Antimicrobial Stewardship in the Long-Term Care Setting

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I, Spencer Durham, have no actual or potential conflict of interest in relation to this program.
• At the end of the presentation, the audience will be able to:
  – Understand the reasons for resistant infections in the LTC setting and identify patient specific factors that contribute to infections
  – Correctly interpret the antibiogram from a LTCF
  – Describe techniques for providing antimicrobial stewardship in the LTC setting
  – Utilize the SNAP approach to antimicrobial stewardship to work through real life cases
"The thoughtless person playing with penicillin treatment is morally responsible for the death of the man who succumbs to infection with the penicillin-resistant organism. I hope this evil can be averted."

- Sir Alexander Fleming
What is Antimicrobial Stewardship?

• “Stewardship” – the activity or job of protecting and being responsible for something

• Antimicrobial stewardship involves taking responsibility for the management of antimicrobials with the goal of using them most appropriately
What is Antimicrobial Stewardship?

• Antimicrobial stewardship encompasses numerous strategies:
  – Utilizing narrow-spectrum antibiotics
  – IV to PO conversions
  – Renal dose adjustments
  – Cost effectiveness
• Per the Infectious Disease Society of America (IDSA):
  – “Coordinated interventions designed to improve and measure the appropriate use of antimicrobials by promoting the selection of the optimal antimicrobial drug regimen, dose, duration of therapy, and route of administration.”
  – “Antimicrobial stewards seek to achieve optimal clinical outcomes related to antimicrobial use, minimize toxicity and other adverse events, reduce the costs of health care for infections, and limit the selection for antimicrobial resistant strains.”
Why is Antimicrobial Stewardship Important?

- Multidrug-resistant organisms (MDROs) are increasing at an alarming rate
- 2 million illnesses and 23,000 deaths associated with antibiotic-resistant bacteria annually
- In May 2016, colistin-resistant *E. coli* was first reported in the U.S.
- Misuse of antimicrobial agents is the major contributing factor to disseminated resistance
• California is the first and only state to legislate antimicrobial stewardship
• Bill passed in 2008
  – Requires all acute care hospitals to develop a process for monitoring appropriate use of antibiotics
  – Must be monitored by a quality improvement committee
• California Senate Bill 1311 – Adopted September 2014
  – Requires hospitals to implement stewardship programs in accordance with nationally established guidelines
  – Create a physician-supervised multidisciplinary committee with at least one physician OR pharmacist with training in abx stewardship
• Also in September 2014, presidential Executive Order “Combating Antibiotic-Resistant Bacteria,” was implemented
  – Requires federal agencies to review existing policies and propose new policies to require hospitals to implement stewardship programs
  – Agencies will also help implement programs in the outpatient and long-term care facilities
• California Senate Bill 361 mandates all skilled nursing facilities to adopt an antimicrobial stewardship program by January 1st, 2017
• Centers for Medicare and Medicaid Services (CMS)
  – Movement towards requiring antimicrobial stewardship as a condition for participation
  – President’s Council of Advisors on Science and Technology (PCAST) report recommended antimicrobial stewardship be mandatory by 2017
  – Not in place yet, but very likely to happen in the future
• Centers for Medicare and Medicaid Services (CMS)
  – June 2016 – Issued a proposed rule to promote stewardship in hospitals
    • 60 day comment period for the proposed rule
  – Requires hospital-wide infection prevention and stewardship program
  – Designate qualified leaders to implement the measures for infection prevention
Barriers in the LTCF

• ~4 million patients live in or will be admitted to a LTCF each year
• Antibiotics are the most common medication prescribed in these facilities
  – 7 out of 10 patients will receive at least one course of antibiotics
• 40-75% of antibiotic prescriptions are either unnecessary or written incorrectly
Barriers in the LTCF

• Many antibiotics in the LTCF are prescribed for colonization as opposed to true infections
  – Urinary tract
  – Respiratory tract

• CDC recommends working with a consultant pharmacist who has background or training with antimicrobial stewardship
Barriers in the LTCF

