MHA/OHA HIIN
Antibiotic Stewardship/MDRO Collaborative

July 11, 2017
Reminders

- For best sound quality, dial in at **1-800-791-2345** and enter code **11076**
- Please use the chat box to ask questions!

*Please note – this webinar is being recorded.*
Housekeeping

- **Education Credit**
  - Nursing Education Credit – 1 hour
  - Pharmacy Education Credit – 0.1
    - Pharmacists, please list your license number on the sign-in sheet to receive credit
Agenda

- Welcome
- Presentation:
  - Antimicrobial Stewardship: The Practical Aspects of Leveraging Technology by Kimberly Boeser, PharmD, MPH, BCPS AQ-ID
- Questions/discussion
- ASP 101 reminders
- Wrap-up
ANTIMICROBIAL STEWARDSHIP: THE PRACTICAL ASPECTS OF LEVERAGING TECHNOLOGY

KIMBERLY BOESER, PHARM.D., MPH, BCPS AQ-ID
INFECTIOUS DISEASES CLINICAL PHARMACIST
ANTIMICROBIAL STEWARDSHIP COORDINATOR
DIRECTOR, PGY2 INFECTIOUS DISEASE RESIDENCY PROGRAM
THE CALL FOR STEWARDSHIP

**Stewardship:** the conducting, supervising, or managing of something; especially: the careful and responsible management of something entrusted to one's care

**Antimicrobial Stewardship:** coordinated interventions designed to improve and measure the appropriate selection, dosing, route and duration of antimicrobial therapy

- Primary Goal: optimize clinical outcomes, while minimizing unintended consequences of antimicrobial use
  - Toxicity
  - Selection of pathogenic organisms (MRSA, VRE, ESBL gram negative bacteria)
  - Emergence of RESISTANCE
- Secondary Goal: reduce health care costs w/out adversely impacting quality of care
ANTIMICROBIAL STEWARDSHIP

Growing body of evidence demonstrates that ASPs dedicated to improving antibiotic use,

- Improve the quality of patient care and patient safety
  - Increase infection cure rates
  - Reduce treatment failures
  - Reduce adverse events associated with antimicrobial therapy
- Decrease antibiotic resistance
  - Significantly reduce hospital rates of *Clostridium difficile* infections (CDI)
    - Fairview quality initiative 2017
- Provide hospitals with opportunity for cost savings

2014 CDC recommended that all acute care hospitals implement Antibiotic Stewardship Programs

ASPs can be implemented effectively in a wide variety of hospitals

- SUCCESS is dependent on defined leadership and a coordinated multidisciplinary approach
Implementing an Antibiotic Stewardship Program: Guidelines by the Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America


1Section of Infectious Diseases, Boston University School of Medicine, Boston, Massachusetts; 2Division of Infectious Diseases, Johns Hopkins University School of Medicine, Baltimore, Maryland; 3Division of Infectious Diseases, University of Miami Miller School of Medicine, Miami, Florida; 4Department of Clinical Pharmacy, School of Pharmacy, University of California, San Francisco; 5Department of Medicine, Weill Cornell Medical Center/New York–Presbyterian Hospital, New York, New York; 6Department of Internal Medicine, Texas A&M Health Science Center College of Medicine, Houston; 7Division of Healthcare Quality Promotion, Centers for Disease Control and Prevention, Atlanta, Georgia; 8Division of Allergy and Infectious Diseases, University of Washington School of Medicine, Seattle; 9Department of Medicine, Case Western Reserve University and Veterans Affairs Medical Center, Cleveland, Ohio; 10Department of Medicine, University of Pennsylvania Health System, Philadelphia; 11Hamilton House, Virginia Beach, Virginia; 12Division of Infectious Diseases, Denver Health, Denver, Colorado; 13Department of Anesthesiology and Critical Care Medicine, Johns Hopkins University Schools of Medicine and Nursing, Baltimore, Maryland; 14Division of Infectious Diseases, University of Michigan Health System, Ann Arbor; 15Department of Emergency Medicine, University of California, Davis; 16Department of Emergency Medicine, David Geffen School of Medicine, University of California, Los Angeles Medical Center, Sylmar; 17Department of Veterans Affairs, Hines, Illinois; 18Department of Pediatrics, Washington University School of Medicine in St. Louis, Missouri; 19Section on Infectious Diseases, Wake Forest University School of Medicine, Winston-Salem, North Carolina; 20Department of Veterans Affairs and University of Utah, Salt Lake City; 21Infectious Diseases, Memorial Sloan Kettering Cancer Center, New York, New York; and 22Trivedi Consults, LLC, Berkeley, California

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.
HOSPITALS WITH ANTIBIOTIC STEWARDSHIP PROGRAMS BY STATE, 2014*

*A hospital stewardship program is defined as a program following all 7 of CDC core elements of antibiotic stewardship programs.

AE, AP, AS, GU, VI data are not shown due to 7 or fewer hospital respondents but are included in the overall percentage.

