

Implementation of Rapid Diagnostics Tests and Medical Apps by Stewardship Teams

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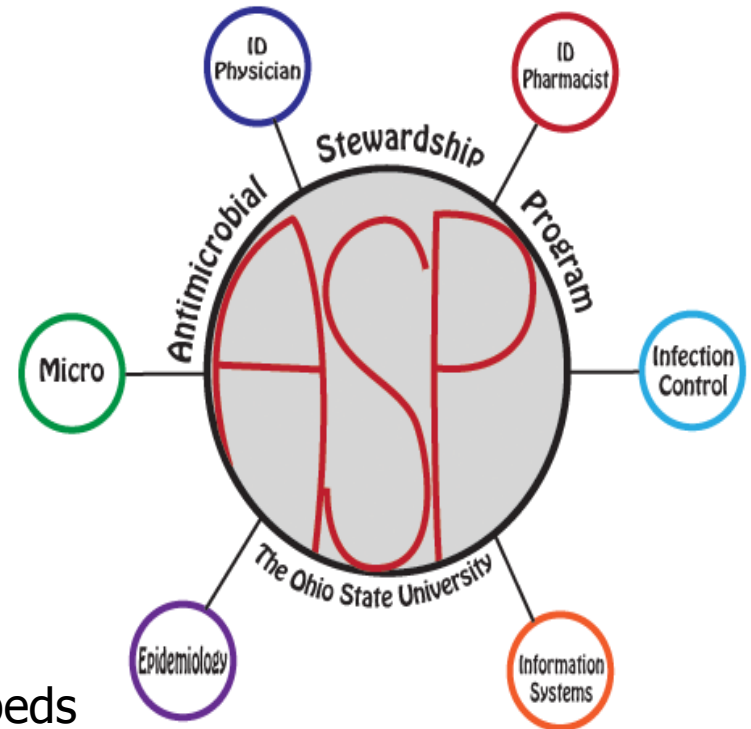
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Outline

- Describe different types of rapid molecular tests for bloodstream infections
- Review studies that evaluate the clinical and economic impact of rapid molecular tests.
- Discuss the role of antimicrobial stewardship programs (ASP) with implementation of new diagnostic tests

Antimicrobial Stewardship Program The Ohio State University



- **James Cancer Center** 175 beds
bone marrow transplants/oncology
- **Ross Heart Hospital** 115 beds
Heart and lung transplants/cardiac
- **The Ohio State University Hospital** 750 beds
solid organ transplant/gen med/surgery
SICU, MICU, NICU, Burn unit

Challenges with New Diagnostic blood culture tests

- Cost savings due to rapid identification of organisms is realized outside of the micro lab
Reduced LOS, pharmacy costs
- Without physician buy-in labs are reluctant to implement new expensive tests
impacts the micro budget
- ASP can be the best advocate to implement and justify new diagnostic tests

