Updates in Antimicrobial Stewardship

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Disclosures

• No disclosures to report
Learning Objectives

• Review the importance of prudent antimicrobial prescribing

• Describe key components of antimicrobial stewardship programs

• Discuss antimicrobial stewardship strategies in inpatient and outpatient settings
Antimicrobial Use

- Majority (2/3) of antimicrobial prescriptions are written in the outpatient setting.
- Of 184,000 ambulatory care visits in the US in 2010-2011, 12.6% resulted in antimicrobial prescriptions.
- Of all outpatient antimicrobial courses in this study 30% were deemed to have been inappropriately prescribed.
- Of all inpatient antimicrobial prescriptions up to 50% are inappropriately prescribed.

Community Antibiotic Prescriptions per 1,000 Population by State — 2014

At least 30% of antibiotics prescribed in doctors’ offices, emergency departments and hospital clinics are unnecessary.*

Data source: IMS Health Xponent 2014.
Global deaths attributable to antimicrobial resistance (AMR)
Which providers are prescribing outpatient antimicrobials?
What outpatient antimicrobials are being prescribed?
“Coordinated interventions designed to improve and measure the appropriate use of antibiotic agents by promoting the selection of the optimal antibiotic drug regimen including dosing, duration of therapy, and route of administration”
Goals of Antimicrobial Stewardship

• Primary
  – To optimize clinical outcomes while minimizing unintended consequences of antimicrobial use, including toxicity, the selection of pathogenic organisms (such as *Clostridium difficile*), and the emergence of resistance

• Secondary
  – To improve rates of antimicrobial susceptibilities to targeted antimicrobials
  – To optimize resource utilization

Clin Infect Dis 2007;44:159-77.  
Antimicrobial Stewardship Team
Multidisciplinary Approach

Inpatient Physician/
Hospitalist

Quality & Safety Management

Primary Medical Provider

Microbiology

Infection Prevention and
Control

Hospital Epidemiologist

Information System Specialist

Hospital Administration

Antimicrobial Stewardship Team
ID Physician
ID Pharmacist

ANTIBIOTIC STEWARDSHIP
IN YOUR FACILITY WILL

DECREASE
- ANTIBIOTIC RESISTANCE
- C. DIFFICILE INFECTIONS
- COSTS

INCREASE
- GOOD PATIENT OUTCOMES

ANTIBIOTIC STEWARDSHIP PROGRAMS ARE A “WIN-WIN” FOR ALL INVOLVED

A UNIVERSITY OF MARYLAND STUDY SHOWED
ONE ANTIBIOTIC STEWARDSHIP PROGRAM
SAVED A TOTAL OF $17 MILLION
OVER EIGHT YEARS

ANTIBIOTIC STEWARDSHIP HELPS IMPROVE
PATIENT CARE AND SHORTEN
HOSPITAL STAYS, THUS BENEFITING
PATIENTS AS WELL AS HOSPITALS
Recent Antimicrobial Stewardship Legislation and Policy

- January 2014 – **VHA Directive 1031**: Each VA facility must develop and implement an Antimicrobial Stewardship Program (ASP)

- March 2014 – **CDC Core Elements of Hospital Antibiotic Stewardship Programs**

- September 2014 – California Senate Bill 1311: Hospitals to adopt and implement ASPs

- September 2014 – Report to the President on Combating Antimicrobial Resistance and Executive Order 13676: Combating Antibiotic-Resistant Bacteria
Recent Antimicrobial Stewardship Legislation and Policy

- October 2015 – National Quality Forum announces Advancing Antibiotic Stewardship in Healthcare Initiative
- November 2015 – Joint Commission Proposed Medication Management Standards for ASPs (MM 09.01.01)
- April 2016 – IDSA/SHEA Guidelines on Implementing an Antibiotic Stewardship Program
- May 2016 – National Quality Forum publishes Antibiotic Stewardship Playbook
Recent Antimicrobial Stewardship Legislation and Policy

- November 11, 2016 – **CDC Core Elements of Outpatient Antibiotic Stewardship**
- December 13, 2016 – **21st Century Cares Act: Emphasizes antimicrobial drug development for serious infections in a limited patient population**
- January 1, 2017 – **Joint Commission Medication Management Standards for ASPs in effect**
Leadership Commitment: Dedicating necessary human, financial and information technology resources

Accountability: Appointing a single leader responsible for program outcomes. Experience with successful programs show that a physician leader is effective

Drug Expertise: Appointing a single pharmacist leader responsible for working to improve antibiotic use.

Action: Implementing at least one recommended action, such as systemic evaluation of ongoing treatment need after a set period of initial treatment (i.e. “antibiotic time out” after 48 hours)
CDC Core Elements of Hospital Antimicrobial Stewardship Programs

- **Tracking**: Monitoring antibiotic prescribing and resistance patterns
- **Reporting**: Regular reporting information on antibiotic use and resistance to doctors, nurses and relevant staff
- **Education**: Educating clinicians about resistance and optimal prescribing

http://www.cdc.gov/getsmart/healthcare/implementation/core-elements.html
What is the current status of ASPs in the United States?

