Road to Success: A Multi-Faceted Approach to Antibiotic Stewardship

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Director of Infection Control
Rockport Healthcare Services
Disclosures

• I have nothing to disclose
Objectives

• At the end of this session, participants will:
  – Understand the current urgency to developing an Antibiotic Stewardship Program (ASP)
  – Be able to understand how to utilize the CDC Core Elements of an ASP in Nursing Homes
  – Be able to describe the challenges for implementing a stewardship program
  – Be able to discuss opportunities for process improvement utilizing laboratory tools in stewardship efforts
Change is inevitable...........

“It is not the strongest of the species that survives, nor the most intelligent, but the one most responsive to change.”

Charles Darwin
Did you know?

- 25-75% of systemic antimicrobial use and 60% of topical use of antimicrobial use in long-term care is considered inappropriate\(^1\)\(^3\)
- 30% of antimicrobial use in acute care is either inappropriate or suboptimal\(^2\)\(^3\)
- Studies have found that 70% of residents in LTCFs will receive at least one course of antibiotics each year\(^3\)

3 Trivedi K, MD. Approaches to antimicrobial stewardship in LTC. September 2014
Infections and Antibiotic Use in Adult Long-Term Care Facilities

• Single day survey
  – Infection prevalence was 5.3% and incidence rate of 3.6-5.2 per 1000 resident days

• A literature review of 156 articles:
  – 47-79% of Long-Term Care Facility’s (LTCF) residents exposed to ATBs in 12 month period
  – 25-75% of courses of ATB considered to be inappropriate

6 Smith PW, et al. Infect Control and Hosp Epi, 32 (2011);732-34
Orange County CDI Collaborative – Facilities
“Connectedness”
Could We Return to the Preantibiotic Era?

Photo credit: CDC/ Barbara Jenkins, NIOSH.
CARBAPENEMASE-PRODUCING CRE IN THE UNITED STATES


CDC, unpublished data

Nov 2006
States with KPC-producing Carbapenem-resistant Enterobacteriaceae (CRE)

This map was last updated on February 2015

Reported to the Centers for Disease Control and Prevention (CDC) as of February 2015

Antibiotic exposure is the major risk factor for *Clostridium difficile* infection (CDI).\(^8\) or CDI risk are observed with increased cumulative dose, number of antibiotics (ATB), and days of ATB therapy.\(^8\)

### Risk of CDI compared to resident on 1 antibiotic

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<thead>
<tr>
<th>Number of ATBs</th>
<th>2</th>
<th>3-4</th>
<th>5+</th>
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<td>2.5 times higher</td>
<td>3.3 times higher</td>
<td>9.6 times higher</td>
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</table>

### Risk of CDI compared to resident on ATB <4 days

<table>
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<tr>
<th>Days of ATBs</th>
<th>4-7</th>
<th>8-18</th>
<th>&gt;18</th>
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<td>1.4 times higher</td>
<td>3.0 times higher</td>
<td>7.8 times higher</td>
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\(^8\) Epson, E. Orange County CDI Prevention Collaborative: Antimicrobial Stewardship. CDPH. August 31, 2015

# Cost of Antimicrobial-resistant Infections (ARI)

<table>
<thead>
<tr>
<th></th>
<th>All Patients</th>
<th>Patients with ARI</th>
<th>Patients without ARI</th>
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<tr>
<td>n (%)</td>
<td>1391</td>
<td>188 (13.5)</td>
<td>1203 (86.5)</td>
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<tr>
<td>APACHE II score</td>
<td>42.1</td>
<td>54.8*</td>
<td>40.1*</td>
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<tr>
<td>LOS (days)</td>
<td>10.2</td>
<td>24.2*</td>
<td>8.0*</td>
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<tr>
<td>HAI (n)</td>
<td>260</td>
<td>135*</td>
<td>125*</td>
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<td>Cost per day ($)</td>
<td>1651</td>
<td>2098*</td>
<td>1581*</td>
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<td>Total cost ($)</td>
<td>19,267</td>
<td>58,029*</td>
<td>13,210*</td>
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<tr>
<td>Death [n (%)]</td>
<td>70</td>
<td>34 (18.1)*</td>
<td>36 (3.0)*</td>
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*p<0.001

