Coalition for Care
IHA's Hospital Engagement Network

Indiana Hospital Association
INDIANA PATIENT SAFETY CENTER

CRE
Carbapenem-resistant *Enterobacteriaceae*

September 25, 2014

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Welcome & Objectives

Participants will:

1. Be educated in the CRE priority for state-wide focus
2. Learn how collaboration within the Indianapolis Patient Safety Coalition has led to the development of a CRE protocol in control and prevention across the continuum of care
3. Be provided with tools to conduct an organizational assessment
4. Be provided with resources to support organizational CRE protocol development by December 31, 2014

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2014 Anthem Scorecard

Measure Title: CDC CRE Toolkit

Description: The Facility has implemented the Core Measures described in the CDC CRE Toolkit to control transmission of Carbapenem-resistant Enterobacteriaceae (CRE).

Evaluation Criteria: The Facility must have:

- Systems in place to identify patients with a history of CRE colonization or infection at admission and place them on Contact Precautions if not known to be free of colonization.
- Laboratory protocols in place for the rapid notification of clinical and infection prevention staff whenever CRE are identified from clinical specimens to ensure timely implementation of control measures.
- A process in place for patients colonized or infected with CRE to be cared for by dedicated staff and to be housed in single patient rooms, and when single rooms are not available, cohorted together in specific areas. Preference for single rooms should be given to patients at highest risk for transmission such as patients with incontinence, medical devices, or wounds with uncontrolled drainage.
- A CRE screening process to identify unrecognized CRE colonization among epidemiologically linked contacts of known CRE colonized or infected patients, and/or point prevalence surveys for units containing unrecognized CRE patients are conducted

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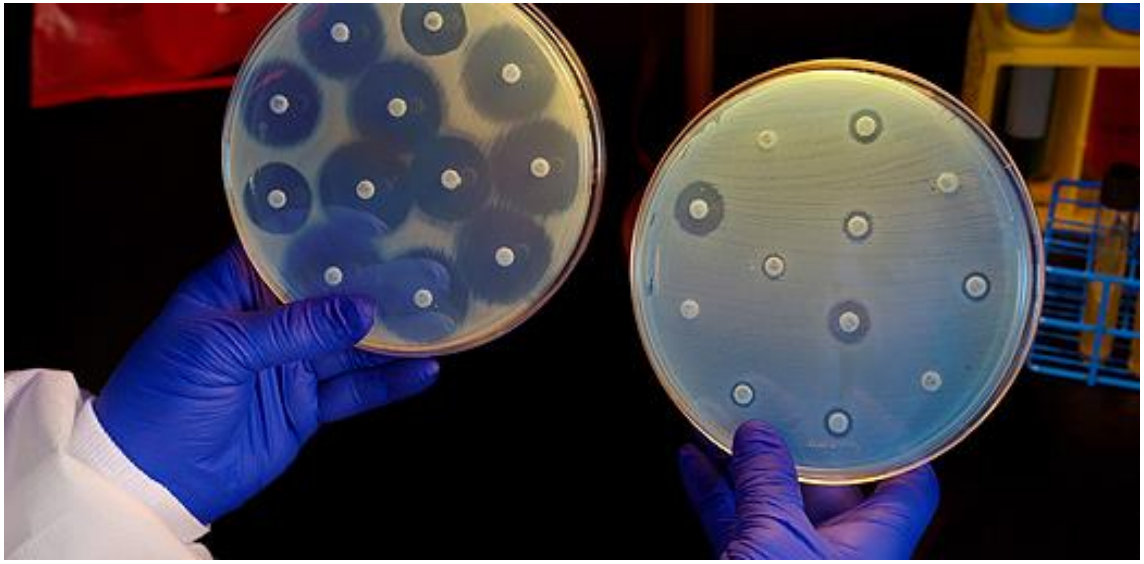
Program Agenda & Speaker Introductions

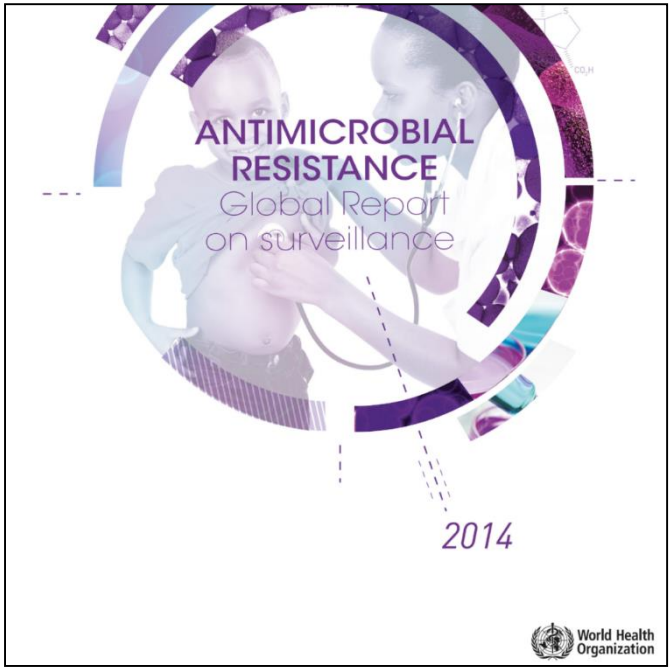
Time (Eastern)	Presenter(s)	Topic Content
1:00 – 1:05 pm	Welcome IHA Staff	Introduction speakers with review of program objectives
1:05 – 1:30 pm	Dr. Daniel Livorsi	Overview of CRE and CDC Priority; Control and Prevention
1:30 – 1:50 pm	Laurie Fish, RN CIC	Review of CRE Core Measures and CRE Protocol developed by Indianapolis Patient Safety Coalition
1:50 - 1:55 pm	Dr. Livorsi Laurie Fish, RN CIC	Question and Answers
1:55 - 2:00 pm	Summary IHA Staff	Review of objectives, available resources and announcement of future supportive programming to address next steps

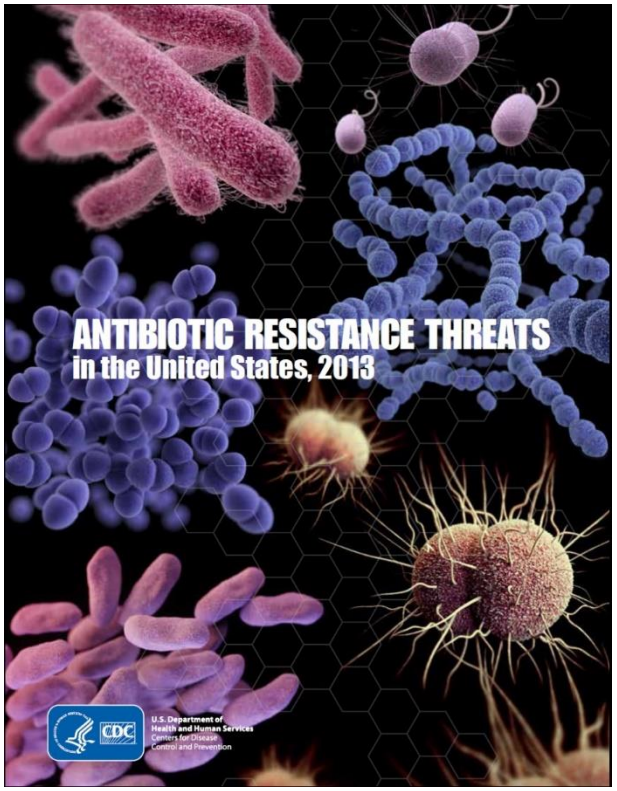
The Growing Threat of Carbapenem-resistant *Enterobacteriaceae* (CRE)



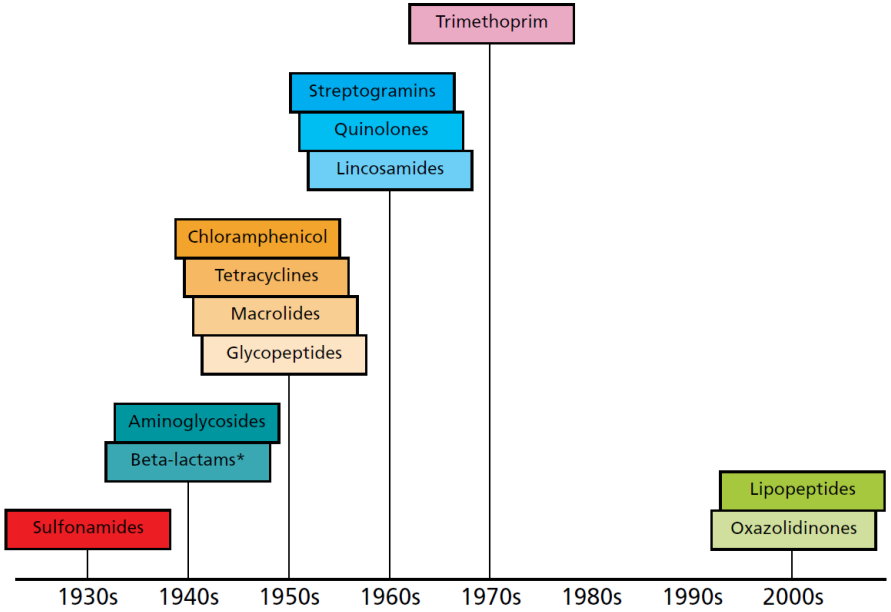
Daniel Livorsi, MD, MSc
dlivorsi@iu.edu

Recent WHO and CDC reports highlight the threat of increasing antibiotic resistance





Discovery of new classes of antibiotics has stalled



Note: Penicillins were the first beta-lactams. Other frequently used agents of the beta-lactam class include cephalosporins and carbapenems, developed in the 1960s and 1980s, respectively (European Medicines Agency & European Centre for Disease Prevention and Control 2009).

