Healthcare-Associated Infections: Moving Toward Elimination

Alice Guh, MD, MPH

Division of Healthcare Quality Promotion
Centers for Disease Control and Prevention

November 19, 2010

Elimination of Infectious Diseases

Maximal reduction of "the incidence of infection caused by a specific agent in a defined geographical area as a result of deliberate efforts; continued measures to prevent reestablishment of transmission are required."

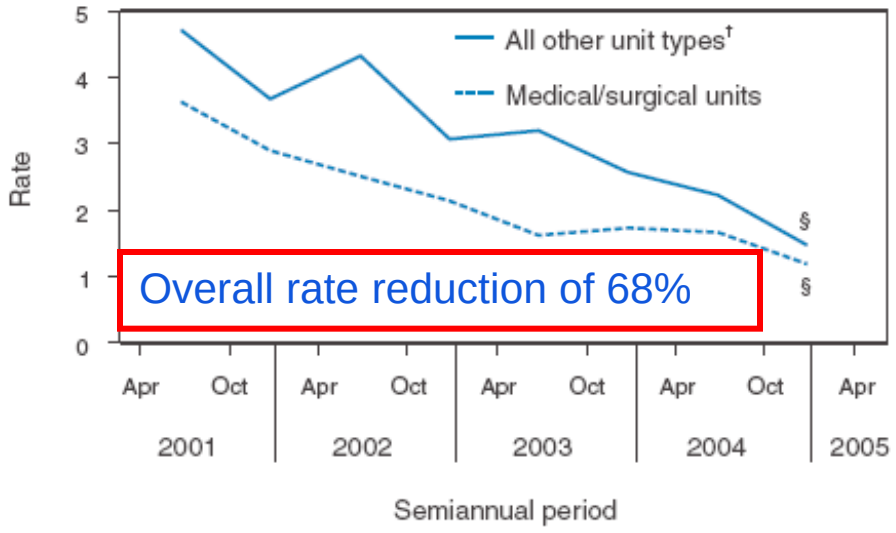
CDC. *MMWR* 1999;48(S):1-28.

LOCAL AND NATIONAL SUCCESSES

Examples of Local Successes: Implementation of CDC Guidelines

Pittsburgh Regional Healthcare Initiative

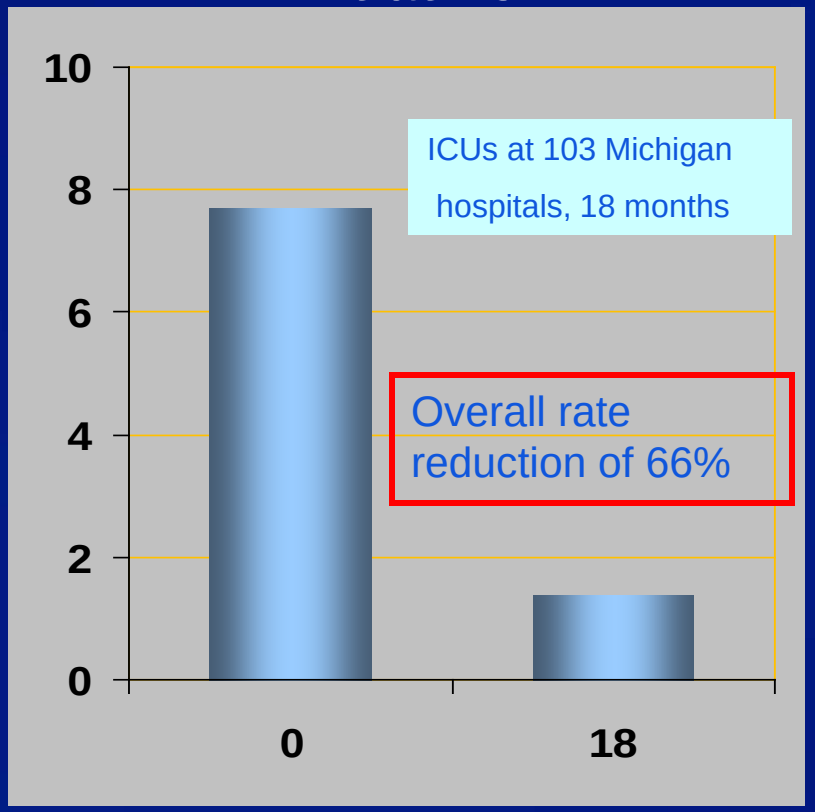
FIGURE. Central line–associated bloodstream infection rate* in 66 intensive care units (ICUs), by ICU type and semiannual period — southwestern Pennsylvania, April 2001–March 2005



* Pooled mean rate per 1,000 central line days.
† Includes cardiothoracic, coronary, surgical, neurosurgical, trauma, medical, burn, and pediatric ICUs.
§ p<0.001.

