Antibiograms and Infection Prevention Efforts to Combat Antimicrobial Resistance Post COVID-19

Welcome!

• All lines are muted, so please ask your questions in Q&A
• For technical issues, chat to the ‘Technical Support’ Panelist
• Please actively participate in polling questions that pop up on the lower right-hand side of your screen

We will get started shortly!
Antibiograms and Infection Prevention Efforts to Combat Antimicrobial Resistance Post COVID-19

May 25, 2021

Darrell Childress, PharmD, Antimicrobial Stewardship Coordinator
Brooke Bailey, Director of Infection Prevention
East Alabama Medical Center
Making Health Care Better Together

Hospital Quality Improvement

Welcome from all of us!

Collaborators:
- Alabama Hospital Association
- Alliant Quality
- Comagine Health
- Georgia Hospital Association
- KFMC Health Improvement Partners
- Konza
Darrell Childress, PharmD
Antimicrobial Stewardship Coordinator & Pharmacy Residency Director
East Alabama Medical Center

Brooke Bailey
Director of Infection Prevention
East Alabama Medical Center
Learning Objectives

• Learn Today:
  – Evaluate the impact of COVID-19 on hospital acquired infections (HAI) and changes in resistance patterns
  – Review antibiograms and the importance of stratifying based on specific hospital locations
  – Discuss EAMC’s antimicrobial stewardship efforts in combating antimicrobial resistance in a post COVID environment

• Use Tomorrow:
  – Analyze MDRO and HAI data to enhance and stratify antibiograms
East Alabama Medical Center

• 314-bed acute care regional referral center
• Antimicrobial Stewardship Team
  – Infectious Diseases (ID) Physician, ID Pharmacist, clinical microbiologists, and infection prevention nurses

![Graph showing the number of COVID-19 cases/day from 3/16/20 to 2/16/21]
Antimicrobial Stewardship

• Diversion of resources for COVID-19
  – Testing and Reporting
  – Monitoring inpatients
  – Medication procurement
  – Assisting with ID rounds

• Surveillance cultures for patients receiving immnosuppressive therapy for COVD-19
“We haven’t seen that organism before”

- Multi-Drug resistant Organisms (MDRO)
  - *Ewingella americana*
  - *Stenotrophomonas maltophilia*
  - *Carbapenem Resistant Pseudomonas*
  - *Carbapenem Resistant Acinetobacter*
  - *Aspergillus fumigatus*
Respiratory Organisms 2019-2020

![Bar Chart](chart.png)

<table>
<thead>
<tr>
<th>Location</th>
<th>2019</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>2SW</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>4T</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>5ST</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>6ST</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>7ST</td>
<td>16</td>
<td>11</td>
</tr>
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<td>8SE</td>
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<td>23</td>
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<td>8SW</td>
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<td>7</td>
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<tr>
<td>CVU</td>
<td>28</td>
<td>42</td>
</tr>
<tr>
<td>ICU</td>
<td></td>
<td>131</td>
</tr>
</tbody>
</table>

Legend: **2019** | **2020**
MDRO Respiratory 2019-2020

MDRO:
2019: 54
2020: 90
ICU Pathogens

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>2019</th>
<th>2020</th>
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<tbody>
<tr>
<td>Acinetobacter baumannii</td>
<td>4</td>
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<tr>
<td>Aspergillus fumigatus</td>
<td>0</td>
<td>3</td>
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<tr>
<td>Escherichia coli</td>
<td>2</td>
<td>5</td>
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<tr>
<td>Klebsiella pneumoniae</td>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td>MRSA</td>
<td>10</td>
<td>13</td>
</tr>
<tr>
<td>MSSA</td>
<td>11</td>
<td>18</td>
</tr>
<tr>
<td>Pseudomonas aeruginosa</td>
<td>14</td>
<td>21</td>
</tr>
<tr>
<td>Stenotrophomonas (Xanthomonas) maltophilia</td>
<td>3</td>
<td>10</td>
</tr>
</tbody>
</table>
MDRO-ICU

2019: 26
2020: 54

MDR-Acinetobacter baumannii
MDR-Enterobacter cloacae
MDR-Klebsiella (Enterobacter)...
MDR-Klebsiella pneumoniae
MDR-Pseudomonas aeruginosa
MDR-Serratia marcescens
MRSA
Stenotrophomonas...