Sources: Figure based on the findings of Levy 2002; Nordberg et al. 2004; Singh & Greenstein 2000 – constructed and provided courtesy of EMEA.

A recent patient admitted to an Indianapolis hospital

An elderly woman with multiple sclerosis complicated by paraplegia and a neurogenic bladder (chronic indwelling urethral catheter) was transferred to the hospital from her nursing home because of fevers and presumed sepsis.

- She was found to have bilateral ulcers over her ischium and sacrum that were contaminated with stool.
- Her blood culture grew multi-drug resistant E.coli, and her urine culture grew…..

Klebsiella pneumoniae grew in a urine culture

Antibiotic	Susceptibility
Ampicillin-sulbactam	Resistant
Pip/tazobactam	Resistant
Cefazolin	Resistant
Ceftriaxone	Resistant
Cefepime	Resistant
Gentamicin	Resistant
Amikacin/Tobramycin	Resistant
Imipenem	Resistant
Meropenem	Resistant
Levofloxacin	Resistant
Trimeth-sulfa	Resistant

Carbapenem-resistant *Enterobacteriaceae*: the sobering facts

50% Mortality rate for CRE bloodstream infections

2 The number of systemic antibiotics that would have been active against this patient's *K.pneumoniae* strain.

Both are given IV and are of limited efficacy.

Enterobacteriaceae

- Large family of bacteria
- Normal inhabitants of human intestinal tract
- Causes a range of clinical infections that are normally treatable
- CRE are *Enterobacteriaceae* resistant to multiple antibiotics, including a group of last-resort antibiotics called carbapenems

CDC's current definition for CRE: carbapenem-resistant *Enterobacteriaceae*

Enterobacteriaceae *E.coli, Klebsiella* spp. *Enterobacter*, etc.	
Non-susceptible to ≥ 1 carbapenem:	**Resistant to all 3rd generation cephalosporins that were tested:**
Doripenem Meropenem Imipenem	Ceftriaxone Cefotaxime Ceftazidime

****This definition will likely be changing.**

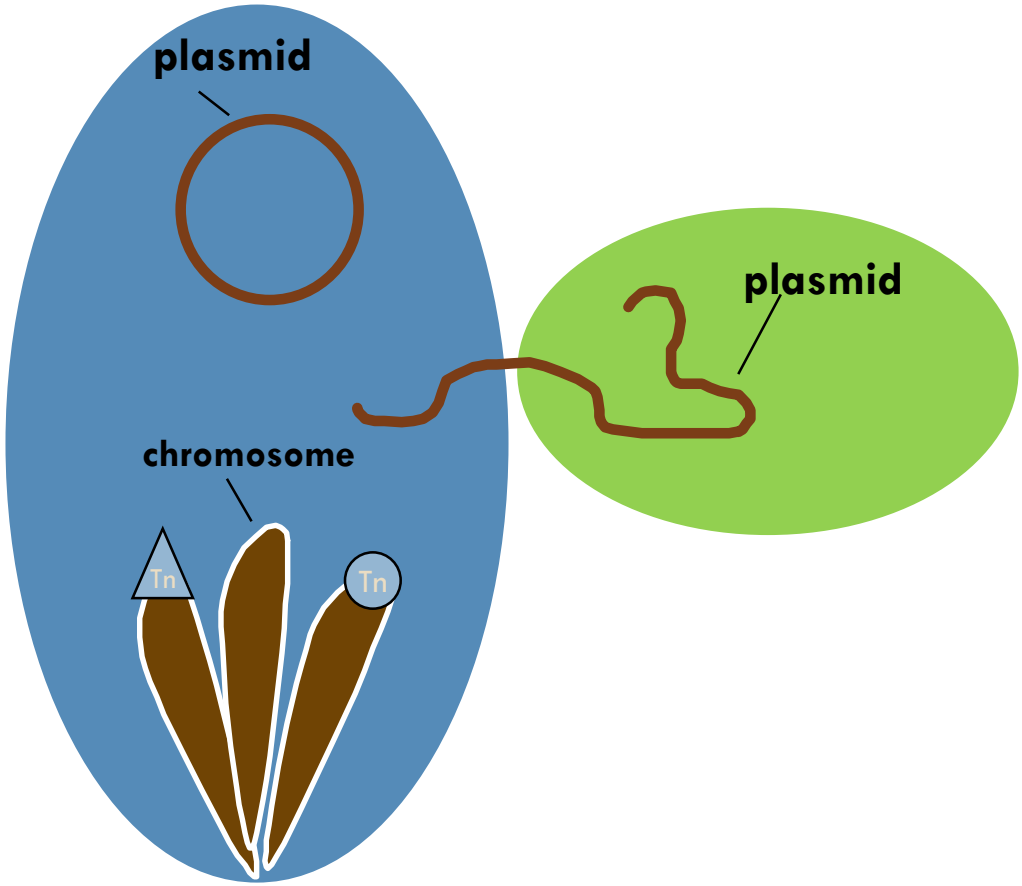
Different forms of CRE

Enzymes that break down antibiotics

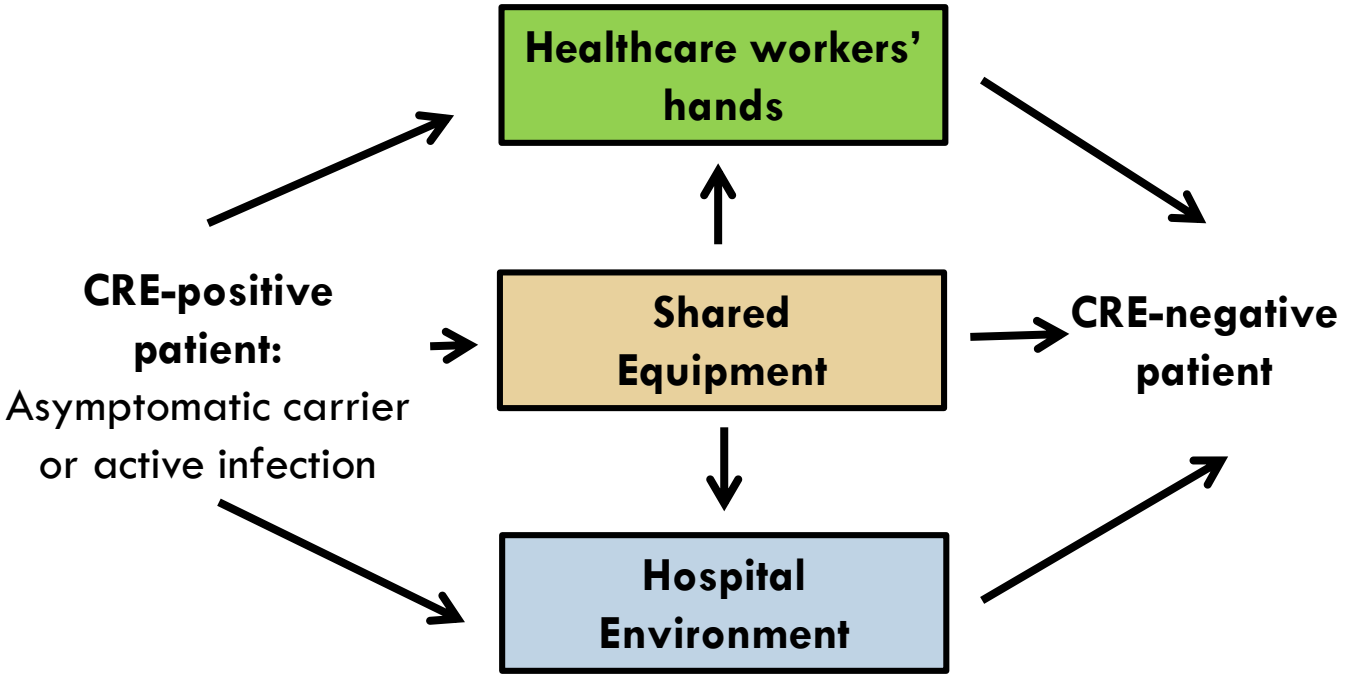
- **KPC:** *Klebsiella pneumoniae* carbapenmase
- **NDM:** New Dehli metallo-beta-lactamase
- **VIM:** Verona Integron metallo-beta-lactamase