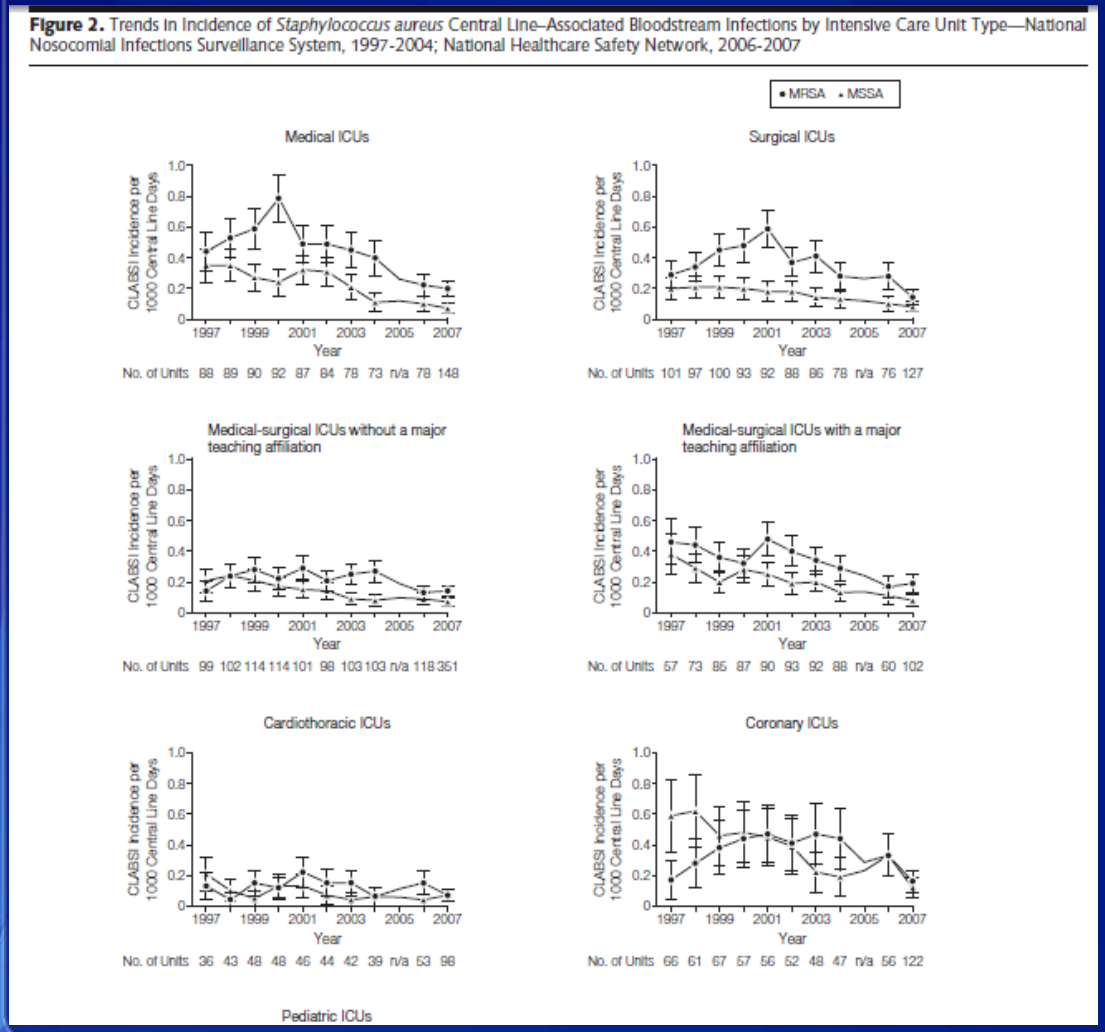
Muto C et al. *MMWR* 2005;54:1013-6.

Michigan Keystone Initiative



Pronovost P et al. *New Engl J Med* 2006;335:2725-32.

Trends in Bloodstream Infections by ICU types, NHSN Hospitals, 1997–2007



- 2001 onward: MRSA CLABSIs decreased in all 6 ICU types: -51.5% to -69.2% relative change

Estimated:

- 7,000 BSIs prevented
- 1,800 lives saved
- $50-$180M in costs averted annually

Burton DC et al. *JAMA* 2009;301:727-36.

ABCs Surveillance: Healthcare-Associated Invasive MRSA Infections, 2005–2008

Table 3. Modeled Yearly Percent Change for All Invasive Methicillin-Resistant *Staphylococcus aureus* (MRSA) Infections and Bloodstream Infections, January 2005-December 2008

Epidemiological Category	Modeled Yearly Percent Change (95% Confidence Intervals), %[a]	*P* Value
All invasive MRSA infections		
Hospital-onset	–9.4 (–14.7 to –3.8)	.005
Health care–associated community-onset	–5.7 (–9.7 to –1.6)	.01
MRSA bloodstream infections		
Hospital-onset	–11.2 (–15.9 to –6.3)	.001
Health care–associated community-onset	–6.6 (–9.5 to –3.7)	<.001
Dialysis in last year	–6.4 (–11.4 to –1.1)[b]	.02
No dialysis in last year	–7.2 (–11.4 to –2.8)[b]	.006

[a] Multilevel model adjusted for age and race unless otherwise specified.
[b] Unadjusted multilevel model.

Kallen A et al. *JAMA* 2010;304:641-48.

