Putting the Pieces Together: An Antimicrobial Stewardship Program

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OBJECTIVES

Objective 1
Discuss the antimicrobial stewardship program (ASP) national guidelines.

Objective 2
Explain the steps for expanding and optimizing an ASP.

Objective 3
Identify potential benefits and barriers when addressing key initiatives in the ASP.
Poll the Audience

• Who has heard of an ASP?

• Who has an ASP in their facility?

• If you have an ASP how old?
  • Less than 5 years old?
  • Greater than 5 years old?
What is an Antimicrobial Stewardship Program?

Why do we need them?
Introduction

• Antimicrobial Stewardship
  • Program of policies, management, and coordinated interventions that help to ensure appropriate selection, dosing, route, and duration of antimicrobial agents

• Goals
  • Optimize appropriate antimicrobial use
  • Impede the rate of resistance
  • Decrease cost
The gang’s all here, now what?
Algorithm for Antimicrobial Stewardship Program Success

- Antimicrobial Stewardship
  - Background
  - Implementation
  - Education
  - Evaluation
Background

• Antibiotic Use
Background

• Culture Susceptibilities
  • How are they reported?
  • Are we using selective and cascade reporting?

• Hospital antibiogram
  • How, when, and where is it reported?
  • Is it stratified by location, age, etc.?
  • Are we using a combination antibiogram?
  • Is education provided?

• Technology
  • Are we using rapid diagnostics to streamline appropriate care?
  • Is the electronic medical record optimized?
Background

• Measurements
  • Are we using appropriate metrics?
  • What are our baseline statistics and benchmarks?

• Education
  • Are we advocating and educating?
    • If so, how?
    • Are we doing more than passive lectures?

• Special populations?

• What are our problem areas?
Implementation

• Antimicrobial Stewardship Program (ASP) Team
• Antimicrobial Criteria Based Policy
• Susceptibility Rules
• Rapid Diagnostic Pathway
• Antibiogram
• Guidelines and Protocols
• Surveillance
• Interventions
ASP Team

- ID Physician
- ID Pharmacist
- Infection Control
- Nursing
- Epidemiology
- Informatics Specialist
- Microbiology Experts
- Clinical Pharmacists and Physicians
ASP Team

Duties and Responsibilities

• Antimicrobial formulary additions/deletions
• Guidelines and protocols
• Evaluation
  • Antimicrobial usage
  • Resistance data
  • Restricted Drug Policy
• Report to Pharmacy and Therapeutics Committee
• Education and guidance to hospital staff
Criteria Based Medication Policy and Guide

• Advocates for appropriate antimicrobial use throughout the hospital.

• Criteria is based on indication and/or service.

• Prior-authorization or evaluation required for use of antimicrobial (aggressive vs. passive).

• Education to hospital staff that includes criteria for acceptable use and regular feedback.
Guidelines and Protocols

Benefits

• Appropriate selection and de-escalation of antimicrobial agents
• Time effective and complete
• Cost minimization
• Resistance and super infections occurrence reduction
• Adverse events minimization
Susceptibility Rules

• Selective and cascading reporting is recommended.

• The Clinical and Laboratory Standards Institute (CLSI) provides guidance, but no published guidelines exist.

• Work with ASP Team to create appropriate rules in your facilities to help guide selection to prescribers.
# Susceptibility Rules

<table>
<thead>
<tr>
<th>Reporting A</th>
<th>Reporting B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penicillin</td>
<td>Penicillin S</td>
</tr>
<tr>
<td>Ampicillin</td>
<td>Doxycycline S</td>
</tr>
<tr>
<td>Amp/Sulb</td>
<td>Cefazolin S</td>
</tr>
<tr>
<td>Doxycycline</td>
<td>Clindamycin S</td>
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<td>Clindamycin</td>
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<tr>
<td>Ciprofloxacin</td>
<td>Note: Penicillin is considered drug of choice.</td>
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<tr>
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<td>Gentamicin</td>
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<td>Cefepime</td>
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<tr>
<td>Vancomycin</td>
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</table>

