Antibiotic Stewardship in a Long-term Care Facility - Focus on Multidisciplinary approach

Pharmacy perspective

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Disclosure Statement

The author has no actual or potential conflict(s) of interest/relevant financial relationship(s) with any commercial interests in relation to this CE activity

Objectives

- Describe the development and implementation of antibiotic stewardship in a Long Term Care facility based on example of a single facility.
- Understand the importance of interdisciplinary approach to antibiotic stewardship.
- Understand the process of selecting appropriate antibiotic therapy:
  - Determine the need for antibiotic therapy (e.g., urinary tract infection vs. asymptomatic bacteriuria, wound infection vs. chronic wound management)
  - Evaluate patient specific factors: age, gender, past infections/cultures, comorbidities, degree of immunosuppression, risk for resistant pathogens, prior failed therapies.
  - Use local antibiogram to select empiric therapy.
  - Utilize treatment algorithms.
  - Evaluate other aspects affecting therapy such as allergies, drug interactions, disease interactions, renal function, route of administration, cost of medication etc.
- Key resources for development of antibiotic stewardship in your facility.
### Antibiotics: Scope of the Problem

- 1.6-3.8 million nursing home patients are treated for infections in the US each year.
- 400,000 – number of deaths from infections in US nursing homes each year.
- According to the Society of Healthcare Epidemiology of America, antibiotics comprise up to 40% of all prescribed medications in Long Term Care Facilities.
- 25% to 75% of the antibiotic use in nursing homes is inappropriate.

**Sources:**

#### Annual incidence of antibiotic-resistant infections in US nursing homes

- MRSA, vancomycin-resistant enterococci, beta-lactam-resistant Gram-negative bacteria - green
- C. difficile - red
- Both - blue

**Source:**

### Inappropriate use of antibiotics:
- Increase bacterial resistance
- Increased risk of drug-related complications
- Drug-drug interactions
Antimicrobial stewardship refers to 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. — Infectious Disease Society of America.

Elements of antibiotic stewardship:
- Practitioners with infectious disease training
- Institutional policy
- Antibiotic formulary
- Antibiogram
- Education

Role of pharmacists is well established and supported by Infectious Disease Society of America (IDSA)

Research data: Morgan et al. Impact of hospital-based antimicrobial management program on clinical and economic outcomes
- ID pharmacists vs ID fellows.
- Comparative study focused on appropriateness of antimicrobial therapy, patient outcomes and cost of hospitalization.
- Recommendations retrospectively evaluated by a blinded ID physician

Antibiotic Stewardship: Pharmacist Role

<table>
<thead>
<tr>
<th>Study Results</th>
<th>ID Pharmacists</th>
<th>ID Fellows</th>
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<tbody>
<tr>
<td>Antibiotic choice was deemed appropriate</td>
<td>87%</td>
<td>47%</td>
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<tr>
<td>Cure Rate</td>
<td>64%</td>
<td>42%</td>
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<tr>
<td>Median Cost of Hospitalization</td>
<td>$6468</td>
<td>$7864</td>
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<tr>
<td>Median Cost of Antibiotics</td>
<td>$79</td>
<td>$122</td>
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</table>


Antibiotic Stewardship: Pharmacist Role

- Antibiotic stewardship efforts so far have been focused on inpatient/hospital setting
- Little experience with antibiotic stewardship in long-term care facilities

Support from major health care societies
- Centers for Disease Control and Prevention (CDC)
- Infectious Disease Society of America
- Society for Healthcare Epidemiology of America (SHEA)
- Association for Professionals in Infection Control and Epidemiology (APIC)
- American Society of Health-System Pharmacists

Antibiotic Stewardship in Long-term Care Facilities

Barriers:
- Lack of appropriately trained MDs and PharmDs
- Insufficient knowledge of current guidelines
- Lack of antibiogram
- Lack of electronic medical records


Memorial Health Center, Medford WI

- Critical access hospital
- Memorial Nursing and Rehab Center
- Pharmacy
- Dialysis center
- Primary care clinics
- Fitness center
- Satellite campus for Aspirus Heart and Vascular Institute

