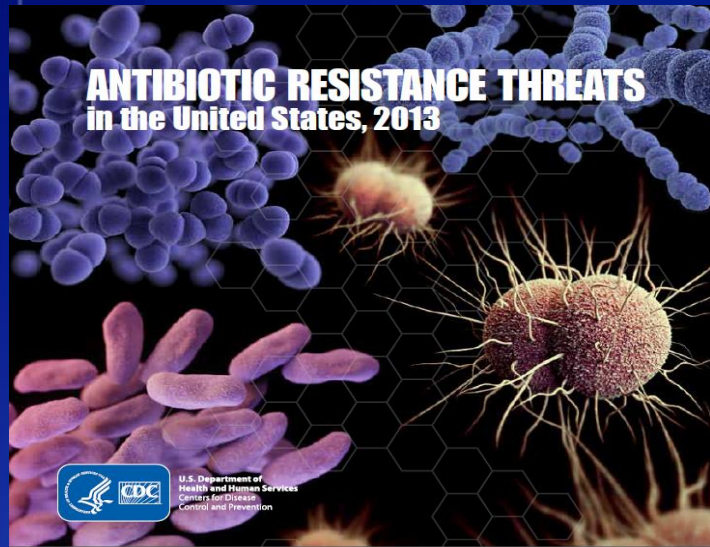


Surveillance for MDRO in the United States

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Antibiotic Resistance Old Challenge, New Opportunity



ANTIBIOTIC RESISTANCE THREATS IN THE UNITED STATES, 2013

Executive Summary

Antibiotic Resistance Threats in the United States, 2013 is a snapshot of the complex problem of antibiotic resistance today and the potentially catastrophic consequences of inaction. The overriding purpose of this report is to increase awareness of the threat that antibiotic resistance poses and to encourage immediate action to address the threat. This document can serve as a reference for anyone looking for information about antibiotic resistance. It is specifically designed to be accessible to many audiences. For more technical information, references and links are provided.

HAZARD LEVEL

URGENT



These are high-consequence antibiotic-resistant threats because of significant risks identified across several criteria. These threats may not be currently widespread but have the potential to become so and require urgent public health attention to identify infections and to limit transmission.

Clostridium difficile (*C. difficile*), Carbapenem-resistant Enterobacteriaceae (CRE), Drug-resistant *Neisseria gonorrhoeae* (cephalosporin resistance)

HAZARD LEVEL

SERIOUS



These are significant antibiotic-resistant threats. For varying reasons (e.g., low or declining domestic incidence or reasonable availability of therapeutic agents), they are not considered urgent, but these threats will worsen and may become urgent without ongoing public health monitoring and prevention activities.

Multidrug-resistant *Acinetobacter*, Drug-resistant *Campylobacter*, Fluconazole-resistant *Candida* (a fungus), Extended spectrum β -lactamase producing Enterobacteriaceae (ESBLs), Vancomycin-resistant *Enterococcus* (VRE), Multidrug-resistant *Pseudomonas aeruginosa*, Drug-resistant Non-typhoidal *Salmonella*, Drug-resistant *Salmonella* Typhi, Drug-resistant *Shigella*, Methicillin-resistant *Staphylococcus aureus* (MRSA), Drug-resistant *Streptococcus pneumoniae*, Drug-resistant tuberculosis (MDR and XDR)

HAZARD LEVEL

CONCERNING



These are bacteria for which the threat of antibiotic resistance is low, and/or there are multiple therapeutic options for resistant infections. These bacterial pathogens cause severe illness. Threats in this category require monitoring and in some cases rapid incident or outbreak response.

Vancomycin-resistant *Staphylococcus aureus* (VRSA), Erythromycin-resistant *Streptococcus* Group A, Clindamycin-resistant *Streptococcus* Group B

