

CDC Vital Signs: Containing Unusual Resistance

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Vital Signs: Containment of Novel Multiresistance Mechanisms — United States

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Abstract

Background: Approaches to controlling emerging antibiotic resistance to broad-spectrum antimicrobials mediated by extended-spectrum beta-lactamase (ESBL) and carbapenemase-producing Enterobacteriaceae (CPE) that confer resistance to carbapenem antibiotics emerged, direct interventions to slow spread were not widely promoted. These approaches could have resulted in differences in spread of these along with initial findings of an enhanced antibiotic resistance developed to control carbapenem resistance.

Methods: Infection data from the National Healthcare Safety Program (NHSP) in the annual proportion of selected pathogens that were ESBL phenotype or resistant to carbapenems (carbapenem-resistant Enterobacteriaceae [CRE] and carbapenem-resistant *Pseudomonas aeruginosa* [CRPA]) are analyzed.

Results: The percentage of ESBL phenotype Enterobacteriaceae decreased by comparison, the CRE percentage decreased by 19% per year (carbapenemase testing was performed for 4,442 CRE and 1,2 carbapenemase producers. In response, 1,489 screening tests were performed, 11% were positive.

Conclusions: The proportion of Enterobacteriaceae infections that were ESBL phenotype. This difference suggests that the efforts implemented to slow transmission of CRE than those of ESBL phenotype. Launch at the first sign of unusual resistance.

Introduction

The emergence and spread of antibiotic resistance threatens to outpace the development of new antimicrobials, and slowing the spread of these organisms has become a priority. Among Enterobacteriaceae, the family of pathogens most responsible for hospital-acquired infections, the emergence of unusual resistance genes is a major public health concern.

221 New nationwide instances of unusual resistance genes in 2017 uncovered 221 instances of unusual resistance genes in "nightmare bacteria."

1 in 10 11% of screening tests, in people with no symptoms, found a hard-to-treat germ that spreads easily.

1st The Containment Strategy keeps new threats from spreading. Launch at the first sign of unusual resistance.

Containing Unusual Resistance
Early, aggressive action can prevent spread

More than 23,000 Americans die each year from infections caused by germs resistant to antibiotics. While antibiotic resistance (AR) threats vary nationwide, AR has been found in every state. And unusual resistance genes, which are resistant to all or most antibiotics tested and are uncommon or carry special resistance genes, are constantly developing and spreading. Lab tests uncovered unusual resistance more than 200 times in 2017 in "nightmare bacteria" alone. With new resources nationwide, early and aggressive action—when even a single case is found—can keep germs with unusual resistance from spreading in health care facilities and causing hard-to-treat or even untreatable infections. For example, CDC estimates show that this aggressive approach could prevent 1,600 cases of CRE* in one state over three years. Health departments can lead the Containment Strategy and act swiftly with health care facilities and CDC at the first sign of unusual resistance.

State and local health departments can:

- Make sure all health care facilities know what state and local lab support is available and what isolates (pure samples of a germ) to send for testing. Develop a plan to respond rapidly to unusual genes and germs when they first occur.
- Assess the quality and consistency of infection control in health care facilities across the state. Help improve practices.
- Coordinate with affected health care facilities, the new AR Lab Network regional labs, and CDC for every case of unusual resistance. Investigations should include onsite infection control assessments and colonization screenings for people who might have been exposed. They could spread it to others. Continue until spread is controlled.
- Provide timely lab results and recommendations to affected health care facilities and providers. If the patient came from or was transferred to another facility, alert that facility.

Want to learn more?
Visit: www.cdc.gov/vitalsigns/containing-unusual-resistance

*CRE is carbapenem-resistant Enterobacteriaceae.