Combination of anti-antibiotic mechanisms

Transmission of KPC Plasmids between Bacteria



How is CRE transmitted



Centers for Disease Control and Prevention
MMWR
Morbidity and Mortality Weekly Report
Weekly / Vol. 62 / Nos. 51 & 52
January 3, 2014

Notes from the Field

New Delhi Metallo-β-Lactamase–Producing *Escherichia coli* Associated with Endoscopic Retrograde Cholangiopancreatography — Illinois, 2013

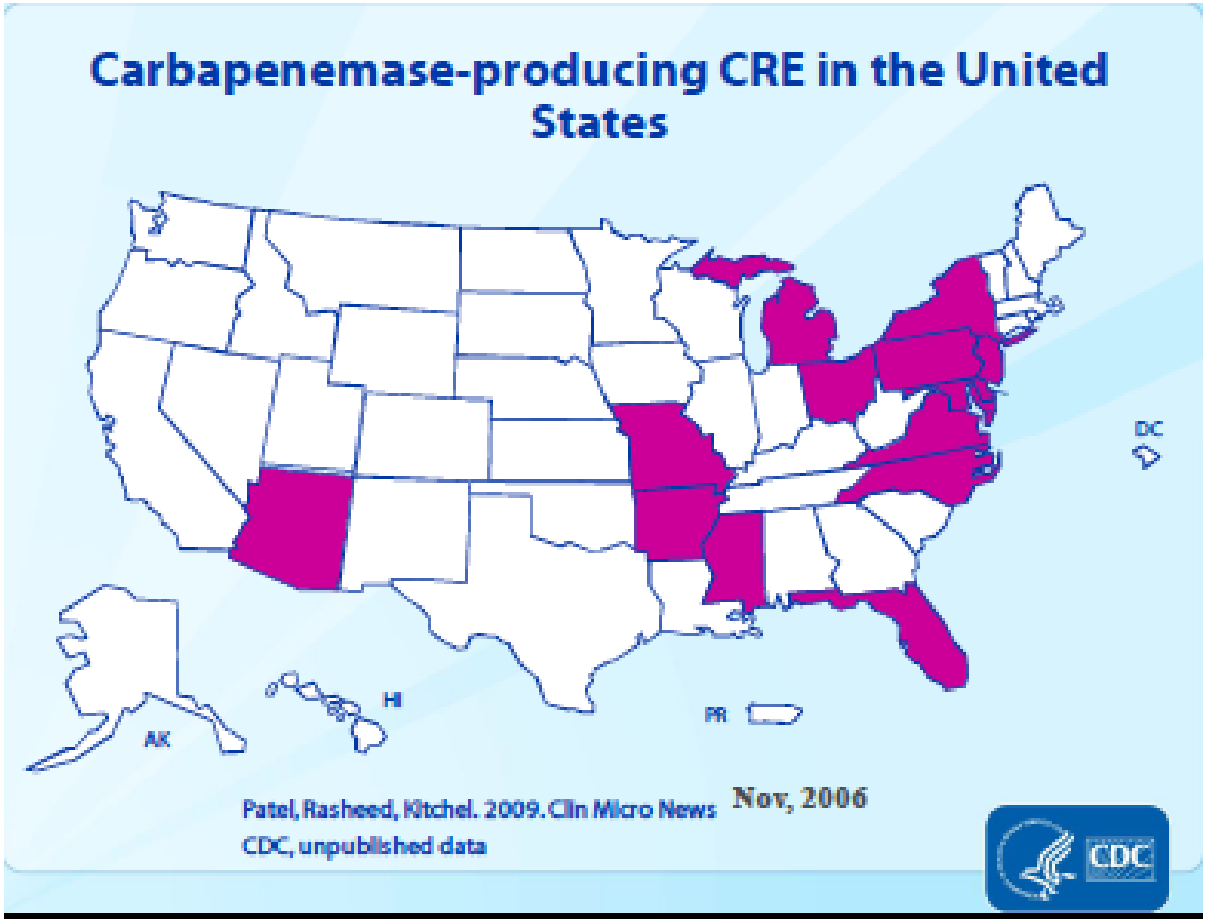
- 32 CRE cases linked to a contaminated endoscope used for ERCP
- No lapses were observed in endoscope reprocessing

CRE is becoming more prevalent across the United States

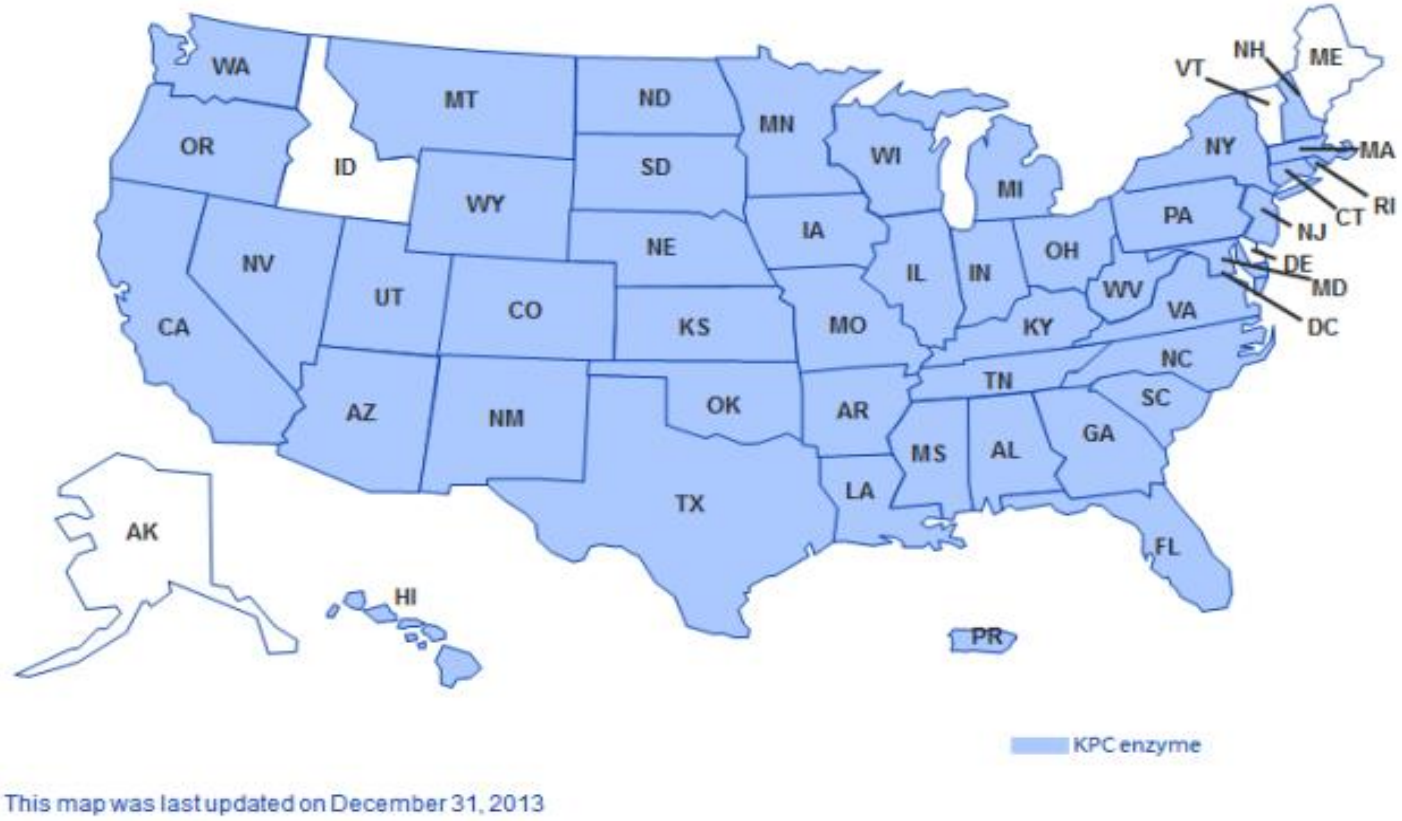
Type of organism	% of healthcare-associated infections resistant to carbapenems	
	NNIS 2001	NHSN 2011
***Klebsiella* spp.**	**1.6%**	**10.4%**
E.coli	1.0%	1.0%
Enterobacter spp.	1.4%	3.6%