Antibiotic stewardship programs in U.S. acute care hospitals: findings from the 2014 National Healthcare Safety Network (NHSN) Annual Hospital Survey

- Analyzed 2014 NHSN Annual Hospital Survey to describe ASPs in U.S. acute care hospitals as defined by the CDC’s Core Elements for Hospital Antibiotic Stewardship Programs
- Among 4,184 U.S. hospitals, 39% reported having comprehensive ASPs that met all 7 CDC defined core elements
- Major teaching hospitals (54%) were more likely to have comprehensive ASPs compared to hospitals with undergraduate education or no teaching affiliation (34%)
- Written support (RR 7.2; 95% CI, [6.2-8.4]) or salary support (RR 1.5; 95% CI, [1.4-1.8]) were significantly associated with having a comprehensive ASP

## Joint Commission Medication Management Standards for ASPs (MM 09.01.01)

<table>
<thead>
<tr>
<th>Element of Performance</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Leaders establish antimicrobial stewardship as an organizational priority.</td>
</tr>
<tr>
<td>2</td>
<td>Educate staff and licensed independent practitioners involved in antimicrobial ordering, dispensing, administration, and monitoring about antimicrobial resistance and antimicrobial stewardship practices. Education occurs upon hire and annually thereafter.</td>
</tr>
<tr>
<td>3</td>
<td>Educate patients, and their families as needed, regarding the appropriate use of antimicrobial medications, including antibiotics.</td>
</tr>
<tr>
<td>4</td>
<td>The hospital has an antimicrobial stewardship multidisciplinary team that includes the following members, when available in the setting: Pharmacist(s), Infection disease physician, Infection preventionist(s)</td>
</tr>
<tr>
<td>Element of Performance</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>5</td>
<td>The hospital's antimicrobial stewardship program includes the following core elements: <strong>Leadership Commitment, Accountability, Drug Expertise, Action, Reporting, Education</strong></td>
</tr>
<tr>
<td>6</td>
<td>The hospital's antimicrobial stewardship program uses organization-approved multidisciplinary protocols.</td>
</tr>
<tr>
<td>7</td>
<td>The hospital <strong>collects and analyzes data</strong> on its antimicrobial stewardship program, including antimicrobial prescribing and resistance patterns.</td>
</tr>
<tr>
<td>8</td>
<td>The hospital <strong>takes action on improvement opportunities</strong> identified in its antimicrobial stewardship program.</td>
</tr>
</tbody>
</table>
CDC Core Elements of Outpatient Antibiotic Stewardship

• **Commitment:** Demonstrate dedication to and accountability for optimizing antibiotic prescribing and patient safety.

• **Action for policy and practice:** Implement at least one policy or practice to improve antibiotic prescribing, assess whether it is working, and modify as needed.

• **Tracking and reporting:** Monitor antibiotic prescribing practices and offer regular feedback to clinicians, or have clinicians assess their own antibiotic prescribing practices themselves.

• **Education and expertise:** Provide educational resources to clinicians and patients on antibiotic prescribing, and ensure access to needed expertise on optimizing antibiotic prescribing.

Antimicrobial Stewardship Strategies

- Antimicrobial Restriction
  - Preauthorization and/or Prospective Audit and Feedback
  - Delayed Prescribing, Watchful Waiting
- Education of Staff and Patients
- Clinical Practice Guidelines
- Interventions for Specific Infectious Disease Syndromes

- Reassessment of Antimicrobial Therapy
  - Antibiotic Time Outs
- IV to PO Conversion
- Duration of Therapy
- Tracking and Reporting
Antimicrobial Restriction

• Preauthorization
  – Strategy to improve antibiotic use by requiring clinicians to get approval for certain antibiotics before they are prescribed

• Prospective Audit and Feedback (PAF)
  – An intervention that engages the clinician after an antibiotic is prescribed

<table>
<thead>
<tr>
<th>Preauthorization Advantages</th>
<th>PAF Advantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduces initiation of unnecessary/ inappropriate antibiotics</td>
<td>Can increase visibility of antimicrobial stewardship program and build collegial relationships</td>
</tr>
<tr>
<td>Optimizes empiric choices and influences downstream use</td>
<td>More clinical data available for recommendations, enhancing uptake by prescribers</td>
</tr>
<tr>
<td>Prompts review of clinical data/prior cultures at the time of initiation of therapy</td>
<td>Greater flexibility in timing of recommendations</td>
</tr>
<tr>
<td>Decreases antibiotic costs, including those due to high-cost agents</td>
<td>Can be done on less than daily basis if resources are limited</td>
</tr>
<tr>
<td>Provides mechanism for rapid response to antibiotic shortages</td>
<td>Provides educational benefit to clinicians</td>
</tr>
<tr>
<td>Direct control over antibiotic use</td>
<td>Prescriber autonomy maintained</td>
</tr>
<tr>
<td></td>
<td>Can address de-escalation of antibiotics and duration of therapy</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Preauthorization Disadvantages</th>
<th>PAF Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impacts use of restricted agents only</td>
<td>Compliance voluntary</td>
</tr>
<tr>
<td>Addresses empiric use to a much greater degree than downstream use</td>
<td>Typically labor-intensive</td>
</tr>
<tr>
<td>Loss of prescriber autonomy</td>
<td>Success depends on delivery method of feedback to prescribers</td>
</tr>
<tr>
<td>May delay therapy</td>
<td>Prescribers may be reluctant to change therapy if patient is doing well</td>
</tr>
<tr>
<td>Effectiveness depends on skill of approver (ID Pharmacist + ID Physician vs. ID Fellows)</td>
<td>Identification of interventions may require information technology support and/or purchase of computerized surveillance systems</td>
</tr>
<tr>
<td>Real-time resource intensive</td>
<td>May take longer to achieve reductions in targeted antibiotic use</td>
</tr>
<tr>
<td>Potential for manipulation of system (i.e. presenting request in a biased manner to gain approval)</td>
<td></td>
</tr>
<tr>
<td>May simply shift to other antibiotic agents and select for different antibiotic-resistance patterns</td>
<td></td>
</tr>
</tbody>
</table>
Preauthorization and/or Prospective Audit and Feedback