Centers for Disease Control and Prevention
National Center for Emerging and Zoonotic Infectious Diseases

The US Experience: KPC

ANTIMICROBIAL AGENTS AND CHEMOTHERAPY, Apr. 2001, p. 1151–1161
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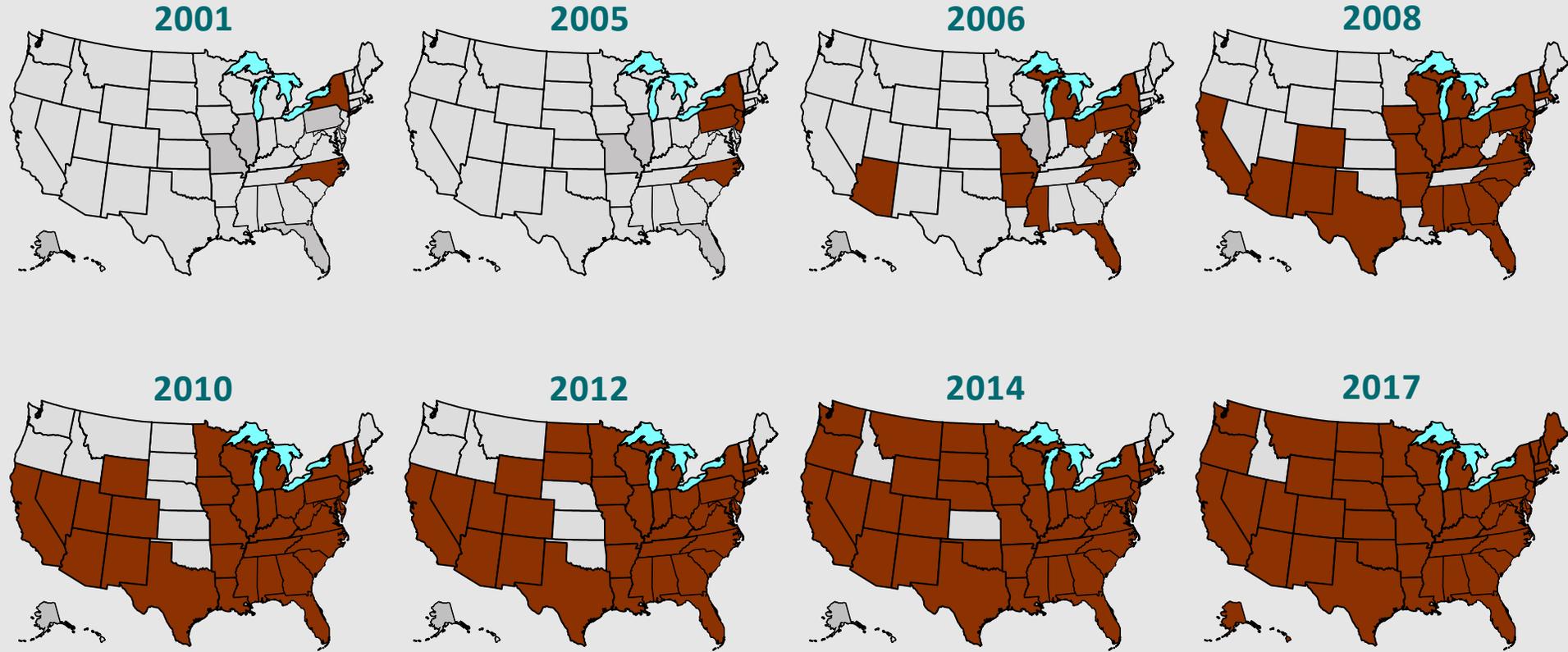
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Novel Carbapenem-Hydrolyzing β -Lactamase, KPC-1, from a Carbapenem-Resistant Strain of *Klebsiella pneumoniae*

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- Isolate collected in 1996 during an ICU surveillance project from NC

KPC-CRE found in the US spread from 2 states in 2001 to 49 states, DC, and PR in 16 years



States with *Klebsiella pneumoniae* carbapenemase (KPC)-producing Carbapenem-resistant Enterobacteriaceae (CRE) confirmed by CDC

Morbidity and Mortality Weekly Report

Vital Signs: Containment of Novel Multidrug-Resistant Organisms and Resistance Mechanisms — United States, 2006–2017

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PROBLEM:

Antibiotic-resistant germs can spread like wildfire.

- Once antibiotic resistance spreads, it is harder to control.
- Finding and responding to unusual resistance early, before it becomes common, can help stop its spread and protect people.

