

Question 1d: What Can We Learn from Other Jurisdictions?

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TOPICS

- Focus of ARO Control
- Public Reporting — Types & Uses
- Lessons From Past & Current AROs
- Practical Experience with Mandates
- Conclusions

Why Does The Focus of Control Vary?

THE ARO PENDULUM



- Like Politics, All Resistance is Local
- But It's a Shrinking Globe
- And the "Resistance Iceberg" and "Colonization Pressure" are Universal

GRAM-POSITIVES

MRSA

VRE

CDI

GRAM-NEGATIVES

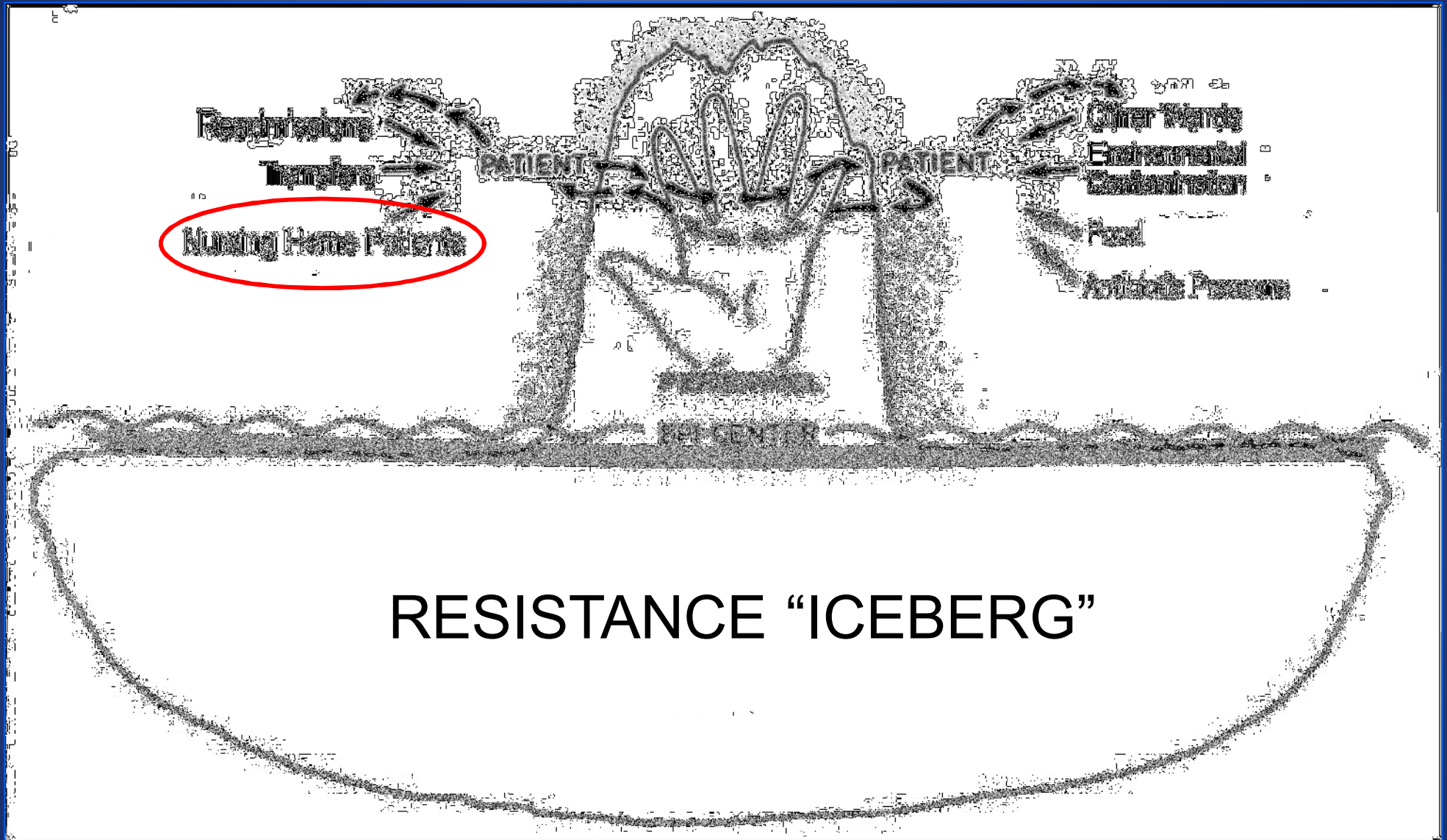
ESBLs

CRE

NDM

MRSA, methicillin-resistant *S aureus*; VRE, vancomycin resistant-enterococcus; CDI, *C difficile* infection; ESBLs, extended spectrum β -lactamases; CRE, carbapenem-resistant Enterobacteriaceae; NDM, New Dehli metallo- β -lactamase

Understanding Epidemiology of Resistance



ARO & Long-term Care — Not A New Problem

Multiple Antibiotic-Resistant *Klebsiella* and *Escherichia coli* in Nursing Homes

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ANTIBIOTIC RESISTANCE AMONG nosocomial pathogens is a cause of major concern.¹⁻³ Three aspects of this problem have been particularly challenging: the frequent emergence of resistance to the newest antibiotics; the presence of antibiotic resistance genes on bacterial plasmids, which may be transferred among different bacterial species; and the spread of resistant bacteria among patients not only in the hospital but also in the community.

Context Infections caused by ceftazidime sodium-resistant gram-negative bacteria that harbor extended-spectrum β -lactamases (ESBLs) are increasing in frequency in hospitals in the United States.

Objectives To report a citywide nursing home-centered outbreak of infections caused by ESBL-producing gram-negative bacilli and to describe the clinical and molecular epidemiology of the outbreak.

Design Hospital-based case-control study and a nursing home point-prevalence survey. Molecular epidemiological techniques were applied to resistant strains.

Settings A 400-bed tertiary care hospital and a community nursing home.