Challenges with New Diagnostic blood culture tests

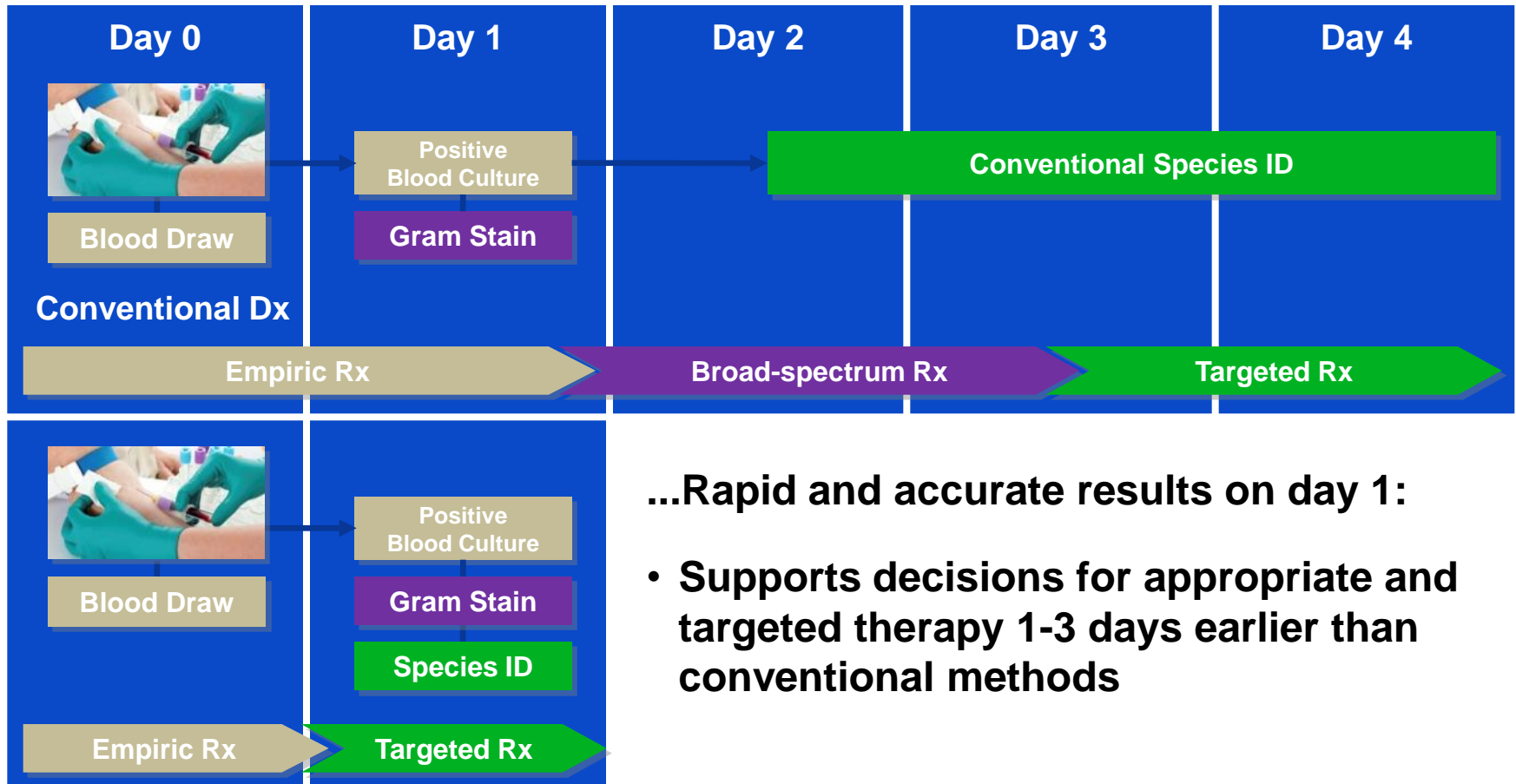
- **Cost**
equipment (own or lease) + cost per test
- Lab **space** requirements
- Technical **complexity**
CLIA (Clinical lab improvement amendments)
certified complexity of the test/personnel skills
- Technician **time**
- Sensitivity and specificity

- **Ability to document impact on antimicrobial selection and patient outcomes**

Examples of New Tests

GeneXpert
AccuProbe
BD GeneOhm
Traffic Light
Luminex
Light Cycler
MALDI-TOF
FilmArray

Rapid Diagnostic tests

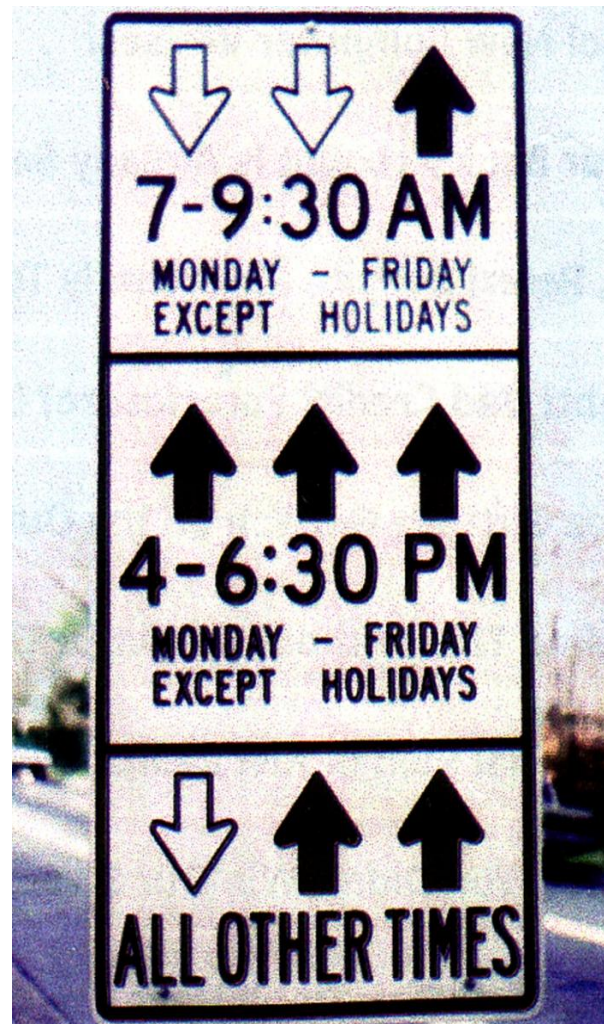


Implementation Steps

for real-time PCR rapid detection of MRSA/SA BC GeneXpert®MRSA/SA BC

- Clinical microbiologist presents data to antibiotic subcommittee with recommendations to implement test
- In-house validation done
- ASP discusses how to communicate the availability of the new test to the medical staff
 1. How is the test reported and is the interpretation of the test result intuitive?
 2. Will MDs need to be prompted to change antibiotic therapy?

Are the test results clearly written and easy to understand by a non-microbiologist?



Can clinicians interpret the micro reports?