Main Points

- CDC's Containment Strategy is an aggressive approach to stop the spread of "unusual" AR.
- Based on identification of a single isolate not a cluster
- Often targeting a "mechanism" instead of a bacteria
 - CP-CRE, CP-*Acinetobacter* and *Pseudomonas*
 - *Candida auris*
 - Pan-resistant strains

Antibiotic Resistance Can Spread Like Wildfire

-  From people with and without symptoms of infection
-  Between facilities
-  Between germs

STOP SPREAD AT THE FIRST SIGN OF UNUSUAL RESISTANCE

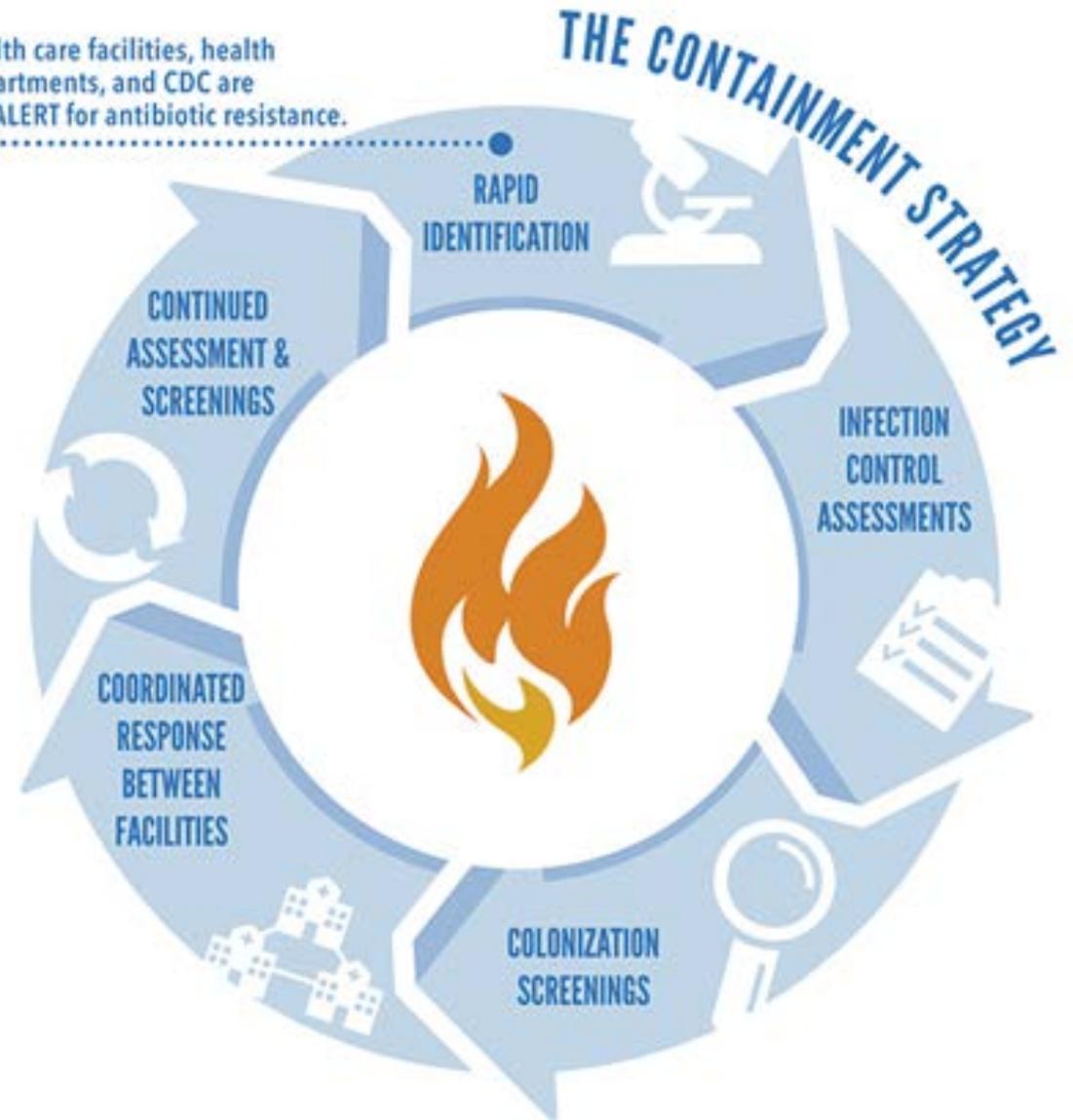
 

The Containment Strategy



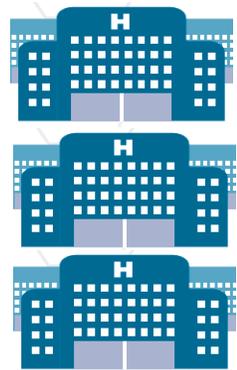
- Rapid detection in health care facilities
- Infection control assessments led by the health department
- Colonization screenings, when needed
- Coordination between healthcare facilities
- Continued vigilance until spread is controlled

Health care facilities, health departments, and CDC are ON ALERT for antibiotic resistance.



Antimicrobial Resistance Laboratory Network (ARLN): Laboratory Support for Containment

Hospitals/Clinical Laboratories



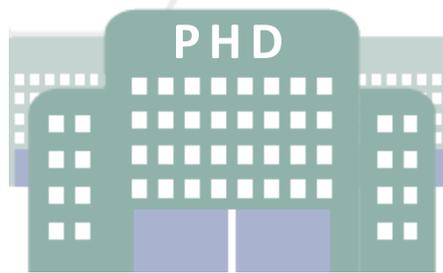
CRE/CRPA isolates



Public Health Laboratories

50 States

5 Local Health Departments



Species identification

Confirmatory AST

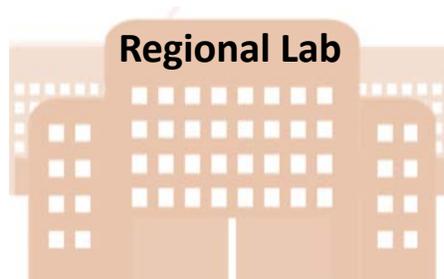
Phenotypic screening for carbapenemase production

Carbapenemase mechanism testing

mcr-1 testing (some labs)