MMWR 3/8/2013

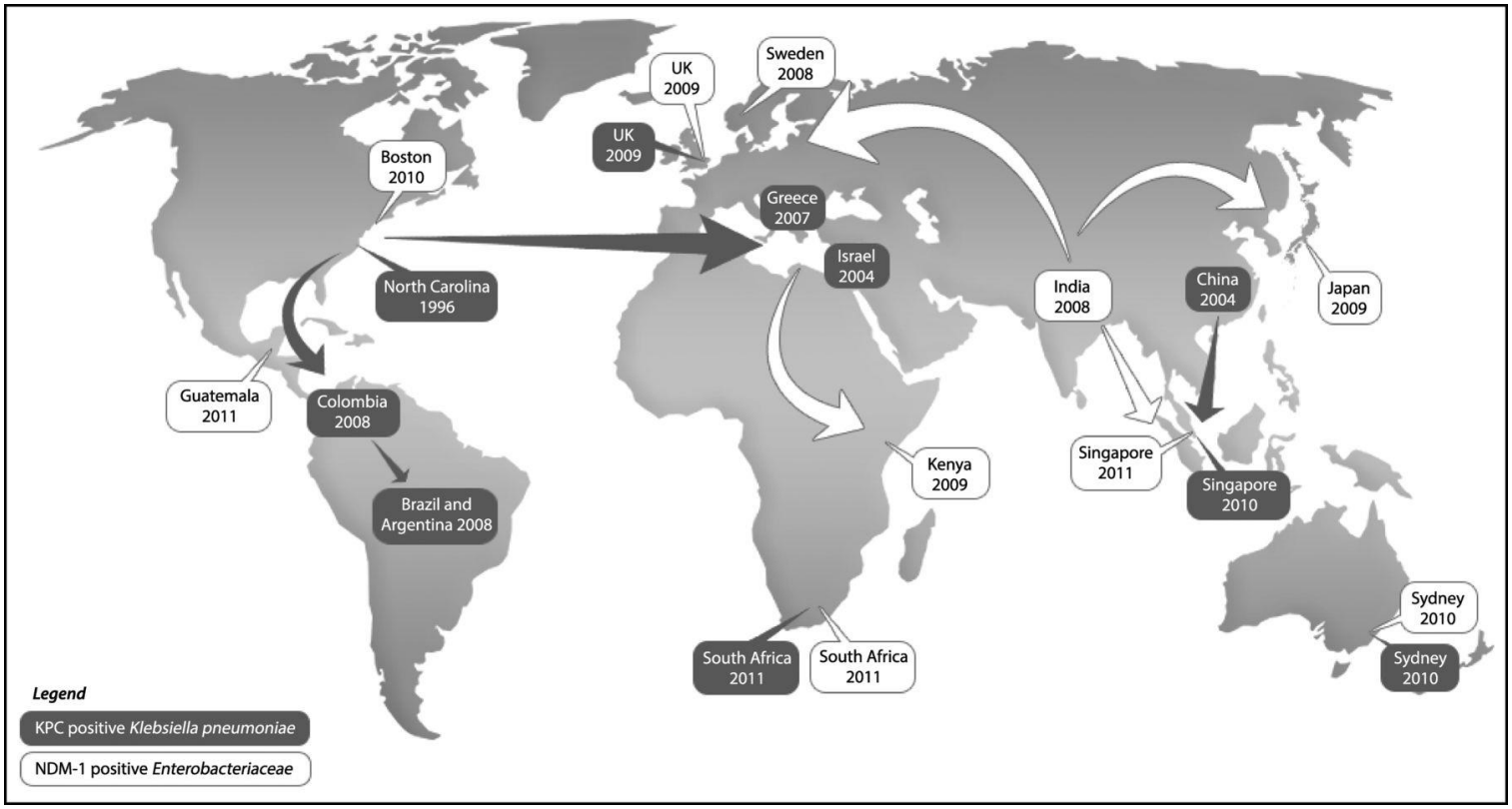
Epidemiology of CRE in 2009



Epidemiology of CRE in 2013



Global dissemination of CRE



Molton J, et al. Clin Infect Dis 2013;56:1310-1318

CDC Antibiotic Report 2013

CRE is an immediate threat to public health

Why should we focus on CRE?

- CRE infections are extremely difficult to treat, and there are few effective antibiotics in the pipeline.
- The incidence of CRE is increasing, but it has yet to firmly establish itself in our region.
- CDC ranks CRE as an immediate threat to public health that requires urgent and aggressive action.

Guidance for Control of Carbapenem-resistant Enterobacteriaceae (CRE)

