Elimination of Health Care-Associated Infections
Russell Olmstead, MPH CIC, Saint Joseph Mercy Health System
A Webber Training Teleclass

Elimination of Health Care-Associated Infections: Is It Possible & Can We Afford Not To Try?

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Hosted by Paul Webber
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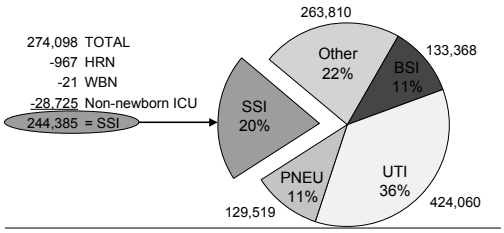
Today's Agenda -

- Describe at least one external factor influencing infection prevention & control programs in hospitals in N. America.
- List factors involved in diffusion of innovation involving application of infection prevention evidence to direct patient care.
- Identify components of infection prevention bundles for central line-associated bloodstream infection (CLABSI) & ventilator-associated pneumonia (VAP)
- Describe components of a process-focused intervention to prevent catheter-associated urinary tract infections (CA-UTIs)
- List components of an effective PI collaborative.

Calculation of estimates of HAIs in U.S. hospitals among adults and children outside of intensive care units, 2002; total = 1.7 million; 98,987 deaths



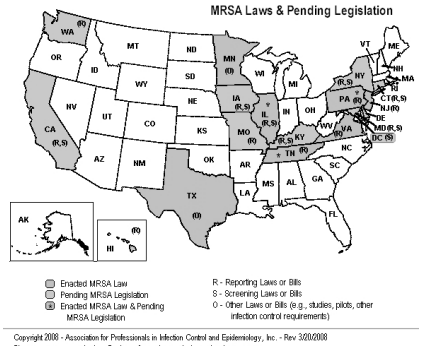
HRN = high risk newborns
WBN = well-baby nurseries
ICU = intensive care unit
SSI = surgical site infections
BSI = bloodstream infections
UTI = urinary infections
PNEU = pneumonia

Klevens, et al. *Pub Health Rep* 2007;122:160-6

U.S. Legislative "Score Card" on Mandates for Public Disclosure of Health Care-Associated Infection (HAI)

MRSA Mandate "Score Card"

03/20/08



External Factors -
Centers for Medicare & Medicaid Services (CMS) & Value-Based Purchasing

- Payment reforms for inpatient hospital services in 2008:
  - …ensure that Medicare no longer pays for the additional costs of certain preventable conditions (including certain infections) acquired in the hospital…

1) Serious preventable events:
   - Object left in during surgery;
   - air embolism;
   - delivering ABO-incompatible blood or blood products
2) Catheter-associated urinary tract infections
3) Pressure ulcers (stages III, IV)
4) Vascular catheter associated infection
5) Mediastinitis after CABG surgery
6) Patient falls

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CMS & Value-Based Purchasing, 2009

1) Manifestations of poor glycemic control
2) Deep vein thromobsis (DVT) / pulmonary embolism following total knee or hip replacement
3) Surgical Site Infection following select procedures:
   a) Orthopedic – spine, neck, shoulder, elbow
   b) Bariatric – Lap. Gastric bypass, Gastroenterostomy, Lap. Gastric restrictive surgery

The Joint Commission

National Patient Safety Goals, Hospital & Critical Access Hospital, 2009

- 7c. Prevent multiple drug-resistant organisms (MDRO) infections, especially methicillin-resistant *Staphylococcus aureus* (MRSA) and C*lostridium difficile*-associated disease (CDAD).
- 7d. Prevent catheter-associated BSI (CABSI)
- 7e. Prevent surgical site infections (SSI)
- 13a. Patient involvement in their care: respiratory & hand hygiene on day of admission – pt. & family

CHICA — CANADA

Infectious diseases threaten the health and well-being of Canadians and lead to major social, political and economic consequences.
- One in nine Canadian hospital patients acquires an infection during their stay
- Healthcare-associated infections kill 8,000 to 12,000 Canadians a year
- Infections cost our economy an estimated $15B annually

A BATTLE WE CAN WIN:
Reducing Healthcare Associated Infections by 50%

UNE BATAILLE QU'ON PEUT GAGNER : Réduire de 50% l'incidence des infections associées aux hôpitaux