Antibiotic Stewardship at the Memorial Health Center

- Led by Pharmacists
- Includes
  - PharmD with infectious diseases training
  - Internal medicine physician on as needed basis
  - Staff pharmacists
  - Infection control coordinator
- Practice setting:
  - Memorial Health Center hospital and Nursing and Rehab center.
  - Access to full medical record
  - Staff dedicated to providing the best patient care
Antibiotic Stewardship

- Antibiotic stewardship was implemented at the MHC Hospital in the spring-summer 2011
- The process of expansion of the program to Memorial Health Nursing and Rehab Center.
  - Evaluate the need
  - Challenges
  - Develop a model of antibiotic stewardship program for LTCF
  - Evaluate outcomes

Antibiotic Stewardship: Evaluating the Need

- A study was conducted at the Memorial Health Center Nursing and Rehab Center
  - Evaluate the use of antibiotics
  - Determine the need for the Antibiotic Stewardship
  - Evaluate the effectiveness of the Antibiotic Stewardship
  - Determine the areas for improvement

Study Design

<table>
<thead>
<tr>
<th>Part I</th>
<th>Part II</th>
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<tbody>
<tr>
<td>Prior to implementation of the antibiotic stewardship program</td>
<td>After the implementation of the antibiotic stewardship program</td>
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<tr>
<td>3 month</td>
<td>3 months</td>
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</table>

- The data was collected using retrospective chart review
Criteria for inappropriate antibiotic use:

- Antibiotic did not provide adequate coverage empirically, current guidelines recommend against using this antibiotic empirically.
- Antibiotic resistance was not addressed after Culture and Sensitivity Report became available.
- Dose of antibiotic was not adjusted to patient’s renal function
- Treatment of asymptomatic bacteriuria
- Duration of therapy too long or too short according to current guideline recommendations.

Prior to implementation of Antibiotic Stewardship (Data from October – December 2010)

<table>
<thead>
<tr>
<th>Number of residents evaluated for possible infections</th>
<th>29</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of residents treated with antibiotics</td>
<td>20</td>
</tr>
<tr>
<td>Number of cases where antibiotics were prescribed inappropriately</td>
<td>8 (40%)</td>
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</tbody>
</table>

Antibiotic stewardship: Evaluating the Need

Prior to implementation of Antibiotic Stewardship (Data from October – December 2010)

| Antibiotic did not cover expected pathogens; current guidelines recommend against using that antibiotic empirically | I I |
| Antibiotics were not changed to address resistance after Culture and Sensitivity report became available | I |
| Dose of antibiotic was not adjusted to patient’s renal function | |
| Attempt to treat asymptomatic bacteriuria, no evidence of infection | I I I I I |

Antibiotic stewardship: Evaluating the need
## Antibiotic Stewardship: Outcomes

<table>
<thead>
<tr>
<th></th>
<th>Prior to Implementation of Antibiotic Stewardship Data from October-December 2010</th>
<th>After Implementation of Antibiotic Stewardship Data from January-March 2011</th>
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</thead>
<tbody>
<tr>
<td>Number of residents evaluated for possible infections</td>
<td>29</td>
<td>24</td>
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<tr>
<td>Number of residents treated with antibiotics</td>
<td>20</td>
<td>19</td>
</tr>
<tr>
<td>Number of cases where antibiotics were prescribed incorrectly</td>
<td>8 (40%)</td>
<td>4 (21%)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Reason</th>
<th>Prior to Implementation of Antibiotic Stewardship Data from October-December 2010</th>
<th>After Implementation of Antibiotic Stewardship Data from January-March 2011</th>
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<tbody>
<tr>
<td>Antibiotic did not cover expected pathogens; current guidelines recommend against using that antibiotic empirically</td>
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<td>1</td>
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<tr>
<td>Antibiotics were not changed to address resistance after Culture and Sensitivity report became available</td>
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<tr>
<td>Dose of antibiotic was not adjusted to patient’s renal function</td>
<td>1</td>
<td>0</td>
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<tr>
<td>Attempt to treat asymptomatic bacteriuria, no evidence of infection</td>
<td>1111</td>
<td>1</td>
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<tr>
<td>Inappropriate duration of therapy</td>
<td>0</td>
<td>1</td>
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</tbody>
</table>