Tracking Resistance Patterns in US

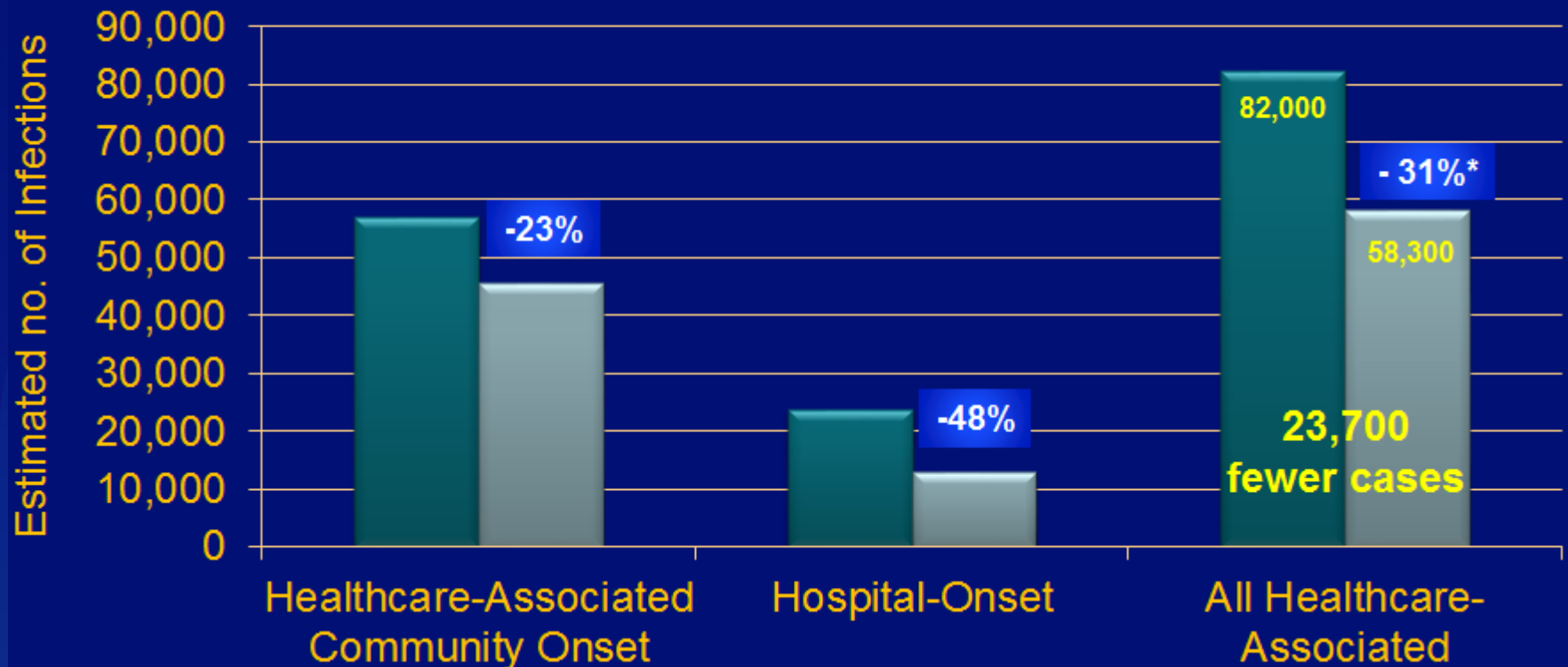
Tracking Networks	Data Collected	Resistant Organisms
Emerging Infections Program (EIP)	Network of public health-academic hospital collaborations in 10 states	<ul style="list-style-type: none"> • <i>Streptococcus pneumoniae</i> • Groups A and B <i>Streptococcus</i> • MRSA • <i>C. difficile</i> • Candida (a fungus) • CRE • MDR Acinetobacter • <i>Salmonella</i> • <i>Campylobacter</i> • <i>Shigella</i>
National Antimicrobial Resistance Monitoring System (NARMS)	Collaboration among CDC, FDA, USA, and state/local health departments	<ul style="list-style-type: none"> • <i>Salmonella</i> • <i>Campylobacter</i> • <i>Shigella</i>
National Healthcare Safety Network (NHSN)	Network of over 12,000 healthcare facilities	<ul style="list-style-type: none"> • Healthcare-associated infections
Gonococcal Isolate Surveillance Program (GISP)	Track resistance in STD clinics in 28 cities	<ul style="list-style-type: none"> • <i>Neisseria gonorrhoeae</i>
National Tuberculosis Surveillance System (NTSS)	Includes data from all 50 states and the US territories	<ul style="list-style-type: none"> • <i>Mycobacterium tuberculosis</i>

