THE ANTIBIOTIC STEWARDSHIP CONTINUUM

Oklahoma City Area Annual Pharmacy Seminar
June 30, 2019

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Russell Kern, Pharm.D., BCPS

Disclosure Statement

Under guidelines established by the Accreditation Council for Pharmacy Education, disclosure must be made regarding financial relationships with commercial interests within the last 12 months.

- Yvette Morrison
  I have no relevant financial relationships or affiliations with commercial interests to disclose.

- Dwayne David
  I have no relevant financial relationships or affiliations with commercial interests to disclose.

- Russell Kern
  I have no relevant financial relationships or affiliations with commercial interests to disclose.
Learning Objectives

At the completion of this activity, pharmacists will be able to:

■ Indicate the rationale for implementing an Antibiotic Stewardship Program (ASP)
■ Recognize the Centers for Disease Control and Prevention (CDC) Core Elements of Antibiotic Stewardship in a variety of patient settings
■ Discuss methods of implementing an outpatient ASP in a multi-facility health system
■ Explain possible reasons for differences in stewardship outcomes within the health system
■ Demonstrate the importance of an interdisciplinary ASP team
■ Discuss methods of implementing an inpatient ASP and measuring outcomes

Presentation Outline

Yvette
Dwayne
Russell
Approximately what percentage of outpatient antibiotic prescriptions are unnecessary?

A. 10%
B. 30%
C. 75%
D. 90%

Approximately how many people in the US develop an antibiotic-resistant infection each year?

A. 250,000
B. 500,000
C. 1,000,000
D. 2,000,000
How many new antibacterial drugs is the Infectious Diseases Society of America calling for by 2020?

A. 0  
B. 5  
C. 10  
D. 20

Definition of Antibiotic Stewardship

“Antibiotic stewardship is the systematic effort to improve antibiotic use to improve patient outcomes in order to help patients and combat antibiotic resistance.”

CDC. 2017 Antibiotic Use in the United States: Progress and Opportunities
Why?

- Antibiotic overprescribing
- Microbial resistance trends
- Lack of new antibiotics

Additional US Antibiotic Use Statistics

Outpatient setting 2010 - 2011

- Majority of use and expenditure
  - 1 in 3 antibiotic prescriptions are unnecessary
- Adding inappropriate prescribing → 50%


Further Evidence of Overprescribing

Outpatient setting - 2016

- ICD-10-CM diagnosis code classification
- Insurance claims data of privately insured
  - Children (0-17YO) and adults (18-64YO)

Chua KP, Fischer MA, Linder JA, BMJ 2019
Microbial Resistance

- Each year in the U.S., at least 2 million people are infected with antibiotic-resistant bacteria, resulting in at least 23,000 deaths

CDC. Antibiotic resistance threats in the United States, 2013
Antibiotic Resistance Threats in the US, 2013

<table>
<thead>
<tr>
<th>Urgent Threats</th>
<th>Serious Threats</th>
<th>Concerning Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clostridiodes difficile</td>
<td>Multidrug-resistant Acinetobacter</td>
<td>Vancomycin-resistant Staphylococcus aureus (VRSA)</td>
</tr>
<tr>
<td>Carbapenem-resistant Enterobacteriaceae (CRE)</td>
<td>Drug-resistant Campylobacter</td>
<td>Erythromycin-Resistant Group A Streptococcus</td>
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<tr>
<td>Drug-resistant Neisseria gonorrhoeae</td>
<td>Fluconazole-resistant Candida</td>
<td>Clindamycin-resistant Group B Streptococcus</td>
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<td>Extended-spectrum Beta-lactamase producing Enterobacteriaceae</td>
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<td></td>
<td>Vancomycin-resistant Enterococcus (VRE)</td>
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<td>Multidrug-resistant Pseudomonas aeruginosa</td>
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<td>Drug-resistant non-typhoidal Salmonella</td>
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<td>Drug-resistant Salmonella Serotype Typhi</td>
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<td>Drug-resistant Shigella</td>
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<td>Methicillin-resistant Staphylococcus aureus (MRSA)</td>
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<td></td>
<td>Drug-resistant Streptococcus pneumoniae</td>
<td></td>
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<tr>
<td></td>
<td>Drug-resistant Tuberculosis</td>
<td></td>
</tr>
</tbody>
</table>

