Long Term Care Infection Prevention: The Good, Bad, and the Ugly

Gail Bennett RN, MSN, CIC
Objectives

• Name three newer multi-drug resistant organisms (MDROs) being detected in LTCFs.
• Describe two challenges encountered in LTCFs relating to implementation of contact precautions.
• List two important issues relating to Infection Prevention being encountered in LTCFs today.
What we will cover:

• General information

• Specific MDROs
  – Methicillin Resistant *Staphylococcus aureus* (MRSA)
  – Vancomycin Resistant Enterococci (VRE)
  – Extended Spectrum Beta Lactamase Producers (ESBLs)
  – Carbapenem Resistant Enterobacteriaceae (CRE)
    • Includes *Klebsiella pneumoniae* carbapenemase (KPCs)
  – Resistant *Acinetobacter baumannii*
What we will cover:

• Surveillance for MDROs

• Control Measures
  – Isolation precautions
  – Hand hygiene
  – Environmental decontamination
  – Antimicrobial stewardship programs
Emergence of Antimicrobial Resistance

- Resistant Bacteria
- Susceptible Bacteria
- Resistance Gene Transfer
- Mutations
- New Resistant Bacteria
Colonization

- Organisms are present but without tissue invasion and damage, thus no signs or symptoms
- Does not cause adverse clinical symptoms even though organisms are present

  - **Colonization:**
    - Patient who screens positive with MRSA in nares on admission
    - Patient with clean, granulating pressure ulcer but positive culture
Infection

- Organisms are present with tissue invasion and damage, thus signs and symptoms
Methicillin Resistant *Staphylococcus aureus* (MRSA)

- MRSA emerged in the US soon after Methicillin became commercially available in the early 1960’s with the first case being detected in 1968.
- Increased prevalence in the ‘70s
Methicillin Resistant *Staphylococcus aureus* (MRSA)

- 2000: MRSA accounted for 53% of all S. aureus clinical isolates from patients with nosocomial infections acquired in US ICUs (NNIS)
- 2003: the percentage had increased to 59.5% (NNIS)
- 2007: 60%
Methicillin Resistant *Staphylococcus aureus* (MRSA)

- The 1st identification of MRSA in LTCFs was in 1970 but it was uncommon in LTC until around 1985.
Methicillin Resistant *Staphylococcus aureus* (MRSA)

- Resistant to methicillin, oxacillin, and nafcillin
- Transmitted by direct and indirect contact
- No more virulent than MSSA
- Susceptible to common disinfectants
Risk Factors Contributing to MRSA Colonization/Infection for all Facility Types

- Poor functional status
- Conditions that cause skin breakdown
- Presence of invasive devices
- Prior antimicrobial therapy
- History of colonization
Specific Risk Factors for MRSA Colonization in LTCFs

- Male gender
- Urinary incontinence
- Fecal incontinence
- Presence of wounds
- Pressure ulcers
- Antibiotic therapy
- Hospitalized within the previous 6 months
What residents are more likely to shed MRSA?

- Heavy draining wound
- Incontinent, diarrhea, colostomy
- Cannot/will not contain secretions and excretions
- Very poor hygiene
- Difficult behaviors that may increase the risk of transmission
- Other
Treatment Regimens for MRSA Infection

• Vancomycin is the drug of choice

• Disadvantages of Vancomycin
  – expensive
  – parenteral administration
  – ototoxicity
  – can potentiate nephrotoxicity of aminoglycosides
Treatment Regimens for MRSA Infection

• Linezolid (Zyvox) has been an alternative to Vancomycin treatment of MRSA since 2000

• Administered orally
Colonization/carrier State of MRSA by Healthcare Workers

• Do not routinely culture staff for colonization with MRSA

• It may be needed as part of an outbreak investigation
  – HCW epidemiologic link to transmission

• Before culturing,
  – Get expert consultation
  – Have an action plan in place!
Outbreak control

• Contact precautions with observation for compliance
• Hand hygiene
• If a decision has been made to culture staff for nasal colonization: Mupirocinn has been shown to be somewhat effective.
Vancomycin Resistant *Staphylococcus aureus*

- Vancomycin resistant gene transferred from VRE in same patient
- To date, the US has had approximately 11 cases of VRSA
- CDC recommends private room, contact precautions, dedicated staff
- Reportable to your state and CDC
Vancomycin Resistant *Staphylococcus aureus*

What about surveillance cultures to find all residents colonized or infected with resistant organisms?

