

# Carbapenem-Resistant Enterobacteriaceae in Virginia

Results from a Survey of Hospital Infection Preventionists  
September 24, 2014

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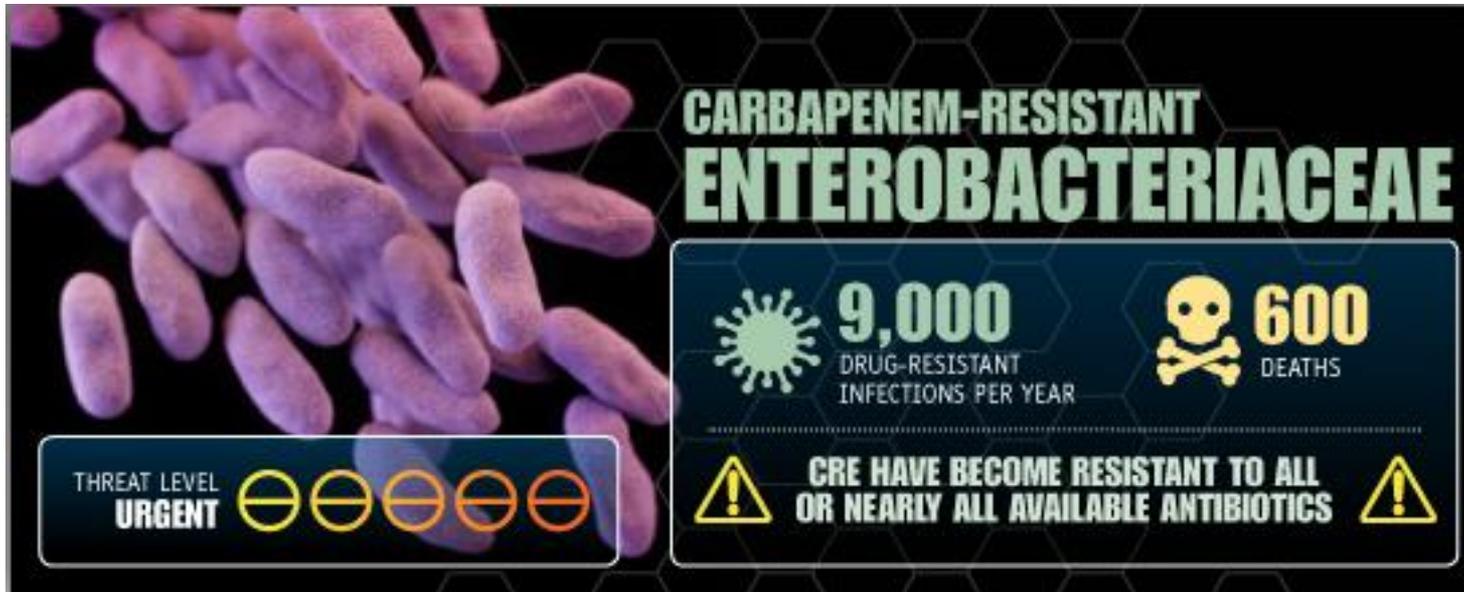
# Objectives

- Describe laboratory testing capacity for CRE in Virginia
- Describe current CRE surveillance and prevention practices and discuss how they align with recommended Centers for Disease Control and Prevention (CDC) strategies
- Share recommendations on how to improve communication between laboratorians and infection preventionists and between healthcare facilities to enhance timely implementation of CRE control measures

# Overview

- Brief CRE background
- Laboratory testing capacity in Virginia
- IP survey methodology
- CRE incidence in Virginia
- Prevention strategies
- Inter-facility communication
- Recommendations

# Background



<http://www.cdc.gov/drugresistance/threat-report-2013>

- Antibiotic Resistance Threats in the United States, 2013: “These bacteria are immediate public health threats that require urgent and aggressive action.”
- Incidence and prevalence of CRE in Virginia is unknown

# CRE: Just Another MDRO?

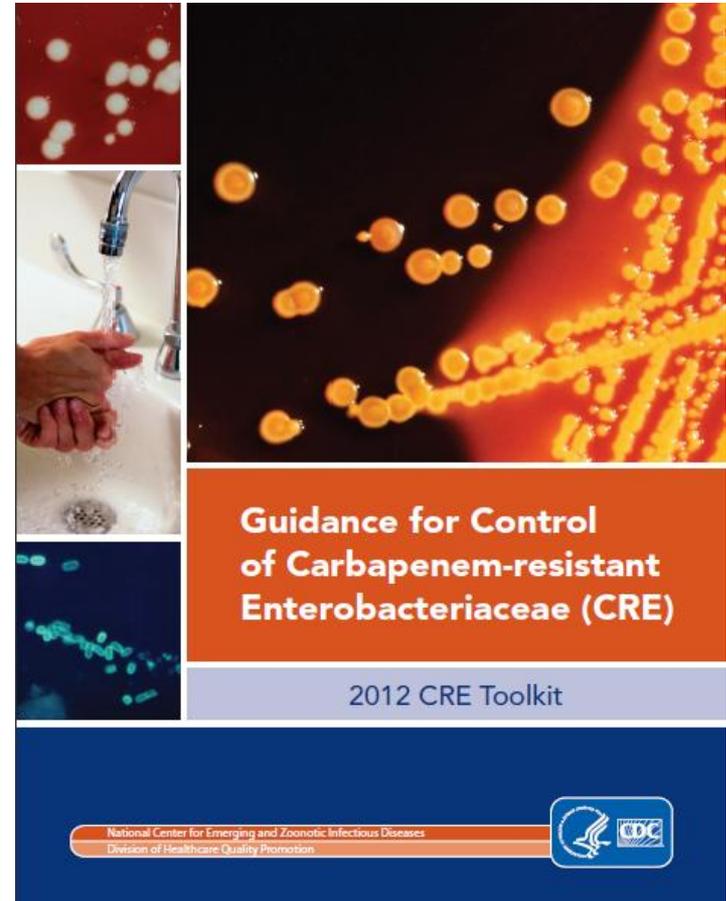
- What makes CRE special...
  - No decolonization strategy
  - Few treatment options available
  - High mortality rate (50% or greater in some studies)
  - Multiple organisms and resistance mechanisms
    - Resistance can hop between many Enterobacteriaceae (over 70 bacteria in the Enterobacteriaceae family)
    - High speed/rate of resistance transfer

# Resistance Mechanisms

- Most prevalent carbapenemase in US is *Klebsiella pneumoniae* carbapenemase (KPC)
- “Unusual” resistance mechanisms (NDM-1, VIM, OXA-48)
  - Risk factor: recent (within last 6 months) exposure to hospitalization in a country outside the US
- VDH has specified that any CRE with an unusual resistance mechanism must be reported to the health department as an “unusual occurrence of disease of public health concern”

# CDC CRE Toolkit (2012)

- Recommendations for healthcare facilities:
  - Implement recommended CRE infection prevention measures
  - Routinely complete inter-facility transfer forms with documentation of a patient's CRE status
- Recommendations for health departments:
  - Conduct regional surveillance
  - Educate and assist facilities in implementing recommended prevention measures and inter-facility communication