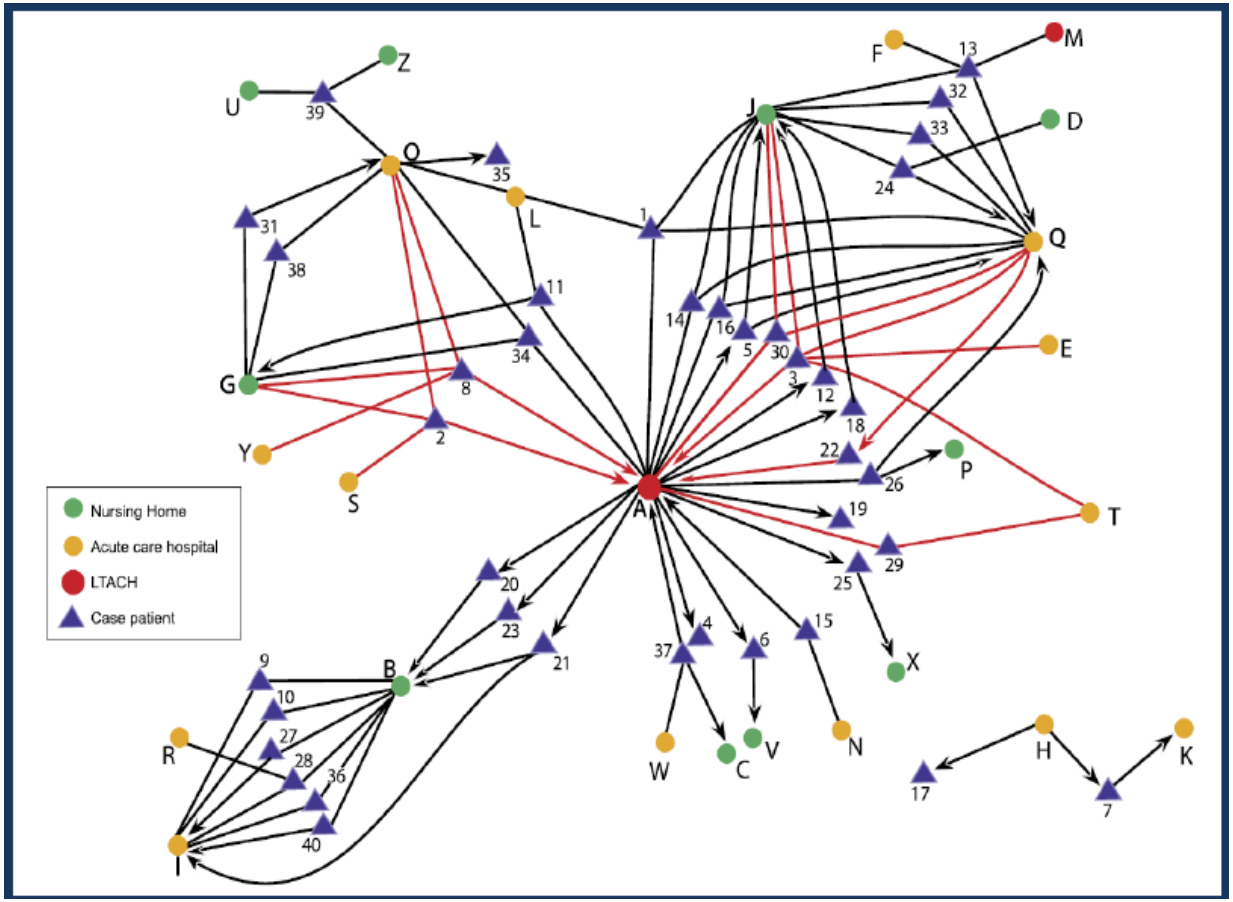
2012 CRE Toolkit

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

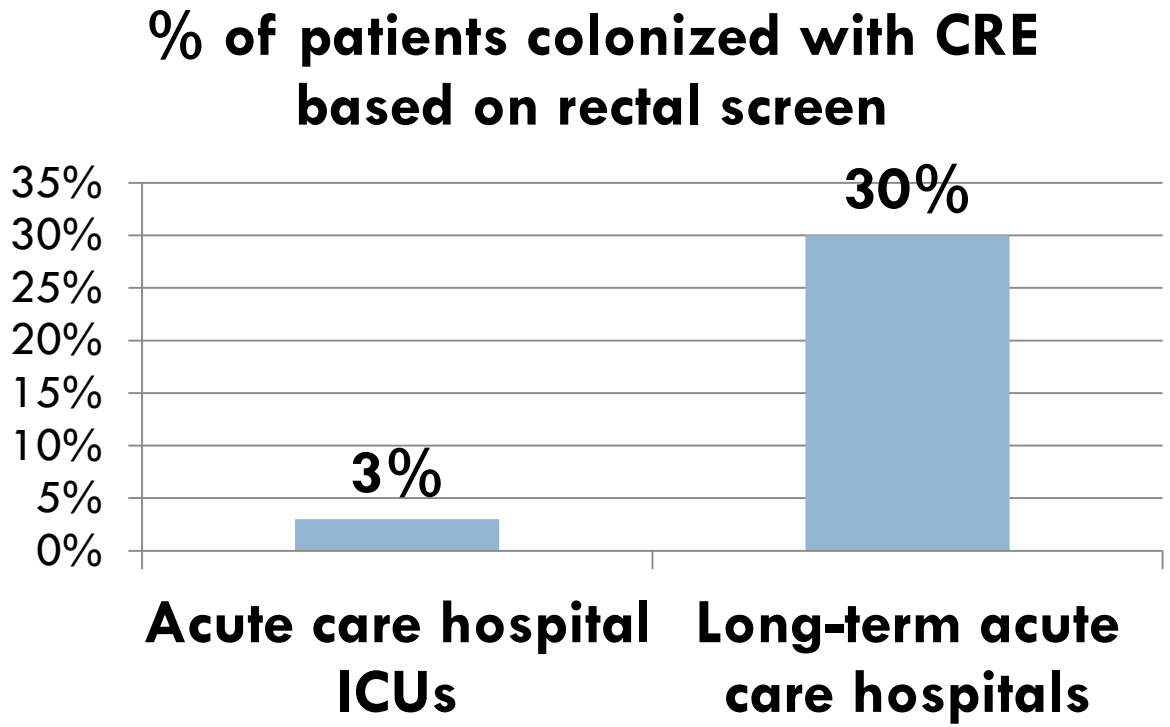
"To prevent the emergence and further spread of CRE, a coordinated regional control effort among healthcare facilities is recommended."

Network graph of CRE outbreak in Chicago: LTACs, SNFs, and hospitals

Won SY, et al. Clin Infect Dis 2011; 53: 532.

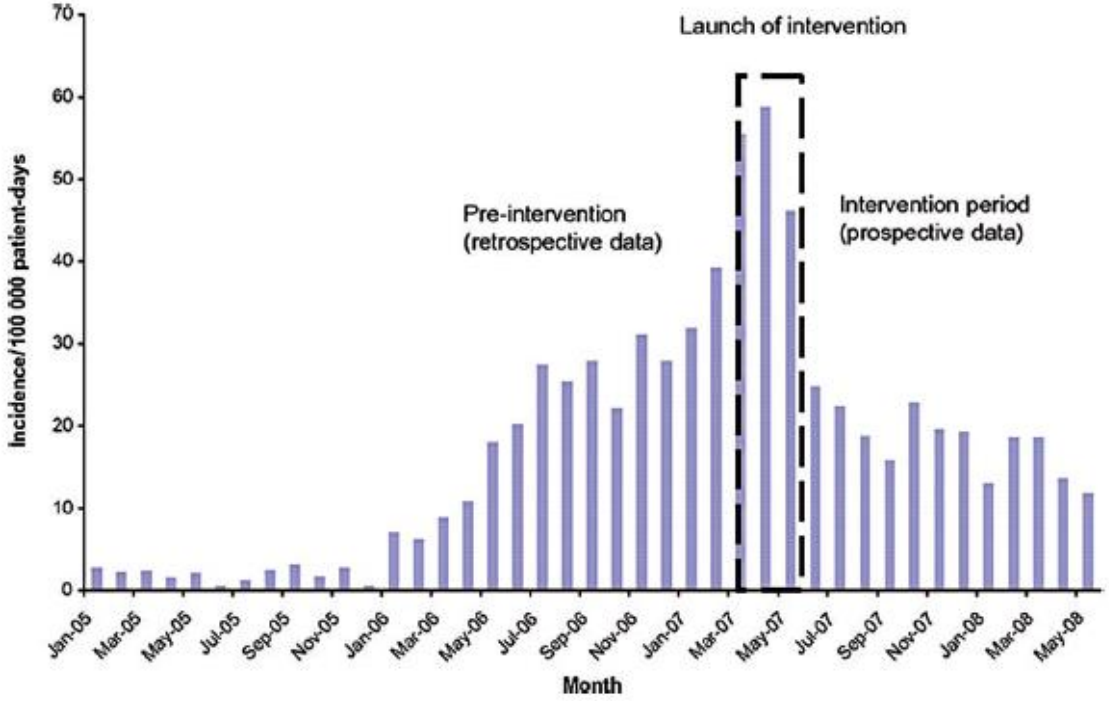


Long-term care facilities are a reservoir of CRE



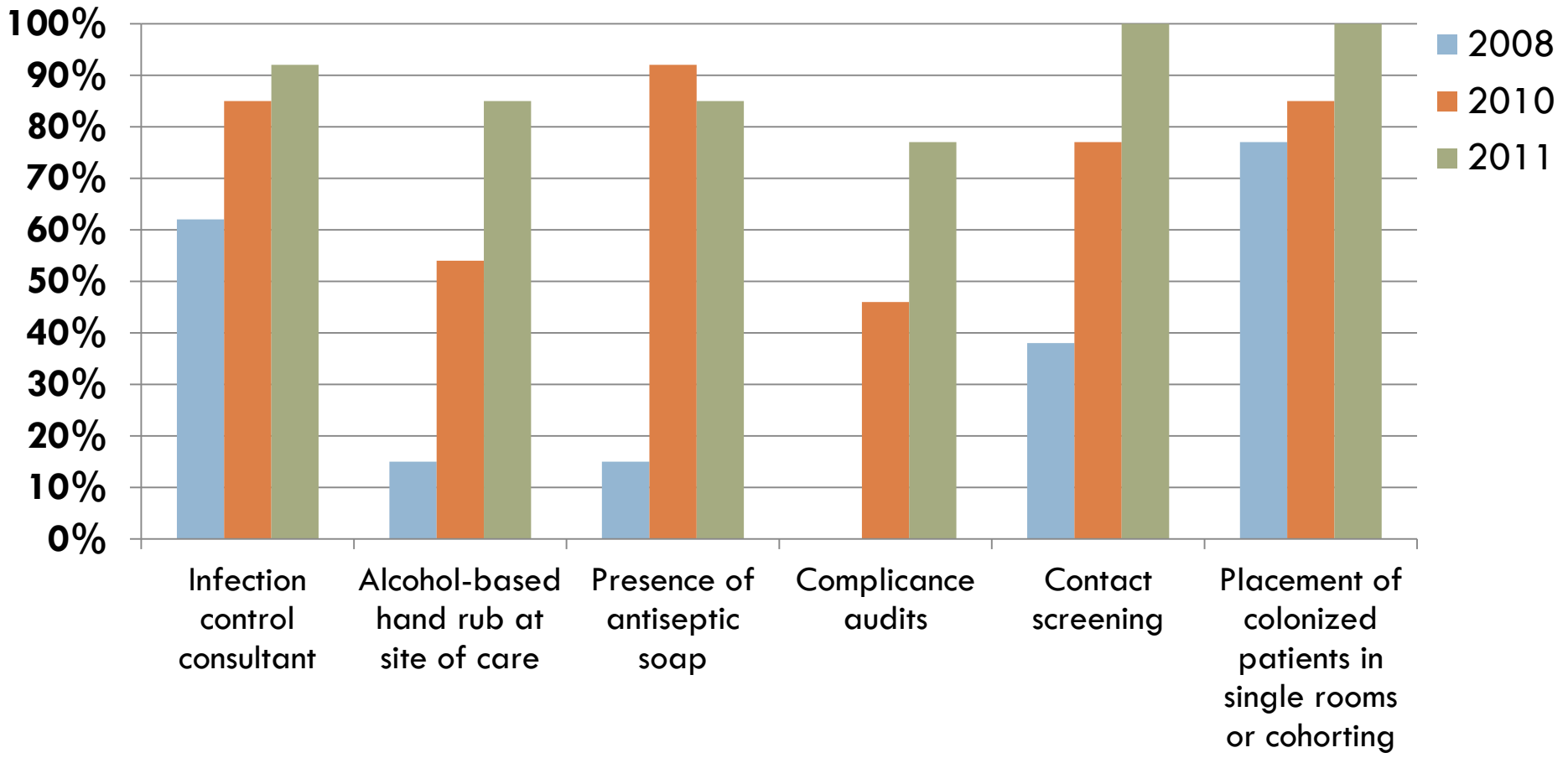
Lin MY, et al. Clin Infect Dis 2013; 57: 1245-52.