Rectal Swabs

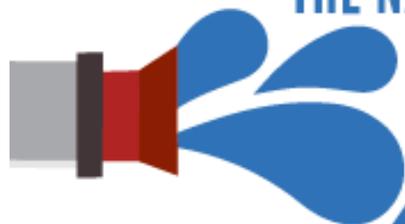
Regional Lab



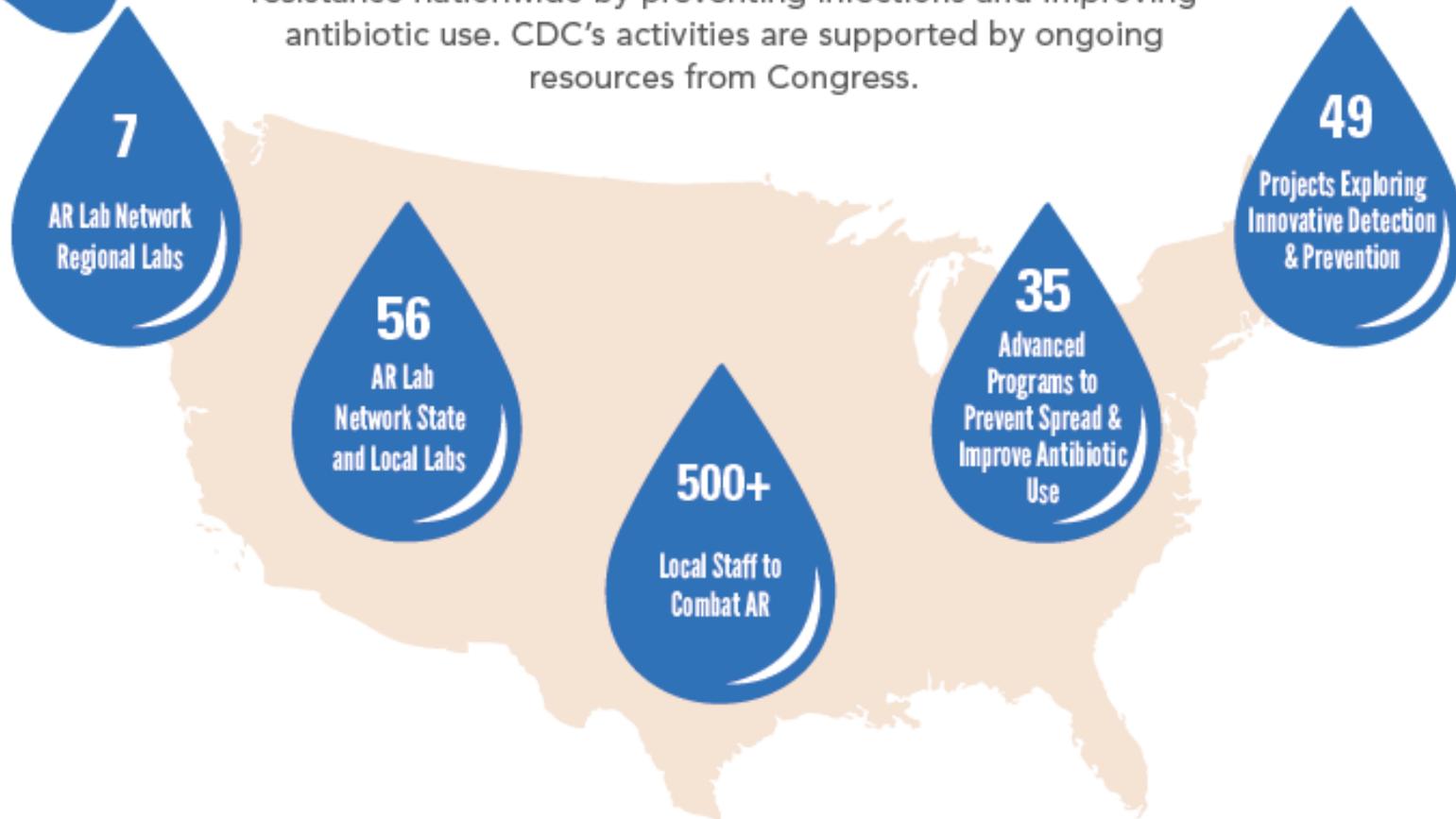
CRE and CRPA Colonization Screening

Containment Strategy: Be on guard to contain the first spark.

THE NATION CAN IDENTIFY AND RESPOND TO UNUSUAL ANTIBIOTIC RESISTANCE



In addition to leading the Containment Strategy, CDC is working with other Federal agencies to combat antibiotic resistance nationwide by preventing infections and improving antibiotic use. CDC's activities are supported by ongoing resources from Congress.