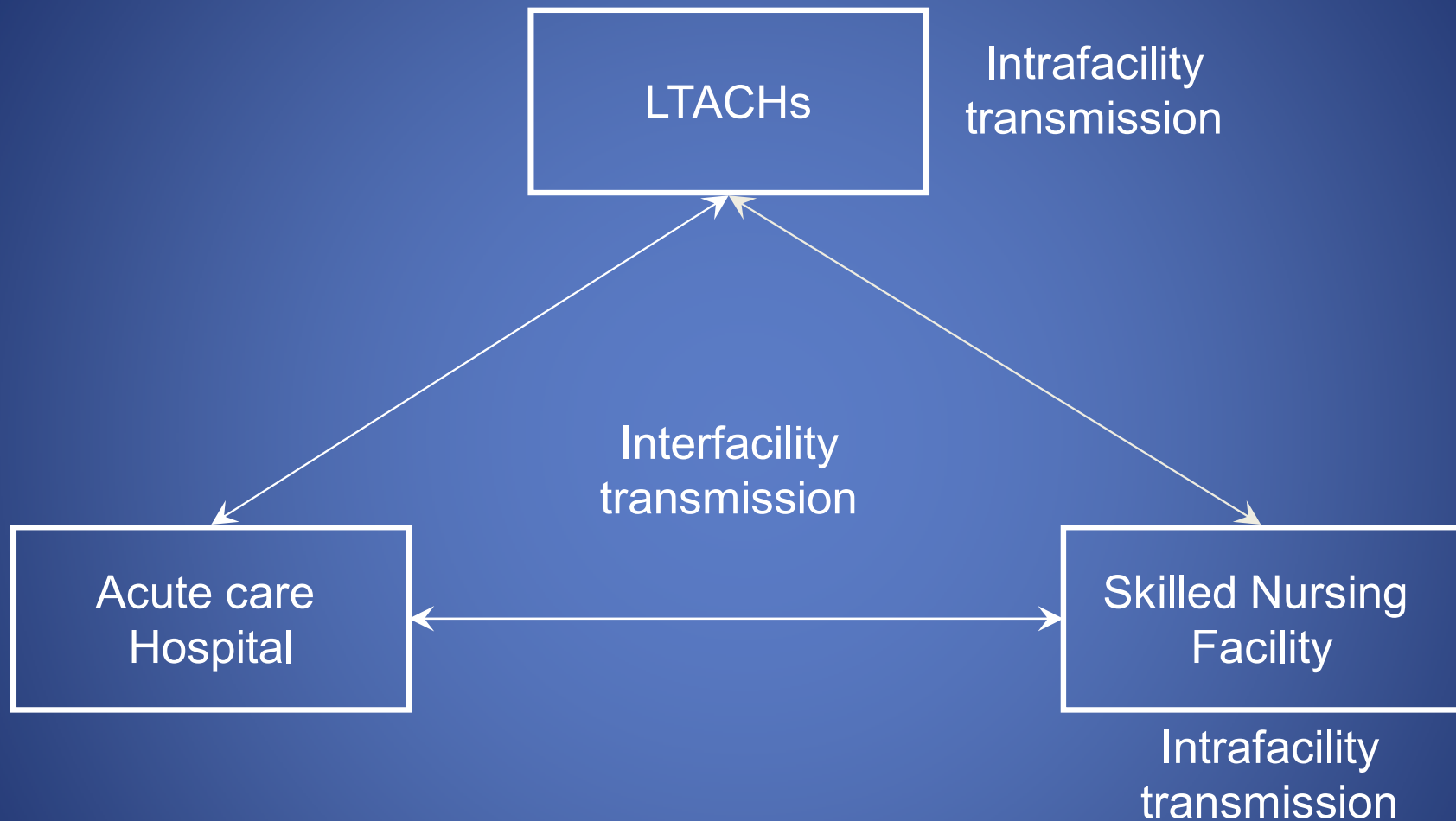
Patients Patients who were infected and/or colonized with ceftazidime-resistant *Escherichia coli*, *Klebsiella pneumoniae*, or both and controls who were admitted from nursing homes between November 1990 and July 1992.

Main Outcome Measures Clinical and epidemiological factors associated with colonization or infection by ceftazidime-resistant *E coli* or *K pneumoniae*; molecular genetic characteristics of plasmid-mediated ceftazidime resistance.

Results Between November 1990 and October 1992, 55 hospital patients infected or colonized with ceftazidime-resistant *E coli*, *K pneumoniae*, or both were identified. Of the 35 admitted from 8 nursing homes, 31 harbored the resistant strain on admission. All strains were resistant to ceftazidime, gentamicin, and tobramycin; 96% were resistant to trimethoprim-sulfamethoxazole and 41% to ciprofloxacin hydrochloride. In a case-control study, 24 nursing home patients colonized with resistant strains on