Israel: Monthly incidence of CRE detected by clinical cultures per 100,000 patient-days Jan 2005-March 2008



Schwaber MJ, et al. Clin Infect Dis 2014; 58: 697-703.

Compliance with Infection Control Guidelines at 13 post-acute care hospitals in Israel



Ben-David D, et al. Infect Control Hosp Epidemiol 2014; 35: 802-9.

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A Regional Approach to the Prevention and Control of CRE in Indianapolis

Indianapolis Coalition for Patient Safety
MDRO Work Group

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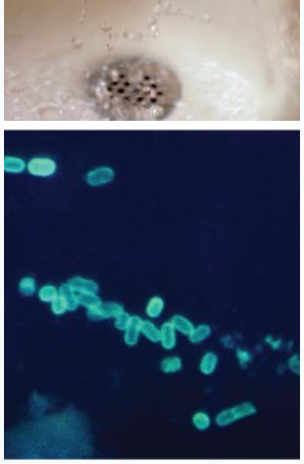

Guidance for Control of Carbapenem-resistant Enterobacteriaceae (CRE)

2012 CRE Toolkit

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

Part 1: Prevention and Control within a facility

- ❑ Defines core and supplemental measures for control within healthcare facilities

Part 2: Regional Control through public health

- ❑ Coordination across facilities
- ❑ CRE added as reportable event

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Core Measures for CRE Prevention at all Acute and Long-term Care Facilities

1. Hand Hygiene
2. Contact Precautions, including pre-emptive precautions
3. Healthcare personnel education
4. Minimize use of invasive devices
5. Patient and staff cohorting
6. Laboratory notification
7. CRE screening
8. Promote antimicrobial stewardship

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Contact Precautions in Long-term care Settings

Residents at high risk for transmission	Residents at low risk of transmission
Totally dependent for ADLs	Able to perform ADLs independently
Ventilator-dependent	Able to perform hand hygiene
Incontinent of stool	Continent of stool
Wounds with uncontrolled drainage	No draining wounds

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Guidance for Control of Carbapenem-resistant Enterobacteriaceae (CRE)

2012 CRE Toolkit

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

"Laboratories should have protocols in place that facilitate the rapid notification of appropriate clinical and infection prevention staff whenever CRE are identified from clinical specimens..."

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Laboratory Standardization in Indianapolis

Indianapolis Coalition for Patient Safety – Multi-Drug Resistant Organism Workgroup 7/23/14

Multicenter Standardized Approach for CRE Infection Prevention and Control Measures for Hospitals

CRE Definition per CDC

Enterobacteriaceae that…

Are non-susceptible (i.e., intermediate or resistant) to ANY carbapenem (e.g., doripenem, ertapenem, imipenem, meropenem) AND resistant to ANY of the following 3rd generation cephalosporins tested: cefotaxime, ceftriaxone, or ceftazidime

1. **Detection**

   - Standardize CLSI version 2010 or more recent

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Situational Awareness

- Each healthcare facility should be aware if they have had any patients with positive CRE cultures (even identified at other facilities)
- Evaluate the timing of the positive cultures related to admission to determine if hospital acquired
- Document key data on CRE positive patients

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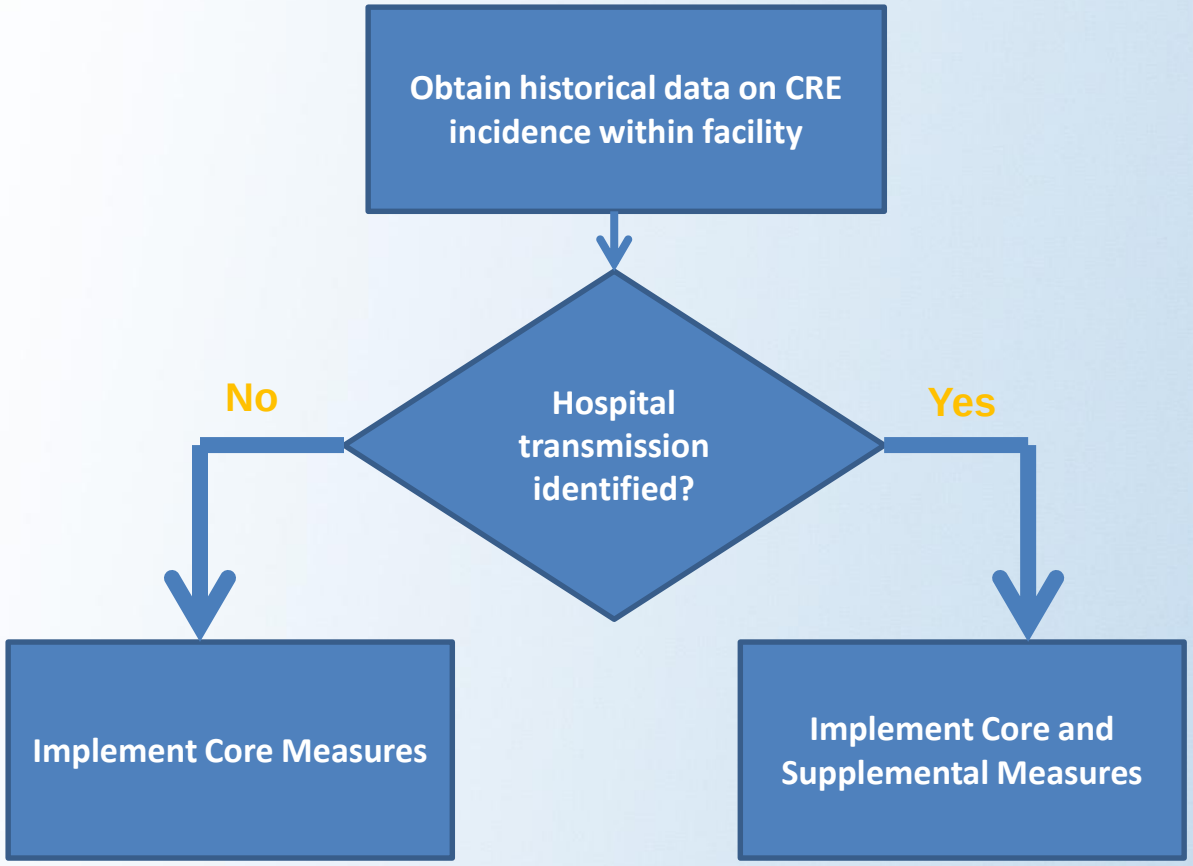
Core and Supplemental Measures



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General Approach to CRE Control in Facilities with < 1 new case/month

New CRE-colonized or CRE-infected patient identified

↓

- Notify appropriate personnel (i.e. clinical staff, IP staff)

↓

- Place patient on Contact Precautions in single room
- Reinforce hand hygiene and use of Contact Precautions on affected unit
- Educate healthcare personnel about preventing CRE transmission

↓

Ensure Contact precautions are maintained

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General Approach to CRE Control in Facilities with < 1 new case/month

New CRE-colonized or CRE-infected patient identified who has not been on Contact Precautions

- Screen patient contacts for CRE
- Consider point-prevalence survey of affected units
- Consider pre-emptive Contact Precautions

- If screening cultures identifies additional CRE patients, consider additional screening
- Consider cohorting patients and staff

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CDC

Laboratory Protocol for Detection of Carbapenem-Resistant or Carbapenemase-Producing, *Klebsiella* spp. and *E. coli* from Rectal Swabs

Purpose

To identify patients colonized with carbapenem-resistant or carbapenamase-producing Enterobacteriaceae in the intestinal tract. Patients who grow these organisms should be placed on Contact Precautions (5) to prevent transmission of the resistant bacteria. The procedure described below is a modification of the procedure described by Landman et al. (4). See the procedural notes for steps in the procedure which can be modified.

Background

Carbapenem-resistant Enterobacteriaceae (CRE) are usually resistant to all β-lactam agents as well as most other classes of antimicrobial agents. The treatment options for patients infected with CRE are very limited. Healthcare-associated outbreaks of CRE have been reported. Patients colonized with CRE are thought to be a source of transmission in the healthcare setting (1). Identifying patients who are colonized with CRE and placing these patients in isolation precautions may be an important step in preventing transmission (6).

Carbapenem resistance in Enterobacteriaceae occurs when an isolate acquires a carbapenemase or when an isolate produces an extended-spectrum cephalosporinase, such as an AmpC-type β-lactamase, in combination with porin loss. In the United States, the most common mechanism of carbapenem resistance is the *Klebsiella pneumoniae* carbapenemase (KPC).