2019  2020
Broad Spectrum Antibiotic Usage

Cefepime DOT/1000 Patient days

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<tr>
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<tbody>
<tr>
<td></td>
<td>26.2</td>
<td>26</td>
<td>22.5</td>
<td>27.4</td>
<td>23.2</td>
<td>34.2</td>
<td>43.4</td>
<td>32.8</td>
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<tr>
<td></td>
<td>47.6</td>
<td>46.9</td>
<td>48.5</td>
<td>49.2</td>
<td>52.2</td>
<td>58.7</td>
<td>54.8</td>
<td>56</td>
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</table>

Meropenem DOT/1000 Patient days

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<tbody>
<tr>
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<td>11.2</td>
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<td>8.4</td>
<td>9.7</td>
<td>15</td>
<td>22.4</td>
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<tr>
<td></td>
<td>22.4</td>
<td>21</td>
<td>21.8</td>
<td>23</td>
<td>23.1</td>
<td>25.4</td>
<td>24.3</td>
<td>18.3</td>
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</table>

Pip/Tazo DOT/1000 Patient days

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</thead>
<tbody>
<tr>
<td></td>
<td>66.7</td>
<td>69.2</td>
<td>60.6</td>
<td>60.1</td>
<td>51.2</td>
<td>61.6</td>
<td>61.1</td>
<td>60.4</td>
</tr>
<tr>
<td></td>
<td>75.3</td>
<td>72.6</td>
<td>72.3</td>
<td>29.1</td>
<td>68.9</td>
<td>69.3</td>
<td>67.4</td>
<td>69.4</td>
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### Susceptibility of β-Lactams

<table>
<thead>
<tr>
<th>Drug</th>
<th>2019</th>
<th>2020</th>
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</thead>
<tbody>
<tr>
<td>Cefepime</td>
<td>94.4%</td>
<td>88.8%</td>
</tr>
<tr>
<td>Zosyn</td>
<td>94.4%</td>
<td>94.1%</td>
</tr>
<tr>
<td>Merrem</td>
<td>99.1%</td>
<td>96.5%</td>
</tr>
</tbody>
</table>

The graph shows the percentage of susceptibility for different β-lactam drugs over two years:

- **Cefepime**: 94.4% in 2019, 88.8% in 2020
- **Zosyn**: 94.4% in 2019, 94.1% in 2020
- **Merrem**: 99.1% in 2019, 96.5% in 2020

The percentage values are marked as blue bars for 2019 and red bars for 2020.
Polling:
Is this happening at your facility?

• Is your facility seeing an increase in antimicrobial resistance or MDROs?
  A. Yes
  B. No
COVID-19's Effect on HAI

- Grasselli et al., Hospital-acquired infections in critically-ill COVID-19 patients.
  - 46% Patients developed HAI
    - 35% MDRO
    - 50% VAP
    - 34% BSI
    - 10% CLABSI
CLABSI and CAUTI during the Pandemic

Coronavirus disease 2019 (COVID-19) pandemic, central-line–associated bloodstream infection (CLABSI), and catheter-associated urinary tract infection (CAUTI): The urgent need to refocus on hardwiring prevention efforts

• CLABSI rates increased by 51.0% during the pandemic
  – Hospitals with high monthly COVID-19 patients (>10%) had SIR 2.38 times higher than hospitals with <5%

• No significant changes were identified for CAUTI

Fakih, et al. Infection Control & Hospital Epidemiology (2021)
Possible Reasons for HAI in COVID-19

• Unnecessary antimicrobial administration
  – ~80% patients received antibiotics on admission
• Prolonged mechanical ventilation
• Higher device utilization
• Disruption in infection prevention strategies
  – Assessment of central lines, etc.
• Treatment options for COVID
  – Steroids
  – IL-6/IL-1 inhibitors
• Redeployment of staff

Smith, et al. Infection Control & Hospital Epidemiology (2021)
## CLABSI and CAUTI 2019 vs 2020