CURRENT STATE OF KNOWLEDGE

HICPAC/CDC Guideline Development Process

- **Extensive systematic reviews of the medical literature**
- **Recommendations graded according to evidence basis**
  - Generally supported by high-quality evidence
  - Some by indirect evidence or expert consensus
- **Close collaboration with professional organizations (IDSA / SHEA)**

Example of Evidence-Based Practice: Effect of Hand Hygiene on Resistant Organisms

Year	Author	Setting	Results
1982	Maki	Adult ICU	Reduction in infection rates
1984	Massanari	Adult ICU	Reduction in infection rates
1994	Webster	NICU	Elimination of MRSA
1995	Zafar	Newborn nursery	Elimination of MRSA
2000	Pittet	Hospitalwide	Reduction in infections and MRSA cross-transmission rates

Source: Guideline for Hand Hygiene in Health-care Settings. MMWR 2002;51(RR-16)

HICPAC/CDC Evidence-Based Prevention Recommendations

- **Developed for each type of infection**
  - Prevention of central-line associated bloodstream infections (CLABSI)
  - Prevention of catheter associated urinary tract infections (CAUTI)
  - Prevention of surgical site infections (SSI)
  - Prevention of healthcare-associated pneumonia
  - Management of multi-drug resistant organisms
- **Guidelines contain many recommendations**

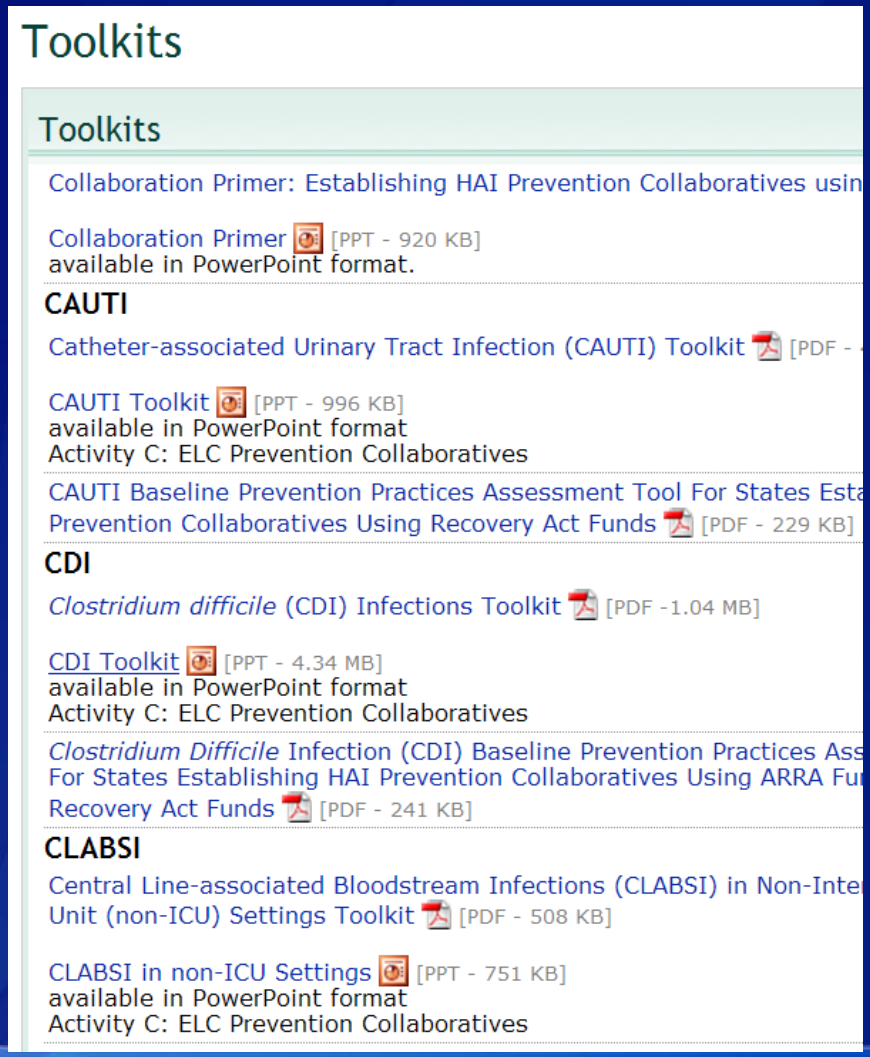
Development of Toolkits for HAI Prevention

- **Distilled current recommendations for optimal prevention strategies**

- Core Strategies
  - High levels of scientific evidence
  - Demonstrated feasibility
- Supplemental Strategies
  - Some scientific evidence
  - Variable levels of feasibility

HAI Prevention Toolkits

http://www.cdc.gov/HAI/recoveryact/stateResources/toolkits.html



Toolkits

Toolkits

Collaboration Primer: Establishing HAI Prevention Collaboratives usin

Collaboration Primer [PPT - 920 KB]
available in PowerPoint format.