Source: CDC’s NHSN Survey

Nationally, 39.2% of all hospitals have stewardship programs (1642 of 4184); the national goal is 100% of hospitals by 2020.
NATIONAL EFFORTS FOR ANTIMICROBIAL STEWARDSHIP
### NATIONAL ACTION PLAN

- 2013 CDC released comprehensive report describing the antibiotic resistant threats in the U.S.
  - Provides the framework for implementing the action plan
  - Addresses the policy recommendations surrounding antibiotic resistance
- President's Council of Advisors on Science and Technology (PCAST) Report
- 2014 CDC 7 Core Elements of Antimicrobial Stewardship
- March 2015 National Action Plan released
- January 2017 - The Joint Commission Regulatory requirements: Standard MM.09.01.01 The hospital has antimicrobial stewardship program based on current scientific literature
- CMS 1.C Promote Antimicrobial Stewardship

### 1.C.9
The hospital has written policies and procedures whose purpose is to improve antibiotic use (antibiotic stewardship).

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 1.C.10
The hospital has designated a leader (e.g., physician, pharmacist, etc.) responsible for program outcomes of antibiotic stewardship activities at the hospital.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 1.C.11
The hospital’s antibiotic stewardship policy and procedures require practitioners to document in the medical record or during order entry an indication for all antibiotics, in addition to other required elements such as dose and duration.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 1.C.12
The hospital has a formal procedure for all practitioners to review the appropriateness of any antibiotics prescribed after 48 hours from the initial orders (e.g., antibiotic time out).

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 1.C.13
The hospital monitors antibiotic use (consumption) at the unit and/or hospital level.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

No citation risk for 1.C.9 through 1.C.13; for information only.
NATIONAL STRATEGY GOALS

1. Slow the development of resistant bacteria and prevent the spread of resistant infections

2. Strengthen national one-health surveillance efforts to combat resistance

3. Advance development and use of rapid and innovative diagnostic tests for identification and characterization of resistance bacteria

4. Accelerate basic and applied research and development for new antibiotics, other therapeutics and vaccines

5. Improve international collaboration and capacities for antibiotic resistance prevention, surveillance, control and antibiotic research and development
# CDC CORE ELEMENTS


| Leadership Commitment | • Formal Statement  
<table>
<thead>
<tr>
<th></th>
<th>• Designated resources: human, financial, IT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accountability</td>
<td>• Single leader responsible for program outcomes</td>
</tr>
<tr>
<td>Drug Expertise</td>
<td>• Single pharmacist leader</td>
</tr>
<tr>
<td>Action</td>
<td>• Implement improvement</td>
</tr>
<tr>
<td>Tracking</td>
<td>• Regular reporting on antibiotic prescribing and resistance</td>
</tr>
<tr>
<td>Reporting</td>
<td>• Regular reporting on antibiotic use and resistance to doctors, nurses and relevant staff</td>
</tr>
<tr>
<td>Education</td>
<td>• Educating clinicians about resistance and optimal prescribing</td>
</tr>
</tbody>
</table>
STATE-WIDE COLLABORATIVE: MN ONE HEALTH

ANTIMICROBIAL STEWARDSHIP

• Multi-partner initiative to address antibiotic use
• Inter-agency approach by government
  • Minnesota Department Health
  • Department of Agriculture
  • Pollution Control Agency
  • Board of Animal Health
• Stakeholders from academia, clinical practice, health and agriculture advocacy groups

• Mission
  • Provide a collaborative environment to promote judicious antibiotic use and reduce the impact of antibiotic resistant pathogens

• Vision
  • Minnesota leaders in human, animal, and environment health will work together to raise awareness and change behaviors to preserve antibiotics and treat infections effectively
STRATEGIC PLAN GOALS

• Promote understanding of one health antibiotic stewardship
• Share resources through online platform
• Support public engagement on antibiotic use
• Hold exchanges among practitioners in different fields
• Improve human antibiotic stewardship
• Make tools available to track antibiotic use across continuum of care
• Set state human health antibiotic goals
• Develop honor roll recognition system for health care facilities
• Improve animal antibiotic stewardship
• Communicate national antibiotic goals for animal stewardship
• Promote animal agriculture best practices
• Increase access to stewardship resources for companion animal medicine
• Facilitate public engagement on animal stewardship
• Develop “antibiotic footprint” tools
• Understand impact of antibiotics in the environment
• Help prescribers make choices to decrease their own antibiotic footprint
ANTIMICROBIAL STEWARDSHIP AT FAIRVIEW-UMMC

January 2007-UMMC implemented first Antimicrobial Stewardship Program

- Co-leadership with Dr. Susan Kline and Dr. Kimberly Boeser
  - 0.5 FTE ID staff physician support
  - 1.0 FTE Infectious Diseases Clinical Pharmacist
- Developed restricted antimicrobial guidelines and disease state guidelines
  - 2014 approved as system guidelines
- Expanded training
  - 2012 PGY2 ID resident
  - 2013 ID fellows training
  - 2015 added a second PGY2 ID resident
  - 2 U of MN College of Pharmacy students per block
- Maintained data collection from 2007-2014
  - Interventions and acceptance rates
  - ABX $/pt day
  - Tracking of MDR-pathogens and C. difficile (Infection Prevention)
  - Morbidity and Mortality (hospital-wide)

January 2014-Fairview Southdale and Ridges Hospitals implemented ASPs

- Co-leadership with Dr. Steve Dittes and Dr. Michelle Borchart, Dr. Emily Medcraft and Dr. Ron Greenberg
- Round 2-3 days a week with ID staff on patients on restricted antimicrobials
STRUCTURE OF OUR ASP TEAM

