections per 100 admissions)

Deaths associated with HAI:
98,987

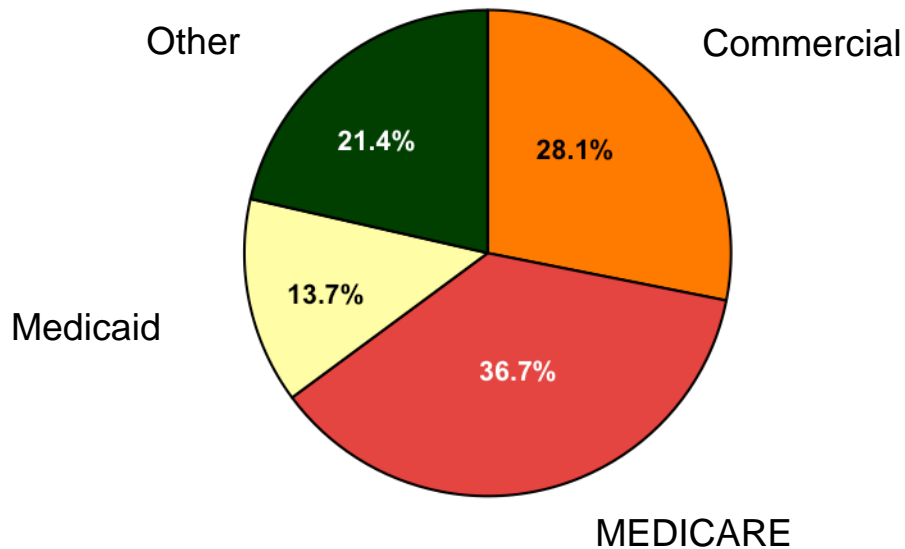


CR-BSI Multiplies The Cost of Care

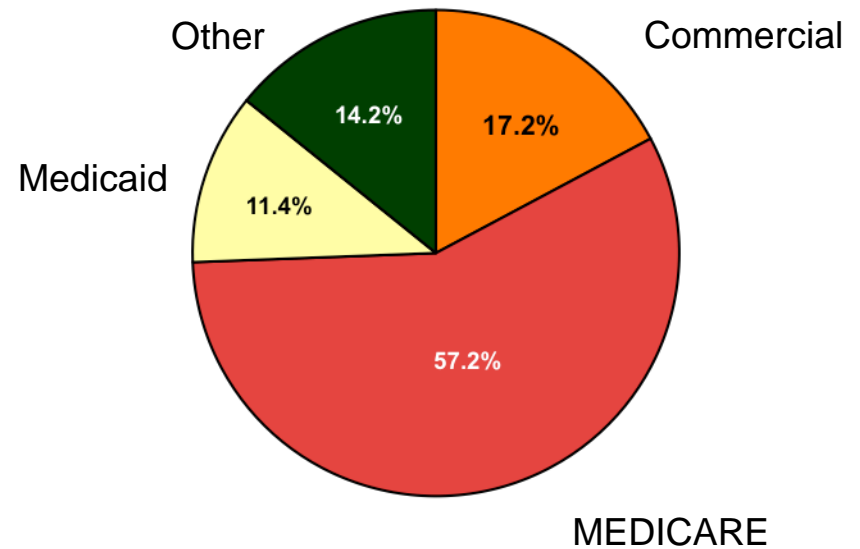


The Burden Is Disproportionate

Patients Without Infection



Patients With Infection



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 !**

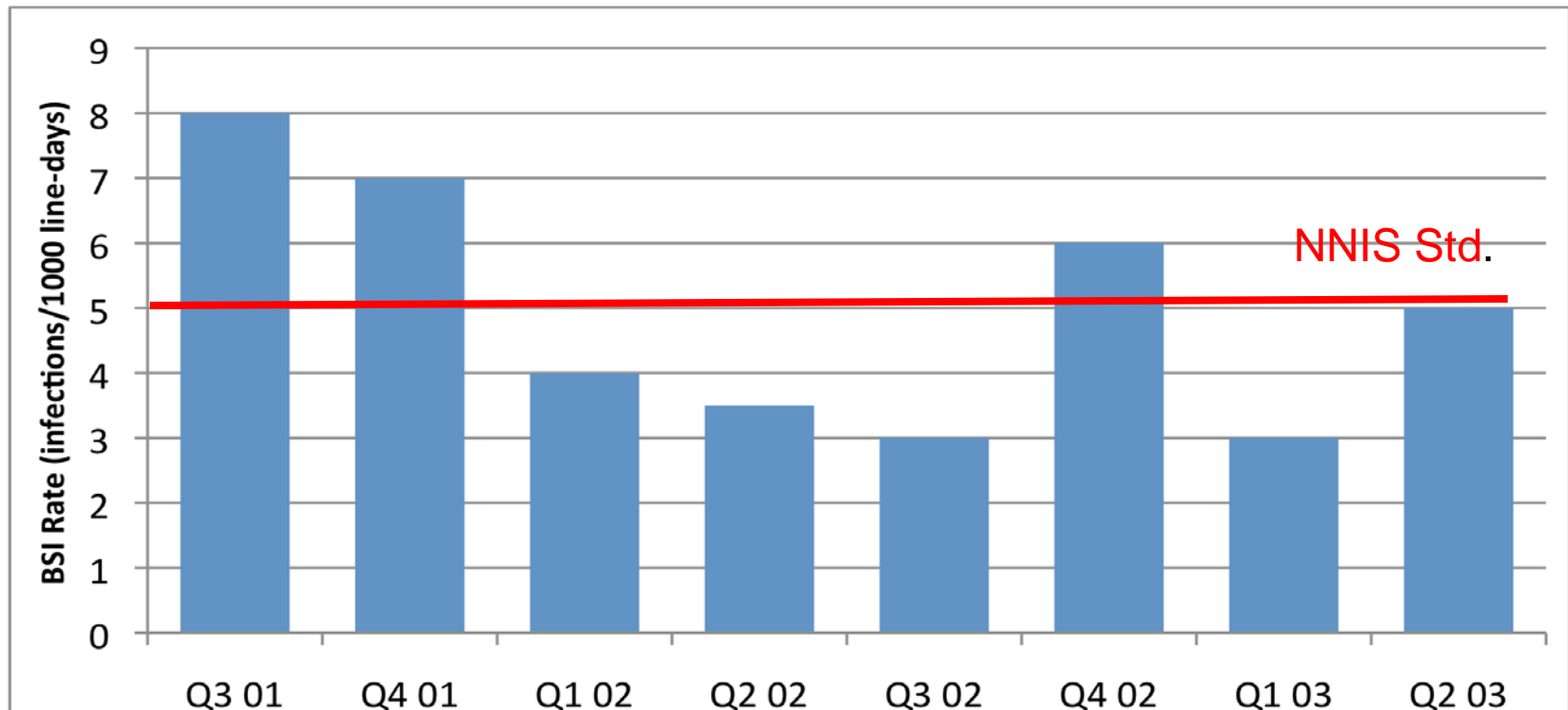
CR-BSI Had Standard” Rates.....

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

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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 specified role of personnel.

"I know how to do this"

"It's how they care for the lines"

"No!"

#!&%#

"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



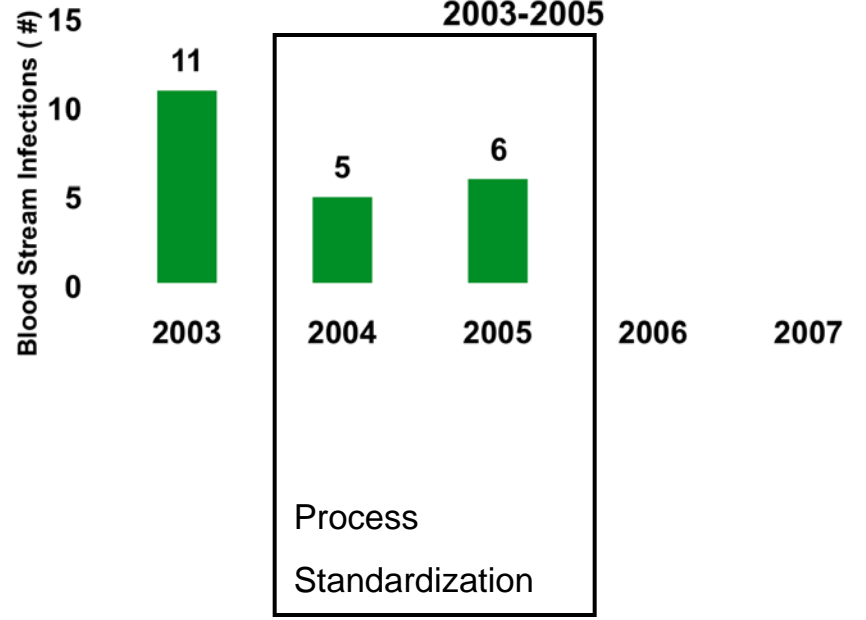
Step 5: Reassess and revise

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

AGH Medical Intensive Care Unit
Catheter Related Blood Stream Infections
2003-2005



