November 19, 2019

DO Read the Comments: micro stewardship nudges from the lab

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Disclosures

- Technical Director in Microbiology at LabCorp Seattle
- This presentation does not necessarily reflect current or future practices at LabCorp and should not be interpreted as a representation of LabCorp procedures.

How can the microbiology lab help

- Antimicrobial stewardship is the motivator behind the design of many lab reports
    - Cascade Reporting
    - Selective Reporting
    - Nudging by framing comments
    - Nudging by providing default choices
    - Rapid testing

Cascade Reporting

Strategy to encourage reduced broad-spectrum antimicrobial use

- Run all Antimicrobial Susceptibility Testing
- Report first line agents
- Report second-line agents:
  - Only if first-line agents appear inappropriate (inactive, inappropriate for specific infection or infecting species, insufficient to cover infections at multiple sites or polymicrobial infections, etc.)
  - Fluoroquinolones and broad-spectrum beta-lactams are most common targets of cascade reporting interventions (Langford et al 2019 ICHE)

Cascade Reporting

Examples:

Enterobacteriaceae

a. *If* isolate is resistant to first-generation cephalosporins,

-> *then* report second and possibly third- and fourth-generation cephalosporins.

b. *If* isolate is resistant to gentamicin

-> *then* report tobramycin or amikacin, or both.

Pseudomonas aeruginosa:

a. *If* isolate is resistant to ceftazidime, piperacillin-tazobactam, and aminoglycosides,

-> *then* report imipenem or meropenem.

Selective Reporting

- Prescribers do respond to antibiotic choice selection
- More likely to start antibiotics where antibiotic susceptibility was released

{Steffee et al JAC 1997}

- Reversal of selective reporting of rifampicin for gram-positive organisms
- Rifampicin use increased after unmasking; inappropriate use increased from 13% to 22%

Cascade Reporting

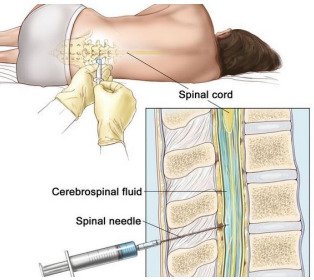
Challenges/Opportunities:

a. LIS programming
b. Rule creation
c. Requires intimate back and forth between stewardship stakeholders and the lab
d. Reference labs can't execute this as smoothly as in-house labs

Selective Reporting: Site Specific Reporting

The very basics

- Report results for agents (e.g., nitrofurantoin or fosfomycin) that are used only for treating urinary tract infections: on urine isolates only.



- *Bacterial Isolates from CSF:*
  - *Do not* report agents administered:
    - only by the oral route
    - first- and second generation cephalosporins (except parenteral cefuroxime)
    - Cephamycins
    - clindamycin, fluoroquinolones, macrolides, or tetracyclines,

Selective reporting

{Schuetz et al DMID 2013}

- Cefazolin is the class representative for AST testing for certain oral cephalosporins (cefaclor, cefdinir, cefpodoxime, cefprozil, cefuroxime axetil, cephalexin, and loracarbef)

- For K. pneumoniae, E. coli and P. mirabilis: Lab comment:

  "Cefazolin with an MIC <= 16 predicts susceptibility to oral cephalosporins when used for therapy of uncomplicated UTIs"

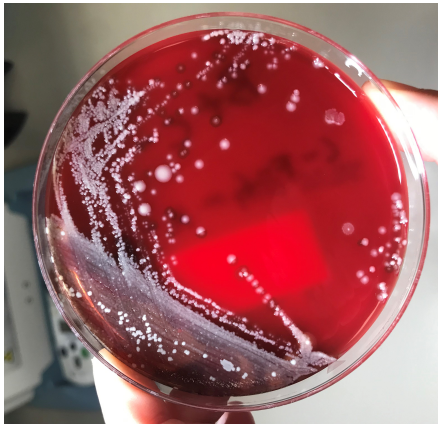
{Johnson et al Eur J Clin Microbiol Infect Dis 2016}

