# Navigating Rapid AST: Key Considerations for Direct-from-Blood Culture Implementation

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# Disclosures

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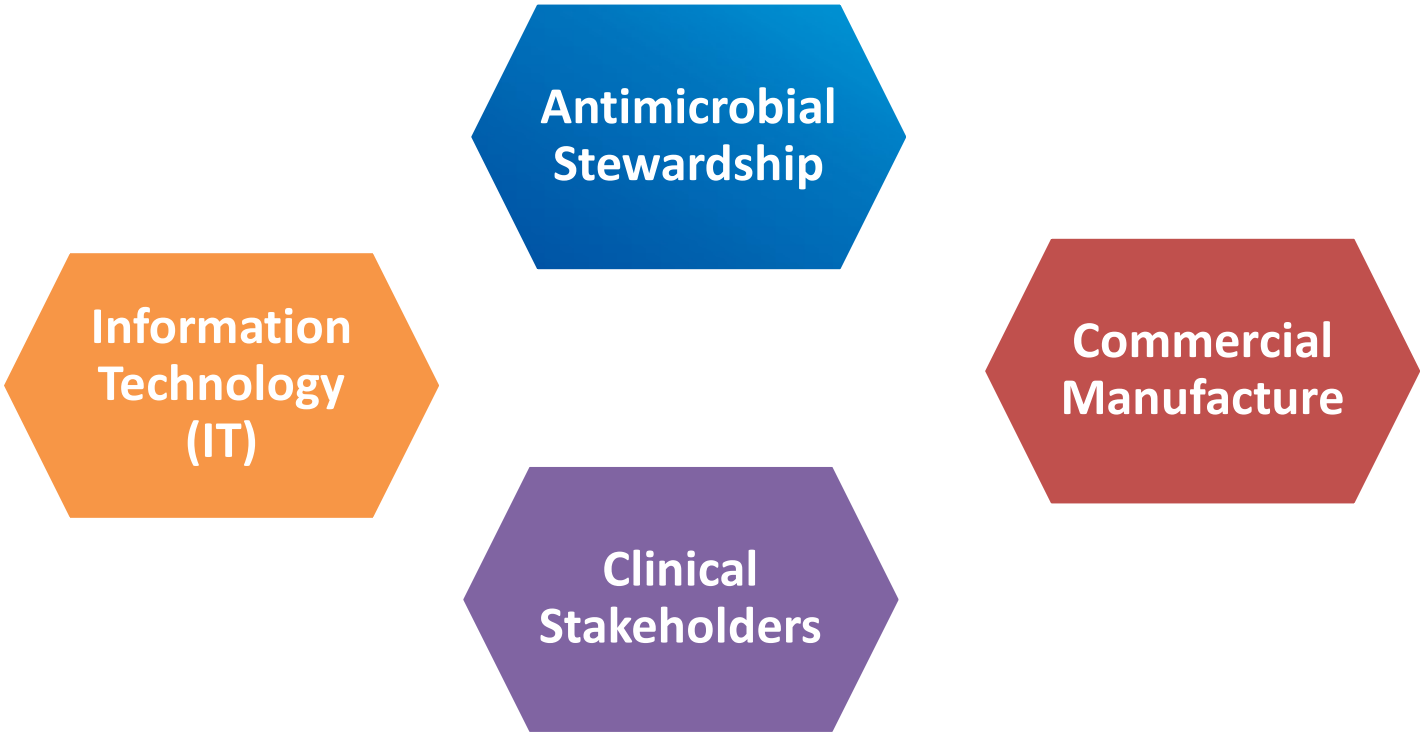
# Objectives

- Summarize manual and currently available commercially rapid, direct-from-blood AST devices
- Identify key points/ considerations for device/system selection
- Outline some considerations and common challenges with implementing rapid AST

# Approach To Implementation



# Antimicrobial Stewardship

**Meet with the team**

- ID pharmacists
- ID physicians
- Microbiologists
- IT / LIS

**Identify the need**

- Escalation
- De-escalation
- IV to PO
- Specific population

**Availability to respond**

- Day shift
- Nights and Weekends

**Who will respond**

- Stewardship member
- Pharmacist
- Infectious Disease
- Resident/ Fellow
- Primary team