Microbiology reports results consistent with FDA labeling which is MRSA/SA

GRAM POSITIVE COCCI IN GROUPS

NEGATIVE for *S. aureus* (SA) DNA by real time PCR.



CoNS

NEGATIVE for METHICILLIN RESISTANT *S. aureus* (MRSA) DNA by real time PCR

POSITIVE for *S. aureus* (SA) DNA by real time PCR.

NEGATIVE for METHICILLIN RESISTANT *S. aureus* (MRSA) DNA by real time PCR



MSSA

GRAM POSITIVE COCCI IN GROUPS

POSITIVE for *S. aureus* (SA) DNA by real time PCR.

POSITIVE for METHICILLIN RESISTANT *S. aureus* (MRSA) DNA by real time PCR



MRSA

An Antimicrobial Stewardship Program's Impact with rapid PCR MRSA/SA blood culture test in patients with *S. aureus* Bacteremia

- **Objective:** Evaluate the clinical & economic impact of the rapid PCR MRSA/SA blood culture test with interventions by ID pharmacists
- **Method:** A comparative study of hospitalized patients with SAB before and after PCR blood culture test implementation.

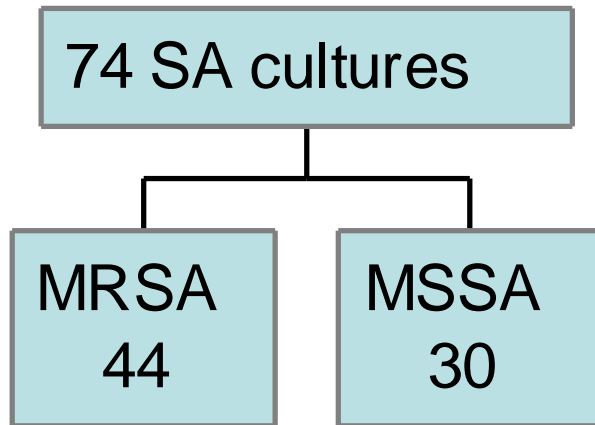
Outcomes

the difference in time from blood culture draw to optimal anti-staphylococcal therapy (OAT) for SAB,
hospital length of stay (LOS),
mortality,

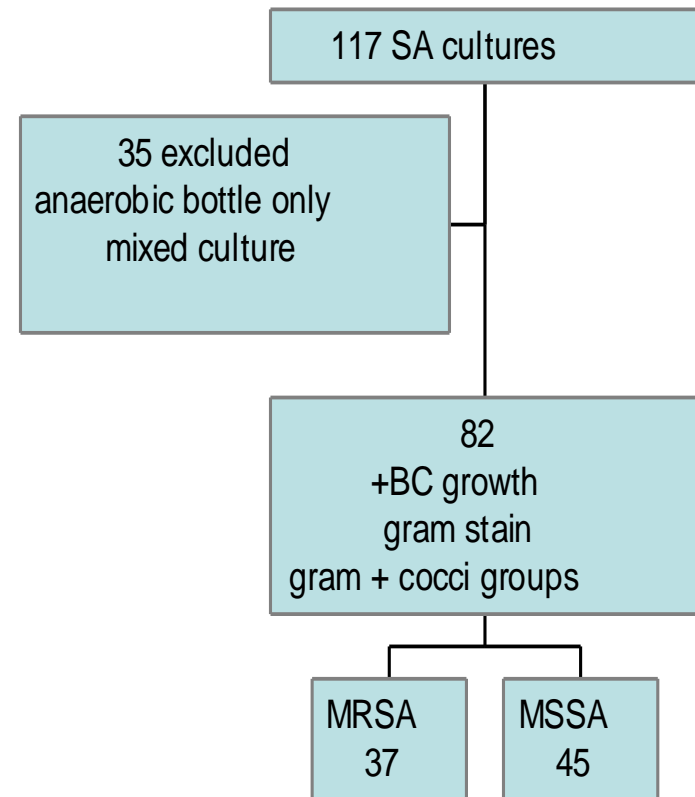
cost of care pre and post introduction of rapid PCR MRSA/SA BC

Methods

Pre Group
Sept - Dec 2008
standard culture



Post Group
March 10- June 30, 2009



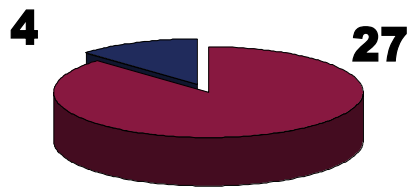
Interventions

- Micro tech made 2 phone calls
 1. Micro called ID PharmD
 - with the rapid PCR MRSA/SA BC results Mon-Fri 8-5pm
 2. Micro called MD or RN
 - with the rapid PCR MRSA/SA BC results 24/7
- ID PharmD called MD with OAT recommendations
 - After reviewing electronic medical record for allergy history, prior antibiotic therapy, or previous culture/MIC data