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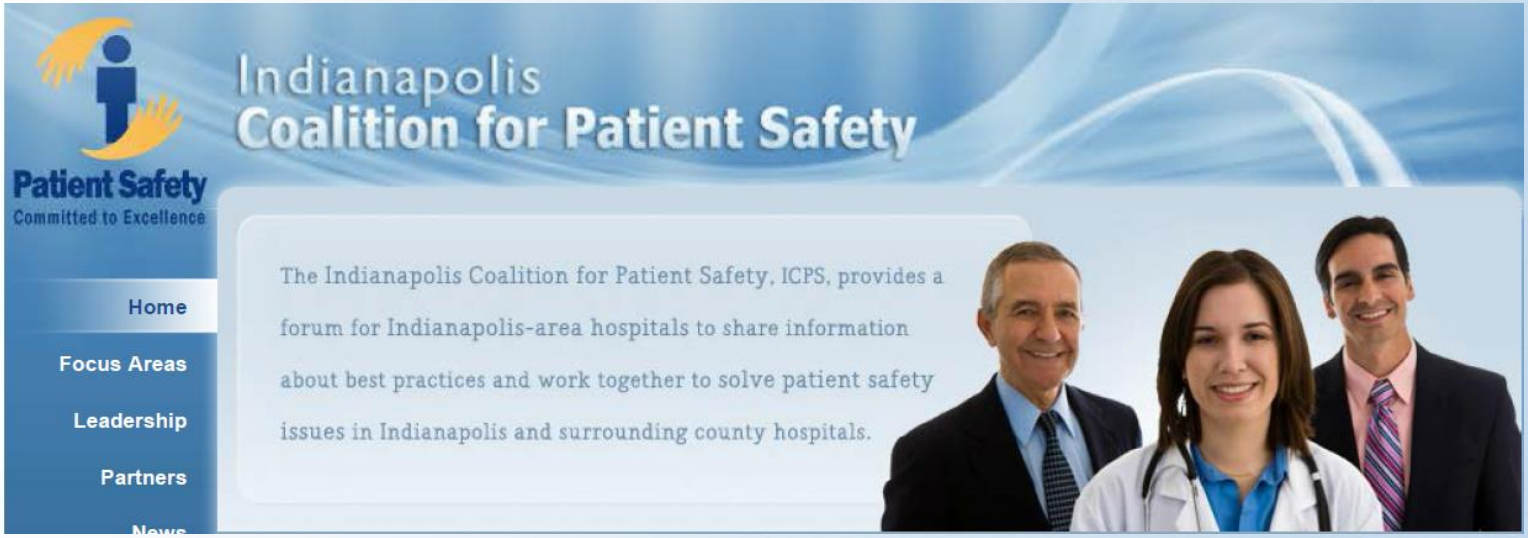

The MDRO workgroup within the Indianapolis Coalition of Patient Safety (ICPS) has developed…

– A common plan for intra-facility CRE control

– A shared Marion County database to track CRE

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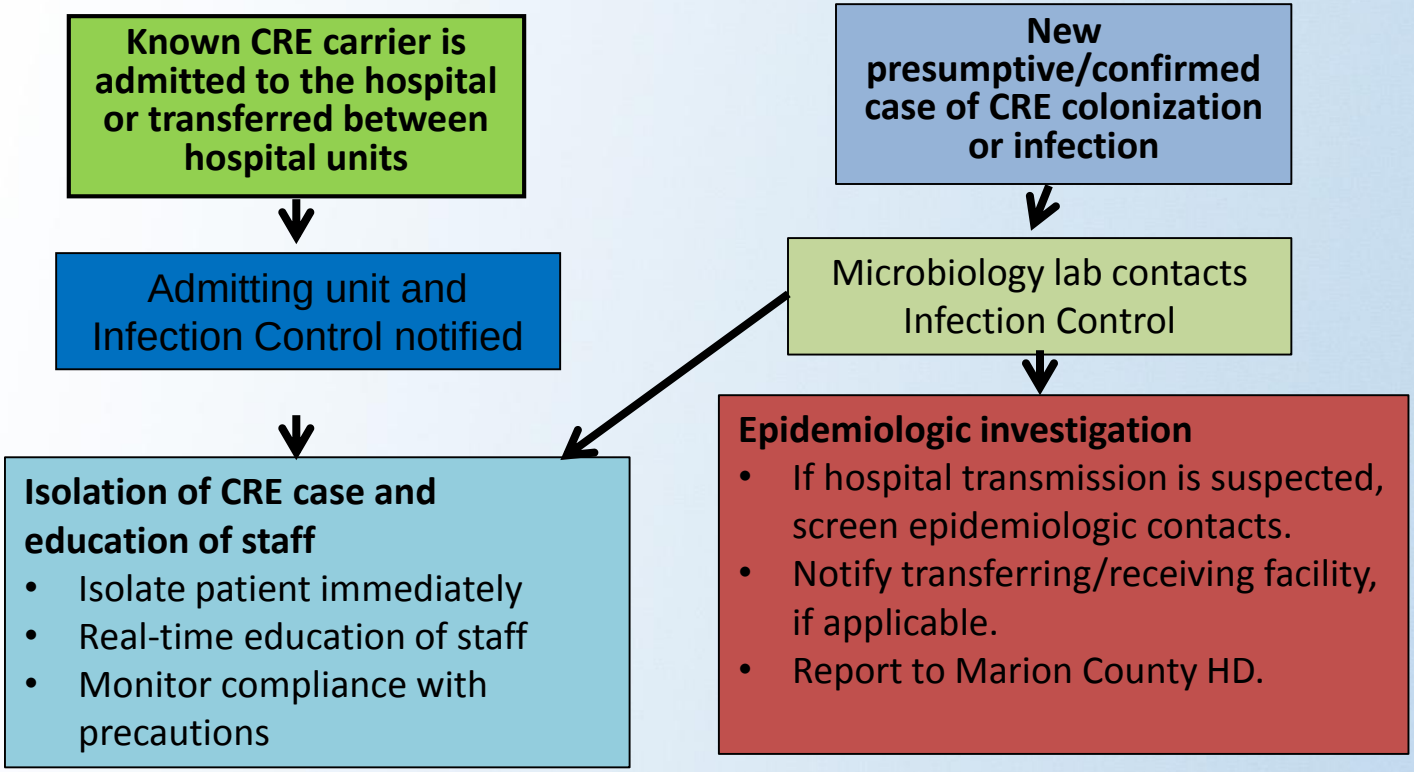
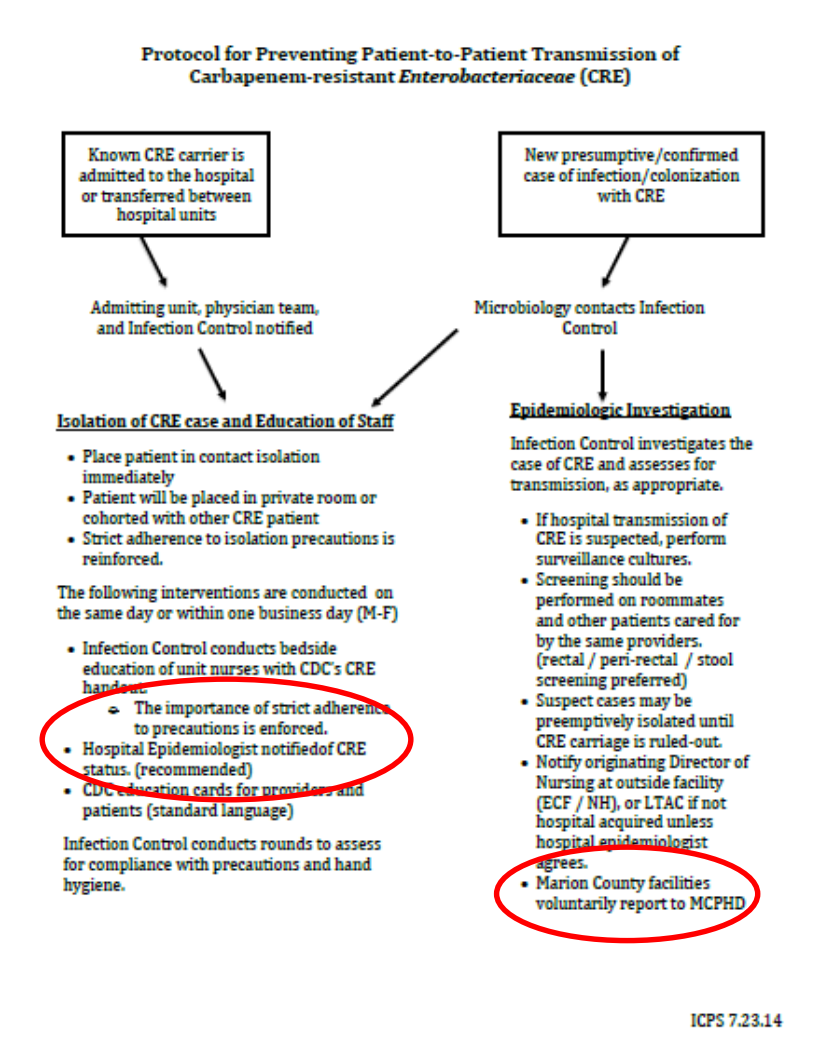
Indianapolis Coalition of Patient Safety Abbreviated CRE protocol



ICPS CRE Protocol



Protocol for Preventing Patient-to-Patient Transmission of Carbapenem-resistant *Enterobacteriaceae* (CRE)

Known CRE carrier is admitted to the hospital or transferred between hospital units

New presumptive/confirmed case of infection/colonization with CRE

Admitting unit, physician team, and Infection Control notified

Microbiology contacts Infection Control

Isolation of CRE case and Education of Staff

- Place patient in contact isolation immediately
- Patient will be placed in private room or cohorted with other CRE patient
- Strict adherence to isolation precautions is reinforced.