<http://www.cdc.gov/hai/organisms/cre/cre-toolkit>

# Virginia CRE Laboratorian Survey

- Distributed by VDH and DCLS to 58 sentinel laboratories in Virginia
  - 100% response rate!
  - 84% hospital labs, 7% independent private labs, 9% other
- Goal was to learn more about laboratory testing for CRE in Virginia as well as communication practices when a CRE isolate is identified

# Lab Survey - Susceptibility Breakpoints

Carbapenem susceptibility breakpoints used by laboratory/reference laboratory when testing Enterobacteriaceae

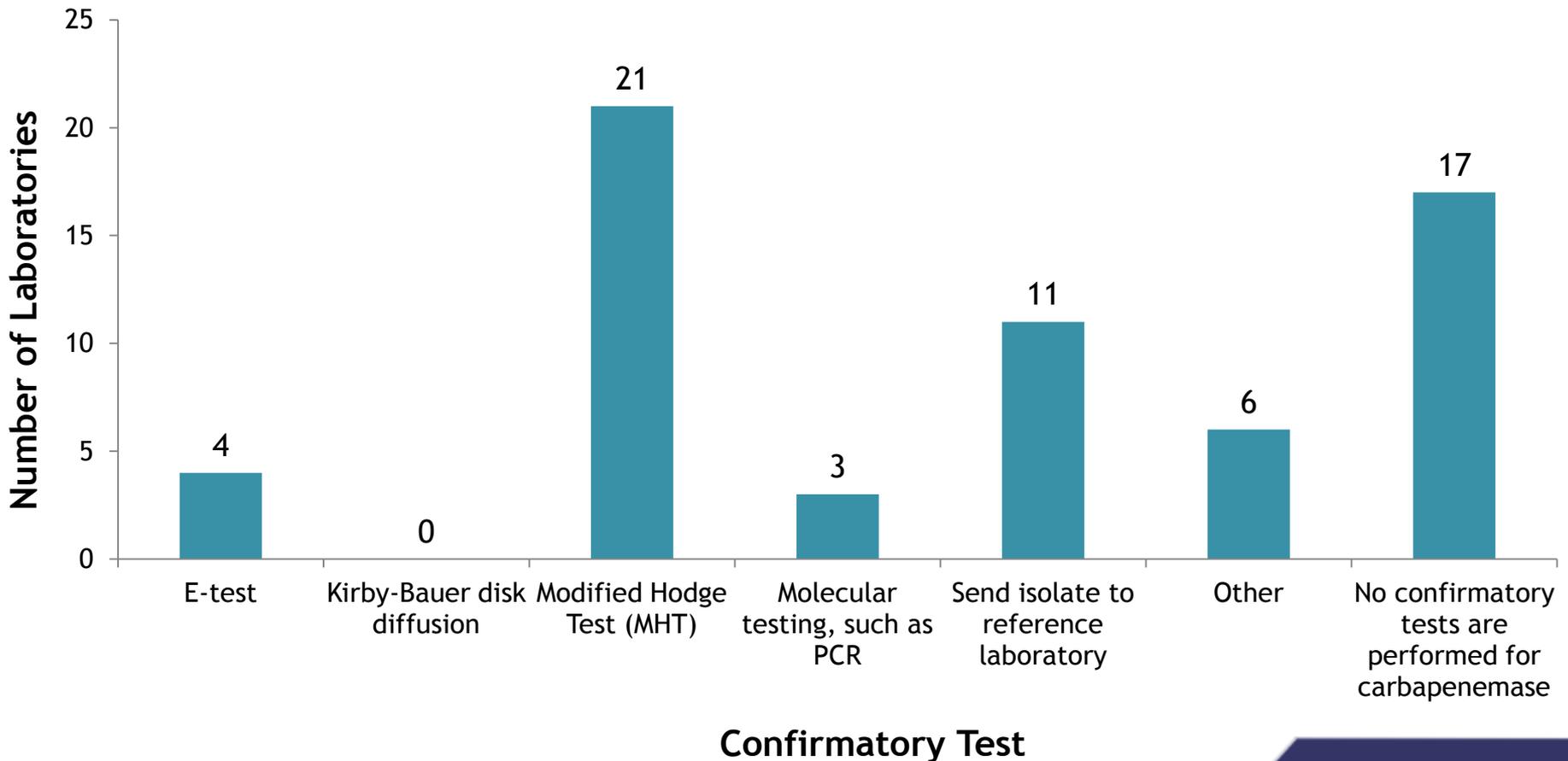
Carbapenem	Minimum Inhibitory Concentration Breakpoint				
	≤0.25 mcg/ml	≤1 mcg/ml	≤2 mcg/ml	≤4 mcg/ml	Do not test
Imipenem	4	10*	10	15	12
Meropenem	6	14*	8	13	10
Ertapenem	4**	16	17	1	13
Doripenem	1	2*	3	0	45
Total	15	42	38	29	80

\* Current CLSI breakpoints at the time of survey administration (CLSI M100-S23)

\*\* The CLSI M100-S23 breakpoint for ertapenem is ≤0.5 mcg/ml, which was not specifically asked in this survey. Instead, ≤0.25 mcg/ml was analyzed as a proxy for ≤0.5 mcg/ml.

# Lab Survey - Confirmatory Testing

Confirmatory tests for carbapenemase performed on non-susceptible isolates of Enterobacteriaceae



# IP Survey Methodology

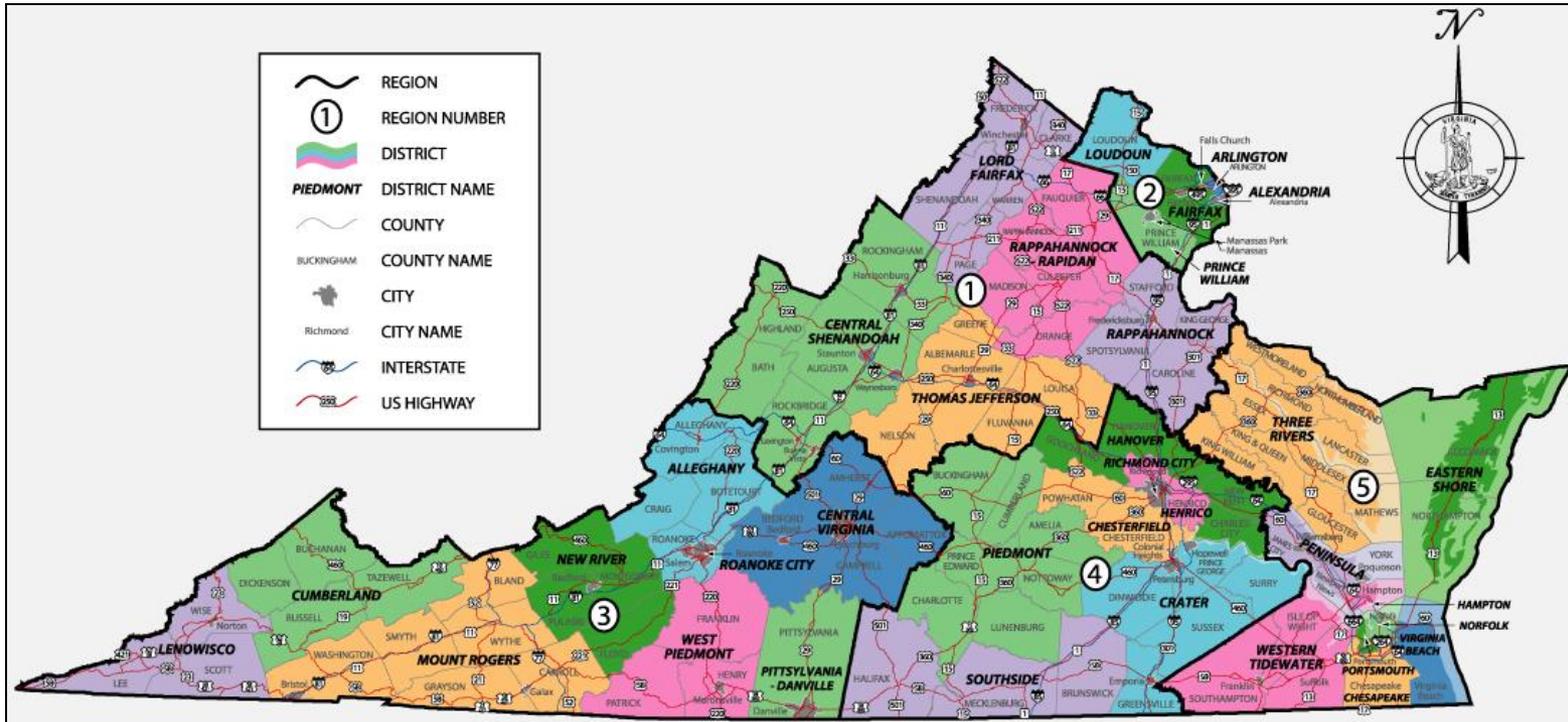
- Developed by VDH and APIC-VA
- Distributed electronically
  - All acute care, children's, critical access, long-term acute care, military hospitals (n=95)
  - Only one response per hospital, unless facility had both an acute care and long-term acute care hospital, in which case separate responses were requested for each hospital setting
- Open for several weeks Oct - Nov 2013
  - Follow-up e-mails to non-responders
  - Phone calls/e-mails to resolve data quality issues

