Preventing the Spread of Carbapenem-resistant *Enterobacteriaceae* in LTCFs

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Preventing the Spread of Carbapenem-resistant *Enterobacteriaceae* in LTCFs

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MN Webinar series
March 29, 2016

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

CDC

Presentation Objectives

- Review the importance of carbapenem-resistant *Enterobacteriaceae* (CRE)
- Describe the strategies outlined in the CDC's CRE Tool-kit to detect and prevent CRE
- Discuss approaches that LTCFs can take to implement CRE prevention activities

Common resistance patterns in *Enterobacteriaceae*

- *Enterobacteriaceae:* Family of gram-negative bacilli
  - Named because they colonize the lower GI tract
- Cause of healthcare-associated urinary tract infections, pneumonia and blood-stream infections

Enterobacteriaceae	Abbrev.	Antibiotic Resistance
• *E. coli* • *K. pneumoniae and K. oxytoca* • *E. cloacae and E. aerogenes*	ESBL	Extended spectrum β-lactamase; causes resistance to penicillins and cephalosporins
	CRE	Carbapenem-resistance

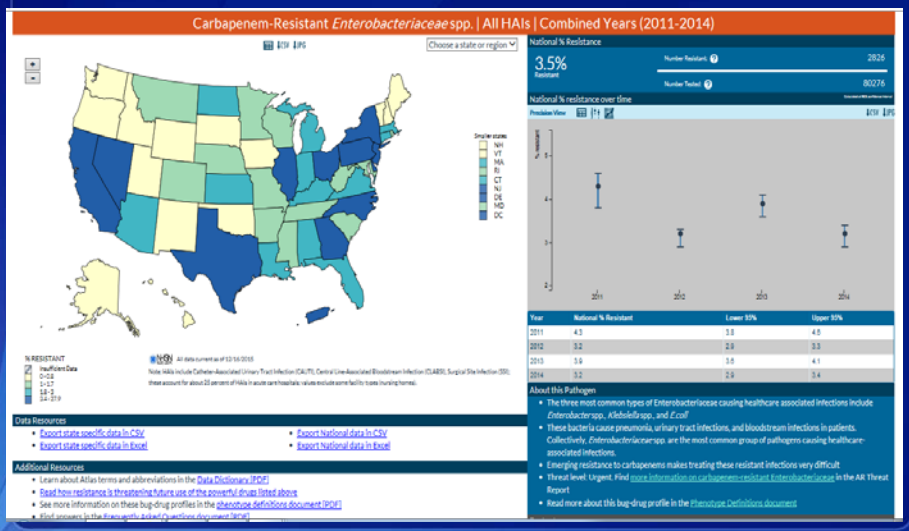
Carbapenem-resistance in gram-negative bacteria

- Carbapenems are reserved for severe, complicated infections with multiple and often resistant bacteria
  - Recall: "Extremely broad-spectrum" antibiotics
  - Resistance to carbapenems significantly limits treatment options for life-threatening infections
- Emerging resistance mechanisms can be spread
  - Carbapenemases are found on mobile genetic elements
  - Resistance genes travel together on these mobile elements; bacteria can become resistant to many classes
  - "Pan-resistant" CRE have been identified → no effective antibiotic therapies available

Why focus on carbapenemases?

- The genetic material creating carbapenemases sits on highly mobile elements
  - These resistance elements can be shared between different bacteria very easily
  - Similar to concern with ESBL spreading cephalosporin-resistance
- Two carbapenemases getting lots of attention
  - *Klebsiella pneumoniae* carbapenemase (**KPC**)
  - New Delhi metallo-beta-lactamase **(NDM-1)**
- Identifying/containing bacteria which produce carbapenemase will *prevent the spread of resistance to other people and other organisms*

Antibiotic Resistance Patient Safety Atlas: Prevalence of CRE



http://gis.cdc.gov/grasp/PSA/MapView.html

CDC CRE Toolkit, updated Nov. 2015

To control the spread of CRE, healthcare facilities should:

- Quantify the magnitude of CRE within the facility
- Identify colonized and infected patients within the facility
- Implement interventions designed to stop the transmission of CRE

http://www.cdc.gov/hai/organisms/cre/cre-toolkit/index.html

Separating colonization from infection

- "Colonizing" bacteria may not be harmful, even when they are antibiotic-resistant
  - Example: CRE cultured from a rectal swab may not harm the colonized person
- Only when bacteria invade our bodies and cause signs/symptoms of illness do we need treatment with antibiotics
- Separating colonization from infection can be difficult
  - Examples: Bacteriuria in an older adult; respiratory secretions from a person on a ventilator
- However, both colonized and infected people can serve as a source for spreading resistant organisms

CRE Surveillance: Awareness is key

- Know whether CRE has been detected in your community
  - Contact infection prevention programs of local referral partners
  - Ask the coordinator of the Healthcare-associated Infections (HAI) program at the state health department
- Know if CRE has been detected from residents receiving care in your facility
  - History of CRE colonization or infection should be communicated at time of admission or transfer
  - Review clinical cultures to see if CRE has been isolated from residents in your facility

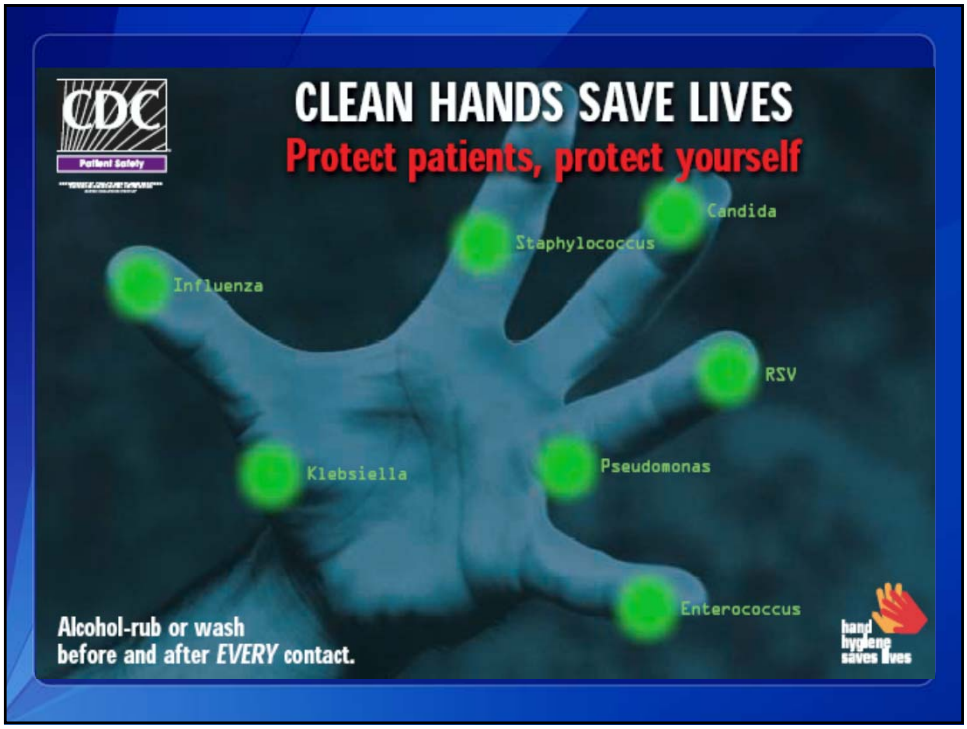
CRE Prevention Strategies

- Hand hygiene
- Contact precautions
- Healthcare personnel education
- Careful use of invasive medical devices
- Laboratory notification
- Communication of CRE status during interfacility-transfer
- Antibiotic stewardship
- Environmental cleaning
- Cohorting of patients and staff
- Screening contacts of known CRE carriers
- Active surveillance for CRE colonization
- Chlorhexidine bathing