AGH Coronary Care Unit
Catheter Related Blood Stream Infections
2003-2005



Jerome E Granato MD 2

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



<p>Central Line Insertion Techniques</p> <p>Jerome E. Granato MD Department of Medicine Allegheny General Hospital May 2005</p>	<p>Anatomic Considerations</p>	<p>Anatomic Considerations</p>	<p>Anatomic Considerations</p>	<p>Anatomic Considerations</p>
<p>Pre Procedure Issues</p>	<p>Pre Procedure Issues</p>	<p>Pre Procedure Issues</p>	<p>Pre Procedure Issues</p>	<p>Internal Jugular Vein Puncture</p>
<p>Internal Jugular Puncture-Technical Aspects</p>	<p>Internal Jugular Puncture-Technical Aspects</p>	<p>Internal Jugular Puncture-Technical Aspects</p>	<p>Internal Jugular Puncture-Technical Aspects</p>	<p>Internal Jugular Puncture-Technical Aspects</p>
<p>Internal Jugular Puncture-Technical Aspects</p>	<p>Radiographic Abnormalities</p>	<p>Radiographic Abnormalities</p>	<p>Reducing The Risk of Infection</p>	<p>Reducing The Risk of Infection</p>

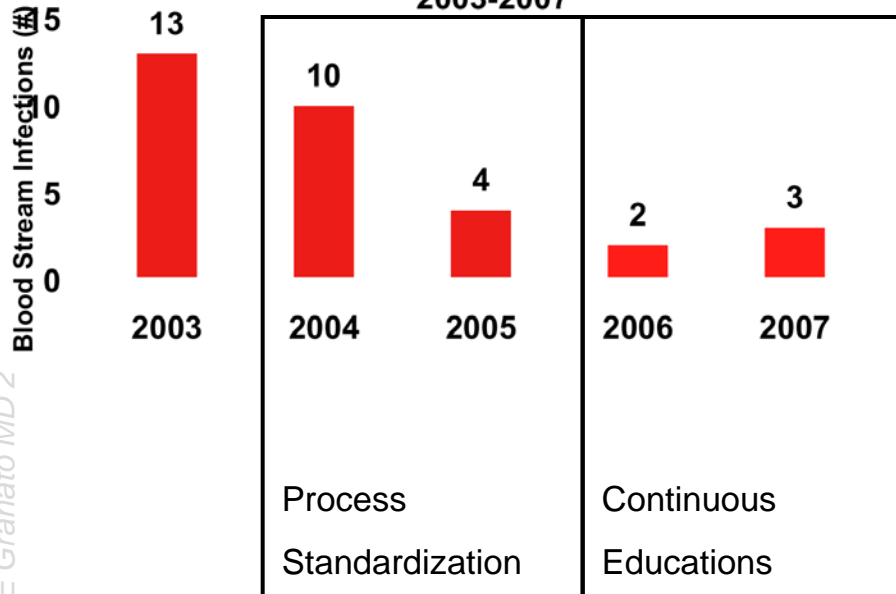
Central Line Self-Learning Module Test

- Which statement is TRUE?
 - The internal jugular vein lies medial to the carotid ar
 - The internal jugular vein lies posterior to the carotid artery.
 - The internal jugular vein lies lateral to the carotid artery.
 - The internal jugular vein lies adjacent to the trachea.
- Which statement is TRUE?
 - The subclavian vein lies beneath the first rib.
 - The subclavian vein lies beneath the medial 1/3 of the clavicle.
 - The subclavian vein lies behind the subclavian artery.
- Which activity is NOT required prior to central line insertion?
 - Compliance with hospital "time out" policy.
 - Obtaining informed consent.
 - Reviewing pertinent lab data.
 - Advising the nursing staff of equipment needs.
 - Antibiotic prophylaxis.
- Strict sterile technique requires all of the following EXCEPT:
 - Vigorous hand washing.
 - Surgical mask, gown and gloves for all participants.
 - Skin preparation with chlorhexidine.
 - Removal of any nasogastric or endotracheal tubes.
 - Sterile drape of entire patient.

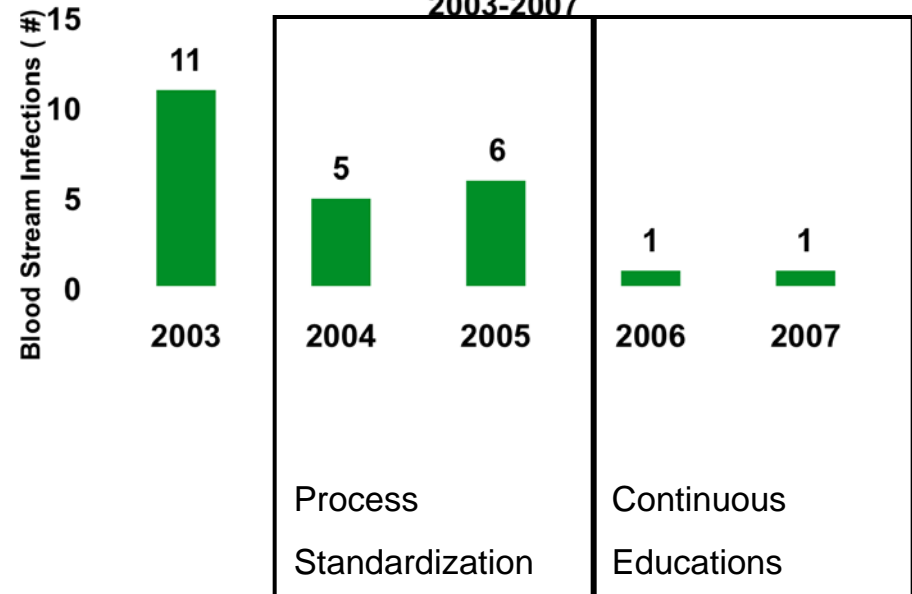
<p>Central Line Insertion and Maintenance Nursing Education Module</p>	<p>Hand Hygiene</p> <ul style="list-style-type: none"> Hand hygiene must be performed before and after any patient contact and all procedures. Wash hands. Use hand sanitizer. 	<p>Hand Sanitizer</p> <ul style="list-style-type: none"> In lieu of handwashing, instant hand sanitizer may be used. Use hand sanitizer with use and apply to all surfaces of hands. 	<p>Preparation for Line Insertion</p> <ul style="list-style-type: none"> Move the EKG leads if necessary. Remove the hair at the insertion site by using clippers (do not use shaving razors). Place a pad under the patient where the line will be inserted. For subclavian insertion, a pillow or rolled towel may be placed under the scapular area for optimum landmark visualization. Place a cap over the patient's head. 	<p>Don a cap and a mask.</p> <ul style="list-style-type: none"> Ensure that all persons in the patient's room are wearing a cap and a mask.
<p>Ensure that the physician is attired appropriately for sterile procedures (sterile gown, cap, mask, and gloves).</p>	<p>Central Line Dressing Procedure</p> <ol style="list-style-type: none"> Wash hands. Open the sterile dressing change tray. Drop the sterile Biopatch onto the sterile field. 	<p>ChlorPrep® Swab</p>	<p>IV Line Maintenance</p> <ul style="list-style-type: none"> IV bags are changed every 24 hours. IV tubing is changed every 96 hours. Exceptions: <ul style="list-style-type: none"> Prepact® IV tubing is changed every 12 hours. Blood tubing is changed at least every 24 hours. TPN tubing is changed every 24 hours. 	<p>Our Progress...</p>
<p>Central Line Complications</p>	<p>Our Progress...</p>	<p>Our Progress...</p>	<p>Our Progress...</p>	<p>Our Progress...</p>