- Preauthorization, PAF, or a combination of those strategies, implementation should serve as the foundation of a comprehensive inpatient ASP.
- Effective implementation requires the support of hospital administration, allocation of necessary resources for a **persistent effort** by dedicated, well-trained personnel, and ongoing communication with clinicians.
- **IDSA/SHEA recommends preauthorization and/or prospective audit and feedback over no such interventions** (strong recommendation, moderate-quality evidence).
Delayed Prescribing and Watchful Waiting

• **Delayed Prescribing**
  – Used for patients with conditions that usually resolve without treatment but who can benefit from antibiotics if the conditions do not improve (e.g., acute uncomplicated sinusitis or mild acute otitis media)

• **Watchful Waiting**
  – Providing symptomatic relief with a clear plan for follow-up if infection symptoms worsen or do not improve

WAIT. Do not fill your prescription just yet. Your healthcare professional believes your illness may resolve on its own.

First, follow your healthcare professional’s recommendations to help you feel better without antibiotics and continue to monitor your own symptoms over the next few days.

- Rest
- Drink extra water and fluids
- Use cool mist vaporizer or saline nasal spray to relieve congestion
- For sore throats in older adults and children, try ice chips, sore throat spray, or lozenges

If you do not feel better in ___ days/hours, or get worse, go ahead and fill your prescription.

If you feel better, you do not need the antibiotic, and do not have to risk the side effects.

Waiting to see if you really need an antibiotic can help you take antibiotics only when it is actually necessary. Antibiotics can cause side effects like a skin rash, diarrhea, a yeast infection, or worse.

Antibiotics can also make future bacterial infections stronger and harder to treat. You can protect yourself and others by learning when antibiotics are and aren’t needed.

Good news! Your healthcare professional believes your illness will likely resolve on its own.

You should watch and wait for ___ days/hours before deciding whether to take an antibiotic.

In the meantime, follow your healthcare professional’s recommendations to help you feel better and continue to monitor your own symptoms over the next few days.

- Rest
- Drink extra water and fluids
- Use cool mist vaporizer or saline nasal spray to relieve congestion
- For sore throats in older children and adults, try ice chips, sore throat spray, or lozenges
- Use honey to relieve cough. Do not give honey to an infant less than 1 year of age.

If you feel better, no further action is necessary — you don’t need antibiotics.

If you do not feel better, experience new symptoms, or have other concerns, call your healthcare professional _______ to discuss if you need a recheck or if you need antibiotics, which may be prescribed over the phone.

It may not be convenient to visit your healthcare professional multiple times, but it is critical to make the right choice. Antibiotics can cause side effects like a skin rash, diarrhea, a yeast infection, or worse.

Antibiotics can also make future bacterial infections stronger and harder to treat. You can protect yourself and others by learning when antibiotics are and aren’t needed.
Education of Staff on Antimicrobial Stewardship

• ASP Education should include all healthcare disciplines and all levels of experience: students, trainees and practitioners

• Education can be provided through didactic lectures, face-to-face or distribution of pamphlets and materials
  – Should address appropriate antibiotic prescribing, adverse drug events, and communication strategies about appropriate antibiotic prescribing

• Education alone can result in unsustainable improvements in antibiotic prescribing
  – Most likely effective when combined with other ASP strategies like PAF

Education of Patients on Antimicrobial Stewardship

• Use effective communications strategies to educate patients about when antibiotics are and are not needed
  – Patients should be informed that antibiotic treatment for viral infections provides no benefit
  – Explanations of when antibiotics are not needed can be combined with recommendations for symptom management
  – Recommendations for when to seek medical care if patients worsen or do not improve

• Educate patients about the potential harms of antibiotic treatment

• Provide patient education materials through multiple venues (print, TV, social media)
How You Can Help?
Everyone can keep antibiotics effective and keep bacteria from becoming resistant. As a patient, you play a very important role.

Here are ways that you can help fight antibiotic resistance.

- Ask your provider if an antibiotic is really necessary
- Don’t ask for antibiotics when you have an infection caused by a virus (like a cold or the flu)
- Remember, antibiotics do not work on infections caused by viruses
- Only use antibiotics when your provider prescribes them for you
- Follow your provider’s instructions when taking antibiotics
- Finish the entire course of antibiotics, even if you start to feel better

Here are some things that you can do to prevent infection...

- Get the recommended vaccines to prevent infection
- Wash your hands frequently, especially after you sneeze or cough
- Practice good cough etiquette
- Avoid frequent touching of your nose, mouth and eyes
- Wash fruits and vegetables thoroughly and avoid raw eggs and undercooked meats
- Don’t share personal items like toothbrushes and razors
- Practice good health habits; get moderate exercise and plenty of sleep

What You Need to Know About Antimicrobial Stewardship Programs

VA | U.S. Department of Veterans Affairs
What is an Antimicrobial Stewardship Program?