ASP Regulations

• Senate Bill 361 for California: passed October 2016
  – Mandate for stewardship in LTCFs began January 1, 2017

• CMS Requirements of Participation for LTCFs finalized October 2016
  • Mandates all states have a Stewardship Program in place by November 2017

• Survey citations:
  – F-441 infection prevention
  – F-329 unnecessary medication
Core Elements

- Identify champions to lead your stewardship efforts (medical director, pharmacy consultant)
- Assign responsibility for overseeing activities in your facility
- Involve pharmacist or physician with drug expertise for ASP
- Choose a focus for your activities
- Monitor one process and correlate to outcomes observed through tracking
- Provide feedback to all providers in your facility as well as to your staff
- Educate families, clinicians, and nursing staff on your practices to improve antibiotic use
Leadership

• Formal, written statement in support of improving antibiotic use
• Communicate ASP program, monitor and enforce policies for ASP
• Create a culture which promotes stewardship
Accountability

- Empower your Stewardship director and ASP committee to set standards for antibiotic prescribing
- Empower Director of Nursing and Infection Preventionist (IP) to set practice standards for assessing, monitoring, and communicating changes in a resident’s condition by front-line staff
- Involve Pharmacist to report antibiotic data
Accountability (2)

• IP to review antibiotic resistance patterns, collect and analyze infection surveillance data

• Laboratory support for Multi-drug Resistant Organisms (MDRO) alert system, education and creation of antibiogram
Drug Expertise

• Involve consultant pharmacist trained in infectious disease (ID) or antibiotic stewardship
• Consider collaborating with acute care hospital ASP leaders
• Develop relationships with ID consultants to support your facilities stewardship efforts
Action

• Policies:
  – Documentation of 5 D’s
    • Doctor, drug, dose, duration, & diagnosis
  – Develop treatment recommendations based on guidelines and local susceptibility reports
  – Establish best-practices for your facility for use of microbiology testing
    • Over-use can lead to unnecessary ATBs
  – Review antibiotic agents on site
Actions (2)

- Interventions:
  - Develop and implement algorithms for assessment of residents suspected to have infection
  - Consider offering physician 48-hour observation period as an alternative to empiric ATB therapy
  - Utilize your antibiogram
  - Antibiotic time-out (review ATB at 48-72 hours)
  - Reduce prolonged ATB treatment courses for common infections
48- Hour Observation Order Set Example

• Vitals signs to be checked (TPR, BP, Pulse ox) every_______ for 48 hours
• Record fluid intake each for shift
• Notify physician if fluid intake is less than___
• Offer resident ___ ounces of water/juice every ___ hours
• Contact physician/NP with an update on _______
### Sample Empiric Therapy Developed from Facility Antibiogram for UTI

