Preventing Healthcare-Associated Infections

Council of State and Territorial Epidemiologists
Sunday Workshop
June 7, 2009

Presented by:
Division of Healthcare Quality Promotion
Centers for Disease Control and Prevention
Agenda

- Welcome & Introduction
- Overview of HAI Prevention Activities
- Recovery Act Background and Intent
- State HAI Plans and Progress
- NHSN
- Prevention Collaboratives
- CDC Technical Support
- Questions
DHQP ACTIVITIES

- Adverse Drug Events
- Immunization Safety
- Healthcare-Associated Infections
- Antimicrobial Resistance
- Transfusion/Transplant Safety
- Healthcare Preparedness

Working through . . .

- Outbreak Investigations
- Surveillance
- Prevention Recommendations
- Intervention Implementation
- Laboratory Support and Research
- Collaborations and Partnerships

- 1.7 million infections in hospitals
  - Most (1.3 million) were outside of ICUs
  - 9.3 infections per 1,000 patient-days
  - 4.5 per 100 admissions (1 out of 20 patients acquire an infection in US)

- 99,000 deaths associated with infections

Increasing #s of outbreaks associated with outpatient care

- Wide range of settings (e.g., ambulatory surgery, cancer clinics, pain medicine, dialysis, long-term care, physician offices)
- Bacterial, fungal, viral and non-infectious adverse events
- Unsafe injections; foundation of basic safe care practices lacking

n = 55, as of March 2009
Changing World of Patient Safety

- MRSA
- C. difficile
- Acinetobacter
- Antimicrobial resistance
- Multi-drug resistant gram negative bacteria
- Increased use of ambulatory care settings
- Public reporting
Increasing numbers of surgical procedures are moving from the inpatient to the outpatient setting.

Chart 1: Inpatient vs. Outpatient Surgery Volume, 1981-2005

Increasing Needs and Opportunities for Public Health Approach Across the Continuum of Care

Acute Care Facility

Home Care

Outpatient/Ambulatory Facility

Long Term Care Facility
The time is right to focus on HAI... 

- Legislative actions:
  - CMS non-payment rules for hospital-acquired conditions includes some HAI
  - Multiple bills introduced at Federal level on HAI
  - Hearings on HAI, GAO investigations

- Public reporting in States: >20 states require mandatory reporting

- IOM reports, private sector initiatives
Patients want to feel safe and assured that we are doing everything possible to eliminate infections.
Preventability of Healthcare-Associated Infections

What proportion of healthcare infections are caused by errors... i.e. are preventable?

Medical Errors and Near-misses

Healthcare-associated Infections

CDC’s SENIC Study-1970’s
Preventability of Healthcare-Associated Infections

What proportion of healthcare infections are caused by errors... i.e. are preventable?

Goal: Best quality of patient care and elimination of preventable healthcare-associated infections
Keys for the Elimination of Healthcare-Associated Infections

- Full adherence to recommendations
  - Across care continuum
- Collect data and disseminate results
  - Communication with providers and consumers
  - Evaluate how we’re doing
- Identify and respond to emerging threats
- Improve science for prevention through research
- Recognize/ensure excellence
Keys for the Elimination of Healthcare-Associated Infections

• Full adherence to prevention recommendations (Accountability)
  • Success in regional initiatives
    ➢ ARRA funds to expand to state health agencies
  • Needs extend across the care continuum
  • Oversight and monitoring

• Collection of data to assess prevention impact and dissemination of results to healthcare providers and consumers (Transparency and sustainability)
  • State reporting legislation
    ➢ NHSN in 50 States, using data to move towards national targets
Keys for the Elimination of Healthcare-Associated Infections (cont.)

- Identify and respond to emerging threats
  - Outbreak investigations as a flag for emerging problems
    - Evidence base, strategies and guidelines to address new problems

- Finding new solutions for HAI prevention
  - Identifying and addressing knowledge gaps
  - Innovative ways to increase adherence to recommendations

- Ensuring excellence
  - CMS deficit reduction act, survey capacity
    - Promoting best practices, ARRA to increase inspections in ASCs
Keys for the Elimination of Healthcare-Associated Infections (cont.)

- New Knowledge
  - Identify and respond to emerging threats
    - Outbreak investigations as a flag for emerging problems
    - Strategies and guidelines to address new problems
  - Finding new solutions for HAI prevention
    - Identifying and addressing knowledge gaps
    - Innovative ways to increase adherence to recommendations
News Release

FOR IMMEDIATE RELEASE
Tuesday, January 6, 2009

HHS Issues Action Plan to Prevent Health Care-Associated Infections

The U.S. Department of Health and Human Services (HHS) unveiled a plan that establishes a set of five-year national prevention targets to reduce and possibly eliminate health care-associated infections (HAIs).

