Washoe County Health District

EPI - NEWS

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International Infection Prevention Week
- Overview of Carbapenem Resistant *Enterobacteriaceae* in Washoe County

BACKGROUND

October 16-22, 2011 represents the 25th Anniversary of International Infection Prevention Week – the commemoration of the importance of infection prevention around the globe. In 1986, President Ronald Reagan first proclaimed the third week of October as **National Infection Control Week.** To commemorate this special week, this article is to address an emerging challenge in healthcare settings, which are the infections with carbapenem-Resistant *Enterobacteriaceae* (CRE) or carbapenemase-producing *Enterobacteriaceae* in Washoe County.

Carbapenem is a class of beta-lactam antibiotics with a broad spectrum of antibacterial activity, including imipenem, meropenem, ertapenem, and doripenem. Carbapenemases are carbapenem-hydrolyzing beta-lactamases that confer carbapenem resistance. Bacteria with the carbapenem-resistance trait are resistant to a class of drugs that were considered the "last resort" for treating serious infections caused by these bacteria. The antibiotic resistant traits are often located on mobile genetic elements, called plasmids. This means that resistance can be readily transferred from one bacterium to another, facilitating the spread of resistance between bacteria. [1] Washoe County Health District (WCHD) has been working with a local *ad hoc* committee to conduct enhanced surveillance for Carbapenem Resistant *Enterobacteriaceae* infection since June of 2010. The objectives of this surveillance are:

- To estimate the disease burden in Washoe County;
- To detect Carbapenamase producing organisms early;
- To assist healthcare facilities in stopping the transmission of special antibiotic resistant bacterial infections.

METHODS

Laboratory-based active surveillance has been performed. A case is defined as the first infection in a given year of a patient with **m**ulti-**d**rug **r**esistant **b**acilli – **c**arbapenem **r**esistance (MDRB-CR) regardless of resident status. MDRB-CR is defined as a **G**ram **n**egative **b**acillus (GNB) that is resistant to three or more classes of antibiotics including carbapenems. GNB includes *Enterobacteriaceae* and non-fermenting Gram negative bacilli such as *pseudomonas* species and *acinetobacter* species. *Stenotrophomonas, Aeromonas* and *Chryseobacterium* were not included due to their constitutive resistance to Carbapenems.

The Modified Hodge Test (MHT) is used by the Nevada State Public Health Laboratory (NSPHL) to detect Carbapenemase production. If the MHT is positive, an additional E-test to screen for metallo-beta-lactamase (MBL) production is performed. MBL is another type of Carbapenemase which is rarely seen in the US at present, but has been reported in Southeast Asia.

Outcome measurements are:
1. Cases per 10,000 patient days and cases per 1,000 admissions
2. Percent of *enterobacteriaceae* that are resistant to Carbapenems
3. Number of cases with a positive MHT result

RESULTS

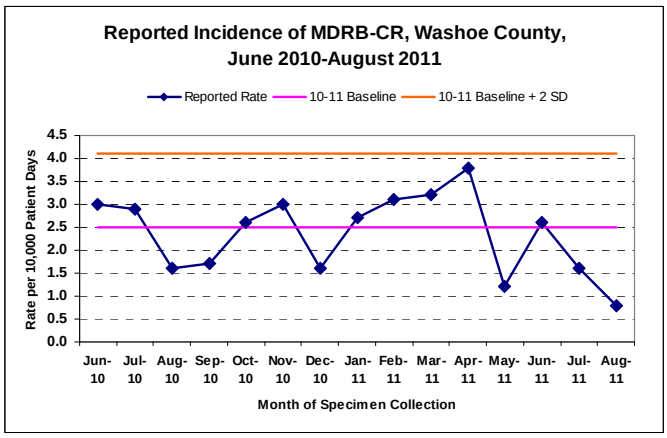
During a 15 month period between June 2010 and August 2011, there were 91 cases who met the case definition. The median age was 67 years (range: 0-93 years), 61% of cases were male. The distribution of sources of specimens were: 47% from a respiratory source, 40% from urine, 10% from a wound, 2% from a sterile site, and 1% from other sources. As to the location of the patients at the time of reporting, 57% were inpatients, 18% were in the intensive care unit,

[1] Thomas Frieden. Antibiotic Resistance and the Threat to Public Health. Testimoney Committee on Energy and Commerce Subcommittee on Health United States House of Representatives. April 28, 2010.