<table>
<thead>
<tr>
<th>Infection/Diagnosis</th>
<th>Likely Pathogen</th>
<th>JHA Initial Treatment</th>
<th>IDSA Empiric Treatment</th>
<th>Alternative Treatment/Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cystitis (UTI) uncomplicated</td>
<td><em>E. coli, Klebsiella, Staph aureus, coagulase negative staph</em></td>
<td>Cephalexin 250-500mg PO q6h x 3-7 days</td>
<td>Bactrim DS 1 tablet BID x 3 days</td>
<td>Penicillin allergy: Bactrim DS 1 tablet BID x 3 days</td>
</tr>
<tr>
<td>Cystitis (UTI) complicated</td>
<td><em>E. coli, Klebsiella, Staph aureus, coagulase negative staph</em></td>
<td>Cephalexin 250-500mg PO q6h x 7-14 days</td>
<td>Ciprofloxacin or Levofloxacin x 5-10 days</td>
<td>Penicillin allergy: Bactrim DS 1 tablet x 7 days</td>
</tr>
<tr>
<td>Pyelonephritis Uncomplicated</td>
<td>MRSA, <em>Enterobacteriaceae</em> (<em>E. coli, Klebsiella, Proteus, Enterococcus</em>)</td>
<td>Piperacillin/Tazobactam 2.25mg IV q6h</td>
<td>Ciprofloxacin or Levofloxacin (use only if <em>E. coli</em> sensitivity is &gt;80% OR ↓)</td>
<td>Penicillin allergy: Aztreonam 500mg-1g IV q8-12h and Vancomycin IV (per pharmacy protocol)</td>
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<tr>
<td>Pyelonephritis Complicated (Foley, instrumentation, Underlying disease)</td>
<td><em>Enterobacteriaceae</em> (<em>E. coli, Klebsiella, Proteus, Pseudomonas, Enterococci</em>), Staph spp.</td>
<td>Piperacillin/Tazobactam 2.25mg IV q6h</td>
<td>Bactrim DS 1 Tablet PO BID (use only if <em>E. coli</em> sensitivity &gt;80%)</td>
<td>Remove change Foley/nephrostomy tube</td>
</tr>
</tbody>
</table>

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11 This table was developed by the pharmacy department at Los Angeles Jewish Home for the Aging – Joyce Eisenberg Keefer facility. Permission to use this table granted by Jewish Home Organization July 29, 2016, Administrator Ilana Grossman. Acknowledgment given to Janice Hoffman PharmD, Florenda Shakir RN, Fatemeh Pournahavandi PharmD Candidate 2017 and Shokoofeh (Nasha) Namiranian PharmD Candidate 2017.
Actions (3)

• Diagnosis and infection specific interventions to consider:
  – Reduce ATB use in asymptomatic bacteriuria (ASB)
  – Reduce antibiotic prophylaxis for prevention of urinary tract infections (UTI)
  – Optimize use of laboratory testing when change in mentation alone is the only presenting symptom
  – Optimize use of superficial cultures for management of chronic wounds
Tracking

• Monitor documentation for antibiotic use and clinical assessments to support use of ATB (process measures)

• Track new ATB starts
  – Be sure there is a stop date!

• Track ATB days of therapy per 1000 resident days (outcome measures)
Reporting

• Share facility-specific reports on ATB use with prescribers
  – Consider generating report which compares each prescriber’s ordering patterns to another

• Distribute antibiograms to providers and nursing staff
  – Educate nurses on how to use the antibiogram

• Involve pharmacist with direct communication with prescribers about how to improve ATB prescribing
Antibiotic Prescribing Patterns-March 2017

<table>
<thead>
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<th></th>
<th>Doctor A</th>
<th>Doctor B</th>
<th>Doctor C</th>
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<td>Total</td>
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<td>11</td>
<td>6</td>
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</table>
Education

• Provide education to residents, families, nursing staff and providers
CHALLENGES FOR ASP IMPLEMENTATION

• Aging associated changes
• Institutional exposure
• Underlying co-morbidities which has greater risk for infection
• Increased use of invasive devices
• Pressure from resident families to order ATBs
• High prevalence of colonization of skin, urine and oropharynx (cultures often positive in absence of infection)
• Limited resources

**CHALLENGES FOR ASP IMPLEMENTATION**
(continued)

- Physicians not always on premises and may not see the resident before ATBs are prescribed
- Physicians may have reservations that their resident may be forgotten (if ATB not ordered), and early signs of sepsis may be missed if the ATB is not ordered
- Diagnostic services are off site
- Resident’s lack of ability to communicate symptoms
- Atypical presentation of infection in the elderly and frail
CHALLENGES FOR ASP IMPLEMENTATION (continued)

- On-call physician is often the one who receives the original “change-of-condition” report from nursing staff
- Pressure from resident and family members to order diagnostic tests and antibiotics
- Litigation concerns
NURSING CHALLENGES