Intervention

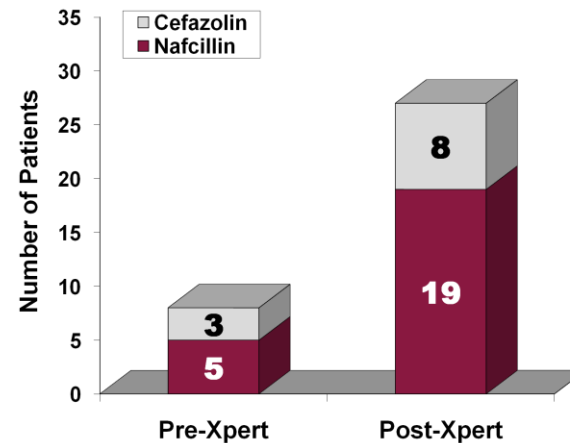
therapy switched to Optimal Antimicrobial Therapy (OAT)

MSSA patients switched from vancomycin



Reason for no intervention

- Penicillin allergy
- Mixed cultures
- Therapy appropriate



8/30 (27%)

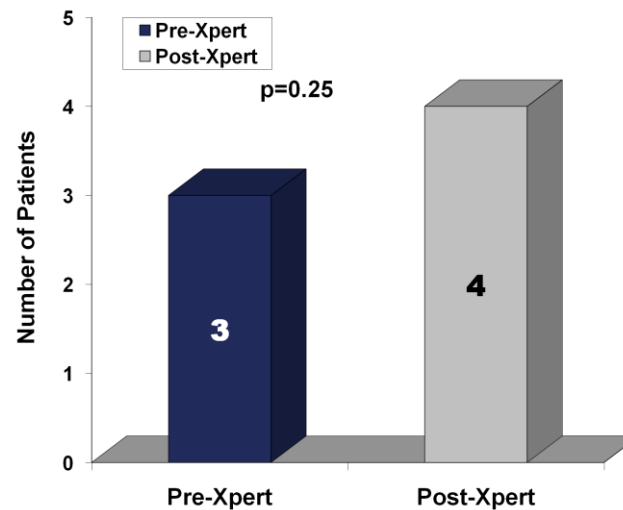
27/45 (60%)

P=0.004

Interventions

therapy switched to Optimal Antimicrobial Therapy (OAT)

MRSA patients switched from vancomycin to daptomycin

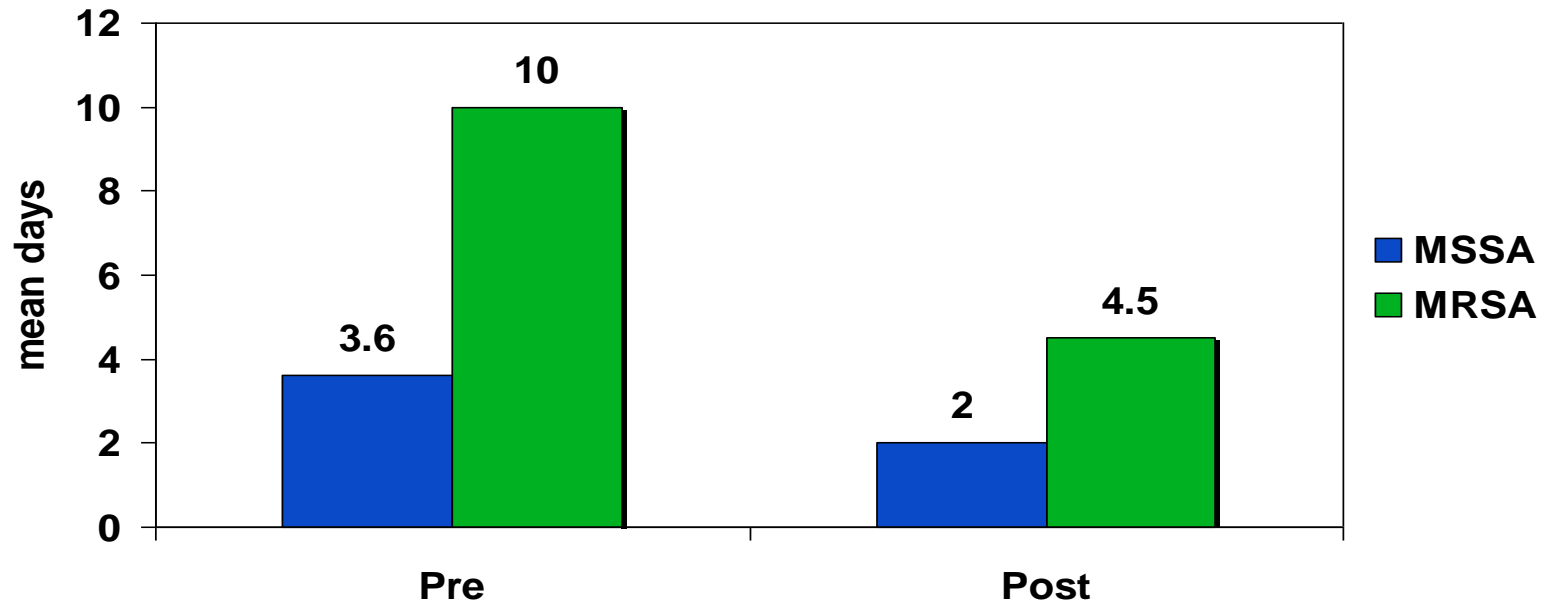


3/44 (7%)