Health care-associated infections are infections that patients acquire while undergoing medical treatment or surgical procedures. These infections are largely preventable.

The plan also outlines cross-agency efforts to save lives and reduce infection efforts.

The department addresses this important public health and patient safety issue. "This collaborative interagency plan will help the nation build a systems strategy and a national messaging plan.

Promises key actions for enhancing and coordinating HHS-supported efforts."

Health care needs leadership from HHS to prioritize prevention practices and improve data on these infections.

Statement of Cynthia A. Baccetta
Director, Health Care

For more information about the plan, contact the OPHS Press Office at (202) 205-0143.

http://www.hhs.gov/OPHS

United States Government Accountability Office
Testimony
Before the Committee on Oversight and Government Reform, House of Representatives

HEALTH-CARE-ASSOCIATED INFECTIONS IN HOSPITALS

Leadership Needed from HHS to Prioritize Prevention Practices and Improve Data on These Infections

Statement of Cynthia A. Baccetta
Director, Health Care

GAO-08-653T
Recovery Act Intent and Background
Recovery Act Intent and Background

  - signed into law February 17, 2009
- Primary Purpose = Economic Stimulus and down payment on Healthcare Reform.
- Unprecedented transparency and accountability
- Requires merit-based selection of recipients
  - Deliver programmatic results
  - Achieve economic stimulus
- Prevention and Wellness Fund
  - ↑ U.S. healthcare infrastructure, ↓ healthcare costs
  - $40 million to CDC for HAI
    - $35.8M through ELC / $4M through EIP
    - Eligibility limited to “States”
This aims to build and improve state health department workforce, training, and tools necessary to rapidly scale up to meet this new HAI prevention work.

Support states that are just starting on HAI prevention activities or, in states that already have some HAI prevention activities, to expand into new HAI prevention areas.

Support the ability for states to submit data on their progress toward the HHS HAI Prevention Targets.

Create new state-level competencies and tools that will continue even after Recovery Act funding has expired and therefore leave behind a sustainable infrastructure for reporting on long-term progress toward meeting the HHS HAI Prevention Targets.
This Recovery Act supplement to ELC includes three activities outlined below.

- **Activity A** is the basic staffing and coordination to draft the State HAI Prevention Plan and establish the state’s capacity to develop an HAI prevention program. In general, Activity A is aimed for state health departments that have little or no current activity or expertise on HAI prevention or reporting.

- **Activity B** aims to increase facility participation in NHSN and use NHSN to establish baseline HAI data for the state.

- **Activity C** aims to support prevention collaboratives in the state to undertake prevention activities or initiatives.

States can apply for any combination of the activities listed above.
Timeline for ARRA Review

- Application Deadline: June 26, 2009
- Anticipated Award Date: August 30, 2009
- State HAI Plans due to HHS: January 1, 2010
- First Quarterly Report due to Recovery.gov: October 10, 2009
State HAI Plans and Progress
To meet FY09 Omnibus Bill requirement for states receiving Preventive Health and Health Services Block Grant funds, states must submit HAI Plans to HHS:

- "Blueprint" for state HAI reduction activities going forward
- July 1, 2009 - States certify by that they will submit an HAI plan to CDC to receive Block Grant funding
- January 1, 2010 – State plans due to HHS

CDC has developed guidance to assist states in developing HAI plans.
HAI Prevention Planning Guidance

- Develop a plan to build and improve health department workforce, training, and tools necessary to rapidly scale up to meet HAI prevention and control needs
- Assist states that are just starting on HAI prevention activities
- Create a path for existing HAI programs to expand into new HAI prevention areas
- Lay groundwork for new state-level competencies and tools for reporting on long-term progress toward meeting the HHS HAI Prevention Targets
Guidance template will help to ensure progress towards five-year national prevention targets as described in the HHS Action Plan in the following areas:

1. Integration, Collaboration, and Capacity Building
2. Reporting, Detection, Response, and Surveillance
3. Prevention
4. Evaluation, Oversight, and Communication
State HAI Prevention Plan
Draft Template Example Elements

Integration, Collaboration, and Capacity Building
• Formation of multidisciplinary group
• State HAI prevention coordinator
• Coordination within state government
• Enhance data sharing mechanisms

Reporting, Detection, Response, Surveillance
• Improve outbreak detection and investigation
• Enhance laboratory capacity
• Identify surveillance targets ~ HHS Action Plan
• Surveillance training and validation
State HAI Prevention Plan
Draft Template Example Elements

Prevention and Oversight

• Establish HAI prevention collaborative(s)
• Prevention training (e.g., certification, campaigns targeting public and providers)
• Promote adherence to HICPAC recommendations (e.g., improved oversight, standards, surveyor tools)

