Antimicrobial Stewardship 101

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Disclosure

I have no actual or potential conflicts of interest to disclose.
Learning Objectives

• Recognize the key components and objectives of an Antimicrobial Stewardship Program (ASP)

• Name at least 3 strategies commonly used by ASP’s

• Identify how ASP activities can be incorporated into your daily clinical practice
Background

• Antimicrobials account for >30% of hospital pharmacy budgets
• More than half of all hospital patients receive an antibiotic
• 30 to 50% of antimicrobial use in hospitals is unnecessary or inappropriate
Background

• Inappropriate antimicrobial use increases selection of resistant pathogens

• Infection due to resistant pathogens increases patient morbidity, mortality, and health care costs
  • CDC estimates >2 million people are infected with antibiotic-resistant organisms, resulting in approximately 23,000 deaths annually
Background

• California Senate Bill 739 (September 28, 2006)
• California Senate Bill 158 (September 25, 2008)

“...general acute care hospitals develop a process for evaluating the judicious use of antibiotics...”
Antimicrobial Stewardship Program (ASP)

Senate Bill No. 739

CHAPTER 526

An act to add Article 3.5 (commencing with Section 1288.5) to Chapter 2 of Division 2 of the Health and Safety Code, relating to health facilities.

[Approved by Governor September 28, 2006. Filed with Secretary of State September 28, 2006.]

LEGISLATIVE COUNSEL’S DIGEST

SB 739, Speier. Hospitals: infection control.
Existing law provides for the licensure and regulation by the State Department of Health Services of health facilities, including general acute care hospitals, as defined. A violation of these provisions by a health facility is a crime. Existing law requires health facilities to implement various measures to protect against the spread of infection in health facilities.

This bill would establish the Hospital Infectious Disease Control Program, which would require the department and general acute care hospitals to implement various measures relating to disease surveillance and the prevention of health care associated infection (HAI). In that...
Antimicrobial Stewardship Program (ASP)

Senate Bill No. 158

CHAPTER 294

An act to amend Sections 1288.5 and 1288.8 of, and to add Sections 1279.6, 1279.7, 1288.45 and 1288.95 to, the Health and Safety Code, relating to health facilities.

[Approved by Governor September 25, 2008. Filed with Secretary of State September 25, 2008]

Ch. 294 — 6 —

(2) Revise existing and adopt new administrative regulations, as necessary, to incorporate current federal Centers for Disease Control and Prevention (CDC) guidelines and standards for HAI prevention.

(3) Require that general acute care hospitals develop a process for evaluating the judicious use of antibiotics, the results of which shall be monitored jointly by appropriate representatives and committees involved in quality improvement activities.
Antimicrobial Stewardship Program (ASP)

• CDC Get Smart for Healthcare Campaign
  http://www.cdc.gov/getsmtart/healthcare/

• IDSA guidelines on implementing ASP published in 2016

• Joint Commission Requirements
  New Antimicrobial Stewardship Standard-effective January 1, 2017
Studies indicate that 30-50% of antibiotics prescribed in hospitals are unnecessary or inappropriate. There is no doubt that overprescribing and misprescribing is contributing to the growing challenges posed by *Clostridium difficile* and antibiotic-resistant bacteria. Studies demonstrate that improving prescribing practices in hospitals can not only help reduce rates of *Clostridium difficile* infection and antibiotic resistance, but can also improve individual patient outcomes, all while reducing healthcare costs. Get Smart for Healthcare is a CDC campaign focused on improving prescribing practices in inpatient healthcare facilities.
Evidence-based guidelines for implementation and measurement of antibiotic stewardship interventions in inpatient populations including long-term care were prepared by a multidisciplinary expert panel of the Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America. The panel included clinicians and investigators representing internal medicine, emergency medicine, microbiology, critical care, surgery, epidemiology, pharmacy, and adult and pediatric infectious diseases specialties. These recommendations address the best approaches for antibiotic stewardship programs to influence the optimal use of antibiotics.

**Keywords.** antibiotic stewardship; antibiotic stewardship programs; antibiotics; implementation.
Antimicrobial Stewardship Program (ASP)

The Joint Commission has approved the following revisions for prepublication. While revised requirements are published in the semiannual updates to the print manuals (as well as in the online E-edition®), accredited organizations and paid subscribers can also view them in the monthly periodical The Joint Commission Perspectives®. To begin your subscription, call 877-223-6866 or visit http://www.jcrinc.com.

