Antimicrobial Stewardship and Long-Term Care

Minnesota Department of Health
Infectious Disease Epidemiology, Prevention and Control Division
PO Box 64975, Saint Paul, MN 55164-0975
651-201-5414 or 1-877-676-5414
www.health.state.mn.us
Objectives

• Describe antimicrobial use/overuse and consequences in long-term care (LTC)

• Define antimicrobial stewardship

• Differentiate urinary tract infection (UTI) vs asymptomatic bacteriuria

• Demonstrate how UTI can be an opportunity for antimicrobial stewardship in LTC
Antimicrobial Use/Overuse and Consequences
Antibiotic Use in Long-term Care

• Antimicrobials account for approximately 40% of all systemic drugs prescribed in LTC – primarily over the phone

• Up to 70% of LTC residents receive an antibiotic every year

• Antibiotics are often prescribed empirically – without culture or antimicrobial sensitivity data
Antibiotic Use in Long-term Care (cont.)

- 19% of respiratory tract infections unnecessarily treated
  - 65%: acute bronchitis

- UTI is most frequent indication for antibiotic use in LTC
  - 41%: abnormal urinalysis unnecessarily treated
  - 56%: inappropriate drug
  - 67%: excessive duration

Rotjanapan. *Arch Intern Med* 2011
Antibiotic misuse is prevalent throughout the medical system.

**Hospitals**
- Pulmonary infiltrates in ICU patients
- Contaminated blood cultures

**Outpatient Clinics**
- Upper respiratory tract infections

**Long-term Care**
- Asymptomatic bacteriuria
- Viral upper respiratory infection
- Treatment of colonization instead of infection

Antibiotic misuse can occur in various settings, including hospitals, outpatient clinics, and long-term care facilities.
Antibiotic Misuse in Long-term Care

Resident Factors
- Chronic medical conditions, debilitation
- Impaired communication
- Difficulty obtaining specimens
- Family concerns

System Factors
- Lack of care continuity
- Time constraints and limited staffing
- Limited diagnostic resources
- Staff turnover

Provider Factors
- Telephone ordering
- Limited direct evaluation
- Lack of access to information at time of decision making

Up to 75% of antibiotic use is inappropriate in LTC
Antibiotic Misuse: Consequences

- Antibiotic resistance, multidrug-resistant organisms
- Adverse drug effects or drug interactions
- Secondary infections (Clostridium difficile)
- Increased cost of care
Emerging Multidrug-resistant Organisms

Susceptibility Profile of *Klebsiella pneumoniae* carbapenemase (KPC)-Producing *K. pneumoniae*

<table>
<thead>
<tr>
<th>Antimicrobial</th>
<th>Interpretation</th>
<th>Antimicrobial</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amikacin</td>
<td>I</td>
<td>Chloramphenicol</td>
<td>R</td>
</tr>
<tr>
<td>Amox/clav</td>
<td>R</td>
<td>Ciprofloxacin</td>
<td>R</td>
</tr>
<tr>
<td>Ampicillin</td>
<td>R</td>
<td>Ertapenem</td>
<td>R</td>
</tr>
<tr>
<td>Aztreonam</td>
<td>R</td>
<td>Gentamicin</td>
<td>R</td>
</tr>
<tr>
<td>Cefazolin</td>
<td>R</td>
<td>Imipenem</td>
<td>R</td>
</tr>
<tr>
<td>Cefpodoxime</td>
<td>R</td>
<td>Meropenem</td>
<td>R</td>
</tr>
<tr>
<td>Cefotaxime</td>
<td>R</td>
<td>Pipercillin/Tazo</td>
<td>R</td>
</tr>
<tr>
<td>Cetotetan</td>
<td>R</td>
<td>Tobramycin</td>
<td>R</td>
</tr>
<tr>
<td>Cefoxitin</td>
<td>R</td>
<td>Trimeth/Sulfa</td>
<td>R</td>
</tr>
<tr>
<td>Ceftazidime</td>
<td>R</td>
<td>Polymyxin B</td>
<td>MIC &gt;4μg/ml</td>
</tr>
<tr>
<td>Ceftriaxone</td>
<td>R</td>
<td>Colistin</td>
<td>MIC &gt;4μg/ml</td>
</tr>
<tr>
<td>Cefepime</td>
<td>R</td>
<td>Tigecycline</td>
<td>S</td>
</tr>
</tbody>
</table>

I: intermediate, S: susceptible, R: resistant
Antimicrobial Stewardship
What is Antimicrobial Stewardship?

