Carbapenemase-Producing Carbapenem-Resistant Enterobacteriaceae Among Patients Without Usual Risk Factors — Kentucky, 2016

Anna Q. Yaffee, MD,1,2 Sae-Rom Chae, MD,3,4 Mark Weng, MD,1,4, D. Cal Ham, MD,5 Kimberly Daniels, RN,2 Amanda Willburn, MPH2, Kimberly Porter, PhD2,3, Andrea Flinchum, MPH2, Maroya Walters, PhD5, Alex Kallen, MD4
1Epidemic Intelligence Service, CDC; 2Kentucky Department for Public Health; 3Division of Foodborne, Waterborne, and Environmental Diseases, CDC; 4Division of Healthcare Quality and Promotion, CDC; 5Career Epidemiology Field Officer Program, CDC

BACKGROUND
Carbapenem-resistant Enterobacteriaceae (CRE)
- Any Enterobacteriaceae species resistant to any carbapenem antibiotic or possessing a documented carbapenemase enzyme
- Documented risk factors for acquisition in the United States include:
  - Exposure to healthcare and antimicrobial agents
  - Travel to countries with higher prevalence
- Person-to-person transmission via contaminated hands, healthcare providers or via shared equipment
- Clinical infections have reported mortality rates of up to 50%
- However, majority of patients with CRE are asymptomatic
- Colonized patients are often not recognized and may serve as source of transmission to other patients

Carbapenem-producing CRE (CP-CRE)
- Express plasmid-encoded enzymes
- Inhibit carbapenem antibiotics
- Potential for epidemic spread
- Person-to-person transmission
- Horizontal transfer of resistance mechanisms
- Associated with sicker patients and healthcare exposure
- True community-acquired cases are rare

THE CALL
On August 11, 2016, the Kentucky Department for Public Health was notified of 2 patients with CP-CRE identified on clinical culture. These patients had short hospitalizations and limited prior healthcare exposures.

OBJECTIVES
- Identify potential patient exposures
- Identify potential CRE reservoirs in hospital environment
- Provide recommendations to prevent further cases

METHODS
- Case definition: Any CRE culture collected at Hospital A January 3–December 16, 2016
- Assentment of patient exposure
- Medical chart abstraction with physician abstractors and standardized site abstraction tool
- Patient interviews via telephone, using open-ended interview and standardized interview form
- Case finding: Microbiology/laboratory survey for retrospective case finding
  - Point prevalence surveys using nasal swabs collected by nursing staff on high-risk admitted patients
  - Review of laboratory and hospital infection control practices
  - Telephone and in-person interviews with staff
- Environmental sampling: Surface and drain environmental samples collected from high risk areas
  - Isolates typed using pulsed-field gel electrophoresis (PFGE) and whole genome sequence analysis

ACKNOWLEDGEMENTS
CDC Rachel Sluiter, Brand Limbago, Sandra Boyer, Alicia Shams, Kathy Selber Kentucky Department for Public Health: Doug Thompson
Hospital A Infection Prevention Team, Administration, and Laboratory Staff

RESULTS
- In addition to 2 initial cases, 21 additional cases were identified
  - Point prevalence survey of high-risk admitted patients identified 5 additional cases
  - Review of laboratory records identified 4 additional cases
  - CRE resistance was not flagged as a CRE

CP-CRE by week of isolation and resistance mechanism*, Hospital A, June 9–December 16, 2016, N=23

- Mechanism unknown unless otherwise specified

ENVIRONMENTAL SAMPLING
- Sampling demonstrated CP-producing CRE in environment
  - Environmental services cart in the Emergency Department
  - Environmental services drain on medical/mental hospital unit

CONCLUSIONS
- CP-CRE outbreak likely attributable to both importation and rapid in-facility transmission
- Carbapenemase presence on DVS equipment indicates a role in healthcare CRE transmission
- Identification of a carbapenemase in the ED environment suggests that patients with CP-CRE might contaminate the healthcare environment during short duration encounters
- The role of the ED environment and EIV equipment in CRE transmission warrants further investigation
- Regional travel for healthcare was identified as a potential CRE exposure in low-prevalence areas

RISK FACTORS FOR ACQUISITION
- Of 23 admitted patients were CRE positive 7 days after admission
  - 11 of 18 (61%) total
  - Pulled field e-gel electrophoresis match to another CRE
  - Or, prior negative screening culture
  - Or, no healthcare exposure within the past year
  - 11 patients participated in telephone interview
  - 5 CRE had traveled regionally or to large Kentucky cities for healthcare
  - None had traveled outside the country

ENVIRONMENTAL SAMPLING
- Sampling demonstrated CP-producing CRE in environment
  - Environmental services cart in the Emergency Department
  - Environmental services drain on medical/mental hospital unit

RECOMMENDATIONS
- Continue CRE surveillance and transmission-based precautions for admitted or newly identified cases
- Routine disinfection of EIV equipment
- Addition of regional travel for healthcare to facility’s at high risk and public agents
- Consider regional prevention strategy with facilities in patient's sharing network