The Impact of Rapid Diagnostics on Antimicrobial Stewardship

Deanne Tabb PharmD, MT (ASCP)
Infectious Disease Pharmacist
Clinical Microbiologist
Objectives

• Review traditional microbiology identification methods
• Discuss the benefits of rapid diagnostic tests
• Describe diagnostic stewardship
• Provide specific examples of rapid tests
The Conundrum

• Healthcare expenditures exceed $3 trillion
• Cost-containment is imperative
• Recent survey of 41 institutions
  • Administrators view cost as the most important ASP outcome
  • ID providers view appropriateness as the most important metric
• Conflict between healthcare efficiency and optimal patient outcomes
• Results in “silo” mentality
• Deprives bedside medicine of new critical technology

Antibiotics January 2016
Suboptimal Antibiotic Use

• Occurs 30 - 50 % of all prescriptions
• Related specifically to microbiology:
  • Inappropriate use or interpretation of microbiology
  • Lack of microbiology confirmed diagnosis
  • Failure to submit appropriate specimens for culture
  • Lab test errors
  • Misuse of microbiology resources
  • Overreliance on empiric coverage regardless of microbiology results
Conventional Identification Method for *Staphylococcus aureus*

1. Incubation
   - 1-5 days of incubation

2. Gram stain
   - GPCC

3. CHROMagar
   - Staphaurex

4. Sensitivity Panel
   - 18-24 hours

Time line: 48 – 72 hours from BC collection

*J Clin Microbiol* 2012;50(1):127-33
Benefits of Adding a Rapid PCR-Based Blood Culture ID Panel to an Established Antimicrobial Stewardship Program (ASP)

• **Background**
  - Single-Center, retrospective
  - Medical University of South Carolina

• **Inclusion Criteria**
  - ≥ 18 years of age
  - Positive blood culture between August 1 and October 31 of 2010, 2012, and 2014

• **Exclusion Criteria**
  - Expired or placed on hospice care prior to blood culture positivity
  - Those whose blood cultures were deemed to contain contaminants

Benefits of Adding a Rapid PCR-Based Blood Culture ID Panel to an Established Antimicrobial Stewardship Program

• Study Groups
  • Group 1: Conventional identification (control group)
  • Group 2: Conventional identification with ASP (AS group)
  • Group 3: Rapid identification with ASP (BCID group)

• Outcomes Evaluated
  • Primary: Time to effective therapy and initial antimicrobial use
  • Clinical Endpoints:
    • In-hospital mortality, 30-day all-cause readmission, microbiological clearance, hospital LOS following blood culture positivity, and overall patient-specific hospital costs
Results (N = 364 patients)

- Median time to organism ID was shorter in the BCID group
  - 17.2 hours vs. 57.4 hours (control) and 53.9 hours (AS)
- Shorter median time to effective therapy in BCID group
  - 4.9 hours vs. 15 hours (control) and 13 hours (AS)
- Antibiotic de-escalation occurred sooner in BCID group
  - 48 hours vs. 63 hours (control) and 61 hours (AS)
- No significant differences in all-cause or infection-related LOS, in mortality, in 30-day readmission
- While the cost between the groups were not significant, the average hospital cost was ~ $10,000 less in the BCID group
- The study found the benefit of BCID group was an improved time to optimal antibiotic therapy
Clinical Impact

Previous studies have identified that RDT results in

- Improved time to optimal antibiotics for MSSA
- Reduced antibiotic exposure for SCN contamination
- Reduced length of stay and call backs to ETC
- Reduced cost to the institution
Rapid Molecular ID Diagnostic Techniques

- Nucleic acid-based diagnostics, monoplex and multiplex PCR
- Microarray panels
- Peptide nucleic acid fluorescent in situ hybridization
- Magnetic resonance-based testing
- Matrix-assisted laser desorption ionization-time of flight mass spectrometry
- Next generation sequencing
“Our technical capabilities are exceeding our ability to apply them effectively and economically to human problems”

John Bartlett 1974
# Choosing an Initiative

## Midtown Medical Center Antimicrobial Stewardship Prioritization Risk Assessment 2017

Assumption: Given the association between antimicrobial use and the selection of resistant pathogens, inappropriate antimicrobial use is often used as a surrogate marker for the avoidable impact on antimicrobial resistance.