# Clinical Stakeholders

**Primary Team**

- Responsible for acting on the results and making a change

**Infectious Disease**

- Consulted for difficult cases and therapeutic management

**Quality**

- Team following hospital quality metrics
  - Length of stay
  - Hospital readmissions

**Hospital Leadership**

- Help facilitate /champion new initiatives

# Commercial Manufacture

**Review Website**

- FDA status
- Product information
- Antimicrobials/ Organisms
- Posters/Papers/ Presentations

**Attend Vendor Show**

- Size
- Configuration
- Demo

**Contact Local Sales Rep**

- Specific Information
- Package Insert/ IFU
  - Limitations
  - Confirmatory testing
- Verification plan

# Information Technology/ Laboratory Information System

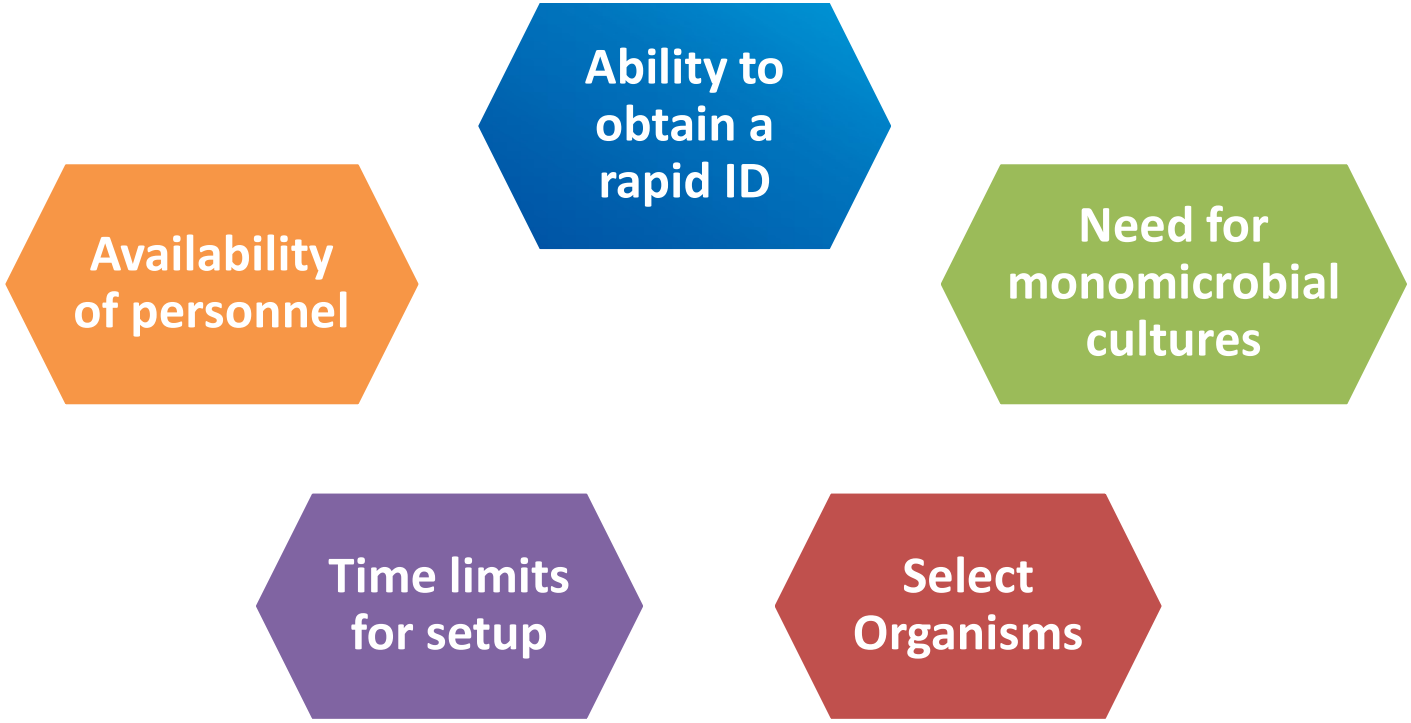
**Laboratory Information System (LIS)**

- Connectivity/ interface between instrument and LIS
- Test build

**Electronic Medical Record (EMR)**

- What the result report will look like to the clinician
- Special alerts
- Results for selected users
  - Stewardship