- Pharmacists recommendations in antibiotic therapy were well received by primary care providers at Memorial Health Center Nursing Home.
- In the first three months of implementation of Antibiotic Stewardship, the number of inappropriately prescribed antibiotics was reduced by 50%.
- Areas for improvement: patient follow up and tools for timely and efficient patient evaluation.
Improved tracking of finalized cultures to ensure follow up

Developed treatment algorithms to assist prescribers and pharmacists in choosing appropriate antibiotic therapies

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**Antibiotic stewardship: Steps for Improvement**

- Improved tracking of finalized cultures to ensure follow up
- Developed treatment algorithms to assist prescribers and pharmacists in choosing appropriate antibiotic therapies

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**Treatment algorithm**

<table>
<thead>
<tr>
<th>Urinary Tract Infection Treatment algorithm</th>
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<tbody>
<tr>
<td><strong>Acute Uncomplicated UTI</strong></td>
<td><strong>Acute Complicated UTI</strong></td>
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<tr>
<td>Non-pregnant females living in the community</td>
<td>Complication: elderly, diabetes, structural abnormality, male, non-recurrent pathogen ID, catheter</td>
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<tr>
<td>Treatment arranged according to IDSA rec.</td>
<td>Treatment arranged according to evidence</td>
</tr>
<tr>
<td><strong>Nitrofurantoin 100mg BID x 5 days</strong> (DOC pregnant)</td>
<td><strong>Levofloxacin 500mg x 5-7 days</strong></td>
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<tr>
<td><strong>Cipro 500mg QD x 7 days</strong></td>
<td><strong>Bactrim DS QD x 7 days</strong></td>
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<tr>
<td><strong>Augmentin 875mg x 7 days</strong></td>
<td><strong>Ampicillin 1g IV x 7 days</strong></td>
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<tr>
<td><strong>More Severe Cases</strong>:</td>
<td><strong>Ceftriaxone 1g IV Q12H x 14 days</strong></td>
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<tr>
<td><strong>Levofloxacin 750mg x 5-7 days</strong></td>
<td><strong>Cipro 750mg IV/PO QD x 5-7, up to 14 days</strong></td>
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<tr>
<td><strong>Cipro 500mg QD x 7 days</strong></td>
<td><strong>Ampicillin 1g IV x 5 days</strong></td>
</tr>
<tr>
<td><strong>Augmentin 875mg x 7 days</strong></td>
<td><strong>Ampicillin 1g IV x 5 days</strong></td>
</tr>
</tbody>
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**Antibiotic stewardship: Challenges in Nursing Home**

- Differences between inpatient setting and skilled nursing facility
  - Provider access - establishing communication
  - Effective provision of service - make it fit into nursing, pharmacist, physician workflow
- Seeking support
  - Prescribers
  - Pharmacists
  - Nurses
  - Administration
  - Infection control
  - Wound care
  - Other providers
Antibiotic Stewardship: Our Model

Antibiotic Stewardship

- Final product – the model that assures timely, convenient communication between nurses, physicians and pharmacists and any other providers involved in patient care.

- The program is constantly evolving:
  - Continue improving antibiotic use practices
  - Educate providers on appropriate use of antimicrobials
The process of selecting appropriate antibiotic therapy: pharmacist approach

- Determine the need for antibiotic therapy
- Evaluate patient specific factors
- Utilize treatment algorithms
- Use local antibiogram to select empiric therapy
- Other aspects affecting therapy

Patient Case

- JJ 60 yo female
- PMH: MS, paraplegia, MDII, obesity, depression, GERD.
- Allergies: penicillin (rash)
- Current diagnosis: urinary tract infection
- Order: SMX/TMP (Bactrim) DS BID x 7 days.

