Superbugs: Integration of an Antimicrobial Stewardship Program in Post Acute Care Settings

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OBJECTIVES

• Identify the common superbug threats found in Post Acute care and their impact to the resident
• Discuss the CDC Fundamental Elements of an Antibiotic Stewardship Program
• Review the necessary steps to successfully implement a cross-functional Stewardship Program

CONTACT HOUR

Participants must complete entire activity. No partial credit will be awarded
Participants must submit a post event evaluation form
There is no conflict of interest for any planner or presenter

This continuing nursing education activity was approved by the Montana Nurses Association, an accredited approver by the American Nurses Credentialing Center's Commission on Accreditation
Dr. Hudson Garrett

Dr. Hudson Garrett is currently employed as the Vice President, Clinical Affairs for PDI, and is responsible for the global clinical affairs program and also the Medical Science Liaison program for all divisions within the company. He is a recognized international infection prevention and control expert. He has completed the Johns Hopkins Fellows Program in Hospital Epidemiology and Infectious Control, and the CDC Fundamentals of Healthcare Epidemiology program. He is board certified in family practice, critical care, vascular access, moderate sedation, and long-term care. He is the President of the Vascular Access Certification Corporation, President of the Southeastern Chapter of the Infusion Nurses Society, and the Chairperson for the Research Committee for the Association for the Healthcare Environment.

Correlations with CDAD

• Antibiotic exposure is the single most important risk factor for the development of Clostridium difficile associated disease (CDAD).
• Up to 85% of patients with CDAD have antibiotic exposure in the 28 days before infection.

Improvement is Possible

Antibiotic Rx for Hospitals

If

Then

30%

26%
Antibiotics are the only drug where use in one patient can impact the effectiveness in another. Antibiotics are a shared resource, and we must use them wisely. If everyone uses antibiotics properly, we will all benefit from them.

Using antibiotics properly is analogous to developing and maintaining good roads. If everyone does not use roads properly, we will all suffer the consequences.

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CDC Core Elements of Hospital Antibiotic Stewardship Programs

- Leadership Commitment
- Accountability
- Drug Expertise
- Action
- Tracking
- Reporting
- Education

Facilities work together to protect patients.

- Common Approach
- Independent Effort
- Coordinated Approach

Antibiotic Stewardship

- Stewardship Program Leader
- Prescriber Leaders and Partners
- Pharmacy Leader and Partners

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Changing Landscape of Healthcare

- Growing populations at risk
  - Immunocompromised individuals
  - Low birth weight, premature neonates
  - Transplant recipients on immunosuppressive therapy
  - Elderly & Patients with increased comorbidities
- Special environments
  - Intensive care and burn units
  - Long-term care, LTC
  - Ambulatory surgery, endoscopy, and infusion services

Times are Changing

Community Pathogens

Healthcare Pathogens

New issues today

- Zika Virus
- Ebola virus
- Enterovirus D68
- Measles
Changing Landscape of Healthcare

- Organizational factors affect HAI prevention
  - Administrative policies
  - Antimicrobial utilization
  - Staffing
  - Education
- Organism adaptation to its environment
- Increased prevalence of antimicrobial-resistant pathogens

New CDC estimates

MDRO’s are Epidemiologically Important Pathogens

Options for treatment are limited

MDRO’s are associated with:
- Increased lengths of stay
- Increased costs
- Increased morbidity and mortality

Can be transmitted in healthcare facilities

Source: Centers for Disease Control and Prevention Guideline for Control of Multidrug-Resistant Organisms in Healthcare Settings, 2006.
SUPER BUGS?
MRSA (Methicillin Resistant *Staph aureus*)
CRE (Carbapenem-Resistant Enterobacteriaceae)
ACINETOBACTER sp.
CDIFF (*Clostridium difficile*)
NOROVIRUS

CURRENT ORGANISMS OF CONCERN ??