We use antibiotics to treat certain kinds of infections. Different types of germs including bacteria and viruses can cause infections. Antibiotics can ONLY treat infections caused by bacteria. Antibiotics DO NOT treat infections caused by viruses like the common cold.

If you take antibiotics when they are not needed OR if you do not take them correctly, they may not work against bacteria that they once killed. You may hear this called “antibiotic resistance”. Resistant bacteria can cause infections that may make you sicker. These infections may require you to be admitted to the hospital and stay in the hospital longer. Infections caused by resistant bacteria are harder to cure and may require antibiotics that can cause more harmful side effects.

Your VA providers have started programs, called Antimicrobial Stewardship Programs, to improve the use of antibiotics. These programs strive to:

- Improve your safety
- Keep bacteria from becoming resistant

When Should You Take Antibiotics?

- For infections caused by bacteria and not viruses.
- These infections include strep throat, pneumonia and infection in the urine with symptoms.

When Should You NOT Take Antibiotics?

- If you have an infection caused by viruses.
  - These infections do not require antibiotics
  - Antibiotics do not work on viruses
- Viruses cause the common cold, the flu and most upper respiratory infections.
- If you use antibiotics for a viral infection, it will NOT:
  - Cure the infection
  - Make you feel better
  - Keep the virus from spreading to others

What Does this Mean for Me?

This means that YOU will receive:

- An antibiotic for an infection that should be treated with antibiotics (not infections caused by a virus)
- The right antibiotic for your infection
- The right dose of an antibiotic
- An antibiotic at the right time
- An antibiotic for the right length of time

This helps YOU:

- Heal faster from an infection
- Lowers your chance of developing side effects to the antibiotic
- Be less likely to be infected with antibiotic-resistant bacteria
Antibiotics Aren’t Always the Answer

FIVE FAST FACTS ABOUT ANTIBIOTICS

1. Antibiotics only treat infections caused by bacteria.
   Viruses cause infections like a cold. If you have a cough, nasal congestion or sore throat, talk to your provider or pharmacist about ways to help you feel better. This may include over-the-counter medicine, a humidifier, or warm liquids.

2. Most sore throats DO NOT require an antibiotic.
   Only 1 in 6 people who see their provider for a sore throat have strep throat. Your provider can test to see if you have strep throat, and will prescribe an antibiotic if you do.

3. If you have green colored mucus, you DO NOT necessarily need an antibiotic.
   As your body’s immune system fights an infection, mucus can change color. This is normal and does not always mean you need an antibiotic.

4. There are potential risks when you take any prescription drug.
   Using antibiotics can cause problems, ranging from an upset stomach to a serious allergic reaction and make them less likely to be effective in the future.

5. Using the right antibiotic at the right time can save your life.
   Only use antibiotics if your provider says you really need them. If we use them to treat health problems that don’t require them, they may not work as well when you have an illness that does.

Viruses cause most coughs and colds. Antibiotics do not cure illnesses caused by a virus.

Viruses cause these common illnesses:
- Colds
- Influenza (the flu)
- Runny noses
- Most coughs
- Most bronchitis
- Most sore throats
- Most sinus infections

Antibiotics WILL NOT treat them
- Viral illnesses, like colds, usually go away without treatment in a week or two.
- Ask your provider or pharmacist what will help you feel better.

Taking antibiotics for viral illnesses:
- Will NOT cure your illness
- Will NOT help you feel better
- Will NOT keep others from catching your illness

Take antibiotics only when your provider feels that you need them.

Using antibiotics can:
- Kill good bacteria in your body. This may lead to problems like diarrhea or yeast infections.
- Cause a serious allergic reaction that may require a stay in the hospital.
- Result in an infection that resists treatment with an antibiotic. Resistant bacteria may stay in your body and can cause severe illnesses that antibiotics cannot cure. A cure for a resistant infection may require stronger treatment and possibly a hospital stay.

There are potential risks when taking any prescription drug.

Talk with your provider about the best way to care for your illness.
Facility-Specific Clinical Practice Guidelines for Common Infectious Diseases Syndromes

- Implementation of facility specific clinical practice guidelines can lead to substantial changes in antibiotic use
  - Most evidence in CAP and HAP
  - Interdisciplinary development
  - Dissemination to providers via multiple routes: electronic and hard copies, education, peer champions, PAF, electronic order sets
- Improvements seen with implementation of facility specific guidelines
  - Increase in appropriate initial therapy, use of narrower-spectrum agents, early IV to PO switch, shorter duration of treatment
  - No adverse effects on clinical outcomes

Introduction

Patients with diabetes mellitus comprise at least 70% of the population who experiences non-traumatic limb loss in this country. In addition to the high excess medical costs associated with amputations, limb loss impairs mobility and ability to live independently, and decreases quality-of-life (see review). Efforts at limb preservation not only provide improved outcomes but also cost savings.

A compromised skin barrier is the portal-of-entry for direct bacterial inoculation of the foot. The development of an foot ulcer or other chronic foot wound precedes 85% of above-ankle amputations, and so the occurrence of a foot ulcer has been referred to as a "sentinel event". Foot ulcers in ambulatory patients – regardless of the chronicity of the wound or whether acute infection is present – merit efforts to achieve wound healing (i.e., full re-epithelialization) to reduce the risk of limb loss.