Evaluation and Communications

• Needs assessment / evaluation of state HAI program
• Communication plan
  • Prevention priorities / progress
  • Public and private stakeholders, including consumers
HAI Prevention Planning Timelines

- June 2009 – CDC distributes HAI planning Guidance
- July 2009 – Teleconferences on HAI planning to assist states
- July 1, 2009 - States sign and submit certification for submitting HAI plan to CDC - July 1, 2009
- July 30, 2009 – State and Local health department meetings on state HAI guidance in Chicago
- January 1, 2010 – State plans due to HHS for certification
- June 1, 2010 – Review of state plans by HHS due to Congress
National Healthcare Safety Network
NHSN
NHSN as a Tool for State HAI Reporting Programs

Catherine Rebmann
NHSN Implementation Team Leader
Division of Healthcare Quality Promotion
Centers for Disease Control and Prevention

CSTE Annual Meeting
June 7, 2009
Target Audience

This session is designed for state or local health department employees who want to use the National Healthcare Safety Network (NHSN) to collect HAI data from all or some of the healthcare facilities in their jurisdiction.
Objectives

- What is NHSN?
  - Purposes
  - Components and Modules
  - Surveillance methodology
- Who is using NHSN and what are they using it for?
- Use of the GROUP function in NHSN
  - What is a Group?
  - How to form a Group
  - Tips for the Group to get the data they need
CDC Surveillance for HAIs

- Voluntary system for monitoring healthcare-associated events and processes (2005 - )
- Increasingly used to comply with State legislation that mandates reporting of HAI data (2007 - )
- Also being used as a tool for prevention collaboratives
CDC Surveillance for HAIs: 2009

This Recovery Act supplement to ELC includes three activities outlined below.

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- **Activity B** aims to increase facility participation in NHSN and use NHSN to establish baseline HAI data for the state.

- **Activity C** aims to support prevention collaboratives in the state to undertake prevention activities or initiatives.
Components of NHSN

- Patient Safety
- Healthcare Personnel Safety
- Biovigilance
- Research and Development
### Patient Safety Component Modules

<table>
<thead>
<tr>
<th>Module</th>
<th>Components</th>
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<tbody>
<tr>
<td>Device-associated</td>
<td>• CLABSI • CLIP • CAUTI • DE • VAP</td>
</tr>
<tr>
<td>Procedure-associated</td>
<td>• SSI • PPP</td>
</tr>
<tr>
<td>Medication-associated</td>
<td>• AUR Pharmacy • AUR Microbiology</td>
</tr>
<tr>
<td>MDRO/CDAD</td>
<td>• MDRO/CDAD Infection • LabID • Processes</td>
</tr>
<tr>
<td>Patient Influenza Immunization</td>
<td>• Method A • Method B</td>
</tr>
</tbody>
</table>
Purposes of NHSN

- Collect data from a sample of US healthcare facilities to permit valid estimation of the
  - magnitude of adverse events among patients and healthcare personnel
  - adherence to practices known to be associated with prevention of healthcare-associated infections (HAI)
- Analyze and report collected data to permit recognition of trends
Purposes of NHSN

- Provide facilities with risk-adjusted data that can be used for inter-facility comparisons and local quality improvement activities
- Assist facilities in developing surveillance and analysis methods that permit timely recognition of patient and healthcare personnel safety problems and prompt intervention with appropriate measures
- Conduct collaborative research studies with members
NHSN Surveillance Methodology

- **Active** (vs. passive)
  - Trained infection preventionists (IPs) look for and identify infections
  - Accumulate information from multiple data sources

- **Patient-based** (vs. laboratory-based)
  - Not based solely on laboratory data
  - Identification of risk factors, patient care procedures

- **Prospective** (vs. retrospective)
  - Monitor patients during their hospitalization when possible

- **Priority-directed** (vs. comprehensive)
  - Surveillance objectives are defined and focused on specific events, processes, organisms, populations
Authority and Confidentiality for NHSN

- Public Health Service Act (42 USC 242b, 242k, and 242m(d))
- Confidentiality Protection
  - Sections 304, 306, and 308(d) of the PHS Act

“The information contained in this surveillance system that would permit identification of any individual or institution is collected with a guarantee that it will be held in strict confidence, will be used only for the purposes stated, and will not be disclosed or released without the consent of the individual, or the institution in accordance with Sections 304, 306, and 308(d) of the Public Health Service Act (42 USC 242b, 242k, and 242m(d)).”
## What and When States Using NHSN are Reporting (n=20)