Results to Date

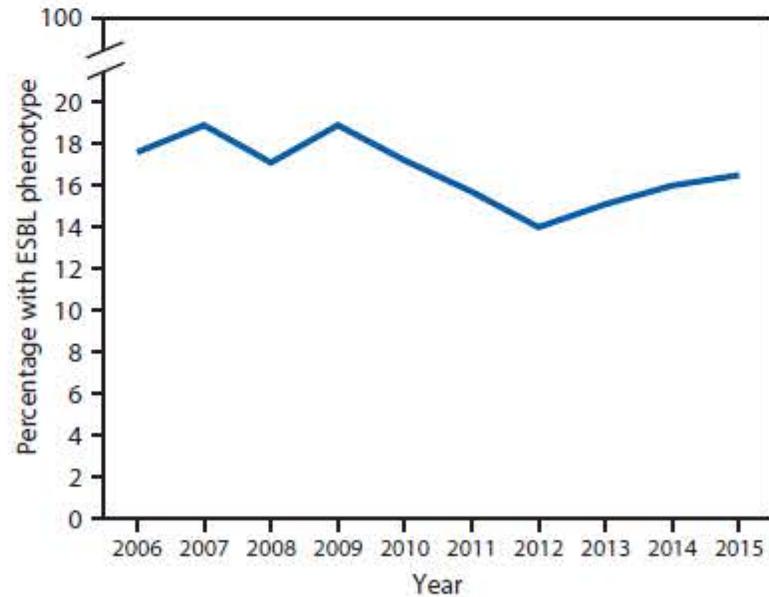
- January - September 2017
 - 4,442 CRE and 1,334 CRPA were tested to identify most concerning strains
 - 1,426 (255) were carbapenemase-producing strains
 - 1489 screening tests were performed as part of 70 surveys
 - Average of 10.5 patients/residents screened per survey
 - 11% were positive
 - Helped identify higher risk facilities where amplification was occurring