CAUTI

Catheter-associated Urinary Tract Infection (CAUTI) Toolkit [PDF -

CAUTI Toolkit [PPT - 996 KB]
available in PowerPoint format
Activity C: ELC Prevention Collaboratives

CAUTI Baseline Prevention Practices Assessment Tool For States Esta
Prevention Collaboratives Using Recovery Act Funds [PDF - 229 KB]

CDI

Clostridium difficile (CDI) Infections Toolkit [PDF -1.04 MB]

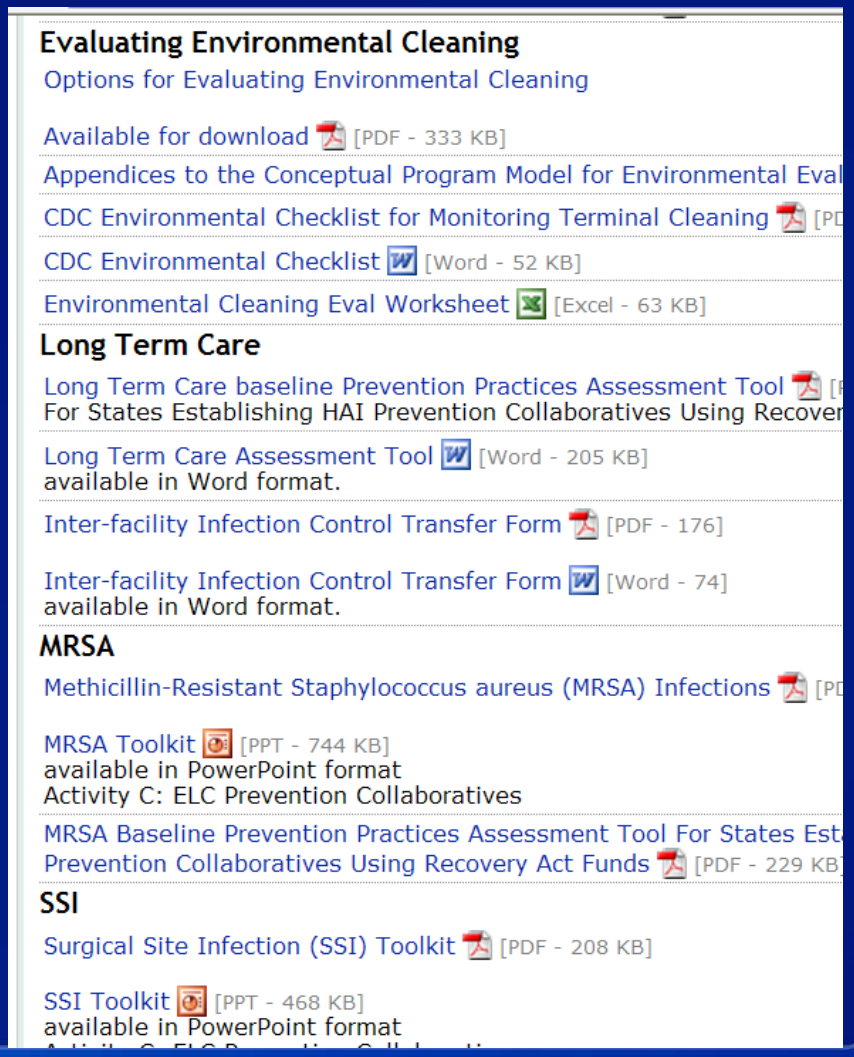
CDI Toolkit [PPT - 4.34 MB]
available in PowerPoint format
Activity C: ELC Prevention Collaboratives

Clostridium Difficile Infection (CDI) Baseline Prevention Practices Ass
For States Establishing HAI Prevention Collaboratives Using ARRA Fu
Recovery Act Funds [PDF - 241 KB]

CLABSI

Central Line-associated Bloodstream Infections (CLABSI) in Non-Inte
Unit (non-ICU) Settings Toolkit [PDF - 508 KB]

CLABSI in non-ICU Settings [PPT - 751 KB]
available in PowerPoint format
Activity C: ELC Prevention Collaboratives



Evaluating Environmental Cleaning

Options for Evaluating Environmental Cleaning

Available for download [PDF - 333 KB]

Appendices to the Conceptual Program Model for Environmental Eval

CDC Environmental Checklist for Monitoring Terminal Cleaning [PD

CDC Environmental Checklist [Word - 52 KB]

Environmental Cleaning Eval Worksheet [Excel - 63 KB]

Long Term Care

Long Term Care baseline Prevention Practices Assessment Tool [
For States Establishing HAI Prevention Collaboratives Using Recover

Long Term Care Assessment Tool [Word - 205 KB]
available in Word format.

Inter-facility Infection Control Transfer Form [PDF - 176]

Inter-facility Infection Control Transfer Form [Word - 74]
available in Word format.