CDC. Antibiotic resistance threats in the Unites States, 2013
Antibiotic Development

■ Infectious Diseases Society of America 10 x ‘20 Initiative

<table>
<thead>
<tr>
<th>Approval Year</th>
<th>Antibiotic Name</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>ceftriaxone (Teflaro)</td>
<td>Bacterial skin infections, bacterial pneumonia</td>
</tr>
<tr>
<td>2011</td>
<td>fidaxomicin (Dificid)</td>
<td>CDAD</td>
</tr>
<tr>
<td>2013</td>
<td>telavancin (Vibativ)</td>
<td>HAP and VAP due to S. aureus</td>
</tr>
<tr>
<td>2014</td>
<td>dalbavancin (Dalvance)</td>
<td>ABSSI</td>
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<tr>
<td></td>
<td>tedizolid (Sivextro)</td>
<td>ABSSI</td>
</tr>
<tr>
<td></td>
<td>ortavancin (Orbactiv)</td>
<td>ABSSI</td>
</tr>
<tr>
<td></td>
<td>ceftolozane + tazobactam (Zerbaxa)</td>
<td>ABSSI</td>
</tr>
<tr>
<td>2015</td>
<td>ceftazidime + avibactam (Avycza)</td>
<td>cUTI and cUTI</td>
</tr>
<tr>
<td></td>
<td>isavuconazonium sulfate (Cresembra)</td>
<td>invasive aspergillosis and invasive mucormycosis</td>
</tr>
<tr>
<td>2016</td>
<td>bezlotoxumab (Zipilava)</td>
<td>Recurrent CDI in patients receiving antibacterial treatment</td>
</tr>
<tr>
<td>2017</td>
<td>delafloxacin (Baxdela)</td>
<td>ABSSI</td>
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<tr>
<td></td>
<td>meropenem + vaborbactam (Vabomere)</td>
<td>cUTI</td>
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<tr>
<td></td>
<td>ozenoxacin (Xepi)</td>
<td>Impetigo</td>
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<tr>
<td>2018</td>
<td>plazomicin (Zemdr)</td>
<td>cUTI</td>
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<tr>
<td></td>
<td>eravacycline (Xerava)</td>
<td>cUTI</td>
</tr>
<tr>
<td></td>
<td>omadacycline (Nuzyra)</td>
<td>CABP and ABSSI</td>
</tr>
</tbody>
</table>

Other Goals for 2020

“CARB” Counting

■ ↓ Inappropriate use
  - 50% in outpatient
  - 20% in inpatient

Healthy People 2020

■ ↓ Treatment courses
  - Acute otitis media
  - Common cold

CDC Core Elements for Antibiotic Stewardship

- Hospital Antibiotic Stewardship Programs (2014)
- Antibiotic Stewardship for Nursing Homes (2015)
- Antibiotic Stewardship in Outpatient Settings (2016)

Core Elements of Outpatient Antibiotic Stewardship

- Commitment
- Action for policy and practice
- Tracking and reporting
- Education and expertise

https://www.cdc.gov/antibiotic-use/community/improving-prescribing/core-elements/core-outpatient-stewardship.html
Core Elements of Hospital Antibiotic Stewardship Programs

- Leadership commitment
- Accountability
- Drug expertise
- Action
- Tracking
- Reporting
- Education

https://www.cdc.gov/antibiotic-use/healthcare/implementation/core-elements.html

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OUTPATIENT ANTIBIOTIC STEWARDSHIP
Which of the following interventions are **least effective**?

A. Posters in exam rooms with signed commitment statement from provider

B. Educate parents on child’s antibiotic use including possible adverse effects

C. Educate adults on their antibiotic use including possible adverse effects

D. Utilizing interactive case-based education to teach medical staff

E. All of the above are effective interventions

Which of the following is likely to lead to problems when implementing an ASP?

A. Designating a single leader for the ASP

B. Training clinicians on how to use a new clinical decision tool

C. Selecting more than one high-priority condition to monitor

D. Building new clinical decision tool without user input

E. All of the above can lead to problems
Clinicn Checklist for Core Elements

Commitment

1. Can you demonstrate dedication to and accountability for optimizing antibiotic prescribing and patient safety related to antibiotics?