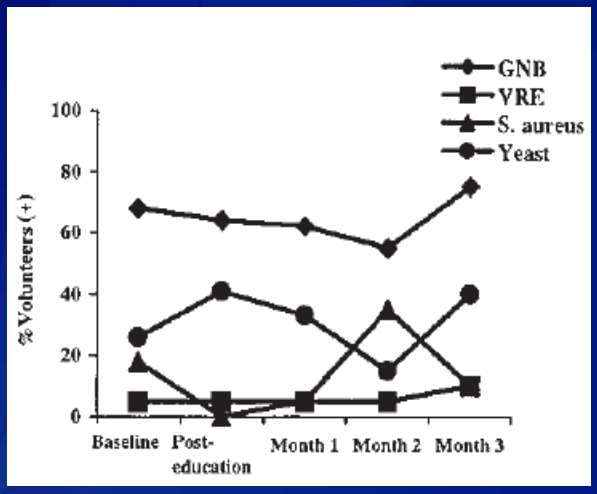
CRE Prevention Strategies

Healthcare Personnel Education

- Identification
  - Laboratory notification
  - Communication of CRE status during interfacility-transfer
  - Screening contacts of known CRE carriers
  - Active surveillance for CRE colonization
- Prevention of emergence
  - Careful use of invasive medical devices
  - Antibiotic stewardship
- Prevention of spread
  - Hand hygiene
  - Contact precautions
  - Cohorting of residents and staff
  - Environmental cleaning
  - Chlorhexidine bathing



Bacterial contamination of HCW hands prior to hand hygiene in a LTCF



- Gram negative bacteria were the most common bugs cultured from hands of staff
- Most Gram neg. bacteria live in the GI tract or colonize the urine

Mody L, et al. Infect Cont Hosp Epi. 2003; 24: 165-71

Teach and reinforce the moments for hand hygiene (HH)

- Before and after physical contact with a resident
- Before donning gloves and after removing gloves
- After handling soiled or contaminated items and equipment, including linens
- Before performing an invasive procedures
- Before handling sterile or clean supplies
- When hands are visibly dirty or soiled with blood and/or bodily fluids*
- After care of a resident with known or suspected infectious diarrhea*
- Before and after eating or handling food*
- After personal use of bathroom*

***Situations where soap and water preferred over alcohol-based hand rub**

Barriers to HH compliance in LTC

- Belief that HH guidelines aren't applicable
  - 30% wouldn't change current practices; 20% guidelines impractical
- Lack of access to appropriate HH supplies
  - 16.2% lack of available sink; 27.5% lack of alcohol-based hand rub
- No HH because of glove use
  - 23% nurses, 17% CNAs, 26% other HCWs
- Forgot HH because of workload
  - 35% of nurses, 22% CNAs, 44% other HCWs
- Lack of access to HH feedback and/or education
  - 55% never to rarely received personal feedback on HH practices
  - Other HCWs less often received periodic education on HH (86.8% vs. 92% of nurses and CNAs, p=0.03)

Ashraf MS et al. ICHE 2010; 31(7):758-762

Promoting and monitoring HH practices

Efforts to improve hand hygiene efforts should be multidisciplinary and multimodal, including:

- Ensuring accessibility of hand hygiene products
- Trial of hand hygiene products before implementation to increase staff buy-in
- Reminders and cues to action for appropriate HH
- Provide feedback on performance data
- Engaging healthcare personnel in discussions to identify HH knowledge gaps and barriers to adherence
- Develop a culture of safety and teamwork

CDC/HICPAC Guideline for Hand Hygiene in Health-care Settings. MMWR 2002; vol. 51, no. RR-16.
World Health Organization. http://www.who.int/gpsc/5may/tools/who_guidelines-handhygiene_summary.pdf

Applying transmission-based precautions in LTCFs

Excerpt from Transmission-based Precautions section of CMS Infection Control Program interpretive guidance (F441):

control measures to prevent transmission. In nursing homes, it is appropriate to individualize decisions regarding resident placement (shared or private), balancing infection risks with the need for more than one occupant in a room, the presence of risk factors that increase the likelihood of transmission, and the potential for adverse psychological impact on the infected or colonized resident.[27]

Department of Health and Human Services. Centers for Medicare and Medicaid Services. Revisions to Appendix PP Interpretive Guidelines for Long Term Care Facilities, Tag 441. Effective 9/30/2009.