# New Antimicrobial Stewardship Standard

**Effective January 1, 2017**

**Medication Management (MM)**

<table>
<thead>
<tr>
<th>Standard MM.09.01.01</th>
</tr>
</thead>
<tbody>
<tr>
<td>The [critical access] hospital has an antimicrobial stewardship program based on current scientific literature.</td>
</tr>
</tbody>
</table>

**Elements of Performance for MM.09.01.01**

1. Leaders establish antimicrobial stewardship as an organizational priority. *(See also LD.01.03.01, EP 5)*

**Note:** An example of an educational tool that can be used for patients and families includes the Centers for Disease Control and Prevention’s Get Smart document, “Viruses or Bacteria—What’s got you sick?” at [http://www.cdc.gov/getsmart/community/downloads/getsmart-chart.pdf](http://www.cdc.gov/getsmart/community/downloads/getsmart-chart.pdf).

4. The [critical access] hospital has an antimicrobial stewardship multidisciplinary team that includes the following members, when available in the setting:
   - Infectious disease physician
   - Infection preventionist(s)
   - Pharmacist(s)
   - Practitioner

**Note 1:** Part-time or consultant staff are acceptable as
Joint Commission Standard MM.09.01.01

1. Leaders establish antimicrobial stewardship as an organizational priority.

2. The hospital educates staff and licensed independent practitioners involved in antimicrobial ordering, dispensing, administration, and monitoring about antimicrobial resistance and antimicrobial stewardship practices.
   • Education upon hire or granting initial privileges and periodically thereafter, based on organizational need.
Joint Commission Standard MM.09.01.01

3. The hospital educates patients, and their families as needed, regarding the appropriate use of antimicrobial medications, including antibiotics.

4. The hospital has an antimicrobial stewardship multidisciplinary team that includes the following members, when available in the setting:
   - Infectious disease physician
   - Infection preventionist(s)
   - Pharmacist(s)
   - Practitioner
Joint Commission Standard MM.09.01.01

5. The hospital’s antimicrobial stewardship program includes the following core elements:
   • Leadership commitment-dedicating necessary human, financial, and information technology resources
   • Accountability-appointing a single leader responsible for program outcomes
   • Drug expertise-appointing a single pharmacist leader responsible for working to improve antibiotic use
   • Action-implementing recommended actions, such as systemic evaluation of ongoing treatment need, after a set period of initial treatment
   • Tracking-monitoring the antimicrobial stewardship program, which may include information on antibiotic prescribing and resistance patterns
5. (cont’d) The hospital’s antimicrobial stewardship program includes the following core elements:

• Reporting—regularly reporting information on the ASP, which may include information on antibiotic use and resistance, to doctors, nurses, and relevant staff

• Education—educating practitioners, staff, and patients on the antimicrobial program, which may include information about resistance and optimal prescribing
6. The hospital’s ASP uses organization-approved multidisciplinary protocols. Examples:
   - Antibiotic formulary restrictions
   - Assessment of appropriateness of antibiotics for community-acquired pneumonia, skin and soft tissue infections, urinary tract infections
   - Care of the patient with *Clostridium difficile*
   - Guidelines for antimicrobial use in adults and pediatrics
   - Plan for parenteral to oral antibiotic conversion
   - Preauthorization requirements for specific antimicrobials
   - Use of prophylactic antibiotics

7. The hospital collects, analyzes, and reports data on its ASP.

8. The hospital takes action on improvement opportunities identified in its ASP.
Antimicrobial Stewardship Program (ASP)

Goals

Right drug  Right dose  Right route  Right duration
## Antimicrobial Stewardship Program (ASP)

### Benefits

<table>
<thead>
<tr>
<th>Improved patient outcomes</th>
<th>Decreased adverse drug effects</th>
<th>Decreased <em>C. difficile</em> infections</th>
<th>Decreased candidiasis</th>
<th>Lower costs</th>
<th>Slowed microbial resistance</th>
</tr>
</thead>
</table>
ASP Team Members

• Medical Director
• Infectious Disease Pharmacist
• Infection Preventionist
• Clinical Microbiologist
• Information System Specialist/Data Analyst
• Hospital Leadership
• Medical Staff/Clinical Pharmacists
Common Strategies of ASP

- Formulary restriction and preauthorization
- Prospective audit with intervention and feedback
- De-escalation
- IV to PO conversion
- Clinical pathways and guidelines
- Education
Performance Measures

• Process measures
  • Utilization of targeted antimicrobials
    • Days of therapy/1000 patient days
    • Numbers/types/acceptance of ASP interventions

• Outcome measures
  • Antimicrobial costs
  • Antibiotic resistance patterns
  • Adverse drug events/unintended consequences
ASP Program at Lucile Packard Children’s Hospital Stanford

Preventative mechanisms
- Antimicrobial formulary restriction
- Palivizumab (Synagis) approval

Corrective mechanisms
- Prospective audit and feedback

Practice guidelines
- Perioperative antimicrobial prophylaxis
- Febrile neutropenia guidelines

Education
- Medical residency program
- Pharmacy residency program
Formulary Restriction and Preauthorization

