A Day in the Life of the Antimicrobial Steward and Beyond

Jad Aridi, MD

Stephanie Barras, RPh, PhAST

Objectives

Review principles and goals of antimicrobial stewardship

Recognize classic and modern tools of implementing antimicrobial stewardship

Implementing antimicrobial stewardship in the relatively resource limited setting

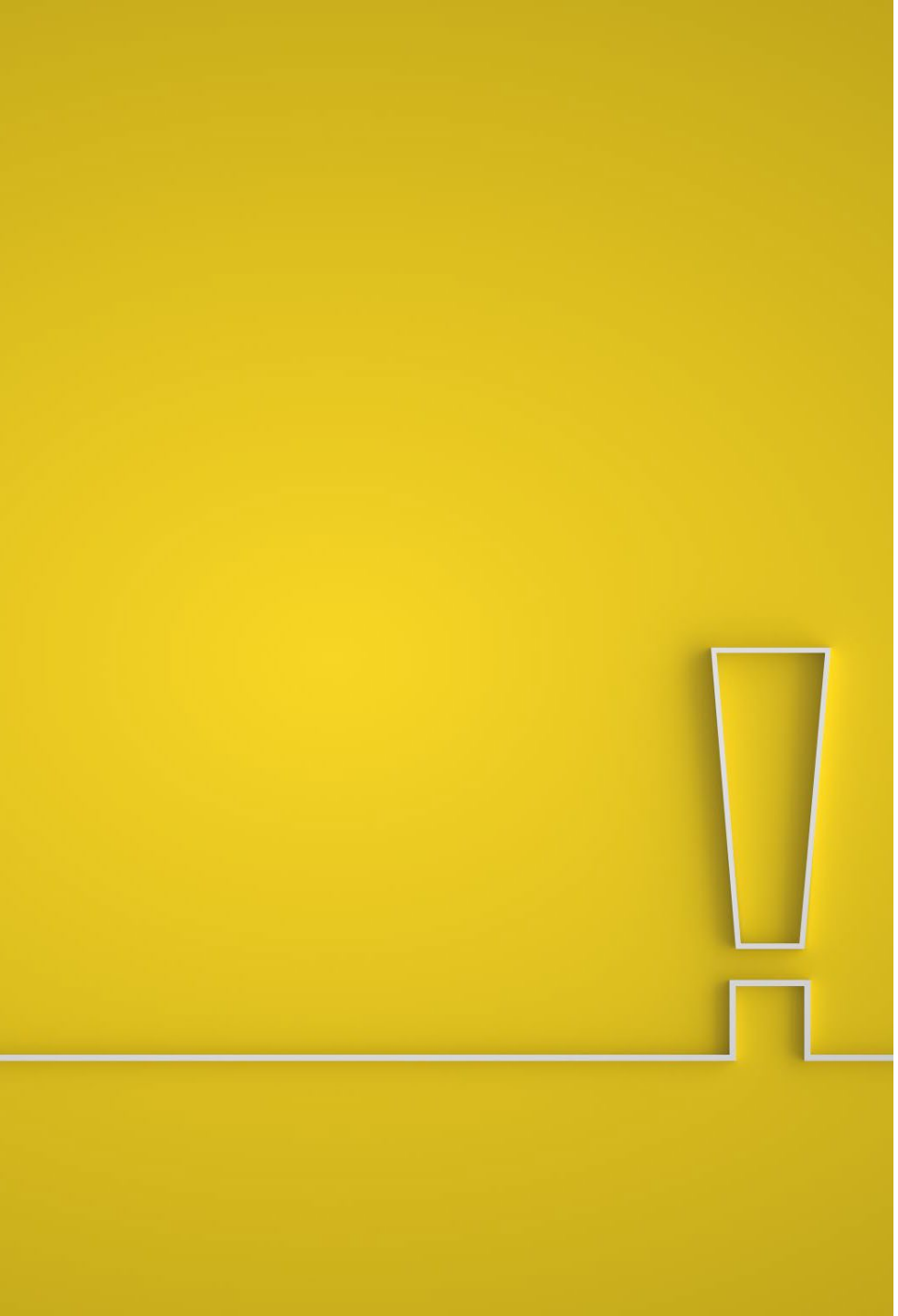
Utilizing new technologies and diagnostics and the future of antimicrobial stewardship

Review Principles and Goals of Antimicrobial Stewardship

Antimicrobial Stewardship Principles and Goals

- Global impact of Antimicrobial Resistance (AMR)
- Right **D**rug, right **D**ose, right **D**uration, **D**e-escalation (to culture directed therapy)
- Multidrug resistant organisms and the importance of reducing carbapenem pressure

Limiting Antibiotic Resistance Depends on ALL of Us!