# Demographics of Survey Respondents

- 46/95 responded (48%)
- Largest proportion (46%) had 100-199 beds
- Average IP FTE = 1.53 (range 0.5-8.5)
- Overall, representation of respondents very similar to all hospitals sent survey

Hospital Type	Respondents		Surveyed Facilities	
	Number	Percent	Number	Percent
Acute Care	41	89.0	76	80.0
Children's	1	2.2	3	3.1
Critical Access	2	4.4	7	7.4
Long-Term Acute Care	2	4.4	5	5.3
Military	0	0	4	4.2
<b>Total</b>	<b>46</b>	<b>100</b>	<b>95</b>	<b>100</b>

# Demographics of Survey Respondents

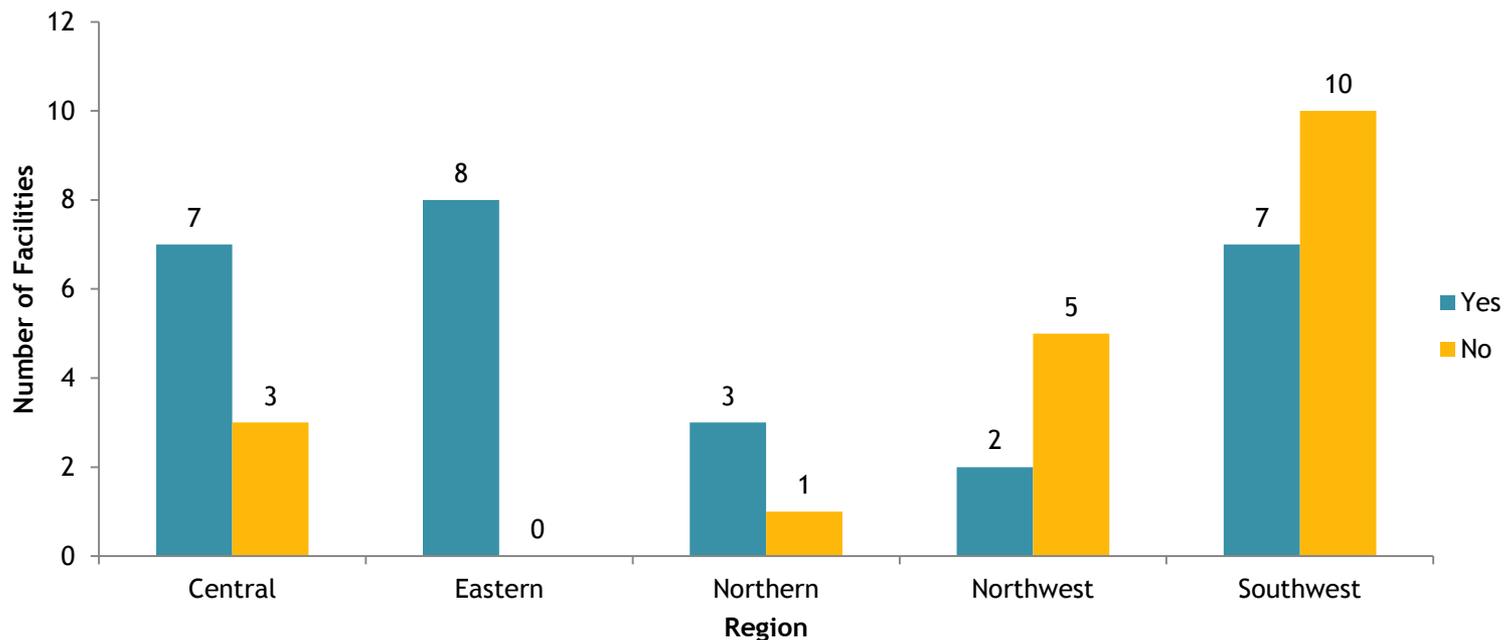


Health Planning Region	Respondents		Surveyed Facilities	
	Number	Percent	Number	Percent
1 - Northwest	7	15.2	15	15.8
2 - Northern	4	8.7	9	9.5
3 - Southwest	17	37.0	28	29.5
4 - Central	10	21.7	19	20.0
5 - Eastern	8	17.4	24	25.3
<b>Total</b>	<b>46</b>	<b>100</b>	<b>95</b>	<b>100</b>