MRSA

Methicillin-Resistant Staphylococcus aureus (MRSA) Infections [PD

MRSA Toolkit [PPT - 744 KB]
available in PowerPoint format
Activity C: ELC Prevention Collaboratives

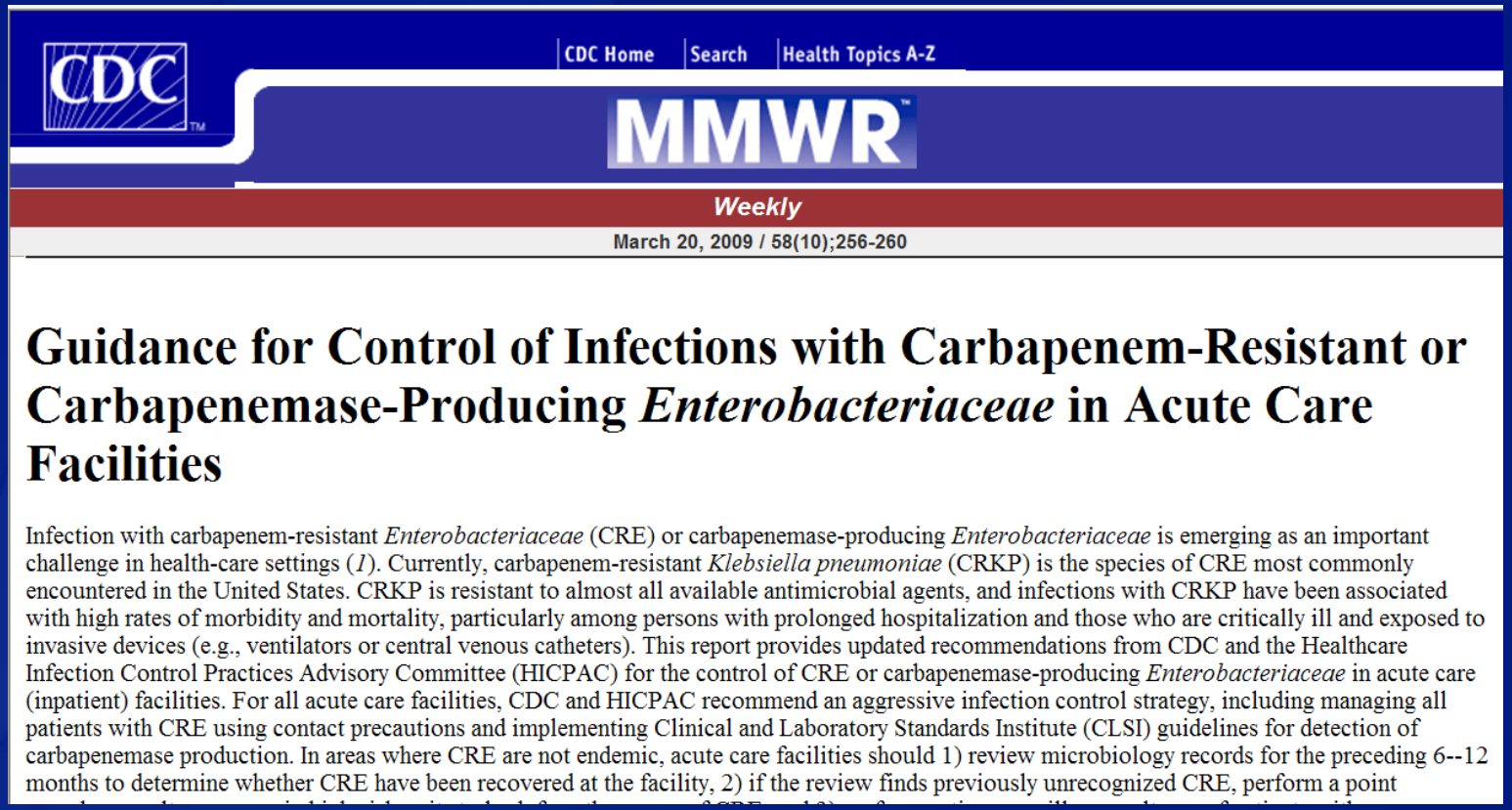
MRSA Baseline Prevention Practices Assessment Tool For States Est
Prevention Collaboratives Using Recovery Act Funds [PDF - 229 KB]

SSI

Surgical Site Infection (SSI) Toolkit [PDF - 208 KB]

SSI Toolkit [PPT - 468 KB]
available in PowerPoint format

Example of MDRO-Specific Guidance: Surveillance and Infection Prevention Measures



CDC Home | Search | Health Topics A-Z

MMWR Weekly

March 20, 2009 / 58(10);256-260

Guidance for Control of Infections with Carbapenem-Resistant or Carbapenemase-Producing *Enterobacteriaceae* in Acute Care Facilities

Infection with carbapenem-resistant *Enterobacteriaceae* (CRE) or carbapenemase-producing *Enterobacteriaceae* is emerging as an important challenge in health-care settings (*1*). Currently, carbapenem-resistant *Klebsiella pneumoniae* (CRKP) is the species of CRE most commonly encountered in the United States. CRKP is resistant to almost all available antimicrobial agents, and infections with CRKP have been associated with high rates of morbidity and mortality, particularly among persons with prolonged hospitalization and those who are critically ill and exposed to invasive devices (e.g., ventilators or central venous catheters). This report provides updated recommendations from CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC) for the control of CRE or carbapenemase-producing *Enterobacteriaceae* in acute care (inpatient) facilities. For all acute care facilities, CDC and HICPAC recommend an aggressive infection control strategy, including managing all patients with CRE using contact precautions and implementing Clinical and Laboratory Standards Institute (CLSI) guidelines for detection of carbapenemase production. In areas where CRE are not endemic, acute care facilities should 1) review microbiology records for the preceding 6--12 months to determine whether CRE have been recovered at the facility, 2) if the review finds previously unrecognized CRE, perform a point