Illustrative Example

- Unusual carbapenemase-producing isolate identified from a resident of a LTCF (IMP)
- DOH conducted site visit to assess interventions and perform PPS
 - 5 additional colonized residents identified
- DOH conducted additional IC assessments and additional PPS
 - Two f/u surveys without evidence of additional transmission

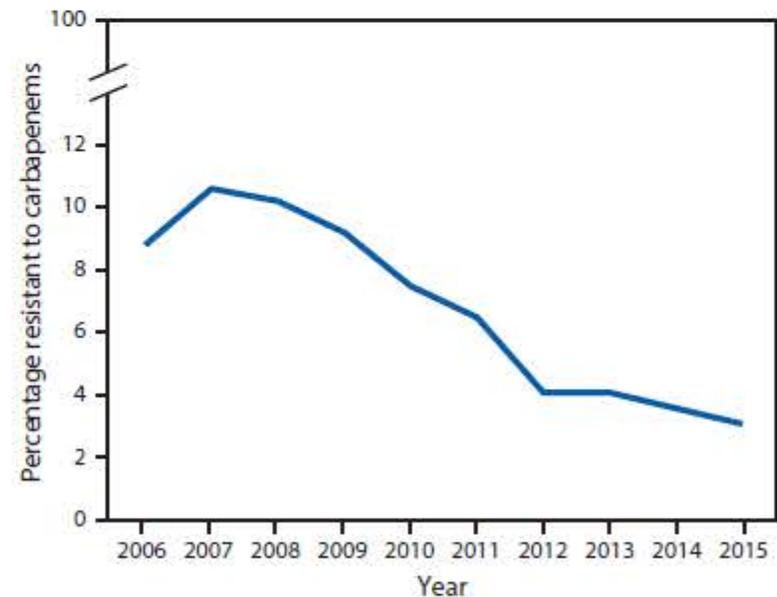
Impact of Targeted Interventions

FIGURE 1. Percentage of *Escherichia coli* and *Klebsiella pneumoniae* isolates from selected health care–associated infections* with the extended-spectrum- β -lactamase (ESBL) phenotype reported as nonsusceptible to extended-spectrum cephalosporins[†] — National Healthcare Safety Network, United States, 2006–2015