• ID PharmD + ID staff (+/- Pharmacy resident(s)-PGY1 or PGY2 ID, ID fellow, pharmacy students)

• Patients are flagged by order for restricted antimicrobial (34) and focus on 12 standard interventions

• Pharmacy team reviews all patients and determine which patients to round on with ID staff

• Round daily with ID staff

• Review all pertinent labs, imaging, drug profile, and cultures and make determination for ongoing antimicrobial approvals

• Place a progress note in the electronic medical record (EMR)

• Communicate with primary teams

• Follow-up on recommendations and monitor for adverse effects and duration of therapy of antimicrobials
MULTIDISCIPLINARY APPROACH

- Medical staff
- Lab Micro
- ASP Champion
- Infection Prevention & Control
- Informatics
- Pharmacists

Patient

CURRENT EXPANSION EFFORTS

• Formal Antimicrobial Stewardship Programs at 3 out of 7 system hospitals
  • Joint efforts between Infectious Disease Providers, Pharmacists, and Infection Prevention
  • Active intervention with real-time feedback
• Current efforts to expand to all 7 hospitals
• Site Gap Analysis were completed 12/2016, updated 7/2017
• System-wide Antimicrobial Stewardship Steering Committee was developed & Project Plan Created
  • Kick-off meeting in May->Project time-line completion by 12/2017
• System Coordinator Role to take effect in May 2017
• Primary goal is to ensure regulatory compliance at all sites
• IT investments for Antimicrobial Stewardship and Infection Prevention (Epic ICON 500)
• Tracking and monitoring-Antibiotic Use and Antibiotic Resistance
  • CDC NHSN AUR module will be the gold standard for reporting and tracking
• Long-term goals->expansion to long term care/rehab facilities and ambulatory клиник
LEVERING TECHNOLOGY AND THE EMR FOR AS PRACTICE
<table>
<thead>
<tr>
<th>Leadership Commitment</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Formal Statement</td>
<td></td>
</tr>
<tr>
<td>• Designated resources: human, financial, IT</td>
<td></td>
</tr>
<tr>
<td>Accountability</td>
<td></td>
</tr>
<tr>
<td>• Single leader responsible for program outcomes</td>
<td></td>
</tr>
<tr>
<td>Drug Expertise</td>
<td></td>
</tr>
<tr>
<td>• Single pharmacist leader</td>
<td></td>
</tr>
<tr>
<td>Action</td>
<td></td>
</tr>
<tr>
<td>• Implement improvement</td>
<td></td>
</tr>
<tr>
<td>Tracking</td>
<td></td>
</tr>
<tr>
<td>• Regular reporting on antibiotic prescribing and resistance</td>
<td></td>
</tr>
<tr>
<td>Reporting</td>
<td></td>
</tr>
<tr>
<td>• Regular reporting on antibiotic use and resistance to doctors, nurses and relevant staff</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td></td>
</tr>
<tr>
<td>• Educating clinicians about resistance and optimal prescribing</td>
<td></td>
</tr>
</tbody>
</table>
**ACTION**

- **Patient Identification and Assessment**
  - Report generated daily for patient started on a restricted antimicrobial
  - AS clinical tool built in Epic to gain efficiency in clinical review
  - Documentation in the EMR
  - Restricted Antimicrobial Guidelines and Disease State Guidelines

- **Verigene® Gram negative bacteremia AS Response Team**
  - AMT on-call 7 days a week 8a-10p
  - Microlab pages AMT on-call for all positive blood cultures with gram negative pathogens
  - AMT/ID pharmacist makes assessment of patient, rounds on patient with ID staff or discusses over the phone
  - Treatment algorithm designed based on validation and antibiogram and order sets built for treating highly, multi-drug resistant bacteremias
  - Standard documentation via an AMT note is placed in the chart, primary medical team is paged

- **Cdiff Risk Assessment Tool**
  - Join effort with IP and EVS
  - 3 pronged approach to early intervention: pharmacist medication stewardship, provider, staff, patient and family education by IP, enhanced bleach cleaning by EVS
  - Physician champions- Dr. Susan Kline and Dr. Alison Galdys

- **Medication Use Evaluations**
  - ~6-8 completed annually, system-wide
  - Examples for 2017: carbapenems, fluoroquinolones, micafungin, vancomycin
  - Findings presented at our System Antibiotic Subcommittee with actions/recommendations for improvement of utilization

- **PCN Allergy Assessment/PAST**
  - Collaboration with ID Division
  - Physician champion- Dr. Pia Franco
  - Training received from ALK
EPIC PATIENT LISTS AND EVENTS

### Antimicrobial Stewardship Notes

- **AMT to review 7/10**
- **Possible PAST candidate**
- **HAP**
- **Azeirnam (7/8-)**
- **Vanc (7/8-)**
- **Lvoq (7/8-)**

Last edited by Kobic, Emir, RPH on 07/10/17 at 0929

### General Information

- **Type:** Antimicrobial Management Team
- **Status:**
- **Significance:**
- **Title:** AMT - appropriate therapy
- **Number:** 1021
- **Outcomes:**

### Associated Orders

- **Order Name or ID**
- **AMT - follow-up in 24-48 hours**
- **AMT - ID consult**
- **AMT - will review TODAY**