<table>
<thead>
<tr>
<th></th>
<th>CY2019</th>
<th>CY2020</th>
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</thead>
<tbody>
<tr>
<td></td>
<td># OF</td>
<td>SIR</td>
</tr>
<tr>
<td></td>
<td>INFECTIONS</td>
<td></td>
</tr>
<tr>
<td><strong>CLABSI</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALL CMS REPORTED UNITS</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ICUs only</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>CAUTI</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALL CMS REPORTED UNITS</td>
<td>1</td>
<td>0.17</td>
</tr>
<tr>
<td>ICUs only</td>
<td>1</td>
<td>0.395</td>
</tr>
</tbody>
</table>
Other Contributing Factors

• Disruption of Infection Prevention Strategies
• Patient census and acuity levels
  – Higher device utilization
  – Prolonged ventilation
• Existing staff reallocation
• Large amount of contract staff
• Supply deficient
• Alternate care sites
EAMC’s Efforts to Combat HAI Post COVID-19 Peak
Infection Prevention Strategies

• Back to Basics
  • Interdisciplinary collaboration
  • Device utilization/Bundle compliance
  • Appropriate utilization of PPE
  • More frequent rounding
  • Staffing consistency
Antibiogram Development

• Published by the Clinical Laboratory Standards Institute (CLSI)

• Recommendations
  – Report number of isolates tested per timeframe
  – Report species with ≥ 30 isolates
  – Report only the first isolate per patient during timeframe
  – Present percentage susceptible
Polling:
Who publishes your antibiogram?

• At your facility, who is in charge of publishing the antibiogram?
  A. Microbiology
  B. Pharmacy
  C. A & B
  D. Other
## Antibiotic and Empiric Treatment Guide 2021

<table>
<thead>
<tr>
<th>INFECTION TYPE</th>
<th>PATHOGENS</th>
<th>Durations</th>
<th>EMPIRIC TREATMENT</th>
<th>ALTERNATIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RESPIRATORY</strong></td>
<td>MRSA/ MSSA</td>
<td>7</td>
<td>Vancomycin (PTD) AND Cefepime 2 gm IV Q8hrs AND Tobramycin (PTD)</td>
<td>ICU/CVU: Recommend ID consultation due to increased MDR0 from COVID-19</td>
</tr>
<tr>
<td></td>
<td>E. coli</td>
<td>4-7</td>
<td>Piperacillin-Tazobactam 3.375 gm IV Q8hrs (4 hr Infusions)</td>
<td>Levafolin 750 mg IV Q24hrs</td>
</tr>
<tr>
<td></td>
<td>Clostridioles difficile</td>
<td>10</td>
<td>Vancomycin 125 mg PO Q12h</td>
<td>Vancomycin 125 mg PO Q12h</td>
</tr>
<tr>
<td><strong>BACTEREMIA</strong></td>
<td>MRSA/ MSSA</td>
<td>4-42</td>
<td>Vancomycin (PTD) AND Piperacillin-Tazobactam 3.375 gm IV Q8hrs (4 hr Infusions)</td>
<td>Penicillin Allergy: Vancomycin (PTD) AND Aztreonam 2 gm IV Q8hrs</td>
</tr>
<tr>
<td></td>
<td>E. coli</td>
<td>10</td>
<td>Vancomycin (PTD)</td>
<td>Vancomycin (PTD)</td>
</tr>
<tr>
<td></td>
<td>K. pneumonia</td>
<td>7-42</td>
<td>Piperacillin-Tazobactam 3.375 gm IV Q8hrs (4 hr Infusions)</td>
<td>Vancomycin (PTD) AND Aztreonam 2 gm IV Q8hrs</td>
</tr>
<tr>
<td><strong>CELLULITIS</strong></td>
<td>MRSA/ MSSA</td>
<td>10</td>
<td>Vancomycin (PTD)</td>
<td>Vancomycin (PTD)</td>
</tr>
<tr>
<td><strong>DIABETIC FOOT INFECTION</strong></td>
<td>MRSA/ MSSA</td>
<td>34-42</td>
<td>Vancomycin (PTD) AND Piperacillin-Tazobactam 3.375 gm IV Q8hrs (4 hr Infusions)</td>
<td>Penicillin Allergy: Vancomycin (PTD) AND Aztreonam 2 gm IV Q8hrs</td>
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<td></td>
<td>E. coli</td>
<td>34-42</td>
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<td>K. pneumonia</td>
<td>34-42</td>
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<td>Vancomycin (PTD) AND Aztreonam 2 gm IV Q8hrs</td>
</tr>
<tr>
<td></td>
<td>S. pneumoena</td>
<td>5</td>
<td>Vancomycin (PTD)</td>
<td>Penicillin Allergy: Vancomycin (PTD) AND Aztreonam 2 gm IV Q8hrs</td>
</tr>
<tr>
<td><strong>MENINGITIS</strong></td>
<td>E. coli</td>
<td>14</td>
<td>Ceftriaxone 2 gm IV Q24hrs</td>
<td>CSF Shunts: Vancomycin (PTD) AND Aztreonam 2 gm IV Q8hrs</td>
</tr>
<tr>
<td></td>
<td>M. meningoides</td>
<td>5</td>
<td>Ceftriaxone 2 gm IV Q24hrs</td>
<td>CSF Shunts: Vancomycin (PTD) AND Aztreonam 2 gm IV Q8hrs</td>
</tr>
<tr>
<td><strong>URENE</strong></td>
<td>E. coli</td>
<td>7</td>
<td>Ceftriaxone 1 gm IV Q24hrs</td>
<td>Gentamicin (PTD)</td>
</tr>
<tr>
<td></td>
<td>K. pneumonia</td>
<td>7</td>
<td>Gentamicin (PTD)</td>
<td>Gentamicin (PTD)</td>
</tr>
</tbody>
</table>