- Not routinely recommended for acute care, LTCFs, or other healthcare facilities
- May be needed in an outbreak
- Must have an action plan before you start culturing – I would suggest a consult with the state epidemiology office first
Active surveillance cultures (ASCs):

- CDC says, “More research is needed to determine the circumstances under which ASC are most beneficial but their use should be considered in some settings, especially if other control measures have been ineffective.”
- CDC MDRO Guideline, 2006
However, hospitals have a relatively new process for surveillance screening for MRSA - Example:

- All admits from LTCFs, jails, prisons
- Anyone on dialysis
- ICU/CCU admissions
- CABG patients
- Orthopedic patients: total joint replacements
- Neuro: open back
- Wounds/cellulitis
Are hospitals screening all admissions for MRSA?

• No, only a small % of their admissions fall in their high risk categories and get screened
So... do we isolate admissions to LTCFs from the hospital who were culture positive for MRSA in the nares?

• No, not if that is the only site of MRSA identified
• We will be alert to the fact that the resident is colonized and alert to any new healthcare associated MRSA cases should they develop
Vancomycin-Resistant Enterococcus (VRE)

- *Enterococcus faecalis*
- *Enterococcus faecium*
- Contact Precautions - culture negative prior to discontinuing precautions?
  - CDC now says we need to decide when to d/c precautions but it may be prudent to have negative culture(s) prior to d/c of isolation
Resistant *Acinetobacter baumannii*

- Aerobic gram-negative bacillus
- High level of resistance
- High numbers of *A. baumannii* infection among our troops in Iraq
- Causing outbreaks in healthcare facilities
- Contact Precautions
- See attached example
**Acinetobacter baumannii: Example microbiology report**

<table>
<thead>
<tr>
<th>Antimicrobial</th>
<th>Interpretation</th>
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<th>Interpretation</th>
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<td>Polymyxin B</td>
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<td>Ampicillin/sulbactam</td>
<td>I</td>
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<td>Ampicillin</td>
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<td>Aztreonam</td>
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<td>Tobramycin</td>
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<td>Piperacillin/tazobactam</td>
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<tr>
<td>Levofloxacin</td>
<td>R</td>
<td>Imipenem</td>
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Extended spectrum beta-lactamase producers (ESBLs)

• Gram negative organisms - *Enterobacteriaceae*
• Excrete the enzyme beta-lactamase
• Inactivates $\beta$-lactam (penicillin) type antibiotics
• Resistance to $\beta$-lactams emerged several years ago and has continued to rise
• ESBLs
  – Klebsiella
  – E. coli
  – Serratia
  – others
## Urine culture - *Klebsiella pneumoniae*

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The Last Line of Defense

• Fortunately, our most potent β-lactam class, carbapenems, remained effective against almost all *Enterobacteriaceae*.

  Doripenem, Ertapenem, Imipenem, Meropenem

• But... Antimicrobial resistance follows antimicrobial use
## Susceptibility Profile of *K. pneumoniae* carbapenemase (KPC)

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<td>Imipenem</td>
<td>R</td>
</tr>
<tr>
<td>Cefpodoxime</td>
<td>R</td>
<td>Meropenem</td>
<td>R</td>
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<td>R</td>
<td>Pipercillin/Tazo</td>
<td>R</td>
</tr>
<tr>
<td>Cetotetan</td>
<td>R</td>
<td>Tobramycin</td>
<td>R</td>
</tr>
<tr>
<td>Cefoxitin</td>
<td>R</td>
<td>Trimeth/Sulfa</td>
<td>R</td>
</tr>
<tr>
<td>Ceftazidime</td>
<td>R</td>
<td>Polymyxin B</td>
<td>MIC &gt;4μg/ml</td>
</tr>
<tr>
<td>Ceftriaxone</td>
<td>R</td>
<td>Colistin</td>
<td>MIC &gt;4μg/ml</td>
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<tr>
<td>Cefepime</td>
<td>R</td>
<td>Tigecycline</td>
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Carbapenem Resistant Enterobacteriaceae Guideline

Guidance for Control of Infections with Carbapenem-Resistant or Carbapenemase-Producing Enterobacteriaceae in Acute Care Facilities