Note: Penicillin is considered drug of choice.
Susceptibility Rules

- If CSF = No, Report: Cefazolin
- If Beta Strep (A,B,C,G) CONSIDERED PEN'S, Report: Vancomycin, Ceftriaxone
- If CSF/blood = No, Report: Clindamycin
- If Staph aureus / lugdenensis, Interpret: Oxacillin
  - If S = MSSA, Report: Nafcillin, Cefazolin
  - If R = MRSA, Report: Vancomycin
- If CSF/Blood = No, Report: Clindamycin, Trimeth/sulfa, Doxycycline
Antibiograms

- CLSI provides guidance on creation and reporting of antibiograms.

- Antibiograms should be created and reviewed yearly.

- Stratified antibiograms can provide valuable.

- Information that could identify unique differences and improve empiric antibiotic therapy.

- Should be used to evaluate and optimize formulary antibiotics and guidelines.

# ICU INPATIENTS (Patients admitted > 72 hours)

Includes isolates obtained from: 5W, Burn, MICU, CCU, 8W, 9W, Stroke unit patients

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<tr>
<th></th>
<th>Total # isolates</th>
<th>Ampk</th>
<th>Amp/ampicillin/Sulfadimethoxine</th>
<th>Amp/ampicillin/Clavulanic acid</th>
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<th>Pencillins</th>
<th>Piperacillin/Tazobactam</th>
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<th>Cefuroxime</th>
<th>Ceftriaxone</th>
<th>Ciprofloxacin</th>
<th>Tobramycin</th>
<th>Amikacin</th>
<th>Netilmicin</th>
<th>Levofloxacin</th>
<th>Clindamycin</th>
<th>Tetacycline</th>
<th>Trimethoprim/Sulfamethoxazole</th>
<th>Vancomycin</th>
<th>Daptomycin</th>
<th>Linezolid</th>
<th>Azithromycin</th>
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**Gram Positive**

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<thead>
<tr>
<th>Non-meningeal Breakpoints</th>
<th>Meningeal Breakpoints</th>
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**Gram Negative**

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<th>Meningeal Breakpoints</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>47</td>
</tr>
</tbody>
</table>

**E. coli** | 559 | 48 | 51 | 80 | 97 | 82 | 90 | 92 | 100 | 92 | 90 | 99 | 69 | 70 | 71 | 68 |

**E. coli (urine only)** | 476 | 47 | 51 | 91 | 98 | 83 | 89 | 92 | 100 | 90 | 90 | 90 | 87 | 88 | 95 | 87 |

**Pseudomonas aeruginosa** | 154 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |

**Klebsiella pneumoniae** | 153 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 |

**Proteus mirabilis** | 66  | 32 | 62 | 62 | 100 | 83 | 100 | 100 | 96 | 84 | 84 | 84 | 95 | 84 | 92 | 83 |

**Enterobacter cloacae** | 57  | 17 | 3  | 3  | 89 | 88 | 88 | 88 | 88 | 88 | 88 | 88 | 88 | 88 | 88 | 88 |

**Serratia marcescens** | 34  | 0  | 0  | 0  | 0  | 90 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

**Klebsiella oxytoca** | 30  | 54 | 63 | 63 | 100 | 90 | 97 | 97 | 100 | 97 | 100 | 100 | 100 | 100 | 100 | 100 |

**Enterococcus faecalis** | 124 | 99 | 86 | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 76 |

**Methicillin Sensitive (MSSA)** | 238 | 0  | 100 | 100 | 84 | 87 | 87 | 87 | 87 | 87 | 87 | 87 | 87 | 87 | 87 | 87 | 87 |