Global Impact of Antimicrobial Resistance

- AMR caused 1.27 million deaths worldwide in 2019, more than HIV/AIDS or malaria
- AMR infections played a role in 4.95 million deaths
- Drug resistance in lower respiratory infections had the greatest impact
- Resistance to fluoroquinolones and beta lactams accounted for 70% of the deaths
- Estimates predict 10 million annual deaths by 2050

AMS Principles: 4D's

- Right **D**rug
- Right **D**ose
- Right **D**uration
- **D**e-escalation (to culture directed therapy)

Carbapenem Pressure Reduction

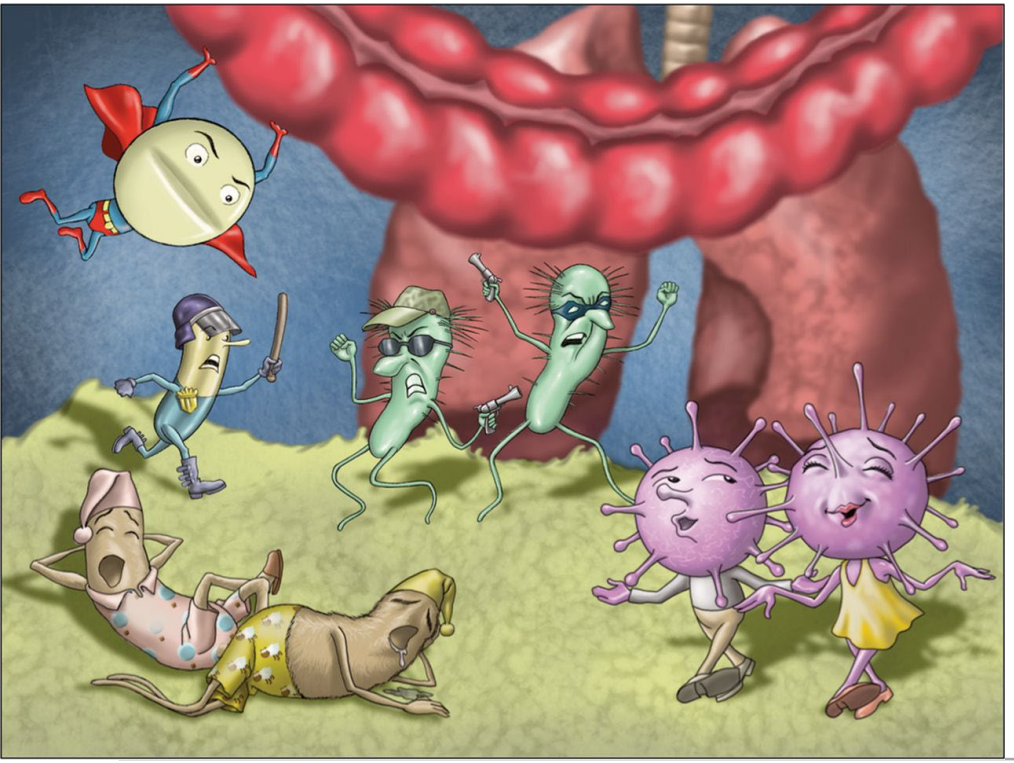
- Carbapenem-resistant organisms (CROs) pose serious threats in healthcare-associated infections (HAIs)
- Multiple studies confirm the direct relationship between increased carbapenem use and an increase in infections due to CROs
- CROs are difficult to treat and contribute to the spread of resistance by horizontal transmission
- CROs increase morbidity, mortality, hospital stay, and healthcare costs

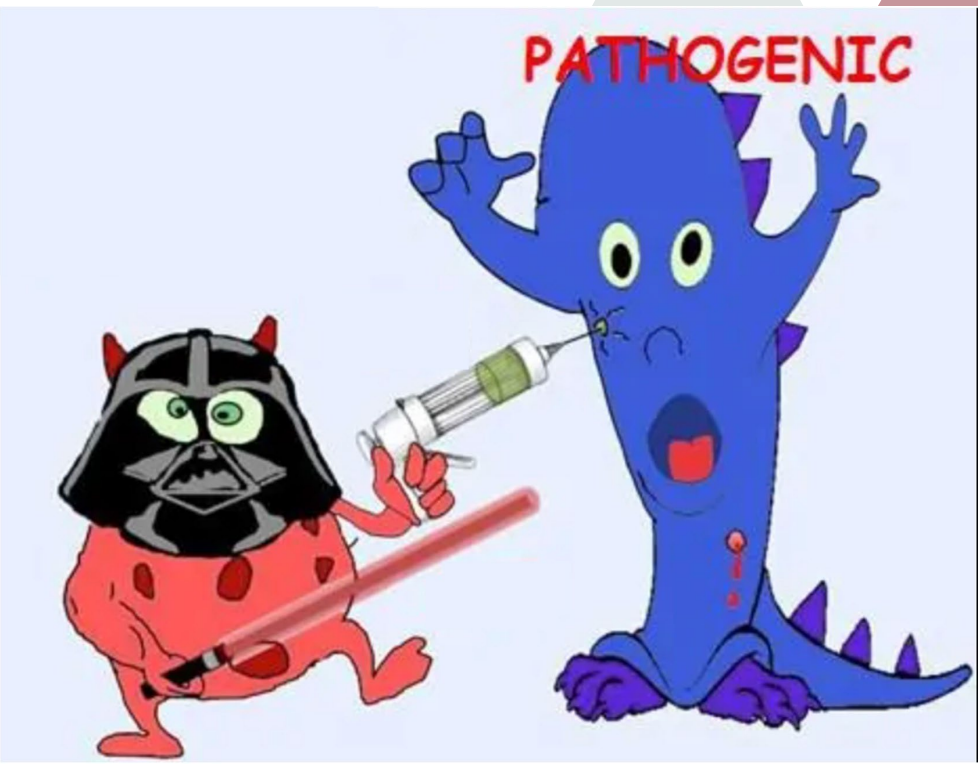
Classic and Modern Tools of Antimicrobial Stewardship