4/37 (11%)

Interventions

Time (days) to OAT

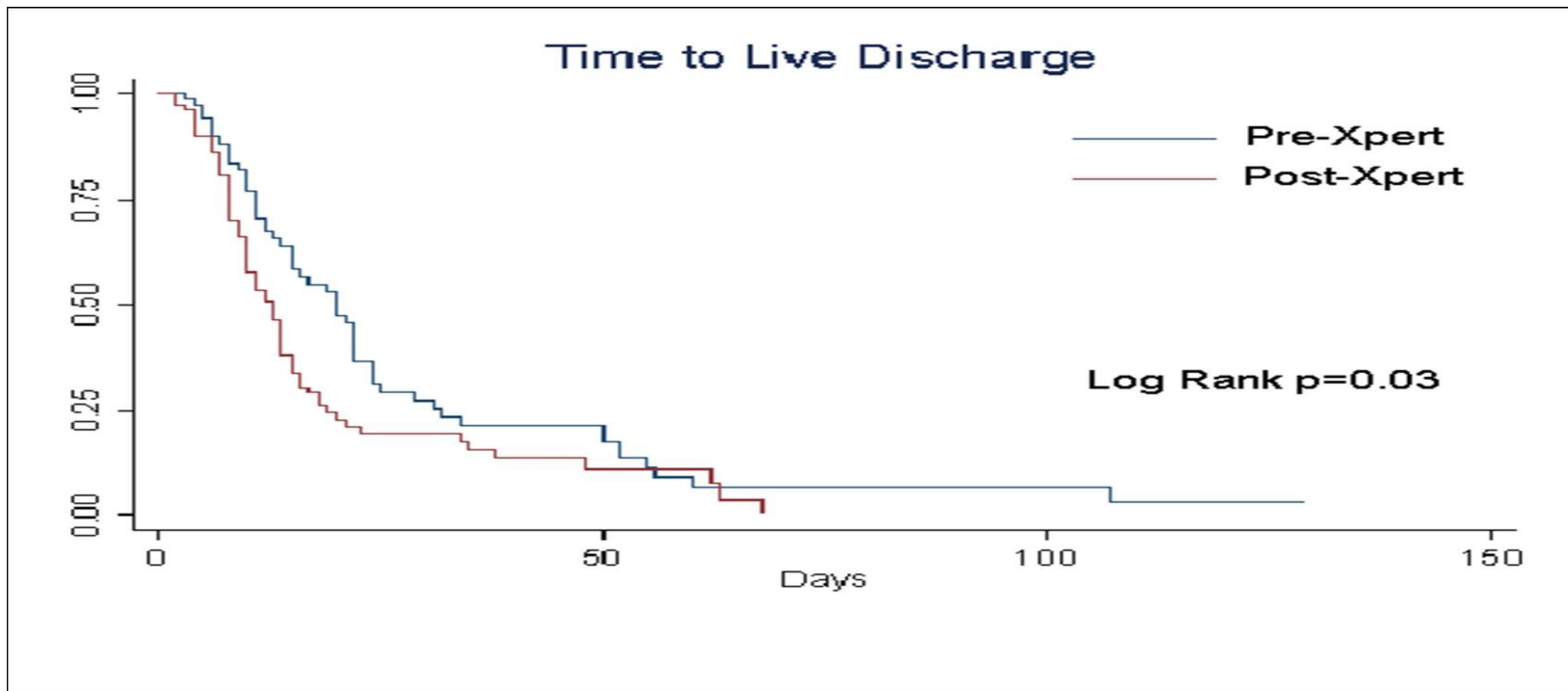


The time (days) to OAT after blood culture draw in MSSA bacteremia was 3.6 days vs 2 days ($p=0.002$)