Three main risk factors have a well-established role in the development of foot ulcers:

1. Patients with diabetes mellitus often develop characteristic structural abnormalities of the foot, including prominent metatarsal heads, valgus deviation of the first toe and “hammer toes”. These abnormalities often result in an abnormal distribution of pressure on the plantar aspect of the foot during the gait cycle and ulcer formation from repetitive trauma to various parts of the foot.

2. Patients with diabetes mellitus often develop sensory neuropathy, also referred to as “loss of protective sensation.” This impairs the normal pain response to skin breakdown and lessens the likelihood diabetic patients will notice chronic repetitive trauma and the development of a foot ulcer.

3. Patients with diabetes mellitus have a high prevalence of peripheral arterial disease. This characteristic happens at the level of the popliteal and tibial arteries. (Note: “small vessel disease” or “microvascular disease” is NOT thought to play a causal role in the development of foot ulcers or limb loss; see review). Moderate to severe peripheral arterial disease results in a degree of tissue perfusion that is often adequate for successful wound healing.
## MEDVAMC Empiric Antibiotic Recommendations

<table>
<thead>
<tr>
<th>CENTRAL NERVOUS SYSTEM</th>
<th>Recommended Therapy</th>
<th>Comments and Alternative Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>MENINGITIS</td>
<td>Vancomycin IV† AND Ceftriaxone 2g IV q12h For adults &gt;50yr, alcoholism, pregnancy, add Ampicillin* 2g IV q4h in cases of viral encephalitis; Acyclovir* 10mg/kg (IBW) IV q8h Consult Infectious Diseases</td>
<td>• PCN anaphylaxis: Vancomycin IV† AND Levofoxacin 750mg IV q24h • Need to consider expanded gram-negative coverage in cases of post-neurosurgical procedure or nursing home setting.</td>
</tr>
</tbody>
</table>

| EAR, NOSE, THROAT       | Consider pretest probability carefully to treat or not treat. Obtain culture. If positive, Penicillin VK* 500mg PO q12h OR Amoxicillin* 500mg PO q12h x 10 days | • Alternatives: Penicillin G Benzathine 1.2 million units IM x 1 dose • PCN rash: Cephalexin* 500mg PO q12h x 10 days • PCN anaphylaxis: Clindamycin 300mg PO q8h x 10 days |

| PHARYNGITIS             | Do NOT give antibiotics unless symptoms ≥10 days, severe or worsening | • PCN anaphylaxis: Doxycline 100mg PO q12h x 5 days OR Levofloxacin 500mg PO q24h x 5 days • Do NOT use: Amoxicillin, Cephalexin, SMX/TMP, Azithromycin or Clarithromycin due to high rates of failure |

| SINUSITIS              | Amoxicillin/Clavulanate* 875/125mg 1 tab PO q12h OR 500/125mg 1 tab PO q8h x 5 days | • PCN anaphylaxis: Clindamycin 300mg PO q8h x 7 days • Inpatient: Amoxicillin/Sulfactam* 1.5-3g IV q6h OR Clindamycin 600 mg IV q8h |

| PERIODONTAL ABSCESSES   | Amoxicillin/Clavulanate* 875/125mg PO q12h OR Clindamycin 300mg PO q8h x 7 days | |

| FEBRILE NEUTROPENIA     | Cefepime* 2g IV q8h (adjust for kidney function) | • Add Vancomycin IV† if MRSA is suspected: catheter-related infections, known colonization with MRSA, blood culture positive for gram-positive bacteria, hypotension, severe mucositis, if prior fluoroquinolone prophylaxis provided |

| GASTROINTESTINAL        | Metronidazole 500mg PO q8h for 10-14 days for initial infection if colitis is mild Oral Vancomycin 125mg PO q6h for 10-14 days for severe or recurrent colitis | • Pts with ileus, septic shock, AMS, temp ≥38.5°C, lactate ≥2.5, WBC ≥15, or <2, respiratory/renal failure; obtain ID and Surgical consults and start Metronidazole 500mg IV q8h AND Oral Vancomycin 500mg PO q6h + rectal Vancomycin |

| Clostridium difficile colitis | | |

| SPONTANEOUS BACTERIAL PERITONITIS | Ceftriaxone 2g IV q24h x 5 days | • Alternatives: Ciprofloxacin* 400mg IV q12h x 5 days |

| INTRA-ABDOMINAL INFECTION | Ceftriaxone 1g IV q 24h AND Metronidazole 500mg IV q8h If healthcare associated: Cefepime* 1g IV q6h AND Metronidazole IV q8h OR Ertapenem* 1g IV q24h | • Alternatives if healthcare-associated: Piperacillin/Tazobactam* 3.375g IV q6h OR Ciprofloxacin* 400mg IV q12h AND Metronidazole 500mg IV q8h |
MEDVAMC Antimicrobial Stewardship Resources

- Antibiograms and Antibiotic Guidelines
  - CPRS → Tools menu → Clinical Guidelines
Facility-Specific Clinical Practice Guidelines for Common Infectious Diseases Syndromes

- Sustainability of the effects of guideline development are not well established
- Interventions to maintain guideline adherence over time may be needed and outcomes monitored
- IDSA/SHEA suggest ASPs develop facility-specific clinical practice guidelines coupled with a dissemination and implementation strategy (weak recommendation, low-quality evidence)
Interventions to Improve Antibiotic Use and Clinical Outcomes in Patients With Specific Infectious Diseases Syndromes