Write and display public commitments in support of antibiotic stewardship

Example: Poster containing a public commitment to use antibiotics appropriately

- Include clinician picture and signature
- Display in patient examination rooms
Action

2. Have you implemented at least one practice to improve antibiotic prescribing?

Use evidence-based diagnostic criteria and treatment recommendations

Use national guidelines (e.g., IDSA) along with local pathogen susceptibilities to guide antibiotic choices

Action

2. Have you implemented at least one practice to improve antibiotic prescribing?

Use delayed prescribing practices or watchful waiting, when appropriate

- Delayed prescriptions and watchful waiting were both effective at reducing antibiotic prescriptions
Tracking and Reporting

3. Do you monitor at least one aspect of antibiotic prescribing?

Self-evaluate antibiotic prescribing practices
- Providers can evaluate themselves and align their prescribing habits with practice guidelines

Participate in continuing medical education and quality improvement activities to track and improve antibiotic prescribing
- Can be conducted through health professional activities, ACPE/CME courses, CDC Train

Education and Expertise

4. Do you provide education to patients and seek out continuing education on antibiotic prescribing?

Use effective communication strategies to educate patients about when antibiotics are and are not needed

Dialogue Around Respiratory Illness Treatment (DART) – CDC Training Module 6
- Negative treatment recommendation plus positive treatment recommendation with a contingency plan resulted in 85% reduction in risk of prescribing antibiotics
Education and Expertise

4. Do you provide education to patients and seek out continuing education on antibiotic prescribing?

Educate about the potential harms of antibiotic treatment

A study of parents of pediatric parents concluded that parents are interested in information on antibiotic associated ADEs while adult patients may be less receptive


Provide patient education materials

- Not much evidence supporting patient education materials alone
  - Educate patient on subject matter

Facility Checklist for Core Elements of Outpatient Antibiotic Stewardship

Commitment

1. Can your facility demonstrate dedication to and accountability for optimizing antibiotic prescribing and patient safety related to antibiotics?

Identify a single leader to direct antibiotic stewardship activities within a facility
- Core elements states successful hospital ASP programs have utilized a physician leader
- Leader can be a pharmacist

Include antibiotic stewardship-related duties in position descriptions or job evaluation criteria

Communicate with all clinic staff members to set patient expectations
- Staff should use consistent messages when communicating with patients
Action

2. Has your facility implemented at least one policy or practice to improve antibiotic prescribing?

Provide communication skills training for clinicians
- Dialogue Around Respiratory Illness Treatment (DART) – Reviewed in Communication Training Module 6 of CDC Training on Antibiotic Stewardship
- Active training tends to be more effective than passive


Action

2. Has your facility implemented at least one policy or practice to improve antibiotic prescribing?

Require explicit written justification in the medical record for non-recommended antibiotic prescribing
- Provider education and written justification in chart decreased antibiotic prescriptions 18% compared to 11% with education alone

Action

2. Has your facility implemented at least one policy or practice to improve antibiotic prescribing?

Provide support for clinical decisions
- Use of clinical prediction rule in EHR
  - Ex: Walsh rule for streptococcal sore throat and Heckerling rule for pneumonia
    - NNT to prevent one antibiotic prescription was 10.8
    - Must develop the process around the user and educate providers on how to use


Action

2. Has your facility implemented at least one policy or practice to improve antibiotic prescribing?

Use call centers, nurse hotlines, or pharmacist consultations as triage systems to prevent unnecessary visits
- Use of nursing advice hotline to optimize self-care of URIs resulted in self-care in 88% of initial advice calls

Tracking and Reporting

3. Does your facility monitor at least one aspect of antibiotic prescribing?

Track and report antibiotic prescribing for one or more high-priority conditions

- Includes UTIs, sinusitis, bronchitis and other respiratory infections where antibiotics are prescribed unnecessarily

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Tracking and Reporting

3. Does your facility monitor at least one aspect of antibiotic prescribing?

Track and report the percentage of all visits leading to antibiotic prescriptions

- Track all visits – this may lead to identifying providers who are diagnosis shifting (clinician manipulates diagnostic code to justify prescribing antibiotic)
Tracking and Reporting

3. Does your facility monitor at least one aspect of antibiotic prescribing?

(If already tracking and reporting one of the above) Track and report, at the level of a health care system, complications of antibiotic use resistance trends among common outpatient bacterial pathogens