<table>
<thead>
<tr>
<th>Priorities</th>
<th>Probability</th>
<th>Do we have an appropriate program, policy, test or procedure?</th>
<th>Is the process effective, including good compliance?</th>
<th>Frequency or chance of non-compliance with p/p if in place</th>
<th>Regulatory Accreditation Issue</th>
<th>RISK*</th>
<th>Ability to measure scope and impact</th>
<th>Target for the organization (C-Suite or departmental buy-in?)</th>
<th>Priority Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCORE</td>
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</tr>
<tr>
<td>Use of ABX when a virus is causing a lower respiratory infection (molecular filmarray respiratory panel)</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>1</td>
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<td>11</td>
<td>1</td>
<td>1</td>
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</tr>
<tr>
<td>Use of abx for treating contaminated blood cultures (Molecular great basin blood culture technology)</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>12</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Use of abx for asymptomatic bacteria (Opportunity to educate)</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>13</td>
<td>2</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Initial empiric therapy with broad-spectrum abx without streamlining to narrow spectrum agents after organism has been identified (Manual Bug Report)</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>9</td>
<td>3</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Inappropriate use of abx (use-restricted)</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>7</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Decreasing ABX utilization rates (DOT/1000)</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>13</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Patient/family appropriately educated on risks/benefits of antibiotic use</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>11</td>
<td>3</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Inappropriate ABX use Metrics: similar spectrum, renal adjustment, 72-hour time out, ID appropriate (Informatics alerts)</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>13</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
Choosing an Initiative

<table>
<thead>
<tr>
<th>EVENT</th>
<th>Mortality</th>
<th>Additional cost</th>
<th>Additional LOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contaminated blood cultures</td>
<td>not available</td>
<td>$8,720</td>
<td>5.4 days^1</td>
</tr>
<tr>
<td>C. diff</td>
<td>1.13 OR^2</td>
<td>$8000 - $8000^3</td>
<td>4.7 days^2</td>
</tr>
<tr>
<td>ADR</td>
<td>0.08 - 0.12/100,000^4</td>
<td>$2262/ADR^4,6</td>
<td>2 days^3</td>
</tr>
</tbody>
</table>

*Scale = 1 low (affects ≤33% of population
# Risk Score Analysis: Low Risk ≤ 6, Moderate Risk 7-9, High Risk ≥ 10

**MIDTOWN MEDICAL CENTER ANTIMICROBIAL STEWARDSHIP PRIORITIZATION RISK ASSESSMENT 2017**

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<th>Frequency or chance of non-compliance with p IPP if in place</th>
<th>Regulatory Accreditation Issue</th>
<th>SEVERITY = (MAGNITUDE - MITIGATION)</th>
<th>RISK^4</th>
<th>Ability to measure scope and impact</th>
<th>Target for the organization (C-Suite or departmental buy-in?)</th>
<th>Priority Rank</th>
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</thead>
<tbody>
<tr>
<td>SCORE</td>
<td>Likelihood this will occur^4</td>
<td>1 = Yes 2 = Developing 3 = No</td>
<td>1 = Yes 2 = Somewhat 3 = No</td>
<td>1 = Low 2 = Medium 3 = High</td>
<td>1 = Internal response 2 = optional core element 3 = External reporting</td>
<td>Risk Score 1 = Good 2 = Fair 3 = Difficult</td>
<td>0 = No</td>
<td>1=Yes 1=being highest importance 3 = lowest importance</td>
<td>1=Yes 1=being highest importance 3 = lowest importance</td>
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<td>1</td>
</tr>
</tbody>
</table>
BC Contamination (Study I)

3-MONTH CHART REVIEW
(April 15 – July 15, 2015)