### Associated Users

- **User**
- **Role**
# AS MONITORING TOOL

## Gram stain [351709450]
- **Order Status**: Completed
- **Specimen Description**
  - Sputum
  - Screen
- **Micro Report Status**
- **Specimen**: Sputum
- **Collected**: 07/10/17 1945
- **Updated**: 07/10/17 2214
- **Specimen Description**
  - <10 Squamous epithelial cells/low power field
  - <25 PMNs/low power field
  - Moderate Mixed gram positive and gram negative bacteria present.
  - **FINAL**: 07/10/2017

## Sputum Culture Aerobic Bacterial [351709449]
- **Order Status**: Completed
- **Specimen Description**
  - Sputum
  - Screen
- **Micro Report Status**
- **Specimen**: Sputum
- **Collected**: 07/10/17 1945
- **Updated**: 07/10/17 2117

## Sputum Culture Aerobic Bacterial [351452341]
- **Order Status**: Completed
- **Specimen Description**
  - Sputum
  - Screen
- **Micro Report Status**
- **Specimen**: Sputum
- **Collected**: 07/08/17 1140
- **Updated**: 07/10/17 1302

## Strep pneumo Agn Ur greater or equal to 13yrs or CSF any age [351485336]
- **Order Status**: Completed
- **Specimen Description**
  - Urine
  - Unspecified Urine
- **Micro Report Status**
- **Specimen**: Urine
- **Collected**: 07/08/17 1745
- **Updated**: 07/09/17 0006

## Gram stain [351479222]
- **Order Status**: Completed
- **Specimen Description**
  - Sputum
  - Screen
- **Micro Report Status**
- **Specimen**: Sputum
- **Collected**: 07/08/17 1140
- **Updated**: 07/08/17 1543

## Radiology (Last 504 hours)
- **07/08 1139**: CT Chest Pulmonary Embolism w Contrast
- **07/07 1841**: XR Chest Port 1 View
- **07/07 0711**: CT Abdomen Pelvis w Contrast
- **05/29 0000**: LS Imaging - HIM Scan
EMR DOCUMENTATION

University of Minnesota Medical Center, Fairview
Antimicrobial Management Team (AMT) Note

Antimicrobial Stewardship Program – a joint venture between Fairview Pharmacy Services and UM Physicians to optimize antibiotic management

NOT a formal Consult/Restricted Antibiotic Review

To:
Unit:
Allergies:
Infection History:

Brief Summary:
HPI:
Interval History:

Assessment:

Recommendation/Interventions:
1).
2).
3).

Intervention Examples:
1. Change to more appropriate antibiotic based on lab data
2. Change to alternative unrestricted anti infective
3. Discontinue one or more antibiotics (PO or IV)
4. Change from IV to PO antibiotics
5. Better empiric antibiotic therapy
6. Antibiotic dosage change
7. Consult recommended (e.g., Infectious Disease, Pulmonary/Critical Care, Renal, Urology, etc.)
8. Additional/Further diagnostic testing recommended
9. Simplify antibiotic regimen (e.g., Inpatients on redundant or excessively broad spectrum antibiotics)
10. Recommend change in post-op antibiotic duration
11. Other (Duration of Therapy)
12. Agree with management

Discussed w/ ID Staff-Dr. XX

Current Antibiotic therapy:

Previous Antibiotic therapy:

Vital Signs and other clinical features:
Temperature
Imaging:

Culture Results:

<table>
<thead>
<tr>
<th>Date</th>
<th>Culture Site</th>
<th>Organism</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Meropenem (Merrem®) Use Guidelines:**

**Reasons for restriction:** To prevent unnecessary use and preserve the efficacy for severe infections. Meropenem will be reserved for infections that are polymicrobial and/or contain resistant gram negative bacteria such as Pseudomonas, Enterobacter, Serratia or an ESBL producing E. coli or Klebsiella. It is also restricted due to costs. For example Pseudomonas susceptible to piperacillin/tazobactam should not be treated with meropenem unless the patient has an IgE-mediated allergy noted (see page 2).

**FDA Approved Indications:**
- Skin or soft tissue infection
- Intra-abdominal infection
- Bacterial Meningitis
- Pediatric-bacterial meningitis

**Fairview Indications:**
- Multidrug resistant gram negative pathogens, e.g. Pseudomonas aeruginosa, Burkholderia cepacia, or Extended Spectrum Beta Lactamase (ESBL) gram negative bacteria which are only sensitive to meropenem
  - Meropenem is a formulary carbapenem that has excellent susceptibility to ESBL producing organisms and may be considered an alternative over meropenem if Pseudomonal coverage is not necessary based on site of infection or documented cultures.
- A dose of 500mg IV Q6H is the approved dosing for all indication except Cystic Fibrosis patients and CNS infections.
  - Higher dose meropenem may be used if a documented pathogen has a higher MIC reported of ≥2.
  - 500 mg IV Q6H is our standard dosing as many of our gram negative pathogens maintain low susceptibility MICs to meropenem and utilizing lower dose but closer frequency (500 mg IV Q6H vs. 1 gm IV Q8H) optimizing time dependent killing

**Dosing:**

**Adult:**
- Standard dose: 500 mg IV Q6H
- Standard dosing for CF patients: 1 gm IV Q8 hours
- Bacterial meningitis: 2 gm IV Q8H

**Pediatric:**
- Bacterial meningitis ≥ 3 months = 40 mg/kg IV Q8 hours
- Skin and/or SQ tissue = 10 mg/kg IV Q8 hours
- Complicated abdominal infections = 20 mg/kg IV Q8 hours