*Critical factors for MRSA or MSSA 10%. Reduce coverage with anti-Pseudomonal antibiotics. *Recommend adding Ampicillin 2gm IV Q8hrs for Pregnancy or Adults over 50 years of age. PTD=Pharmacy to dose
Antibiogram Stratifications

• EAMC stratifies based on:
  – Community versus Hospital acquired
  – Unit*
    • ICU versus Non-ICU
  – Urine versus non-Urine
    • Respiratory (HAP/VAP/CAP)
    • Intra-abdominal infections (IAI)
    • Skin/Soft Tissues infections (SSTI)
    • Meningitis
Rapid Diagnostics

• Current arsenal
  – MALDI-TOF mass spectrometry
  – *Clostridioides difficile* PCR
  – BIOFIRE® respiratory panel (2.1)

• Future armament
  – FUNGITELL®
  – BIOFIRE® Pneumonia and Blood culture (BCID2)
Summary

• EAMC is not unique to other healthcare facilities
• Re-education and getting back to basics is key
• Be creative with Antibiograms
• CDC's The Core Elements of Hospital Antibiotic Stewardship Programs and Program Assessment Tool (Checklist)

https://www.cdc.gov/antibiotic-use/core-elements/hospital.html
References


Key Takeaways

• Learn Today:
  – Evaluate the impact of COVID-19 on hospital acquired infections and changes in resistance patterns
  – Review antibiograms and the importance of stratifying based on specific hospital locations
  – Discuss EAMC’s antimicrobial stewardship efforts in combating antimicrobial resistance in a post COVID environment

• Use Tomorrow:
  – Analyze MDRO and HAI data to enhance and stratify antibiograms

How will this change what you do? Please tell us in the poll…
Questions?

Email us at HospitalQuality@AlliantQuality.org or call us 678-527-3681
### Oral Antibiotic Discharge: Selection & Duration Guideline

<table>
<thead>
<tr>
<th>Infection Diagnosis</th>
<th>Empiric Treatment</th>
<th>Duration of Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncomplicated UTI (cystitis)</td>
<td>Nitrofurantoin (NFT) 100mg BID (excluding NTM), β-lactams, Fosfomycin 3g x 1 dose</td>
<td>NFT: 5 days β-lactams: 5-7 days Fosfomycin: 3 days TMPSMX (SMX): 1-2 days</td>
</tr>
<tr>
<td>Complicated UTI (pyelonephritis)</td>
<td>Levofloxacin 750mg QDay</td>
<td>FQs: 5-7 days TMPSMX: 10 days β-lactams: 10 days</td>
</tr>
<tr>
<td>Asymptomatic bacteriuria</td>
<td>Treatment is NOT recommended unless pregnant or GU procedure</td>
<td>0 days</td>
</tr>
</tbody>
</table>