<table>
<thead>
<tr>
<th>Event Type</th>
<th>Reporting States</th>
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<tbody>
<tr>
<td>CLABSI</td>
<td>CO, CT, DE, IL, MA, MD, NH, NJ, NY, OK, OR, PA, SC, TN, VA, VT, WA, WV</td>
</tr>
<tr>
<td>CAUTI</td>
<td>PA</td>
</tr>
<tr>
<td>SSI</td>
<td>CO, MA, NH, NJ, NY, OR, PA, SC, TN, VT</td>
</tr>
<tr>
<td>VAP</td>
<td>NH, OK, PA, WA</td>
</tr>
<tr>
<td>Dialysis events</td>
<td>CO</td>
</tr>
<tr>
<td>Process measures</td>
<td>CA, DE, MD, NH, NJ, PA, VT, WV</td>
</tr>
</tbody>
</table>

As of 6/3/2009
State of NHSN: Continued Growth (n=2306)

Number of NHSN Facilities Enrolled By Month

- SC Mandatory Reporting, 7/07
- CO Mandatory Reporting, 8/07
- TN, CT Mandatory Reporting, 7/08
- CA, DE, MA, MD, OK, VA, WA Mandatory Reporting, 7/07
- PA Mandatory Reporting, 2/08
- IL Mandatory Reporting, 11/08
- NH, NJ, OR Mandatory Reporting, 1/09


0 500 1000 1500 2000 2500

Count
Why use NHSN for HAI Reporting?

- Provides standard definitions, protocols and methodology
- Not just a reporting tool, comparative rates used for performance improvement
- Useful analysis tools are included
- CDC provides training and user support
- Use of the application is free
- Ability to share data with a Group
What is a Group in NHSN?

- A Group is a collection of facilities that have joined together within the NHSN framework to share some or all of their data at a single (Group) level for a mutual purpose (e.g., performance improvement, state and/or public reporting).
Steps to form a Group in NHSN

1. Complete required reading and training for the Group Administrator or Group User
2. An NHSN facility “nominates” the Group
3. The Group Administrator obtains a digital certificate
4. The Group Administrator adds additional users to the group and sets a Group joining password.
5. The Group Administrator sends the Group ID and Group joining password to facilities and invites them to join the Group
6. Facilities join the Group and confer some/all rights to data
1. Materials and Training for Group Users

- The NHSN Group Administrator Guide
- The NHSN Patient Safety Component Manual AND accompanying materials:
  - Tables of Instructions
  - Data Collection Forms

http://www.cdc.gov/NHSN
2. An NHSN Facility “Nominates” the Group

- Selects Nominate from the Group section of NHSN Nav Bar
- Enters the name and type of Group
- Enters the information about the Group Administrator

- Nominating a group does not automatically join the facility to the group
- Only ONE facility should do the group nomination
- Provide the nominator with your correct e-mail address, it MUST match your digital certificate
Nominate Group

Note: This form should be used for nominating organizations that serve as groups. If the proposed administrator for the group is already a user in the NHSN system, check the Use Existing NHSN User option below. For that case you will be prompted to enter the unique e-mail address of that person.

If the proposed administrator does not already exist, check the Create New NHSN User option. For that case you will be prompted to provide a User ID and initial password for that user along with the person's name, email address, and phone number.

Enter group data

Mandatory fields marked with *

Group Name*: 

Type of Group*: HCSP - Healthcare system, Private, for profit

If group type is Other, enter type here: 

Group Administrator Information*

Use existing NHSN user Create new NHSN user

Note: To specify a new user as the administrator of this group, enter that person's name, email address, and phone number, and then hit the Submit button. The new group administrator will be notified when the group has been added, and will supply potential member facilities with the information necessary to join the group including the joining password.
3. The Nominated Group Administrator...

- Receives an email notification from NHSN containing the Group ID and instructions about obtaining a digital certificate
  - If you already have a digital certificate, you don’t need a new one
  - Just request a new program/activity:
    - Program: National Healthcare Safety Network (NHSN)
    - Activity: NHSN Reporting
- Groups do not enroll and do not require an enrollment number
4. The Group Administrator Adds Users and Sets a Password

- Logs in to NHSN Reporting, adds other Group users, and sets Group joining password
- Shares the Group ID and joining password with those NHSN facilities that should join the group

⚠️ The Group ID is a 5-digit number assigned by NHSN, not the Group Name.

⚠️ The Group joining password is case sensitive and special characters are not recommended.
Setting the Group Joining Password

Enter and verify the joining password. Click "Set Password."
5. **The Group Administrator Invites Facilities to Join**

- From the Group section of NHSN Nav Bar, the Facility Administrator selects Join
- Enters the Group ID
- Enters the Group Joining Password

⚠️ A facility can join as many groups as they want to or need to.
Join a Group

Memberships

Groups that have access to this facility's data

Cathy's test group (14220)

Enter the Group Joining Password: [Password field]

Join Group

The decision to confer rights to a group is a decision made by a facility administrator. Existence of a group organization in NHSN should not be construed as a recommendation from CDC to join the group. CDC cannot be held accountable for how group users use data access granted to the group by a facility.