Current State of Affairs: Suboptimal Adherence to Proven Practices

- Average hand hygiene compliance: ~40%
- Compliance with timing of surgical prophylaxis: ~40%
- Full compliance with key guidelines to prevent HAIs: 30%-38% of U.S. hospitals
- Continued outbreaks due to inattention to basic infection control
- CDC guidelines not always part of federal standards/regulations

IMPROVING ADHERENCE TO EVIDENCE-BASED PRACTICES

Collaborative and Integrated Approach

- Targeted education
- Alignment of incentives
- Partnerships and collaborations

Collaborative and Integrated Approach

- Targeted education
- Alignment of incentives
- Partnerships and collaborations

Educational Intervention to Improve Environmental Cleaning (I)

Study Design (n=36 hospitals)

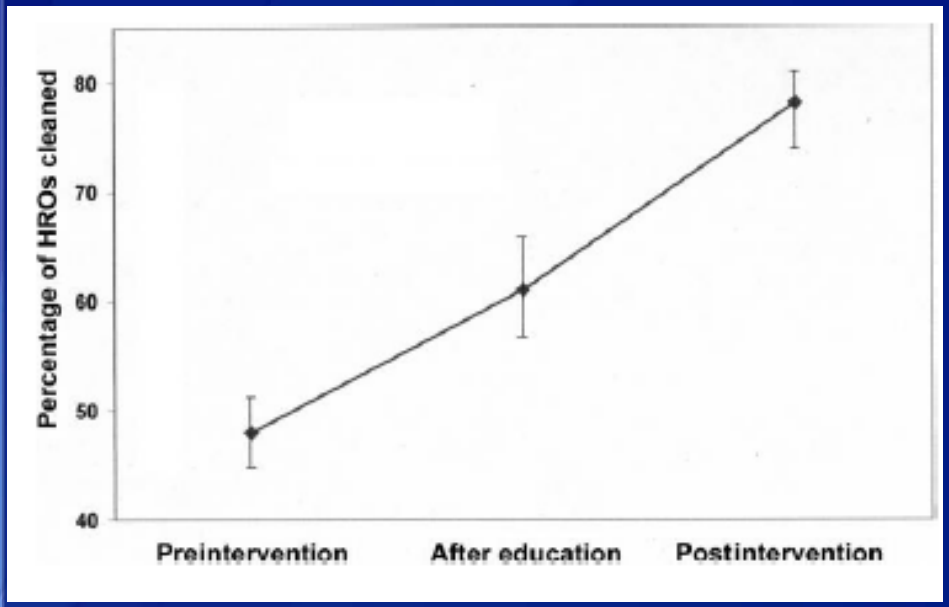
- **Pre-intervention: 48% cleaning rate of a sample of 14 different types of high-risk contact surfaces**
  - Lowest mean cleaning rates (22–29%): bathroom door knobs, handhold, light switch; room door knobs; bedpan cleaner
- **Phase II: standardized educational presentation**
- **Phase III: Performance feedback, additional interventions (programmatic)**

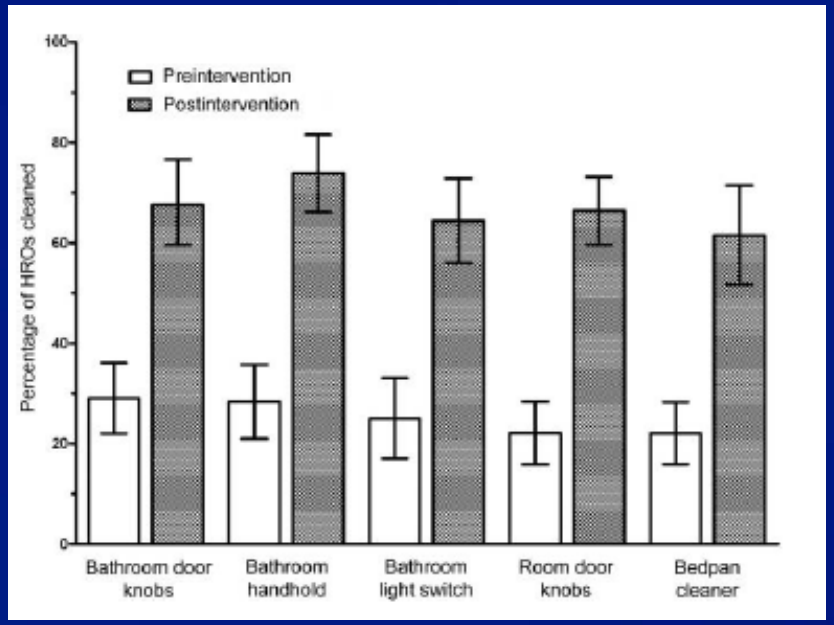
Carling P et al. *Infect Contr Hosp Epidemiol* 2008;29:1035-41.