# Laboratory Considerations



# Ability to Obtain a Rapid Identification

## Molecular ID

Verigene

Biofire Filmarray

Cobas eplex

- Result <2 h
- Limited to on-panel targets

## MALDI TOF MS

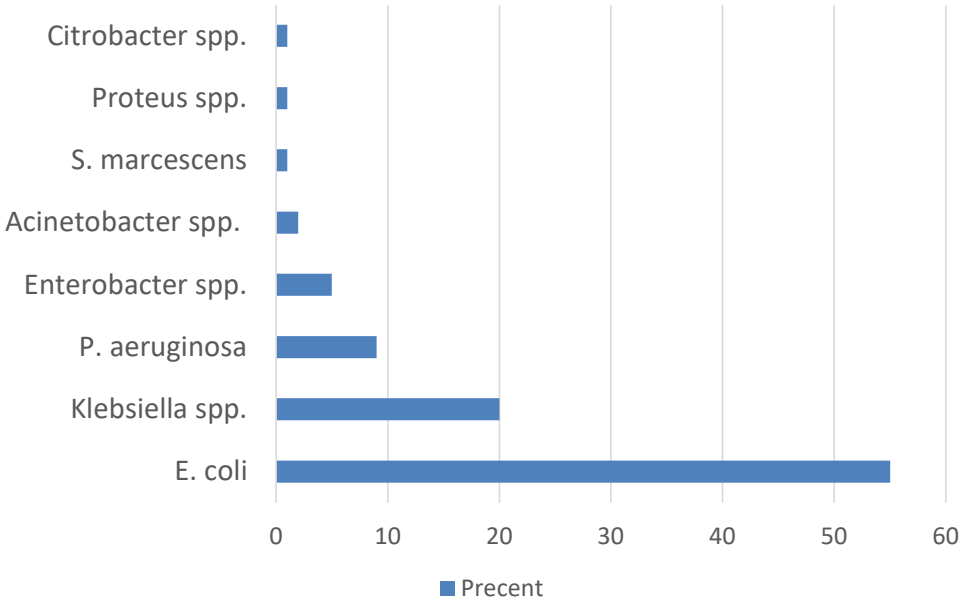
Bruker MALDI Biotyper

BioMerieux VITEK MS

- Direct from blood culture
- Early growth on agar

# FDA clearance for a subset of Enterobacterales and Non-fermenters

## Most Frequent Organisms



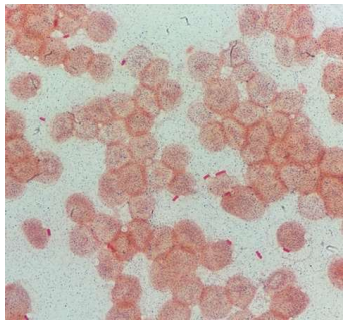

## Useable Results

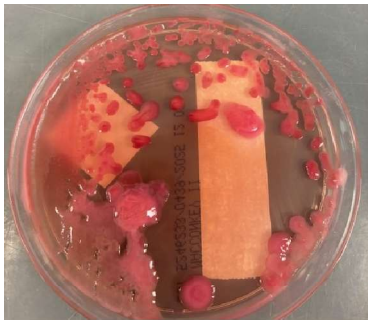
- ~ 85% Gram-negative bacilli are on panel
- ~ 15% of GNB cannot be resulted on a commercial rapid AST system
  - Alternative rapid AST (ie Disk diffusion) for monomicrobial off-panel Enterobacterales
  - Conventional AST


Banerjee et al, CID 2021
Ostermann et al, JCM 2024
Tibetts et al, JCM 2022
Snyder et al, JCM 2024
Esse et al, JCM 2023

# Need for Monomicrobial Blood Cultures

- ~ 3% polymicrobial GNB
  - Cannot distinguish on Gram Stain
  - Not always identified by rapid ID methods
  - Discovered upon sub-culture





- What you can do in the lab
  - Check your sub plate before releasing rapid AST results
    - Could do an early read before the rAST results are released
  - Review AST results before releasing to the chart
    - Look for unusual resistance patterns