New Campaign Launched 09/18/2008

Current Focus: MRSA & Clostridium difficile infection (CDI)
http://www.nidd.ca

Best Practices for Infection Prevention and Control Programs in Ontario, September 2008

Structure & elements of the IPAC program which include:
Organizational support from leadership & adequate infrastructure – I.e. incl. adequate IPAC professionals trained & board certified ;
Hand hygiene program; Surveillance program;
Education for staff and clients/patients/residents and their families;
Occupational Health and Safety;
Timely access to microbiology laboratory reports;
Product review and evaluation;
Review of practices for reprocessing of equipment;
Review of practices for environmental cleaning;
Infection prevention and control input into facility design;
Effective immunization programs;
Outbreak detection and management; and
Adequate resources:incl. adequate IPAC professionals trained & board certified

Ontario

Additional External Resources & Influencing Factors

International Infection Control Council

GLOBAL CONSENSUS

Clostridium difficile associated disease
http://www.chica.org/

AJIC special communications

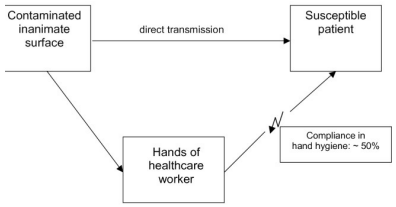
APIC/CHICA-Canada infection prevention, control, and epidemiology: Professional and practice standards

Candace Friedman, BS, MT (ASCP), MPH, CIC,[a] Ruth Curchoe, RN, MSN, CIC,[b] Margie Foster, RN, CIC,[c] Zahir Hirji, RN, BSc, BSCN, MHSC, CIC,[d] Sharon Reystoftak, MS, NS, MT (ASCP), CIC,[e] Rebecca L. Lark, MD (APIC),[a] Linda Lasxon, RN, BSN, CIC,[b] Mary Jane Ruppert, RN,[a] and Linda Spaulding, RNC, CIC[a]

Am J Infect Control 2008;36:385-9.

Basic, but important principle

The Epidemiologic Triangle of Cross Transmission
Most MDROs are transmitted via hands of HCWs



Kramer A BMC Infect Dis 2006;6: 130

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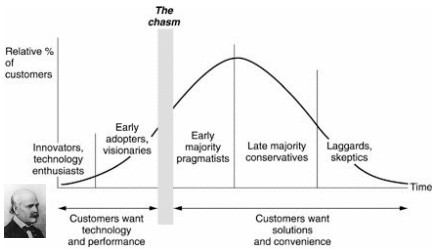
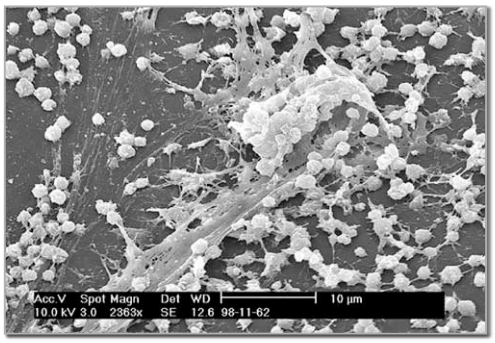
Model of Diffusion of Innovation



1847

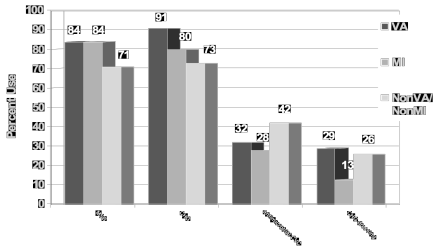
Where do healthcare professionals in 2008 fall along this curve r/t hand hygiene?

Let's take a closer look at CLABSI:
A microbe's view of a central line: Home sweet Biofilm; 24 hrs after insertion. Donlon RM, CDC



Diffusion of Infection Prevention Practices;

Krein S, et al Mayo Clin Proc 2007;82:672-8



Factors: safety Culture; ICP-CIC & PI collaborative = more likely to use BSI prevention practices

Max Barrier Prec.\ Chlorhexidine tincture \ Antimic. CL \ CHG dressing

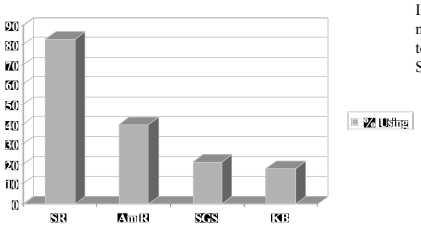
Is BSI Prevention Evidence Making it to the Bedside?