# CRE Incidence in Virginia Hospitals

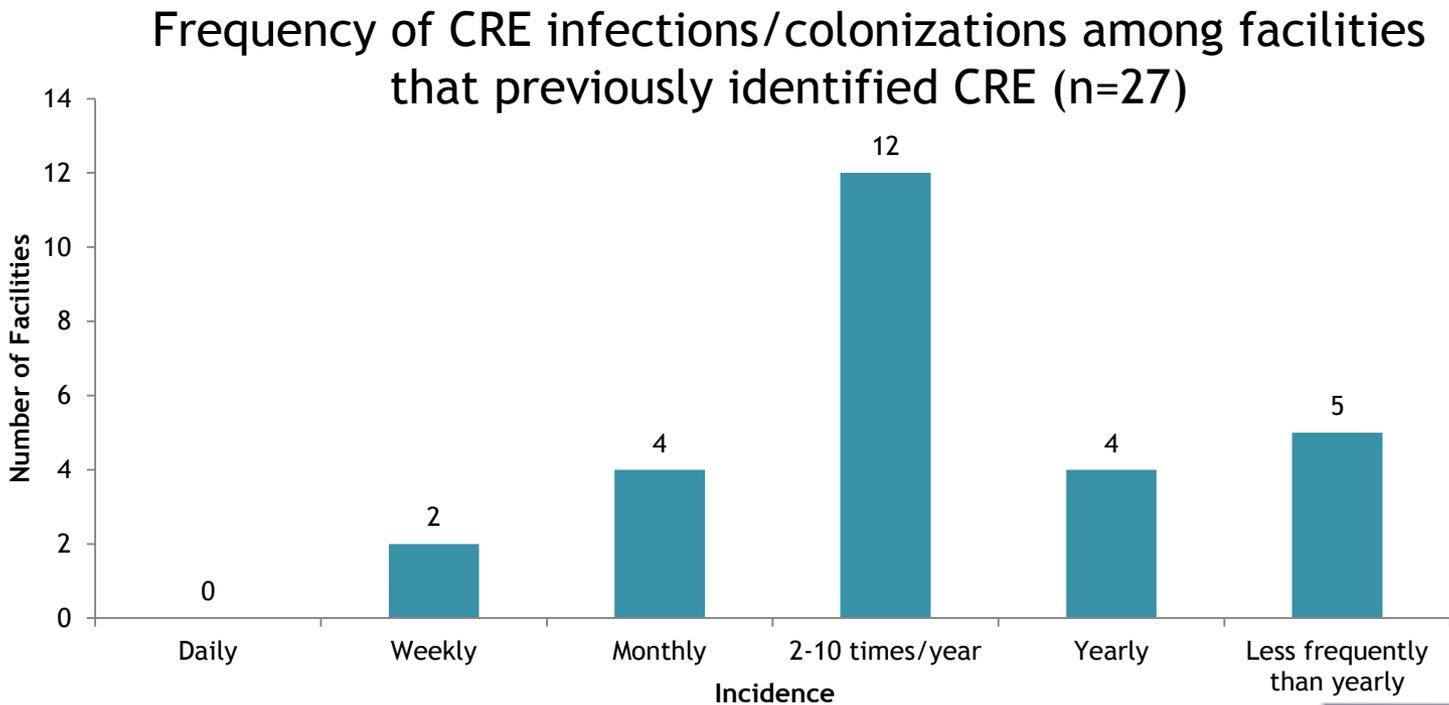
- 27/46 hospitals (59%) have previously identified CRE in their facilities

Facilities that have ever identified CRE infections or colonizations from clinical cultures



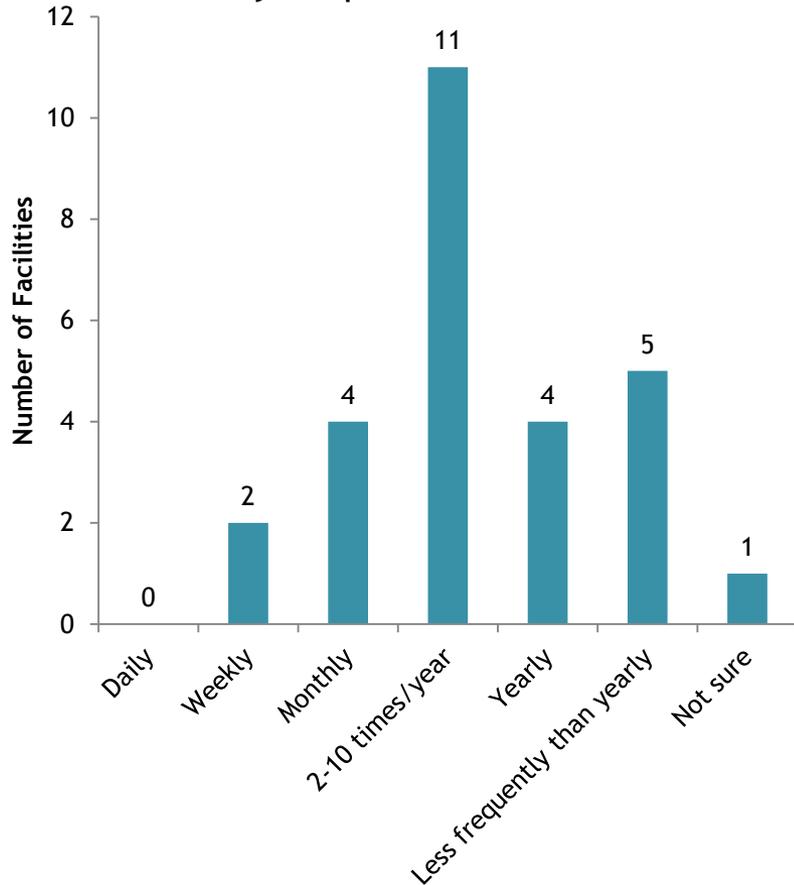
# CRE Incidence

- The 27 hospitals that have previously identified CRE most frequently reported identifying CRE 2-10 times per year (44%)

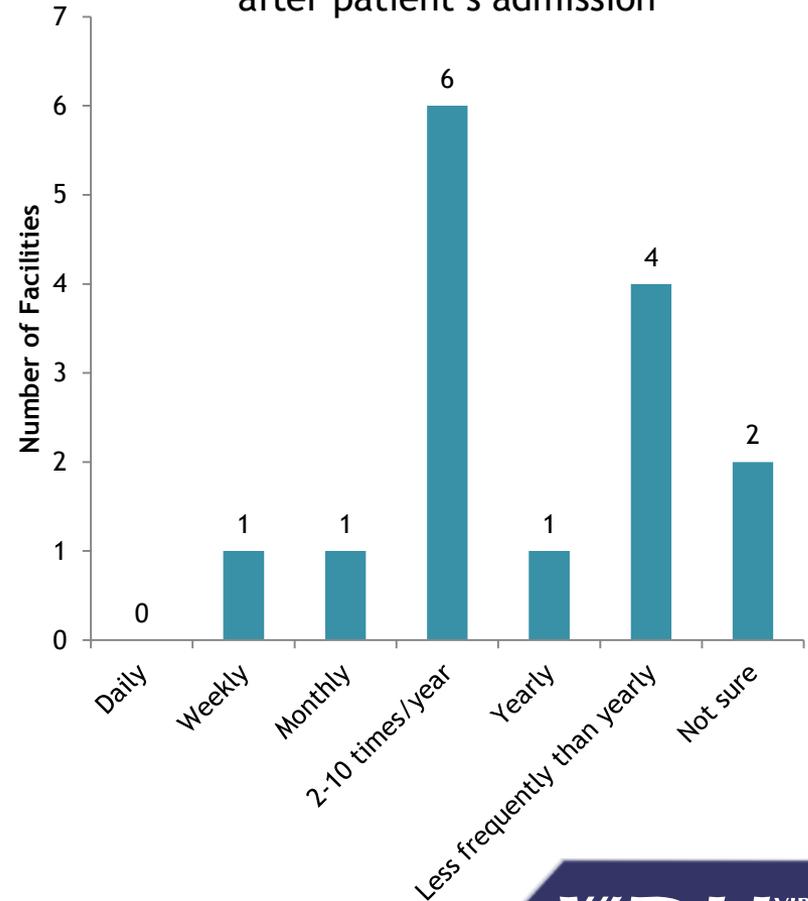


# Community vs Hospital-Associated

Frequency of CRE infections/colonizations identified before or within two calendar days of patient's admission



Frequency of CRE infections/colonizations identified more than two calendar days after patient's admission