• Seven restricted drugs
  • Colistin IV
  • Daptomycin
  • Tigecycline
  • Micafungin
  • Posaconazole
  • Linezolid (added 6/1/2015)
  • Cidofovir (added 2016)

• From June 2, 2014 to September 11, 2016:
  • 183 orders for 84 patients
  • Infection Diseases contacted for 86% of orders (157/183)
Formulary Restriction and Preauthorization

Restricted Formulary Orders, by drugs
(6/2/2014 to 9/11/2016)

- Posaconazole, 73
- Linezolid (IV & PO), 83
- Daptomycin, 14
- Tigecycline, 8
- Micafungin, 4
- Colistin (IV), 1

N=183 orders

Restricted Formulary Orders, by patient
(6/2/2014 to 9/11/2016)

- Posaconazole, 20
- Linezolid (IV & PO), 48
- Daptomycin, 9
- Tigecycline, 2
- Micafungin, 4
- Colistin (IV), 1

N=84 patients
Formulary Restriction and Preauthorization Linezolid Utilization

Aggregate Days of Therapy (DoT) per 1,000 patient days

Days of Therapy (DoT) per 1,000 patient days

DoT per 1,000 patient days

0.86 0.73 0.86 0.70 0.45 0.69 0.22 0.52

Year & Month


Added to restricted formulary

All Measures

DoT per 1,000 patient days
Prospective Audit and Feedback

• Review of antimicrobial use with feedback to the medical team regarding opportunities for antimicrobial optimization

Goals

- Reduced antibiotic use
- Reduced costs
- Reduced adverse events
- Reduced antimicrobial resistance
Prospective Audit and Feedback Process - Overview

1. Identify patients with active antimicrobial order
2. Review medical record
3. Determine opportunity for antimicrobial optimization
4. Communicate recommendation to unit based pharmacist
5. Document recommendation
6. Follow-up recommendation
Prospective Audit and Feedback Process-Review

**Streamlining**
- Inappropriate “double gram negative” coverage e.g. Ceftriaxone + Gentamicin for *E. coli* infection

**Dose optimization**
- Incorrect dose of IV ceftriaxone for meningitis
- Adjust dose for decreased renal function

**Therapeutic duplication**
- Redundant anaerobic coverage e.g. Meropenem + Metronidazole (but metronidazole not for *C. difficile* infection)

**Drug-bug mismatch**
- Organism resistant to antibiotic prescribed e.g. MRSA-Cefazolin
- Organism sensitive to narrower antibiotic e.g. MSSA-Vancomycin
Prospective Audit and Feedback Process-Review

Therapeutic monitoring
- Aminoglycosides, Vancomycin, Voriconazole serum level monitoring
- Daptomycin CK monitoring; Isoniazid LFT’s monitoring

Parenteral to oral conversion
- Convert IV azithromycin, ciprofloxacin, clindamycin or doxycycline to oral route for patients on full oral diets

Drug-drug interactions
- Concurrent use of QT prolonging agents (e.g. moxifloxacin, fluconazole)
- Cidofovir and concurrent use of nephrotoxic drugs (e.g. foscarnet, aminoglycoside)
### Antimicrobial Stewardship Program

#### Antibiotic 2

- **New Reading**
- **Cocsign Report**

<table>
<thead>
<tr>
<th>Name of Antimicrobial</th>
<th>Ceftazidime</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is med active?</td>
<td>Yes</td>
</tr>
<tr>
<td>Attending MD Dictation Number</td>
<td>10147</td>
</tr>
<tr>
<td>Service</td>
<td>Neonatology</td>
</tr>
<tr>
<td>Infectious Disease Consulting for Patient</td>
<td>No</td>
</tr>
<tr>
<td>Infectious Problem</td>
<td>i/o sepsis</td>
</tr>
<tr>
<td>Recommendation Type 1</td>
<td>Stop (No indication)</td>
</tr>
<tr>
<td>Recommendation Type 1 Followed?</td>
<td>Yes</td>
</tr>
<tr>
<td>Recommendation Type 2</td>
<td></td>
</tr>
<tr>
<td>Recommendation Type 3</td>
<td></td>
</tr>
<tr>
<td>Recommendation Type 4</td>
<td></td>
</tr>
<tr>
<td>Date Recommendation was Followed</td>
<td>9/8/2016</td>
</tr>
<tr>
<td>Date of Contact</td>
<td>9/8/2016</td>
</tr>
<tr>
<td>Name of Person Called</td>
<td>Yvonne Zorn</td>
</tr>
</tbody>
</table>

#### Antibiotic 3

- **New Reading**
- **Cocsign Report**
## Most Commonly Prescribed Antibiotics 2014 vs. 2015 (April-September)