Emerging Infections Program

- ❑ **Laboratory-initiated, population-based surveillance**
- ❑ **10 states**
- ❑ **MRSA, C difficile, CRE and CR Acinetobacter**
- ❑ **CRE**
 - *Klebsiella, E. coli, Enterobacter*
 - Sterile sites and urine
 - Definition: NS to imipenem, meropenem, or doripenem AND R to all third-generation cephalosporins tested
- ❑ **Subset of isolates sent to CDC**
- ❑ **In depth chart review provides detailed epidemiology**

Success: Decrease in the estimated incidence of healthcare-associated invasive MRSA in US

■ Baseline (2007-2008) ■ 2012**



* 5 year prevention target is 50% reduction

** 2012 estimates based on preliminary data

Source - <http://www.cdc.gov/abcs/reports-findings/surv-reports.html>

Clostridium difficile infections: a challenge for healthcare facilities

C. difficile (CDI) infections linked to
>20,000 deaths in US each year.

Approximately **350,000** CDIs
in US each year

94% of patients with CDI were
associated with receiving healthcare

75% of these patients first shown
the infection in nursing homes,
doctor's office etc

VitalSigns™ CDC March 2012

Making Health Care Safer

Stopping *C. difficile* infections

3X
Hospital stays from *C. difficile* infections tripled in the last decade, posing a patient safety threat especially harmful to older Americans.

94%
Almost all *C. difficile* infections are connected to getting medical care.

20%
Hospitals following infection control recommendations lowered *C. difficile* infection rates by 20% in less than 2 years.

People getting medical care can catch serious infections called health care-associated infections (HAIs). While most types of HAIs are declining, one – caused by the germ *C. difficile** – remains at historically high levels. *C. difficile* causes diarrhea linked to 14,000 American deaths each year. Those most at risk are people, especially older adults, who take antibiotics and also get medical care. When a person takes antibiotics, good germs that protect against infection are destroyed for several months. During this time, patients can get sick from *C. difficile* picked up from contaminated surfaces or spread from a health care provider's hands. About 25% of *C. difficile* infections first show symptoms in hospital patients; 75% first show in nursing home patients or in people recently cared for in doctors' offices and clinics. *C. difficile* infections cost at least \$1 billion in extra health care costs annually.

**Clostridium difficile* (kloh-STRIHD-oh-sun DEFF-i-see)

To learn more about how to stop the spread of *C. difficile*

→ See page 4

<http://www.cdc.gov/vitalsigns>

National Center for Emerging and Zoonotic Infectious Diseases
Division of Healthcare Quality Promotion

MMWR 2012;61(9):157-162



The National Healthcare Safety Network (NHSN) in a Nutshell

www.cdc.gov/nhsn

- ❑ Web-based system launched by CDC in 2005 for surveillance of healthcare-associated infections (HAIs)
- ❑ Primary users are healthcare facilities, prevention collaboratives, state and federal agencies
- ❑ Data are used for
 - ❑ internal quality improvement
 - ❑ required external reporting, national surveillance
 - ❑ performance measurement
- ❑ Mandatory reporting (CMS Quality Reporting Programs) accounts for rapid growth
 - ❑ from ~ 300 hospitals to 4500 hospitals (13,000 healthcare facilities in 2014)

National Healthcare Safety Network (NHSN): AR modules

- ❑ Device and Procedure module
 - CLABSI, CAUTI, VAP (VAE), SSI
 - Basis of NHSN AR report
 - Provides percent resistant
- ❑ MDRO and CDI lab ID module
 - Blood or all sites (not surveillance cultures)
 - Facility-wide or unit
 - Manual or CDA
 - Denominator is patient-days or admissions
- ❑ Antimicrobial use and resistance module
 - Includes 20 organisms
 - Data captured electronically

HAI/AR Reporting by Facility Type in NHSN

- ❑ Hospitals and Inpatient Rehabilitation Facilities
 - Device-associated infections and SSI
- ❑ Long-term Care Facility Component: CA-UTI
- ❑ Outpatient Dialysis Component: BSI

- ❑ Almost every reported HAI event requires identified organisms (up to 3) to be entered
- ❑ Specific organisms require susceptibility data for select drugs (S, I, R, NT)