Infection with carbapenem-resistant Enterobacteriaceae (CRE) or carbapenemase-producing Enterobacteriaceae is emerging as an important challenge in health-care settings (1). Currently, carbapenem-resistant Klebsiella pneumoniae (CREKP) is the species of CRE most commonly encountered in the United States. CREKP is resistant to almost all available antimicrobial agents, and infections with CREKP have been associated with high rates of morbidity and mortality, particularly among persons with prolonged hospitalization and those who are critically ill and exposed to invasive devices (e.g., ventilators or central venous catheters). This report provides updated recommendations from CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC) for the control of CRE or carbapenemase-producing Enterobacteriaceae in acute care (inpatient) facilities. For all acute care facilities, CDC and HICPAC recommend an aggressive infection control strategy, including managing all patients with CRE using contact precautions and implementing Clinical and Laboratory Standards Institute (CLSI) guidelines for detection of carbapenemase production. In areas where CRE are not endemic, acute care facilities should 1) review microbiology records for the preceding 6–12 months to determine whether CRE have been recovered at the facility, 2) if the review finds previously unrecognized CRE, perform a point prevalence culture survey in high-risk units to look for other cases of CRE, and 3) perform active surveillance cultures of patients with epidemiologic links to persons from whom CRE have been recovered. In areas where CRE are endemic, an increased likelihood exists for importation of CRE, and facilities should consider additional strategies to reduce rates of CRE (2). Acute care facilities should review these recommendations and implement appropriate strategies to limit the spread of these pathogens.

For CREKP, the most important mechanism of resistance is the production of a carbapenem enzyme, bla_kpc. The gene that encodes the bla_kpc enzyme is carried on a mobile piece of genetic material (transposon), which increases the risk for dissemination. Since first described in North Carolina in 1999, CREKP has been identified in 24 states and is recovered routinely in certain hospitals in New York and New Jersey (3). Analysis of 2007 data regarding health-care-associated infections reported to CDC indicated that 8% of all Klebsiella isolates were CREKP, compared with fewer than 1% in 2000 (CDC, unpublished data, 2008). CREKP poses significant
Management of Multidrug-Resistant Organisms In Healthcare Settings, 2006

Jane D. Siegel, MD; Emily Rhinehart, RN MPH CIC; Marguerite Jackson, PhD; Linda Chiarello. RN MS: the Healthcare Infection Control Practices Advisory Committee

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Surveillance for MDROs and Line Listing

• Document your targeted MDROs
• Use a line listing for each target
  – Separate from your general infection line lists
• Determine a way to “flag” residents with a previous MDRO
# LINE LISTING OF MRSA INFECTIONS

<table>
<thead>
<tr>
<th>Month___________</th>
<th>Year______</th>
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<table>
<thead>
<tr>
<th>Room____ Unit____</th>
<th>Name_________________________</th>
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</thead>
<tbody>
<tr>
<td>Admission date____</td>
<td>Type of Infection_______________</td>
</tr>
<tr>
<td></td>
<td>If UTI, catheter present? Yes/ No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Symptoms/Date</th>
<th>Cultures: Date/Site/Results</th>
<th>Treatment</th>
<th>Other actions (if needed)</th>
<th>Does not meet infection criteria</th>
<th>HAI</th>
<th>CAI</th>
</tr>
</thead>
</table>

HAI = healthcare-associated infection  CAI = community acquired infection
Let’s talk about precautions for MDROs.......

Contact Precautions

• Protect HCWs from spreading microorganisms by direct or indirect contact with resident or his environment
• Prevent transmission within the facility
• Contact precautions are the most common transmission-based precaution used in the acute care setting, possibly droplet in LTCFs
• Consider use with infections caused by MDROs (in LTCFs we must make a case by case decision)
• Consider the contaminated environment especially with \textit{C. difficile} and VRE
Contact Precautions for MDROs in Acute Care

• Private room

• Contact precautions

CDC MDRO guideline, 2006
Contact Precautions for MDROs in LTCFs

• CDC tells LTCFs to consider:
  – the individual patient clinical situation
  – prevalence or incidence of MDROs in the facility
    • when deciding to implement or modify contact precautions in addition to standard precautions for MDRO infected or colonized patients.
  – Relatively healthy residents may need only standard precautions while ill residents and those where secretions/excretions cannot be contained may need contact precautions.
  – CAUTION: some MDROs require contact precautions even in LTCFs!