A New Twist to AROs & Long-term Care

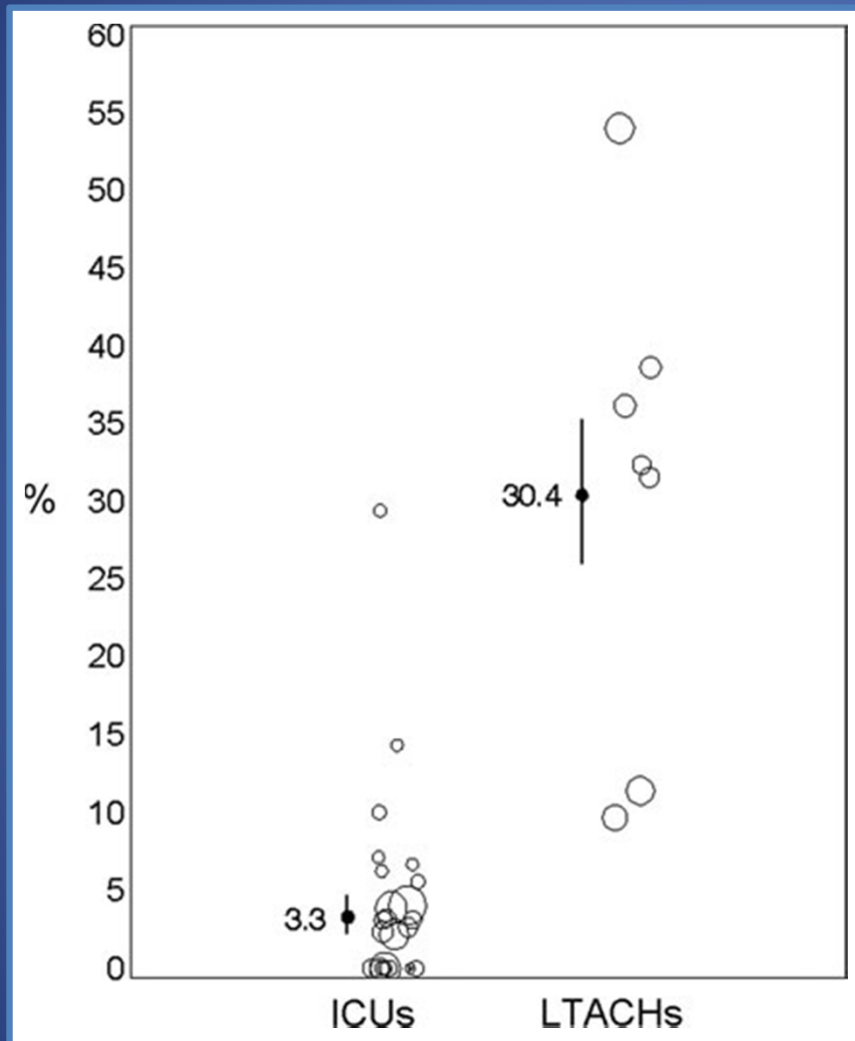
Regional Control of KPC Requires Control at LTACHs



KPC, *Klebsiella pneumoniae* carbapenemase producers; LTACH, Long-term acute care hospital. Adapted from Munoz-Price S, *Clin Infect Dis* 2009; 49:441.

Lin et al, *Clin Infect Dis* 2013; 57:1246; Thurlow et al *ICHE* 2013; 34:56; Prabaker et al, *ICHE* 2012; 33:1193; Won et al, *Clin Infect Dis* 2011; 53:532.

KPC Colonization Prevalence In Chicago Healthcare Facilities — Role of LTACHs



KPC colonization prevalence 9-fold higher in LTACHs than in short-stay acute care hospital adult ICUs

KPC, *Klebsiella pneumoniae* carbapenemase producers; LTACH, Long-term acute care hospital; ICU, intensive care unit

Lin et al, *Clin Infect Dis* 2013; 57(9):1246–52.

A Potential Rate Limiting Step for ARO Control?

The Role of “Colonization Pressure” in the Spread of Vancomycin-Resistant Enterococci

An Important Infection Control Variable

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...once colonization pressure was high, it became the major variable affecting acquisition of VRE

“colonization pressure” (ie, the proportion of other patients colonized) also is an important variable. We studied the effect of colonization pressure, compliance with infection control measures, antibiotic use, and other previously identified risk factors on acquisition of colonization with vancomycin-resistant enterococci (VRE).