HAI Reporting and Select Organisms in NHSN

- ❑ The organisms that currently require susceptibility results include:
 - Coagulase-negative *Staphylococcus*
 - *E. faecium*, *E. faecalis*, *Enterococcus* NOS (species not identified)
 - *S. aureus*
 - *Acinetobacter*
 - *E. coli*
 - *Enterobacter*
 - *K. pneumoniae*, *K. oxytoca*
 - *P. aeruginosa*
 - *Candida*

MDRO/CDI LabID Event Reporting Specifics in NHSN

- ❑ The MDRO/CDI Module monitors laboratory-identified events for:
 - Methicillin-Resistant *Staphylococcus aureus*
 - Vancomycin-Resistant *Enterococcus* (*faecium*, *faecalis*, and NOS)
 - Cephalosporin-Resistant *Klebsiella* (*pneumoniae* and *oxytoca*)
 - Carbapenem-Resistant Enterobacteriaceae (including *Klebsiella pneumoniae*, *Klebsiella oxytoca*, *E. coli*, and *Enterobacter*)
 - Multidrug-Resistant *Acinetobacter*
 - *Clostridium difficile*
- ❑ Data entry manually or electronically via CDA
- ❑ Definitions for the MDROs are pre-defined in NHSN
- ❑ Check box for the identified MDRO being reported
- ❑ No specific susceptibility data collected for LabID Events

Coverage of MDRO/CDI LabID Event Reporting in NHSN

❑ **Nationwide Coverage Due to CMS Reporting Requirements:**

- Acute care hospitals
 - MRSA bacteremia and CDI inpatients facility-wide
- Long-term acute care hospitals
 - MRSA bacteremia and CDI inpatients facility-wide in 2015
- Inpatient rehabilitation facilities
 - MRSA bacteremia and CDI inpatients facility-wide in 2015

❑ **State mandates add other MDROs and facility types**

❑ **Numerous Collaboratives and Initiatives:**

- CMS Quality Improvement Organization Scopes of Work (current 11th)
- CDI and MRSA in long-term care and critical access
- CRE in acute care and long-term care
- National goals for MRSA and C difficile

Antibiotic Use and Resistance (AUR) Reporting Specifics in NHSN

❑ AUR monitors for:

- Antimicrobial Use Data (medication administration data)
- Antimicrobial Resistance Data (laboratory data)
- Data can only be entered electronically through CDA

❑ AR Data

- 19 specific organisms collected at facility-wide level
- Specimens from CSF, blood, lower respiratory, urine
- Required drugs per each organism
- Susceptibility results reported by E-test, MIC, Zone values and final interpretation result
- % Non-Susceptible per Patient Days or Admissions

AUR Reporting and Select Organisms in NHSN

□ The organisms collected for this AR reporting include:

- *Acinetobacter* spp.
- *Candida albicans*, *Candida glabrata*
- *Citrobacter freundii*
- *Enterobacter* spp.
- *Enterococcus faecalis*, *Enterococcus faecium*, *Enterococcus* NOS
- *Escherichia coli*
- Group B Streptococcus
- *Klebsiella oxytoca*, *Klebsiella pneumoniae*
- *Morganella morganii*
- *Proteus mirabilis*
- *Pseudomonas aeruginosa*
- *Serratia marcescens*
- *Staphylococcus aureus*
- *Stenotrophomonas maltophilia*
- *Streptococcus pneumoniae*

Data Output from NHSN AR Reporting

- ❑ Analyses and reports available in NHSN for facility and group users
- ❑ Alerts and reports for specific pre-determined AR patterns
- ❑ Variety of published annual reports that include AR data
- ❑ Focused analytic papers on specific topics (e.g., trend reports)
- ❑ AR NHSN interactive data and tables on CDC website (mid-2015)
- ❑ CMS Hospital Compare and HVBP, HAC Programs
- ❑ State health department public reports
- ❑ Collaboratives and initiatives

Facilities Reporting ≥ 1 CRE, Jan.-Jun. 2012 (CAUTI and CLABSI)

Facility characteristic	No. facilities with CRE (2012)	No. facilities performing surveillance (2012)	(%)
All acute care hospitals	181	3,918	(4.6)
Short-stay acute hospital	145	3,716	(3.9)
Long-term acute care hospital	36	202	(17.8)