Sustained reduction in inappropriate treatment of asymptomatic bacteriuria in a long-term care facility through educational intervention

- Developed a multidisciplinary intervention to discourage collection of urine cultures from asymptomatic patients and treatment of asymptomatic bacteriuria (ASB)
  - Education sessions, pocket cards and posters on ASB, reinforcement education, direct feedback to nurses and providers regarding instances of inappropriate urine collection or treatment of ASB

### Table 1. Educational information for nursing staff regarding criteria for sending urine cultures

<table>
<thead>
<tr>
<th>Criteria for sending a urine culture:</th>
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</thead>
<tbody>
<tr>
<td>Fever or rigors</td>
</tr>
<tr>
<td>Urinary urgency or frequency</td>
</tr>
<tr>
<td>Dysuria</td>
</tr>
<tr>
<td>Hematuria</td>
</tr>
<tr>
<td>New onset of urinary incontinence</td>
</tr>
<tr>
<td>Acute urinary retention</td>
</tr>
<tr>
<td>Flank pain</td>
</tr>
<tr>
<td>Significant change in mental status, with no other explanation</td>
</tr>
</tbody>
</table>

**Do NOT send a urine specimen routinely for:**

- Foul-smelling or cloudy urine
- After every urethral catheter change
- Upon admission
- After treatment to document cure

### Table 2. Educational information for primary care providers regarding diagnosis of symptomatic urinary tract infection

**Symptomatic urinary tract infection must have:**

- One of the following symptoms: fever, urgency, frequency, dysuria, or suprapubic tenderness
- OR
- Positive urine culture ($>10^5$ organisms/cm$^3$)

**AND**

- Two of the following symptoms: fever, urgency, frequency, dysuria, or suprapubic tenderness
- OR
- Two urine cultures with the same uropathogen ($>10^2$ organisms/cm$^3$) or other positive findings

### Table 3. Educational information for primary care providers regarding criteria for empiric antibiotic treatment while awaiting culture results

**No indwelling catheter present:**

- Acute dysuria alone
- OR
- Fever AND at least 1 of the following: urgency, frequency, suprapubic tenderness, hematuria, flank pain, new incontinence

**Indwelling catheter present:**

- Presence of at least 1 of the following symptoms: fever or rigors, costovertebral tenderness, or new-onset delirium

NOTE: Primary care providers include physicians, nurse practitioners, physicians’ assistants.
Interventions to Improve Antibiotic Use and Clinical Outcomes in Patients With Specific Infectious Diseases Syndromes

<table>
<thead>
<tr>
<th></th>
<th>3-Month preintervention</th>
<th>Initial 6 months postintervention</th>
<th>7 to 30 Months postintervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient-days, n</td>
<td>13,151</td>
<td>27,846</td>
<td>124,849</td>
</tr>
<tr>
<td>Total urine cultures sent</td>
<td>49</td>
<td>43</td>
<td>164</td>
</tr>
<tr>
<td>Total urine cultures sent/1000 patient-days (95% CI)</td>
<td>3.7 (2.8-4.9)</td>
<td>1.5 (1.1-2.1)</td>
<td>1.3 (1.1-1.5)</td>
</tr>
<tr>
<td>Inappropriate cultures, n (%)</td>
<td>34 (69.4)</td>
<td>26 (60.5)</td>
<td>75 (45.7)</td>
</tr>
<tr>
<td>Inappropriate cultures/1000 patient-days (95% CI)</td>
<td>2.6 (1.8-3.6)</td>
<td>0.9 (0.6-1.4)</td>
<td>0.6 (0.5-0.8)</td>
</tr>
<tr>
<td>Total ASB identified</td>
<td>34</td>
<td>26</td>
<td>75</td>
</tr>
<tr>
<td>ASB treated, n. (%)</td>
<td>23 (67.6)</td>
<td>18 (69.2)</td>
<td>33 (44.0)</td>
</tr>
<tr>
<td>ASB treated/1000 patient-days (95% CI)</td>
<td>1.7 (1.1-2.6)</td>
<td>0.6 (0.4-1.0)</td>
<td>0.3 (0.2-0.4)</td>
</tr>
<tr>
<td>Antimicrobial days of therapy/1000 patient-days</td>
<td>167.7</td>
<td>117.4</td>
<td>109.0</td>
</tr>
</tbody>
</table>

- IDSA/SHEA suggest ASPs implement interventions to improve antibiotic use and clinical outcomes that target patients with specific infectious diseases syndromes (weak recommendation, low-quality evidence)

Reassessment of Antimicrobial Therapy

• **For Outpatients:** Follow up on culture results, contact ASP or Infectious Diseases for assistance if needed

• **For Inpatients:** common strategies include antibiotic timeouts and antibiotic automatic stop orders at 48-72 hours of therapy to prompt clinicians to re-evaluate current antibiotic therapy
  – Clinicians may require additional prompting from pharmacy or the ASP to comply with these interventions
  – Mechanisms should be in place to prevent unintended interruptions in therapy if automatic stop orders are used
  – IDSA/SHEA suggest the use of strategies (eg, antibiotic time-outs, stop orders) to encourage prescribers to perform routine review of antibiotic regimens to improve antibiotic prescribing (weak recommendation, low-quality evidence)