Methods: Rectal colonization was studied daily for 19 weeks in 181 consecutive patients who were admitted to a single medical intensive care unit. A statistical model was created using a Cox proportional hazards regression model including length of stay in the medical intensive care unit until acquisition of VRE, colonization pressure, personnel compliance with infection control measures (hand washing and glove use), APACHE (Acute Physiology and Chronic Health Evaluation) II scores, and the proportion of days that a patient received vancomycin or third-generation cephalosporins, sucralfate, and enteral feeding.

ratio [HR], 1.052; 95% confidence interval [CI], 1.012-1.052; $P=.002$). In addition, enteral feeding was associated with acquisition of VRE (HR, 1.009; 95% CI, 1.000-1.017; $P=.05$), and there was a trend toward association of third-generation cephalosporin use with acquisition (HR, 1.007; 95% CI, 0.999-1.015; $P=.11$). The effects of enteral feeding and third-generation cephalosporin use were more important when colonization pressure was less than 50%. Once colonization pressure was 50% or higher, these other variables hardly affected acquisition of VRE.

Conclusions: Acquisition of VRE was affected by colonization pressure, the use of antibiotics, and the use of enteral feeding. However, once colonization pressure was high, it became the major variable affecting acquisition of VRE.

Arch Intern Med. 1998;158:1127-1132

TYPES OF PUBLIC REPORTING

- Clinical Events, e.g., CLABSI (www.hospitalcompare.hhs.gov)
- AROs from Clinical Isolates
- AROs from Active Surveillance Cultures

USES OF PUBLIC REPORTING

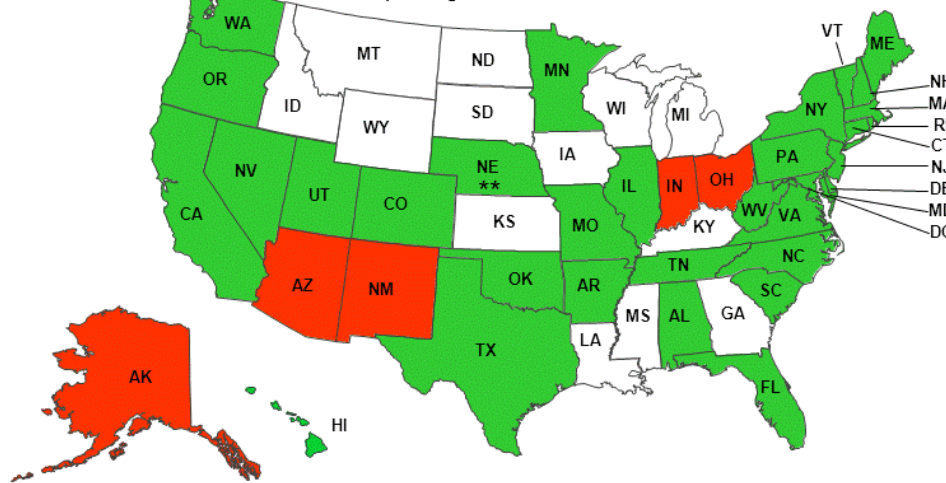
- Trending Rates
- Directing & Evaluating Interventions
- Comparisons of Facilities

CLABSI, Central Line-Associated Blood Stream Infections
ARO, Antibiotic Resistant Organism

Mandatory Reporting of HAIs — USA, 2014

HAI Reporting Laws and Regulations

States That Have Enacted Laws Relating to Reporting of Healthcare-Associated Infections



N = 37


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Basic Tenets

- Hospitals that report rates will work to lower them: What is measured, improves
- Hospitals that report lower rates are safer?
- Informed patients will obtain safer care?