# CRE Prevention Strategies

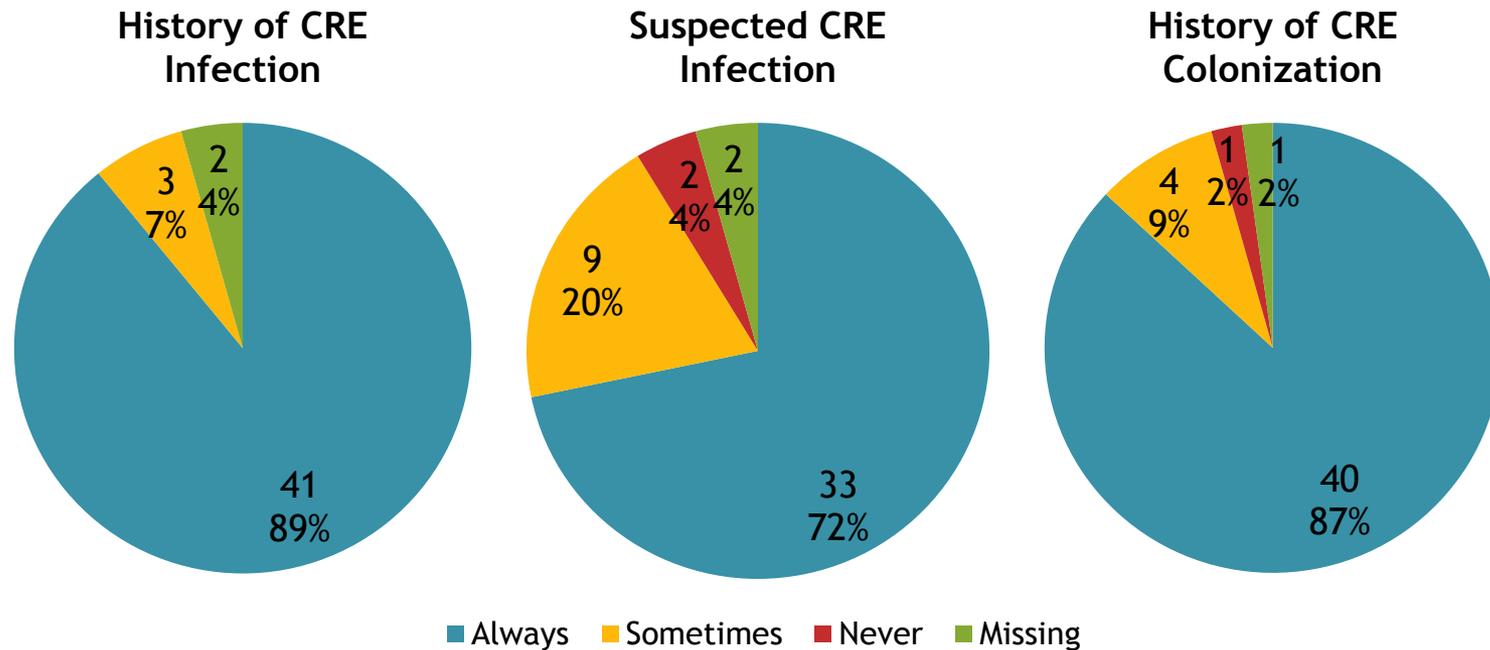
- CDC CRE Toolkit advises all facilities implement 8 core measures to prevent CRE transmission:
  - Hand Hygiene
  - **Contact Precautions**
  - Healthcare Personnel Education
  - Minimize Device Use
  - **Patient and Staff Cohorting**
  - **Laboratory Notification**
  - Antimicrobial Stewardship
  - **CRE Screening**
- Two additional supplemental measures for facilities with CRE transmission:
  - **Active Surveillance Testing**
  - Chlorhexidine Bathing

# Contact Precautions

- All facilities would place **CRE infected** patient on contact precautions
  - Time on contact precautions varied:
    - 52% indefinitely, 32% duration of current stay, 9% screen/culture negative
- 42/46 (91%) would place **CRE colonized** patient on contact precautions
  - Time on contact precautions varied:
    - 44% indefinitely, 34% duration of current stay, 10% until screen/culture negative

# Contact Precautions

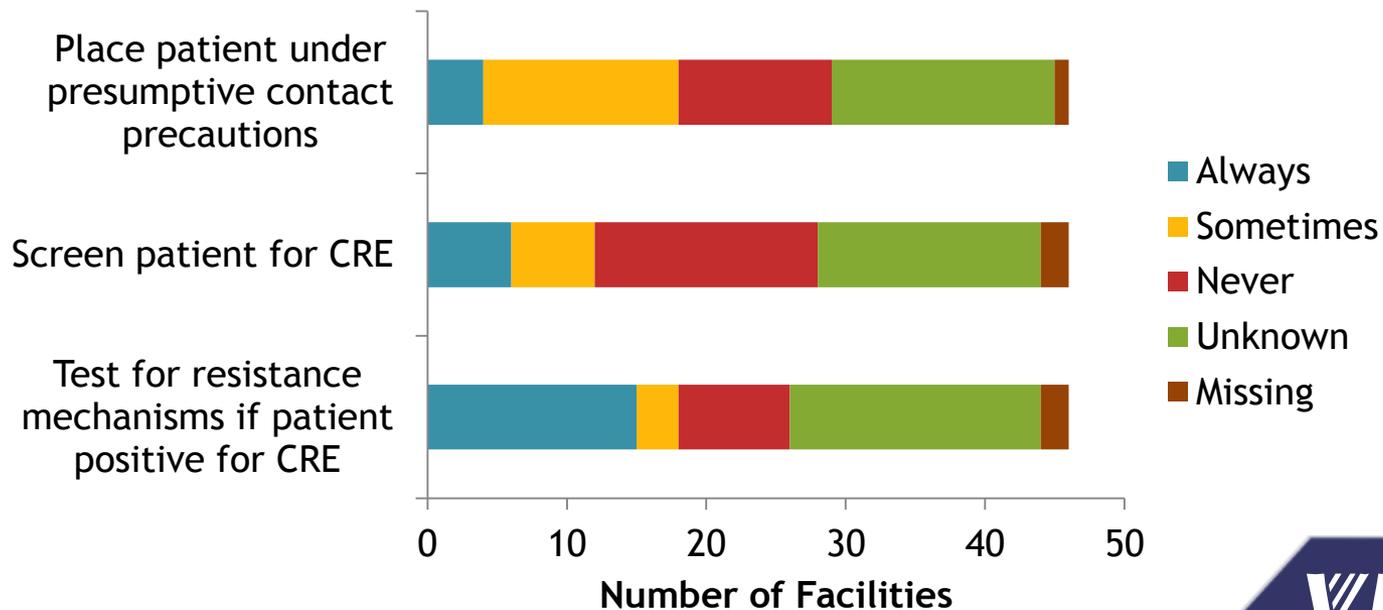
Frequency with which a facility would place patients on contact precautions, given history or suspicion of CRE infection or colonization



# If Patient Reports Foreign Hospitalization

- 59% of facilities indicate they **always** collect whether patient has history of recent hospitalization in a country outside of the US

Frequency certain infection prevention measures are implemented if patient reports recent foreign hospitalization



