Long Beach CRE Collaborative

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City Health Officer
Long Beach Department of Health and Human Services
March 13, 2018
Antibiotic Resistance

› Each year, over 2 million illnesses and 23,000 deaths are caused by antibiotic resistance

› Most of these deaths happen in healthcare settings, including hospitals and nursing homes

Source: CDC
Antibiotic Resistance

How Antibiotic Resistance Happens

1. Lots of germs. A few are drug resistant.
2. Antibiotics kill bacteria causing the illness, as well as good bacteria protecting the body from infection.
3. The drug-resistant bacteria are now allowed to grow and take over.
4. Some bacteria give their drug-resistance to other bacteria, causing more problems.

Source: CDC
Antibiotic Resistant Infections

Resistant infections can cause severe illness. People with these infections:

- May be more likely to be hospitalized and have higher medical expenses
- May take longer to get well again
- May die from the infection

Source: CDC
Antibiotic Resistant Infections

Examples:

- Methicillin resistant *Staph aureus* (MRSA)
- Vancomycin resistant *Enterococcus* (VRE)
- Multi-drug resistant *Acinetobacter*
- Carbapenem resistant *Enterobacteriaceae* (CRE)

Source: CDC
Antibiotic resistance continues to increase...

1. Overuse/abuse
2. Inappropriate prescribing
3. Extensive agricultural use
4. Availability of few new antibiotics

Source: CDC
Overuse and Misuse of Antibiotics

› Improper use of antibiotics can lead to resistant organisms

› Antibiotics are the most commonly prescribed drugs used in human medicine
  › Up to 50% of antibiotics are not prescribed appropriately, or with incorrect dosing/duration

Source: CDC
Inappropriate Prescribing

- Antibiotics are the most commonly prescribed drugs used in human medicine.
  - Up to 50% of antibiotics are not prescribed appropriately, or with incorrect dosing/duration.
  - Up to 60% of patients don’t take as prescribed; don’t finish the course.
  - 30%-60% of antibiotics prescribed in ICUs have been found to be unnecessary, inappropriate, or suboptimal.

Availability of Few New Antibiotics

› Antibiotic development no longer a good investment for pharm industry

› Medicines for chronic diseases make more money than antibiotics (max $1,000 x course vs >$10,000)

› Antibiotics often only used for short periods, whereas drugs for chronic diseases may be used for a lifetime

Personal Story

› January 2017, Nevada woman died of a strain of CRE that was resistant to all 26 antibiotics available in the US

› Became infected with carbapenem-resistant *Klebsiella pneumoniae* while in a hospital in India – there for broken leg

› Had several hospitalizations in India in June 2016 (CRE is more common)

› Pt died in September 2016 in a Reno hospital

› Expecting to see more cases like this as resistance and travel increase

Source: http://www.npr.org/sections/goatsandsoda/2017/01/17/510227493/a-superbug-that-resisted-26-antibiotics
Implications of CRE

› Spread easily in healthcare settings

› Longer hospital stays

› More costly for patient

› More costly for the facility
  (*median cost of 1 CRE infection between $22,000 and $66,000*)

› More likely to end in death

Every Facility Plays a Part

- Patients often transferred to multiple facilities throughout illness/injury
- Lack of proper precautions can cause CRE to spread at ALL facilities
- Poor communications among facilities can lead to greater spread of CRE
What are we doing in Long Beach?

› Going back to basics
› Handwashing
› Isolation
› Cohorting
› Proper use of PPE
› Reporting

Source: CNN, CDC
CRE Reporting

Effective January 12, 2017, the Long Beach City Health Officer mandated that all acute care hospitals and skilled nursing facilities in Long Beach report carbapenem-resistant *Enterobacteriaceae*.

› What it means:

› All acute care hospitals and SNFs must report CRE from any specimen source, either by reporting into NHSN or by submitting a Confidential Morbidity Report along with lab

› Facilities are required to submit an annual antibiogram
CRE Collaborative

Year-long (March 2018 – March 2019) collaborative with acute care hospitals, skilled nursing facilities, Long Beach Department of Health, and CDPH
CRE Collaborative Objectives

1. Improve surveillance efforts by ensuring timely reporting of CRE cases
2. Increase knowledge and capacity to prevent and control CRE in healthcare facilities throughout Long Beach
3. Enhance coordination and communication among facilities to ensure that patients with CRE are transferred using appropriate infection prevention and control precautions
CRE Collaborative Structure

› Assessments
  › Baseline self-assessments
  › Observational assessments
  › Final self-assessment

› Quarterly learning and discussion sessions
  › Identifying and tracking CRE, prevention strategies, inter-facility communication, etc

› Meetings and Conference Calls
  › Checking in, sharing what worked and what didn’t
CRE Collaborative Expectations

› Actively engage all CRE team members by ensuring participation in all collaborative activities (e.g. observational assessment, learning and discussion sessions, etc.)