Classic and Modern Tools of Antimicrobial Stewardship

- Differentiate colonization from true infection
- Durations of antibiotics for common infectious entities
- Subtleties of IV to PO conversion of antimicrobials
- General de-escalation techniques in daily antimicrobial stewardship practice
- Penicillin allergies and carbapenem alternatives in eligible patients

Colonization, Contamination, Infection





Colonization, Contamination, Infection

- Asymptomatic bacteriuria versus true UTI
- Tracheal/respiratory colonization in tracheostomy, long term ventilation, and cavitary lung diseases
- Contaminated blood culture versus true bacteremia

Asymptomatic bacteriuria vs UTI

- Asymptomatic bacteriuria (ASB): Bacteria in the urine in the absence of symptoms of infection
- **Does not require** antibiotic treatment.
- Per 2019 IDSA guidelines the only populations that require antibiotics for ASB are:
  - Pregnancy
  - Surgeries involving urinary tract

Asymptomatic bacteriuria vs UTI

- ASB statistics:
  - Elderly in LTAC==>50%
  - Spinal cord injury==>69%
  - Long term indwelling catheter==>100%

Asymptomatic bacteriuria vs UTI

- Differentiation determined by:
  - Symptoms
  - Urinalysis
  - Alternative diagnoses

Asymptomatic bacteriuria vs UTI

- **Symptoms:**
  - Pain or burning
  - Urinary frequency
  - Blood in urine
  - Fever/chills (more indicative of complicated UTI)
- **Not symptoms:**
  - Smell
  - Color
  - Change in appearance

Asymptomatic bacteriuria vs UTI

Urinalysis:

- Pyuria is the presence of 10 or more white cells per cubic millimeter-primary indicator of UTI
- Squamous epithelial cells are indicative of colonization
- Nitrites and leukocyte esterase may be indicators of UTI, but are not diagnostic

Asymptomatic bacteriuria vs UTI

- A urine specimen for **culture** should be obtained **prior to initiating antimicrobials** and following standard cleaning methods

- If an indwelling catheter has been in place for >2 weeks at the onset of CA-UTI and is still indicated, the **catheter should be replaced preferably prior to culture**

Case Presentation

73-year-old female presents to ER with altered mental status. UA/reflex culture ordered. Results reveal WBC <5, trace leukocytes, dark color, cloudy appearance, nitrites negative. Patient started on Ceftriaxone 1gm q24. No fever.

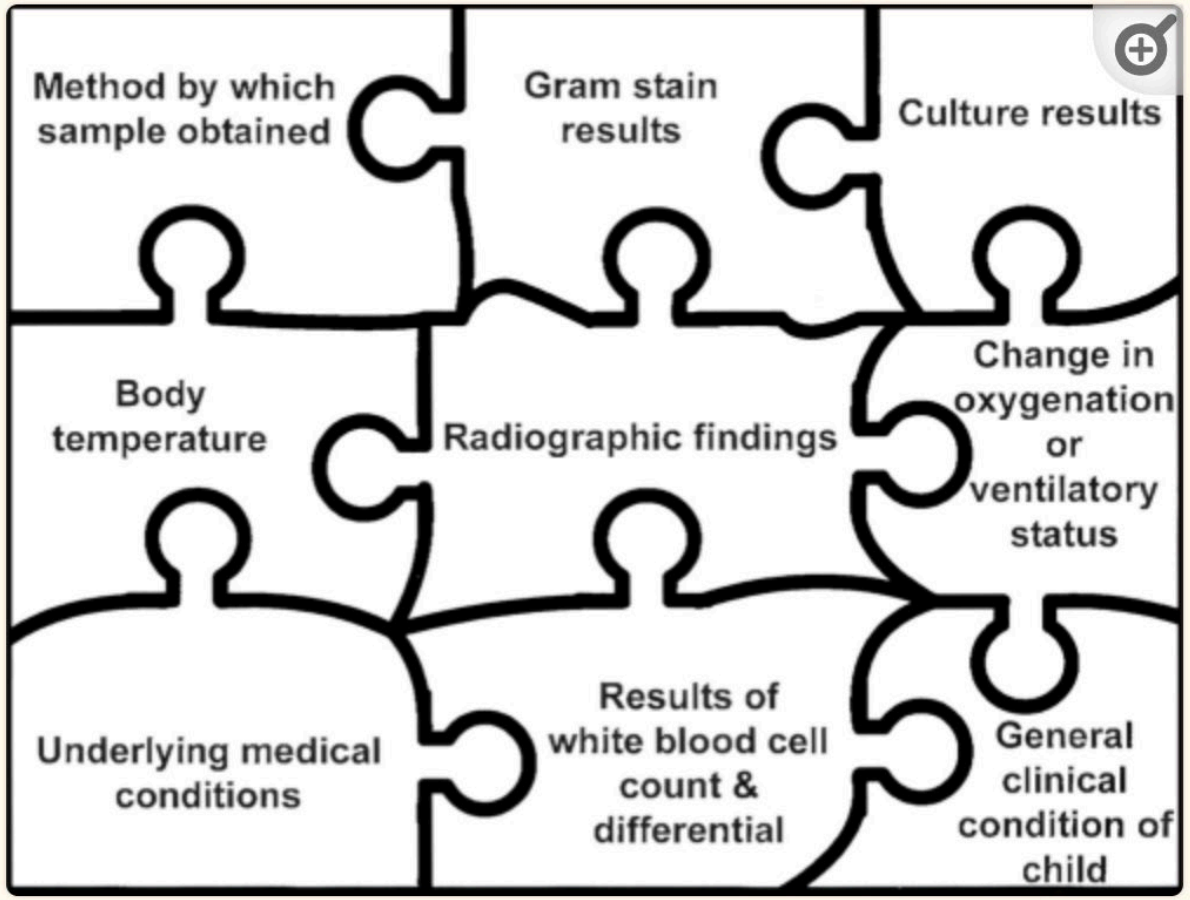
A. Continue current antibiotics for 3-5 days