Principles of an Antibiotic Time Out

An Antibiotic Timeout offers the opportunity to modify therapy based upon the clinical course of the patient and preliminary and/or final microbiology results. This information may lead to one of the following assessments:

- **An infection requiring antibiotic therapy is no longer present**
- The patient may have clinically improved to such an extent that oral antimicrobial therapy can be substituted for parenteral therapy.
- The infecting micro-organism may be susceptible to an antibiotic that has a more narrow spectrum or activity and/or a less toxic antibiotic.
- The infecting micro-organism may be resistant to the initially selected therapy and require therapy with an antibiotic with enhanced activity.
TheraDoc Broad Spectrum De-escalation Alert

TAM Alert
Admit Diagnosis:

This patient appears to have received at least 72 hours of therapy with a broad spectrum antibacterial and may be a candidate for therapy with a more narrow spectrum antibacterial.

Recent Broad Spectrum Antibacterial Orders at Alert Time:

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose</th>
<th>Start</th>
<th>End</th>
<th>Status</th>
<th>Pat Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERTAPENEM INJ, PWDR</td>
<td>1GM/1VIAL IV PIGGYBACK DAILY</td>
<td>06/10/2016 15:44</td>
<td>06/14/2016 17:00</td>
<td>ACTIVE</td>
<td>I</td>
</tr>
<tr>
<td>ERTAPENEM INJ, PWDR</td>
<td>1GM/1VIAL IV PIGGYBACK DAILY</td>
<td>06/07/2016 16:23</td>
<td>06/10/2016 15:16</td>
<td>INACTIVE</td>
<td>I</td>
</tr>
<tr>
<td>ERTAPENEM INJ, PWDR</td>
<td>1GM/1VIAL IV PIGGYBACK DAILY</td>
<td>06/07/2016 16:23</td>
<td>06/10/2016 11:49</td>
<td>INACTIVE</td>
<td>I</td>
</tr>
<tr>
<td>ERTAPENEM INJ, PWDR (EXPIRED)</td>
<td>1GM/1VIAL IV PIGGYBACK NOW</td>
<td>06/07/2016 16:23</td>
<td>06/07/2016 20:30</td>
<td>INACTIVE</td>
<td>I</td>
</tr>
<tr>
<td>VANCOMYCIN HCL 10GM/VIAL INJ</td>
<td>750 MG IV PIGGYBACK Q12H</td>
<td>06/07/2016 16:23</td>
<td>06/09/2016 13:24</td>
<td>INACTIVE</td>
<td>I</td>
</tr>
</tbody>
</table>

Microbiology Review
Urnalysis
ID Medication Summary
Lab Review
Radiology Review
Antibogram
Nedations
ID Summary
Increased Use of Oral Antibiotics (IV to PO)

• Associated with reduced drug costs and hospital length of stay without adverse effects on efficacy or safety
  – Avoidance of IV catheters and associated complications (infection, thrombosis)
• Mandatory Infectious Diseases consultation for Outpatient Parenteral Antimicrobial Therapy has also been shown to facilitate IV to PO conversion or discontinuation of antimicrobial therapy
• IV to PO conversion should be incorporated into routine pharmacy activities
  – Automatic vs. Discussion with Provider
• IDSA/SHEA recommend ASPs implement programs to increase both appropriate use of oral antibiotics for initial therapy and the timely transition of patients from IV to oral antibiotics (strong recommendation, moderate-quality evidence)
# MEDVAMC Antimicrobial IV to PO Conversion Criteria

## Eligibility Criteria (pt must meet criteria for ≥ 24 hours)

<table>
<thead>
<tr>
<th>Receiving IV antibiotics</th>
<th>Linezolid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Azithromycin</td>
<td>Metronidazole</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>Minocycline</td>
</tr>
<tr>
<td>Clindamycin</td>
<td>Moxifloxacin</td>
</tr>
<tr>
<td>Doxycycline</td>
<td>Rifampin</td>
</tr>
<tr>
<td>Fluconazole</td>
<td>Trimethoprim/Sulfamethoxazole</td>
</tr>
<tr>
<td>Levofloxacin</td>
<td></td>
</tr>
</tbody>
</table>

- Functioning GI tract: Tolerating meds via oral or enteral route, food or enteral feeds
- Hemodynamically stable: HR <100, SBP >90mmHg, RR ≤ 20
- Clinical improvement: T <100°F or <37.7°C, WBC normal/ downtrending