**Methicillin Resistant (MRSA)** | 254 | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |

**Coagulase-negative Staphylococci** | 64  | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 |

**Streptococcus pneumoniae** | 57  | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |

**Azithromycin** | 62  | 80 | 54 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

**Vancomycin** | 62  | 80 | 54 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

**Daptomycin** | 62  | 80 | 54 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

**Linezolid** | 62  | 80 | 54 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

**Azithromycin** | 62  | 80 | 54 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
## Combination Antibiogram

<table>
<thead>
<tr>
<th></th>
<th>Monotherapy</th>
<th>Amikacin</th>
<th>Tobramycin</th>
<th>Levofloxacin</th>
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</thead>
<tbody>
<tr>
<td><strong>Pseudomonas aeruginosa</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pip/Tazo</td>
<td>77%</td>
<td>98%</td>
<td>98%</td>
<td>82%</td>
</tr>
<tr>
<td>Cefepime</td>
<td>75%</td>
<td>97%</td>
<td>95%</td>
<td>79%</td>
</tr>
<tr>
<td>Meropenem</td>
<td>79%</td>
<td>98%</td>
<td>95%</td>
<td>80%</td>
</tr>
</tbody>
</table>

- **Empiric Regimen:**
  - *Pseudomonas aeruginosa*
  - Pip/Tazo + Tobramycin
Rapid Diagnostic Pathways

• Rapid viral testing and rapid diagnostic testing with conventional blood culture reporting is recommended to help avoid unnecessary antibiotic use.

• Prior to implementation, the facility should identify a pathway on who should be tested and how results will be notified so that the quickest turnaround is possible.

• Studies have demonstrated that rapid diagnostics with real-time ASP intervention can lead to faster effective and optimal antibiotics.

Technology

- Optimizing the electronic medical record

- Items to consider
  - Indication requirements
  - Antimicrobial timeouts
  - Stop dates
  - Limited order sentences/choices
Surveillance and Interventions

• Evaluate use
• Discontinue therapy
• Streamline or de-escalate therapy
• Pharmacokinetic recommendations
• Add therapy for empiric coverage
• Add therapy with positive cultures
• Answer drug information questions
• Prevent adverse events
• Reduce patient and facility costs
Intervention Process

Antimicrobial Selection
- **Intervention 1**
  - Antibiogram
  - Rapid Diagnostics
  - Guidelines
  - Empiric Coverage
  - Apply/provide patient specific parameters

Time 1: 48 – 72 hours
- **Intervention 2**
  - Discontinuation
  - De-escalation
  - Add therapy
  - IV to PO
  - Antimicrobial Timeout

Time 2
- **Intervention 3**
  - Discontinuation
  - ID consult
  - Antimicrobial Timeout
Education

• What to educate:
  • New initiatives
  • Primary literature and national guideline updates
  • Background lectures on antimicrobials and disease states to hospital staff
  • Updates on hospital specific data

• How to educate:
  • Use multiple techniques!
  • Do it regularly!
Bugs & Drugs: Did You Know?

Topic: Asymptomatic Bacteriuria

**Definition:**
- Urinary tract infection that is characterized by a lack of symptoms. Symptoms that normally accompany urinary tract infection are:
  - Pain or burning while urinating
  - Frequent urination
  - Feeling the need to urinate despite having an empty bladder
  - Cloudy or cloudy urine
  - Pressure or cramping in the groin or lower abdomen

**Who should we NOT screen and treat?**
- Premenopausal, non-pregnant women
- Diabetic women
- Older patients living in the community
- Patients with spinal cord injury
- Patients with indwelling catheters

**Diagnosis of Asymptomatic Bacteriuria**
- For asymptomatic women, bacteriuria is defined as 2 consecutive voided urine specimens with isolation of the same bacterial strain in quantitative counts of ≥10⁵ colony forming units.
- A single, clean-catch voided urine specimen with 1 bacterial species isolated in a quantitative count of ≥10⁵ cfu/ml identifies bacteriuria in asymptomatic men.
- A single catheterized urine specimen with 1 bacterial species isolated in a quantitative count of ≥10⁵ cfu/ml identifies bacteriuria in women and men.