OK

Back
6. Facilities Confer Rights to the Group

- Facility gives access rights to certain pieces of its data to the Group
- Group can analyze the data of its member facilities
- NHSN facilities in the Group cannot see one another’s data
- Facilities can confer rights
  - By Component
  - By Plan status
  - By Location
  - By Date Range
  - By Procedure/Setting
  - By Event
Confer rights to patient data, with or without identifiers

Conferring rights to the Annual Hospital Survey will allow the Group to see the Facility’s name, address, phone, and facility type
Confer Rights to a Group

- Can copy all locations to the Summary Data section
- Can copy all procedures to the Denominator Data section
The Group users will be able to access data from all their member facilities or they can select a single facility.
Many analysis options are available to the Group users from within NHSN.
After Facilities Join the Group and Confer Rights

National Healthcare Safety Network
Line Listing for All Device-Associated Events
As of: June 5, 2009 at 1:53 PM
Data Range: DA_EVENTS admDateYr 2008 to 2009

<table>
<thead>
<tr>
<th>orgID</th>
<th>patID</th>
<th>dob</th>
<th>gender</th>
<th>admitDate</th>
<th>eventID</th>
<th>eventDate</th>
<th>eventType</th>
<th>centralLine</th>
<th>location</th>
<th>locCDCDesc</th>
<th>spcEvent</th>
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<tbody>
<tr>
<td>10000</td>
<td>134655</td>
<td>09/22/1956</td>
<td>F</td>
<td>10/02/2008</td>
<td>1478627</td>
<td>10/14/2008</td>
<td>BSI</td>
<td>Y</td>
<td>MICU</td>
<td>Medical Critical Care</td>
<td>LCBI</td>
</tr>
<tr>
<td>10000</td>
<td>MD-4050</td>
<td>03/12/1963</td>
<td>F</td>
<td>03/03/2009</td>
<td>1756275</td>
<td>03/12/2009</td>
<td>BSI</td>
<td>Y</td>
<td>MICU</td>
<td>Medical Critical Care</td>
<td>LCBI</td>
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<tr>
<td>10000</td>
<td>MD-4060</td>
<td>02/03/1954</td>
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<td>03/15/2009</td>
<td>1808572</td>
<td>03/26/2009</td>
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<td>Y</td>
<td>MICU</td>
<td>Medical Critical Care</td>
<td>LCBI</td>
</tr>
<tr>
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<td>03/22/2009</td>
<td>1913748</td>
<td>03/30/2009</td>
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<td>Medical Critical Care</td>
<td>LCBI</td>
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<td>10000</td>
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<td>F</td>
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<td>BSI</td>
<td>Y</td>
<td>MICU</td>
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<td>LCBI</td>
</tr>
</tbody>
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Sorted by eventType
Data contained in this report were last generated on June 5, 2009 at 1:40 PM.

National Healthcare Safety Network
Rate Table for All Device-Associated Data
As of: June 5, 2009 at 1:43 PM
Data Range: All DA_RATES
Device-Associated Rates

<table>
<thead>
<tr>
<th>eventType</th>
<th>inf</th>
<th>numddays</th>
<th>rate</th>
<th>NHSN_mean</th>
<th>IDR_pval</th>
<th>IDR_pctl</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLAB (central line assoc BSI)</td>
<td>1</td>
<td>200</td>
<td>5.0</td>
<td>2.4</td>
<td>0.3761</td>
<td>87</td>
</tr>
</tbody>
</table>

Data contained in this report were last generated on June 5, 2009 at 1:40 PM.
Data sets can be exported to various other programs for review and analysis.
Summary of the NHSN Group Function

- Any entity can form a group in NHSN
- An NHSN facility “nominates” the group
- Facilities join the group and confer some/all rights to data
- The Group can analyze the data of its member facilities
- Facilities within the Group cannot see each other’s data
- Facilities can join as many groups as they like
CDC Support for the Group-Level User

- Consultation on experience from other States
- Presentations to Advisory Groups
- Collaboration with CSTE, SHEA, APIC, IDSA, other Federal agencies including CMS and AHRQ
- Access to “test” facilities
- NHSN State Users Group
  - Conference calls monthly
  - Web Board to share materials
- Consultation on analysis, HAI comparison metrics
NHSN Team Members

- Protocols and definitions support
  - Kathy Allen-Bridson
  - **Gloria Morrell**
  - Maggie Dudeck

- Technical support
  - Yvonne Smith
  - **Tiffany Dozier**

- State and other Groups support
  - Cathy Rebmann
  - **Paul Malpiedi**
  - Alexis Harvey

- Reports and statistics support
  - Jonathan Edwards
  - Yi Mu
National Healthcare Safety Network (NHSN)