Evolution of Drug Resistance in *S. aureus*

<table>
<thead>
<tr>
<th>Drug Resistance</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penicillin</td>
<td>1950</td>
</tr>
<tr>
<td>Penicillin-resistant <em>S. aureus</em></td>
<td>1970</td>
</tr>
<tr>
<td>Methicillin</td>
<td>1990</td>
</tr>
<tr>
<td>Methicillin-resistant <em>S. aureus</em> (MRSA)</td>
<td>2002</td>
</tr>
<tr>
<td>Vancomycin</td>
<td>1997</td>
</tr>
<tr>
<td>Vancomycin-resistant enterococci (VRE)</td>
<td>2002</td>
</tr>
</tbody>
</table>


Examples of How Antibiotic Resistance Spreads

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antibiotics given in hospital setting</td>
<td>Bacteria in the body</td>
</tr>
<tr>
<td>Antibiotics given orally</td>
<td>Bacteria in the gut</td>
</tr>
<tr>
<td>Drug-resistant bacteria on food</td>
<td>Bacteria on food</td>
</tr>
<tr>
<td>Drug-resistant bacteria on soil</td>
<td>Bacteria on soil</td>
</tr>
<tr>
<td>Drug-resistant bacteria on hospital staff</td>
<td>Bacteria on hospital staff</td>
</tr>
<tr>
<td>Drug-resistant bacteria on environment</td>
<td>Bacteria on environment</td>
</tr>
</tbody>
</table>

Simply using antibiotics creates resistance. These drugs should only be used to treat infections.
VISA: Vancomycin Intermediate S. aureus
VRSA: Vancomycin Resistant S. aureus

Persons with VISA/VRSA typically have:
- Underlying health conditions (such as diabetes and kidney disease)
- Previous infections with MRSA
- Intravenous (IV) long term catheters
- Recent hospitalizations
- Recent/multiple exposure to Vancomycin and other antimicrobial agents

Treatment is much more difficult without the benefit of Vancomycin


TIME ABOVE THE MEAN INHIBITORY CONCENTRATION (MIC)
- THERAPEUTIC LEVELS OF DRUG
- PRESCRIBED TIME
- CORRECT DOSING FOR BODY WEIGHT
ESBL and CRE

**ESBL**: Extended-Spectrum Beta Lactamase-Producing gram-negative bacteria

**CRE**: Carbapenem Resistant Enterobacteriaceae

**Cause variety of infections:**
- Pneumonia
- Bloodstream Infections
- Wound infections
- Resistant to many antibiotics and difficult to treat

Source: APIC Text, Association for Professionals in Infection Control and Epidemiology, 2009.

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**Why the hype on CRE?**

- **High mortality rate**
- **Easily spread by contact**
- **Transfer antibiotic resistance**

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**ESBL**

- Gram negative organisms that produce an enzyme called beta-lactamase that causes resistance to these antibiotics:
  - Penicillins
  - Cephalosporins (1st, 2nd, 3rd & 4th generation) (Keflex, cefepine)
  - Monobactams (Azactam)
  - One or more Carbapenems
- Can usually be treated with one of the Carbapenems:
  - Meropenem, Imipenem, Ertapenem, Doripenem
- Commonly isolated from:
  - abscesses, blood, catheter tips, lungs, sputum, peritoneal fluid
- Risk Factors include:
  - Recent surgery or instrumentation, admission to ICU, recent Abx therapy (esp. Beta lactams), prolonged hospital stay

Source: APIC Text, Association for Professionals in Infection Control and Epidemiology, 2009.
CRE
- Gram negative organisms that produce one type of beta-lactamase enzyme called carbapenemase.
- Occurs typically in the Enterobacteriaceae family of bacteria
- Confers resistance to all currently available antibiotics, including Carbapenems
- Carbapenem Resistant Enterobacteriaceae
- Most common CRE is: Klebsiella pneumoniae - KPC

Source: CDC MMWR, Vol. 58 No. 10 3/20/09

TRANSFER OF RESISTANCE

Source: www.naid.nih.gov

History of antibiotic discovery and concomitant development of antibiotic resistance.

**ACINETOBACTER sp.**
- Gram negative bacilli
- Found in water and soil
- Can live on healthy dry human skin
- Survive on surfaces for one month
- Infection can be a result of colonization
- Inherently resistant to most antibiotics
- Has a low virulence and does not typically cause infection
- Can cause pneumonia in vented patients


**CLOSTRIDIUM DIFFICILE**
- Anaerobic spore-forming bacteria in your intestines
- Normal bacteria in our intestines keep C. diff under control
- When antibiotics are taken, the levels of good bacteria are reduced and C. diff becomes prevalent


**CLOSTRIDIUM DIFFICILE**
- C. difficile is the chief cause of health care-acquired infectious diarrhea
- Outbreaks reported in health care facilities and in the community caused by a new virulent strain of C. difficile throughout North America
- Spores survive long periods of time (5 months) in the environment and may be transmitted to others

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NOROVIRUS

- *Norovirus* is a small non-enveloped virus and is the most common agent of acute gastroenteritis causing outbreaks in areas of close contact.
- Symptoms of infection include fever, nausea, vomiting, cramping, malaise, & diarrhea
- Illness is typically self-limiting for 2-5 days
- Immunity after infection is strain-specific with limited duration of several weeks.