**Cost:**

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>Cost/dose</th>
<th>Cost/day</th>
<th>Alternative Agent</th>
<th>Cost/dose</th>
<th>Cost/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meropenem 500 mg vial</td>
<td>$6.40</td>
<td>$25.60</td>
<td>Primaxin (Imipenem/Cil) 500 mg vial</td>
<td>$7.50-8.50</td>
<td>$30.00-34.00</td>
</tr>
<tr>
<td>Meropenem 1 gm vial</td>
<td>$12.81</td>
<td>$38.43</td>
<td>Primaxin $4.50</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


VERIGENE®
GRAM-NEGATIVE BLOOD CULTURE ASSAY (BC-GN)

Cultured on the 1st day of incubation: *Klebsiella pneumoniae*
Critical Value/Significant Value, preliminary result only, called to and read back by MARK C. RN @2312 4/1/17. CT
(Note)
POSITIVE for *KLEBSIELLA PNEUMONIAE* by Verigene multiplex nucleic acid test. Final identification and antimicrobial susceptibility testing will be verified by standard methods.

Specimen tested with Verigene multiplex, gram-negative blood culture nucleic acid test for the following targets: Acinetobacter sp., Citrobacter sp., Enterobacter sp., Proteus sp., E. coli, *K. pneumoniae/oxytoca*, *P. aeruginosa*, and the following resistance markers: CTX, KPC, NDM, VIM, IMP and OXA.

Blood culture Gram stain
Gram-negative bacilli

**CTX-M, KPC, VIM, IMP, NDM, OXA NOT Detected**

- **Escherichia coli**
  - Ceftriaxone
  - Alternatives: Piperacillin-tazobactam
    - History of ESBL
    - Meropenem
  - Narrow once susceptibilities are available

- **Klebsiella species**
  - Ceftriaxone
  - Alternatives: Piperacillin-tazobactam
    - History of ESBL
    - Meropenem
  - Narrow once susceptibilities are available

- **Enterobacter species**
  - Cefepime
  - Alternative: Meropenem

- **Citrobacter species**
  - Cefepime
  - Alternative: Meropenem

- **Proteus species**
  - Ceftriaxone
  - Alternatives: Piperacillin-tazobactam
    - History of ESBL
    - Meropenem
  - Narrow once susceptibilities are available

- **Acinetobacter species**
  - Ceftriaxone
  - Alternatives: Piperacillin-tazobactam
    - History of ESBL
    - Meropenem
  - Narrow once susceptibilities are available

- **Pseudomonas aeruginosa**
  - Meropenem

**CTX-M DETECTED**

- **Meropenem**
  - Narrow once susceptibilities are available

**KPC, VIM, IMP, NDM, OXA DETECTED**

- **Obtain an ID consult**
  - Meropenem 2 g q8h
  - PLUS Tigecycline
  - PLUS Colistin or Gentamicin
CDIFF RISK ASSESSMENT TOOL

CDIFF Pilot Units (153 Patients)

<table>
<thead>
<tr>
<th>UNIT</th>
<th>Patient Name/Age/Sex</th>
<th>CDIFF Risk Scoring System Score Column</th>
<th>C Diff Follow-Up</th>
<th>C-Diff score change</th>
<th>C-DIFF RISK SCORING SYSTEM Time Since Reviewed Column</th>
<th>Admission Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>UU56C</td>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td>26 hrs 10 mins</td>
<td>2/26/16</td>
</tr>
<tr>
<td>UU5CBM</td>
<td>21</td>
<td></td>
<td></td>
<td></td>
<td>16 hrs 58 mins</td>
<td>12/30/16</td>
</tr>
<tr>
<td>UU5CBM</td>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td>477 hrs 56 mins</td>
<td>11/3/16</td>
</tr>
<tr>
<td>UU4E</td>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td>17 hrs 6 mins</td>
<td>9/16/16</td>
</tr>
<tr>
<td>UU4E</td>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12/30/16</td>
</tr>
<tr>
<td>UU5CBM</td>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12/30/16</td>
</tr>
</tbody>
</table>

C-DIFF Risk: 22 [Last reviewed: Mason, Jocelyn, RPH at 01/02/17 13:10]

**Pharmacy CDI Review Complete on 12/30/2016 11:42 AM by Jocelyn Mason**
Intervention: discontinue PPI
Estimate Time Spent: 10 min

**IP CDI Review Complete on 12/30/2016 11:45 AM by Jocelyn Mason**
EV/VS Notified: Yes
Sign Placed: Yes
Education: RN/PUI/Family/Provider
EV/VS Cleared: Yes
Estimate Time Spent: 15 min