Continuous Education Enhances Process Standardization

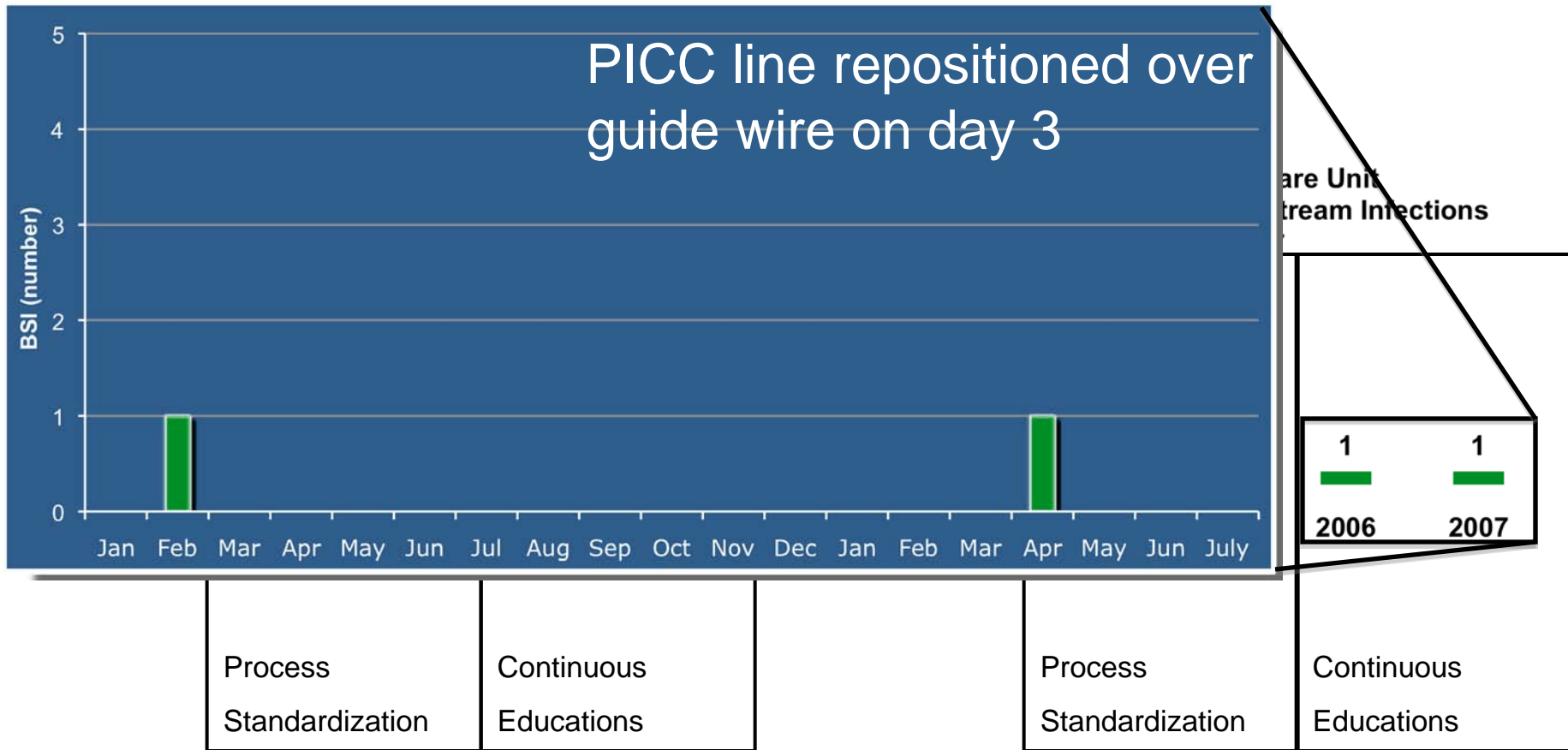
**AGH Medical Intensive Care Unit
Catheter Related Blood Stream Infections
2003-2007**



**AGH Coronary Care Unit
Catheter Related Blood Stream Infections
2003-2007**

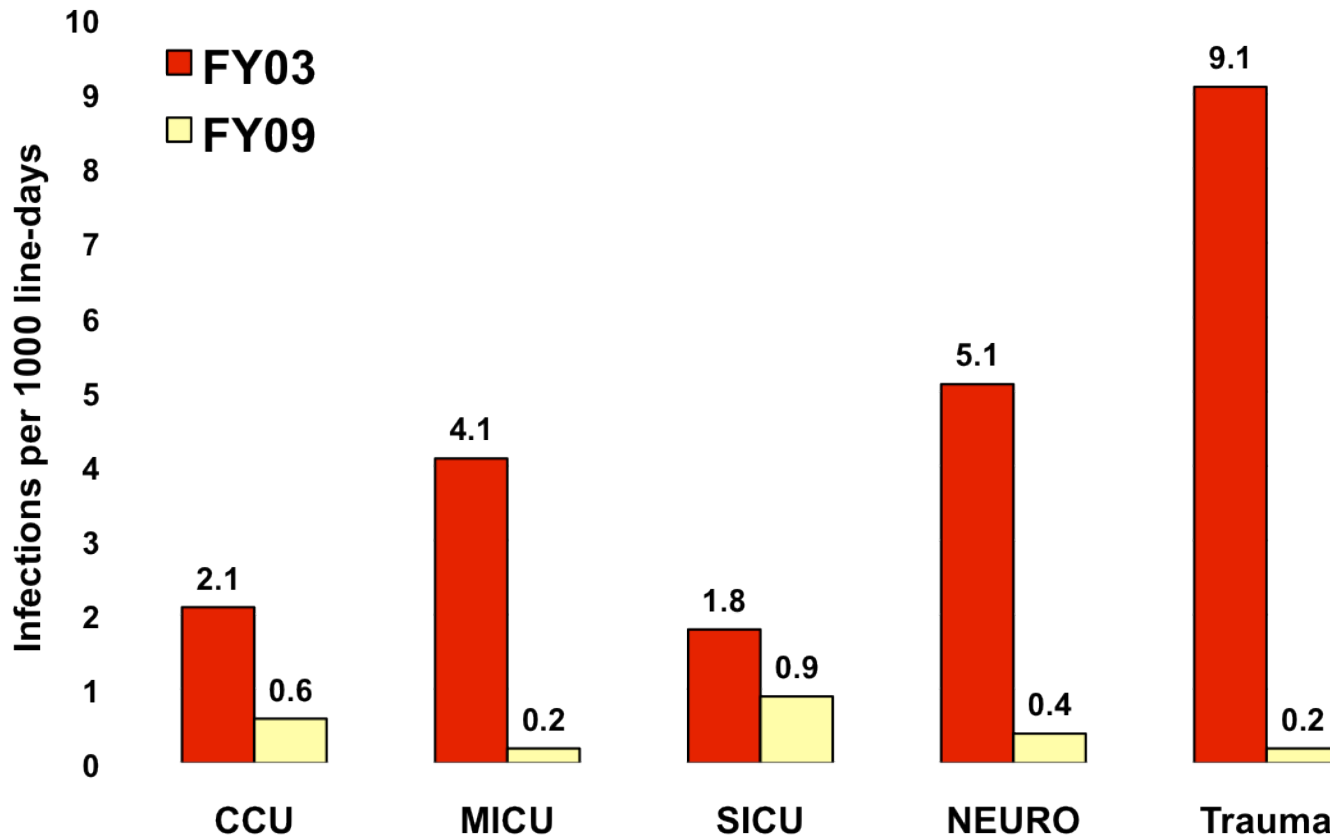


Continuous Education Enhances Process

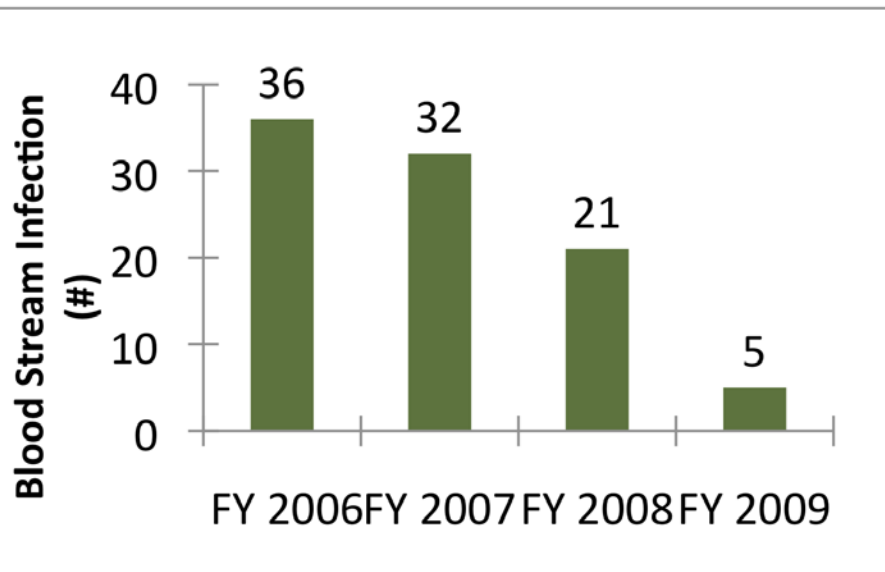


These lessons were readily transferrable to other units

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*

USER'S GUIDE
Eliminating Catheter-Related Complications:
A Guide for More Effective Infection Prevention and Control:
A CME/CNE-Certified Program

APIC

Avoiding Infections at Home in Your Central Line

Emergency?