Benefits: What's Measured Improves & Now National Data

HAIs, hospital-associated infections
www.apic.org



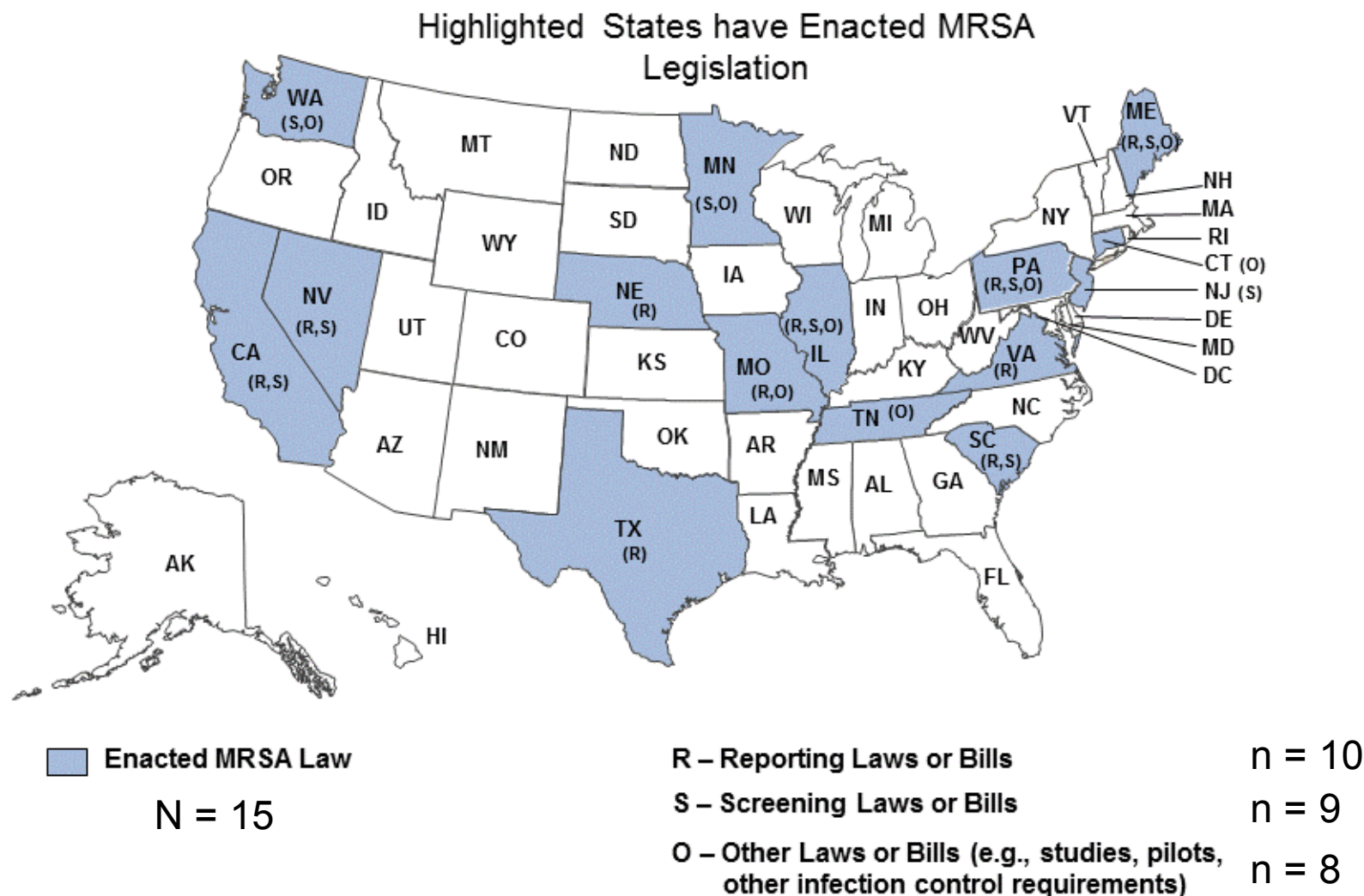
"Yah, but there is a slight drawback. Most patients here do NOT survive surgery. to get infected."

See, this is where I should go !