- Investigate Clostridioides difficile infections for possible links to ambulatory care visits
- Review antibiotic drug interactions and adverse drug events
- Utilize lab and infection prevention personnel to analyze resistance trends

Sanchez, G.V., Fleming-Dutra, K.E., Roberts, R.M., Hicks, L.A. Core Elements of Outpatient Antibiotic Stewardship. MMWR Recomm Rep 2016;65(No. RR-6):1

Tracking and Reporting

3. Does your facility monitor at least one aspect of antibiotic prescribing?

Assess and share performance on quality measures and established reduction goals addressing appropriate antibiotic prescribing from health care plans and payers

- The National Strategy for Combating Antibiotic-Resistant Bacteria aims to reduce inappropriate use 50% for monitored conditions in outpatient settings by 2020
- Current Healthcare Effectiveness Data and Information Set (HEDIS) measures
- Merit-based Incentive Payment System (MIPS)

Sanchez, G.V., Fleming-Dutra, K.E., Roberts, R.M., Hicks, L.A. Core Elements of Outpatient Antibiotic Stewardship. MMWR Recomm Rep 2016;65(No. RR-6):1
Education and Expertise

4. Does your facility provide resources to clinicians and patients on evidence-based antibiotic prescribing?

Provide face-to-face educational training (academic detailing)

- Interactive and case-based education for clinicians reduced antibiotic prescribing 24.6%
- Peer comparison

Education and Expertise

4. Does your facility provide resources to clinicians and patients on evidence-based antibiotic prescribing?

Ensure timely access to persons with expertise
- Pharmacists can assist clinicians in selecting appropriate antibiotic therapy
- Pharmacists have been associated with improved patient outcomes and overall cost savings in hospital stewardship programs

**Outpatient ASP Core Elements Checklist**

- Combination of interventions are more effective than single interventions
- Interventions targeting decreases in overall antibiotic prescriptions were more often effective than interventions targeting improvements in antibiotic selection
- Using EHR clinical decision support systems improves antibiotic selection – develop the process around the user and educate providers on how to use it
- Educate parents on antibiotic use including possible adverse effects
- No single intervention is recommended for all settings
- Clinician education should be interactive not passive and include communication skills
Implementing Outpatient Antibiotic Stewardship

- Outpatient Antibiotic Stewardship Program (ASP) was started at Cherokee Nation Health Services (CNHS) in 2017
- Utilized Core Elements to develop program
- CNHS ASP Team consists of the following personnel:
  - ID Physician – Resides over ID program
  - ID Nurse Practitioner – Supports ASP Program
  - ID Pharmacist – Coordinates ASP Program
  - Infection Prevention Personnel – Supports ASP Program
  - Hospital Medical Director – Administration (leadership) Support
  - Clinic Medical Director – Physician Champion (leadership support)
  - Pharmacist at each clinic – Appointed ASP lead at each clinic

Role of Pharmacy

- Each clinic has a pharmacist appointed as the ASP lead
  - Disseminates information to clinic staff
  - Leads interventions at respective clinic
  - Meets with ASP Team to discuss status of ASP at respective clinic
ASP Goals

- High-priority condition was selected
  - Goal was to decrease unnecessary antibiotics for acute respiratory infections
- Targeted azithromycin as there was concern it was being prescribed for viral ARIs (bronchitis)

Drug Use Evaluation

- ID pharmacist ran report for all azithromycin prescriptions over 8-month period for one clinic
- 30 adult patients chosen at random from list
- Reviewed the following:
  - Drug allergies
  - If an antibiotic was indicated
  - If the appropriate antibiotic was selected
  - Dose
  - Duration
  - Antibiotic use in last 6 months
Drug Use Evaluation

- Results confirmed improvements could be made to proper prescribing of azithromycin
- First aim of ASP was to reduce total number of azithromycin prescriptions by 25% health system wide in one year thereby reducing the number of inappropriate antibiotics for viral ARIs
- Support for clinical decisions
  - Developed outpatient order sets for common conditions (pneumonia, cellulitis, UTI, etc.)
  - These order sets were developed using national guidelines along with local antibiogram

ASP Road Trip

- The ASP Team visited each Cherokee Nation clinic
- Presented same information to each clinic regarding antibiotic stewardship
- Audience included facility directors, medical directors, providers, and nurses
- Expectations were set during these meetings
  - Each member of ASP Team talked to the audience
  - Administration assured providers they were behind ASP efforts
  - Providers more comfortable knowing if patient complained about not getting an antibiotic, administration was backing provider’s decision
ASP Road Trip