B. Likely ASB, reach out to physician to discontinue antibiotics

Tracheal/Respiratory Colonization

- Mostly in patients with tracheostomy, long term vent, or with cavitary lung diseases (bronchiectasis, CF, ILD etc.)
- Colonization is common and multiple factors need to be met to characterize it as infection

Tracheal/Respiratory Colonization



Contaminated Blood Culture vs True Bacteremia

- Differentiating contamination from active pathogen with coagulase-negative staphylococci (CoNS) in blood cultures:
  - 2 sets with 4 bottles positive with same organism (based on susceptibilities)
  - Presence of hardware
  - Polymicrobial CoNS bacteremia typically represents contamination except in the right patient
  - Isolated CoNS bacteremia does not need an automatic TTE (may be warranted in patient with hardware)

Durations of Antibiotics for Common Infectious Entities

Durations of Antibiotics for Common Infectious Entities

- Urinary tract infections (UTI)
- Community-acquired pneumonia (CAP)
- Skin and soft tissue infections (SSTI)

Durations of Antibiotics for Common Infectious Entities - UTI

- Cystitis: 3 days if uncomplicated. Consider one and done therapy
- Pyelonephritis: 7-14 days depending on the patient and clinical scenario
- 7 days is equivalent to longer courses, including bacteremia

Durations of Antibiotics for Common Infectious Entities - CAP

- Reasonable to treat for 5 days if:
  - Patient is afebrile for at least 48 hours
  - Initial therapy was appropriate
  - No signs of extrapulmonary infection

Durations of Antibiotics for Common Infectious Entities - SSTI

- Aim for 5 to 10 days, despite worsened appearance (erythema, skin changes), if systemic improvement is present
- Elevation and compression is important!

IV to PO Conversion

IV to PO Conversion

- IV antibiotics for more than 48 hours
- Able to tolerate oral therapy
- Clinical improvement over the last 24 hours
- Intact gut absorption
- In cases where a prolonged course of IV antibiotics is not required (as in the case of more severe disease states)

IV to PO Conversion

Antibiotics	Bioavailability PO formulation
Ciprofloxacin	80%
Levofloxacin	100%
Clindamycin HCl	90%
Doxycycline	>90%
Linezolid	100%
Metronidazole	100%
Minocycline	90%
SMX-TMP	95%
Voriconazole	95%
Fluconazole	>90%

Other Carbapenem Reduction Techniques

Daily AMS Practices

- Narrowing spectrum of coverage based on cultures results
- Stopping double coverage
- IV to PO conversion
- Providing education to teams
- Formulary restrictions
- Stewardship rounds
- Best practice advisories (BPAs)in electronic medical record (EMR)
- Using molecular techniques to de-escalate therapy (MRSA PCR, BCID, respiratory panels etc.)

Penicillin Allergies and Carbapenem Alternatives

Penicillin Allergy

Is it Really a Penicillin Allergy?

Evaluation and Diagnosis of Penicillin Allergy for Healthcare Professionals

Did You Know?

5 Facts About Penicillin Allergy (Type 1, Immunoglobulin E (IgE)-mediated)

1. Approximately 10% of all U.S. patients report having an allergic reaction to a penicillin class antibiotic in their past.
2. However, many patients who report penicillin allergies do not have true IgE-mediated reactions. When evaluated, fewer than 1% of the population are truly allergic to penicillins.[1]
3. Approximately 80% of patients with IgE-mediated penicillin allergy lose their sensitivity after 10 years.[1]
4. Broad-spectrum antibiotics are often used as an alternative to penicillins. The use of broad-spectrum antibiotics in patients labeled "penicillin-allergic" is associated with higher healthcare costs, increased risk for antibiotic resistance, and suboptimal antibiotic therapy.[1]
5. Correctly identifying those who are not truly penicillin-allergic can decrease unnecessary use of broad-spectrum antibiotics.[1]

10% of the population reports a penicillin allergy but <1% of the whole population is truly allergic.