Eliminating Catheter-Related Complications
A Guide for More Effective Infection Prevention and Control
A CME/CNE Certified Program
APIC

Overview of Central Venous Catheter Safety
Deb Richardson, RN, MS
Virginia Gonzalez, B.S., C.I.C.

APIC

CME/CNE Information
Release Date: June 15, 2007
Expiry Date: June 15, 2009
Estimated Time to Complete Activity:
1 Hours for CME
2 Hours for CNE
CME Credit provided by: education | outcomes | science
CNE Credit Provided by: APIC

Supported by an unrestricted educational grant from Enturia, Inc.

Funded by an unrestricted educational grant from Enturia, Inc.

The Message Has Spread..... *Into the Community*

[skin] isthesource.org

INFECTION PREVENTION SKIN AND INFECTION FAQ'S SKIN FACTS WHAT EXPERTS SAY PRESS ROOM

Play Video

- HOME
- A PERSONAL STORY
- PREVENTINFECTION.ORG
- APIC WEB SITE

TIPS to avoid or reduce the risk of acquiring infection

Skin is the Source of Deadly — Preventable — Infections

Did you know your own skin could be the source of deadly infections that could kill you? Currently, 271 people a day die on average from healthcare-associated infections (HAIs).¹ Many people, possibly including you, aren't even aware of these deadly infections let alone how to prevent them. It all starts at their source — your skin.

The Message Has Spread..... *Across the Ocean*

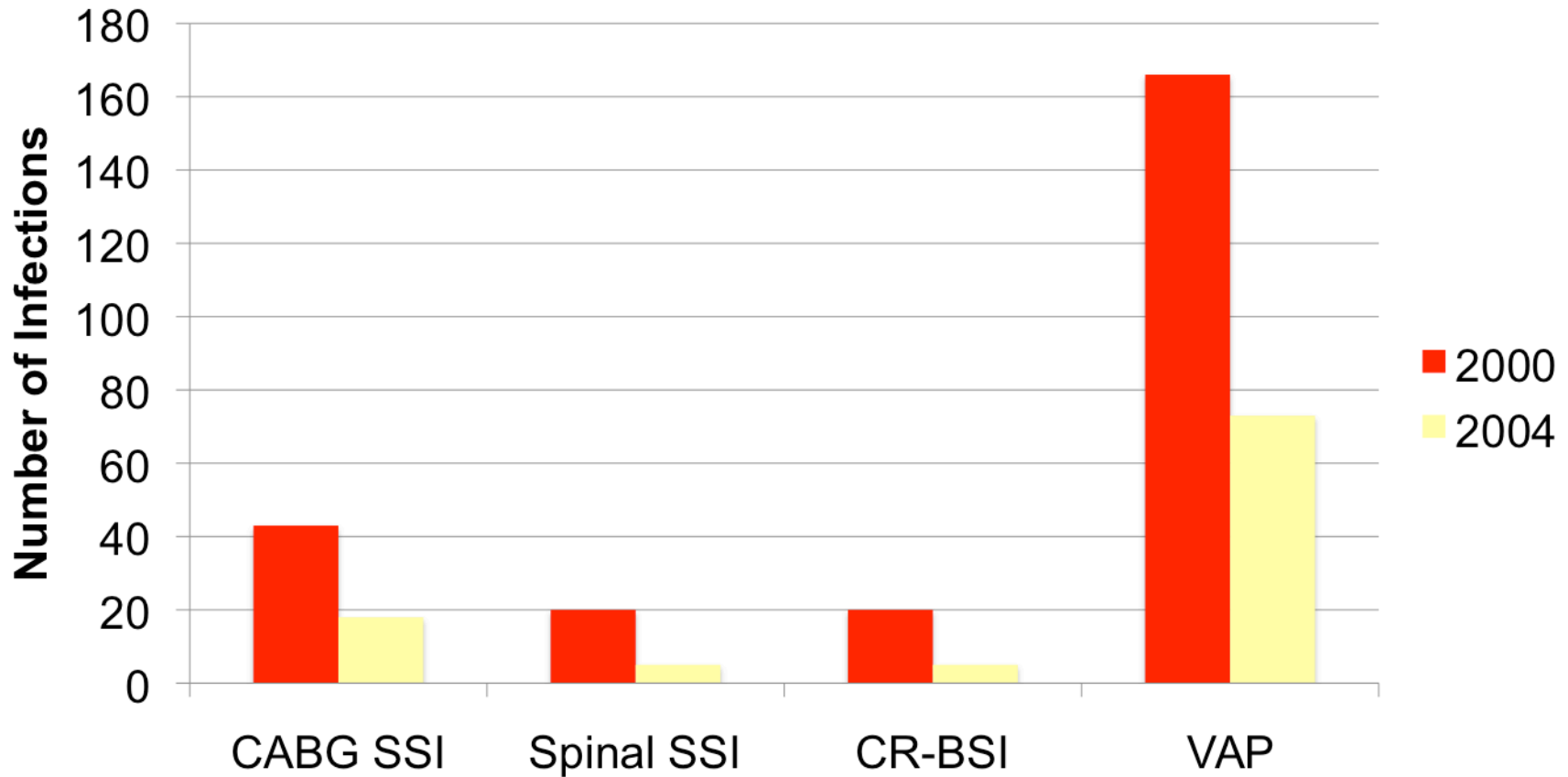


Process Standardization and Continuous Training Leads to the Elimination of Catheter Related Blood Stream Infections (CR-BSI)

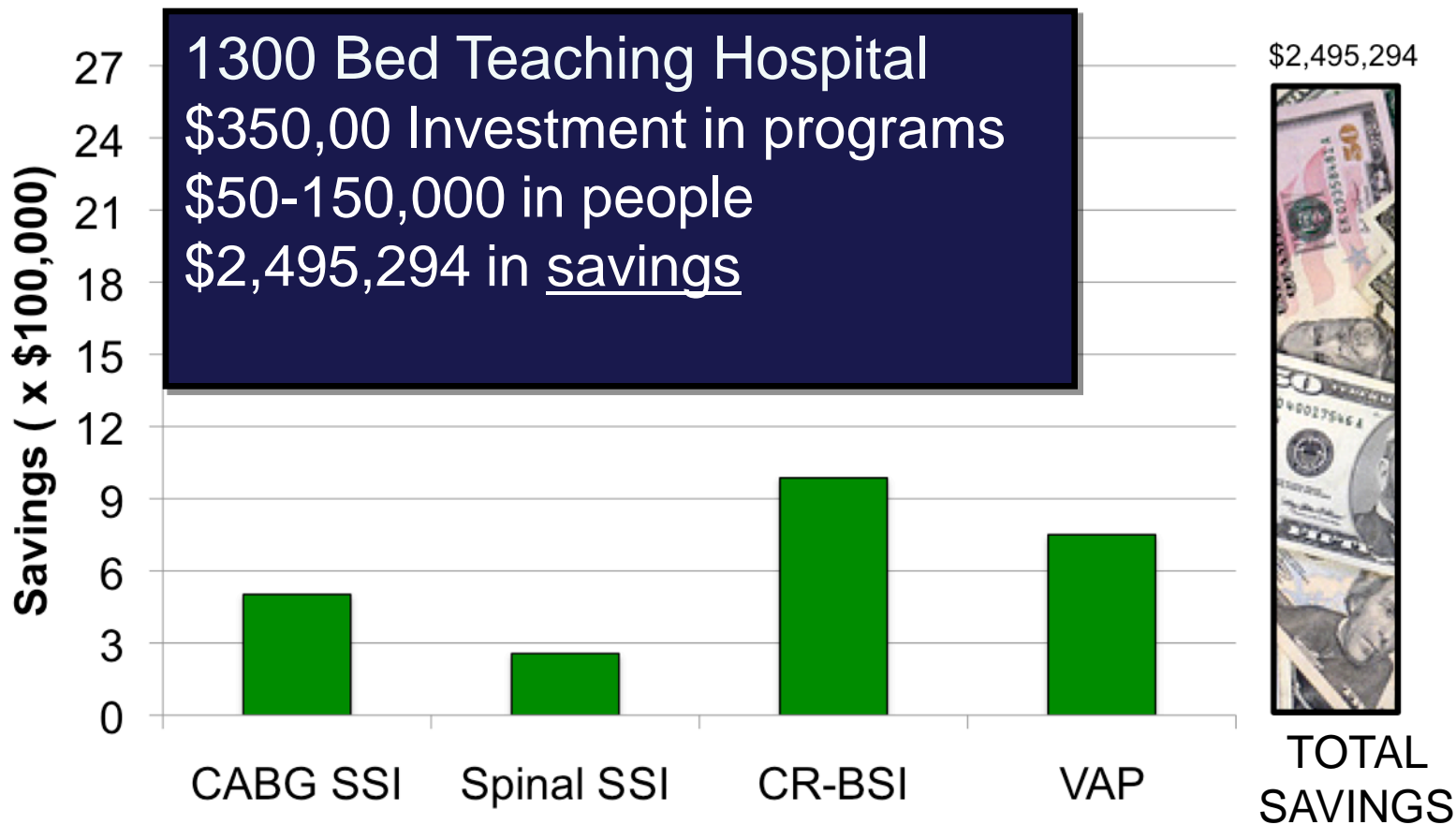
Jerome E. Granato MD MBA, Kimberly Curry RN BSN , Joy Peters RN MSN MBA, Julie Gerstrbein RN MSN CCRN, Veronica Andrews RN, Cheryl Herbert RN CIC, Richard P Shannon MD.