The National Healthcare Safety Network (NHSN) is a voluntary, secure, Internet-based surveillance system that integrates and expands legacy patient and healthcare personnel safety surveillance systems managed by the Division of Healthcare Quality Promotion (DHQP) at CDC. NHSN also includes a new component for hospitals to monitor adverse reactions and incidents associated with receipt of blood and blood products. Enrollment is open to all types of healthcare facilities in the United States, including acute care hospitals, long term acute care hospitals, psychiatric hospitals, rehabilitation hospitals, outpatient dialysis centers, ambulatory surgery centers, and long term care facilities. For more information, click on the topics below.
Prevention Collaboratives
Establishing HAI Prevention Collaboratives using ARRA Funds
Establish a Prevention Collaborative

- Activity C in Funding Opportunity Number: CI07-70402ARRA09
- “Establish multicenter evidence-based HAI prevention collaboratives among acute care hospitals within the state”
- “Make measurable progress toward the National Prevention Targets outlined in the HHS Action Plan to Prevent Healthcare-Associated Infections”
Why a Prevention Collaborative?

- Rethinking the preventable fraction
  - Prevention successes
- Organizational theory
  - Healthcare facilities as complex adaptive systems likely to benefit from collaboration
- Evidence for collaboratives in other disciplines
What is the Preventable Fraction of Healthcare-Associated Infections?
What is the Preventable Fraction of Healthcare-Associated Infections?

- Study on the Efficacy of Nosocomial Infection Control (SENIC) study results
  - 1971-1976
  - Suggested 6% of all nosocomial infections could be prevented by minimal infection control efforts, 32% by “well organized and highly effective infection control programs

- Harbarth et al: at least 20% of infections are preventable J Hosp Infect 2003;54:258
What is the Preventable Fraction of Healthcare-Associated Infections?

- Some may have interpreted these data to mean that *most* healthcare-associated infections are inevitable
  - What impact has this had on the psychology of prevention?
- How has this influenced the way infection control programs operate?
  - Difficult to define success when achievable results unknown—what should the goal be?
Overall rate reduction of 68%
Semi-Annual Central Line-associated Bloodstream Infection Rates in Medical-Surgical Intensive Care Units Participating in the Southwest Pennsylvania Collaborative and NNIS, 2001-2005

Rate per 1000 central line-days

- Apr 2001-Sept 2001
- Oct 2001-Mar 2002
- Apr 2002-Sept 2002
- Oct 2002-Mar 2003
- Apr 2003-Sept 2003
- Oct 2003-Mar 2004
- Apr 2004-Sept 2004
- Oct 2004-Mar 2005

p<0.001

p=NS

*NNIS data only available for Oct-Dec 2004
### Table 3. Rates of Catheter-Related Bloodstream Infection from Baseline (before Implementation of the Study Intervention) to 18 Months of Follow-up.*

<table>
<thead>
<tr>
<th>Study Period</th>
<th>No. of ICUs</th>
<th>No. of Bloodstream Infections per 1000 Catheter-Days</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Overall</td>
</tr>
<tr>
<td></td>
<td></td>
<td>median (interquartile range)</td>
</tr>
<tr>
<td>Baseline</td>
<td>55</td>
<td>2.7 (0.6–4.8)</td>
</tr>
<tr>
<td>During implementation</td>
<td>96</td>
<td>1.6 (0–4.4) †</td>
</tr>
<tr>
<td>After implementation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0–3 mo</td>
<td>96</td>
<td>0 (0–3.0) ‡</td>
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<tr>
<td>4–6 mo</td>
<td>96</td>
<td>0 (0–2.7) ‡</td>
</tr>
<tr>
<td>7–9 mo</td>
<td>95</td>
<td>0 (0–2.1) ‡</td>
</tr>
<tr>
<td>10–12 mo</td>
<td>90</td>
<td>0 (0–1.9) ‡</td>
</tr>
<tr>
<td>13–15 mo</td>
<td>85</td>
<td>0 (0–1.5) ‡</td>
</tr>
<tr>
<td>16–18 mo</td>
<td>70</td>
<td>0 (0–2.4) ‡</td>
</tr>
</tbody>
</table>

* Because the ICUs implemented the study intervention at different times, the total number of ICUs contributing data for each period varies. Of the 103 participating ICUs, 48 did not contribute baseline data. P values were calculated by the two-sample Wilcoxon rank-sum test.
† P ≤ 0.05 for the comparison with the baseline (preimplementation) period.
‡ P ≤ 0.002 for the comparison with the baseline (preimplementation) period.
MRSA Incidence, Veterans Affairs Pittsburgh Medical Center, 1999-2007

Source: Ellingson et al., abstract presentation, SHEA 2008
MRSA Incidence, Veterans Affairs Pittsburgh Medical Center, 1999-2007

Difference between pre- and post-intervention slopes (p=0.0055)