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Individualized use of precautions

"Consider the individual resident's clinical situation and prevalence or incidence of MDRO in the facility when deciding whether to implement or modify Contact Precautions in addition to Standard Precautions for a patient infected or colonized with a target MDRO"

V.A.5.c.ii.1 "For relatively healthy residents (e.g., mainly independent) follow Standard Precautions making sure that gloves and gowns are used for contact with uncontrolled secretions, pressure ulcers, draining wound, stool incontinence, and ostomy tubes/bags."

V.A.5.c.ii.2. For ill residents (e.g., those totally dependent upon healthcare personnel for healthcare and activities of daily living…) and for those residents whose infected secretions or drainage cannot be contained, use Contact Precautions, in addition to Standard Precautions."

V.A.5.c.iii. For MDRO colonized or infected patients without draining wounds, diarrhea, or uncontrolled secretions, establish ranges of permitted ambulation, socialization, and use of common areas based on their risk to other patients and on the ability of the colonized or infected patients to observe proper hand hygiene and other recommended precautions to contain secretions and excretions.

CDC/HICPAC. Management of Multidrug-Resistant Organisms in Healthcare Settings, 2006. http://www.cdc.gov/hicpac/pdf/MDRO/MDROGuideline2006.pdf

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Challenges with contact precautions in LTC settings

- Staff concerns about negative impact of gown/glove use on residents
  - Unlikely to change practices if aware of an MDRO
  - Isolation could negatively impact a resident's well-being
- Lack of private rooms / limited ability to move residents
  - Moving rooms is disrupting to residents and staff
  - Ability to identify carriers to cohort is limited (no active surveillance in most facilities)
- Determining duration of contact precautions
  - Unable to restrict resident mobility and participation in social events/therapy for prolonged periods
  - Unlikely to document clearance of carriage

Furuno, JP et al. AJIC. 2011; 1-5 epub

Education on appropriate personal protective equipment (PPE) use

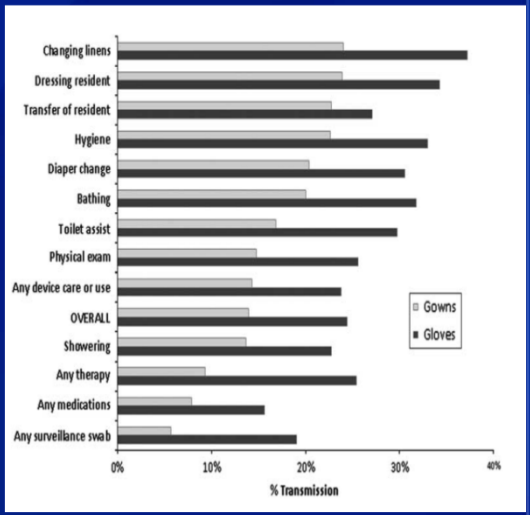
- Based on the nature of healthcare personnel-resident interaction
  - Type of task being performed
- Anticipated degree of contact with blood and/or body fluids, or pathogen exposure
- HH always performed before/after PPE use

Personal protective equipment (PPE)	
Gloves	For touching blood, body fluids, secretions, excretions, contaminated items; for touching mucous membranes and nonintact skin
Gown	During procedures and patient-care activities when contact of clothing/exposed skin with blood/body fluids, secretions, and excretions is anticipated..
Mask, eye protection (goggles), face shield*	During procedures and patient-care activities likely to generate splashes or sprays of blood, body fluids, secretions, especially suctioning, endotracheal intubation

CDC/HICPAC. 2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings. Table 4. http://www.cdc.gov/hicpac/2007IP/2007isolationPrecautions.html

Transmission of resistant organisms to healthcare personnel hands/clothes

- Evaluated ~950 different interactions between HCP and residents colonized with MRSA
- Used cultures of gowns/gloves to mimic transmission
- Morning/evening care bundled together increased transmission
- Presence of chronic wounds increased transmission