Allegheny General Hospital Pittsburgh, Pennsylvania, USA

Barnes-Jewish Healthcare HAI Elimination Efforts



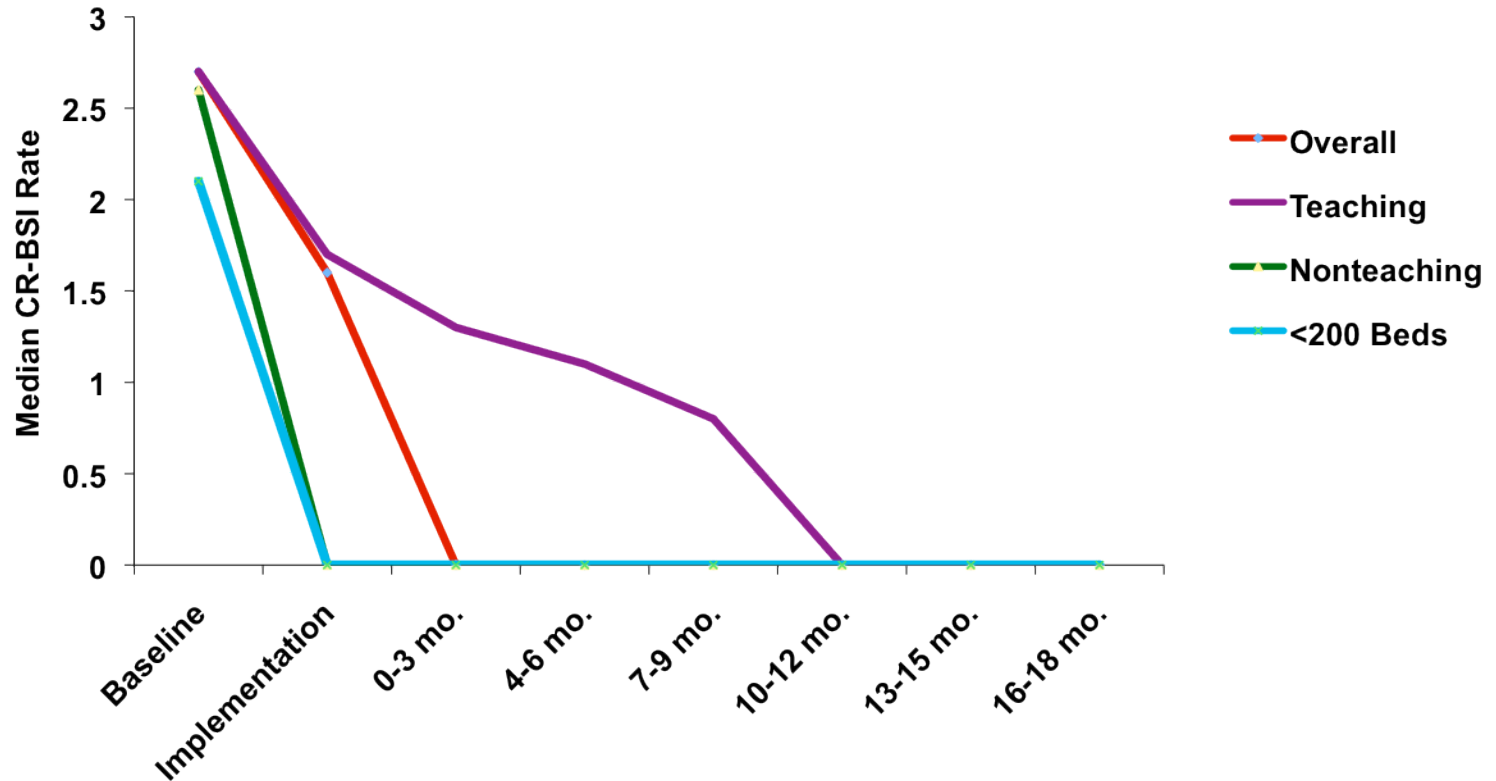
Barnes-Jewish Healthcare HAI Elimination Efforts