- Selective reporting of cefazolin for susceptible gram-negative organisms
- Increase in de-escalation from 48% to 71% after the intervention

Nudging by framing comments

Normal/Commensal flora is often reported from Respiratory cultures:

- Micro Lab Intention:
  - Signal that a non-pathogenic mix of organisms are present: Coagulase negative staphylococcus; Diptheroids; alpha-hemolytic streptococci; commensal Neisserias and haemophilus.
- Unintended consequence: interpretation as positive finding



Mixed normal flora

Pure culture

Nudging by framing comments

- Lab intervention: Report Normal Flora AND add comment " No MRSA, No Pseudomonas"

  - McBride et al 2015 OFID: 129 patients
    - Total antibiotic prescribing per patient decreased from 2.3 to 1.9
    - Broad-spectrum prescribing per patient decreased from 1.9 to 1.4 antibiotics

  - Musgrove et al 2018 OFID: compared 2 6month time periods
  - 5.5-fold increase in de-escalation
  - Decrease in anti-MRSA and anti-Pseudomonal duration from 7 to 5 days
  - Acute kidney injury was reduced (31% vs 14%, P = .003).
  - No difference in all-cause mortality was detected between the groups (30% vs 18%, P = .052)

- Clinicians might need re-assurance prior to de-escalation!

Nudging by providing default choices

{Daley et al ICHE 2018}

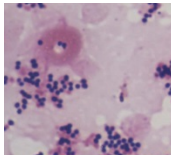
Intervention in reporting of urine cultures

- Traditional reporting: Identification + AST
- Modified reporting: "*This POSITIVE urine culture may represent asymptomatic bacteriuria or urinary tract infection. If urinary tract infection is suspected clinically, please call the microbiology laboratory … for identification and susceptibility results*."

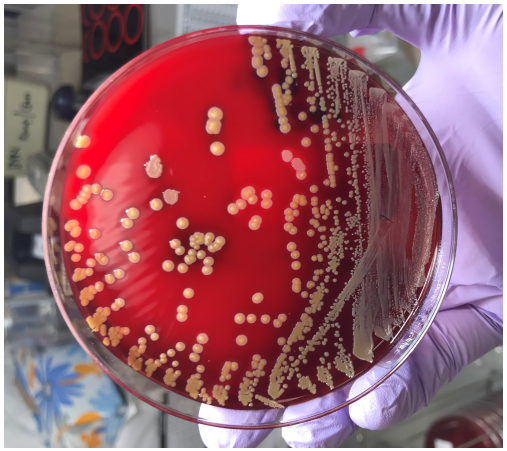
- 80% vs 53% of cultures w/ appropriate abx prescribed

- exclusion criteria: age <18 years, pregnancy, indwelling catheter, patient on abx, neutropenia, ICU admit.

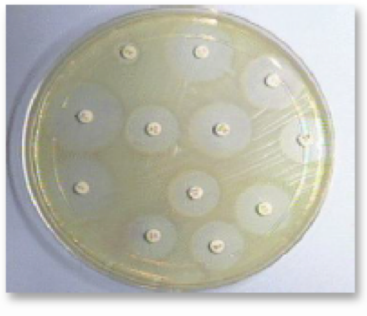
Rapid testing from blood culture:



18hrs



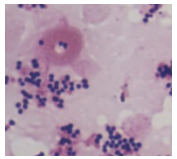
12-24hr



Full AST

Traditional pathway

Rapid techniques for blood culture



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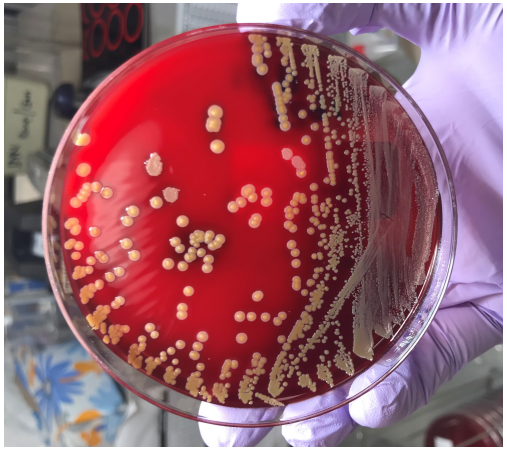