## Exclusion Criteria

<table>
<thead>
<tr>
<th>Severe infection</th>
<th>neutropenic fever, CNS infection, endocarditis, fungemia, Staph aureus bacteremia, undrained abscess/empyema</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral route unavailable/unreliable</td>
<td>active NPO order, severe N/V, receiving anti-emetics, severe diarrhea, mucositis, malabsorption, ileus, vasopressor therapy, TPN within last 72 hrs, active GI bleed</td>
</tr>
<tr>
<td>Dosing Conversions</td>
<td>IV Dose</td>
</tr>
<tr>
<td>--------------------------------------------------------</td>
<td>------------------------------</td>
</tr>
<tr>
<td>Azithromycin</td>
<td>500 mg q24h</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>400 mg q8h</td>
</tr>
<tr>
<td></td>
<td>400 mg q12h</td>
</tr>
<tr>
<td></td>
<td>200 mg q12h</td>
</tr>
<tr>
<td>Clindamycin</td>
<td>600 mg q8h</td>
</tr>
<tr>
<td>Trimethoprim/Sulfamethoxazole</td>
<td>320 mg q12h</td>
</tr>
<tr>
<td>(dosing is Trimethoprim component)</td>
<td>160 mg q12h</td>
</tr>
<tr>
<td>Antibiotics w/ equivalent IV and PO dosing</td>
<td>doxycycline, fluconazole, levofoxacin, linezolid, metronidazole, minocycline, moxifloxacin, rifampin</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Oral/Enteral Administration Considerations</th>
<th>With or without food</th>
<th>Chelation medication interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Azithromycin</td>
<td>With or without food. Increased tolerability w/ food</td>
<td>Avoid simultaneous administration</td>
</tr>
<tr>
<td>Ciprofloxacin&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Give w/ liberal fluids with or without food; should not be taken with dairy products or calcium-fortified juices alone</td>
<td>Administer ciprofloxacin 2 hours before or 6 hours after</td>
</tr>
<tr>
<td>Clindamycin</td>
<td>Give w/ full glass of water, with or without food</td>
<td></td>
</tr>
<tr>
<td>Doxycycline&lt;sup&gt;b&lt;/sup&gt; and Minocycline&lt;sup&gt;c&lt;/sup&gt;</td>
<td>Give w/ adequate fluids. If GI irritation occurs, may be given w/ food or milk</td>
<td>Absorption decreased, no specific recommendations</td>
</tr>
<tr>
<td>Fluconazole</td>
<td>With or without food</td>
<td></td>
</tr>
<tr>
<td>Levofoxacin&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Solution 1 hour before or 2 hours after eating Tablet with or without food</td>
<td>Administer levofoxacin 2 hours before or 2 hours after</td>
</tr>
<tr>
<td>Linezolid</td>
<td>With or without food. Avoid foods/drinks w/ tyramine</td>
<td>Administer moxifloxacin 4 hours before or 8 hours after</td>
</tr>
<tr>
<td>Metronidazole&lt;sup&gt;c&lt;/sup&gt;</td>
<td>With or without food</td>
<td></td>
</tr>
<tr>
<td>Moxifloxacin&lt;sup&gt;a&lt;/sup&gt;</td>
<td>With or without food</td>
<td></td>
</tr>
<tr>
<td>Rifampin</td>
<td>1 hour before or 2 hours after a meal w/ full glass of water</td>
<td>Administer rifampin 1 hour before or 2 hours after</td>
</tr>
<tr>
<td>Trim/ Sulfal</td>
<td>Give with adequate fluids, with or without food</td>
<td></td>
</tr>
<tr>
<td>Enteral administration</td>
<td>Solutions preferred over tablets; if tablet, must be able to be crushed (not XR or enteric coated)</td>
<td>Avoid recommending fluoroquinolones for enteral administration;&lt;sup&gt;b&lt;/sup&gt; Doxycycline supplied as a capsule, avoid recommending;&lt;sup&gt;c&lt;/sup&gt; Should not be crushed due to slow release</td>
</tr>
</tbody>
</table>
Reducing Antibiotic Therapy to the Shortest Effective Duration

- Recommendations on duration of therapy can be incorporated into other ASP interventions such as during preauthorization or PAF, education or institutional guidelines.

- IDSA/SHEA recommend that ASPs implement guidelines and strategies to reduce antibiotic therapy to the shortest effective duration (strong recommendation, moderate-quality evidence).

Tracking and Reporting

- Data on antimicrobial use should be shared with clinicians to inform them of their practices and monitor adherence to institutional guidelines and procedures.

- Rates of *C. difficle* infection or antibiotic resistance are complex metrics that can be influenced by factors other than antimicrobial stewardship (patient population, infection control procedures, pathogen and host factors) but can be assessed as secondary outcome measures.

Conclusion

• Antimicrobial Stewardship is gaining recognition outside Infectious Diseases on a local, state, national and international level.

• Antimicrobial Stewardship Programs should be multidisciplinary and include ID Physicians, ID Pharmacists, Infection Control Practitioners and Clinical Microbiologists among others.

• Either Preauthorization or Prospective Audit and Feedback should be utilized as the primary mode of inpatient antimicrobial restriction.
Conclusion

• Education about Antimicrobial Stewardship should be provided to every clinician and trainee and include reinforcement of Antimicrobial Stewardship Program guidelines

• Antibiotic timeouts for re-evaluation and de-escalation of current antimicrobial therapy at 48-72 hours should be encouraged of all inpatient providers

• Antimicrobial Utilization should be tracked and reported out as feedback to clinicians on their prescribing practices and adherence to Antimicrobial Stewardship Program guidelines
Things you can do to practice Antimicrobial Stewardship

• Observe antibiotic best practices
  – Obtain appropriate samples for cultures and **follow up results**
  – Choose antibiotics based on local antibiograms, severity and location of infection
  – Use the **most narrow antibiotic possible**
  – Use the **shortest duration** of treatment possible based on the indication

• **AVOID** antibiotics for inappropriate indications
  – Upper respiratory tract infections, asymptomatic bacteriuria

• **Take the time** to educate your patients on when antibiotics ARE and ARE NOT needed
  – Recommend symptomatic relief and back-up plans, Reassure your patients

• Seek out the personnel of the local Antimicrobial Stewardship Program at your facility
Updates in Antimicrobial Stewardship

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