**TESTED
THE BEST**
Good choice!
Hospital with
lowest
infection
rate after
surgery

OPNAME

State MRSA Reporting — USA



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Potential Effectiveness of REGIONAL Active Surveillance & Reporting

Conclusions An active infection-control intervention, which includes the obtaining of surveillance cultures and the isolation of infected patients, can reduce or eliminate the transmission of vancomycin-resistant enterococci in the health care facilities of a region. (N Engl J Med 2001;344:1427-33.)

vancomycin-resistant enterococci, and compared in- Between December 1996 and April 1997, the num-

Prevalence of VRE in 30 Acute and Long-term Care Facilities in Siouxland Region*

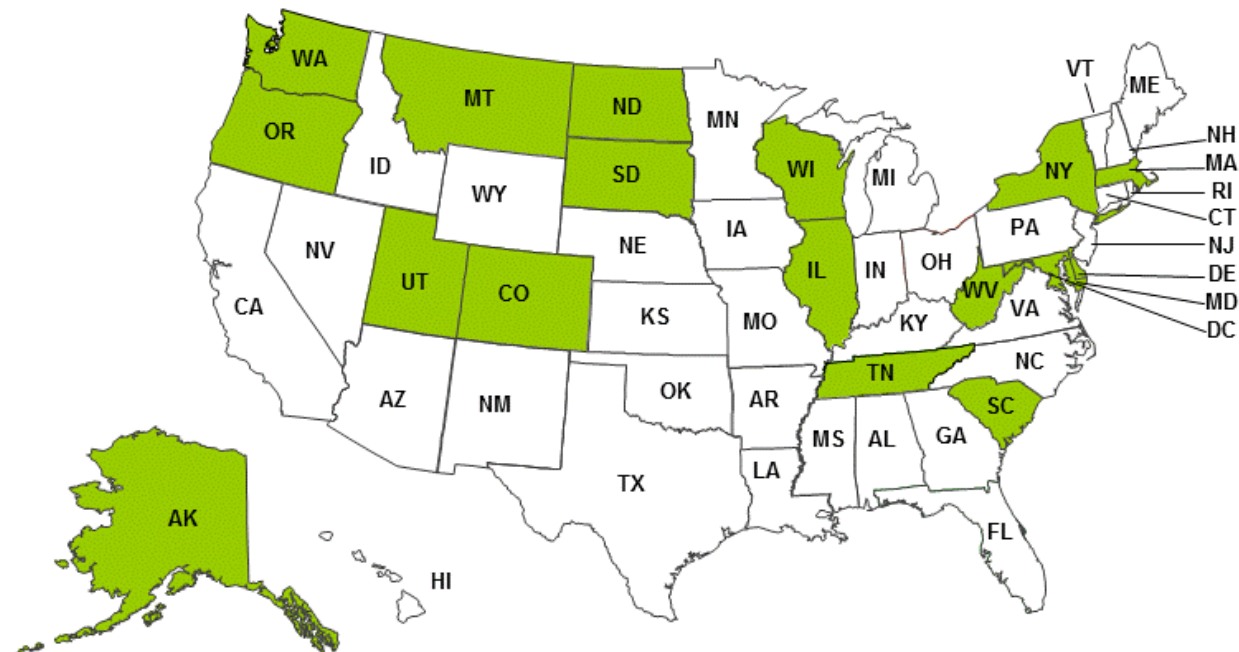
Type of Facility	Colonization with VRE		
	8/1997	10/1998	10/1999
	No. of patients (%)		
All	40 (2.2)	26 (1.4)	9 (0.5)
Acute care	10 (6.6)	9 (5.5)	0
Long-term care	30 (1.7)	17 (1.0)	9 (0.5)

*Only data from the 30 facilities that participated in all three years of the study were included. VRE denotes vancomycin resistant enterococci. Chi square for trend, $P < 0.001$.