MDRO/CDI Data Reports within NHSN

National Healthcare Safety Network SIR - MRSA Blood FacwideIN LabID Data

As of: September 4, 2014 at 11:02 AM
Date Range: All LABID_RATESMRSA

Facility Org ID=10401 CMS Certification Number=N/A

Facility Org ID	Location	Summary Yr/Qtr	Months	MRSA Blood Incident LabID Count	MRSA Blood Incident LabID Number Expected	Patient Days	SIR	SIR p-value	95% Confidence Interval
10401	FACWIDEIN	2013Q1	3	2	0.221	4455	-	-	-
10401	FACWIDEIN	2013Q2	3	4	1.434	7450	2.789	0.0733	0.886, 6.728
10401	FACWIDEIN	2013Q3	3	3	1.162	6418	2.582	0.1429	0.657, 7.028

Includes only inpatient facility-wide (FACWIDEIN) data relevant to MRSA | National Healthcare Safety Network

The number expected and SIRs are not calculated when Group By = sum | Line Listing - All LabID Events

Lower bound of 95% Confidence Interval only calculated if infCount > 0. | As of: September 4, 2014 at 10:59 AM
Date Range: All LABID_EVENTS

If a quarter's prevalence rate is >0.88, the number expected will not be cal
SIR excludes those months where patient days and/or admissions are mi
verification of 'report no events' has not been completed when 0 events hav

Source of aggregate data: 2010-2011 NHSN MRSA Blood LabID Data

Data contained in this report were last generated on September 4, 2014 at 10:53 AM.

Facility Org ID	Patient ID	Event ID	Specific Organism	Location	Outpatient?	Previous Organism Infection	Onset	Fac Admission Date	Location Admission Date	Specimen Source	Date Specimen Collected
10401	0012	43009	CDIF	2N	N	N	CO	06/10/2013	06/10/2013	STOOL	06/12/2013
10401	0210	43015	MRSA	MED	N	N	CO	07/04/2013	07/04/2013	BLDSPC	07/05/2013
10401	0332	43014	MRSA	LEUK	N	N	CO	06/14/2013	06/14/2013	BLDSPC	06/15/2013
10401	0332	43019	MRSA	TELE	N	N	HO	01/01/2013	01/01/2013	BLDSPC	01/09/2013
10401	0369	43016	MRSA	MED	N	N	CO	08/14/2013	08/14/2013	BLDSPC	08/15/2013
10401	0416	39781	MRSA	BURN	N	N	CO	07/03/2013	07/05/2013	BLDSPC	07/05/2013
10401	0995	43001	CDIF	BURN	N	N	CO	04/04/2013	04/04/2013	STOOL	04/05/2013
10401	1035	43008	CDIF	MED	N	N	CO	06/08/2013	06/09/2013	STOOL	06/09/2013
10401	1254	39742	MRSA	3N	N	N	CO	05/30/2013	05/30/2013	BLDSPC	05/30/2013
10401	1254	39778	MRSA	3N	N	Y	CO	05/30/2013	05/30/2013	BLDSPC	06/01/2013
10401	1254	39779	MRSA	ICU	N	Y	CO	06/10/2013	06/10/2013	BLDSPC	06/12/2013
10401	1595	39219	MRSA	BURN	N	Y	HO	06/18/2013	06/20/2013	BLDSPC	07/02/2013
10401	1595	39220	MRSA	MED	N	Y	HO	06/18/2013	07/03/2013	BLDSPC	07/04/2013
10401	3002	43010	CDIF	ICU	N	N	CO	04/30/2013	05/01/2013	STOOL	05/02/2013
10401	3026	43012	MRSA	HEME	N	N	CO	04/01/2013	04/01/2013	BLDSPC	04/01/2013
10401	3212	39232	CDIF	ICU	N	N	HO	05/28/2013	05/28/2013	STOOL	06/29/2013
10401	3213020	38294	MRSA	3N	N	N	HO	01/10/2013	01/10/2013	BLDSPC	01/15/2013
10401	3214	39693	MRSA	3N	N	N	HO	06/05/2013	06/06/2013	BLDSPC	06/10/2013
10401	3214	39694	MRSA	3N	N	N	HO	06/05/2013	06/06/2013	BLDSPC	06/25/2013