Total Patients
N = 267

Excluded
(N=95)

Included
(N=172)

Outpatient
(N=46)

<19 years old
(N=49)

True Infection
(N=112)

Contamination
34% (N=60)
Impact of Contamination (Study II)

• 4.5 month retrospective chart review
  (04/01/2013 – 08/15/2013)
• versa TREK blood culture recovery system
• Age > 18 years
Data Collection

- Patient unique identification
- Patient location
- Reason for Hospitalization
- Demographics
  - Age, Gender, Antibiotic allergies
- Culture and sensitivity
  - Time from admission to BC collection
  - Number and date of bottles collected
  - Number of bottles positive
  - BC collection site and time
  - Culture and Sensitivity report
  - Empiric/Targeted antibiotics
  - Repeat BC
- Risk factors
  - Intravascular devices
  - Prosthetic devices
  - IV drug use
  - Immunocompromised
- Outcomes
  - Number of CoNS blood stream infections verses contamination
  - Appropriate antibiotic selection
  - Duration of therapy
  - Length of hospital stay
  - Increased LOS for contaminated BC bottles
  - ID consultation
Duration of Therapy

Total number of positive blood cultures for patients with Coagulase negative staphylococcus (N=114)

Contamination with no other ID indication (N=31)
- Seen in Emergency Department then discharged (N=15)
- Inpatient (N=16)
  - Average duration of therapy = 4 days
  - Range (2-6)
  - 10 vancomycin
  - 6 Not treated

Positive blood cultures for CoNS with other ID indications present requiring antibiotics (N=64)

CoNS Bacteremia with risk factors (N=19)
- Average duration of therapy = 9 days
  - (range 1-20)
  - 14 vancomycin
  - 1 daptomycin
  - 2 Not treated
  - 1 expired
  - 1 transferred to another institution
Impact of Rapid BC Identification (Study III)

Patient Inclusion Criteria \((N = 43)\)

- Immunocompetent, age > 18 years
- No-risk factors for MRSA such recent hospitalization, antibiotic exposure, prior MRSA infection or colonization
- No foreign devices in place
- No additional ID indications requiring empiric vancomycin

Testing

- Quick FISH GPCC BC (QF GPCC) is a peptide nucleic acid fluorescence in-situ hybridization
- \(N = 50\) kit secured from company
- Targets the 16S rRNA of Staph aureus and CoNS directly from BC with a sensitivity and specificity 98%

Table 2: Patients who were excluded

<table>
<thead>
<tr>
<th>Reason for exclusion</th>
<th>Number of patients ((n=34))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additional infectious disease indications requiring continuation of empiric vancomycin</td>
<td>20</td>
</tr>
<tr>
<td>Immunocompromised host</td>
<td>3</td>
</tr>
<tr>
<td>Foreign device in place</td>
<td>5</td>
</tr>
<tr>
<td>Risk factor for MRSA</td>
<td>6</td>
</tr>
</tbody>
</table>

Almangour, Tabb and Alhifany. *Canadian Journal of Infectious Diseases and Medical Microbiology*, April 2017
Criteria for testing: Rapid diagnostic testing will be performed for positive blood cultures with gram positive cocci in clusters (GPCC) except in the following patients:

- Patients who have additional ID indications necessitating continuation of empiric vancomycin
- Immunocompromised or foreign device in place (e.g., central line) where coagulase negative staphylococcus may be an opportunistic pathogen warranting continuation of vancomycin

Positive Blood Culture with GPCC

0700 – 1400
Call panic value to floor. Then, call ID pharmacy service at extension (1420) to screen for molecular testing eligibility

After 1400
Call panic value to floor

Plate read: Next am, inadequate growth on culture requiring additional 24-hours incubation

Call ID pharmacy service to screen for molecular testing eligibility

Adequate growth on culture

Work up isolate and report results in Meditech
Tested Patients (N = 9)

Projected soft cost avoidance for ROI
- MSSA – $21,397
- SCN/Micrococcus - (8 x $ 8,720) $69,760