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

Michigan Health and Hospital Association



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

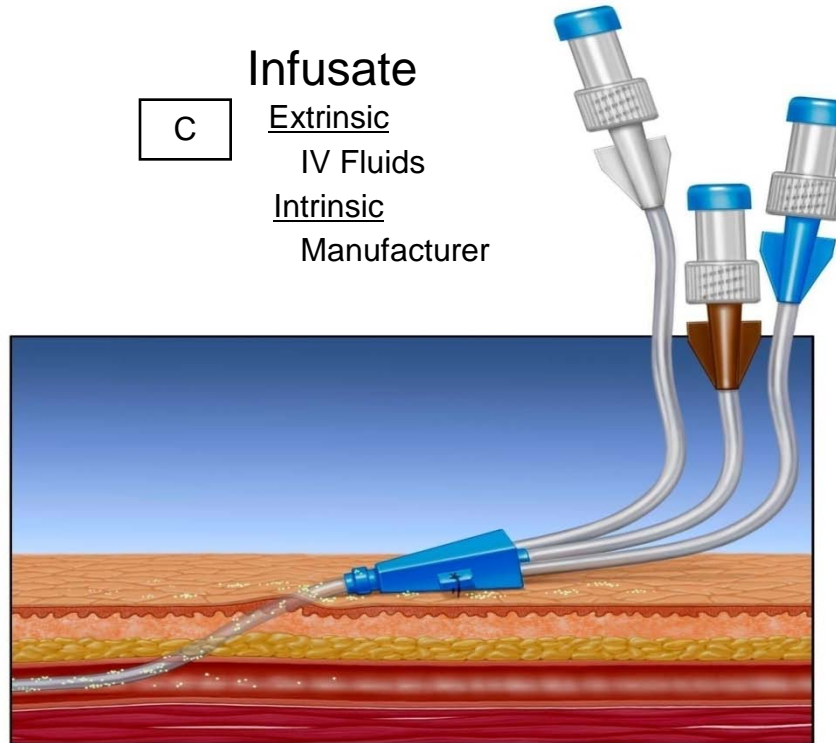
B Catheter hub

Endogenous

Skin flora

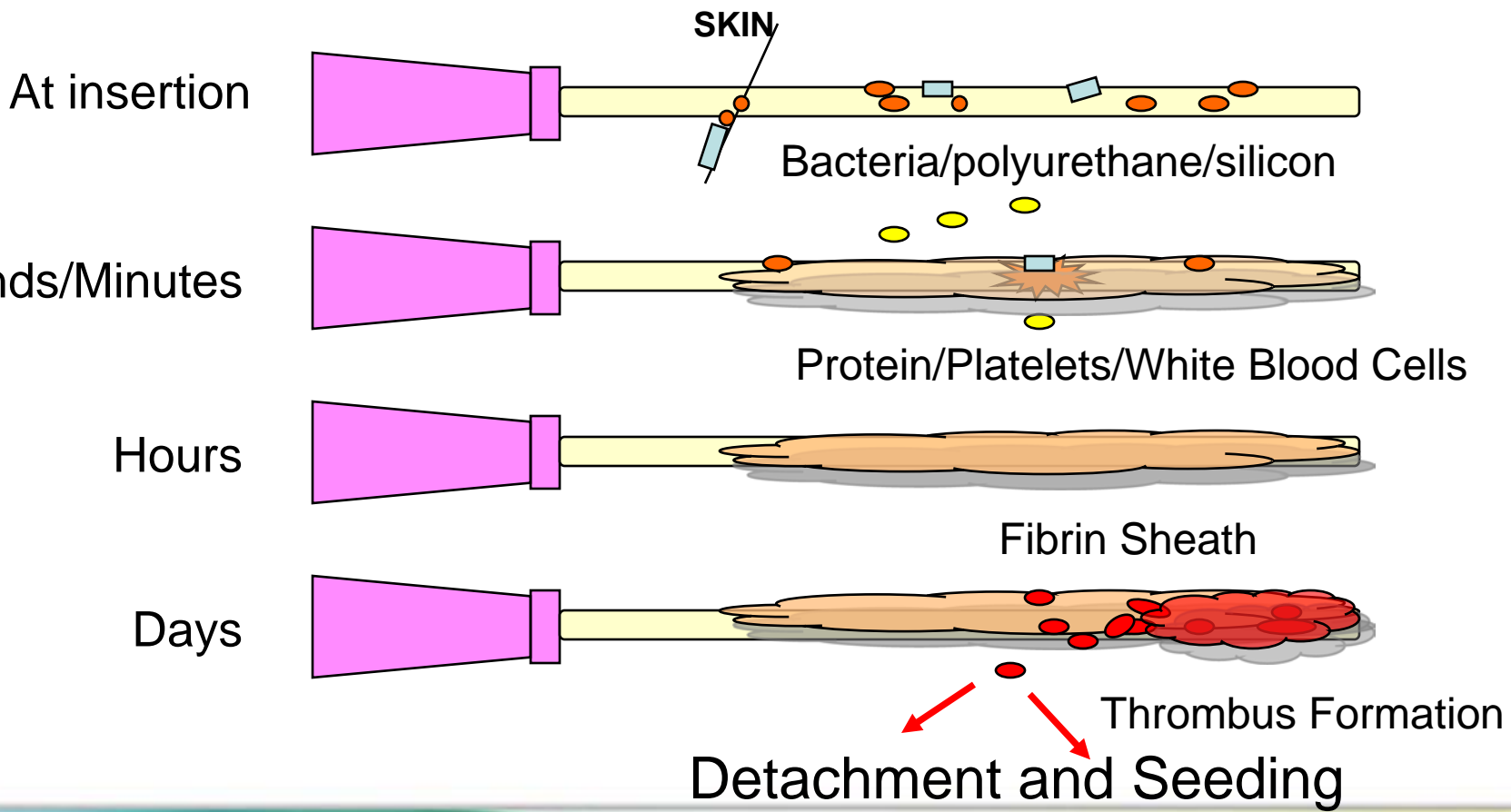
Extrinsic

HCW hands



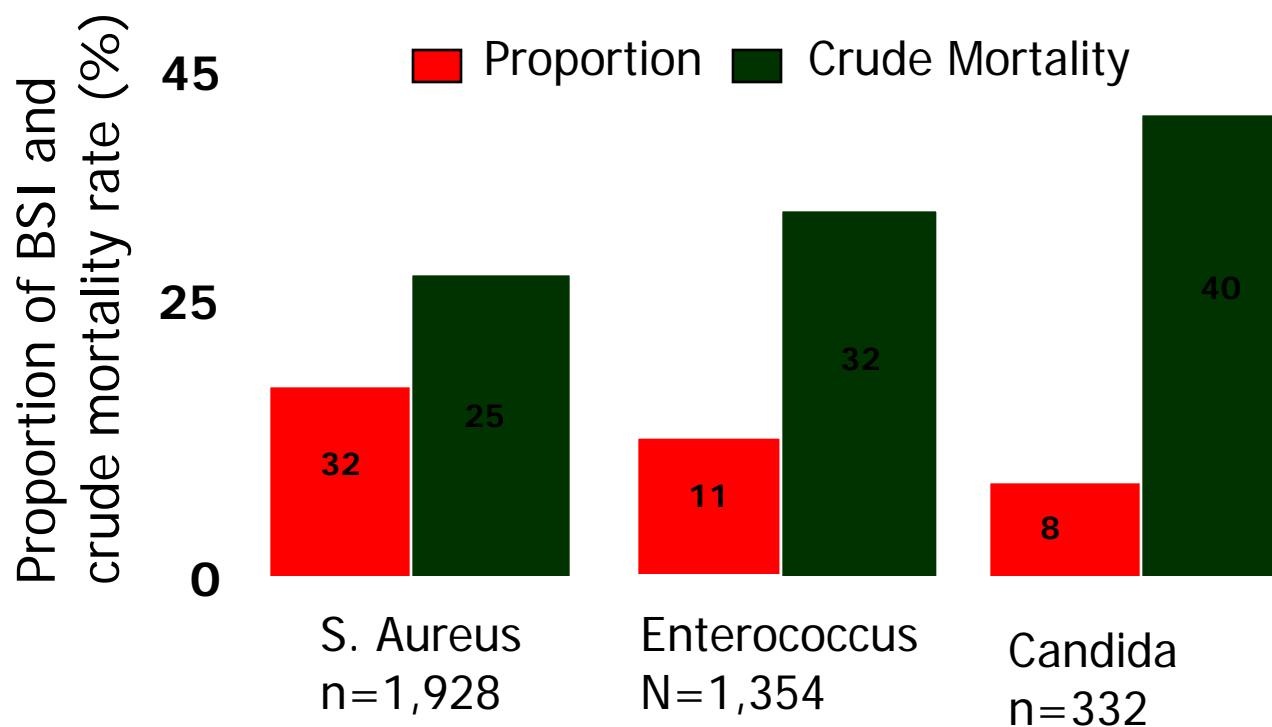
Nearly 80% of CR-BSI originate from skin flora

Catheter-Related Blood Stream Infections: Bio-film Formation



Jerome E Granato MD 2010

Variable Mortality Rate By Organism Causing Nosocomial Infection



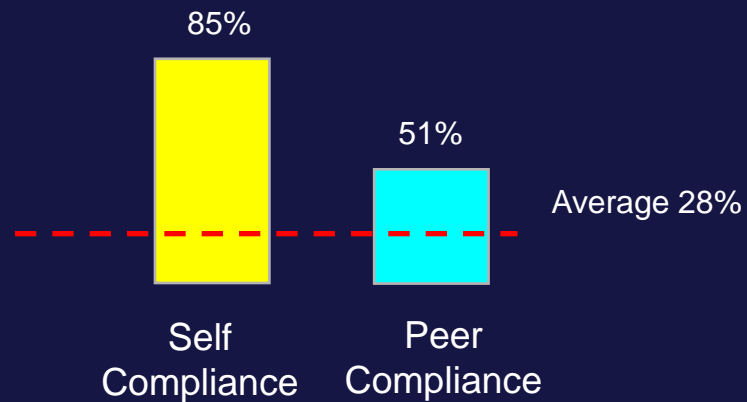
Enforcing Hand Hygiene Is Important

- 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 sanitizer¹
- Use of gloves during procedure does not remove need for proper hand hygiene