Banerjee et al, CID 2021
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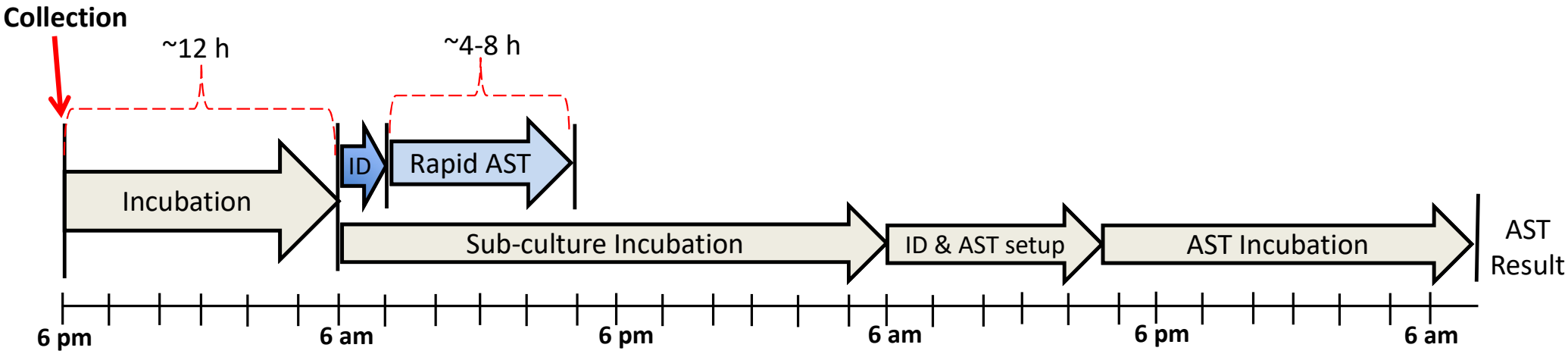
# Workflow Considerations