- Survey of ICUs in 10 academic medical centers across the U.S. –
  - In 80% of the ICUs 5 separate groups of physicians inserted 24-50% of CLs
  - Written policy for CL insertion (80%)
  - Policy Requires maximal sterile barriers at insertion (28%)
  - Formal education program for personnel (52%)
  - Policy stated hand hygiene prior to insertion (80%)
  - Policy stated hand hygiene prior to accessing CL (36%)

Warren DK, et al. Infect Control Hosp Epidemiol 2006;27:3-7

Diffusion of Infection Prevention Practices;

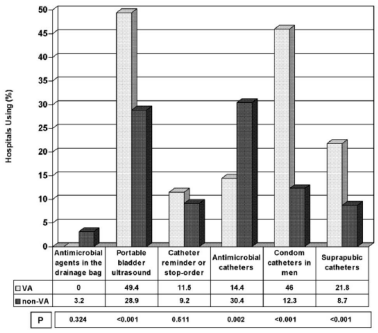
Krein S, et al. *Infect Control Hosp Epidemiol* 2008; 29:933-940.



ICP with CIC: more likely to use SGS

Semi-recumbent Position.\ Antimic. Oral Rinse \ Subglottic Sx \ Kinetic Bed

Prevention of CA-UTI: How are we doing?



Saint S, et al. Preventing Hospital-Acquired Urinary Tract Infection in the United States: A National Study. Clin Infect Dis 2008;46:243-50.

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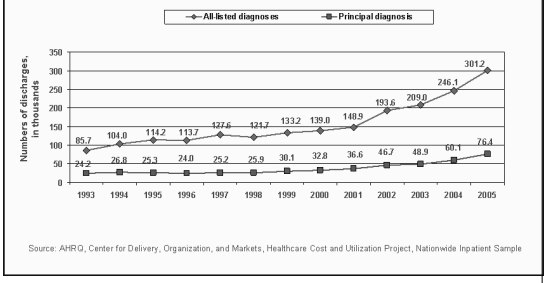
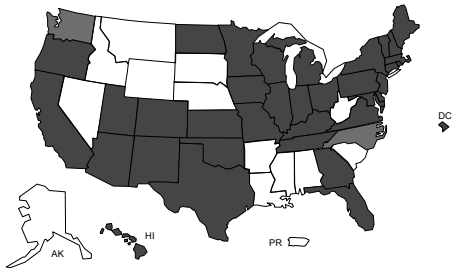
Figure 1. Trends in hospital stays associated with Clostridium difficile-associated disease, 1993-2005



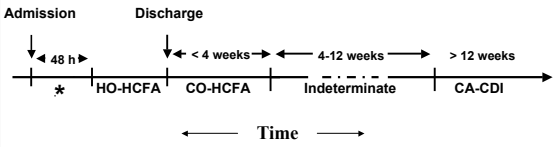
Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample

Elixhauser A, Jhung M. **Clostridium Difficile-Associated Disease in U.S. Hospitals, 1993-2005 April 2008. http://www.hcup-us.ahrq.gov/reports/statbriefs/sb50.jsp**

States with BI/NAP1/027 Strain of *C. difficile* (N=38), November, 2007



Recommendations for Surveillance of *Clostridium difficile* Infection



HO: Hospital (Healthcare) onset
CO-HA: Community Onset Healthcare-associated
CA: Community Associated
*** Depending upon whether patient was discharged within previous 4 weeks, CO-HA vs. CA**

CDAD Surveillance Working Group. *Infect Control Hosp Epidemiol* 2007; 28:140-145

Squeezing the Balloon

- "Infection Control programs that focus on one organism or only one antimicrobial agent are unlikely to succeed."
- Safdar N, Maki DG. Ann Intern Med 2002

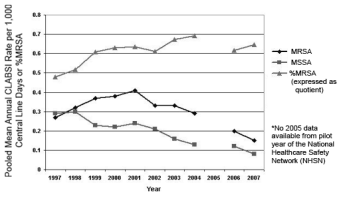
ESBL + gram neg. *P. aeruginosa*; *A. Baumannii* ; Carbapenemase producing *K. pneumoniae* (KPC)

MRSA

Pathogen Specific Analysis: MRSA & CLABSI

- NNIS & NHSN data, CDC
- CLABSIs - ICU
- % of BSI caused by MRSA increased from 47.9 to 64.7
- However: incidence of BSI from both MRSA decreased by 44.4% since 2001