CDC MDRO guideline, 2006
Contact Precautions

• Designed to reduce the risk of transmission of microorganisms by direct or indirect contact

• Direct contact
  – skin-to-skin contact
  – physical transfer (turning patients, bathing patients, other patient care activities)

• Indirect contact
  – Contaminated objects
  – Hands
  – Equipment

• Clothing- potential exists for contaminated clothing to transfer infectious agents to successive patients
  – New in the 2007 CDC isolation guidelines – cannot re-use same isolation gown even on same patient
Contact Precautions

• **Patient placement**
  – Private room OR
  – Cohorting (two or more residents in same room with same organism) OR
  – CDC recommends that LTCFs consider the infectiousness and epidemiology of the organism to determine rooming.
    • Consult internally with management and nurse consultant if needed.
    • If roommate, should be someone low risk.
Who is a low risk roommate?

- No major wounds
- No tubes (invasive devices)
- Not otherwise immunocompromised
Contact Precautions

• Hand hygiene
• Gloves upon entering the room
• Gowns upon entering the room
• Resident socializing outside the room?
  • Consider:
    – Clean
    – Contained
    – Cooperative
    – Cognitive
• Resident care equipment: dedicate to single resident if possible; if not – decontaminate prior to removal from the room
  – Purchase additional equipment if necessary
Challenges in Implementing Contact Precautions

- Room set-up/carts in the hallway
- Determining resident placement
- Confused residents
- Education of staff as well as visitors/family
- Compliance by staff
- Signage
- Other
Contact Isolation

- Pediculosis (lice)
- Scabies
- Ebola
- Lassa or Marburg
- Multi-drug Resistant Organisms
Environmental Decontamination

• Use an EPA registered healthcare disinfectant for environmental cleaning in clinical areas
• Use a detergent disinfectant or clean before disinfecting
• Use the appropriate wet contact time based on the organisms that you wish to kill
• May consider increased frequency of cleaning in heavily soiled areas
• Identify “high touch” areas throughout the building and have them on scheduled cleaning
• Be familiar with your EPA label claims
Cleaning and Disinfection

• Cleaning should include high touch/high contamination items (examples):
  – Commodes
  – Toilets
  – Bed railing
  – Hand rails in hallways
  – Call lights
  – Faucets
  – Telephones
  – Door handles
Cleaning and Disinfection: Special considerations

• *C. difficile*
• Norovirus
Guideline for Hand Hygiene in Health-Care Settings

Recommendations of the Healthcare Infection Control Practices Advisory Committee and the HICPAC/SHEA/APIC/IDSA Hand Hygiene Task Force

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The material in this report originated in the National Center for Infectious Diseases, James M. Hughes, M.D., Director, and the Division of Healthcare Quality Promotion, Steve Solomon, M.D., Acting Director.

Summary

The Guideline for Hand Hygiene in Health-Care Settings provides health-care workers (HCWs) with a review of data regarding handwashing and hand antisepsis in health-care settings. In addition, it provides specific recommendations to promote improved hand-hygiene practices and reduce transmission of pathogenic microorganisms to patients and personnel in health-care settings. This report reviews studies published since the 1985 CDC guideline (Ganer JS, Fasero M3. CDC guideline for handwashing and hospital environmental control, 1985. Infect Control 1986;7:231–45) and the 1995 APIC
Hand Hygiene

- **CDC Guideline for Hand Hygiene**
  - If washing with soap and water, at least 15 seconds
  - Soap and water for spore formers (C. diff), before eating, after bathroom, if hands are visibly contaminated
  - Otherwise, alcohol rubs acceptable unless hands are soiled
  - No requirement to wash with soap and water after so may uses of alcohol rub
  - Many facilities have mounted them in all resident rooms
  - What about toxicity if swallowed?
  - Less abrasive to hands than soap and water
  - Wash after removing gloves
  - Fingernails - short
Does she work at your facility?
Antibiotic Review

• F441: Because of increases in MDROs, review of the use of antibiotics is a vital aspect of the infection prevention and control program.

• An area of increased surveyor focus - an area where you need to assess if you are meeting the surveyor guidance
Antibiotic Monitoring and Review

• What most likely exists currently in your program:
  – Comparison of prescribed antibiotics with available susceptibility reports (charge nurse and infection preventionist)
  – Review of antibiotics prescribed to specific residents during regular medication review by consulting pharmacist
Antibiotic Monitoring and Review

• What may be needed:
  – Antibiotic stewardship program in the facility (CDC recommendation – 2006 MDRO guideline)
  – Broader overview of antibiotic use in your facility with reporting to quality assurance/infection control committee
    • Right drug
    • Right dosage
    • Right monitoring
    • Feedback of data to MDs
Antimicrobial stewardship

Why Inpatient Stewardship?