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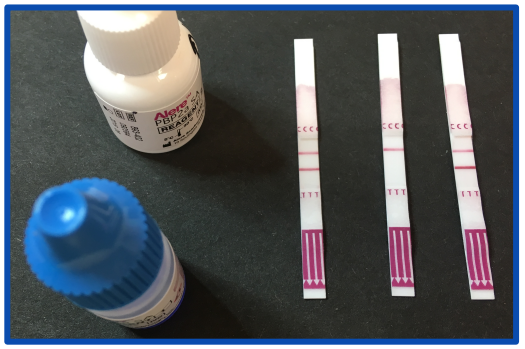
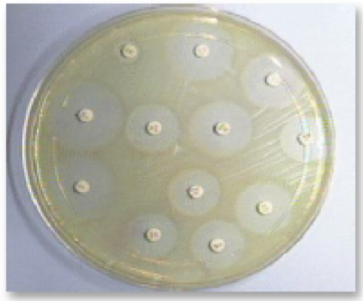


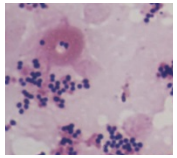
PBP2 detection:
Positive =MRSA
Negative = MSSA
~12hour gain

12-24 h



Full AST

Rapid identification from blood culture



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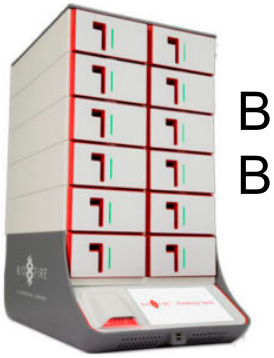
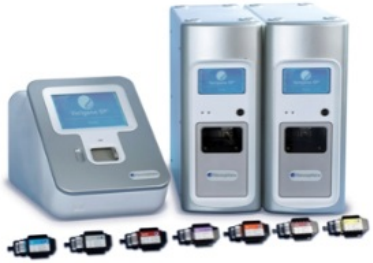


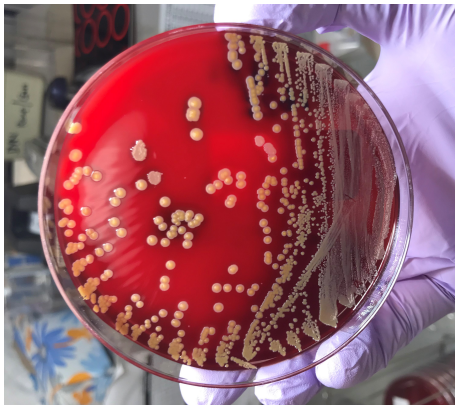
Biofire
BCID panel

2.5hr

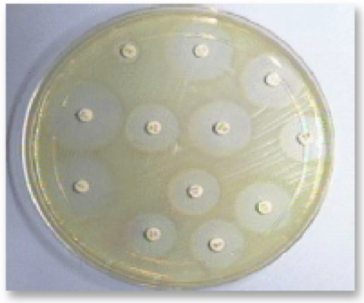


Verigene
panels

18hrs



12-24 h



Full AST

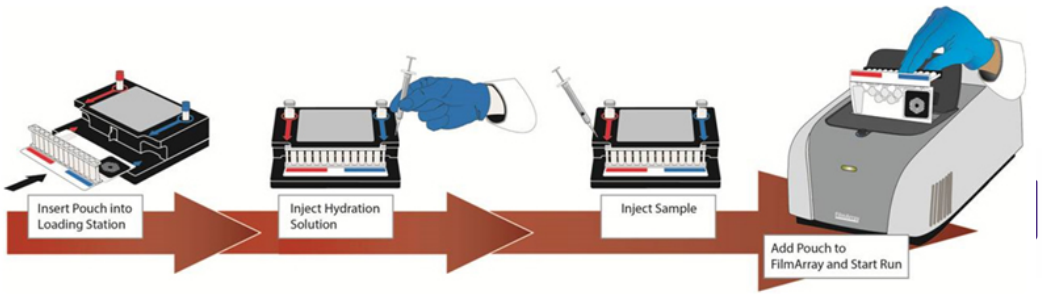
Organisms identified by rapid panels:

BC-GP		BC-GN	
Bacterial Targets	**Resistance Targets**	**Bacterial Targets**	**Resistance Targets**
Staphylococcus spp.	*mecA*	*Acinetobacter spp.*	CTX-M (*bla*$_{CTX-M}$)
Staphylococcus aureus	*vanA*	*Citrobacter spp.*	KPC (*bla*$_{KPC}$)
Staphylococcus epidermidis	*vanB*	*Enterobacter spp.*	NDM (*bla*$_{NDM}$)
Staphylococcus lugdunensis		*Proteus spp.*	VIM (*bla*$_{VIM}$)
Streptococcus spp.		*Escherichia coli*	IMP (*bla*$_{IMP}$)
Streptococcus pneumoniae		*Klebsiella pneumoniae*	OXA (*bla*$_{OXA}$)
Streptococcus pyogenes		*Klebsiella oxytoca*	
Streptococcus agalactiae		*Pseudomonas aeruginosa*	
Streptococcus anginosus group [1]			
Enterococcus faecalis			
Enterococcus faecium			
Listeria spp.			

Organisms identified by rapid panels:

Gram+ Bacteria	Gram– Bacteria
Enterococcus *Listeria monocytogenes* *Staphylococcus* *Staphylococcus aureus* *Streptococcus* *Streptococcus agalactiae* *Streptococcus pyogenes* *Streptococcus pneumoniae*	*Acinetobacter baumanniiHaemophilus influenzae* *Neisseria meningitidis* *Pseudomonas aeruginosa* *Enterobacteriaceae* *Enterobacter cloacae complex* *Escherichia coli* *Klebsiella oxytoca* *Klebsiella pneumoniae* *Proteus* *Serratia marcescens*

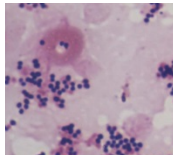
Yeast	Antibiotic Resistance
Candida albicans *Candida glabrata* *Candida krusei* *Candida parapsilosis* *Candida tropicalis*	mecA - methicillin resistance vanA/B - vancomycin resistance KPC - carbapenem resistance



Impact of rapid testing

- Rapid identification panels:
  - **<u>if Micro lab reaches out to stewardship!</u>**
  - Obtain results ~12 hours prior to conventional testing ->
  - Allows switch to appropriate therapy
    - Pseudomonas -> d/c ceftriaxone
    - Staphylococcus aureus -> d/c or add vancomycin

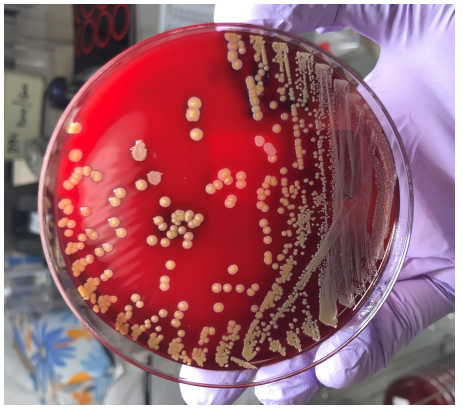
Rapid AST from blood culture



0-8hr

Accelerate Pheno

18hrs



12-24 h

Full AST

Impact of rapid testing

- Accelerate Pheno:

Charnot-Katsikas et al 2018: 232 cultures:

- time to identification: decreased by 23.47 h
- time to susceptibility: decreased by 41.86 h

Summary

- Antimicrobial stewardship is the motivator behind the design of many lab reports

- The result of constant dialog with stewardship stakeholders

    - Cascade Reporting
    - Selective Reporting
    - Nudging by framing comments
    - Nudging by providing default choices
    - Rapid testing