A **1.6 day reduction** in time

Outcome

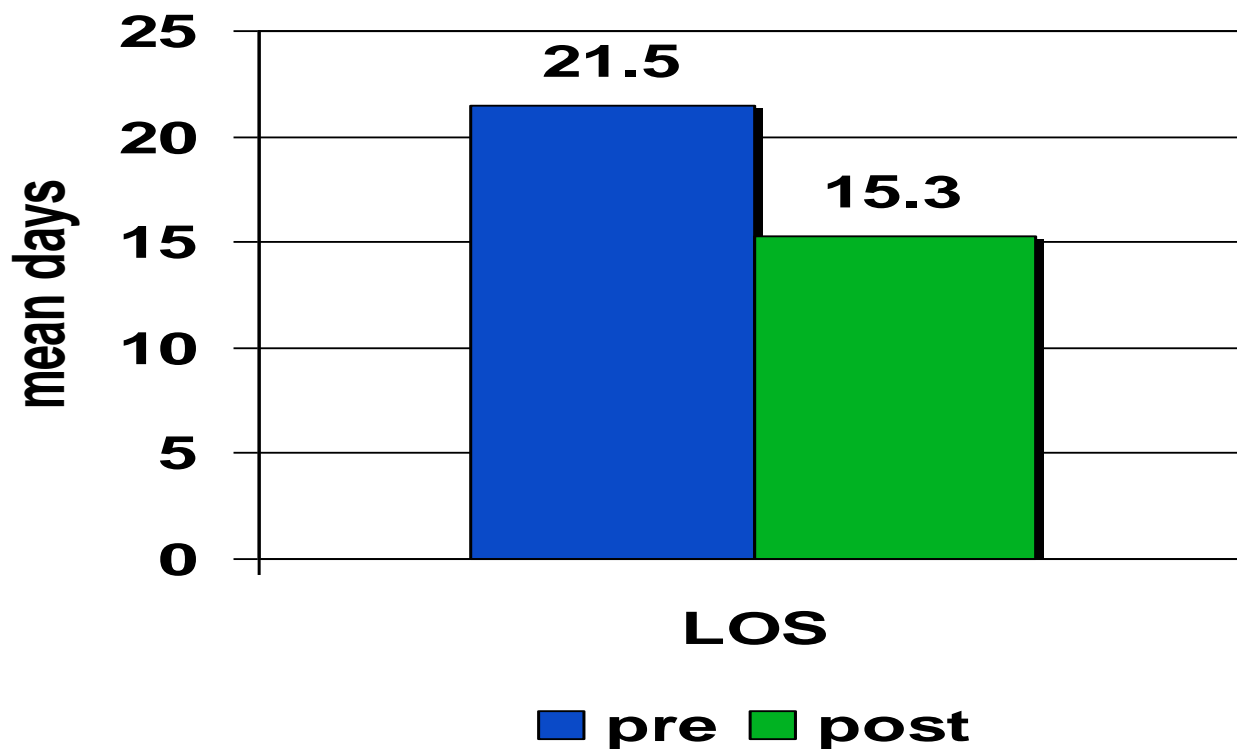
mortality



- No difference in all-cause mortality was observed (**27% Pre-Xpert vs 21% Post-Xpert** OR=0.74; 95% CI=[0.29,1.84]).

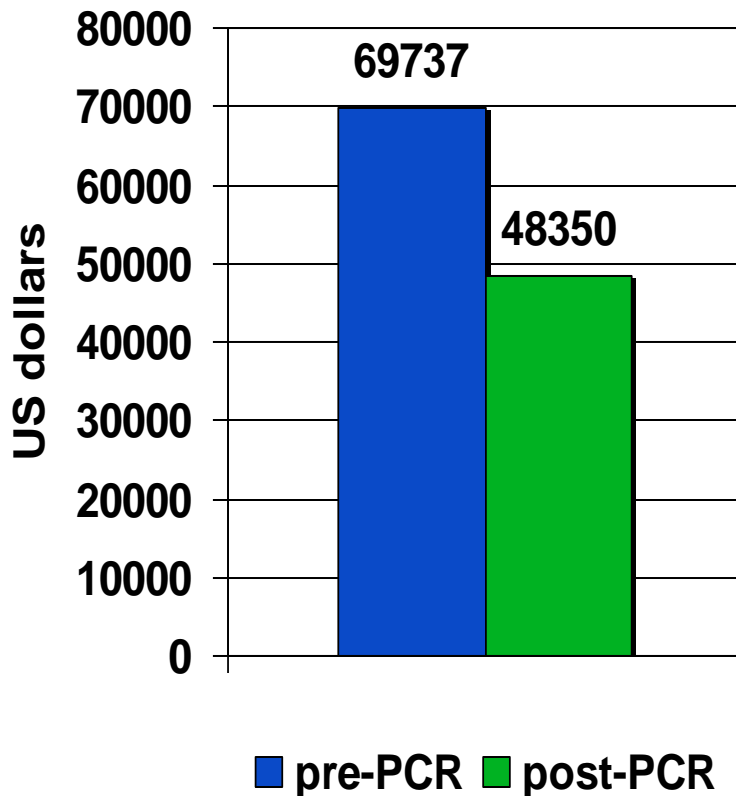
Outcomes

Length of Stay (LOS)



- Mean LOS was reduced by 6.2 days in the post PCR MRSA/SA BC group.
(21.5 vs 15.3 p=0.07)

Economic Impact of rapid PCR for SAB



- Mean hospital costs were reduced by \$21,287 in the post-PCR test group (p=0.02)
- ICU cost were \$9,930 less in the post-PCR test group (p=0.03)

Conclusions

The rapid PCR test decreased time to OAT after time of blood culture draw in MSSA bacteremia ($p=0.002$) by **1.6 days**.