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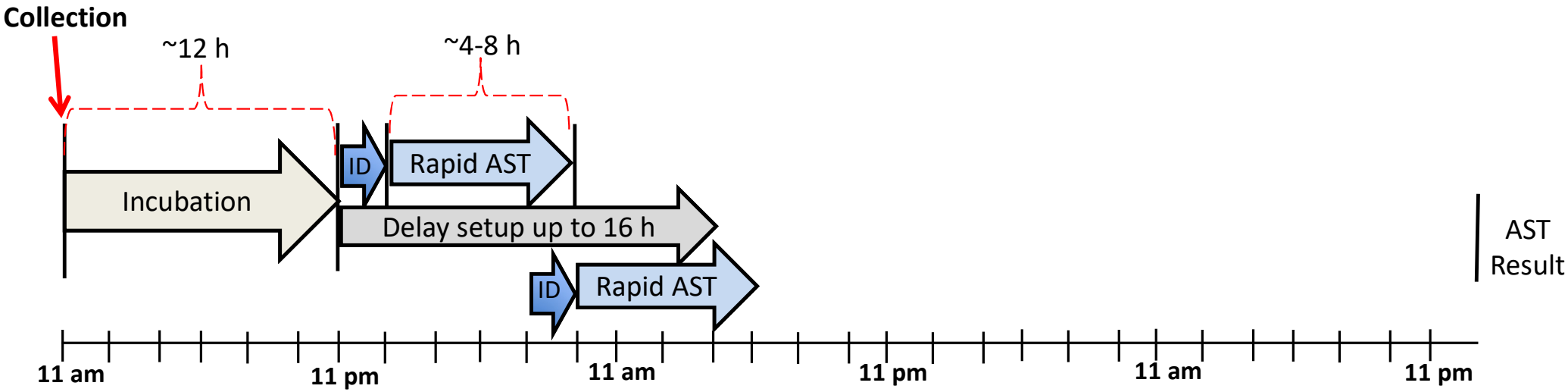
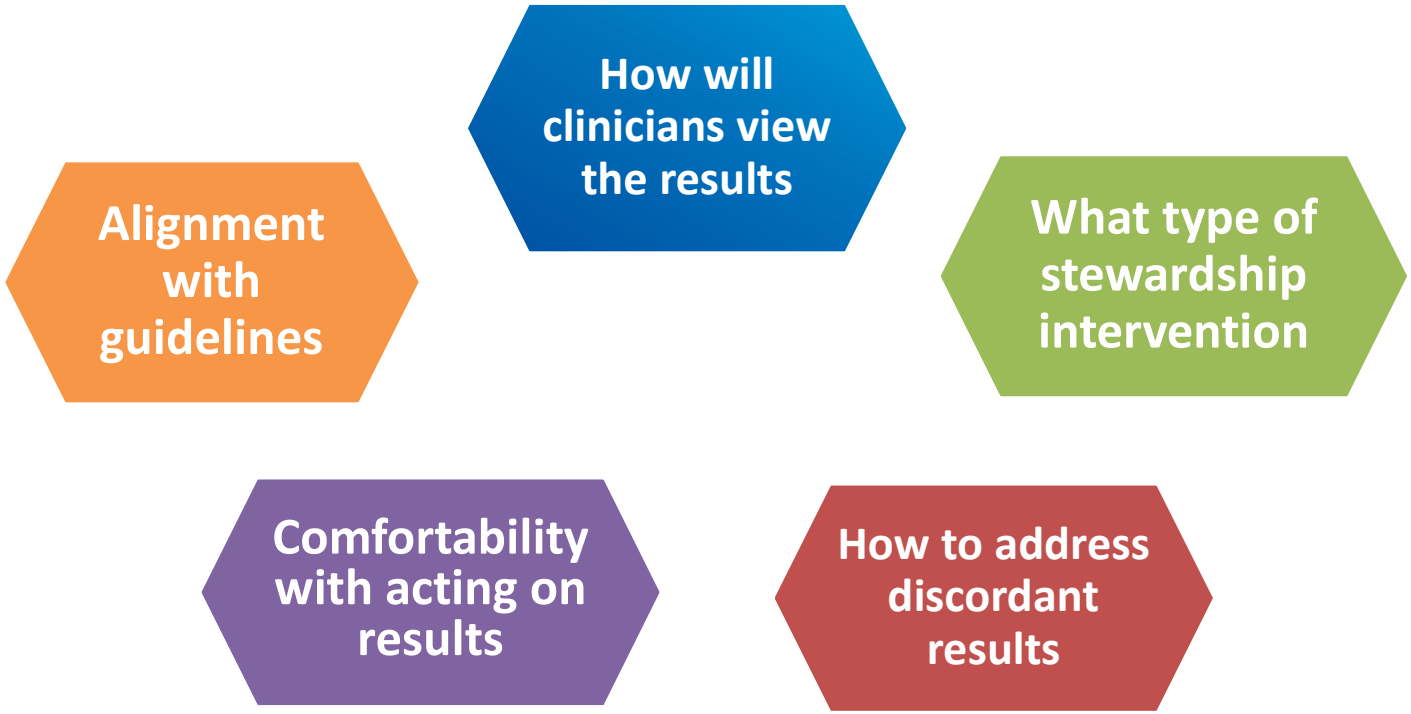


# Workflow Considerations

- Where are blood cultures incubated
  - On-site
  - Centralized lab
- How is the laboratory staffed
  - All 3 shifts
  - 1st and 2nd
  - 1st only
- Who is reading GS, performing rapid ID and AST
  - What shift, dedicated microbiologist or generalist
- Who is reporting the rapid AST result
  - Dedicated microbiologists, level of training

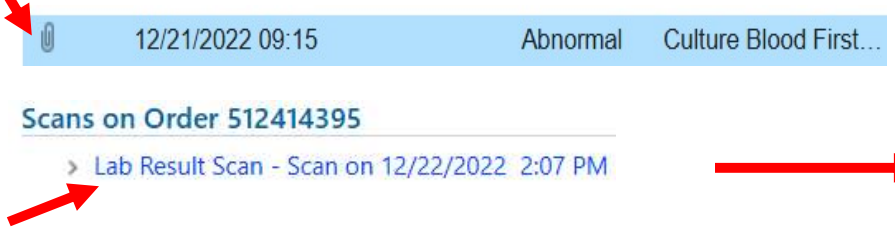
# Clinical Considerations



# How will the clinician view the result

## Hyperlink to the instrument-generated report

**Result View**




**IDENTIFICATION RESULTS**

| SPECIES | IDENTIFICATION |
|---|---|
| Klebsiella spp. | Positive [1, 2] |

**SUSCEPTIBILITY RESULTS**

Klebsiella spp.