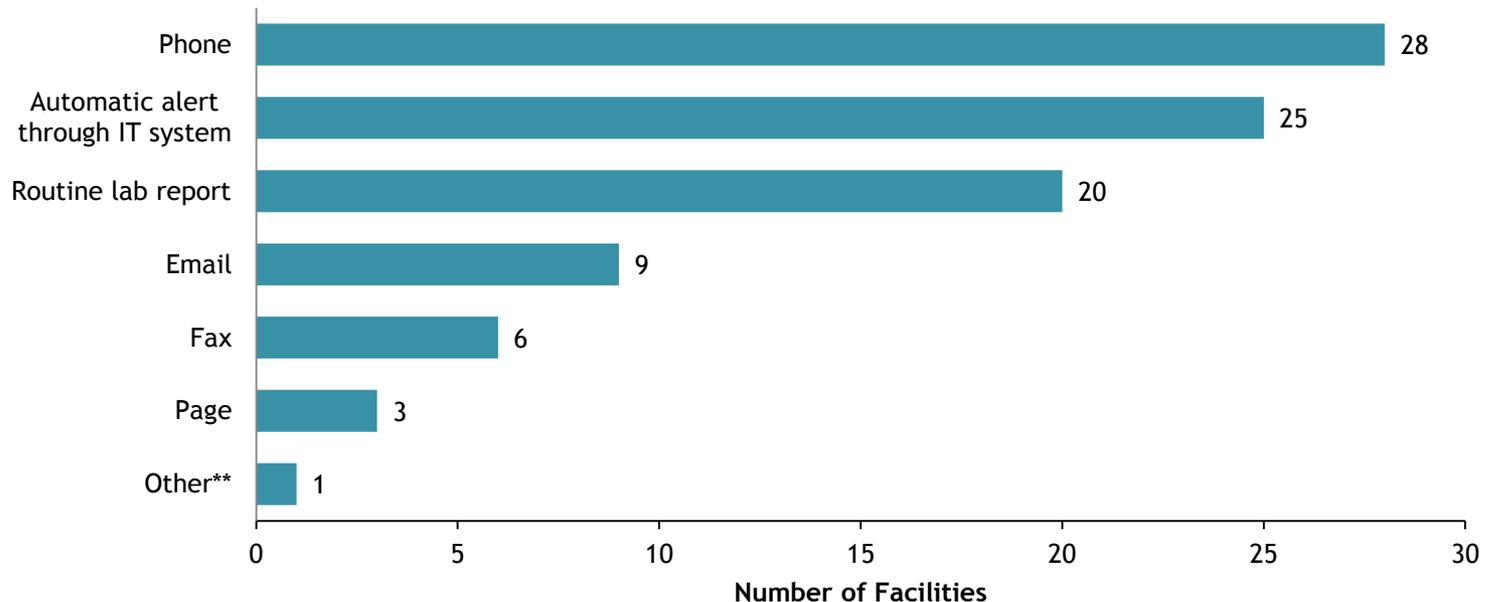
# Patient and Staff Cohorting

- Place patient in single room:
  - CRE infected - 97%
  - CRE colonized - 89%
- Implement patient/staff cohorting:
  - CRE infected - 24%
  - CRE colonized - 20%

# Laboratory Notification

- Majority of facilities (87%, n=40) reported having an established system in place for lab to alert IPs in timely manner when CRE identified

Preferred communication methods for laboratory to report CRE results to infection prevention\*

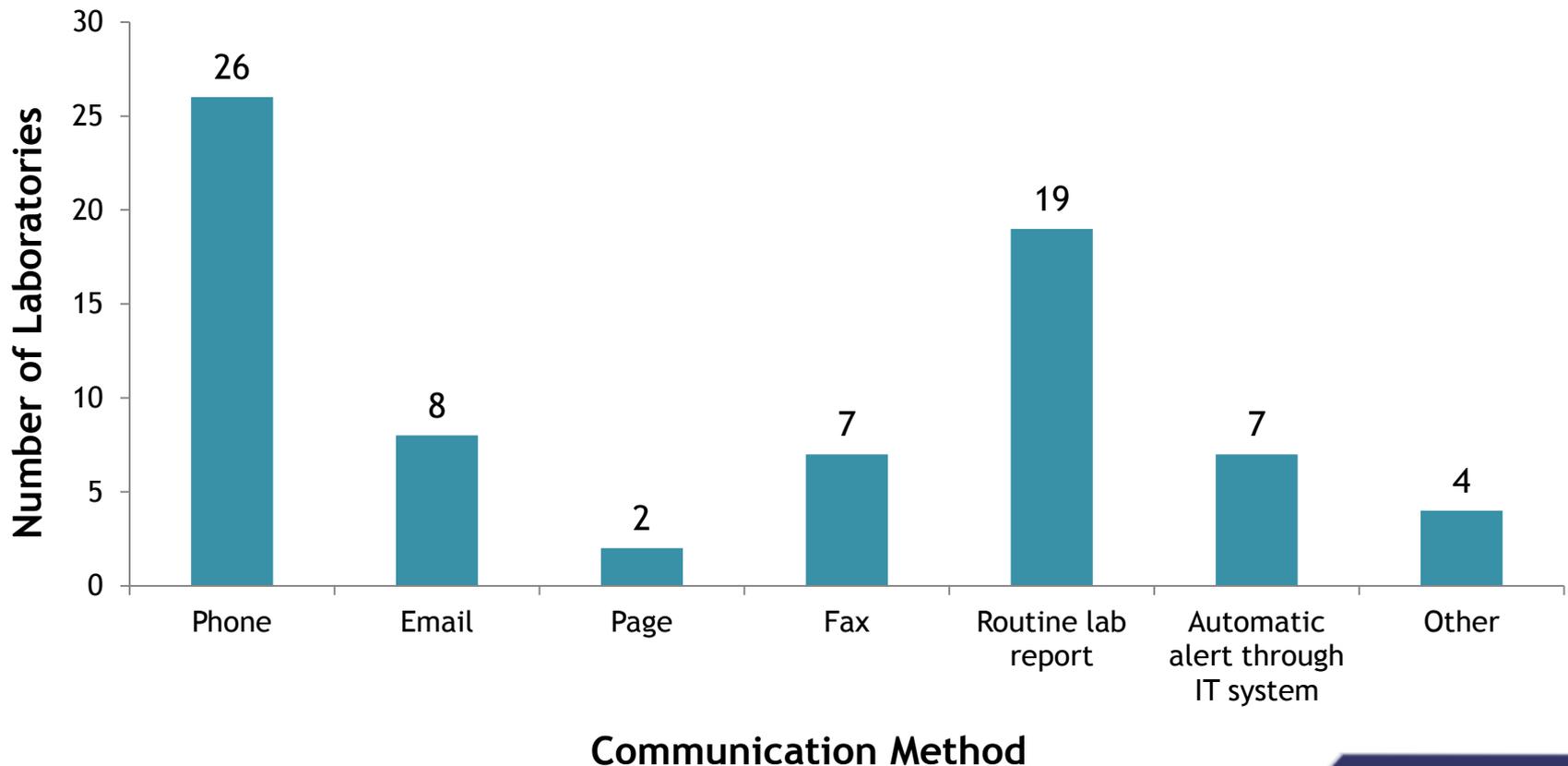


\* Respondents could select more than one answer

\*\*Other specified: "Lab prints all positive cultures to my printer"

# Lab Survey: IP Notification

Communication methods used to notify Infection Prevention when CRE isolate is confirmed (n=40)



# CRE Results on Laboratory Report

IPs were asked if the way the laboratory communicates CRE results on a laboratory report allows Infection Prevention to know it is CRE in a timely manner so appropriate action can be taken:

- N/A, never had a CRE case - 43% (n=20)
- Yes - 41% (n=19)
- No - 13% (n=6)
  - Two facilities provided suggestions on how the CRE results on a lab report could be communicated more quickly or effectively:
    - “Make CRE a critical [value] that needs to be called to the nurse.”
    - “Call [directly] to IP.”