Roghmann MC et al. Infect Control Hosp Epidemiol. 2015; 36(9):1050-7

Consider a resident-centered approach to gown/glove use

AGING AND INFECTIOUS DISEASES | INVITED ARTICLE

Kevin High, Section Editor

Conceptual Model for Reducing Infections and Antimicrobial Resistance in Skilled Nursing Facilities: Focusing on Residents with Indwelling Devices

Lona Mody,[1,2,4] Suzanne F. Bradley,[1,2,4] Andrzej Galecki,[1,3,5] Russell N. Olmsted,[3,5,6] James T. Fitzgerald,[4,5] Carol A. Kauffman,[2,5] Sanjoy Saint,[3,5,7] and Sarah L. Krein[3,5,7]

[1]Divisions of Geriatric Medicine, [2]Infectious Diseases, and [3]Veterans Affairs/University of Michigan Patient Safety Enhancement Program, [4]Geriatric Research, Education and Clinical Center, [5]Veterans Affairs Ann Arbor Health Service Research and Development Center of Excellence, and [6]Infectious Diseases Section, Veterans Affairs Ann Arbor Healthcare System, and [7]General Internal Medicine, University of Michigan Medical School, [8]Infection Prevention & Control Services, Saint Joseph Mercy Health System, Ann Arbor, Michigan, [9]Department of Medical Education, University of Michigan, and, [10]Department of Biostatistics, School of Public Health, University of Michigan

- Gown/glove use during care of all high-risk residents, regardless of MDRO status
- High risk = presence of indwelling medical devices, chronic wounds, uncontained secretions or excretions

Mody L et al. Clinical Infectious Diseases 2011; 52(5):654-661

Barrier precautions without isolation

Table 1. Comparison of Preemptive Barrier Precautions for High-Risk vs General Residents of Skilled Nursing Facilities

Enhanced precautions for residents with indwelling devices	Standard precautions for all residents
Place enhanced barrier precautions signs on clinical charts, nursing stations, resident rooms.	None.
Hand hygiene before and after providing any patient care. Hand hygiene performed before donning gloves and after they are removed.	Hand hygiene before and after providing any patient care. Hand hygiene performed before donning gloves and after they are removed.
Gloves to be worn upon entry into rooms of patients with devices. Glove use encouraged when providing any assistance with activities of daily living, such as transfers, grooming, feeding, during physical and occupational therapy and feeding. Gloves must be changed before caring for different patients.	Gloves to be used when contact with blood or potentially infectious materials could occur. Gloves must be changed before caring for different patients.
Protective gown to be worn to protect skin and to prevent soiling or contamination of clothing during procedures and patient care activities when contact with body fluids, blood, secretions, or excretions is expected.	Protective gown to be worn to protect skin and to prevent soiling or contamination of clothing during procedures and patient care activities when contact with body fluids, blood, secretions, or excretions is expected.
Protective gown to be worn when providing any morning and evening care. Morning and evening care activities include dressing (clothing change, including donning or removing shoes, socks, sweaters), bathing (sponge bath daily and showering twice weekly), toileting, oral hygiene (mouth, teeth, and denture care), and grooming (hair care and glasses).	
When residents leave their rooms for any activities, their wounds and other areas of drainage will be covered.	When residents leave their rooms for any activities, their wounds and other areas of drainage will be covered.

Mody Let al. ClinInfecDis. 2011; 52(5):654-661

Original Investigation

A Targeted Infection Prevention Intervention in Nursing Home Residents With Indwelling Devices

A Randomized Clinical Trial

Lona Mody, MD; Sarah L. Krein, PhD; Sanjay K. Saint, MD

INTERVENTION DETAILS

Intervention	Control s
Pre-emptive barrier precautions Gown and glove use for any intimate care including am and pm care, ADL help	Standard Gown a policie
Active Surveillance and monthly feedback MDRO colonization (surveillance cultures) Infections	Data gath MDRO Infectio
Interactive Education 1. Hand hygiene promotional posters, glo-germ, pre and post hand cultures demonstrations 2. Personal use hand sanitizers 3. Interactive Infection Prevention Modules (10 modules, q 2-3 mo) 4. IP Mini-conference on surveillance 5. Surveillance definition cards to providers	Educatio As nee state s