“Annual” HAI Antimicrobial Resistance Report

INFECTION CONTROL AND HOSPITAL EPIDEMIOLOGY JANUARY 2013, VOL. 34, NO. 1

NHSN UPDATE

Antimicrobial-Resistant Pathogens Associated with Healthcare-Associated Infections: Summary of Data Reported to the National Healthcare Safety Network at the Centers for Disease Control and Prevention, 2009–2010

Dawn M. Sievert, PhD;¹ Philip Ricks, PhD;¹ Jonathan R. Edwards, MS;¹ Amy Schneider, MPH;¹ Jean Patel, PhD;¹
Arjun Srinivasan, MD;¹ Alex Kallen, MD;¹ Brandi Limbago, PhD;¹ Scott Fridkin, MD¹
for the National Healthcare Safety Network (NHSN) Team and Participating NHSN Facilities

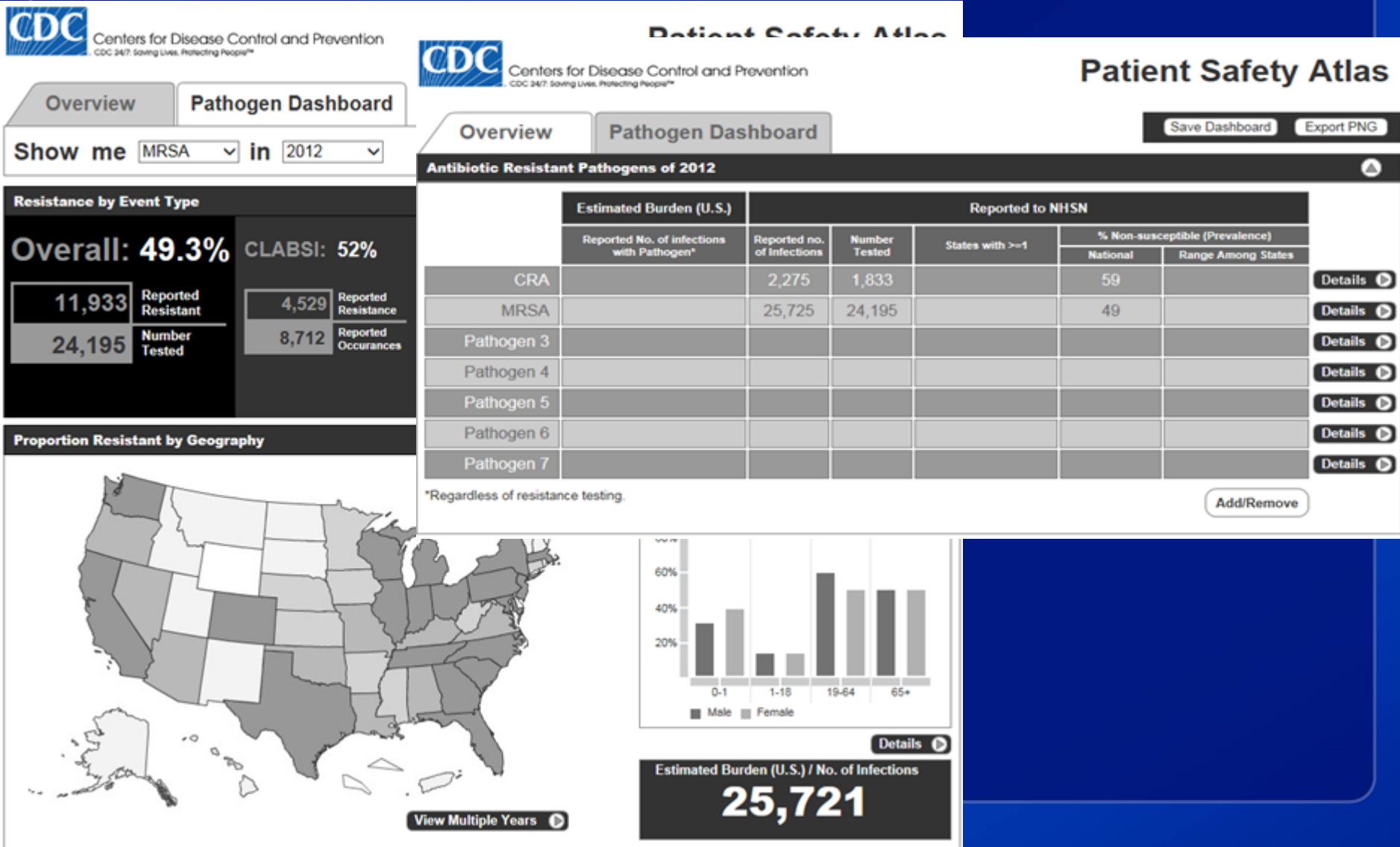
INFECTION CONTROL AND HOSPITAL EPIDEMIOLOGY NOVEMBER 2008, VOL. 29, NO. 11

NHSN ANNUAL UPDATE

Antimicrobial-Resistant Pathogens Associated With Healthcare-Associated Infections: Annual Summary of Data Reported to the National Healthcare Safety Network at the Centers for Disease Control and Prevention, 2006–2007