- The IP in LTC usually wears many hats
- Turnover of staff within facility is high
- High turnover of the designated IP
  - Lack of formal training of IP for infection control duties
- Lack of adequate time to perform all duties
LABORATORY TESTING CONSIDERATIONS

- Assess the rationale for urinalysis and culture & sensitivity (C&S) orders\(^{14,15}\)
  - Are non-specific changes driving urine testing? (i.e. mental confusion, cloudy urine)\(^{14}\)
  - Consider asking physician to order tests as UA, C&S, IF INDICATED


\(^{15}\) Consultative collaboration between Dr. Rekha Murthy, Dr. Jake Scott, from Cedars Sinai (Cedars Sinai ASP Project), Dr. Amanda Kamali (CDC) and Dolly Greene (Diagnostic Laboratories). November 9, 2015. Written permission to use this slide from Dr. Murthy
Laboratory Testing (2)

- Assess specimen collection practices before ATB started\(^1\)
  - Poor collection practices can lead to false positive results\(^1\)
  - Are follow-up or “test-for-cure” cultures ordered?
  - Diagnostic tests can be positive without being clinically significant\(^{14}\)
  - Diagnostic tests which are positive may indicate colonization rather than infection but still drive ATB treatment\(^{14}\)
Tools

• CDC Core Elements checklist

• SBAR

• Antibiograms

• Develop laboratory data metrics for tracking stewardship efforts
SBAR

• Communication tool
• Provides guidance to nurse on what information should be reported to physician for better treatment outcomes
• Allows for opportunity for nurse to make suggestions to physician on how to proceed
What’s an Antibioticogram?
WHAT IS AN ANTIBIOGRAM USED FOR?

• An antibiogram is an essential tool for any clinician when treating an infection empirically
  ○ Empiric treatment occurs prior to determination of a causative bacterial agent
• An antibiogram can serve as an alternative to a C&S report until the results of a C&S are available
• An antibiogram can serve as an alternative to a C&S report if no organism is grown out of a C&S despite high clinical suspicion of an infection
The greater the number of isolates, the more accurate the sensitivity results for the given organism. Minimum should be 10-30.

### Parts of an Antibiogram

#### Number of Isolates

<table>
<thead>
<tr>
<th>Antigen</th>
<th>Aerococci oxygeniserae</th>
<th>Enterococci</th>
<th>Coagulase negative Staphylococci</th>
<th>Staphylococci aurea</th>
<th>E. coli</th>
<th>Enterococci on ESBL positive</th>
<th>K. pneumonia</th>
<th>M. morganii</th>
<th>Pro. vulgaris</th>
<th>S. aurea resistant</th>
<th>S. aurea methicillin resistant</th>
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**Antibiogram Implementation**

- Only a patient’s treating physician or non-physician practitioner can determine if and when empiric antibiotic treatment should be implemented.
- Once this decision is made, an antibiogram provides information on the expected efficacy of specific antibiotics based upon the facility’s current and historic susceptibility data.
- Proper use of an antibiogram may lead to higher levels of empiric efficacy, thus faster treatment, and better patient clinical outcomes leading to potential financial savings as well.
Cedars Sinai Medical Center (CSMC) started an ASP with their network of 8 skilled nursing facilities.

- The CSMC team visited each facility and assessed their infection control practices.
- The team assessed how orders were given for ATBs and the frequency of developing CDI.
- Antibiograms were reviewed.
### Cedars Sinai Medical Center Metrics