• Lack of ID providers
  – Most LTCFs do not routinely have ID support
  – Providers are generally family medicine, internal medicine, or mid-level providers

• Lack of ID pharmacist specialists

• Time and effort
  – Other things seen as more of a priority
• Lack of laboratory data
  – Cultures may not be ordered as frequently in the LTC setting as in the acute care setting
  – Labs may be send outs
• Practitioners may be less willing to accept pharmacist recommendations
Resistant Infections in the LTCF

• Many patients come from the acute care setting, where they may have acquired a MDRO

• Multiple treatment courses for similar conditions
  – UTIs
  – Pneumonias
  – SSTIs
Resistant Infections in the LTCF

• Overuse of unnecessary broad-spectrum antimicrobials
  – Fluoroquinolones
  – Upper generation cephalosporins
  – Extended-spectrum penicillins

• Patient population
  – Geriatric
  – Weaker immune systems
  – Multiple comorbidities
Antibiogram

• Antibiogram – periodic summary (usually one year) of antimicrobial susceptibilities from local isolates (usually those of a specific hospital or health system)

• Used for:
  – Selection of empiric antimicrobial therapy
  – Monitor for trends in resistance
## Antibiogram

<table>
<thead>
<tr>
<th></th>
<th><em>Escherichia coli</em></th>
<th><em>Klebsiella pneumoniae</em></th>
<th><em>Proteus mirabilis</em></th>
<th><em>Pseudomonas aeruginosa</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Amikacin</td>
<td>99</td>
<td>100</td>
<td>100</td>
<td>96</td>
</tr>
<tr>
<td>Ampicillin/sulbactam</td>
<td>63</td>
<td>88</td>
<td>89</td>
<td>-</td>
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<tr>
<td>Ampicillin</td>
<td>42</td>
<td>-</td>
<td>84</td>
<td>-</td>
</tr>
<tr>
<td>Aztreonam</td>
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<td>96</td>
<td>98</td>
<td>76</td>
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<tr>
<td>Cefazolin</td>
<td>89</td>
<td>93</td>
<td>89</td>
<td>-</td>
</tr>
<tr>
<td>Cefepime</td>
<td>96</td>
<td>96</td>
<td>98</td>
<td>82</td>
</tr>
<tr>
<td>Ceftazidime</td>
<td>94</td>
<td>95</td>
<td>97</td>
<td>79</td>
</tr>
<tr>
<td>Ceftriaxone</td>
<td>96</td>
<td>96</td>
<td>97</td>
<td>-</td>
</tr>
<tr>
<td>Doripenem</td>
<td>99</td>
<td>100</td>
<td>100</td>
<td>92</td>
</tr>
<tr>
<td>Gentamicin</td>
<td>94</td>
<td>97</td>
<td>83</td>
<td>84</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>70</td>
<td>85</td>
<td>72</td>
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<td>Levofoxacin</td>
<td>72</td>
<td>95</td>
<td>69</td>
<td>57</td>
</tr>
<tr>
<td>Piperacillin/tazobactam</td>
<td>98</td>
<td>96</td>
<td>99</td>
<td>85</td>
</tr>
<tr>
<td>Trimeth/sulfa</td>
<td>74</td>
<td>86</td>
<td>73</td>
<td>-</td>
</tr>
</tbody>
</table>

(-) = Not Applicable or Not Tested
## Antibiogram

<table>
<thead>
<tr>
<th></th>
<th><strong>MRSA</strong></th>
<th><strong>Staphylococcus Aureus (MSSA)</strong></th>
<th><strong>Enterococcus faecalis</strong></th>
<th><strong>VRE</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cefazolin</strong></td>
<td>-</td>
<td>100</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Clindamycin</strong></td>
<td>71</td>
<td>73</td>
<td>-</td>
<td>-</td>
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<tr>
<td><strong>Erythromycin</strong></td>
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<td>-</td>
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<tr>
<td><strong>Gentamicin</strong></td>
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<td>95</td>
<td>-</td>
<td>-</td>
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<td><strong>Levofloxacin</strong></td>
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<td><strong>Linezolid</strong></td>
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<td>100</td>
<td>100</td>
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<tr>
<td><strong>Penicillin</strong></td>
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<td>-</td>
<td>86</td>
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<tr>
<td><strong>Rifampin</strong></td>
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<td>-</td>
<td>-</td>
</tr>
<tr>
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<tr>
<td><strong>Tigecycline</strong></td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>-</td>
</tr>
<tr>
<td><strong>Trimeth/Sulfa</strong></td>
<td>99</td>
<td>98</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Vancomycin</strong></td>
<td>100</td>
<td>100</td>
<td>91</td>
<td>0</td>
</tr>
</tbody>
</table>