Alicia I. Hidron, MD; Jonathan R. Edwards, MS; Jean Patel, PhD; Teresa C. Horan, MPH; Dawn M. Sievert, PhD;
Daniel A. Pollock, MD; Scott K. Fridkin, MD; for the National Healthcare Safety Network Team and
Participating National Healthcare Safety Network Facilities

Patient Safety Atlas – Antibiotic Resistance (Interactive Web-based NHSN AR Dataset)



Data for Action

- ❑ Local – prevent infection, contain new resistant infection, improve antibiotic use
- ❑ State/regional – detect, respond and prevent across healthcare settings
- ❑ Federal – assess impact and gaps

Regional Prevention Program Framework

❑ Situational awareness (detect)

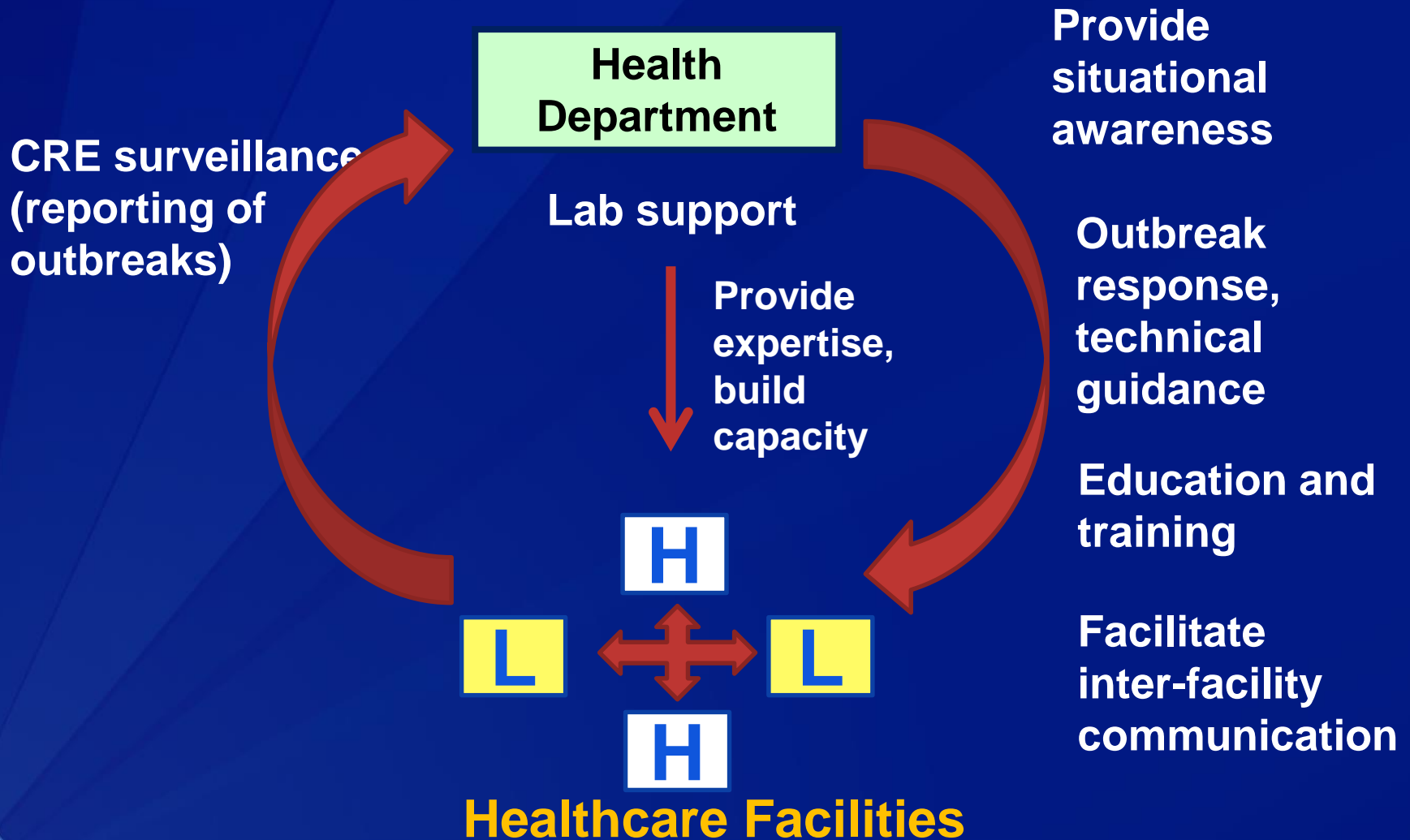
- Sentinel or comprehensive surveillance, laboratory expertise
- Dynamics of patient movements between continuum of care
- Identify hot spots both within and between hospitals/LTC