Overview
The Centers for Disease Control and Prevention has launched *Get Smart for Healthcare*, a new campaign focused on improving antimicrobial use in inpatient healthcare settings such as acute-care facilities, and long-term care through the implementation of antimicrobial (or antibiotic) stewardship programs. These antimicrobial (or antibiotic) stewardship programs are interventions designed to ensure that hospitalized patients receive the right antibiotic, at the right dose, at the right time, and for the right duration.

Antimicrobial stewardship interventions have been proven to improve individual patient outcomes, reduce the overall burden of antibiotic resistance, and save healthcare dollars. Implementation of an antimicrobial stewardship program in a healthcare facility – regardless of inpatient setting – will help ensure that hospitalized patients receive the right antibiotic, at the right dose, at the right time, and for the right duration. As a result, there is reduced mortality, reduced risks of *Clostridium difficile*-associated diarrhea, shorter hospital stays, reduced overall antimicrobial resistance within the facility, and cost savings. Despite all of these benefits, antimicrobial stewardship programs and interventions are far from the norm in U.S. hospitals today.

If everyone — healthcare providers, hospital administrators, policy makers, and patients — works together to employ effective prevention strategies and invest in antimicrobial stewardship programs, we can more effectively combat antibiotic resistance and ultimately save lives.
The Elephant in the Room: Decontaminating Glucometers
Glucometers

- Decontaminate after every use!
- See manufacturer’s recommendation re: product to use
- Be wary of manufacturer’s recommendations that are not in compliance with the OSHA bloodborne pathogens standard
Outbreaks of hepatitis B virus (HBV) infection associated with blood glucose monitoring have been identified with increasing regularity, particularly in long-term care settings, such as nursing homes and assisted living facilities, where residents often require assistance with monitoring of blood glucose levels and/or insulin administration.
CDC report - MMWR, 2005 relating to Nursing Homes A and B

- Obvious breaches in technique
“Glucose monitors, insulin vials, or other surfaces contaminated with blood from an HBV-infected person might have resulted in transfer of infectious virus to a health-care worker's gloves and to the fingerstick wound or subcutaneous injection site of a susceptible resident.”
Infection Prevention during Blood Glucose Monitoring and Insulin Administration

Summary
The Centers for Disease Control and Prevention (CDC) has become increasingly concerned about the risks for transmitting hepatitis B virus (HBV) and other infectious diseases during assisted blood glucose (blood sugar) monitoring and insulin administration.

CDC is alerting all persons who assist others with blood glucose monitoring and/or insulin administration of the following infection control requirements:

- Fingerstick devices should never be used for more than one person.
- Whenever possible, blood glucose meters should not be shared. If they must be shared, the device should be cleaned and disinfected after every use, per manufacturer’s instructions. If the manufacturer does not specify how the device should be cleaned and disinfected then it should not be shared.
- Insulin pens and other medication cartridges and syringes are for single-patient-use only and should never be used for more than one person.

Blood Glucose Monitoring and Insulin Administration
Monitoring of blood glucose levels is frequently performed to guide therapy for persons with diabetes. Blood glucose monitoring and insulin administration can be accomplished in two ways: self-monitoring of blood glucose and insulin administration, where the individual performs all steps of the testing and insulin administration themselves, and assisted monitoring of blood glucose and insulin administration, where another person assists with or performs testing and insulin administration for an individual.

Examples of settings where assisted monitoring of blood glucose and insulin administration may occur include:

- Hospitals or clinics
- Long term care settings such as nursing homes and assisted living facilities
- Senior centers
Safe Practices

• The entire lancet is disposable, one time use
• One meter per resident if possible
• If used between residents, decontamination of the meter:
  – Clean the meter
  – Disinfect the meter using an appropriate product
    • Hypochlorite (bleach) based OR
    • Disinfectant with EPA label as effective against HIV and HBV OR tuberculocidal
      – Follow wet contact time for the disinfectant
    • Place on a clean surface
  – Remove gloves and clean hands
  – Easiest solution – use appropriate disinfectant wipes - one for cleaning and one or more for disinfection observing the appropriate wet contact time
References


• SHEA *Guidelines for Preventing Nosocomial Transmission of Multidrug-Resistant Strains of Staphylococcus aureus and Enterococcus*. Infection Prevention & Hospital Epidemiology, May 2003, pp. 362–386

Thank you!!

- Questions?
- Comments?
- Discussion?

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