Before prescribing broad-spectrum antibiotics to a patient thought to be penicillin-allergic, evaluate the patient for true penicillin allergy (IgE-mediated) by conducting a history and physical, and, when appropriate, a skin test and challenge dose.

History and Physical Examination

The history and physical examination are important components when evaluating a patient's drug reactions.[1]

- Questions to ask during the examination:
  - What medication were you taking when the reaction occurred?
  - What kind of reaction occurred?
  - How long ago did the reaction occur?
  - How was the reaction managed?
  - What was the outcome?[2]
- Characteristics of an IgE-mediated (Type 1) reaction:
  - Reactions that occur immediately or usually within one hour[1]
  - Hives: Multiple pink/red raised areas of skin that are intensely itchy[3]
  - Angioedema: Localized edema without hives affecting the abdomen, face, extremities, genitalia, oropharynx, or larynx[4]
  - Wheezing and shortness of breath
  - Anaphylaxis

- Broad-spectrum antibiotics are often used as an alternative to narrow-spectrum penicillins.
- Using broad-spectrum antibiotics can increase healthcare costs and antibiotic resistance, and may mean your patient receives less than the best care.
- Correctly identifying if your patient is actually penicillin-allergic can decrease these risks by reducing unnecessary use of broad-spectrum antibiotics.

Centers for Disease Control and Prevention
National Center for Emerging and Zoonotic Infectious Diseases

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- Anaphylaxis[1] requires signs or symptoms in at least two of the following systems:
  - Skin: Hives, flushing, itching, and/or angioedema
  - Respiratory: Cough, nasal congestion, shortness of breath, chest tightness, wheeze, sensation of throat closure or choking, and/or change in voice-quality (laryngeal edema)
  - Cardiovascular: Hypotension, faintness, tachycardia or less commonly bradycardia, tunnel vision, chest pain, sense of impending doom, and/or loss of consciousness
  - Gastrointestinal: Nausea, vomiting, abdominal cramping, and diarrhea[5]

Penicillin Skin Tests and Challenge Doses

Based on the patient history and physical exam, additional tests may be needed to confirm a penicillin allergy.

Penicillin skin testing and challenge doses are reliable and useful methods for evaluating for IgE-mediated penicillin allergy.[5]

Penicillin Skin Testing

A positive result means the patient is likely to have a penicillin allergy. If negative, the skin test is usually followed by an oral penicillin class challenge (e.g., with amoxicillin) to safely rule out an IgE-mediated penicillin allergy.[1,7]

- The current standard of care is to perform a skin test with the major determinant penicilloylpolylysine and commercially-available penicillin G.
- To rule out penicillin allergy, an oral challenge dose can be done after skin testing. The negative predictive value of skin testing with the major and minor determinants is more than 95%, but approaches 100% when followed by a challenge dose.[2]

A direct oral challenge without prior skin testing may also be performed in selected patients and can rule out penicillin allergy. For more information, please consult an allergist.

Special Considerations

Patients with severe hypersensitivity syndromes

Patients with other severe hypersensitivity syndromes—like Stevens-Johnson syndrome, toxic epidermal necrolysis, serum sickness, acute interstitial nephritis, hemolytic anemia, and drug rash with eosinophilia and systemic symptoms (DRESS)—should not use the offending drug in the future. The skin test and challenge described here are not appropriate for patients with these severe hypersensitivity syndromes.[1,2,6]

Cephalosporin use in penicillin-allergic patients

Many cephalosporins, especially in the later generations, can be safely tolerated despite a penicillin allergy.[6,8] Patients with anaphylaxis or other severe reactions to penicillin may require further evaluation prior to the use of cephalosporins.

Pediatric patients

Children who are receiving amoxicillin or ampicillin and have Epstein-Barr virus infection can develop a non-allergic, non-pruritic rash that can appear similar to an allergic reaction.[1,9]

For more information about antibiotic use, visit www.cdc.gov/antibiotic-use.