Figure. Trends in %MRSA and Incidences of MRSA and MSSA Central Line-Associated Bloodstream Infections (CLABSIs) in Intensive Care Units—United States, 1997–2007*



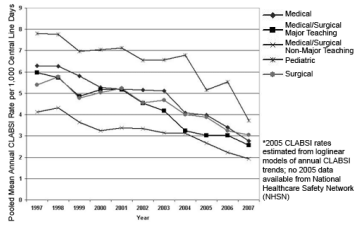
Burton DC, et al. SHEA 2008 (abstr #4)

Power of the Collaborative: Central Line-Associated BSI (CLABSI) Rates, 1997-2007, NNIS & NHSN, CDC

CLABSI rates declined In Medical, Med-Surg, & Pediatric ICUs

Significant declines observed over the past decade in most ICUs at facilities enrolled in NNIS & NHSN

Figure. Trends in Central Line-associated Bloodstream Infections (CLABSI) by Intensive Care Unit Type--United States, 1997-2007*



Burton DC, et al. SHEA 2008 (abstract #2)

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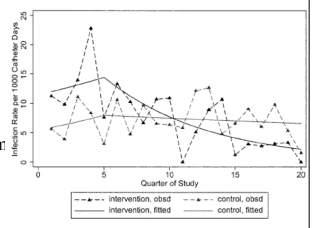
Preventing CLABSI: System-level success

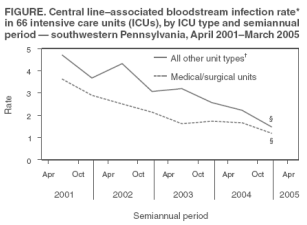
- Prospective cohort study, SICU & concurrent control ICU
- Bundled CLABSI Prevention Interventions in SICU
- CLABSI rate decreased from 11.3 to 0.0/1,000 CVC days in SICU; control ICU 5.7 to 1.6
- Estimated 42 CVC-BSIs avoided; savings of > $1.9 million



Berenholtz SM. Crit Care Med 2004;32:2014-20.

Efficacy of Network level Performance Improvement Collaborative, cont.

- Pittsburgh. Regional Health Initiative (PRHI)
  - 66 ICUs; 32 hospitals
    - Education
    - Equipment
    - Process improve
  - 68% drop in CVC-BSI [4.31 to 1.36/1000 CVC days
  - MMWR 2005 (Oct.14);54:1013-16.



Results from other collaboratives

- 24 NICUs, Germany
- Participation in surveillance collaboratives with feedback to participants can significantly lower BSI rates and reduce pneumonia

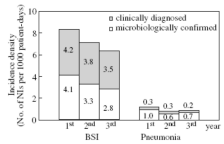


Figure 2 Incidence densities of microbiologically confirmed and clinically diagnosed bloodstream infection (BSI) and pneumonia by year of participation. NI, nosocomial infections.

Schwab F, et al. J Hosp Infect 2007; 65, 319 - 325

Other Collaboratives: Duke Infection Control Network

- 12 Community Hospitals, NC & VA
- Results:
  - HA-BSI: dropped by 23%
  - HA-Infection+Colonization with MRSA: dropped by 22%
  - VAP: dropped by 40%
  - Occupational sharps injuries: dropped by 18%

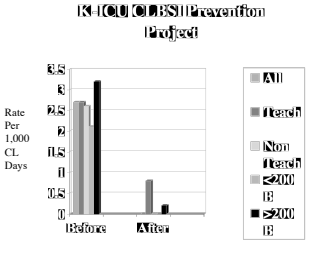
Kaye KS, et al. Infect Control Hosp Epidemiol 2006;27:228-32.

KEYSTONE-ICU PROJECT

- Statewide initiative-70 Hospitals, 127 ICUs
- In Collaboration with Johns Hopkins Quality and Research Institute
- Reduce errors and improve patient outcomes in ICUs
- Combination of evidence based medicine and quality improvement
- 5 interventions implemented over a 2 year period
  - Patient Safety Program and incident reporting
  - **Eliminate Blood Stream Infections (BSIs)**
  - Improve care of the ventilated patient
  - Implement Daily Goals Sheet
  - Implement and evaluate an intervention to reduce ICU mortality

Keystone ICU Project: The Results

- 66% reduction in Central Line Bloodstream Infections (CLBSI)
- Interventions:
  - Hand hygiene
  - Max. barrier prec. during insertion
  - CHG antiseptic on insertion site
  - Avoid femoral CLs
  - Remove CL when not needed
- Pronovost P, et al. NEJM 2006;355:2725-32.