Educational Intervention to Improve Environmental Cleaning (II)

Results

- Change in mean rate of cleaning over study period
- High-risk contact surfaces with lowest baseline rates: pre- vs post-intervention





Carling P et al. *Infect Contr Hosp Epidemiol* 2008;29:1035-41.

Targeted Educational Initiative to Improve Injection Practices

- Safe Injection Practices Coalition

  http://www.oneandonlycampaign.org/

One & Only Campaign Materials

- Pilot state campaigns: Nevada, New York

Collaborative and Integrated Approach

- Targeted education
- Alignment of incentives
- Partnerships and collaborations

Promote System-Wide Improvement

- **Create sustainable HAI elimination**
  - Healthcare payment incentives
  - Oversight and accreditation
- **Encourage systems of care that are prevention oriented**
- **Prevention of HAIs embedded in processes of care**

Centers for Medicare and Medicaid Services (CMS)

- **October 2008**
- **Non-payment rules for “Never events”**
  - Preventable conditions acquired during patient’s hospital stay
  - Includes HAI bloodstream infections, urinary tract infections, and selected surgical site infections

Federal Efforts to Improve Oversight and Enforcement

- **Strengthen regulatory and accreditation standards across all healthcare settings**
  - Particular focus on infection control
- **Collaboration with CMS**
  - Expanded incorporation of infection control requirements into conditions for coverage and inspection procedures
    - Hemodialysis
    - Ambulatory surgical centers

ASC Infection Control Survey Tool

PART 2 – INFECTION CONTROL & RELATED PRACTICES

Instructions:

- Circle the applicable response, as well as information on the manner in which information was obtained
- Unless otherwise indicated, a "No" response to any question below must be cited as a deficient practice in relation to 42 CFR 416.51(a).
- If N/A is circled, please explain why there is no associated observation, or why the question is not applicable

I. Hand Hygiene

Additional Instructions:

- **Observations are to focus on staff directly involved in patient care (e.g., physicians, nurses, CRNAs, etc.).** Hand hygiene should be observed not only during t
while making other observations in the ASC throughout the survey.
provide additional evidence for what the surveyor has observed, bu

CMS
CENTERS for MEDICARE & MEDICAID SERVICES

http://www.cms.hhs.gov/SurveyCertificationGenInfo/downloads/SCLetter09_37.pdf

State Efforts to Improve Oversight and Enforcement

- Periodic infection control training requirements for licensed healthcare providers (NY)
- Requirement for outpatient endoscopy and surgical centers to retain a licensed Infection Preventionist (NJ)
- Increased licensing, accreditation, and/or inspection requirements for physician offices and clinics based on levels of anesthesia or sedation provided (NY, NV)

Collaborative and Integrated Approach

- Targeted education
- Alignment of incentives
- Partnerships and collaborations

Importance of Teamwork

- **Collaboration across all healthcare personnel groups**
- **Each person has role in HAI prevention**
- **Empowered to promote patient safety**
  - Success of positive deviance programs

“Collaboration rather than competition should be the hallmark of elimination efforts.”

Pronovost P. HICPAC November 2009.