- A multidisciplinary approach to optimizing antimicrobial use through appropriate selection, dosing, and duration while minimizing unintended consequences.

- Goal: Ensure the 5 D’s of optimal antimicrobial therapy:

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Does the condition require antibiotic therapy?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drug</td>
<td>Is the bacteria susceptible?</td>
</tr>
<tr>
<td>Dose</td>
<td>What is the recommended dose?</td>
</tr>
<tr>
<td>Duration</td>
<td>What is the recommended duration?</td>
</tr>
<tr>
<td>De-escalation</td>
<td>Can the antibiotic be switched from IV to oral?</td>
</tr>
</tbody>
</table>


Antimicrobial Stewardship in Hospitals

• Implemented in many acute care hospitals

• Demonstrated positive outcomes
  • Community-acquired pneumonia – decreased mortality, intubation
  • Decreased number of antimicrobial prescriptions
  • Decreased antimicrobial days
  • Decreased C. difficile infection

• All healthcare facilities (hospitals, ambulatory care, LTC) should implement antimicrobial stewardship programs per Infectious Disease Society of America (IDSA) and Society of Healthcare Epidemiology of America (SHEA)

Hauck LD. Ann Epidemiol 2004
Koppel R. JAMA 2005
Davey. Cochrane Database Syst Rev 2013
Antimicrobial Stewardship Strategies

- Multidisciplinary approach: prescribers, pharmacy, infection prevention, microbiology, nursing, administration, information specialists

- Education (alone is not enough)
- Thorough resident assessment
- Documentation and communication
- Guidelines and clinical pathways
- Optimization of antimicrobial therapy
- Review of microbiology results / revision / de-escalation of empiric prescribing
What Does Antimicrobial Stewardship Look Like?

- Standardized process for eliciting information and communicating a change in resident condition from nursing assistants to nurses
- Standardized processes for communicating clinical information from nurses to providers
- Standardized protocols for lab testing
- Standardized treatment algorithms
  - Evidence-based recommendations (ex: Loeb, 2001)
- Processes must work in the facility
  - Start small; trial and error will determine what fits for the facility
  - Integrate into existing systems

Loeb et al. *Infect Control and Hosp Epidemiol* 2001
Role of the Provider in Antimicrobial Stewardship

Three steps to ensure wise prescribing and optimal use:

1. **All** orders must contain **dose, duration, and indication**

2. When placing orders, include **microbiology cultures**

3. When culture results come back in 24-48 hours, take an **antibiotic time-out** to reassess therapy
   - Is this antibiotic still warranted?
   - Is this antibiotic still effective against this organism?

[GET SMART logo]

[www.cdc.gov/getsmtart]
UTI vs. Asymptomatic Bacteriuria: An Opportunity for Antimicrobial Stewardship
Quiz Question

If you collected urine cultures on every resident in a 500-bed LTC facility, how many residents would have a UTI requiring antibiotic treatment?
Example: 500 Bed Long-term Care Facility

- Resident in facility
- Resident with bacteriuria
- Resident with UTI requiring treatment
Conclusions:

- Majority of residents with positive cultures would not require antibiotics.
- Use of urine culture to determine who needs treatment is not very helpful without additional information.
How is a UTI Diagnosed?

If there are > 10 WBC/HPF on the UA
OR
≥ 10^5 CFU/ml on the urine culture

…then an infection is present, right?

Unfortunately, no.

CFU: colony-forming unit
HPF: high power field
UTI Diagnosis

- The diagnosis of UTI is primarily clinical

- Based on symptoms and objective findings from resident assessment

- Urinalysis and culture can provide supportive evidence, but are not helpful without clinical signs/symptoms

- A negative urinalysis and culture can exclude UTI
Bacteriuria ≠ UTI

- $\geq 10^5$ CFU is just a number
  - Number was only validated in young women with bacteriuria

However,
- $\geq 10^5$ CFU alone does **not** indicate infection
- $< 10^5$ does **not** disprove infection

Presence of symptoms **and** bacteriuria indicates an infection
Pyuria ≠ UTI

- > 90% of persons with bacteriuria will also have pyuria, so this is not generally helpful
  - Pyuria is expected as it indicates host response to a stimulus such as bacteria