Source: Burton et al., abstract presentation, SHEA 2008
MRSA Incidence, Veterans Affairs Pittsburgh Medical Center, 1999-2007

1.4% (95%CI, 0.8%-1.8%) decrease in MRSA per Month (p<0.0001)

Source: Burton et al., abstract presentation, SHEA 2008
MRSA Incidence, Veterans Affairs Pittsburgh Medical Center, 1999-2007

% MRSA = 77%

% MRSA = 56%*

Source: Burton et al., abstract presentation, SHEA 2008

* p<.001
Positive Deviance MRSA Prevention Collaborative

• In 2006 three hospitals partnered with the Plexus Institute and CDC to implement MRSA prevention programs in acute care settings

• Began in early 2007
  - Positive Deviance approach
  - Hand hygiene
  - Contact precautions
  - Active Surveillance in ICUs only

• Hospitals agreed to share electronic data for objective evaluation of the intervention
### Interrupted Time Series Analysis of MRSA Incidence

<table>
<thead>
<tr>
<th>Effect</th>
<th>Hospital</th>
<th>Incidence Rate Ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre vs. Post Intervention Trend ($\beta_3$)</td>
<td>A</td>
<td>0.978</td>
<td>0.29</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>0.951</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>0.986</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>Pooled</td>
<td>0.977</td>
<td>0.0008</td>
</tr>
<tr>
<td>Post Intervention Trend per Month ($\beta_1 + \beta_3$)</td>
<td>A</td>
<td>0.980</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>0.949</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>0.986</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>Pooled</td>
<td>0.978</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

**Aggregate Post-Intervention % Decreases:**
- 26% (A)
- 31% (B)
- 62% (C)
Interrupted Time Series Analysis of Proportion of S. aureus Isolates Resistant to Methicillin

<table>
<thead>
<tr>
<th>Effect</th>
<th>Hospital</th>
<th>Odds Ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre vs. Post Intervention Trend ( \beta_3 )</td>
<td>A</td>
<td>1.009</td>
<td>0.74</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>0.972</td>
<td>0.15</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>0.986</td>
<td>0.21</td>
</tr>
<tr>
<td></td>
<td>Pooled</td>
<td>0.985</td>
<td>0.11</td>
</tr>
<tr>
<td>Post Intervention Trend per Month ( \beta_1 + \beta_3 )</td>
<td>A</td>
<td>0.990</td>
<td>0.44</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>0.972</td>
<td>0.09</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>0.983</td>
<td>0.11</td>
</tr>
<tr>
<td></td>
<td>Pooled</td>
<td>0.983</td>
<td>0.02</td>
</tr>
</tbody>
</table>

Aggregate Post-Intervention % Decreases: 7%(A), 15%(B), 28%(C)
Different Organizational Theories of Healthcare Delivery

- **Traditional Organizational Theories**
  - Healthcare facilities viewed as machine-like, replaceable parts, if each part doing its job things will go smoothly
  - “well oiled machine”

- **Organizational theory based on complexity science**
  - Healthcare facilities viewed as dynamic, living, social systems, or “Complex Adaptive Systems”
Stacey R.D. *Complexity and Creativity in Organizations.*
Definition by Ralph Stacey:

- CASs consist of a network of agents that interact with each other according to a set of rules that require them to examine and respond to each other’s behavior to improve their behavior and thus the behavior of the system they comprise.
Diverse fields of science have found value in complexity theory
- Chemistry, Physics, Physiology, Mathematics, Sociology, Economics, Meteorology

Examples of systems that have been studied as a Complex adaptive systems:
- immune system
- Human brain
- a colony of social insects such as termites or ants
- the stock market
- almost any collection of human beings
Complex Adaptive Systems

- **System** implies:
  - Multiple Agents
  - Agents are Interdependent and Connected

- **Complex** implies:
  - Diversity
  - Many Elements
  - Large Number of Connections

- **Adaptive** implies:
  - Capacity to Alter or Change
Complex adaptive systems depend upon interconnection to adapt, change, and transform.

If healthcare facilities behave like complex adaptive systems, then they should benefit greatly from collaboration.
Social Network Mapping

- In building a “healthy” collaborative, groups generally emerge through 4 distinct phases:
  - Scattered Fragments
  - Single hub-and-spoke
  - Multi-hub network
  - Core/periphery
Quality Improvement Collaboratives Are Popular

- Northern New England Cardiovascular Disease Study Group
- SunHealth Alliance Internal Group Benchmarking Projects
- UniHealth’s Collaborative on Joint Replacement
- Vermont-Oxford Neonatal Network
- Institute for Healthcare Improvement Breakthrough Collaboratives
- Pittsburgh Regional Healthcare Initiative
- Michigan Keystone
- Veteran’s Health Affairs
- Health Disparities Collaborative (HRSA)
- United Kingdom’s National Health Service
- Institute for Clinical Systems Improvement
- Rochester Health Commission
- Wisconsin Collaborative on Healthcare Quality
Evidence for Impact of Quality Improvement Collaboratives