| ANTIMICROBIAL | MIC | SIR |
|---|---|---|
| Amikacin | ≤4 | S[2, 3] |
| Ampicillin-Sulbactam | 4 | S[2, 3] |
| Aztreonam | 2 | S[2, 3] |
| Cefepime | ≤1 | S[2, 3] |
| Ceftazidime | ≤2 | S[2, 3] |
| Ceftriaxone | ≤0.25 | S[2, 3, 4] |
| Ciprofloxacin | ≤0.25 | S[2, 3] |
| Ertapenem | 0.25 | S[2, 3] |
| Gentamicin | ≤1 | S[2, 3] |
| Meropenem | ≤0.25 | S[2, 3] |
| Piperacillin-Tazobactam | ≤4 | S[2, 3] |
| Tobramycin | ≤1 | S[2, 3] |

**NOTES**

| |
|---|
| AIM[2]: Check culture for multiple morphologies due to possibility of a second species being present. |
| AIM[1]: Identification results that are discordant with Gram stain should be confirmed with alternate method. |
| AIM[3]: Culture to agar media recommended to ensure the morphologic consistency of the ACCELERATE PHENO system identification |
| AIM[4]: For Enterobacterales, ceftriaxone SIR classification can be used to predict cefotaxime classification. |

# How will the clinician view the result

## Incorporate into the full susceptibility result

- Rapid AST results are interfaced directly to LIS
- Two AST reports
  - Rapid AST
  - Conventional AST
    - May not be needed if rapid AST has adequate antibiotics
- Hybrid AST report that contains both rapid and conventional AST results

**Hypothetical Hybrid Report**

Susceptibility

| | Klebsiella pneumoniae +ANTIBIOTIC MIC | | |
|---|---|---|---|
| Amoxicillin/CA | <=2 mcg/mL | Sensitive | |
| Ampicillin | 16 mcg/mL | Resistant | |
| Aztreonam | <=1 mcg/mL | Sensitive | Rapid AST |
| Cefepime | <=1 mcg/mL | Sensitive | Rapid AST |
| Ceftriaxone | <=1 mcg/mL | Sensitive | Rapid AST |
| Ciprofloxacin | <=0.25 mcg/mL | Sensitive | |
| Ertapenem | <=0.5 mcg/mL | Sensitive | Rapid AST |
| Gentamicin | <=1 mcg/mL | Sensitive | Rapid AST |
| Levofloxacin | <=0.12 mcg/mL | Sensitive | |
| Meropenem | <=0.25 mcg/mL | Sensitive | Rapid AST |
| Piperacillin/tazobactam | <=4 mcg/mL | Sensitive | Rapid AST |
| Tetracycline | <=1 mcg/mL | Sensitive | |
| Trimethoprim/Sulfa | <=20 mcg/mL | Sensitive | |

# What type of stewardship intervention is needed

- **Active**
  - Laboratory phone call/ text message/ page/ email to a stewardship member on-call
    - i.e. Secure text to pharmacy resident between 7am-11pm 7 days a week
  - EMR alert to stewardship or providers' inbox

- **Passive**
  - Reporting comments

***Klebsiella pneumoniae***
*This organism is carbapenem resistant. Infectious disease consult is recommended.*

***Pseudomonas aeruginosa***
*This organism is carbapenem resistant and cefepime susceptible. Infectious disease consult is recommended.*

# What if the rapid and the conventional AST reports are discrepant

## Rapid AST performance is good

- Categorical agreement
  - 85% - 95% compared to standard of care AST
- Essential agreement
  - 92% – 95% compared to standard of care AST
- Discordant analysis with reference BMD
  - ~50% of discordant results will agree with rapid AST

## Comfort level of clinicians acting on results

- Performance of the rapid AST to your standard of care AST method
- Severity of illness of the patient
- Number of co-morbidities in a patient
- Additional pending laboratory tests and diagnostics

Tibetts et al, JCM 2022
Snyder et al, JCM 2024
Esse et al, JCM 2023
Unpublished, Penn State

# Additional Points to Consider

- Review your local antibiogram
  - Is there a high level of resistance in the population you serve
  - How often does the escalation of antibiotics occur

- Alignment with current institutional and professional treatment guidelines
  - 2024 IDSA guidance on the treatment of resistant gram-negative infections emphasizes the detection of specific resistance markers to guide treatment decisions
    - ESBL /CTX-M
    - KPC/ NDM/ OXA-48

# Thank You