› Commit to a prevention action plan and participate in a one-time onsite prevention assessment

› Conduct and share information regarding CRE surveillance
Questions?
Carbapenem-resistant Enterobacteriaceae (CRE)- Question and Answer

Sam Horwich-Scholefield MPH CIC
Long Beach, CA
March 13th 2018
Objectives

1. Understand the scope and significance of carbapenem-resistant Enterobacteriaceae (CRE)

2. Describe the factors that contribute to CRE transmission and CRE incidence

3. Understand the basis for infection prevention and antimicrobial stewardship interventions to reduce CRE

4. Identify opportunities for CRE prevention across the continuum of care
1. What are Enterobacteriaceae?
1. Enterobacteriaceae are …

- Gram negative bacteria that are a normal part of human gut flora

- Causative agents of various infections
  - UTI, wound infections, pneumonia, bacteremia

- Important causes of community and healthcare-associated infections, including outbreaks
2. What are carbapenem resistant Enterobacteriaceae (CRE)?
2. CRE are Enterobacteriaceae that are...

- **Resistant to carbapenems**, a broad spectrum class of antibiotics used as a last resort for some infections

- **Associated with healthcare exposures**, including overnight stays at healthcare facilities, recent history of antibiotic use, and presence of indwelling medical devices
3. Are CRE a problem?
3. CRE are an urgent threat to patient safety and public health

- CRE are often resistant to multiple classes of antibiotics and are difficult to treat
  - Invasive infections result in 40-50% mortality

- Prevalence has increased dramatically in the United States since early 2000s

- Considered by CDC to be one of the top 3 most urgent antibiotic resistant threats
Antibiotic Resistance of *Klebsiella pneumoniae* in United States

% Resistant (invasive isolates)

<table>
<thead>
<tr>
<th>Year</th>
<th>Aminoglycosides</th>
<th>Carbapenems</th>
<th>Cephalosporins (3rd gen)</th>
<th>Fluoroquinolones</th>
<th>Polymyxins</th>
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Center for Disease Dynamics, Economics & Policy (cddep.org)

Source: CDC National Healthcare Safety Network
Percentage CRE Among HAI Reported to NHSN, 2014-2015, California Acute Care Hospitals (N=342)
CRE Trends in Orange County CA

Hospital and Healthcare-Associated Community Onset CRE Incidence
(N = 21 Hospitals)

Gohil S. IDWeek, 2014; Slide courtesy of Susan Huang, UC Irvine
4. What makes certain Enterobacteriaceae resistant to carbapenems?
4. Antibiotic use and transmission of resistance genes

- Exposure to multiple different antibiotic classes associated with risk of CRE

- Different types of CRE
  - Carbapenemase-producing (CP) CRE
    - Make enzymes that inactivate carbapenems
      - KPC, NDM, VIM, IMP, OXA, and others
    - Carbapenemase genes be transmitted between bacteria → potential for widespread transmission of carbapenem resistance
  - Non-carbapenemase producing (non-CP) CRE
Geographical Distribution of KPC-Producers 2001
Geographical Distribution of KPC-Producers 2005
Geographical Distribution of KPC-Producers 2006
Geographical Distribution of KPC-Producers 2008
Geographical Distribution of KPC-Producers 2010
Geographical Distribution of KPC-Producers 2012
Geographical Distribution of KPC-Producers 2014
Geographical Distribution of KPC-Producers 2015
5. How do we identify CRE in a patient?
5. Patients can be infected or colonized with CRE

- Patients can be colonized with CRE without signs/symptoms of infection
  - CRE colonized patients can still contaminate environment and healthcare worker hands/clothing, leading to transmission
Two ways to detect CRE

• **Clinical cultures** collected to evaluate for infection
  – Fail to identify one third to one half of patients with CRE

• **Surveillance cultures** identify patients who are colonized with CRE
  – Identify between 70-80% of colonized patients
  – Enable infection prevention measures to be implemented for colonized patients and prevent transmission
Identifying CRE Colonization

- Surveillance cultures of rectal swabs
  - Identify patients colonized with CRE in the intestinal tract
  - Further testing is needed to distinguish CP-CRE from non-CP CRE

- CDC published a laboratory protocol to specifically screen for carbapenem resistant bacteria

http://www.cdc.gov/HAI/pdfs/labSettings/Klebsiella_or_Ecoli.pdf
6. What tests can be used to identify and distinguish CP-CRE from non-CP CRE?
6. Antimicrobial susceptibility testing identifies carbapenem resistance, but doesn’t distinguish between CP and non-CP CRE

1. Phenotypic Tests
   - Can tell you if a carbapenemase is present, but not which kind
     - Modified Hodge Test, Carba-NP

2. Molecular Tests
   - Can identify which kind of carbapenemase is present
     - PCR-based tests
     - Whole genome sequencing
7. What are the major risk factors for CRE?
7. Risk factors for CRE infection and colonization include:

- Extensive antibiotic use
- Poor functional status
- Presence of indwelling medical devices; receipt of mechanical ventilation
- Recent stay at a long-term acute care (LTAC) hospital
- Healthcare exposures outside the U.S.
Carbapenem-resistant *K. pneumoniae* in Long Term Acute Care Hospitals