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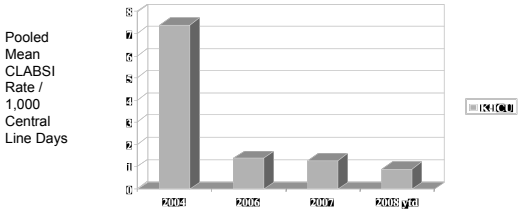
Process Indicators: CLABSI ALL UNITS, SJMHS

	May-June '04	July-August '04	Sept. '04	Nov-Dec '04	April-May 05
Lines inserted	31	58	31	61	66
Follow correct procedure	65% (20/31)	86% 50/58	90% (28/31)	87% (53/61)	86% (57/66)
Required correction	52% (16/31)	45% (26/58)	35% (11/31)	28% (17/61)	27% (18/66)
Femoral lines inserted	16% (5)	19% (11)	6% (2/31)	8% (5/61)	12% (8/66)
Average insertion time	41.5 minutes	40 minutes	34 minutes	44 minutes	35 minutes

Sustaining Prevention: Can it be done?

MI Keystone ICU: Long Term Trends in CLABSI



Learn from a Defect Tool(LDT): One Hospital's Experience

- Divided into three sections:
- **Section 1** asks the users to identify what happened or the defect they want to investigate
- **Section 2** is a framework provided for the investigators to identify any contributing factors. These factors include: patient, task, caregiver, and team related, training and education, local environment, information technology and institutional environment.
- **Section 3** asks participants to develop an action plan with assigned responsibility for task completion and follow up dates for each item.

Chart Review

- No excess blood products given on these patients
- Median blood glucose was <140 mg/dl
- All of the patients that had CLABSI had a single-lumen infusion catheter (SLIC®) that had been placed by the nursing staff into an existing cordis: (percutaneous sheath) introducer.
- Further discussion identified that maximal barrier precautions were <u>not</u> being used during placement of SLIC

Follow-up

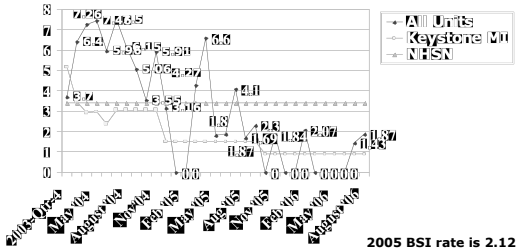
- Reformat BSI checklist to ensure proper sequence of line insertion procedure
- Provide re-education to staff on basic surgical asepsis
- Educate nursing staff to use maximal barrier precautions during SLIC insertions
- Incoming residents able to take Fundamentals in Critical Care Course which includes line placement instruction and practice
- Educate staff on pre-procedure briefing process
- Line cart restocking process now 2 times per day
- Ordered ultrasonic vein finder

Resident / Physican Assistant Survey

- The line cart was very helpful, but often not stocked.
- Felt that the nurse's presence in the room was valuable, but not consistently happening.
- Additional support and training was requested.

August 2006
All Units BSI rate per 1000 catheter days
SJMH Compared to state of MI and NHSN

CLABSI Best Practices Bundle Implemented July 2004

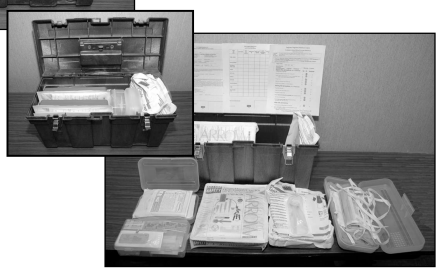


2005 BSI rate is 2.12
2006 YTD rate is 0.67

The Expanding Use of Central Lines Outside the ICU Setting:

- Climo M, et al. 2003:
  - 1 Day Point Prevalence Survey Six Medical Centers:
    - 2,459 patients; 29% with central lines (CL)
      - ICU: 43-80% had CL
      - Non-ICU: 7-39% with CL
    - Of all CLs in use 66% were in non-ICU
- Vonberg RP, et al. 2006:
  - 42 hospitals, 77 non-ICUs, July 02- June 04
  - CL utilization: 8,317 CL days in 181,401 patient days
  - Mean CLABSI rate = 4.3/1,000 CL days