J Antimicrob Chemother 2006;58:154-158
Canadian Journal of Infectious Diseases and Medical Microbiology, April 2017
Return on investment

- SCN contaminants (N = 41) for 3 months x 4 = 164 patients annually
- Assay cost $66.81 x 164 = $10,956 annually
- Vancomycin cost per day, $24.30/day
- Average vancomycin DOT, 4 days (range 2-6)
- Vancomycin levels $ 2.64/case x 164 = $ 433 annually
- Therefore, treatment cost for 164 patients = $24.30 x 4 days = $ 15,940 + $ 433 = $16,373 annually
- Projected annual hard cost avoidance $ 16,373 - $ 10,956 = $ 5,417
Goal of Diagnostic stewardship

FIG 1 Workflow pathways for conventional microbiology and RDT. Implementation of RDT increases laboratory workflow complexity but can hasten the availability of results. Communication of results is a key factor. Blue arrows represent the conventional microbiology pathway, orange arrows represent the RDT pathway, and green arrows represent opportunities for the laboratory and antimicrobial stewardship teams to improve communication of results. AST, antimicrobial susceptibility testing.
# Key Roles of Microbiology

<table>
<thead>
<tr>
<th>Antimicrobial Stewardship</th>
<th>Description</th>
<th>Examples</th>
</tr>
</thead>
</table>
| **Diagnosis**             | Make the right diagnosis | Guidance on quality specimens  
RDT of BC isolates  
Inform about advanced tests  
Educate on test performance |
| **Debridement/drainage**  | Drain abscesses remove foreign material | Prioritize and trace samples |
| **Drug**                  | Right empiric therapy | Antibiograms, supplementary testing, cascade reporting, refer isolates, notification, surveillance |
| **Dose**                  | Right dose | Report select MIC’s |
| **Duration**              | Appropriate DOT | Develop protocols to use biomarker testing to set DOT (timely PCT) |
| **De-escalation**         | Time-out | Do not report skin contaminants  
Append clinical guidance to microbiology reports |

Adapted from: Clinical microbiology review January 2017, volume 30; issue 1, 381 - 407
Cost-Value Analysis

- Time to appropriate antimicrobial therapy is the single most important predictor of mortality
- Identifying the causative pathogen sooner

<table>
<thead>
<tr>
<th>Outcomes:</th>
</tr>
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<tbody>
<tr>
<td>Decrease overuse of antimicrobials, LOS, unnecessary admissions, morbidity and mortality</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overuse:</th>
</tr>
</thead>
<tbody>
<tr>
<td>RDT add to healthcare cost</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Underuse:</th>
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<tbody>
<tr>
<td>Suboptimal outcomes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Inappropriate use:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low pretest probability false +</td>
</tr>
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<table>
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<tr>
<th>Actions:</th>
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</thead>
<tbody>
<tr>
<td>Develop diagnostic algorithms, automatic reflex testing, quick turnaround, report to ASP team for intervention</td>
</tr>
</tbody>
</table>
Provider Education

- RDT method and technology used
- Indications for testing in the institution
- Available alternative testing
- Advantages and limitations
- Turnaround time
- Presentation of report and guidance on interpretation
- Rapid ASP intervention for optimal time to appropriate antibiotics