(\(-\) = Not Applicable or Not Tested)
Urine Culture: >100,000 CFUs *Escherichia coli*

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>SUSC</th>
<th>INTP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ampicillin</td>
<td>&gt;=8</td>
<td>R</td>
</tr>
<tr>
<td>Ampicillin/sulbactam</td>
<td>&gt;=8</td>
<td>R</td>
</tr>
<tr>
<td>Cefazolin</td>
<td>16</td>
<td>R</td>
</tr>
<tr>
<td>Cefepime</td>
<td>&lt;=1</td>
<td>S</td>
</tr>
<tr>
<td>Ceftriazone</td>
<td>&lt;=1</td>
<td>S</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>&lt;=2</td>
<td>S</td>
</tr>
<tr>
<td>Imipenem</td>
<td>&lt;=2</td>
<td>S</td>
</tr>
<tr>
<td>Gentamicin</td>
<td>&lt;=2</td>
<td>S</td>
</tr>
<tr>
<td>Nitrofurantoin</td>
<td>&gt;=256</td>
<td>R</td>
</tr>
<tr>
<td>Piperacillin/tazobactam</td>
<td>&lt;=4</td>
<td>S</td>
</tr>
<tr>
<td>Trimethoprim/sulfamethoxazole</td>
<td>&gt;=320</td>
<td>R</td>
</tr>
</tbody>
</table>
• **Minimum inhibitory concentration (MIC)**
  - MIC = Mixture with the lowest concentration of antibiotic where there is no visible growth
  - ***Remember, just because an antibiotic has the lowest MIC for a pathogen, does not mean it is the best choice***

• The number associated with the MIC is variable by drug, so the lower the number does not necessarily mean a bacteria is more sensitive to the drug
• The perfect recipe for a bug to develop resistance to an antibiotic is to give a low concentration of the antibiotic over a prolonged period of time
  – In general, use upper end of dosing range
  – Do not prolong therapy longer than needed, but MUST counsel patients to finish their course of antibiotics!

• Try to use the most narrow-spectrum agent possible as quickly as possible
• SNAP approach to antimicrobial stewardship
• Safety, Need, Adequacy, Prudence
• Step-by-step process to assess antimicrobial therapy when antibiotics have already been prescribed
• If initially recommending an antibiotic, change to the NAPS approach
Antimicrobial Stewardship

• “S” – Safety
• Ask “is it safe for this patient to be receiving this drug?”
• Assessment of allergies
• Assess for likelihood of potential adverse drug reactions
Antimicrobial Stewardship

• “N” – Need

• Ask “Does this patient need antimicrobial therapy?
  – Does the patient actually have an infection?
  – Is the infection likely to be:
    • Bacterial?
    • Viral?
    • Fungal?
Antimicrobial Stewardship

• “A” – Adequacy

• Ask “Is the drug that has been prescribed treating, or likely to treat, the infection?”
  – Is the drug a guideline recommended therapy?
  – Does the drug provide appropriate coverage against the pathogens most likely causing the infection?
  – Will the drug reach the site of infection?
Antimicrobial Stewardship

• “P” – Prudence

• Ask “Is this the most prudent drug to use for this infection?”
  – Is the drug the most-narrow spectrum agent that will adequately treat this infection?