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Penicillin Allergy

Beta-lactam Antibiotic Cross-Allergy Chart

Beta-lactams	AMOXICILLIN*	AMPICILLIN	CLOXACILLIN	PENICILLIN	PIPERACILLIN*	CEFADROXIL	CEFAZOLIN	CEPHALEXIN	CEFOXITIN	CEFPROZIL	CEFUROXIME	CEFIXIME	CEFOTAXIME	CEFTAZIDIME	CEFTRIAXONE	CEFEPIME	ERTAPENEM	IMIPENEM	MEROPENEM
AMOXICILLIN*		X[1]	X[5]	X[4]	X[3]	X[1]	✓	X[1]	✓	X[2]	✓	✓	✓	✓	✓	✓	✓	✓	✓
AMPICILLIN	X[1]		X[5]	X[4]	X[3]	X[2]	✓	X[2]	✓	X[2]	✓	✓	✓	✓	✓	✓	✓	✓	✓
CLOXACILLIN	X[5]	X[5]		X[5]	X[5]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PENICILLIN	X[4]	X[4]	X[5]		X[5]	✓	✓	✓	X[3]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PIPERACILLIN*	X[3]	X[3]	X[5]	X[5]		X[3]	✓	X[3]	✓	X[3]	✓	✓	✓	✓	✓	✓	✓	✓	✓
CEFADROXIL	X[1]	X[2]	✓	✓	X[3]		✓	X[1]	✓	X[2]	✓	✓	✓	✓	✓	✓	✓	✓	✓
CEFAZOLIN	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CEPHALEXIN	X[1]	X[2]	✓	✓	X[3]	X[1]	✓		✓	X[2]	✓	✓	✓	✓	✓	✓	✓	✓	✓
CEFOXITIN	✓	✓	✓	X[3]	✓	✓	✓	✓		✓	X[2]	✓	✓	✓	✓	✓	✓	✓	✓
CEFPROZIL	X[2]	X[2]	✓	✓	X[3]	X[2]	✓	X[2]	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓
CEFUROXIME	✓	✓	✓	✓	✓	✓	✓	✓	X[2]	✓		X[3]	X[1]	X[3]	X[1]	X[2]	✓	✓	✓
CEFIXIME	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	X[3]		X[3]	X[3]	X[3]	X[3]	✓	✓	✓
CEFOTAXIME	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	X[1]	X[3]		X[3]	X[1]	X[1]	✓	✓	✓
CEFTAZIDIME	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	X[3]	X[3]	X[3]		X[3]	X[3]	✓	✓	✓
CEFTRIAXONE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	X[1]	X[3]	X[1]	X[3]		X[1]	✓	✓	✓
CEFEPIME	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	X[2]	X[3]	X[1]	X[3]	X[1]		✓	✓	✓
ERTAPENEM	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		X[5]	X[5]
IMIPENEM	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	X[5]		X[5]
MEROPENEM	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	X[5]	X[5]	

* Also applies to beta-lactamase inhibitor combinations (amoxicillin-clavulanate and piperacillin-tazobactam)

AVOID ALL beta-lactam antibiotics if:

- ICU admission related to allergy
- Delayed beta-lactam antibiotic allergy causing:
  - interstitial nephritis
  - hepatitis
  - hemolytic anemia
- Delayed severe skin allergic reactions:
  - Stevens-Johnson syndrome
  - toxic epidermal necrolysis
  - exfoliative dermatitis
  - acute generalized exanthematous pustulosis (AGEP)
  - drug reaction with eosinophilia and systemic symptoms (DRESS)

LEGEND:	
Penicillins	
1st Generation Cephalosporins	
2nd Generation Cephalosporins	
3rd Generation Cephalosporins	
4th Generation Cephalosporins	
Carbapenems	
✓	Different structure. CONSIDERED SAFE TO PRESCRIBE
Reaction likely based on side chain:	
X[1]	Same side chain - clinical evidence of cross reaction. DO NOT PRESCRIBE
X[2]	Same side chain - Theoretical risk of cross reaction, no clinical studies. DO NOT PRESCRIBE
X[3]	Similar side chain - Potential for cross reaction. DO NOT PRESCRIBE
Reaction likely based on Beta-lactam ring	
X[4]	Clinical evidence of cross reaction. DO NOT PRESCRIBE
X[5]	Theoretical risk of cross reaction, no clinical studies. DO NOT PRESCRIBE

FIGURE 1. Beta-lactam cross-allergy chart.

Source: Interior Health Authority.

Penicillin Allergy

- **Non-carbapenem alternatives**:
  - Tetracyclines
  - Quinolones
  - Macrolides
  - Aminoglycosides
  - Vancomycin
  - Aztreonam
  - Cephalosporins (best place to try is in the hospital)

Implementing Antimicrobial Stewardship Programs

Core Elements

Core Elements of Hospital Antibiotic Stewardship Programs

Hospital Leadership Commitment
Dedicate necessary human, financial, and information technology resources.

Accountability
Appoint a leader or co-leaders, such as a physician and pharmacist, responsible for program management and outcomes.

Pharmacy Expertise (previously "Drug Expertise"):
Appoint a pharmacist, ideally as the co-leader of the stewardship program, to help lead implementation efforts to improve antibiotic use.

Action
Implement interventions, such as prospective audit and feedback or preauthorization, to improve antibiotic use.

Tracking
Monitor antibiotic prescribing, impact of interventions, and other important outcomes, like *C. difficile* infections and resistance patterns.

Reporting
Regularly report information on antibiotic use and resistance to prescribers, pharmacists, nurses, and hospital leadership.

Education
Educate prescribers, pharmacists, nurses, and patients about adverse reactions from antibiotics, antibiotic resistance, and optimal prescribing.