The following interventions are conducted on the same day or within one business day (M-F)

- Infection Control conducts bedside education of unit nurses with CDC's CRE handout.
  - The importance of strict adherence to precautions is enforced.
- Hospital Epidemiologist notifiedof CRE status. (recommended)
- CDC education cards for providers and patients (standard language)

Infection Control conducts rounds to assess for compliance with precautions and hand hygiene.

Epidemiologic Investigation

Infection Control investigates the case of CRE and assesses for transmission, as appropriate.

- If hospital transmission of CRE is suspected, perform surveillance cultures.
- Screening should be performed on roommates and other patients cared for by the same providers. (rectal / peri-rectal / stool screening preferred)
- Suspect cases may be preemptively isolated until CRE carriage is ruled-out.
- Notify originating Director of Nursing at outside facility (ECF / NH), or LTAC if not hospital acquired unless hospital epidemiologist agrees.
- Marion County facilities voluntarily report to MCPHD

ICPS 7.23.14

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Voluntary reporting of CRE cases to the Marion County Health Department

New CRE case identified → **MCHD database:**
Microbiology data
Admission date
Recent stays at other facilities

Characteristics of 234 CRE cases	% (n)
Klebsiella pneumoniae *Escherichia coli*	59% (138) 27% (64)
Resided at a long-term or extended care facility within the past 3 months	52% (120)
Cases associated with specific ECFs/LTACs	
Facility A	20% (47)
Facility B	16% (37)
Facility C	7% (16)

What's Next?

ICPS Expanding Scope to Long-term Care

- Development of educational materials geared toward long-term care frontline workers
  - Aim to address and guide implementation of the basic infection control practices contained in the core measures
- Outreach will be completed by hospital infection prevention or designee at the time of notification of a CRE positive patients
- Development of tools and resources for facilities with ongoing transmission

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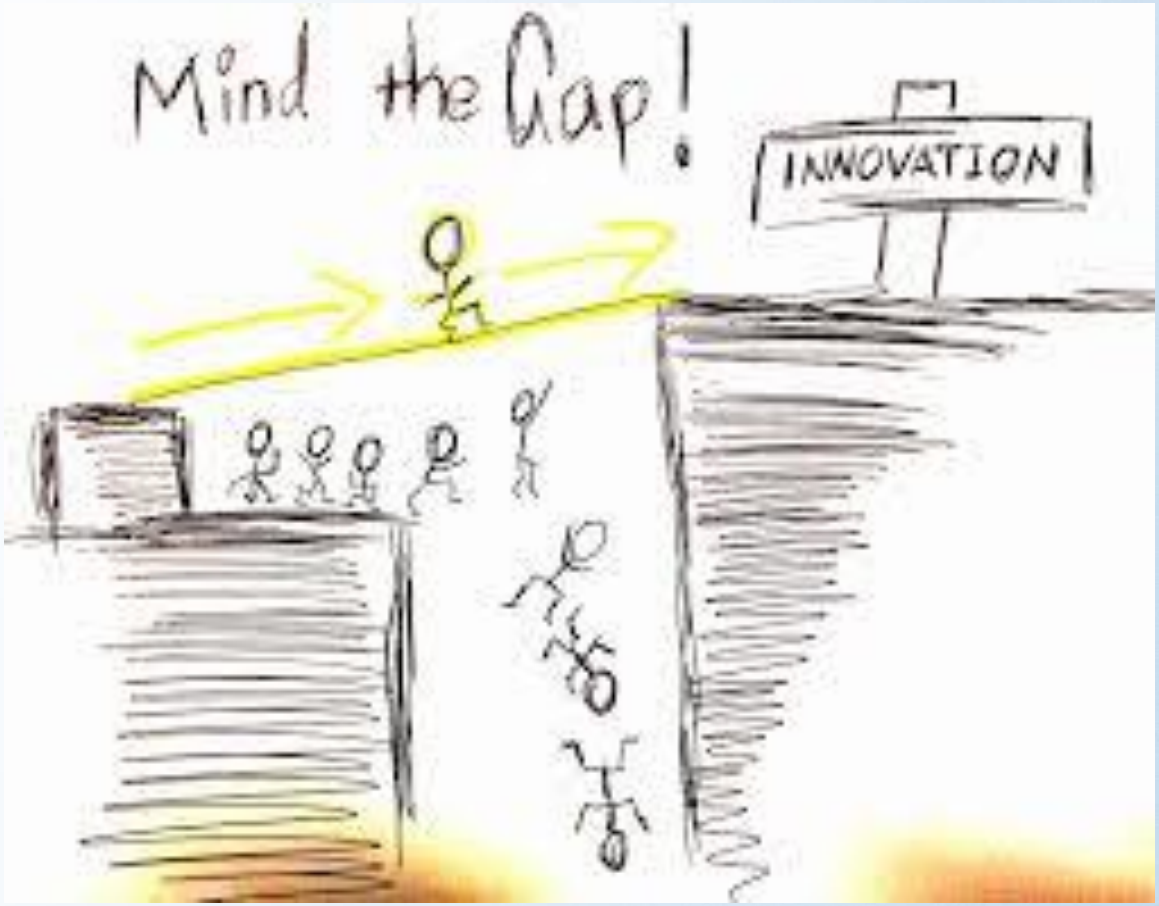
CRE Control:
A gap analysis for your facility



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Summary of Gap Analysis: Part 1

1. Talk to your microbiology lab
   - Are they looking for CRE? Do they use the latest CLSI standards?
   - If they suspect CRE, do they call you right away?
   - Would they know how to screen rectal swabs for CRE, if needed?

2. Review your isolation protocols
   - How do you ensure patients are promptly isolated?
   - Do you monitor compliance with hand hygiene and CP?
   - Do you have a method for real-time education of staff?

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Summary of Gap Analysis: Part 2

3. Antibiotic Stewardship
   - Have you reviewed the CDC's checklist?
   - If there are deficits, who do you need to engage at your hospital?

4. Regional collaboration
   - Do you know the prevalence of CRE within your region?
   - Is your local health department engaged?
   - Are the LTACs at the table?

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Thanks

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MDRO Work Group Members:

Dan Livorsi Wishard/VA / Laurie Fish IU Health -- Co-Chair

Bonnie Van	HHCORP lab
Cheryl Cline	VA
Chris Scott	Wishard / Eskenazi
Christian Cheatham	St Francis
Christiane Hadi	HHCOPR
Claire Roembke	St Francis
David Smith	IU Health
Davis, Thomas E.	Wishard / Eskenazi
Diana Greathouse	VA
Doug Webb	IU Health
Dustin Rose	IU Health
Gayle Walsh	Community
John Lock	St Vincent
Laura Archer	VA
Lynae Kibiger	Wishard /Eskenazi
Marc Rosenman	Regenstrief
Mary Kinney	VA
Patricia Garry	VA
Redkey, Jaime	St Vincent
Sandy Benson	St Vincent
Sharon Erdman	Purdue
Shelia Guenin	HHCORP
Virginia Caine	HHCOPR
Vera Winn	MidAmerica Lab

Thanks also to Dr. Livorsi for sharing his slides on CRE and the CRE Tool Kit and Jim Fuller, President of ICPS.

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Questions For Panelists

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What Are Your Organization's Next Steps?

1. Conduct an organizational assessment regarding CRE
2. Develop CRE protocol by December 31, 2014

Resources:

http://www.cdc.gov/HAI/organisms/cre/index.html

CDC *Guidance for Control of CRE: 2012 CRE toolkit*

AHRQ *CRE Control & Prevention Toolkit*

CDC *Checklist for Core Elements of Hospital Antibiotic Stewardship*

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Evaluation & Follow-up

- Webinar funded by CMS through the *Partnership for Patients*
- CMS reviews results and wants 80% of participants to evaluate educational sessions
- Please complete the simple three question evaluation by Oct. 9, 2014:

https://www.surveymonkey.com/s/2014_9_25_CREWebinar

- Link to evaluation and webinar recording will be distributed to participants within one week

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Thank you!