- Limitations of the evidence base
  - Demand-induced bias
    - Most often published in management- and practitioner-oriented journals whose mission and readership attract practical guidance and insight from successful efforts
  - Methodologic Weakness
    - Commonly uncontrolled pre-post test analyses
    - Measures of process and outcome often rely on participant’s unvalidated self-reports, lack of standardized surveillance methods/definitions
    - Often measured for short periods of time immediately following the intensive collaborative period

Mittman BS Ann Intern Med 2004;140:897-901
Evidence for Impact of Quality Improvement Collaboratives

- Recent Systematic Review (Loes et al. BMJ 2008:36;1491-1494)
  - Systematic review of published literature
  - Only 9 controlled studies
    - 7 studies reported an effect on some of selected outcome measures
    - 2 studies showed no significant effect
  - Conclusion
    - “The evidence underlying quality improvement initiatives is positive, but limited”
Why the Heterogeneity of Results?

Possibilities:
- Collaboration has no (or only modest) benefit
- Effects are unpredictable
- Intervention (i.e. effective collaboration) incorrectly or incompletely implemented in some cases

Even if the collaboration itself is not responsible for improvement, the demonstrating improvement across a large group of healthcare facilities may be an important strategy for stimulating global changes in practice
Characteristics of Effective Collaboration

- Active support of leaders
  - Engagement of experts
- Free flow of information
  - informal
  - Formal
    - Use standardized, valid methodology for measuring outcomes
- Multiple individuals within a unit/facility interact and develop meaningful working relationships with those in other units/facilities
- Make use of the peripheries of individuals/organizations to draw in new ideas (i.e. diverse participation, involve the “unusual suspects”)
Characteristics of Effective Collaboration

- Support self organizing behavior
  - Encourage and coach individuals/facilities to form projects and test out ideas for improvement (even very small projects)
    - provide opportunities to share with the larger collaborative
- View collaborative as longer term commitment
- Regional collaboration may have special advantages
Objectives for Activity C in ARRA Funding

- Need an objective, standardized measure of outcomes
  - Use of NHSN: recommended
  - Consistency with NHSN definitions: required
- Constitute and convene a multidisciplinary advisory group
- Collaborate with ongoing activities in hospitals, hospital associations, others
Objectives for Activity C in ARRA Funding

- Identify/define participating hospitals
- At least three face-to-face meetings over the two years
- Establish multicenter evidence-based HAI prevention collaboratives
- Demonstrate progress toward reaching at least two HHS HAI Prevention Targets
Establishing a Multidisciplinary Oversight/Advisory Group

- Should involve multiple stakeholders
  - e.g. health department, healthcare facilities, payors, purchasers, consumers, hospital associations, professional organizations).

- Provides project leadership and guidance, including initial selection of targets for HAI prevention initiatives and ongoing project oversight
Establishing a Multidisciplinary Oversight/Advisory Group

- Examples of proposed metrics of activity
  - Letters of commitment from steering group members
  - Face to face meetings
  - Selection of targets for prevention collaborative (i.e. which HAIs will be targeted in the prevention collaborative?)
  - Selection of specific prevention goal
  - Regular feedback of outcomes to Steering group
What are the Staff Needs?

- Project coordination (managing logistics, coordinating meetings, coordinating communications, tracking progress, etc.)
- Expertise and/or training in healthcare infection control
- Expertise and/or training in coordinating multicenter collaborative prevention projects
How will You Facilitate Sharing of Information

- Successful prevention collaboratives are dependent upon mechanisms to facilitate sharing of information and data among participating facilities
  - face-to-face meetings
  - regularly scheduled teleconferences between face-to-face meetings
  - other supportive communication infrastructure for regular sharing between participants (web sites, listservs, etc.)
How will You Measure and Present Outcomes?

- Successful prevention collaboratives have standardized and uniform outcome measures that allow sharing of progress among participants and tracking aggregate group progress
  - Select measurement system (e.g. NHSN)
  - Establish willingness of facilities to participate in measurement system and share data with central coordinator
  - Demonstrate regular feedback of outcome data to participating facilities, to include a comparison of their individual performance to aggregate performance of others.
CDC Technical Support
Questions
Thank you!

CDC’s Division of Healthcare Quality Promotion
http://www.cdc.gov/ncidod/dhqpp/

Technical assistance specific to the Recovery Act project:
Telephone: (404) 639-4000
Email: DHQPHAIARRA@cdc.gov

The findings and conclusions in this presentation are those of the author(s) and do not necessarily represent the official position of the Centers for Disease Control and Prevention.