Clinical microbiology review January 2017, volume 30; issue 1, 381 - 407
• Cascade reporting
• Rapid viral testing to limit antibiotic prescribing
• RDT on positive blood cultures
• Rapid PCT for ICU patients to assist in setting DOT
• Nonculture based fungal markers in patients with hematologic malignancies
<table>
<thead>
<tr>
<th>Organism</th>
<th>Cascade (conditional reporting)</th>
</tr>
</thead>
</table>
| MDR Acinetobacter if isolate resistant to ≥ 3 classes of antibiotics including meropenem (see below) | • Report susceptibility from panel for *tigecycline (excluding*) urinary and blood isolates  
• if *imipenem* MIC ≤ 4 mcg/mL, set up etest and report susceptibility  
• Set up etest for *minocycline* and *colistin* and report susceptibility |
| MDR Pseudomonas if isolate resistant to ≥ 3 classes of antibiotics including *ceftazidime* and *meropenem* (see below) | Set up etest for *ceftazidime/avibactam*, *ceftolozane/tazobactam*, and *colistin* and report susceptibility |
| CRE Enterobacteriaceae | • Report susceptibility from panel for *tigecycline (excluding*) urinary and blood isolates  
• Set up etest for *ceftazidime/avibactam*, *Meropenem/vaborbactam* and *colistin* and report susceptibility |
| MRSA from *blood* cultures | If isolate has a vancomycin MIC ≥ 2 mcg/mL, set up confirmatory vancomycin etest. Only report sensitivity interpretation pending etest results  
**E-Test results:**  
• If vancomycin etest MIC < 2, report vancomycin etest result  
• If vancomycin etest MIC ≥ 2, report vancomycin e-test result and panel results for *daptomycin* and *ceftaroline* |
| VRE Enterococcus from *sterile body sources* resistant to linezolid (excluding lung samples) | If VRE enterococcus isolate is resistant to linezolid, report *daptomycin* MIC and interpretation |
| Fluconazole resistant Candida from sterile body sources (including *krusei*) | Report *caspofungin* and *voriconazole* |

**Revised: 12/13/2017**  
*Note:* save all isolates requiring etest work up for further investigation if needed

**Applicable for MDR Acinetobacter and MDR Pseudomonas: Classes of Antibiotics**
- Aminoglycosides (tobramycin, gentamicin, amikacin)
- Fluoroquinolones (levofloxacin, ciprofloxacin)
- Anti-Pseudomonal Cephalosporins (ceftazidime, cefepime)
- Aztreonam
- Carbapenem (meropenem, doripenem, imipenem)
- β-lactam β-lactamase inhibitor (piperacillin/tazobactam)
• Cascade reporting
• Rapid viral testing to limit antibiotic prescribing
• RDT on positive blood cultures
• Rapid PCT for ICU patients to assist in setting DOT
• Nonculture based fungal markers in patients with hematologic malignancies
Procalcitonin Kinetics

Fig. 1 Procalcitonin (PCT) concentrations (mean±standard deviation) in patients with PCT-guided antibiotic treatment (filled circles) and the control group (empty circles) did not show any difference.

Table 2

<table>
<thead>
<tr>
<th>Procalcitonin changes at various time points in patients with bacterial sepsis according to antibiotic therapy</th>
<th>First-line empirical antibiotic therapy</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Appropriate</td>
<td>Inappropriate</td>
</tr>
<tr>
<td>PCT at D1 (n = 180; 129 S, 51 NS)a</td>
<td>27.2 (62.7)</td>
<td>29.6 (96.7)</td>
</tr>
<tr>
<td>PCT at D2 (n = 163; 117 S, 46 NS)a</td>
<td>27.4 (45.1)</td>
<td>40.9 (74.3)</td>
</tr>
<tr>
<td>ΔPCT D1–D2</td>
<td>+1.7 (35.0)</td>
<td>+5.2 (47.4)</td>
</tr>
<tr>
<td>PCT at D3 (n = 164; 117 S, 47 NS)a</td>
<td>24.4 (58.4)</td>
<td>34.4 (55.7)</td>
</tr>
<tr>
<td>ΔPCT D2–D3</td>
<td>-3.9 (35.9)</td>
<td>+5.0 (29.7)</td>
</tr>
<tr>
<td>PCT at D4 (n = 121; 80 S, 41 NS)a</td>
<td>17.3 (45.8)</td>
<td>32.4 (46.2)</td>
</tr>
<tr>
<td>ΔPCT D1–D4</td>
<td>-9.1 (46.7)</td>
<td>-0.8 (102.5)</td>
</tr>
<tr>
<td>ΔPCT D3–D4</td>
<td>-8.3 (21.5)</td>
<td>-8.4 (16.6)</td>
</tr>
</tbody>
</table>

Changes in procalcitonin (PCT) values at various time points in patients with bacterial sepsis according to the appropriateness of the first-line empirical antibiotic therapy. S, survivors; NS, nonsurvivors. ΔPCT D1–D2, procalcitonin decrease between day 2 and day 1 after the onset of sepsis, and so forth. Missing data are due to insufficient serum sample or death of patients within the 1-day, 2-day or 3-day-period following the onset of sepsis. D1, day sepsis is diagnosed.