The rapid differentiation of MSSA and MRSA in blood cultures enables faster switch to OAT

Communication by the microbiology tech to the ID PharmD resulted in earlier OAT that was associated with a decreased LOS and costs (\$21,287 per episode of SAB).

Assessment of the impact of PNA FISH for rapid identification of coagulase-negative staphylococci in the absence of antimicrobial stewardship intervention

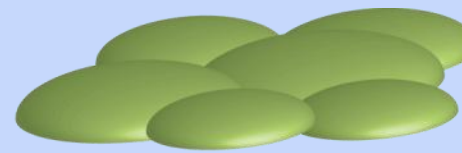
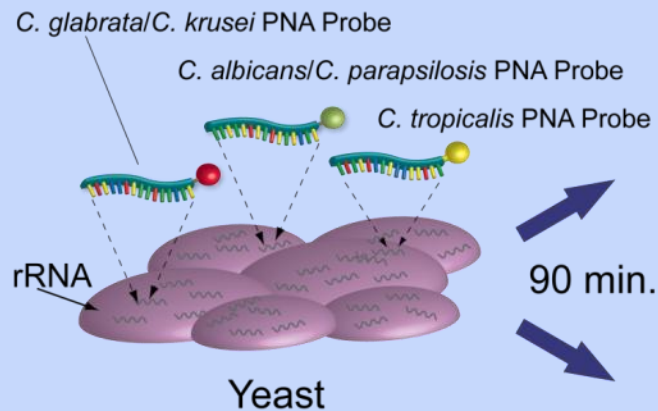
- **Study design:** A retrospective, pre(May 2005-Oct 2006) /post(Dec 2006- May 2008) study to determine whether there would be similar impact of the PNA FISH assay on LOS and vancomycin usage in patients with CoNS in the absence of active AST intervention.
- **Primary outcome**
hospital LOS in days before and after the introduction of the PNA
- **Secondary outcome**
number of days of vancomycin treatment as a response to a positive Gram stain from a single-positive blood culture
- **Results:**
No statistically significant difference in mean days of vancomycin treatment duration (4.15 days pre-PNA FISH group vs. 3.51 days post-PNA FISH group)
- No statistically significant differences in overall hospital LOS between the two groups
- The *S. aureus* PNA FISH™ assay for the rapid detection of presumptive CoNS pseudobacteremia when implemented without active reporting of results or additional support from an antimicrobial stewardship team did not reduce LOS or vancomycin use

Assessment of the impact of PNA FISH for rapid identification of coagulase-negative staphylococci in the absence of antimicrobial stewardship intervention

Conclusion

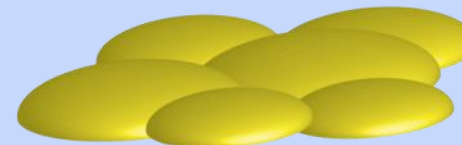
- New technologies for the rapid diagnosis of infection are advocated as a way to reduce inappropriate antimicrobial use, LOS, and healthcare costs.
- However, without real-time notification and/or administrative support and intervention, those benefits may not be realized

Yeast Traffic Light[®] PNA FISH[®]



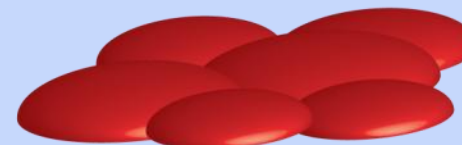
C. albicans or *C. parapsilosis*

OR

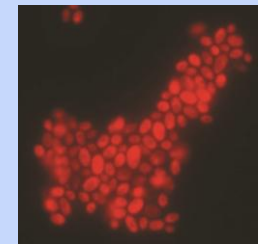
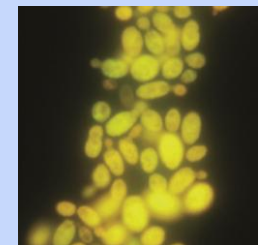
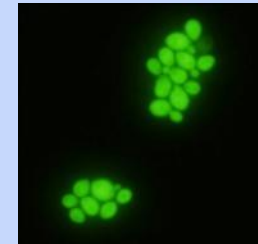


C. tropicalis

OR



C. glabrata or *C. krusei*



ASP and New Diagnostic Tests

Timing is Everything!