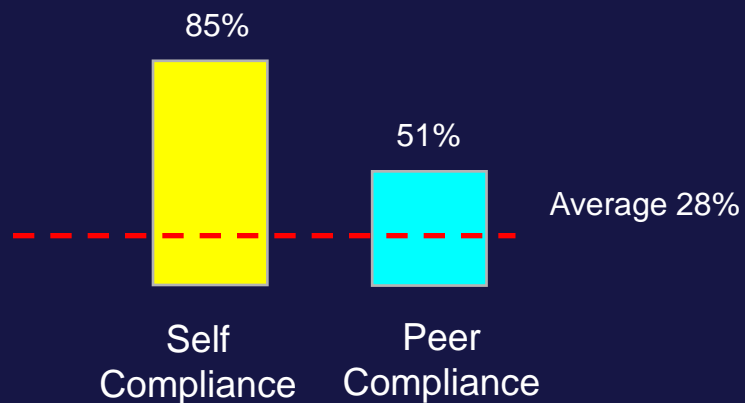
Enforcing Hand Hygiene Is Difficult

HealthCare Workers Perception of Hand Hygiene



Enforcing Hand Hygiene Is Difficult

HealthCare Workers Perception of Hand Hygiene



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%

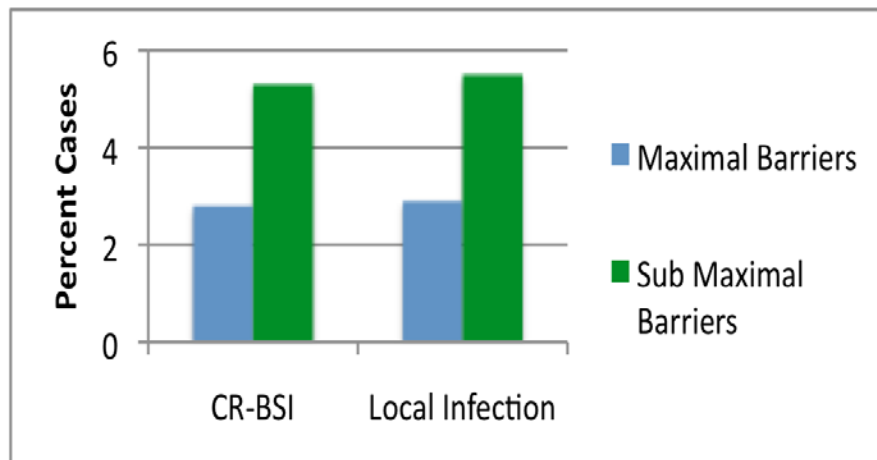
Using Maximal Sterile Barriers Matters

- 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



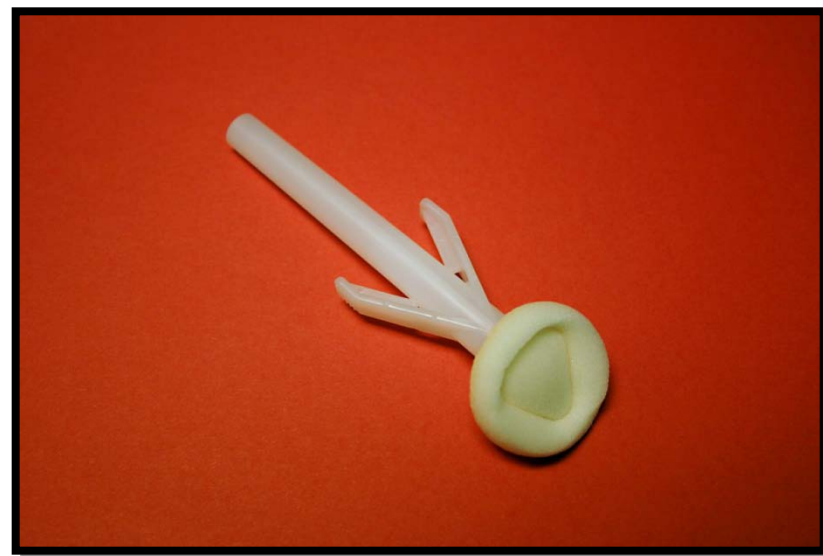
- Maximal barrier precautions are cost effective
- For every 270 catheters placed:
 - Seven CR-BSI avoided
 - One death prevented
 - \$68,000 saved

Insertion Site Preparation Is Important

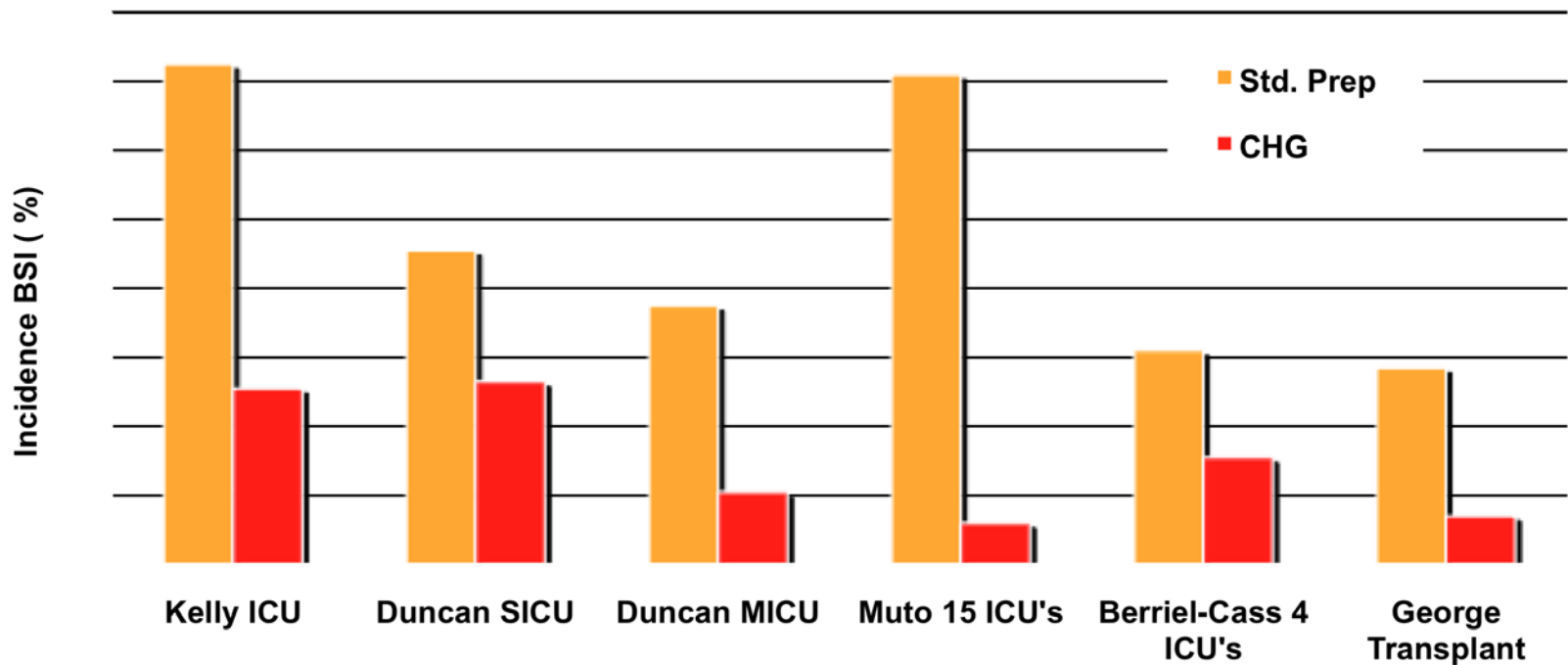
- 2% CHG is preferred antiseptic for prevention of catheter-related infections

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

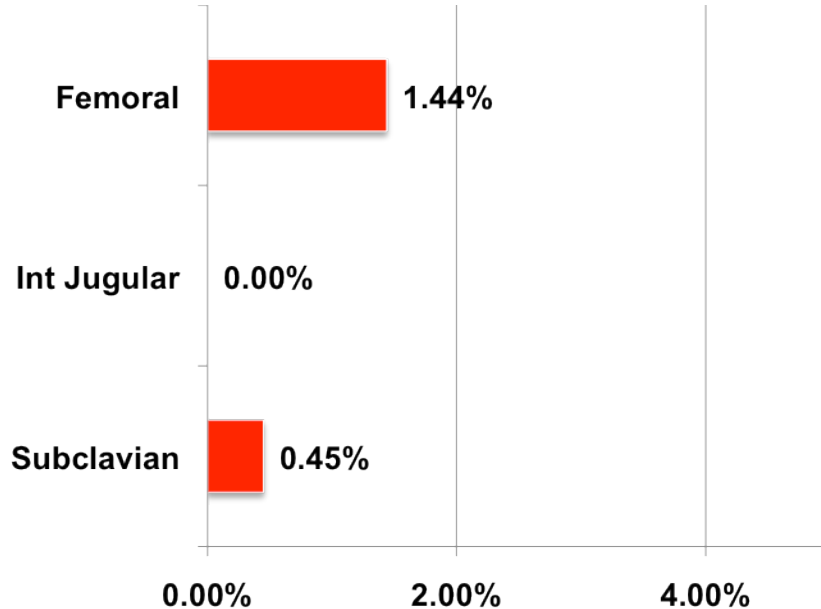


The Site of Insertion Matters

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% ‡

Operator Training and Experience May Matter

831 insertions 4735 line days

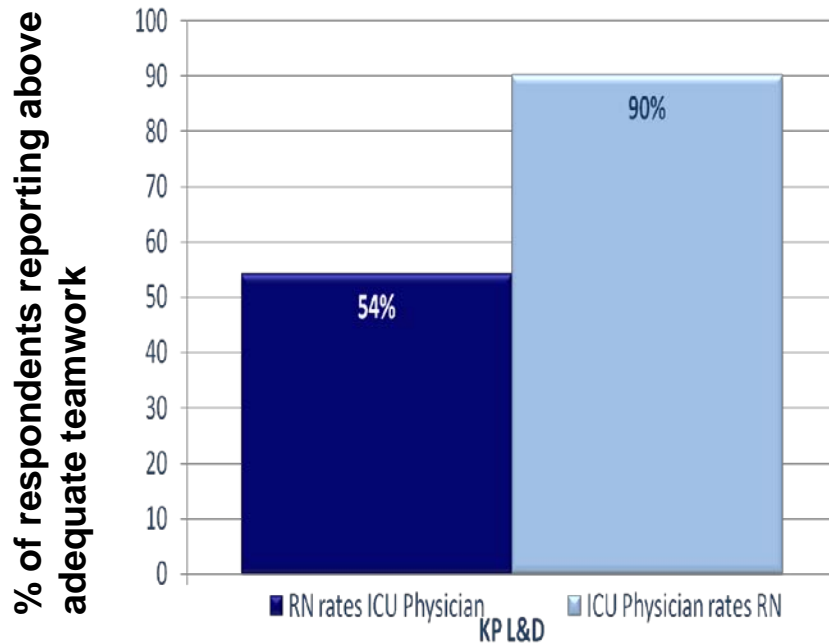


- Teaching Hospital
- Minimum of 50 Insertions
- Attending and Fellows only
- Coverage 24/7