Hitting the Road with CL Kits



Other K-ICU Bundles:
VAP Prevention

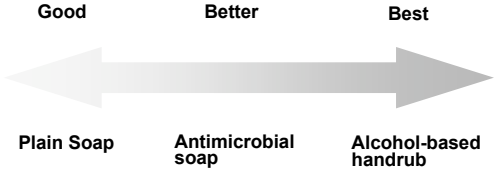
- Improve care of ventilated patients
  - Elevate HOB
  - Provide DVT prophylaxis
  - Provide PUD prophylaxis
  - Hold sedation
  - Test for ability to extubate
  - Glycemic control

The Next Big Thing @ Keystone Center

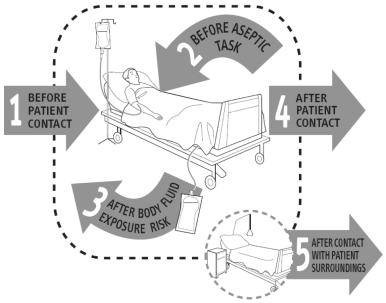
- Hospital-Associated Infection (K-HAI) Prevention Project – [kickoff January 2007]
  - http://www.mha.org/mha_app/keystone/index.jsp
- 108 Hospitals in Michigan are participating
- Components:
  - Hand hygiene bundle
  - The Bladder Bundle
  - Expanding central line associated BSI prevention beyond the ICU
  - Comprehensive Unit-based Safety Program (CUSP)

Systematic Approach – Preventing Cross Transmission of All Pathogens
Efficacy of Hand Hygiene Preparations in Killing Bacteria

Hand Hygiene for Healthcare Personnel



Your 5 moments for HAND HYGIENE



The Bladder Bundle: Nursing Intervention to Remove Unnecessary Urinary Catheters

Mohamad Fakih, MD, MPH
St John Hospital and Medical Center

Fakih M, et al. **Effect of Nurse-Led Multidisciplinary Rounds on Reducing the Unnecessary Use of Urinary Catheterization in Hospitalized Patients** *Infect Control Hosp Epidemiol* 2008; 29:815– 819

Elements of the Bladder Bundle

- Point prevalence: evaluate frequency of utilization of urinary catheters by patient care units: identify target unit(s)
- Pre-intervention Baseline: data collection
- Intervention: goal is to increase appropriate use
  - Urinary catheter order sheet;
  - automatic stop orders;
  - RN-authorized discontinuation protocol; etc.
- Post-intervention: evaluation

Where to start:

- Begin with a pilot unit then spread from there
- Project plan
  - Review materials with teams
  - Determine a timeframe for roll-out
  - Identify your cohort.

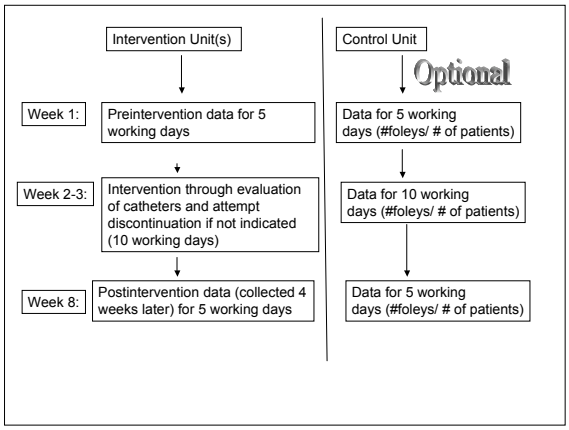
Point Prevalence Assessment

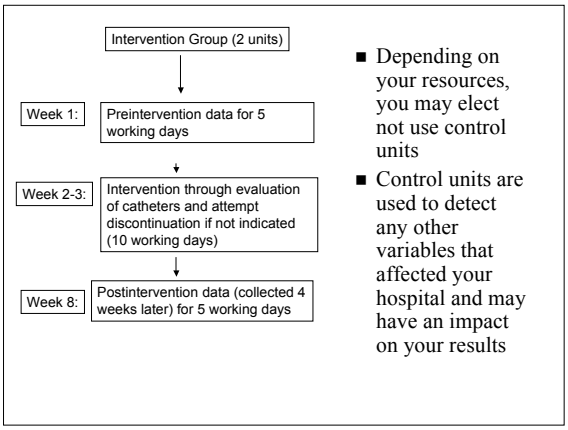
- Point prevalence: on all general medical units at your hospital to determine the units with the highest utilization of urinary catheters.
- Example: count the number of urinary catheters used per unit and the number of patients on the same unit on a single day
- Point prevalence utilization ratio=
  - # of urinary catheters on unit A / total # of patients on unit