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>1. Vancomycin</td>
<td></td>
<td>1. Vancomycin</td>
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<tr>
<td>2. Zosyn</td>
<td></td>
<td>2. Bactrim</td>
<td></td>
</tr>
<tr>
<td>3. Ampicillin</td>
<td></td>
<td>3. Cefazolin</td>
<td></td>
</tr>
<tr>
<td>5. Cefazolin</td>
<td></td>
<td>5. Ampicillin</td>
<td></td>
</tr>
</tbody>
</table>
Common Strategies of ASP

- Formulary restriction and preauthorization
- Prospective audit with intervention and feedback
- Antibiotic time out/de-escalation
- IV to PO conversion
- Clinical pathways and guidelines
- Education
Antibiotic Time Out/De-escalation

• 48 hour rule-out
  • Reassess antibiotic(s) based on cultures/tests results and clinical exam

• De-escalation of antibiotic therapy
  • Microbiology culture and susceptibilities results
  • Empirically narrow therapy

• Indication/duration of therapy
IV to PO Conversion

• Appropriate situations:
  • Patient tolerating food or feeds
  • Not NPO
  • Improving clinically
  • Patient not with special conditions that would compromise absorption of oral/enteral medication

• Clinical decision tool:
  • Prescriber will be prompted when electronically ordering IV antibiotic with excellent enteral absorption to consider using enteral formulation as soon as clinically appropriate

• Benefits: Reduce CLABSI risk, discharge home earlier, cost savings
### IV to PO Conversion

<table>
<thead>
<tr>
<th>Category</th>
<th>Medications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Azoles</td>
<td>Fluconazole, Posaconazole, Voriconazole</td>
</tr>
<tr>
<td>Fluoroquinolones</td>
<td>Ciprofloxacin, Levofloxacin, Moxifloxacin</td>
</tr>
<tr>
<td>Macrolide</td>
<td>Azithromycin</td>
</tr>
<tr>
<td>Tetracycline</td>
<td>Doxycycline</td>
</tr>
<tr>
<td>Clindamycin</td>
<td></td>
</tr>
<tr>
<td>Linezolid</td>
<td></td>
</tr>
<tr>
<td>Rifampin</td>
<td></td>
</tr>
<tr>
<td>Sulfamethoxazole/Trimethoprim</td>
<td>Septra™, Bactrim™</td>
</tr>
<tr>
<td>Metronidazole</td>
<td></td>
</tr>
</tbody>
</table>
Clinical Pathway and Guidelines

- Antibiotic lock therapy guidelines
- Cytomegalovirus (CMV) prophylaxis in solid organ transplantation patients
- Fever and neutropenia guidelines
- Ventilator-associated pneumonia (VAP) guidelines
Applying ASP Knowledge

- Duplicative anaerobic coverage
  - Meropenem + metronidazole
    - Ask if metronidazole for other indication (e.g., *C. difficile* infection)

- Double gram-negative coverage for documented infection
  - Ceftriaxone + gentamicin for *E. coli*
  - Cefepime or carbapenem for ESBL organisms
Applying ASP Knowledge

• Know your hospital resistance patterns/antibiogram
• Dose adjustments in patients with organ dysfunction
• Dose optimization (pharmacokinetics) to optimize treatment of organisms, especially with reduced susceptibility
• Monitor adverse effects
Join the ASP Team

• Join the ASP Team as a champion!!
• Attend a conference to learn about infectious diseases or antimicrobial stewardship
  • ID Week—the combined annual meeting of the IDSA, SHEA, HIVMA and PIDS
  • Making A Difference In Infectious Diseases (MAD-ID) meeting

IDSA - Infectious Diseases Society of America
SHEA - Society for Healthcare Epidemiology of America
HIVMA - HIV Medicine Association
PIDS - Pediatric Infectious Diseases Society
Test Questions

1. Antimicrobial Stewardship Program (ASP) is designed to promote:
   a. The appropriate selection of antibiotics
   b. The appropriate dosing of antibiotics
   c. The appropriate route of antibiotics
   d. The appropriate duration of antibiotics
   e. All of the above

Answer: e
2. Which of the following strategies is not commonly used by antimicrobial stewardship programs?
   a. Restricted formulary and authorization
   b. Charging prescriber for each inappropriate use
   c. Antibiotic time-out and de-escalation
   d. Prospective audit with feedback
   e. IV to PO conversion

Answer: b
3. Which of the following is not an example of applying ASP knowledge in daily clinical activities?
   a. Dose optimization by pharmacokinetics calculation
   b. Clarify indication of an antibiotic at rounds and recommend a stop date
   c. Recommend changing IV clindamycin to PO in non-ICU patient on full oral diet
   d. Record who prescribes broad-spectrum antibiotic for ASP team

Answer: d
References


Session Code:

1. Write down the course code. Space has been provided in the daily program-at-a-glance sections of your program book.

2. To claim credit: Go to www.cshp.org/cpe before December 1, 2016.