New Delhi metallo-beta-lactamase (NDM)–producing CRE
8. What are the strategies to prevent CRE?
8. CDC CRE Toolkit Prevention Strategies

1. Hand Hygiene
2. Contact Precautions
3. Healthcare Personnel Education
4. Minimize Device Use
5. Rapid Laboratory Notification
6. Interfacility Communication
7. Antimicrobial Stewardship
8. Environmental Cleaning
9. Patient and Staff Cohorting
10. Screening Contacts of CRE Patients
11. Active Surveillance Testing
12. Chlorhexidine Bathing

Specific CRE prevention strategies will be addressed throughout the Collaborative.
Infection control interventions can reduce CRE transmission

A bundled approach reduced incidence of CRE colonization by half

- Screening patients for CRE upon admission
- Semi-monthly surveillance cultures
- Contact isolation and cohorting of CRE colonized and infected patients
- Daily chlorhexidine bathing
- Adherence monitoring
- Healthcare worker education

9. How is the application of CRE prevention strategies different in acute care versus skilled nursing facilities?
9. Adapting CRE Prevention in Skilled Nursing Facilities

• While caring for residents with CRE in a skilled nursing facility, recognize:
  − Residents may be admitted for prolonged periods
  − Infection control measures need to allow for resident mobility and socialization needs

• CRE prevention strategies should be based on resident’s
  − Clinical and functional status
  − Risk of transmitting CRE
    ▪ Transmission risk depends on degree to which resident might contaminate their environment or HCW
# CRE Transmission Risk Assessment for Skilled Nursing Facility Residents

<table>
<thead>
<tr>
<th>Higher Transmission Risk</th>
<th>Lower Transmission Risk</th>
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<tbody>
<tr>
<td><strong>Functional Level</strong></td>
<td><strong>Functional Level</strong></td>
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<tr>
<td>− Totally dependent on assistance for activities of daily living (ADLs)</td>
<td>− Able to dress, eat, bathe, toilet, transfer, walk, groom with minimal assistance</td>
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<tr>
<td>− Cognitively unable to maintain personal hygiene</td>
<td>− Cognitively able to maintain personal hygiene</td>
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<tr>
<td><strong>Presence of indwelling devices</strong> (urinary catheter, feeding tube, tracheostomy tube, vascular catheters)</td>
<td><strong>No indwelling devices</strong></td>
</tr>
<tr>
<td><strong>Ventilator-dependent</strong></td>
<td><strong>Not ventilator-dependent</strong></td>
</tr>
<tr>
<td><strong>Wounds</strong></td>
<td><strong>No wounds</strong></td>
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<tr>
<td><strong>Incontinence of stool and/or urine</strong></td>
<td>** Continent of stool and urine**</td>
</tr>
</tbody>
</table>
Adapting CRE Prevention in Skilled Nursing Facilities

• **Contact precautions** for CRE colonized or infected residents at **higher risk for CRE transmission**
  - Single room preferred
  - If limited, reserve for those with highest risk for transmission
• Contact precautions may **not** be necessary for lower risk CRE colonized residents
Adapting CRE Prevention in Skilled Nursing Facilities

• Standard precautions should always be observed.
  – Gloves and/or gowns when contact with body fluids is possible
    ▪ Bathing
    ▪ Assisting with toileting
    ▪ Changing briefs
    ▪ Changing wound dressings
    ▪ Manipulating devices
Why are we using a coordinated approach to prevent the spread of CRE?
Patient sharing among Long Beach healthcare facilities is well documented.
CDC recommends a “coordinated approach” to reduce antibiotic-resistant infections in healthcare facilities

- Common approach – individual healthcare facilities apply contact precautions only to CRE-colonized or infected patients identified through routine tests
- Independent augmented efforts – some facilities begin active detection (i.e., CRE surveillance cultures) and isolation of CRE-colonized patients
- **Coordinated augmented approach** – facilities share CRE data with public health, and notify receiving facilities of patients’ CRE status upon inter-facility transfer
Facilities work together to protect patients.

Common Approach (Not enough)
- Patients can be transferred back and forth from facilities for treatment without all the communication and necessary infection control actions in place.

Independent Efforts (Still not enough)
- Some facilities work independently to enhance infection control but are not often alerted to antibiotic-resistant or C. difficile germs coming from other facilities or outbreaks in the area.
- Lack of shared information from other facilities means that necessary infection control actions are not always taken and germs are spread to other patients.

Coordinated Approach (Needed)
- Public health departments track and alert health care facilities to antibiotic-resistant or C. difficile germs coming from other facilities and outbreaks in the area.
- Facilities and public health authorities share information and implement shared infection control actions to stop spread of germs from facility to facility.

Figure from CDC Vital Signs: http://www.cdc.gov/vitalsigns/stop-spread/index.html
Projected countywide prevalence of CRE over a 15-year period under three different intervention scenarios — 102-facility model, Orange County, California

![Graph showing CRE prevalence over 15 years under different interventions.](CDC MMWR Vital Signs, Aug 7, 2015)
Questions?

For more information, please contact The HAI Program at sam.horwich-scholefield@cdph.ca.gov

Thank you