Evaluation of Procalcitonin Use

**Purpose:** To evaluate the current use of PCT in guiding antibiotic therapy decisions

**Methods:** An IRB approved, single site, retrospective chart review between December 2016 and May 2017

**Data collected:** age, order dates and times, lab results, ordering physician, time to results, action taken, indication, and days of therapy

**Inclusion criteria:** all patients $\geq$ 18 years old

**Primary objective:** determine if procalcitonin is being used to guide ABX decisions

**Definitions:**
1. More than one PCT level ordered was a surrogate marker for classifying a prescriber as using a clinical pathway designed to set DOT
2. A single PCT level that returned negative for bacterial infection resulting in discontinuation of antibiotics or continued observation with no antibiotics was used to classify a prescriber as using a clinical pathway to rule out sepsis.

**Results:**

- **N = 140 Patients**
- **4 patients excluded** (<18 yoa)
- **136 Patients included**
- **15 patients discharged before lab result**
- **5 Patients expired before lab result**

- More than one PCT level drawn 2.2% (3/136)
- Single PCT orders 97.8% (133/136)
- Turnaround time = 59 hours from order to result
PCT ordered ≤ 24 hours after admission

- 90% (84/93) started on empiric antibiotics
- N = 41, PCT level resulted in infection not likely
- Antibiotic therapy continued in 50% (20/41)
Additional Rapid Test Examples
GeneXPERT

• Utilizes Multiplex PCR technology

• MRSA/SA BC
  • Provides accurate determination of Staph from gram-positive BC in 1 hour
  • Can be easily integrated into sepsis bundles

• MRSA/SA SSTI
  • Wound swab
  • Can detect in less than 1 hour
  • Identifies presumptive positive strain for correct classifications
C. Difficile Identification

- Glutamate Dehydrogenase (GDH) + Toxin Enzyme immunoassay (EIA) +/- PCR
- Discordant results are set up on PCR
- GeneXPERT C.diff
  - Results in 45 minutes
  - Eliminates need for additional repeat testing
  - 93.5% sensitive
  - 94% specific
C difficile 6-Month Test Results  
(5/1/2016 – 10/31/2016)

Summary:

- Rate of positive C. diff: 19.5% (165/846)
- Rate of discordant GDH/EIA results: 57.6% (95/165)
- Rate of positive PCR from discordant samples: 69.5% (66/95)

If PCR was not available, we would have missed 66 cases - 40% (66/165)
• Rapid, qualitative isothermal test differentiates A & B
  • Processing time < 15 minutes
• For use with nasal or nasopharyngeal specimens
  • Direct nasal swabs
  • Nasal/Nasopharyngeal swabs (eluted in viral transport media)
• Sensitivities of Rapid EIA Flu tests range from 50-70%
• Alere

<table>
<thead>
<tr>
<th></th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza A</td>
<td>97.9%&lt;sup&gt;b&lt;/sup&gt; (95% CI: 92.6%, 99.4%)</td>
<td>86.2%&lt;sup&gt;a&lt;/sup&gt; (95% CI: 82.8%, 89.0%)</td>
</tr>
<tr>
<td>Influenza B</td>
<td>92.5%&lt;sup&gt;d&lt;/sup&gt; (95% CI: 84.6%, 96.5%)</td>
<td>96.5%&lt;sup&gt;c&lt;/sup&gt; (95% CI: 94.5%, 97.8%)</td>
</tr>
</tbody>
</table>
Alere I Instrument