	Number of MDROs/1000 device days		RR
	Intervention	Control	
MRSA	15.1	21	0.72 (0.61,0.85)
VRE	7.4	10.3	0.71 (0.56, 0.9)
CTZ-R GNB	10	16.3	0.68 (0.50,0.75)
CIP-R GNB	35.8	46.1	0.78 (0.7,0.86)
All MDRO	68.4	93.7	0.73 (0.68,0.79)

Mody L et al. JAMA Intern Med. 2015 May;175(5):714-23
Presented as oral abstract #1208. IDWeek 2013, San Fransisco, CA. Oct 5, 2013

Pros and cons of a resident-centered approach to gown/glove use

PROS

- No longer relying on identification of specific pathogens
- Care planning based on resident needs aligns with principles of "resident-centered care"
- Simplifies messaging to front-line staff
- Enables early implementation of appropriate PPE based on new risks or changing care needs

CONS

- Paradigm shift for facility staff, residents, families and visitors – will require education
- Approach will increase gown/glove use during care of a subset of high risk residents – devices, wounds, new or worsening incontinence, etc.

Gown/glove use to prevent CRE spread

- Identify risk factors among residents identified with CRE colonization/infection
  - Presence of indwelling devices, wounds, ventilator-dependence
  - Functional dependence, incontinence, uncontained secretions
- Consider types of care which may increase transmission of CRE to hands/clothes of healthcare personnel
  - Bathing, dressing, assisting with toileting, changing linens
  - Wound care, device handling, suctioning/oral care
- Use of gown/gloves during direct resident care activities does not prevent individuals from participating in social activities if sites of colonization are covered/contained

Other considerations for use of transmission-based precautions

- Ensure that all healthcare personnel receiving education on proper use of PPE during resident care
- Communication to caregivers, families and residents about approach to MDRO management is key
  - Decisions and rationale about gown/glove use during care and room placement should be clearly documented
- Cues to action, monitoring and feedback of adherence to gown/glove use is critical for staff performance
  - Practices at the bedside must align with policies
- Discontinuation of precautions based on resident risk decreasing rather than presence/absence of organism

Resident placement principles

Determine resident placement based on the following principles:

- Route(s) of transmission of the known or suspected infectious pathogen
- Risk factors for transmission in the infected resident (e.g. draining wounds, diarrhea, uncontrolled secretions)
- Risk factors for adverse outcomes resulting from an infection in other residents in the room
- Duration of time in the facility and stability of current roommate
- Consider availability of single rooms, and options for room-sharing (e.g. cohorting, placement with a resident at lower risk of infection)

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Resident placement (con't)

- Establish strategies for movement of residents outside of the room based on level of risk for spread of infection
- Consider the following issues:
  - Presence of active signs/symptoms of infection (e.g., new vomiting or diarrhea, undiagnosed cough, and/or new fever)
  - Inability to contain excretions or secretions
  - Challenges with maintaining personal hygiene
- Only restrict resident movements and participation in group activities for as long as needed
  - Discontinue as soon as high risk diagnosis ruled out; active signs/symptoms resolve; risk of transmission is low

CDC/HICPAC. 2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings. http://www.cdc.gov/hicpac/2007IP/2007isolationPrecautions.html
CDC/HICPAC. Management of Multidrug-Resistant Organisms in Healthcare Settings, 2006. http://www.cdc.gov/hicpac/pdf/MDRO/MDROGuideline2006.pdf

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Take Home Points

- Nursing homes must be aware of and take steps to prevent spread of CRE among residents in their care
- Understand the risk factors for CRE colonization among residents to help guide prevention strategies
- Consider a resident-centered approach to implementation of gown/glove use during care
- Understanding barriers and providing education will help healthcare personnel prevent the spread of CRE and other MDROs at the bedside

Thank you!!

Email: nstone@cdc.gov with questions/comments

For more information please contact Centers for Disease Control and Prevention

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