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

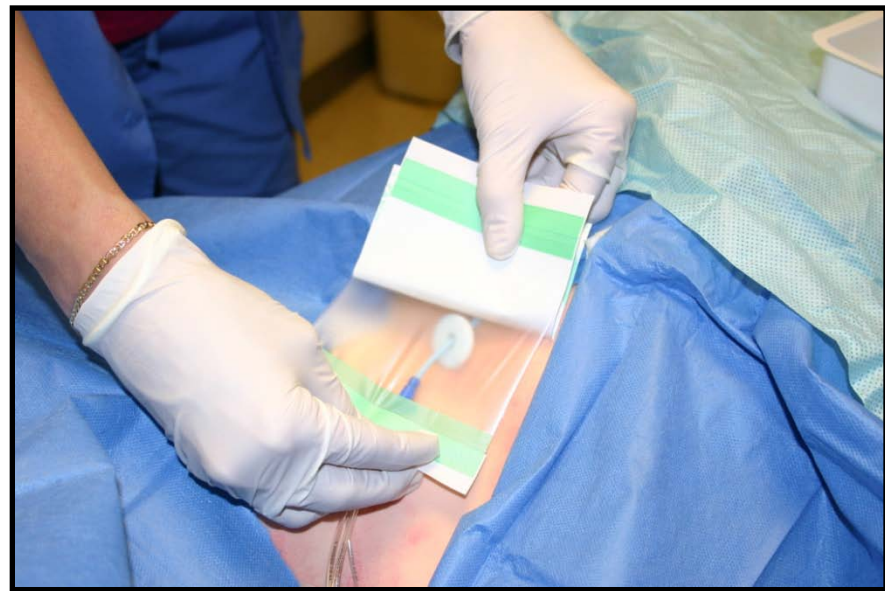
ICU Physicians and ICU RN Collaboration



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

Standardized Catheter Site Care

- Use chlorhexidine 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 infections¹ 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

Interest

Challenging!

Barriers To Change

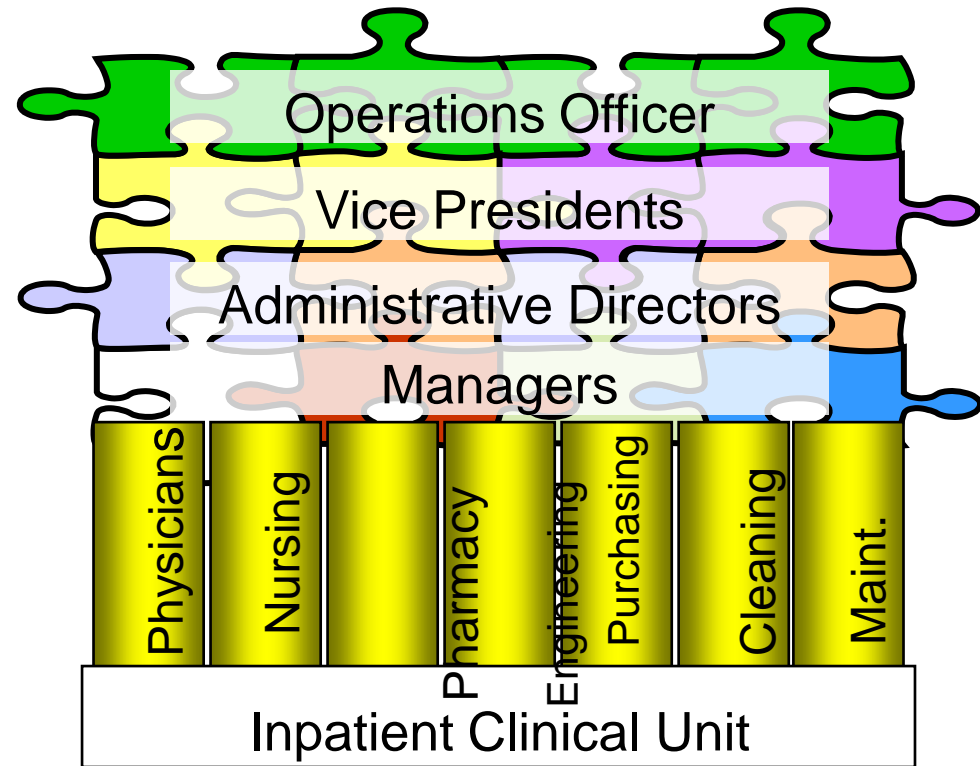
- **High staff turn over**
- **Competing projects**
- Reduction in UTI
- MRSA transmission
- Reduction in VAP
- Decubitus ulcer protocol
- Improving patient transport and flow
- Conversion to an electronic medical record

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.

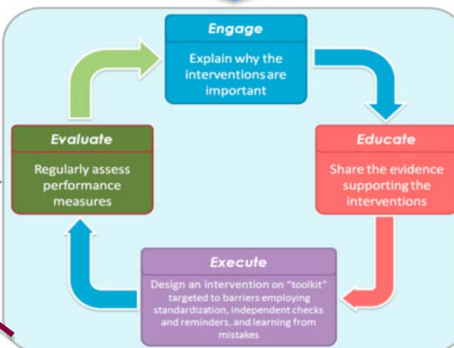
3. **Measure** Performance

Real time analysis.

Record the right metrics: Process and/or outcome.

Post the information.

4. **Never** Stop !



Culture Change Can Be Achieved



Jerome E Granato MD 2010

We Are Serious About Stopping Infection!

AGH Coronary Care Unit



The bug stops here!

Contact Information

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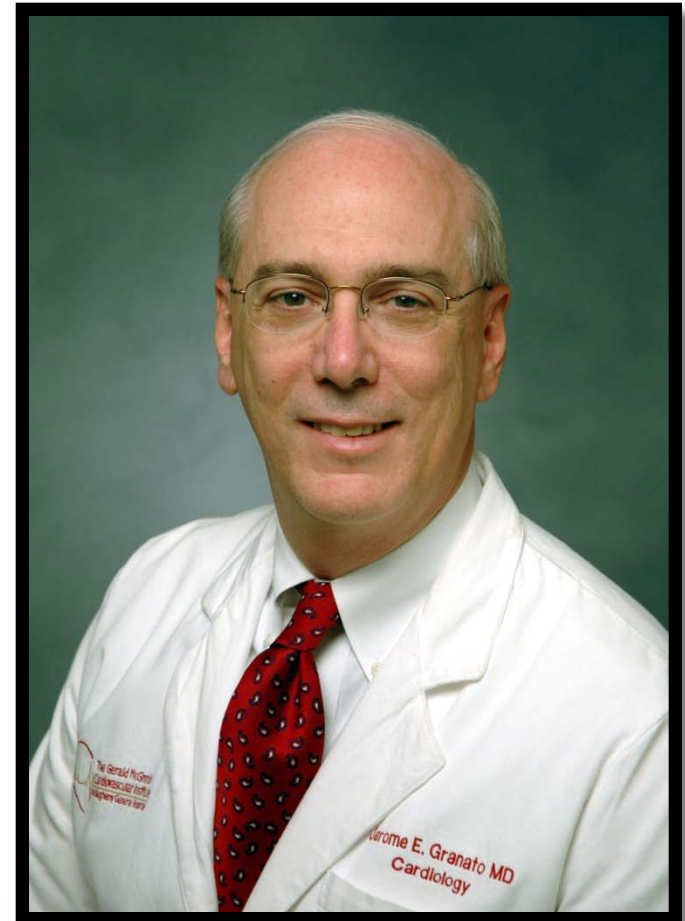
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Selected Reading

- Murphy D, et al. *Dispelling the Myth: The True Cost of Healthcare Infections*. APIC briefing 2007 <http://apic.org>
- Pronovost P. et 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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Spreading knowledge. Preventing infection.™

APIC Thanks Bard Access Systems for Supporting the Development of the
CATHETER-RELATED BLOODSTREAM INFECTION (CRBSI) INITIATIVE
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Catheter-Related Bloodstream Infection (CRBSI) Initiative