Regional Evaluation of a Legislative Mandate (REALM) Project



State CRE Reporting Requirements — USA, 2014



Statewide CRE Reporting N = 17

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CRE identified

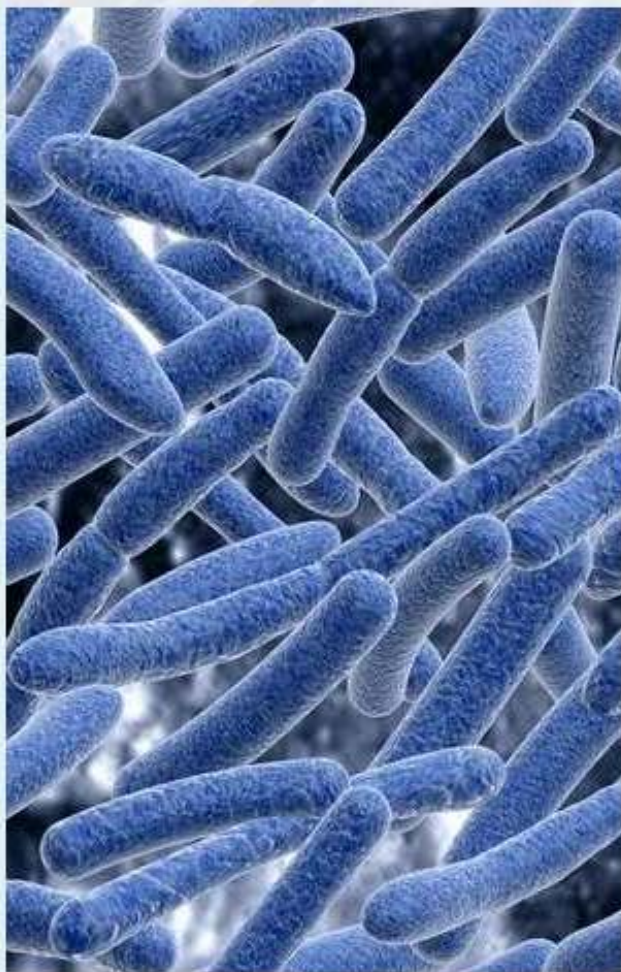
Report

**XDRO
Registry**

Query

Patient admit
(unknown CRE
status)

Isolation
Precautions
(Y/N)



Carbapenem-resistant Enterobacteriaceae (CRE) are extremely drug resistant organisms (XDR0s) that have few treatment options and high mortality rates. CRE are increasingly detected among patients in Illinois, including acute and long term care healthcare facilities.

In response to the CRE public health threat, the Illinois Department of Public Health (IDPH) has guided development an infection control tool called the XDR0 registry. The purpose of the XDR0 registry is two-fold:

1. **Improve CRE surveillance:** The first CRE-positive culture per patient stay must be reported to the XDR0 registry.
2. **Improve inter-facility communication:** Healthcare facilities can query the XDR0 registry to see whether a patient has been previously reported as CRE-positive.

For access to the XDR0 registry, click [here](#)

UPDATES

IL CRE Detect and Protect Campaign. [More...](#)

CRE are reportable to IDPH via the XDR0 registry. Links: [\[IDPH letter to facilities, September 2013\]](#)[\[Reporting rule\]](#)

XDR0 registry orientation webinar [\[Slides\]](#)[\[Recording\]](#)

CDC guidance on control of CRE: [\[The 2012 Toolkit\]](#)

The XDR0 registry is a product of collaboration between IDPH, Medical Research Analytics and Informatics Alliance (MPAIA), and the Chicago CDC

Finally, ARO Information Needs Vary By Stakeholder

- Clinician — Needs Phenotype (antimicrobial susceptibility pattern)
- Infection Control — May Also Need Genotype (mechanism of resistance)
- Public Health
 - Needs Phenotype and Genotype
 - What is Practical — Regional Labs?
- Needs of Others? Patients, Patient Advocates, Insurers

Conclusions

- Resistance is Local — But Not For Long
- Reporting Clinical Events — Useful
 - Provides Trending Perspective
 - Drives Improvements
 - Not Reliable For Inter-facility Comparisons
- Reporting Surveillance Culture Data
 - Useful For Emerging Pathogens (e.g., currently CRE in some locales)
 - Particularly Useful Depending on Epidemiology (e.g., Long-term Care “Epicenters”)
 - Best Used in Conjunction With Interventions
- Reporting Needs (e.g., Phenotype and/or Genotype)
 - Depend on Stakeholder