Urinary Tract Infections: Optimizing Inpatient Therapy

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MPA Spring Seminar: April 27th, 2019
Disclosure Statement

- IRB status: approved
- Co-investigators:
  - Jayme Hartzell, PharmD, MS, BCPS
  - Sadie Giuliani, PharmD, BCPS
- Conflict of interest: none
- Project sponsorship: none
Learning Objective

• Develop appropriate antimicrobial regimens for urinary tract infections based on patient-specific factors
Background

- A urinary tract infection (UTI) of any part of the urinary system including kidneys, ureters, bladder, and urethra
- Prevalence of these infections worldwide is estimated at 150 million people every year with a healthcare cost of $3.5 billion annually in the United States alone
- Four subcategories
  - Asymptomatic bacteriuria
  - Uncomplicated cystitis
  - Complicated cystitis
  - Catheter-associated UTI
Clinical Practice Guideline for the Management of Asymptomatic Bacteriuria: 2019 Update by the Infectious Diseases Society of America

Background

- Asymptomatic bacteriuria
  - Presence of one or more species of bacteria growing in urine ($\geq 10^5$ colony-forming units [CFU]/mL or $\geq 10^8$ CFU/L), irrespective of pyuria
  - Absence of signs or symptoms attributable to UTI

- Pyelonephritis
  - Fever ($>99.9^\circ F/37.7^\circ C$), signs or symptoms of systemic illness, flank pain, or costovertebral tenderness
• Uncomplicated cystitis
  • Dysuria, urinary frequency or urgency, and/or suprapubic pain in the absence of vaginal symptoms (vaginal pruritus or discharge)

• Complicated cystitis
  • Lacks a consensus definition
  • Male, poorly controlled diabetes, symptoms >7 days, urologic abnormalities, urologic prosthetic material, or immunosuppression

• Catheter associated-UTI
  • Signs and symptoms compatible with UTI with no other identifiable source of infection from a patient whose catheter has been removed within the previous 48 hours
Purpose

• The purpose of this study is to assess empiric antibiotic prescribing for urinary tract infections before and after implementation of a treatment algorithm
Methods

• Retrospective, single center, observational review
• Urinary tract infection algorithm with hospitalist, intensivist, and emergency department provider education
• Empiric antibiotics derived from the Infectious Disease Society of America guidelines and Providence St. Patrick’s antibiogram
• Data gathered via electronic medical record
Methods

• Inclusion criteria
  • Diagnosis of asymptomatic bacteriuria, uncomplicated cystitis, pyelonephritis, or catheter-associated UTI
  • Admission to inpatient units

• Exclusion criteria
  • <18 years of age
  • Pregnant
  • Antibiotic use within seven days or empirically covering additional disease state
Methods

• Primary outcome
  • Appropriate empiric antibiotic selection defined by treatment algorithm

• Secondary outcomes
  • Days of antibiotic therapy
  • Length of hospital stay
  • 30-day readmission rates
  • Length of time before de-escalation to oral therapy
Methods

• Sample size
  • Assessed 50 patients diagnosed with UTI from January 2018-March 2018 and February 2019-March 2019 post algorithm implementation

• Statistical analysis
  • Fisher’s exact test
  • Two-tailed analysis
# Results

<table>
<thead>
<tr>
<th>Demographics and Characteristics</th>
<th>Pre-algorithm</th>
<th>Post-algorithm</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Female</strong>, n (%)</td>
<td>37 (74)</td>
<td>27 (54)</td>
</tr>
<tr>
<td><strong>Age</strong>, years (mean)</td>
<td>68</td>
<td>68</td>
</tr>
<tr>
<td><strong>Weight</strong>, kg (mean)</td>
<td>165</td>
<td>75</td>
</tr>
<tr>
<td><strong>Serum Creatinine</strong>, mg/dL (mean)</td>
<td>1.17</td>
<td>1.25</td>
</tr>
<tr>
<td><strong>Penicillin allergy</strong>, n (%)</td>
<td>5 (10)</td>
<td>9 (18)</td>
</tr>
<tr>
<td><strong>ICU</strong>, n (%)</td>
<td>3 (6)</td>
<td>1 (2)</td>
</tr>
</tbody>
</table>
Results

Urinary Tract Infection Diagnosis

<table>
<thead>
<tr>
<th>Condition</th>
<th>Pre-Algorithm</th>
<th>Post-Algorithm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catheter-associated UTI</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Pyelonephritis</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Complicated Cystitis</td>
<td>14</td>
<td>20</td>
</tr>
<tr>
<td>Uncomplicated Cystitis</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Asymptomatic Bacteriuria</td>
<td>13</td>
<td>14</td>
</tr>
</tbody>
</table>
Results

• Primary Outcome

<table>
<thead>
<tr>
<th></th>
<th>Pre-Algorithm</th>
<th>Post-Algorithm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appropriate Empiric Therapy</td>
<td>28</td>
<td>36</td>
</tr>
<tr>
<td>Inappropriate Empiric Therapy</td>
<td>22</td>
<td>14</td>
</tr>
</tbody>
</table>

P=0.1443
Results

- Secondary Outcomes

<table>
<thead>
<tr>
<th></th>
<th>Pre-Algorithm</th>
<th>Post-Algorithm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Days of Antibiotic Therapy</td>
<td>7.31 (1-30)</td>
<td>7.44 (1-14)</td>
</tr>
<tr>
<td>Length of Hospital Stay</td>
<td>6.12 (1-30)</td>
<td>5.94 (1-20)</td>
</tr>
<tr>
<td>30-day Readmission</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>Length of Time Before De-escalation</td>
<td>2.53 (1-6)</td>
<td>3.1 (1-7)</td>
</tr>
</tbody>
</table>
Discussion

- Overall, empiric antimicrobial therapy for urinary tract infections improved post provider education and algorithm.
- Although results were not statistically significant, a 20% improvement in prescribing is notable.
- Strengths
  - Local antibiogram used in combination with IDSA guidelines
  - Algorithm approved by all infectious disease physicians at Providence St. Patrick Hospital
- Limitations
  - Sample size, retrospective chart review, bias
  - Unable to verify those originally diagnosed with asymptomatic bacteriuria
  - Diagnosis was not always clear
  - No external validity
Discussion

• Lessons Learned
  • Have clinical pharmacists more involved in algorithm
    • Document when algorithm was recommended and whether or not it was accepted
  • Increase number of patients reviewed with documented urinary tract infection
  • Identify patients by diagnosis code rather than antibiotics prescribed
Conclusions

- Empiric therapy better aligned with guideline directed antibiotics after algorithm was implemented
  - Length of therapy, de-escalation, and length of hospital stay are areas of improvement
Future Directions

- Education
  - New IDSA guideline for asymptomatic bacteriuria
- Reinforce appropriate empiric prescribing for urinary tract infections
  - Antibiotic de-escalation and length of therapy
- Questioning attitude for antibiotic therapy
Acknowledgments

• Co-investigators
  • Jayme Hartzell, PharmD, MS, BCPS
  • Sadie Giuliani, PharmD, BCPS

• Infectious Disease Physicians
  • Claude Tonerre, MD
  • Joshua Christensen, MD
  • David Christiansen, MD
Questions?
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References