Increasing Needs and Opportunities for Partnerships Across the Continuum of Care

Acute Care Facility

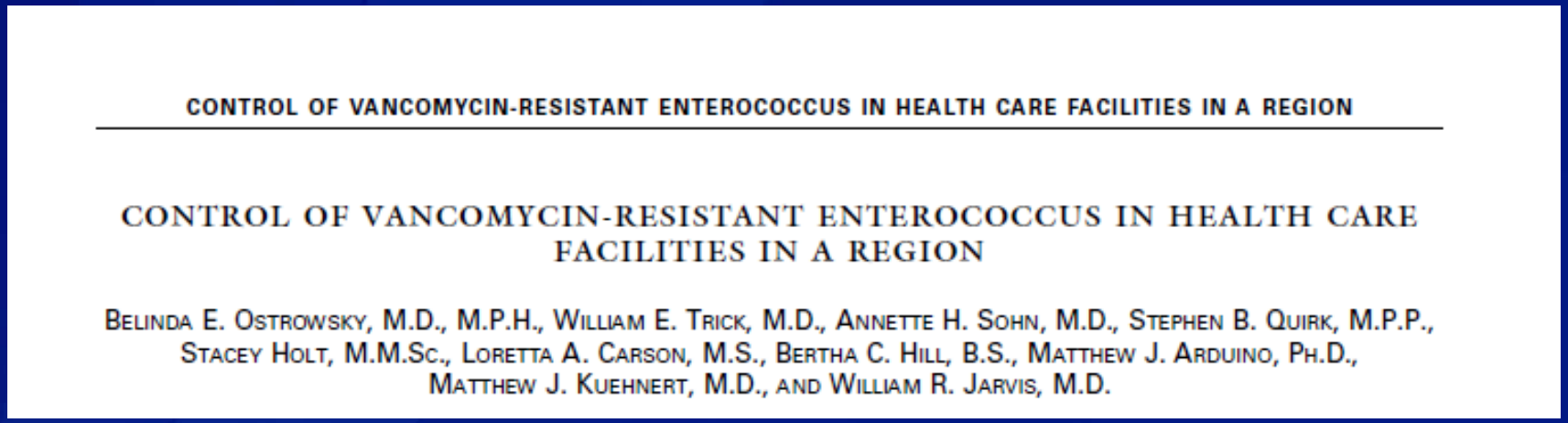
Home Care

Outpatient/ Ambulatory Facility

State Health Departments

Long Term Care Facility

Regional Approach May be the Key



CONTROL OF VANCOMYCIN-RESISTANT ENTEROCOCCUS IN HEALTH CARE FACILITIES IN A REGION

CONTROL OF VANCOMYCIN-RESISTANT ENTEROCOCCUS IN HEALTH CARE FACILITIES IN A REGION

BELINDA E. OSTROWSKY, M.D., M.P.H., WILLIAM E. TRICK, M.D., ANNETTE H. SOHN, M.D., STEPHEN B. QUIRK, M.P.P., STACEY HOLT, M.M.SC., LORETTA A. CARSON, M.S., BERTHA C. HILL, B.S., MATTHEW J. ARDUINO, PH.D., MATTHEW J. KUEHNERT, M.D., AND WILLIAM R. JARVIS, M.D.

- Emergence of VRE in acute care facilities and LTCF in Siouxland region
- Collaboration among health departments and all 32 facilities controlled VRE outbreak

Ostrowsky B et al. *New Engl J Med* 2001;344:1427-33.

A New Model for Prevention: Prevention Collaboratives

- Gold standard in HAI prevention
- Group of healthcare facilities engaged in a common effort to reduce HAIs
- Members use a common strategy
- Discuss progress regularly and share lessons learned in real time

Strengths of a Prevention Collaborative

- Opportunities to share experiences on what works and does not work
- Ability to get advice from others who are working on the same project
- Peer pressure is also a motivator
- Regional prevention collaborative is key in preventing MDRO transmission

What's the Minimum Size of a Prevention Collaborative?

- **2 or more facilities working together meaningfully**
- **Ideal size depends on multiple factors**
  - Specific subject or targeted HAI
  - Type of healthcare facilities
  - Available resources
  - More "cutting edge" — smaller number
  - More established "change packages" can be quite large
  - Level of enthusiasm

Lessons Learned from Pittsburgh and Michigan

- Successful collaboration among participating hospitals with varying ICU types
- Prevention practices utilized during these interventions were not novel
- Practical implementation strategies identified that can be successful across many facilities

Muto et al. *MMWR* 2005.;54:103-6. Pronovost et al. *New Engl J Med* 2006;335:2725-32.

Common Elements for Successful Infection Prevention

- Simple
- Patient-centered, integrated with care
- Evidence-based recommendations
- Part of a “package” for prevention
- Engaging and empowering providers
- Protocols and systems in place
- Standardized ways for recording information about infections (e.g., NHSN)
- Regular feedback of information to providers
- Changing to a pro-safety culture
- Leadership support

Muto et al. *MMWR* 2005.;54:103-6. Pronovost et al. *New Engl J Med* 2006;335:2725-32.

State-Based HAI Prevention Collaboratives

- **ARRA funded collaboratives (fully or in part) – July 2010**
- **39 states, 45 collaboratives**
  - CLABSI (n=14)
  - CAUTI (n=5)
  - MRSA (n=9)
  - SSI (n=6)
- **Vermont: MDRO prevention collaborative involving all acute care facilities + LTCFs**

ADDRESSING GAPS IN KNOWLEDGE

Improving HAI Surveillance

- **Provide accurate and timely data to assess HAI risks and impact of prevention strategies**
- **Continue refining and developing new standard definitions and surveillance methods**
  - Capture nonhospital HAIs
- **Identify less-labor intensive method**
  - Algorithmic detection of HAIs
  - Capture through electronic health information records

Building Capacity for Outbreak Response

- **Investigations of HAIs or adverse events in various healthcare settings**
- **Why we care so much about outbreaks**
  - Major detriment to patient care and safety
  - Possible massive financial and public health impacts (e.g. undermine preventive care)
  - Sentinel events and can play a major role in making recommendations that improve overall patient care
  - Provide important opportunities for education

Continuing Prevention Research

- **Develop effective prevention strategies**
  - Particularly non-ICU and nonhospital settings
- **Enhance understanding of the epidemiology of certain HAI pathogens**
- **Identify strategies for improving adherence**

Infection Prevention is Everyone's Responsibility!

Thank you

For more information please contact Centers for Disease Control and Prevention

1600 Clifton Road NE, Atlanta, GA30333
Telephone, 1-800-CDC-INFO (232-4636)/TTY: 1-888-232-6348
E-mail: cdcinfo@cdc.gov Web: www.cdc.gov