<table>
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<th>Metric</th>
<th>Description</th>
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<tbody>
<tr>
<td>Number of urine tests ordered</td>
<td>Number of urine tests negative</td>
</tr>
<tr>
<td>Number of ATBs ordered for colony counts under 100,000</td>
<td>Number of ATBs ordered for events that DNMC</td>
</tr>
<tr>
<td>Number of ATB ordered empirically</td>
<td>Number of days of ATB therapy</td>
</tr>
<tr>
<td>Number of UA CS, if indicated</td>
<td>Number of positive <em>Clostridium difficile</em> tests ordered</td>
</tr>
<tr>
<td>Number of new MDROs identified</td>
<td>Number of urine tests ordered</td>
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17 Consultative collaboration between Dr. Rekha Murthy, Dr. Jake Scott, from Cedars Sinai (Cedars Sinai ASP Project) Dr. Amanda Kamali (CDC) and Dolly Greene (Diagnostic Laboratories). November 9, 2015. Written permission to use this slide from Dr. Murthy
<table>
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<th>Baseline</th>
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<tbody>
<tr>
<td>Number of cultures ordered</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of negative cultures</td>
<td></td>
<td></td>
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<tr>
<td>Number of antibiotics ordered for urinary tract events</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of ATBs ordered for low colony count (( \downarrow 10^5 ) less than 100,000 colonies)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Number of ATBs for multiple organisms on culture</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of cases that met McGeer's Criteria on ATBs</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Number of ATB orders for residents with mental confusion only without localized urinary tract symptoms</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of ATBs ordered empirically</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number UTI days of ATB therapy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number ATBs inappropriate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of UA and CS, if indicated</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Clostridium difficile tests ordered</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of positive Clostridium difficile results</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of new MDROs identified</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
## Sequential Quarterly Results – Facility 1

<table>
<thead>
<tr>
<th>Scottsdale XXXX YYYY</th>
<th>4Q2014</th>
<th>1Q2015</th>
<th>2Q2015</th>
</tr>
</thead>
<tbody>
<tr>
<td># Urine C&amp;S orders</td>
<td>56</td>
<td>31</td>
<td>37</td>
</tr>
<tr>
<td># Urine C&amp;S positive</td>
<td>39</td>
<td>15</td>
<td>19</td>
</tr>
<tr>
<td># Antibiotic Rx</td>
<td>24</td>
<td>12</td>
<td>5</td>
</tr>
<tr>
<td># Rx with low colony count</td>
<td>10</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td># Meeting standardized clinical criteria</td>
<td>1</td>
<td>(7)</td>
<td>1</td>
</tr>
<tr>
<td># Days of Antibiotic Therapy (DOT)</td>
<td>186</td>
<td>88</td>
<td>36</td>
</tr>
<tr>
<td># Days of Inappropriate Therapy (IDOT)</td>
<td>TBA</td>
<td>TBA</td>
<td>TBA</td>
</tr>
<tr>
<td># Antibiotic Rx - empiric</td>
<td>TBA</td>
<td>TBA</td>
<td>TBA</td>
</tr>
<tr>
<td># C. difficile orders</td>
<td>10</td>
<td>8</td>
<td>3</td>
</tr>
</tbody>
</table>
PEARLS OF AN ASP

Things to consider when resident is confused:

- D- Drugs (new medication, changes in dosage) or discomfort
- E- Ear, Eyes, Environment (check hearing aids, glasses), emotions
- L- Low oxygen (heart attack, or stroke)
- I- Infection (pneumonia, symptomatic UTI, cellulitis)
- R- Retention (constipation, urinary retention)
- I- Ictal state (seizure)
- U- Under (dehydrated, malnutrition)
- M- Metabolic (diabetes, check blood sugar)
- S- Subdural hematoma (head trauma, fall)

18 Delirium, “An Old Word with a New Importance”.
http://www.unmc.edu/media/intmed/geriatrics/lectures/delirium.htm
Share the Data

• Develop relationship with your acute care partners
• Participate in collaboratives with Public Health partners
• You are not alone!
• Share your data
  – Give regular feedback to your team
• Data is most powerful when shared!
“Synergy is better than my way or your way”

Stephen Covey
American educator, author, and businessman
In Summary..........

• Over utilization and inappropriate use of antibiotics contributes to the increasing problem of multi-drug resistant microorganisms
• We are running out of antibiotics to treat the most serious infections
• Utilize the tools available for antibiotic stewardship programs
• Engage all members of your team e.g., medical directors, pharmacist, DON, IP, nurses, families and residents.
Antibiotic Stewardship is a Team Sport!
Questions??????

Thank You