• This often cannot be fully assessed unless culture and susceptibility results are available
• HPI: D.B. is a 65 year old WM, 2 year resident of your LTCF, who has developed difficulty breathing, 3 day history of fever, productive cough, night sweats, and chills
• Allergies: NKDA
• PMH: DM, HTN, dyslipidemia
• Meds: Metformin, glypizide, atorvastatin, lisinopril, HCTZ
• PE: BP 130/82; HR 86; RR 28; Temp 103.5
Case 1

- Chest x-ray: bilateral infiltrates

- The attending physician initiates therapy with ceftriaxone 1 gram IV daily and levofloxacin 500 mg IV daily
Case 1

• Which of the following is the most appropriate recommendation for D.B. at this time?

A) Continue the currently prescribed therapy

B) Change to ceftriaxone 2 grams IV daily and levofloxacin 750 mg IV daily

C) Discontinue antibiotics; infection is likely viral

D) Change to levofloxacin, cefepime, and vancomycin
Case 2

- J.S. is a 73-year-old female, recently admitted to your LTCF, who is evaluated by the attending physician for a large, pus-filled boil on her back.
- Allergies: Sulfonamides (rash)
- PMH: CHF, HTN, DM, depression
- Meds: insulin, carvedilol, enalapril, HCTZ, citalopram
- PE: BP 118/76; HR 70; RR 18; Temp 99
Case 2

- She is prescribed Bactrim DS, 1 tablet PO BID for 14 days
Case 2

• Do you agree with the initial choice of antimicrobial therapy?
• What is the most likely bacterial etiology?
• Are there any non-pharmacological therapies that should be recommended at this time?
Case 3

- N.P. is an 85 year old AAF, 10 year resident of your LTCF. The nursing staff grow concerned because she is experiencing increased confusion from baseline.
- Allergies: Penicillin (rash)
- PMH: Dementia, dyslipidemia, COPD, CHF
- Meds: Numerous
- PE: BP 132/76, P 80, RR 22, T 99.6°F
Case 3

• A variety of tests were ordered, with the urinalysis showing multiple abnormalities
• A urine culture is ordered and sent to the lab
• The attending physician orders levofloxacin 500 mg PO daily for 10 days
• Do you agree with this choice of empiric therapy?
Case 3

- **Urine culture results:**

  - *Klebsiella pneumoniae*

    | SUSC | INTP |
    |------|------|
    | Amikacin | <=2  | S   |
    | Ampicillin | >=8  | R   |
    | Cefazolin | <=4  | S   |
    | Cefepime | <=1  | S   |
    | Ceftazidime | <=1  | S   |
    | Ceftriaxone | <=1  | S   |
    | Levofloxacin | <=2  | S   |
    | Imipenem | <=2  | S   |
    | Gentamicin | <=2  | S   |
    | Tobramycin | <=2  | S   |
    | Nitrofurantoin | >=256 | R   |
    | Piperacillin/tazobactam | <=4  | S   |
    | Trimethoprim/sulfamethoxazole | <=20 | S   |
Case 3

• Which of the following is the best recommendation for this patient?
  A) Continue the current therapy
  B) Change to cephalexin
  C) Change to Bactrim
  D) Change to IM ceftriaxone
Case 4

• J.R. is a 62 year old WM, recent admit to your LTCF s/p stroke. He complains today of a dry cough x 3 days, rhinorrhea, and sore throat.
• Allergies: NKDA
• PMH: Stroke, HTN, DM
• Meds: Numerous
• PE: BP 140/86, P 74, RR 22, T 97.5°F
Case 4

- Chest x-ray: negative
- Rapid strep: negative
- The attending physician orders cefdinir 300 mg PO BID for 7 days, plus azithromycin 500 mg PO on day 1, 250 mg PO on days 2-5
Case 4

• What is the best recommendation for J.R. at this time?
  A) Continue the current therapy
  B) Change to levofloxacin
  C) Change to Bactrim
  D) Discontinue antibiotics
Antimicrobial Stewardship

• Additional Resources:
  • www.idssociety.org
    – IDSA clinical practice guidelines
    – Antimicrobial Stewardship guidelines
  • www.cdc.org
  • www.cms.org
QUESTIONS???