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CD Info

HEALTHY CHICAGO
CHICAGO DEPARTMENT OF PUBLIC HEALTH

Rahm Emanuel, Mayor | September 2018 | Julie Morita MD, Commissioner

CDInfo is a surveillance newsletter intended to promote prevention of morbidity and mortality by providing useful data and practical recommendations for clinicians, laboratories, and infection control personnel who diagnose, treat or report infectious diseases in Chicago.

Emergence of New Delhi Metallo-β-Lactamase (NDM) -Producing Carbapenem-Resistant Enterobacteriaceae in Chicago, 2013-2017

- An increased number of NDM clinical or colonized individuals have been identified from 2013 to 2017.
- History of foreign travel is less common now compared to 2013-2014, indicating transmission is occurring locally.
- More than 70% of patients with NDM-CRE and no foreign travel stayed in post-acute healthcare facilities, underscoring the need for infection control training in these settings.

Carbapenem-resistant Enterobacteriaceae (CRE) are a serious public health threat. Enterobacteriaceae may acquire resistance by expressing carbapenemase enzymes with activity against carbapenem antibiotics. Infections with carbapenemase-producing CRE (CP-CRE) are difficult, and in some cases impossible, to treat and have been associated with mortality rates up to 50%[1]. CRE disproportionately affect chronically ill patients in post-acute care facilities such as long-term acute care hospitals (LTACHs) and ventilator skilled nursing facilities (vSNFs), considered high risk settings because they provide long term care for high-acuity patients[2]. Carbapenemases encoded on plasmids, including *Klebsiella pneumoniae* carbapenemase (KPC) and NDM, can move between bacterial strains and have the potential to rapidly increase the proportion of Enterobacteriaceae resistant to carbapenems[3]. As such, CP-CRE have been a particular focus of CDPH public health surveillance and response to understand carbapenemase-producing CRE prevalence in the Chicago region. While KPC is the most prevalent mechanism of resistance identified in the United States, NDM-CRE have been emerging in our region. Patients with NDM-CRE in Illinois were identified by clinical laboratories using molecular methods, point prevalence surveys conducted by CDPH in response to clusters, or as part of an ongoing CDC-funded project to understand carbapenemase-producing CRE prevalence in high risk healthcare settings in the Chicago region. Increased number of cases identified in recent years is likely due to a combination of increased local transmission and enhanced detection.

Figure 1. Number of CRE reports and patients with NDM-CRE among Chicago patients

	2013**	2014	2015	2016	2017	Total
CRE Reports* among Chicago patients	140	976	921	998	1020	4055
CRE Reports* among Chicago patients with molecular testing	37	321	231	170	364	1123
Patients with NDM-CRE	1	2	9	10	22	44
NDM-CRE patients with complete risk factor history obtained	1	1	7	10	22	41

*May include multiple reports per patient

**November 1, 2013-December 31, 2013

Epidemiologic Investigation

Chicago patients colonized or infected with NDM-CRE reported to the XDRO registry are investigated by CDPH to identify risk factors present within 6 months of culture collection and implement infection control measures to prevent further transmission.

Twenty-two (50%) NDM-CRE were identified from clinical cultures (16 urine, 3 blood, 2 sputum, 1 tissue), and 21 (48%) from rectal screening cultures. Three (7%) patients had undergone endoscopy, 18 (44%) had other invasive procedures, 18 (44%) were mechanically ventilated, 20 (49%) had a tracheostomy, and 20 (49%) had a gastrostomy tube.

Figure 2. NDM-CRE Specimen Source in Chicago (N=44)

	N	%
Surveillance Culture	21	48
Urine	16	36
Blood	3	7
Sputum	2	5
Tissue	1	2
Urine and Wound	1	2

Figure 3. NDM-CRE Risk Factors (N=41)

	N	%
Tracheostomy	20	49
PEG tube	20	49
Mechanical ventilation	18	44
Other invasive procedures	18	44
Endoscopy	3	7

Among 32 NDM-CRE unique patients reported between November 2013 and December 2017 for which Enterobacteriaceae species was identified from available isolates, 22(69%) were identified in *Klebsiella pneumoniae*, 8(25%) were identified in *Escherichia coli*, 1(3%) was identified in both *Klebsiella pneumoniae* and *Escherichia coli*, and 1(3%) was identified in *Proteus mirabilis*.

Travel and Hospitalization Risk-Factors

All investigated patients with NDM-CRE had a history of foreign travel or overnight healthcare stay, suggesting community transmission in the Chicago region is not common. More than 70% of patients with NDM-CRE and no foreign travel stayed in a vSNF or LTACH, underscoring the need for infection control training and surveillance of carbapenemase-producing CRE in these settings. History of foreign travel is less common now compared to 2013-2014, indicating transmission is occurring locally.

Figure 4. Recent* travel and hospitalization history of NDM-CRE patients among those with risk factor history obtained (N=41)

	2013** n (%)	2014 n (%)	2015 n (%)	2016 n (%)	2017 n (%)	Total n (%)
Foreign travel	1 (100)	0 (0)	4 (57)	4 (40)	3 (14)	12 (29)
Hospitalization outside of the United States	1 (100)	0 (0)	4 (57)	3 (30)	2 (9)	10 (24)
Overnight stay at any Illinois healthcare facility	1 (100)	1 (100)	5 (71)	9 (90)	20 (91)	36 (88)
Overnight stay at an Illinois vSNF	0 (0)	1 (100)	2 (29)	2 (20)	11 (50)	16 (39)
Overnight stay at an Illinois LTACH	0 (0)	1 (100)	1 (14)	4 (40)	9 (41)	15 (37)
Overnight stay at an Illinois SNF	0 (0)	0 (0)	0 (0)	2 (20)	3 (14)	5 (12)

*Recent is defined as within 6 months of culture collection

**November 1, 2013-December 31, 2013

To contain spread, CDPH and its partners have implemented intensive, on-going infection control assessments in Chicago vSNFs and LTACHs with high prevalence of NDM-CRE and other emerging MDROs using CDC's 2017 MDRO containment guidance[4].

Health Care Facilities can:

- Work with the health department to stop spread of unusual resistance. Review and support infection control in the facility
- Establish protocols that immediately notify the health department, health care provider, and infection control staff of unusual resistance
- Place patients with unusual resistance on contact precautions, assess and enhance infection control
- Work with the health department to screen at-risk patients
- Communicate about status when patients are transferred
- Continue infection control assessments and colonization screenings until spread is controlled
- Ask about any recent travel or health care to identify at-risk patients

Selected Sources

1. CDC. Healthcare-associated Infections: Tracking CRE. Available at http://www.cdc.gov/hai/organisms/cre/TrackingCRE.html.
2. Prabaker K, et al. Transfer from high-acuity long term care facilities is associated with carriage of Klebsiella pneumoniae carbapenemase-producing Enterobacteriaceae: a multihospital study. Infect Control Hosp Epidemiol. 2012
3. Woodworth KR, Walters MS, Weiner LM, et al. Vital Signs: Containment of Novel Multidrug-Resistant Organisms and Resistance Mechanisms — United States, 2006–2017. MMWR Morb Mortal Wkly Rep 2018;67:396-401.
4. CDC. Interim guidance for a public health response to contain novel or targeted multidrug-resistant organisms (MDROs). 2017. Available at https://www.cdc.gov/hai/outbreaks/docs/Health-Response-Contain-MDRO.pdf

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