Hospital Leadership Commitment

- Providing dedicated time, resources and staffing
- Integrating ASP activities into quality improvement and patient safety efforts
- Supporting training and education for ASP leaders and hospital staff

Accountability

- Co-leading with physician and pharmacist
- Clearly delineated roles and responsibilities of the leadership members
- Regular rounding between co-leaders increases efficiency
- Circles back to ensuring dedicated time is available

Pharmacy Expertise

- Empowering pharmacist as leader or co-leader of ASP to lead to highly effective program
- CDC resources: https://www.cdc.gov/antibiotic-use/index.html

Action

- Prospective audit and feedback (post-prescription review)
  - Depends on level of expertise available
  - Limited ID expertise: comparing prescribed treatment courses to recommendations in hospital specific treatment guidelines and focus on common conditions
  - ID expertise: Can analyze more complex antibiotics courses
- Preauthorization
  - Requires availability of expertise and staff who can complete authorizations in a timely manner
- All actions reported in previous section apply in this section

Tracking

- Antibiotic Use Measures
  - Electronic reporting to the National Healthcare Safety Network (NHSN) Antimicrobial Use (AU) Option
  - Needs collaboration between ASP and IT
  - NHSN AU provides rates of antibiotic use expressed as days of therapy (DOTs)
  - Also provides risk-adjusted benchmark of antibiotic use referred to as the Standardized Antimicrobial Administration Ratio or “SAAR”

Tracking

- Outcome measures
  - Number of C. diff infections
  - Antibiotic resistance patterns
  - Financial impact
- Process Measures for Quality Improvement
  - Tracking the types and acceptance rates of recommendations: identify areas where more education or focused interventions may be needed
  - Monitoring adherence to facility-specific treatment guidelines
  - Monitoring the performance of antibiotic timeouts (assessing need for continued therapy at 48hr mark)
  - Monitoring other interventions: IV to PO, duration of therapy etc.

Reporting

- Communicating those tracking results to prescribers, pharmacists, nurses, and leadership
- Multi-disciplinary approach to improve implementation and adherence to policies

Education

- Most effective when paired with interventions and measurement of outcomes
- Didactic presentations, which can be done in formal and informal settings, messaging through posters, flyers and newsletters, or electronic communication to staff groups
- Needs to be tailored to institution specific

Smaller Hospitals with Relatively Limited Resources

Smaller Hospitals with Relatively Limited Resources

- Leadership commitment is just as important
- Bringing AMS to the forefront of quality and safety conversation
- Lead by pharmacist on site or remote that is at least partly dedicated to AMS
- If ID physician unavailable, designate physician (hospitalists are good resources) to co-lead and support pharmacist
- Create a reporting structure to ensure AMS activity is shared across all levels of the hospital system from leadership to staff

Smaller Hospitals with Relatively Limited Resources

- In hospitals without infectious disease trained pharmacists, general clinical pharmacists are often co-leaders or pharmacy leaders
- Focus on low hanging fruits
- Majority of all antibiotic use in hospitals is driven by just three conditions: CAP, UTIs and SSTIs
    - Interventions available to improve antibiotic use for each
    - These are often high-yield targets for improvement

Smaller Hospitals with Relatively Limited Resources

- Hospitals that are not yet reporting to the NHSN AU Option
  - Get antibiotic use data from their pharmacy record systems
  - Usually either as days of therapy (DOT) or as defined daily doses (DDDs)
  - Can focus on institution's top 5 used antibiotics
  - Track adherence to facility-specific treatment recommendations for CAP, UTI, SSTI (can even tailor to physician specific)
  - Obtaining data is essential to recognize areas where improvement or adjustment is needed

Smaller Hospitals with Relatively Limited Resources

- Prepare regular reports on the measures being tracked related to antibiotic use and report to pharmacy and therapeutics, patient safety/quality, medical staff leadership and committees, and hospital board
- Confidentially share provider specific reports if appropriate
- Distribute data and key messaging through staff newsletters and emails

Smaller Hospitals with Relatively Limited Resources

- Regular interval updates on antibiotics stewardship activities, resistance, treatment recommendations etc.
- Include in orientation for new recruits and re-credentialling
- Involve patients in education about antibiotics, resistance, side effects and AMS

Newer Technologies and the Future of Antimicrobial Stewardship

Molecular Technologies

- MRSA nasal PCR
- BCID
- Joint, Pulmonary, ME panels PCR
- 16sRNA
- T2 systems

MRSA Nasal PCR

- 88.0% sensitivity and 90.1% specificity
- Positive predictive value of 35.4%
- **Negative predictive value of 99.2%**
- In cases of culture-negative pneumonia where initial empirical antibiotics include an MRSA-active agent, a negative MRSA PCR swab can be reasonably used to guide antibiotic de-escalation

Blood Culture Identification 2 (BCID-2) Panel

- Rapid PCR identifies most common gram-positive and gram-negative bacterial organisms, yeast, and resistance genes.
- Results within 1 to 2 hours after positive culture
- 99% sensitivity and 99.8% specificity