- Influenzae A and B
- Group A Strep
- RSV
<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Details</th>
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</thead>
</table>
| 12:50 - 12:55 | **Microbiology update: Throat Culture Evaluation** | **Background:** Current IDSA guidelines recommend throat culture submission for all quick strep negative samples. Newer molecular technology with high sensitivity/specificity has been developed and was recently implemented at MMC. According to the company, this newer technology obviates the need for confirmatory throat cultures. Microbiology presented a 6 month post-implementation evaluation of the molecular rapid Group A test kit (Alere) versus reflex throat cultures.  
710 throat samples with quick strep negative results were processed for culture. The following organisms were recovered:  
- 11 Group A Streptococci  
- 14 Group C Streptococci  
- 15 Group G Streptococci  
Sensitivity 98% for GAS  
- In total, it was noted that reflex cultures identified an additional 5% of patients with bacterial pharyngitis who may benefit from antibiotic therapy for infection resolution.  
- Microbiology will investigate reimbursement for reflex throat cultures and report back to the AST committee. |
FilmArray System and Panels

• **Multiplex PCR**
  - Uses PCR to amplify several different DNA sequences simultaneously
  - Consists of multiple primer sets with a single PCR mixture

• **BioFire’s Respiratory Panel**
  - New Respiratory Panel (RP2)
  - Nasopharyngeal swab
  - Looks for 21 targets
    - 17 viral
    - 4 bacterial
  - Results in 45 minutes
### Pathogens Detected by FilmArray RVP

<table>
<thead>
<tr>
<th>Pathogen</th>
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<tbody>
<tr>
<td>Adenovirus</td>
<td></td>
</tr>
<tr>
<td>Coronavirus</td>
<td>HKU1</td>
</tr>
<tr>
<td></td>
<td>NL63</td>
</tr>
<tr>
<td></td>
<td>229E</td>
</tr>
<tr>
<td></td>
<td>OC43</td>
</tr>
<tr>
<td>Human metapneumovirus</td>
<td></td>
</tr>
<tr>
<td>Human rhinovirus/ enterovirus</td>
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<tr>
<td>Influenza</td>
<td>A</td>
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<tr>
<td></td>
<td>A/H1</td>
</tr>
<tr>
<td></td>
<td>A/H1-2009</td>
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<tr>
<td></td>
<td>A/H3</td>
</tr>
<tr>
<td></td>
<td>B</td>
</tr>
<tr>
<td>Parainfluenza</td>
<td>1</td>
</tr>
<tr>
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<td>RSV</td>
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<tr>
<td>Bordetella pertussis</td>
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<tr>
<td>Chlamydophila pneumonia</td>
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<tr>
<td>Mycoplasma pneumonia</td>
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</tbody>
</table>
MALDI Biotyper CA

- Identifies:
  - Gram-Positives and Gram-Negatives
  - Anaerobes
  - Yeast
- Bruker’s MALDI Biotyper CA
  - Determines unique protein “fingerprint” of the organism
  - Characteristic patterns of the proteins are used to ID microorganisms by matching against an FDA cleared library
Just because you can .....
Audience Question 1

Which are the following are included in rapid diagnostic test (RDT) provider education:

A. Presentation of report and guidance on interpretation
B. Indications for testing in the institution
C. Rapid ASP intervention for optimal time to appropriate antibiotics
D. RDT method and technology used
E. All the above
Audience Question 2

Prioritization risk assessments for ASP include all of the following except:

A. Anticipated frequency of non-compliance with the test or process if in place
B. Likelihood the event will occur
C. Is the proposed test or initiative labor intensive or expensive?
D. Is the current process in place effective, including good compliance?
Previous studies have identified that RDT tests result in:

A. Improved time to optimal antibiotics for MSSA
B. Reduced antibiotic exposure for coagulase negative staphylococcus BC contaminants
C. Reduced length of stay and call backs to ED
D. Reduced cost to the institution
E. All the above
Questions?

Deanne Tabb PharmD, MT (ASCP)
Infectious Disease Pharmacist
Clinical Microbiologist