Determine the Need for Antibiotic Therapy

- Asymptomatic bacteriuria - WHOM NOT TO TREAT:
  - Diabetic patients
  - Elderly in the community and NH residents
  - Spinal cord injury
  - Indwelling urethral catheters

- Avoiding treatment of asymptomatic bacteriuria is important for reducing development of antibiotic resistance

References:
### UTI vs asymptomatic bacteriuria

<table>
<thead>
<tr>
<th>Patient Findings</th>
<th>UTI</th>
<th>Asymptomatic Bacteriuria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Culture grows bacteria</td>
<td>+</td>
<td>+</td>
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<tr>
<td>Urinalysis: non-contaminated, clean catch urine sample</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>collected and shows presence of bacteria &gt;100,000 CFU/ml, &gt;10 WBC/HPF, positive</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>leukocyte esterase, +/− nitrates and other indicators of urinary tract infection</td>
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<tr>
<td>Presence of symptoms of urinary tract infection. The symptoms of UTI may include:</td>
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<tr>
<td>dysuria, hematuria, altered mental status, urinary frequency and urgency, fever,</td>
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<tr>
<td>loss of appetite, abdominal pain.</td>
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</tbody>
</table>

Patient Case: Determine the Need for Antibiotic Therapy

- **Nursing assessment** – patient complains Sx of burning upon urination and hematuria.
- **Lab** -

<table>
<thead>
<tr>
<th>Urinalysis</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacteria &gt;100,000 cfu</td>
<td></td>
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<tr>
<td>Urine color Straw</td>
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<tr>
<td>Clarity Cloudy</td>
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<tr>
<td>Leuk esterase 3+</td>
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<tr>
<td>Nitrite -</td>
<td></td>
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<tr>
<td>WBC urine 20 WBC/HPF</td>
<td></td>
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<tr>
<td>RBC urine 0</td>
<td></td>
</tr>
<tr>
<td>Culture pending</td>
<td></td>
</tr>
</tbody>
</table>

Choosing the Best Therapy

| Determine the need for antibiotic therapy | ✓ needed |
| Evaluate patient specific factors       |          |
| Utilize treatment algorithms            |          |
| Use local antibiogram to select empiric therapy |       |
| Other aspects affecting therapy         |          |
### Patient Case: Evaluate Patient-Specific Factors

<table>
<thead>
<tr>
<th>Age/ gender</th>
<th>60 yo F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comorbidities</td>
<td>MS, DMII, paraplegia, obesity, depression, GERD</td>
</tr>
<tr>
<td>Degree of immunosuppression</td>
<td>Moderate</td>
</tr>
<tr>
<td>Past infections/ cultures</td>
<td>Past UTI significant for Pseudomonas aeruginosa pan-sensitive</td>
</tr>
<tr>
<td>Risk factors for resistant pathogens</td>
<td>Residence in NH, immunosuppression, Hx of nosocomial pathogen</td>
</tr>
<tr>
<td>Prior failed therapies</td>
<td>None</td>
</tr>
<tr>
<td>Allergies</td>
<td>PNC - rash</td>
</tr>
<tr>
<td>Renal function</td>
<td>24 ml/min</td>
</tr>
</tbody>
</table>

### Choosing the Best Therapy

| Determine the need for antibiotic therapy | ✓ needed |
| Evaluate patient specific factors | ✓ Past UTI Pseudomonas aeruginosa pan-sensitive |
|                                          | ✓ Residence in nursing home |
|                                          | ✓ Impaired ability to fight infection |
|                                          | ✓ PNC allergy |
|                                          | ✓ CrCl 24ml/min |

Utilize treatment algorithms

Use local antibiogram to select empiric therapy.