- PPI active in last 60 days: 2 points - [Last updated: 01/03/17 15:29]
- Fluoroquinolone ordered in last 90 days: 1 points - [Last updated: 01/03/17 15:29]
- Age 50-80 years: 1 points - [Last updated: 01/03/17 15:29]
- At least 1 day in ICU (1 point): 1 points - [Last updated: 01/03/17 15:29]
- Readmitted in last 30 days: 2 points - [Last updated: 01/03/17 15:29]
- Most recent albumin < 3.6: 1 points - [Last updated: 01/03/17 15:29]
- Currently on antineoplastic medication: 3 points - [Last updated: 01/03/17 15:29]
- History of C-diff diagnosis or positive result in last year: 3 points - [Last updated: 01/03/17 15:29]
- Antibiotic ordered in last 90 days: 1 points - [Last updated: 01/03/17 15:29]
- Beta Lactam and glycopeptide ordered in last 90 days: 2 points - [Last updated: 01/03/17 15:29]
- Beta-lactam and Fluoroquinolone ordered in last 90 days: 2 points - [Last updated: 01/03/17 15:29]
- Transplant Patient (or on wait list): 3 points - [Last updated: 01/03/17 15:11]
PCN ALLERGY ASSESSMENT PROGRAM

Have you ever taken drugs similar to penicillin?
Cephalosporins such as Cephalexin (Keflex), Cefepime (Maxipime), Ceftriaxone (Rocephin) Carbapenems such as Imipenem (Primaxin), Meropenem (Merrem), Etrapenem (Invanz)  

Procedure was reviewed and discussed with the patient and or family member: {YES NO:124710:"Yes"}
The patient met University of Minnesota Medical Center Penicillin Skin Test Protocol for Penicillin Allergy Skin Testing: {YES NO:124710:"Yes"}

Step 1: Puncture Test Results:
The test was read after *** minutes of placement.

***Insert picture

Histamine control response (+): {YES NO:124710:"Yes"} (***mm)
Normal saline control response (-): {YES NO:124710:"Yes"} (***mm)
PRE-PEN response (PRP): {YES NO:124710:"Yes"} (***mm)
Penicillin G response (PG): {YES NO:124710:"Yes"} (***mm)

Assessment:
The histamine response was {Positive / Negative:124514}, determining that the patient ***does or does not have the ability to mount an allergic reaction.
The normal saline response was {Positive / Negative:124514}, determining that the patient ***does or does not have skin too sensitive for testing.
The penicillin and PRE-PEN sites ***did or did not produce larger wheals than the controls or were {Positive / Negative:124514} for any reaction and therefore, the patient ***does or does not appear initially allergic and the testing ***can or cannot continue to the second portion of testing with intradermal testing.

Step 2: Intradermal Test Results:
The test was read after *** minutes of placement.

*** Insert picture here
| Leadership Commitment                      | • Formal Statement  
|                                           | • Designated resources: human, financial, IT |
| Accountability                             | • Single leader responsible for program outcomes |
| Drug Expertise                             | • Single pharmacist leader |
| Action                                     | • Implement improvement |
| Tracking                                   | • Regular reporting on antibiotic prescribing and resistance |
| Reporting                                  | • Regular reporting on antibiotic use and resistance to doctors, nurses and relevant staff |
| Education                                  | • Educating clinicians about resistance and optimal prescribing |
EPIC ICON MODULE IMPLEMENTATION

- Required the upgraded version of Epic in order to build the reporting structure
- Significant financial investment from Fairview and MHealth for IT infrastructure upgrades
  - Epic upgrade
  - Currently undergoing Sunquest LIS (MicroLab) upgrade
- Currently in the build and testing the functionality of the module components
  - Goal is to utilize the module (Ivents) for total assessment, intervention and documentation->allows easy method for tracking and reporting
  - Leveraging our technology to gain efficiencies with clinical activities
- Creating a AS Dashboard
- Hurdles: Technology upgrades take time, time intensive to build and test, many different groups involved and everyone has their own priorities
- Go-Live: October 2\textsuperscript{nd}, 2017
NATIONAL HEALTHCARE SAFETY NETWORK (NHSN) AU(R) MODULE

- AUR=Antibiotic Use and Resistance module
- Launched in 2012
- Goal=provide a mechanism for facilities to report and analyze antimicrobial use and/or resistance as part of local or regional efforts to reduce antimicrobial resistance
- Must coordinate with their laboratory and/or pharmacy information software providers to configure their system to enable the generation of standard formatted file(s) to be imported into NHSN
- Data can be system wide, hospital specific, and/or unit specific
- Ideal state=aggregate information of antibiotic use at a regional or national level->create antibiotic benchmarks
STANDARDIZE ANTIMICROBIAL ADMINISTRATION RATIO (SAAR)

• Measurement for tracking and reporting continues to be difficult and facilities risk not being compliant with this core element
• SAAR could be used for benchmarking for antibiotic use
  • Same concept as Standard Infection Ration (SIR) that Infection Prevention uses
  • Gives the observed antimicrobial use over predicted
  • May allow for risk adjusted comparisons
• CDC has been collaborating with organization to make this module doable and helpful
  • Grant was available from the CDC for Departments of Health
• SAAR may be more helpful if reported by specific patient populations or grouped by antibiotics
  • Agents mainly for healthcare associated pathogens
  • Agents mainly for community pathogens
  • Agents active against MRSA
  • Agents frequently use for surgical prophylaxis
  • All agents

National Healthcare Safety Network
Rate Table - All Submitted AU Data - Antimicrobial Utilization Rates by Location
Rate per 1,000 Days Present
As of: February 3, 2012 at 3:52 PM
Date Range: All AU_RATELOCATION