Point Prevalence- Example

- Look at multiple units and decide the most feasible unit to start (it may be highest utilization)
- Unit B has the highest utilization ratio

	# of foleys	# of patients	Ratio
Unit A	6	32	0.19
Unit B	10	29	0.34
Unit C	4	30	0.13
Unit D	8	32	0.25
Unit E	2	28	0.07





- Depending on your resources, you may elect not use control units
- Control units are used to detect any other variables that affected your hospital and may have an impact on your results

Intervention Phase,
Botsford Hospital,
Farmington Hills, MI

- **'Bladder Bundle Team' begins!**
  - Nurses, NA's, Physician,
- **Training on prevention of UTI + appropriate indications for urinary catheters**
  - Training on alternatives to catheterization
  - Physicians given brochure
- Daily rounds "**catheter patrol**"
- Assess reason for use, indicated vs. non-indicated
- RN initiates process to discontinue non-indicated catheters. Nursing staff crucial to success of program.
  - RN & NA develop a plan to manage incontinence as needed for patients who have their catheter DC'd (not all patients will be incontinent)
- Collect data M – F

Post-intervention (Week 8)

- No additional intervention is done weeks four through seven.
- Data is collected for 5 working days four weeks post-intervention (week 8) to evaluate if the effect of the intervention persists.
- Also Week 8: the project manager will evaluate the need of the urinary catheter (similar to pre-intervention data collection)

Evaluation

- Focus on the urinary catheters that are used without indications (to see if there is a trend)
- Did the intervention impact utilization? e.g. calculate discontinuation rate for unnecessary catheters:
  - # of unnecessary catheters discontinued/ all cases of urinary catheters evaluated and found to have no indications X 100

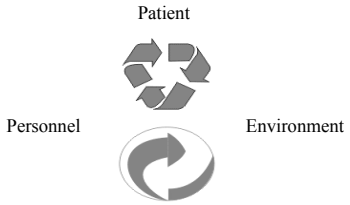
The Most Important Factors for Success

- Partnering with different disciplines (eg, case management, nursing, infection prevention) to be able to achieve your goals
- Support from the organizational and unit-based leadership
  - Results at one hospital – proportion of unnecessary catheters dropped from 40% at pre-intervention to 24%

Elimination of Health Care-Associated Infections
Russell Olmstead, MPH CIC, Saint Joseph Mercy Health System
A Webber Training Teleclass

Prevention Strategies for MDROs & Other Unwelcomed Pathogens in the Critical Care Environment

HYGIENE MODEL



ORIGINAL INVESTIGATION

Effectiveness of Chlorhexidine Bathing to Reduce Catheter-Associated Bloodstream Infections in Medical Intensive Care Unit Patients

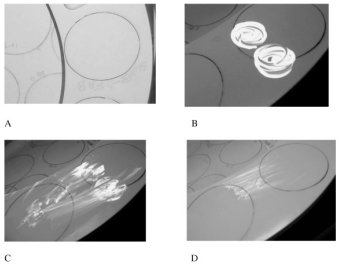
Susan C. Bleasdale, MD, William E. Trick, MD, Ines M. Gonzalez, MD, Rosie D. Lyles, MD, Mary K. Hayden, MD, Robert A. Weinstein, MD

Patient Safety Using Hygiene

- 1 yr. cross over study in two MICUs, Stroger hospital, Chicago IL
  - Intervention: daily cleansing of patients with disposable cloth containing chlorhexidine gluconate (CHG)
  - Control group: daily cleansing with soap and water
- Results:
  - Intervention group:
    - 4.1 primary BSIs / 1,000 pt. days
    - 6.4 / 1,000 central line days
  - Control group:
    - 10.4/ 1,000 pt. Days
    - 16.8 / 1,000 central line days
- Conclusion: Incidence of BSI in CHG-cloth group was 61% lower than control (soap and water) group. Reduction of concentration of bacteria on skin lessens risk of BSI.