### Non-purulent cellulitis
- Cephalexin 500 mg QID (7.5g/day) 6 days
- Clindamycin 300 mg QID (3.5g/day) 5 days

### Purulent cellulitis (other than RTI)
- TMPSMX 1-2 QID 5 days

### Animal bite wound
- Amoxicillin/Clav 875/125mg BID (10 days)
- Ampicillin 1000mg BID (5 days)

### Without comorbidities or risk factors for DRSP
- Vancomycin 10mg/kg QID (10 days)
- Ceftiraxone 1g QID (7 days)

### Comorbidities or risk factors for DRSP
- Vancomycin 10mg/kg QID (7 days)
- Ceftiraxone 1g QID (7 days)

### Upper Respiratory Tract infections
- β-lactams not recommended 5 days

### Bacterial Rhinosinusitis
- 98% viral infection 5 days

### Bronchitis
- 90% viral infection 5 days

### Pharyngitis
- > 90% viral infection 5 days

### Acute COPD exacerbation
- Dalfampridine 10mg BID 5 days

### Influenza
- Oseltamivir 75mg BID 5 days

---

### Questions?

---

### COMMUNITY ACQUIRED

<table>
<thead>
<tr>
<th>All Sources Except Urine</th>
<th>Gram-Positive Community-Acquired Percent Susceptible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enterococcus faecalis</td>
<td>100%</td>
</tr>
<tr>
<td>Enterococcus spp (all)</td>
<td>100%</td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>93%</td>
</tr>
<tr>
<td>Staphylococcus aureus - MRSA</td>
<td>100%</td>
</tr>
<tr>
<td>Staphylococcus aureus - MSSA</td>
<td>100%</td>
</tr>
<tr>
<td>Staphylococcus coagulase negative - S aureus</td>
<td>100%</td>
</tr>
<tr>
<td>Streptococcus agalactiae (Group B)</td>
<td>100%</td>
</tr>
</tbody>
</table>

### All Sources Except Urine | Gram-Negative Community-Acquired Percent Susceptible |
<table>
<thead>
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</thead>
<tbody>
<tr>
<td>Escherichia coli</td>
<td>92%</td>
</tr>
<tr>
<td>Klebsiella pneumonia</td>
<td>86%</td>
</tr>
<tr>
<td>Proteus mirabilis</td>
<td>84%</td>
</tr>
<tr>
<td>Pseudomonas aeruginosa</td>
<td>84%</td>
</tr>
</tbody>
</table>

### Urine Isolates Only | Gram-Positive Community-Acquired Percent Susceptible |
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Enterococcus faecalis</td>
<td>100%</td>
</tr>
<tr>
<td>Enterococcus spp (all)</td>
<td>100%</td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>94%</td>
</tr>
<tr>
<td>Staphylococcus coagulase negative - S aureus</td>
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<td>84%</td>
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<tr>
<td>Pseudomonas aeruginosa</td>
<td>84%</td>
</tr>
</tbody>
</table>
HQIC Goals

Behavioral Health Outcomes & Opioid Misuse
- Promote opioid best practices
- Decrease high dose opioid prescribing and opioid adverse events in all settings
- Increase access to behavioral health services

Patient Safety
- Reduce risky medication combinations
- Reduce adverse drug events
- Reduce C. diff in all settings

Quality of Care Transitions
- Convene community coalitions
- Identify and promote optimal care for super utilizers
- Reduce community-based adverse drug events
Upcoming Events

June 22, 2021, 2:00 p.m. EST
Monoclonal Antibody Therapy for High Risk COVID Patients

July 27, 2021, 2:00 p.m. EST
Opioid Pain Management
https://bit.ly/2RZJYLo
Making Health Care Better Together

Thank you for joining us!
How did we do today?
Making Health Care Better Together

Hospital Quality Improvement

This material was prepared by Alliant Quality, the quality improvement group of Alliant Health Solutions (AHS), the Hospital Quality Improvement Contractor (HQIC) under contract with the Centers for Medicare & Medicaid Services (CMS), an agency of the U.S. Department of Health and Human Services. The contents presented do not necessarily reflect CMS policy. Publication No. AHSHQIC-TO3H-21-572