Org ID=10846 CDC Location=IN:ACUTE:CC:M Location=INMEDCC

<table>
<thead>
<tr>
<th>Summary Yr/Mon</th>
<th>Antimicrobial Category</th>
<th>Antimicrobial Class</th>
<th>Antimicrobial Days</th>
<th>Days Present</th>
<th>Rate per 1000 Days Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011M01</td>
<td>Antibacterial</td>
<td>-- All --</td>
<td>90165</td>
<td>10000</td>
<td>9,016.500</td>
</tr>
<tr>
<td>2011M01</td>
<td>Antibacterial</td>
<td>Aminoglycosides</td>
<td>438</td>
<td>10000</td>
<td>43.800</td>
</tr>
<tr>
<td>2011M01</td>
<td>Antibacterial</td>
<td>Carbapenems</td>
<td>12</td>
<td>10000</td>
<td>1.200</td>
</tr>
<tr>
<td>2011M01</td>
<td>Antibacterial</td>
<td>Cephalosporins</td>
<td>57</td>
<td>10000</td>
<td>5.700</td>
</tr>
<tr>
<td>2011M01</td>
<td>Antibacterial</td>
<td>Fluoroquinolones</td>
<td>12</td>
<td>10000</td>
<td>1.200</td>
</tr>
<tr>
<td>2011M01</td>
<td>Antibacterial</td>
<td>Folate pathway inhibitors</td>
<td>6</td>
<td>10000</td>
<td>0.600</td>
</tr>
</tbody>
</table>
NATIONAL STRATEGY OBJECTIVES

• 95% of eligible hospitals report antibiotic use data to National Healthcare Safety Network Antibiotic Use & Resistance by 2020

• Reduce inappropriate inpatient antibiotic use by 20% from 2014 levels

• Reduce inappropriate outpatient antibiotic use by 50% from 2010 levels
WHAT ELSE DOES THE STEWARDSHIP TEAM DO?

- Improve the quality of patient care and patient safety
- Increase infection cure rates
- Reduce treatment failures
- Reduce adverse events associated with antimicrobial therapy
- Reduce use of inappropriate antimicrobials
- Practice cost effective medicine by managing a $3.5 million dollar anti-infective budget
- Prevent collateral damage e.g. Clostridium difficile infection, limit broad spectrum antibiotics, monitor for adverse effects of antimicrobial therapies
- Reduce antimicrobial resistance
- Practice in a collaborative, multi-disciplinary care environment—improves patient care and outcomes
- Promote AS and Educate
- It will take ALL levels of health care providers to understand and commit to these efforts

CLINICAL OUTCOMES

University HealthSystem Consortium Data

<table>
<thead>
<tr>
<th>Discharge Year</th>
<th>Cases</th>
<th>Mean LOS Observed</th>
<th>Mean LOS Expected</th>
<th>LOS Index</th>
<th>% Deaths Observed</th>
<th>% Deaths Expected</th>
<th>Mortality Index</th>
<th>UHC Risk Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>28,071</td>
<td>5.21</td>
<td>5.33</td>
<td>0.98</td>
<td>1.65</td>
<td>1.98</td>
<td>0.84</td>
<td>Pre-2012 model</td>
</tr>
<tr>
<td>2006</td>
<td>29,194</td>
<td>5.19</td>
<td>5.36</td>
<td>0.97</td>
<td>1.71</td>
<td>1.93</td>
<td>0.89</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>31,194</td>
<td>5.12</td>
<td>5.31</td>
<td>0.97</td>
<td>1.41</td>
<td>1.67</td>
<td>0.85</td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>30,312</td>
<td>5.28</td>
<td>5.58</td>
<td>0.95</td>
<td>1.53</td>
<td>1.83</td>
<td>0.84</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>28,705</td>
<td>5.39</td>
<td>5.78</td>
<td>0.93</td>
<td>1.58</td>
<td>2.07</td>
<td>0.76</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>28,805</td>
<td>5.62</td>
<td>5.80</td>
<td>0.97</td>
<td>1.85</td>
<td>2.22</td>
<td>0.84</td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>28,216</td>
<td>5.71</td>
<td>5.97</td>
<td>0.95</td>
<td>1.76</td>
<td>2.05</td>
<td>0.86</td>
<td>2012 model</td>
</tr>
<tr>
<td>2012</td>
<td>28,302</td>
<td>5.38</td>
<td>5.80</td>
<td>1.03</td>
<td>1.97</td>
<td>1.85</td>
<td>1.07</td>
<td>2015 model</td>
</tr>
</tbody>
</table>

MULTIDRUG RESISTANT HAI RATES

<table>
<thead>
<tr>
<th>Year</th>
<th>MRSA</th>
<th>VRE</th>
<th>CDI</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>28,302</td>
<td>5.80</td>
<td>1.03</td>
</tr>
<tr>
<td>2014</td>
<td>27,738</td>
<td>6.02</td>
<td>1.02</td>
</tr>
<tr>
<td>2015</td>
<td>26,701</td>
<td>6.10</td>
<td>1.02</td>
</tr>
<tr>
<td>2016</td>
<td>18,584</td>
<td>6.30</td>
<td>0.93</td>
</tr>
</tbody>
</table>

SUMMARY

1. HAI trends, MRSA and VRE rates have decreased during the intervention period, but SBL and CRE rates have increased.
2. CDI rates have increased during the intervention period.
3. Mortality, morbidity, and LOS have remained stable since implementation of ASP.
4. Antibiotic costs are under control, with a 20% reduction in ASP.
5. Effects of ASP and infection prevention appear to be synergistic.