Bleasdale SC,et al. Arch Intern Med 2007;167:2073-9

Ultraviolet Marker on Environmental Surfaces



A = surface in visible light

B = Heavy residual maker

C = Moderate residual

D = Light residual

Source: Alfa MJ, et al *BMC Infect Dis.* 2008; 8: 64

Measurement of MDROs

The National Healthcare Safety Network (NHSN) Manual

Patient Safety Component

Protocol: Multidrug-resistant Organism (MDRO) and *Clostridium difficile*-Associated Disease (CDAD) Module

- Two options
  - Multi-drug resistant organism (MDRO)
  - *C. difficile*-associated disease (CDAD)
- See also:
  - **Cohen AL, et al. Recommendations for Metrics for Multidrug-Resistant Organisms in Healthcare Settings: SHEA/HICPAC Position Paper. Infect Control Hosp Epidemiol 2008;29(No.10):901-13.**

http://www.cdc.gov/ncidod/dhqp/nhsn_MDRO_CDAD.html

Tools of the Collaborative

- Engage
  - stories of harm & efficacy of prevention
- Educate
  - Original papers, fact sheet, slides, coaching calls, web-based archive, biannual workshops
- Execute
  - Standardize, create independent checks, learn
- Evaluate
  - Measure, Measure, & more measurement – web based data submission and reporting tool

To Do the Right Thing and Prevent Mistakes

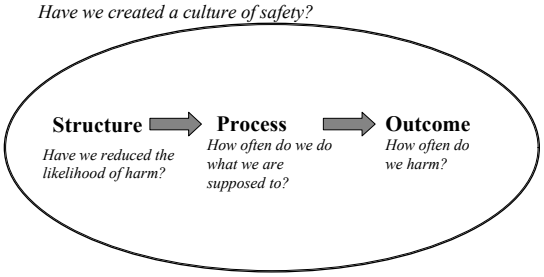
- Create culture of safety:
  - completed unit education on patient safety
  - Training to senior medical staff and residents
  - Education to nurses and respiratory therapists
  - Empower nurses/RT to stop line placement
- Improve Processes
  - Reduce complexity: Line cart
  - Create independent checks for key processes: BSI checklist
  - Nurse in room during line insertion
  - Sign on door: 'Procedure in progress' to decrease traffic in room
- Automate: put checklist and standard documentation in new bedside computer system

Hosted by Paul Webber paul@webbertraining.com
www.webbertraining.com

Conceptual Model for Collaboratives

Context

Have we created a culture of safety?



Adapted from: Donabedian A. Evaluating the quality of medical care. *Milbank Memorial Fund Quarterly* 1966;44:166–206.

Tool kits

- Engage
  - Opportunity calculator, stories of harm
- Educate
  - Original papers, fact sheet, slides
- Execute
  - Standardize, create independent checks, learn, conference calls & workshops (2x/yr)
- Evaluate
  - Measure, report, analyze, and sustain

Summary Points

- Expectations for Elimination of HAIs are coming from patients, payers, & providers.
- There is increasing evidence that infection prevention collaboratives can move evidence from the literature to the bedside and are effective.
- A "checklist" is an important component of the toolkit – however engaged champions for safety + supportive culture of safety are key elements.
- Evidence Score for Collaboratives:
  - "Educational programs and multi-disciplinary teams may be effective strategies to reduce rates of HAI." [Aboelela SW, et al. JHI 2007;66:101-8]

The Next Few Teleclasses

Just added	10 Oct. 08	(FREE South Pacific Teleclass) Rebirth of Public Health & Infection Control Post-SARS Speaker: Dr. Dick Zoutman, Queen's University Broadcast live from the Australian Infection Control Association conference
	20 Oct. 08	(South Pacific Teleclass) Biofilms - When Bugs Get Clingy Speaker: Dr. David Hammer, Canterbury District Health Board
	23 Oct. 08	Health Care Facility Maintenance for Infection Control Speaker: Andy Streifel, University of Minnesota
	30 Oct. 08	LTC - How Maryland Increased ICP Presence in Long Term Care Facilities Speaker: Dr. Brenda Roup, Maryland Department of Health and Mental Health
Teleclass sponsored by Virox Technologies www.virox.com	11 Nov. 08	(British Teleclass) Clostridium difficile - Prevention is Better Than Cure Speaker: Prof Mark Wilcox, University of Leeds
	20 Nov. 08	Managing Indoor Air & Water Systems for Infection Control & Prevention Speaker: Andrew Striefel, University of Minnesota

www.webbertraining.com.schedulep1.php