❑ Ability to act on data and outbreaks (respond)

❑ Prevention focus

- Collaborations, cross spectrum of healthcare delivery
- Relationship building with hospital and LTC community
- Educational components
- Target influential areas to have impact on region

What Should a Regional Control Strategy Include?

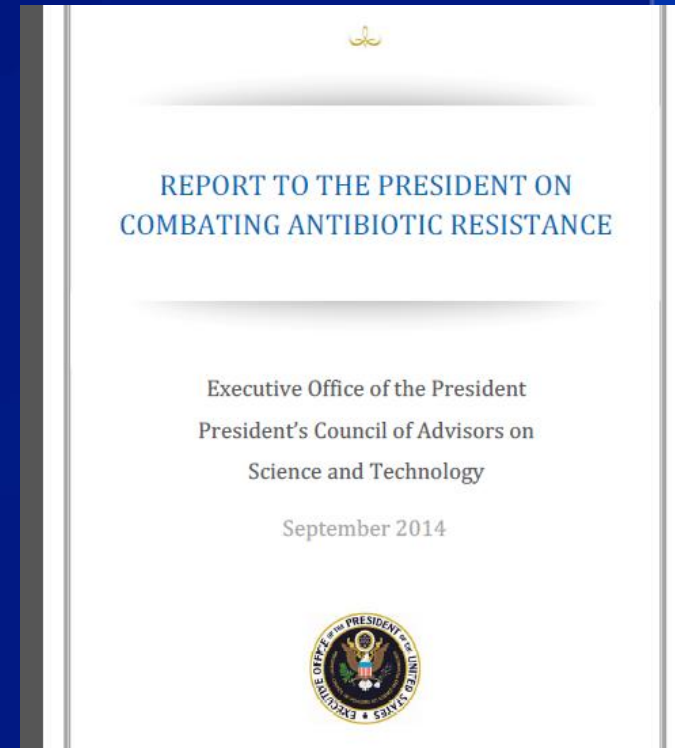


Challenges

- ❑ Burden of data collection
- ❑ Lack of standards for e-surveillance
- ❑ Access to data for regional action
- ❑ Criteria to stop or redirect a surveillance system

Report from the President's Council of Advisors on Science and Technology

- ❑ Eight high level recommendations to the president to combat antibiotic resistance:
 - Ensure strong federal leadership
 - Effective surveillance and response
 - Fundamental research
 - Clinical trials with new antibiotics
 - Increase economic incentives for new antibiotics
 - Improve stewardship of existing antibiotics
 - Limit the use of antibiotics in animal agriculture
 - Ensure effective international coordination



Consumers

Medical Professionals

Public Health

Industry

**Prevention of HAIs is Everyone's
Responsibility**

Professional
Organizations

Government

Healthcare
Facilities

Payors