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NOROVIRUS

- Norovirus infection results from exposure to direct or indirect fecal contamination on fomites (surfaces), ingestion of contaminated food/water, or exposure to vomiting aerosols can readily cause infection.
- This small non-enveloped virus is difficult to kill with household cleaners and many disinfectants.
- This can lead to multiple and persisting outbreaks in close quarter community settings.


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HOW DOES TRANSMISSION OCCUR?

- Patient
- Healthcare Worker
- Patient Care Equipment
- Environmental Surfaces

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**Chain of Infection**

1. **Infectious Agent**
2. **Susceptible Host**
3. **Reservoir**
4. **Portal of Entry**
5. **Mode of Transmission**
6. **Portal of Exit**


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**Active Surveillance**

- Active surveillance helps identify not only infected but also colonized persons

Source: Hand Hygiene Core-Supplemental Slides, Centers for Disease Control and Prevention, 2005.

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**Hand Hygiene**

- Wash hands with soap and water:
  - If visibly soiled with blood or other body fluids, before eating, after using the restroom, C. difficile infection

- Use alcohol based hand sanitizer to decontaminate hands.
  - Before direct patient contact, after contact with patient’s intact skin (i.e., vitals, repositioning), after contact with objects in the patient’s environment, after removing gloves

- **Patient and Visitor Hand Hygiene**
  - Educate the patient and provide access to hand hygiene
  - Educate families and other visitors, engage active participation

Source: Hand Hygiene Core-Supplemental Slides, Centers for Disease Control and Prevention, 2005.
Environmental Disinfection

- Clean and disinfect surfaces and equipment that may be contaminated with pathogens
- Those that are in close proximity to the patient (e.g., bed rails, bedside tables, portable supply trays)
- Frequently-touched surfaces in the patient care environment (e.g., door knobs, surfaces in and surrounding toilets in patients or resident rooms).

Surface Disinfectant Claims

**Label Claims**
- Broad Spectrum for bacteria
- Viruses (non-enveloped and enveloped)
- Multi-Drug Resistant Organisms
- Pathogenic Fungi
- Bloodborne Pathogens (HIV, HBV, HCV)

**Directions for Use**
- Concentration of the product (liquid dilution)
- Exposure time to disinfectant (contact time)
- Contact time stated by manufacturer for all organisms on label claim
- Nature of object to be cleaned/disinfected
- Temperature and relative humidity

Contact Precautions

Everything in the room should be considered contaminated
- Appropriate barrier PPE for activities
- Remove PPE prior to leaving
- Hand hygiene after removing PPE
- Enter Clean / Leave Clean

Source: Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings, Centers for Disease Control and Prevention, 2007
Monitoring and Compliance
• Develop Measures
  – Observation of adherence to protocols and practice, contact precautions, hand hygiene
  – New Infections
  – Organism prevalence
  – Microbiological Antibiograms Resistance Trends
• Collect Data
• Analyze Data
• Present Findings
• Develop strategies for improvement

Team Collaboration toward changes and success
• Utilize a TEAM APPROACH
• Define your GOAL
• Work toward your END RESULT
• Celebrate your SUCCESS

SUPER BUGS...
“Survival of the fittest”
Realize they are here to stay
  ▪ In the environment
  ▪ In all healthcare facilities
  ▪ In or on ourselves

Practice Prevention Methods
Culture change

“Many infections are inevitable; some might be preventable”

“Each infection is potentially preventable, unless proven otherwise”

References


CDC Guidelines for Environmental Infection Control in Healthcare Facilities. MMWR 2003;52(RR 10):1-42. Available at: http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5210a1.htm


References


• http://www.cdc.gov/hai/toolkits/Evaluating-Environmental-Cleaning.html

• http://www.cdc.gov/hai/organisms/organisms.html

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References


CDC Guidelines for environmental infection control in healthcare facilities. MMWR 2003;52(RR 10):1-42. Available at: http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5210a1.htm.


Resources

- www.ahrq.gov
- www.cdc.gov/hai
- www.hhs.gov
- www.epa.gov
- www.fda.gov
- www.apic.org
- www.ahe.org

Questions and Answers

- Whose Infection will you prevent when you return to your institution?
- How will you approach HAI prevention differently in LTCFs?

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- Email: Hudson.garrett@nadona.org
- Visit: www.nadona.org for more information