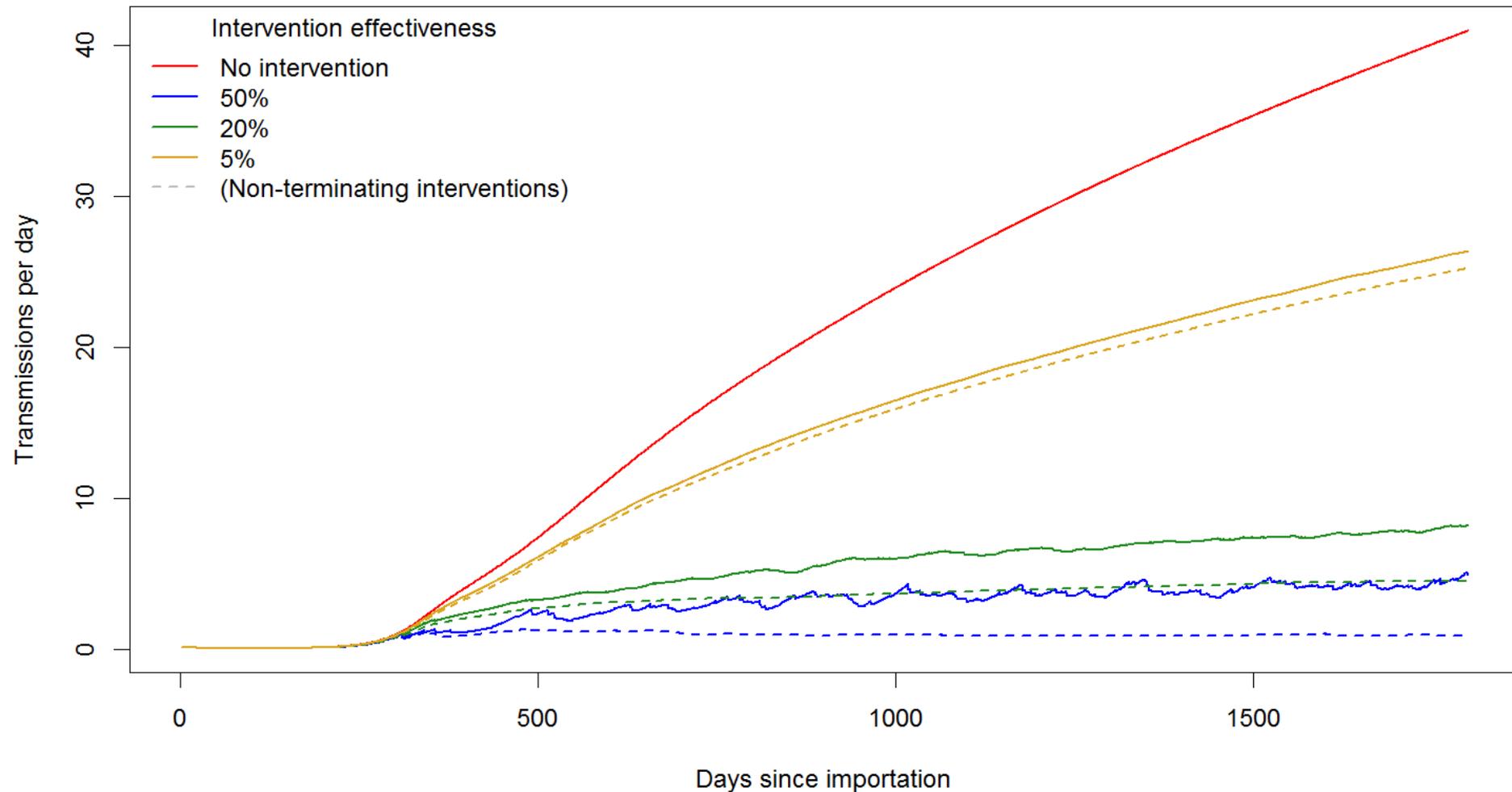
ESBL phenotype

FIGURE 2. Percentage of *Escherichia coli* and *Klebsiella pneumoniae* isolates from selected health care–associated infections* reported as resistant to a carbapenem — National Healthcare Safety Network, United States, 2006–2015



CRE phenotype

Simulating an Outbreak: The Containment Strategy Can Slow Transmission



What Can People Do?

Health Care Facilities can:

- Plan for unusual resistance arriving in your facility. Find resources: www.cdc.gov/hai/outbreaks/mdro
- **Leadership:** Work with the health department to stop spread of unusual resistance. Review and support infection control in the facility.
- **Clinical labs:** Know what isolates to send for testing. Establish protocols that immediately notify the health department, health care provider, and infection control staff of unusual resistance. Validate new tests to identify the latest threats. If needed, use isolates from wwwn.cdc.gov/arisolatebank/.
- **Healthcare providers, epidemiologists, and infection control staff:** Place patients with unusual resistance on contact precautions, assess and enhance infection control, and work with the health department to screen others. Communicate about status when patients are transferred. Continue infection control assessments and colonization screenings until spread is controlled. Ask about any recent travel or health care to identify at-risk patients.

Thanks for Your Attention

For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