# Lab Survey: Language on Lab Reports

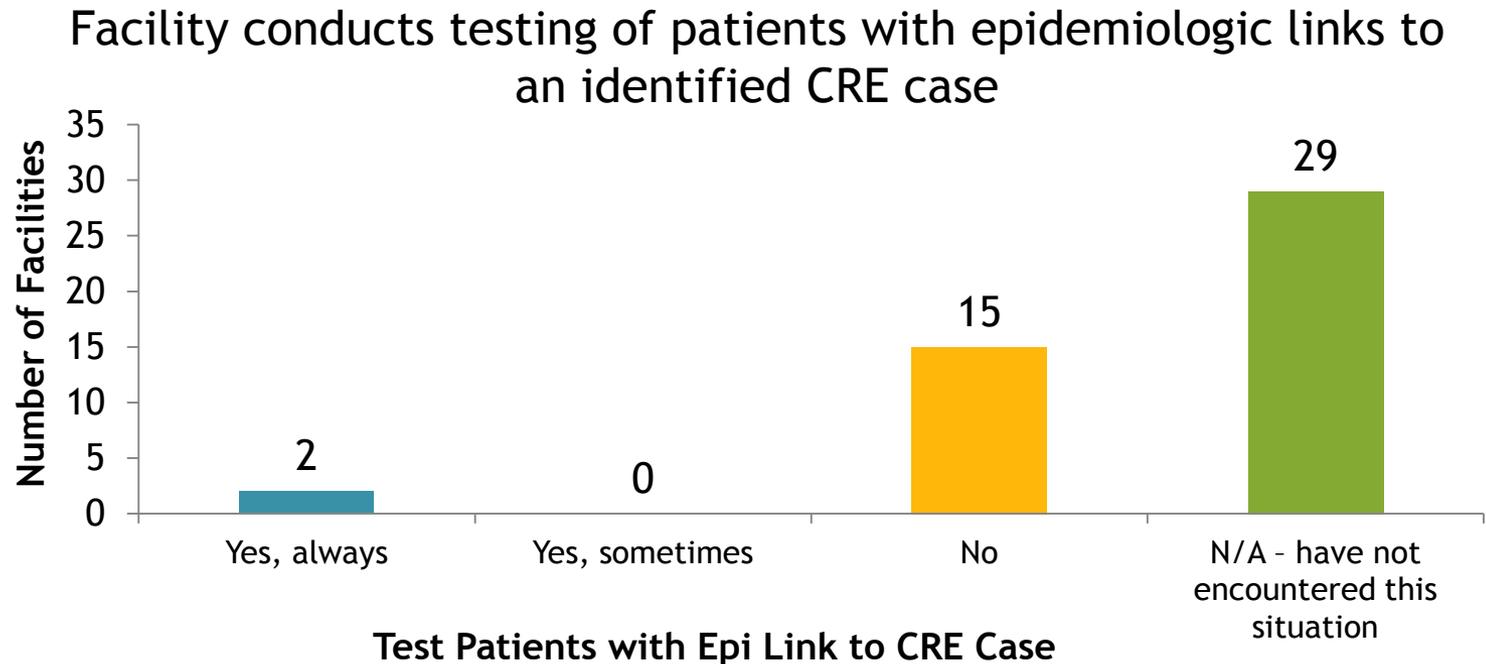
- Many laboratories added language to lab report to help IPs identify the isolate as a CRE:
  - “CRE”
  - “carbapenem-resistant”
  - “carbapenemase-producing”
- Some added language was not conducive to timely identification of CRE
  - “MDRO”
  - “extended spectrum beta-lactamase (ESBL)-producing”

# CRE Screening

- Microbiology record review: review microbiology records for a given time period to detect previously unrecognized or unreported cases
  - 15 facilities (33%) have done this for CRE
    - 6 facilities (40%) identified previously unrecognized/unreported cases
- Point prevalence survey: single round of active surveillance cultures in high-risk units
  - 5 facilities (11%) have done this for CRE
    - 2 facilities did not identify any unrecognized cases, 3 facilities didn't specify

# Screening Epidemiologic Links

- Epidemiologic Link = a patient who was in same unit or was provided care by same healthcare personnel as a person who tested positive for CRE



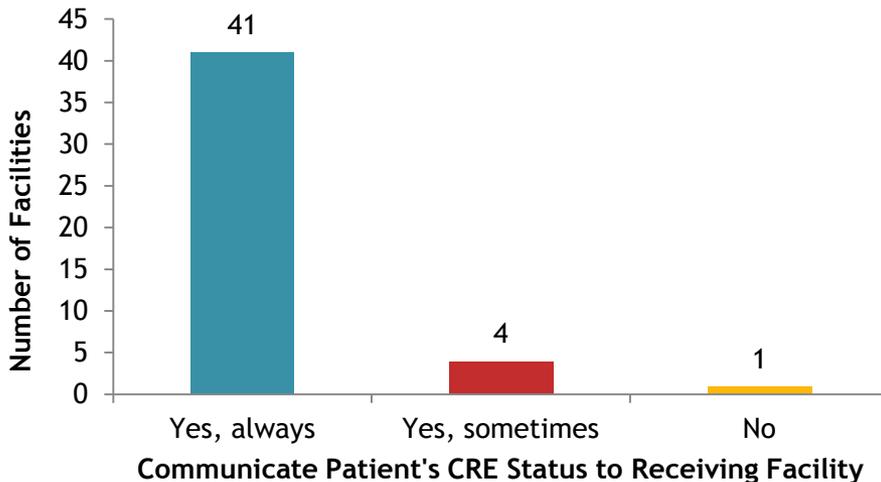
# Active Surveillance Testing

- Supplemental measure for facilities that have identified CRE transmission within their facility
- Screen patients at admission for CRE, or screen at admission and periodically during hospital stay
  - Focus on high-risk patients or patients transferred from high-risk settings (e.g., LTACHs)
- 13 facilities reported previously identifying hospital-associated CRE cases
  - Only 4 facilities (31%) have conducted active surveillance testing