BCID-2

BCID2 Panel [944811225] (Abnormal)
Order Status: Completed

Specimen: Blood
Collected: 05/04/23 1034
Updated: 05/05/23 0111

Enterococcus faecalis	Not Detected
Enterococcus faecium	Not Detected
Listeria monocytogenes	Not Detected
Staphylococcus spp.	Not Detected
Staphylococcus aureus	Not Detected
Staphylococcus epidermidis	Not Detected
Staphylococcus lugdunensis	Not Detected
Streptococcus spp.	Not Detected
Streptococcus agalactiae (Group B)	Not Detected
Streptococcus pneumoniae	Not Detected
Streptococcus pyogenes (Group A)	Not Detected
Acinetobacter calcoaceticus/baumannii complex	Not Detected
Bacteroides fragilis	Not Detected
Enterobacterales	Detected !
Enterobacter cloacae complex	Not Detected
Escherichia coli	Detected !
Klebsiella aerogenes	Not Detected
Klebsiella oxytoca	Not Detected
Klebsiella pneumoniae group	Not Detected
Proteus spp.	Not Detected
Salmonella spp.	Not Detected
Serratia marcescens	Not Detected
Haemophilus influenzae	Not Detected
Neisseria meningitidis	Not Detected
Pseudomonas aeruginosa	Not Detected
Stenotrophomonas maltophilia	Not Detected
Candida albicans	Not Detected
Candida auris	Not Detected
Candida glabrata	Not Detected
Candida krusei	Not Detected
Candida parapsilosis	Not Detected
Candida tropicalis	Not Detected
Cryptococcus neoformans/gattii	Not Detected

CTX-M (ESBL producer) Detected !

Comment: Note: Antimicrobial resistance can occur via multiple mechanisms. A Not Detected result for antimicrobial resistance gene(s) does not indicate antimicrobial susceptibility. Subculturing is required for species identification and susceptibility testing of isolates.

IMP (Cabapenemase producer) Not Detected

Comment: Note: Antimicrobial resistance can occur via multiple mechanisms. A Not Detected result for antimicrobial resistance gene(s) does not indicate antimicrobial susceptibility. Subculturing is required for species identification and susceptibility testing of isolates.

KPC resistance gene (Carbapenemase producer) Not Detected

Comment: Note: Antimicrobial resistance can occur via multiple mechanisms. A Not Detected result for antimicrobial resistance gene(s) does not indicate antimicrobial susceptibility. Subculturing is required for species identification and susceptibility testing of isolates.

mcr-1 Not Detected

Comment: Note: Antimicrobial resistance can occur via multiple mechanisms. A Not Detected result for antimicrobial resistance gene(s) does not indicate antimicrobial susceptibility. Subculturing is required for species identification and susceptibility testing of isolates.

mecA ID N/A

Comment: Note: Antimicrobial resistance can occur via multiple mechanisms. A Not Detected result for antimicrobial resistance gene(s) does not indicate antimicrobial susceptibility. Subculturing is required for species identification and susceptibility testing of isolates.

mecA/C and MREJ (MRSA) gene N/A

Comment: Note: Antimicrobial resistance can occur via multiple mechanisms. A Not Detected result for antimicrobial resistance gene(s) does not indicate antimicrobial susceptibility. Subculturing is required for species identification and susceptibility testing of isolates.

NDM (Carbapenemase producer) Not Detected

Comment: Note: Antimicrobial resistance can occur via multiple mechanisms. A Not Detected result for antimicrobial resistance gene(s) does not indicate antimicrobial susceptibility. Subculturing is required for species identification and susceptibility testing of isolates.

OXA-48-like (Carbapenemase producer) Not Detected

Comment: Note: Antimicrobial resistance can occur via multiple mechanisms. A Not Detected result for antimicrobial resistance gene(s) does not indicate antimicrobial susceptibility. Subculturing is required for species identification and susceptibility testing of isolates.

vanA/B (VRE gene) N/A

Comment: Note: Antimicrobial resistance can occur via multiple mechanisms. A Not Detected result for antimicrobial resistance gene(s) does not indicate antimicrobial susceptibility. Subculturing is required for species identification and susceptibility testing of isolates.

VIM (Carbapenemase producer) Not Detected

Comment: Note: Antimicrobial resistance can occur via multiple mechanisms. A Not Detected result for antimicrobial resistance gene(s) does not indicate antimicrobial susceptibility. Subculturing is required for species identification and susceptibility testing of isolates.

Which antibiotic should the ASP pharmacist recommend for this BCID result?

- A. ceftriaxone
- B. cefepime
- C. piperacillin/tazobactam
- D. meropenem

Other Molecular Techniques

- Joint, Pulmonary, ME panels PCR:
  - Similarly, allow for more accurate and rapid detection of organisms
- 16sRNA:
  - Once tissue is available, can run PCR against database and detect organism without preset panel or positive culture, even after antibiotics have been initiated
- T2 systems:
  - Blood culture detection of molecular sequences without positive cultures based on pre-set panels (bacterial and fungal)

Future of AMS

- Expanding smaller regional AMS programs
- Further multi-disciplinary involvement in AMS committees including pharmacists, ID physicians, ICU physicians, ER providers etc.
- Heavier emphasis on outpatient AMS
- Expanding use of molecular techniques and appropriate de-escalation

Thank You

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Evaluation Reminder

Evaluation reminder for the 2023 Louisiana Office of Public Health Antimicrobial Stewardship Summit

Please use this QR code or log-on/type in the following URL: https://bit.ly/AMR2023

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Healthcare-associated Infections HAI Elimination Louisiana

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