ANTIMICROBIAL COSTS TABLE

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Cost</th>
<th>UHC Risk Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>$3.5 million</td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>$3.5 million</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>$3.5 million</td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>$3.5 million</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>$3.5 million</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>$3.5 million</td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>$3.5 million</td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>$3.5 million</td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td>$3.5 million</td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td>$3.5 million</td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td>$3.5 million</td>
<td></td>
</tr>
</tbody>
</table>

Ongoing Impact of an Antimicrobial Stewardship Program at a Large Academic Medical Center, 9 Years of Experience

Susan Kline1,2,3, MD, MPH, Kimberly Boese1,2, PharmD, MPH, SCPS A1,3, ID, Samantha Saunders1,3, MPH, Dawn England1,3, MPH, CIC, Kari Lawrence1,3, MPH, BBA, Jessica Kankleitz1, BA and Pamela Phelp1, PharmD, FASHP

1) Dept. of Medicine, Infectious Disease Division, University of Minnesota Medical School, 2) Pharmacy Dept., University of Minnesota Medical Center/University of Minnesota Masonic Children’s Hospital, 3) Infection Prevention Dept., University of Minnesota Medical Center/University of Minnesota Masonic Children’s Hospitals, - Minneapolis, Minnesota

ABSTRACT

INTRODUCTION

Objective: To track and measure the impact of the antimicrobial stewardship program (ASP) on key outcome measures over time since implementation in 2007, compared to pre-intervention period of 2006.

- Interventions made by the ASP team (~1,900-2,400/year)
- Acceptance Rate (~80%/year)
- Morbidity, mortality, length of stay (LOS)
- Antibiotic costs
- Antimicrobial resistance trends
- Antibiotic usage (since institution of EPIC in 2011 downward trend)
WHAT DO WE DO NOW?

• Keep fighting!
• Leadership and Engagement
• Education and Training
• Protect our patients
  • Quick identification and treatment
  • Active Surveillance
• Support local and national efforts including legislation
• Work with industry
• Be Stewards…everyone…including you!
Resistance anywhere is resistance everywhere. Antibiotic overuse increases the development of drug-resistant germs and limits treatment options for infections. You have a role in preventing antibiotic resistance.

http://www.health.state.mn.us/divs/idepc/dtopics/antibioticresistance/index.html
QUESTIONS & DISCUSSION

CONTACT: KIMBERLY BOESER, PHARMD., MPH, BCPS AQ-ID
KVAREJCI@FAIRVIEW.ORG
# ASP 101 Reminders

## MHA/OHA Acute Care ASP 101

### Implementation Timeline

#### Phase 1: CDC Core Elements 1-3

<table>
<thead>
<tr>
<th>June 2017</th>
<th>July 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Events</strong></td>
<td><strong>Action Items</strong></td>
</tr>
<tr>
<td>- June 20 - ASP 101 Kick off webinar - overview of ASP initiative across the continuum of care</td>
<td>- July 11 - MHA/OHA collaborative webinar “Leveraging the EMR to Promote ASP activities” (Register <a href="#">online</a>)</td>
</tr>
<tr>
<td><strong>Homework</strong></td>
<td>- Develop an ASP team</td>
</tr>
<tr>
<td>- Review Kansas DOH ASP Toolkit for Rural and Critical Access Hospitals pg. 1-14</td>
<td>- Draft a leadership ASP statement of support (example provided)</td>
</tr>
<tr>
<td><strong>Due</strong></td>
<td><strong>Due</strong></td>
</tr>
<tr>
<td>- ASP team in place</td>
<td>- Leadership ASP statement of support for your facility</td>
</tr>
</tbody>
</table>

#### Phase 2: CDC Core Element 4

<table>
<thead>
<tr>
<th>August 2017</th>
<th>September 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Events</strong></td>
<td><strong>Action Items</strong></td>
</tr>
<tr>
<td>- Aug. 8 - ASP 101 Sharing call and presentation, “TJC ASP Lessons Learned” (Register <a href="#">online</a>)</td>
<td>- Sept. 12 - MHA/OHA Collaborative Webinar (Register <a href="#">online</a>)</td>
</tr>
<tr>
<td><strong>Homework</strong></td>
<td>- Based on the facility ASP statement of support draft an ASP policy that supports optimal antibiotic use (example provided)</td>
</tr>
<tr>
<td>- Review Kansas DOH ASP Toolkit for Rural and Critical Access Hospitals Pg. 15-24</td>
<td><strong>Due</strong></td>
</tr>
<tr>
<td></td>
<td>- Facility specific ASP policy and procedure</td>
</tr>
</tbody>
</table>
MHA/OHA HIIN Contacts

- **OHA**
  - James Guliano, Vice President Quality Programs
  - Rosalie Weakland, Senior Director Quality Programs
  - Subcontractor – HSAG
    - Christine Bailey, Director, Quality Improvement and Patient Safety

- **MHA**
  - Tania Daniels, Vice President, Quality and Patient Safety
  - Lali Silva, Senior Director Quality and Process Improvement
  - Susan Klammer, Quality & Process Improvement Specialist
Thank you for joining us!

Next Webinar:
“TJC ASP Lessons Learned”
Tuesday, August 8 at 11:30am CST/ 12:30pm EST
Join online: https://zoom.us/j/537497272