- Discussed importance of antibiotic stewardship and how pharmacy would be monitoring antibiotic prescriptions
  - Discussed antibiotics and viral ARIs
  - Providers asked to document justifications in chart for antibiotics that were being used for non-recommended purposes
- Discussed outpatient order sets for antibiotic prescriptions
- Reviewed local antibiogram

Results of Intervention

- Report generated for 3-month period one year prior to ASP road trip at each clinic for total number of azithromycin prescriptions for each clinic
- Report generated again for same 3-month period after the road trip
- Aim of 25% reduction in azithromycin was achieved health system wide
  - Some clinics achieved less and others had much more of a reduction
  - Pharmacy reviewed azithromycin prescriptions prospectively and called providers if inappropriate
  - Did not appear to increase prescriptions of other antibiotics
Pitfalls

- The order sets were used by some but not all providers
  - Accessing the order sets is not part of the normal workflow for writing prescriptions
    - IT is determining methods for incorporating order sets into workflow
    - ASP pharmacist at each clinic will review how to access order sets with each provider
    - Laminated card set given to each provider with same information as order sets
- Reductions at some clinics were less than the aim of 25% 
  - Possibly due to some providers not attending presentations
  - Possibly not as many inappropriate prescriptions for azithromycin at those clinics

Going Forward

- The total prescriptions for azithromycin at each clinic has continued to decline one-year post road trip
- Continue provider training on ASP
- Incorporate communications skills training from DART
- Continuously look for improvements in antibiotic prescribing
- Peer comparison of antibiotic prescriptions with email to providers
- DNV (equivalent to JCAHO) is reviewing outpatient ASP as part of accreditation process
Which of the following interventions are least effective?

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C. Educate adults on their antibiotic use including possible adverse effects

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Resources

- CDC Train website for outpatient antibiotic stewardship
  - https://www.train.org/cdctrain/training_plan/3697
- CDC Core elements of outpatient antibiotic stewardship

INPATIENT ANTIBIOTIC STEWARDSHIP
Which intervention is the most effective in preventing unnecessary antibiotic use?

A. Antibiotic time out  
B. Prior authorization  
C. Audit and feedback

Who is the most important member of the ASP Team?

A. Pharmacist  
B. Lab  
C. Physician  
D. Nurse  
E. Everyone plays an integral part of the team!
IV antibiotics with the same bioavailability are more effective than PO in treating infections.

- True
- False

Leadership Commitment

- Have a formal statement from leadership that shows they support efforts to improve and monitor antibiotic use
- Include stewardship-related duties in job descriptions
- Support training and education
- Have as many departments included in ASP activities as possible
STATEMENT OF LEADERSHIP COMMITMENT FOR ANTIBIOTIC STEWARDSHIP

The Claremore Indian Hospital (CIH) commits to improving antibiotic use in our facility. Facility leadership is committed to embracing and executing the Centers for Disease Control and Prevention’s (CDC) Core Elements of Antibiotic Stewardship. The seven core elements for antimicrobial stewardship include leadership commitment, accountability, drug expertise, action, tracking, reporting, and education.

STATEMENT OF COMMITMENT

1. We, the administration, are committed to supporting efforts that improve antibiotic use in our facility. (Leadership Commitment Core Element)

2. We understand that antimicrobial stewardship is an interdisciplinary activity that improves the selection of an antibiotic therapy (correct drug, dose, duration and ordered only when necessary).

3. We will provide dedicated and protected time for the facility’s Antimicrobial Stewardship Program (ASP) Committee to meet the goals of the ASP Policy & Procedure. (Accountability Core Element)

4. We will communicate with providers the facility’s expectations about the use of antibiotics and the monitoring and enforcement of antimicrobial stewardship policies. (Action Core Element)

5. We will financially and educationally support a commitment to safe and appropriate antibiotic use in our facility (per 2017 CMS recommendations) which currently states: “Requires an antibiotic stewardship program that includes antibiotic use protocols and a system for monitoring antibiotic use (§ 483.80).”