Please share this information with all physicians/staff in your facility/office.

20% stayed in a long term acute care facility, and 6% were outpatients. Forty-two (42%) of cases were resistant to three classes of antibiotics, 31% to four classes, and 27% to five or more classes of antibiotics.

The reported incidence rate is seen in the following figure. The pink line represents the mean of reported incidence rates for the period June 2010 and May 2011. The orange line represents a threshold of 2 standard deviations above the historical baseline. The reported incidence rate during this 15 month period varied from month to month but none exceeded the threshold.



According to monthly laboratory reports during the 16 month period between January 2010 and April 2011 the prevalence of CRE was less than 0.5%.

Between June 2010 and September 2011, a total of 111 isolates were tested by MHT at the NSPHL. Of 111 isolates tested, six (5%) were positive, 102 (92%) were negative, two (2%) were non-viable, and 1 (1%) were indeterminate. Of the six positives, none were positive for MBL. The median age of the six cases was 60 years (range: 46-73 years), and four were male. Four isolates were from urine specimens, one from a respiratory specimen, and one from a wound. Four isolates were identified as *Enterobacter Cloacae*, one was *Serratia Marcescens*, and one was an *Acinetobacter* species. The six cases were from three facilities. No cluster was identified.

DISCUSSIONS AND CONCLUSIONS

Preliminary findings from the active surveillance suggest that:

1) CRE has been seen in our community; however, the prevalence rate remains low. Analysis of 2007 data regarding healthcare associated infections reported to CDC indicated that 8% of all *Klebsiella* isolates were carbapenem-resistant *Klebsiella pneumoniae* (CRKP) which is the species of CRE most commonly encountered in the United States. Fortunately, Washoe County's local antibiogram between 2002 and 2009 showed that less than 1% of *Klesbiella pneumoniae* isolates were CRKP.

2) The disease burden of MDRB-CR has been stable and did not exceed the threshold in comparison with the community's baseline.

RECOMMENDATIONS FOR HEALTHCARE PROVIDERS

CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC) have developed new guidance for CRE infection prevention and control in an effort to limit the further emergence of these organisms.

- All patients colonized or infected with CRE or carbapenemase-producing *Enterobacteriaceae* should be placed on contact precautions.
- Acute care facilities should establish a protocol, in conjunction with Clinical Laboratory Standard Institute (CLSI) guidelines, to detect nonsusceptibility and carbapenemase production in *Enterobacteriaceae,* particularly *Klebsiella* spp. and *Escherichia coli*, and immediately alert epidemiology and infection control staff members if identified.
- All acute care facilities should review microbiology records for the preceding 6--12 months to ensure that previously unrecognized CRE cases have not occurred. If previously unrecognized cases are identified, facilities should conduct a point prevalence survey in units with patients at high risk to identify any additional patients colonized with carbapenem-resistant or carbapenemase-producing *Klebsiella* spp. and *E. coli*. The recommended surveillance culture methodology is aimed at detecting carbapenem resistance or carbapenemase production in *Klebsiella* spp. and *E. coli* only, because 1) this method facilitates performing the test in the microbiology laboratory without the use of molecular methods and 2) these organisms represent the majority of CRE encountered in the United States. When a case of hospital-associated CRE is identified, facilities should conduct a single round of active surveillance testing of patients with epidemiologic links to the CRE case.

Detailed recommendation can be found in "Guidance for Control of Infections with Carbapenem-Resistant or Carbapenemase-Producing *Enterobacteriaceae* in Acute Care Facilities. " (CDC, 2009). For healthcare providers who are not working in the acute healthcare facilities, practicing good hand hygiene, i.e., hand washing before and after each patient contact and cautiously using appropriate antibiotics are highly recommended. Please contact **Dr. Lei Chen** at **775-328-3735** for additional questions.