Other aspects affecting therapy

### Patient Case: Utilize Treatment Algorithms

#### Urinary Tract Infection Treatment algorithm

**Acute Uncomplicated UTI**
- Non-pregnant females living in the community
- Treatment arranged according to IDSA rec:
  - Nitrofurantoin 100mg BID x 5 days
  - Bactrim DS BID x 3 days
  - Fosfomycin 3g PO once dose
  - Levaquin 250mg QD x 3 days
  - Cipro 250 mg q 12h x 3 days

**Complicated= elderly, diabetes, structural abnormality, male, nosocomial pathogen:**
- Treatment arranged according to evidence:
  - Levaquin 500mg x 5-7 days
  - Cipro 500mg QD x 7 days
  - Levaquin 500 mg QD x 7-14 days
  - Cefpodoxime 100 mg Q12h x 7 days
  - Augmentin 875 mg Q12h x 7 days

**Mild Infection:**
- Levaquin 750mg x 5-7 days
- Levaquin 500mg QD x 7 days
- Cipro 500 mg Q 12 h x 7 days
- Bactrim DS Q12 H x 14 days
- Augmentin 875mg Q12 H x 10-14 days
- Cefpodoxime 100-200mg Q12 H x 10-14 days

**More Severe Cases:**
- Ceftriaxone 1g IV Q24H x 14 days
- Ciprofloxacin 400mg IV Q12h x 14 days
- Levaquin 750 mg IV/PO QD x 5-7, qmax 14 days
- Aminoglycoside x 5 days
- Meropenem 500 mg IV q 6h x 7 days

**More Severe Cases:**
- Ceftriaxone 1g IV Q24H x 14 days
- Ciprofloxacin 400mg IV Q12h x 14 days
- Levaquin 750 mg IV/PO QD x 5-7, qmax 14 days
- Aminoglycoside x 5 days
- Meropenem 500 mg IV q 6h x 7 days
Patient Case: Utilize Treatment Algorithms

According to the algorithm appropriate choices would be:

- Levofloxacin 500mg x 5-7 days
- Ciprofloxacin 500mg Q12 h x 7 days
- TMP/SMX DS Q12 h 7-10 days
- Cefpodoxime 100 mg Q12 h x 7 days
- Amoxi/Clav 875 mg q 12 H x 7 day

Utilize Treatment Algorithms

According to the algorithm appropriate choices would be:

- Levofloxacin 500mg x 5-7 days
- Ciprofloxacin 500mg Q12 h x 7 days
- TMP/SMX DS Q12 h 7-10 days
- Cefpodoxime 100 mg Q12 h x 7 days
- Amoxi/Clav 875 mg q 12 H x 7 day - penicillin allergy

Other aspects affecting therapy:

- Determine the need for antibiotic therapy
  - Yes
- Evaluate patient specific factors
  - Yes
  - Past UTI
  - Pseudomonas aeruginosa pan-sensitive
  - Impaired ability to fight infection
  - PMN allergy
  - C/C 24mg/min
  - Complicated UTI
- Utilize treatment algorithms
  - Yes
  - SMX/TMP
  - Ciprofloxacin
  - Levofloxacin
  - Cefpodoxime

Use local antibiogram to select empiric therapy.
### Patient Case

Determine the need for antibiotic therapy
- **needed**

Evaluate patient specific factors
- Past UTI
- Pseudomonas aeruginosa pan-sensitive
- Impaired ability to fight infection
- PNC allergy
- CrCl 24ml/min
- Complicated UTI

Utilize treatment algorithms
- SMX/TMP
- Ciprofloxacin
- Levofloxacin
- Cefpodoxime

Use local antibiogram to select empiric therapy
- Ciprofloxacin
- Levofloxacin

Other aspects affecting therapy
- Controls
- Microbiology

### Use Local Antibiogram to Select Empiric Therapy

Use local antibiogram to select empiric therapy.
- Ciprofloxacin
- Levofloxacin

### Patient Case: Use Local Antibiogram to Select Empiric Therapy

<table>
<thead>
<tr>
<th>Gram (-) bacteria</th>
<th>Acinetobacter baumannii</th>
<th>Citrobacter freundii</th>
<th>Citrobacter koseri</th>
<th>Enterobacter aerogenes</th>
<th>Enterobacter cloacae</th>
<th>Esherichia coli</th>
<th>Klebsiella oxytoca</th>
<th>Klebsiella pneumoniae</th>
<th>Proteus mirabilis</th>
<th>Pseudomonas aeruginosa</th>
<th>Serratia marcescens</th>
<th>Stentrophomonas maltophilia</th>
<th>Haemophilus influenzae</th>
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### Remark