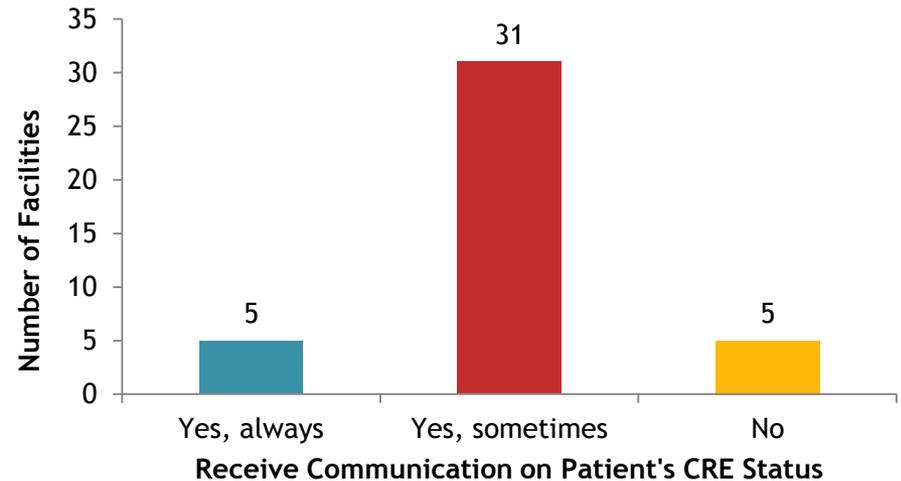
# Inter-Facility Communication

- In addition to prevention strategies, CDC CRE Toolkit encourages all facilities to routinely communicate a patient's MDRO status when transferring

Frequency with which a facility communicates a patient's CRE status when transferring to another facility

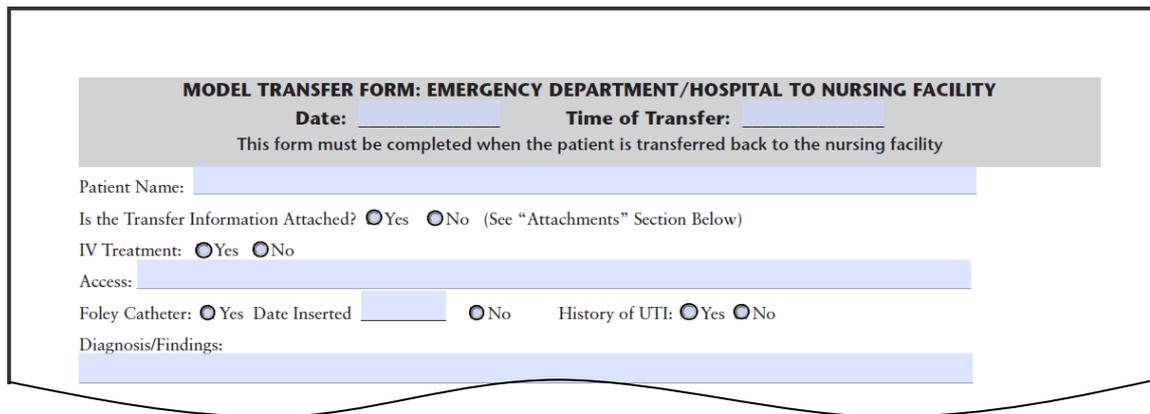


Frequency with which a facility receives communication on a transfer patient's CRE status when receiving from another facility



# Inter-Facility Communication

- To make sure MDRO status gets communicated, the CDC CRE Toolkit recommends using a transfer form for every transfer
  - 69% of facilities reported using a transfer form when transferring a patient to another facility
  - 67% of facilities reported receiving a transfer form when a patient is transferred to their hospital



**MODEL TRANSFER FORM: EMERGENCY DEPARTMENT/HOSPITAL TO NURSING FACILITY**  
Date: \_\_\_\_\_ Time of Transfer: \_\_\_\_\_  
This form must be completed when the patient is transferred back to the nursing facility

Patient Name: \_\_\_\_\_

Is the Transfer Information Attached?  Yes  No (See "Attachments" Section Below)

IV Treatment:  Yes  No

Access: \_\_\_\_\_

Foley Catheter:  Yes Date Inserted \_\_\_\_\_  No History of UTI:  Yes  No

Diagnosis/Findings: \_\_\_\_\_

# Discussion

- Based on the reported incidence, all regions in Virginia are “regions with few CRE identified” - per CDC CRE Toolkit
  - Toolkit recommends aggressive action to control and prevent further CRE spread
- Limitations:
  - Low response rate - only 48%
  - Survey conducted at single point in time, incidence and prevalence could have changed already
  - Many hospitals not actively screening for CRE - likely the actual CRE incidence in Virginia is higher than what was measured

# Recommendations

- Conduct more epidemiologic screenings for CRE, such as point prevalence surveys, retrospective microbiology record reviews, or active surveillance testing of high-risk patients.
  - Will allow facilities to better understand their incidence of CRE and to identify any potentially missed CRE cases
  - VDH can assist by offering educational resources on how to conduct CRE screenings.
- Ensure CRE risk factor information, such as recent foreign hospitalization, is collected at admission and documented in a way that is easy for Infection Prevention and clinical staff to locate in patient's medical record.

# Recommendations

- If a previously unrecognized CRE infection or colonization is identified, assess for and screen any other patients with epidemiologic links to the CRE case to prevent the organism's spread within the facility.
- The CDC 2012 CRE Toolkit emphasizes that infection prevention measures are the same for patients with CRE infection *or* colonization. Ensure that the recommended infection prevention measures are carried out for both types of patients in your facility.

# Recommendations

- Assess current inter-facility transfer communication methods to determine if they are adequate for CRE, MDROs, and epidemiologically important organisms. Consider adopting an inter-facility transfer form if one is currently not in use.
  - Refer to the Virginia Model Universal Transfer Form or the CDC Inter-Facility Infection Control Transfer Form as a guide.
- Have discussions with laboratory about IP and clinical preferences for laboratory notification of CRE
  - Assure that there is a process to deliver CRE results on weekends and holidays that ensures appropriate infection prevention precautions can be implemented.

# Recommendations

- Explore opportunities to participate in antimicrobial stewardship initiatives with other healthcare partners.
  - Stewardship Interest Group of Virginia (SIGoVA):  
<http://www.vshp.org/sigova.html>
- Report any CRE suspected or confirmed to have an unusual resistance mechanism (e.g. NDM-1, VIM, OXA-48) to the health department as an “unusual occurrence of disease of public health concern.”
  - Any suspected or confirmed outbreak of CRE (regardless of resistance mechanisms) is reportable too

# Resources - VDH

- VDH Multidrug-Resistant Organisms website (includes links to CRE survey report, CRE PPT for education, summary CRE surveillance and prevention recommendations, CRE fact sheet):

<http://www.vdh.virginia.gov/epidemiology/surveillance/hai/MRSAandMDRO.htm>

- To find your local health department:  
[www.vdh.virginia.gov/lhd](http://www.vdh.virginia.gov/lhd)

- VDH Healthcare-Associated Infections Program
  - 804-864-8141

# Resources - CDC

- CDC CRE toolkit: <http://www.cdc.gov/hai/organisms/cre/cre-toolkit/index.html>
- CDC CRE laboratory protocol: [http://www.cdc.gov/HAI/pdfs/labSettings/Klebsiella\\_or\\_Ecoli.pdf](http://www.cdc.gov/HAI/pdfs/labSettings/Klebsiella_or_Ecoli.pdf)
- CDC Health Advisory on CRE (Feb 2013): <http://emergency.cdc.gov/HAN/han00341.asp>
- CDC Inter-facility Infection Control Transfer Form: <http://www.cdc.gov/HAI/toolkits/InterfacilityTransferCommunicationForm11-2010.pdf>
- CDC, Antibiotic Resistant Threats in the United States, 2013: <http://www.cdc.gov/drugresistance/threat-report-2013/pdf/ar-threats-2013-508.pdf>.

Thank you!

Questions?

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