6. We commit to creating a culture, through messaging, education, and celebrating improvement, which promotes antimicrobial stewardship within our facility. (Education Core Element)

ASP Members

- Physician Director
- ASP Manager – Inpatient Pharmacist
- Internal Medicine Physician
- Family Medicine Provider
- Inpatient Clinical Pharmacist
- Microbiology Laboratory Staff Member
- Hospital Infection Control Nurse
Where to start – ASP Guidebook

1. Develop and ASP Guidebook for your facility
   - Introduction
   - Recommendations Based on Infectious Disease
   - Surgical Site Prophylaxis
   - Antibiogram
   - IV to PO

- Develop quick orders in the EHR for the providers based on the guidebook recommendations

- Don't set up menus that just list all antibiotics available to order but rather organize antibiotics based on indication to guide the providers in appropriate selection

These recommendations were developed as a guide to assist in determining the most appropriate empiric antimicrobial selection for adult infectious diseases commonly encountered in the healthcare setting. Therapy beyond 72 hours should be tailored based on culture and sensitivity results. The recommendations should not supersede clinical judgement. Patient specific factors and antibiotic formulary should be taken into account when selecting therapy. These recommendations are based on the most recent antibiogram and evidence based medicine.

Community Acquired Pneumonia Non ICU...
Community Acquired Pneumonia ICU...
Community Acquired Pneumonia with COPD...
Healthcare Associated Pneumonia...
Aspiration Pneumonia...
Urinary Tract Infection / Pyelonephritis...
Intra Abdominal Infections...
Skin and Soft Tissue Infections...
c. difficile...

Preop Antibiotics GI Surgery...
Preop Antibiotics OB/GYN Surgery...
Preop Antibiotics Podiatry and Ortho Surgery...
Develop clinical decision making tools
IV to PO

**RF to PO**
- Why IV to PO conversion?
  - Decrease length of hospitalization without affecting outcome
  - Reduced risk of IV catheter infection
  - Reduced risk of phlebitis
  - Reduced hospital cost
  - Reduced preparation time by pharmacist
  - Great patient comfort and easier ambulation
  - Decreases nursing personnel time
- **Recommended Induction Criteria**
  - Able to take and absorb medications orally
  - Able to take at least 24 hours at (101°F or 38.3°C)
  - Heart rate <90 beats per minute
  - Respiratory rate <20 breaths per minute
  - Systolic blood pressure 100 without vasopressors
  - Response to 2 hours of analgesia/antipyretics
  - Clinically improving signs/symptoms of infection—Improving WBC, hemodynamically stable, not septic
- **Recommended Exclusion Criteria**
  - Persistent nausea/vomiting/diarrhea
  - GI obstruction
  - New
  - NPO status
  - Asthma (NSAID)
  - Difficulty swallowing/oral risk for aspiration
  - Vasopressor dependent or hemodynamically unstable
  - Immunosuppressed
  - Certain infectious conditions that require full course IV antibiotics— CNS infection, bacteremia, osteomyelitis, endocarditis

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### Antibiotic Timeout Tool

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>Day 1</th>
<th>Day 2</th>
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<tbody>
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</tbody>
</table>

**Indication for Continuing Antibiotics:**
- Skin/soft tissue infection
- Pneumonia
- Urinary Tract Infection
- Septis
- Bacteremia
- Peri-abdominal infection
- CNS Infection
- Clostridium difficile

**Does the patient have any of the following conditions for which antibiotics are NOT typically recommended?**
- Non-infectious etiology of symptoms: [ ] Yes [ ] No
- Bacteremia in sepsis: [ ] Yes [ ] No
- Surgical prophylaxis beyond 24 hours: [ ] Yes [ ] No
- Candida in sputum or urine: [ ] Yes [ ] No
- Coagulase-negative staph in one blood culture: [ ] Yes [ ] No
- Asymptomatic bacteremia: [ ] Yes [ ] No

**Based on clinical status, including available culture results:**
- Can any of the antibiotics be discontinued? [ ] Yes [ ] No
- Can existing therapy be narrowed spectrum? [ ] Yes [ ] No
- Should additional agents or broader-spectrum be added? [ ] Yes [ ] No
- Are there any IV agents that can be changed to PO route? [ ] Yes [ ] No

**Are the antibiotics consistent with local guidelines?** [ ] Yes [ ] No

**Planned duration of therapy is ___ days.**

**Is planned duration of therapy different than the recommended duration?**
[ ] Yes, Explain:

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### Drug Conversion - IV to PO Formulation of the same drug