- Presence of pyuria does not differentiate true infection from asymptomatic bacteriuria

- Absence of pyuria in an immunocompetent host may be used to rule out UTI; should not be used to rule in UTI

Malodorous Urine ≠ UTI

• Abnormal odor caused by many factors
  • Dehydration, diet, bacteriuria

• Urine odor to identify bacteriuria resulted in error in 1/3 of cases

• Even if urine odor is caused by bacteriuria, this does not indicate infection that needs to be treated unless other symptoms are present

• First step: Always encourage increased fluids, if not fluid restricted

Midthun. J Gerontol Nurs 2004
Fever Alone + Bacteriuria ≠ UTI Without an Indwelling Catheter

- Most residents (90%) with fever and no urinary symptoms have another explanation for fever

- Most residents with bacteriuria do not have a clinical UTI needing antimicrobial treatment

- The positive predictive value of a positive urine culture for a UTI is ~12%

Urinary Tract Infection is Primarily a Clinical Diagnosis
Asymptomatic Bacteriuria

• Definition: presence of bacteria in the urine without any symptoms of infection

• Very common in LTC residents
  • 25-50% of female residents
  • 15-40% of male residents
  • Nearly 100% of people with chronic indwelling catheters
  • Ratio of asymptomatic bacteriuria to symptomatic UTI in LTC is > 100:1
Antibiotic Treatment of Asymptomatic Bacteriuria in LTC: Results of Randomized Trials

- No effect on
  - Morbidity or mortality
  - Symptoms of chronic incontinence
  - Acute episodes of UTI

- Negative consequences
  - Increased drug side effects
  - Increased future isolation of resistant organisms
  - Increased cost

Nicolle et al. *NEJM* 1983
Treatment of Asymptomatic Bacteriuria in LTC Residents: The Down-Side

• Increased adverse drug effects, notably *C. difficile* infection (especially after quinolone antibiotics)

• Re-colonization with antibiotic-resistant organisms

• Conclusion:
  - **Do not** test residents without symptoms - and **do not** treat
  - **Do not** treat cloudy-uria or smelly-uria; these alone are not symptoms of UTI


Colgan. *Am Fam Physician* 2006


Nicolle. *NEJM* 1983


Darouiche. *Clin Inf Dis* 2005
UTI: Clinical Diagnosis

- Acute genitourinary symptoms
  - Dysuria
  - Frequency or urgency
  - Suprapubic or costovertebral pain
  - Gross hematuria
  - New incontinence (chronic incontinence ≠ UTI)

- Fever
  - Present in most serious infections – may be an increase relative to resident’s baseline
  - May be absent in elderly
Loeb Minimum Criteria For Antibiotics
Residents without urinary catheter

Acute Dysuria

Fever

At least ONE of:

• Urgency
• Frequency
• Suprapubic pain
• CVA tenderness
• Gross hematuria
• New incontinence

Loeb et al. Infect Control and Hosp Epidemiol 2001
Loeb Minimum Criteria For Antibiotics Residents with urinary catheter

At least ONE of:

- Fever
- Rigors
- New CVA tenderness
- New delirium

Loeb et al. Infect Control and Hosp Epidemiol 2001
UTI: Treatment Considerations

- Prevention: Get the catheters out
- Do not treat asymptomatic bacteriuria
- Focus on acute clinical symptoms attributable to genitourinary system
- Obtain urine culture prior to starting antibiotics
UTI: Treatment Considerations (cont.)

• Antibiotic choice depends on several factors:
  • Local susceptibility data
  • Prior culture data and antibiotic use in the resident
  • Potential for drug interactions or side effects
  • Resident drug allergies

• Reassess antibiotic therapy when susceptibilities are available

• Use narrow-spectrum agents whenever possible
UTI: Treatment Considerations (cont.)

- Antibiotic therapy - generally:
  - 3-6 days for cystitis
  - 7-14 days for pyelonephritis

- Post-therapy urine cultures are not recommended unless symptoms recur

- Majority of residents will re-acquire bacteriuria by 6 weeks after treatment
Summary

- Antibiotics are misused in all health care settings, including LTC
- Asymptomatic bacteriuria is more common in LTC residents than symptomatic UTI
- Asymptomatic bacteriuria should not be treated in LTC residents
- UTI is a clinical diagnostic – lab results can provide supporting data
- Antimicrobial stewardship programs can improve the quality of resident care and improve resident safety; providers play a very important role