Determine the need for antibiotic therapy
- **needed**

Evaluate patient specific factors
- Past UTI
- Pseudomonas aeruginosa pan-sensitive
- Impaired ability to fight infection
- PNC allergy
- CrCl 24ml/min
- Complicated UTI

Utilize treatment algorithms
- SMX/TMP
- Ciprofloxacin
- Levofloxacin
- Cefpodoxime

Use local antibiogram to select empiric therapy
- Ciprofloxacin
- Levofloxacin

Other aspects affecting therapy
- Controls
- Microbiology
### Patient Case: Other Aspects

<table>
<thead>
<tr>
<th>Ciprofloxacin</th>
<th>Levofloxacin</th>
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<tr>
<td>E.coli sensitivity</td>
<td>95%</td>
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<tr>
<td>Pseudomonas sensitivity</td>
<td>85%</td>
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Final recommendation: Ciprofloxacin 250 mg twice daily x 7 days

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### Summary:

| Determine the need for antibiotic therapy | ☑ needed |
| Evaluate patient specific factors | ☑ Past UTI Pseudomonas aeruginosa pan-sensitive |
| | ☑ Impaired ability to fight infection |
| | ☑ PNC allergy |
| | ☑ CrCl 24 ml/min |
| | ☑ Complicated UTI |
| Utilize treatment algorithms | ☑ SMX/TMP |
| | ☑ Ciprofloxacin |
| | ☑ Levofloxacin |
| | ☑ Cefpodoxime |
| Use local antibiogram to select empiric therapy. | ☑ Ciprofloxacin |
| | ☑ Levofloxacin |
| Other aspects affecting therapy | ☑ Ciprofloxacin |

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### Patient Case

**Follow up**
- Monitor Sx improvement
- Culture and Sensitivity report in 24-48 hrs
- Adjust antibiotics if needed
The Process of Selecting an Appropriate Antibiotic Therapy: Pharmacist Approach

Pharmacists

**Evidence Based Information**

Center for Disease Control and Prevention (CDC) Get Smart for Healthcare program.
- Provides evidence based information supporting antibiotic stewardship.

Society of Infectious Diseases Pharmacists.
- www.sidp.org
- Antimicrobial Stewardship Certificate Program

Infectious Disease Society of America.
- Guidelines for Developing an Institutional Program to Enhance Antimicrobial Stewardship: Clinical Infectious Diseases January 2007 vol. 44 no. 2 159-177
- http://www.idsociety.org/Stewardship_Policies/

Policy Statement on Antimicrobial Stewardship by the Society for Healthcare Epidemiology of America (SHEA), the Infectious Diseases Society of America (IDSA), and the Pediatric Infectious Diseases Society (PIDS).
- Infect Control Hosp Epidemiol 2012;33(4):322-327

Key Resources for Development of Antibiotic Stewardship in Your Facility
Described the development and implementation of antibiotic stewardship in a Long Term Care facility based on example of a single facility.

- Importance of team work and good communication
- Roles of different healthcare providers in Antibiotic Stewardship

Case study:

- Determined the need for antibiotic therapy (ex.: urinary tract infection vs asymptomatic bacteriuria, wound infection vs chronic wound management)
- Evaluated patient specific factors: age/ gender, past infections/ cultures, comorbidities, degree of immunosuppression, risk for resistant pathogens, prior failed therapies.
- Utilized local antibiogram to select empiric therapy.
- Utilized treatment algorithms
- Evaluated other aspects affecting therapy (drug interactions, disease interactions, route of administration, cost of medication etc).

Key resources for development of antibiotic stewardship in your facility