<table>
<thead>
<tr>
<th>Drug</th>
<th>IV Dose</th>
<th>PO Dose</th>
<th>IV/PO Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amoxicillin 500mg q8h</td>
<td>500mg q12h</td>
<td>1:1.5</td>
<td></td>
</tr>
<tr>
<td>Ceftriaxone 1g q8h</td>
<td>1g q12h</td>
<td>1:1.5</td>
<td></td>
</tr>
<tr>
<td>Cefotaxime 1g q6h</td>
<td>1g q8h</td>
<td>1:1.5</td>
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<td></td>
</tr>
<tr>
<td>Piperacillin 6.25g q8h</td>
<td>6.25g q12h</td>
<td>1:1.5</td>
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</tbody>
</table>

**Switch Conversion - IV to PO with identical potency**

- Amoxicillin/subactam 1g q8h
- Amoxicillin/clavulanic acid 875mg/125mg BID
- Cefazolin 1g q8h
- Cefepime 1g q8h
- Ceftriaxone 1g q8h
- Cefazolin 1g q8h
Track outcomes

- Inpatient Days of Therapy (DOT) – IV & PO
- Most used antibiotics – IV & PO

DOT

- DOT is the most useful measure of antibiotic use in the inpatient setting to inform stewardship efforts

- Aggregate sum of days for which any amount of a specific antibiotic was administered to individual patients (numerator) divided by a standardized denominator (patient days, days present, or admissions).

- If a patient is receiving two antibiotics for 10 days, the DOT numerator would be 20

- Data obtained from BCMA medication log
DOT example

<table>
<thead>
<tr>
<th></th>
<th>February 2019</th>
<th>March 2019</th>
<th>April 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total number of patients admitted to GMS and ICU</strong></td>
<td>(68) 68</td>
<td>83</td>
<td>(88) 88</td>
</tr>
<tr>
<td><strong>Total number of patients admitted to GMS and ICU on antibiotics IV</strong></td>
<td>(22) 20</td>
<td>21</td>
<td>(33) 30</td>
</tr>
<tr>
<td></td>
<td>(32%) 30%</td>
<td>25%</td>
<td>(37%) 35%</td>
</tr>
<tr>
<td><strong>Total number of days on IV antibiotics</strong></td>
<td>(114) 108</td>
<td>130</td>
<td>(131) 96</td>
</tr>
<tr>
<td><strong>Days of Therapy (DOT) IV</strong></td>
<td>(5.3) 5.1</td>
<td>6.6</td>
<td>(4.8) 4</td>
</tr>
<tr>
<td><strong>Total number of patients admitted to GMS and ICU on antibiotics PO</strong></td>
<td>(9) 8</td>
<td>14</td>
<td>(12) 11</td>
</tr>
<tr>
<td></td>
<td>(13%) 12%</td>
<td>17%</td>
<td>(13%) 13%</td>
</tr>
<tr>
<td><strong>Total number of days on PO antibiotics</strong></td>
<td>(20) 20</td>
<td>49</td>
<td>(40) 30</td>
</tr>
<tr>
<td><strong>Days of Therapy (DOT) PO</strong></td>
<td>(3.2) 2.5</td>
<td>3.5</td>
<td>(3.3) 2.7</td>
</tr>
</tbody>
</table>

Numbers in parentheses () takes into account the patients who were admitted to the hospital, but technically were only here for an outpatient antibiotic infusion. Numbers not in parentheses remove the outpatient infusions from the inpatient DOT data.
Antibiotic Interventions

- Antibiotic “Time outs”
- Prior Authorization
- Prospective audit and feedback

Pharmacy driven interventions

- IV to PO
- Dose adjustments
- Dose optimization
- Stop orders
- Interactions
Which intervention is the most effective in preventing unnecessary antibiotic use?

A. Antibiotic time out
B. Prior authorization
C. Audit and feedback
Who is the most important member of the ASP Team?

A. Pharmacist  
B. Lab  
C. Physician  
D. Nurse  
E. Everyone plays an integral part of the team!
IV antibiotics with the same bioavailability are more effective than PO in treating infections.

- True
- False
THE ANTIBIOTIC STEWARDSHIP CONTINUUM
Oklahoma City Area Annual Pharmacy Seminar
June 30, 2019

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