**Treatment of Asymptomatic Bacteriuria**
- Women treated with antibiotics are 4X more likely to have bacteriuria.

**Myth**
- Antibiotics are indicated for all accidental bacteriuria.

**Did you know?**
- Women treated with antibiotics are 4X more likely to have bacteriuria.

**References**

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**Topic: Hospital-acquired & Ventilator-associated Pneumonia**

**NEW GUIDELINES**
- In July 2016, the Infectious Diseases Society of America (IDSA) and American Thoracic Society published new treatment guidelines for hospital-acquired pneumonia (HAP) and ventilator-associated pneumonia (VAP). Please keep in mind that the guidelines reflect the views of the IDSA panel. Some of the major differences between the 2005 and 2016 guidelines are:
  - Removal of the concept of healthcare-associated pneumonia (HCAP)
  - A greater emphasis on local antibiograms altering the choice of empiric antibiotic therapy and guiding de-escalation
  - Treatment duration for 7-10 days for all pathogens
  - Adoption of GRADE methodology which indicates a level of strength for recommendations based on the quality of evidence

**Biomarkers and Diagnostics**
- Clinical criteria alone should be used to decide whether or not to initiate antibiotic therapy. Guidelines recommend against using biomarkers (e.g., procalcitonin, C-reactive protein, and the Clinical Pulmonary Infection Score) to make the decision to initiate antibiotics for HAP/VAP.
- Procalcitonin levels plus clinical criteria can be used to guide the discontinuation of antibiotic therapy.
- Guidelines recommend noninvasive sampling (e.g., endotracheal aspiration or spontaneous expectoration) over invasive respiratory sampling (e.g., bronchoalveolar lavage) for diagnosis.

**Empirc Treatment of VAP/HAP**
- Based on the antibiogram across all KentuckyOne facilities, everyone should receive empiric coverage for methicillin-resistant Staphylococcus aureus (MRSA) with >10-20% of isolates are methicillin-resistant.
- The most commonly used agents across our facilities is vancomycin as isolates are 100% susceptible. Linezolid is also an option.
- Patients should also receive empiric coverage for Pseudomonas aeruginosa, and other gram negative bacilli.
- The preferred agents include ceftiraxone or piperacillin/tazobactam.

**Examples of Empirc & De-empirc Regimens**

<table>
<thead>
<tr>
<th>Regimen</th>
<th>Combination</th>
</tr>
</thead>
</table>
| NIGGSL | Cefazolin + Vancomycin + Tobramycin + |}

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**February 2017**

**Author:** David Bass, PharmD Candidate
**Chair:** Fred G., Arnold, DO, MSc; FIDSA
**This segment was brought to you by the Subcommittee of Infection Control, representing KentuckyOne Health – Louisville Market.**
Evaluation

• Evaluate and compare data
• Review Metrics and interventions – Identify success
• Identify further problems and/or failures
• Identify areas requiring education or intervention
• Look for research topics
• Once is not enough!
What happens when we are done?
Group Engagement: How to keep it going?

- Group journal clubs
- Bring in guests for learning
- Go to a conference: Learn Together
- Visit another site: Gain Ideas
- Network
- Get certified
- Invite students and trainees
Barriers

• Communication
• Consistent Goals
• Employees
• Education/Competency
• Ownership
• Confidence
• Technology
• Time
• Cost
Benefits

- Better patient care
- Appropriate antimicrobial therapy
- Impede the rate of resistance
- Antimicrobial susceptibility
- Multidisciplinary relationships
- Education
- Progressing the facility
- Cost
- Time
Summary

• Key Concepts
  • Background information MUST be identified to achieve and measure the results you want
  • Implementation and Education go hand-in-hand
  • Evaluation is the key to assessing targets and identifying problem areas

• A collaborative effort is REQUIRED to optimize appropriate antimicrobial therapy, impede the rate of resistance, and decrease cost.
QUESTIONS?