- The fastest test has little value if the results are not acted upon in a timely fashion
- Rapid diagnostic tests for SAB, candidemia shortens the time to optimal therapy, reduces LOS, and decreases overall cost
- ASP should focus on disease management (Big Picture) rather than only antimicrobial management (Little Picture)



Infectious Diseases Resources for the iPhone

Richard L. Oehler,¹ Kevin Smith,² and John F. Toney¹

¹Division of Infectious Diseases and International Medicine and ²Department of Internal Medicine, University of South Florida Co

Modern technology has revolutionized the clinician's ability to have vast information resources available literally at one's fingertips. The advent of the smartphone—an integration of the mobile phone with an ultraportable computer, web browser, multimedia player, and camera, has given clinicians the capability to merge their information and communication resources into one compact handheld instrument. Apple's iPhone, and its sister device, the iPod touch, with a combined customer base of more than 50 million users and more than 100,000 downloadable applications, are now the leading handheld platforms for medical personnel to access personal information, medical reference, clinical data, and medically oriented “apps” on the go. The purpose of this article is to provide an overview of some of the diverse infectious diseases-oriented resources available to the iPhone/iPod touch user.

Popular ID Medical “apps”



My observations:

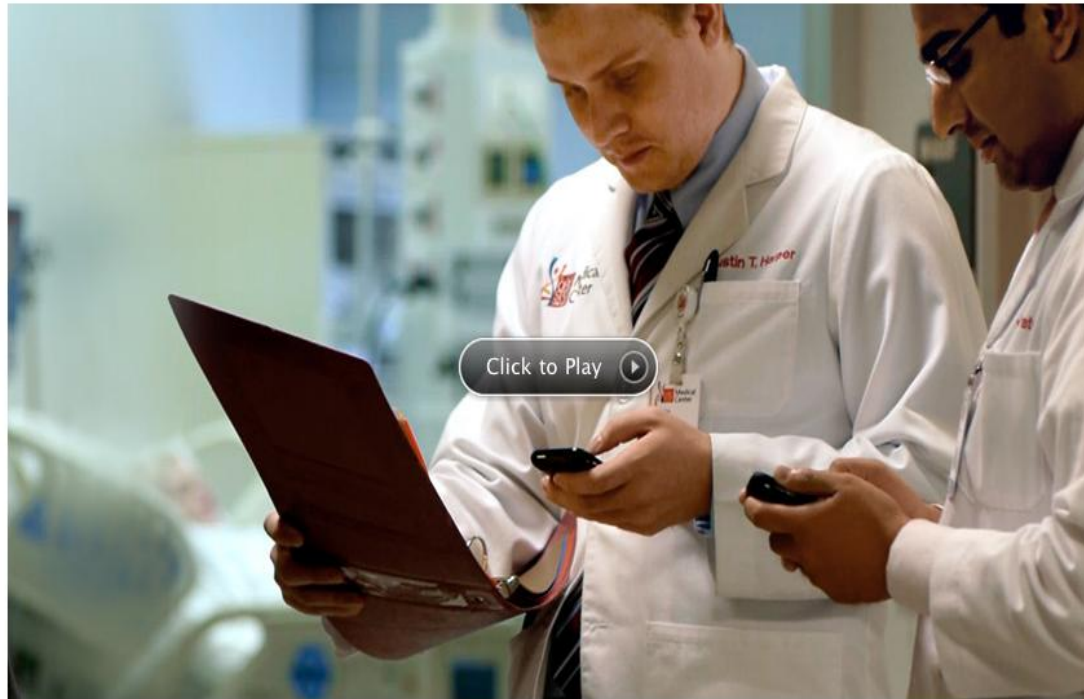
The antibiotic information was “package insert”

You can look up a disease, drug therapy, diagnosis but its not integrated.

Nothing specific to our patients at OSU

My conclusion:

Develop an app that could help teach the appropriate way to manage STAB at OSUMC



Taking lecture podcasts mobile with iPod touch.

iPod touch enables medical students at Ohio State University to listen to lecture podcasts on their own time. This allows for a deeper understanding of the course material and inspires professors to transform their class time into more interactive discussion sessions.

Products they use



iPod touch and iPhone



STAB-IT

Staph aureus bacteremia is terrible



Epidemiology

Microbiology

Diagnosis

Management

Antibiotics

Cases Studies

Clinical Pearls

ASP is first to develop “app” based learning and first to use iPads on rounds to educate health care providers and patients



Why STAB-IT?

OSUMC study



- **113 bacteremic patients identified** (April 2007- March 2008)
All patients were NOT optimally managed
- 15% with recurrent bacteremia did not have documented clearance of bacteremia prior to discharge
- “It’s a contaminant” no treatment
- 12% re-admitted for STAB within 90 days
- 20% had subtherapeutic vanco levels
- 60% consult an ID MD
consult not generated till late in the course

There's an *app* for that!



Index Of All Podcasts		
Title	Author	Subject
A		
A Global Swarming: Infectious Diseases and Climate Change	Richard L. Oehler, MD	October 23, 2009
Aesthetic Medicine and Infectious Complications	Robert Casanas, MD	February 25, 2008
Aminoglycosides: The Basics of Dosing	Linda Kam, PharmD	October 15, 2009
Antibiotic Review: Beta Lactams		

Podcasts
April 3, 2010 Glycopeptide Resistance and MRSA Robert C Moellering, MD
March 30, 2010 Microbial Pathogenesis Update John Greene, MD
March 30, 2010 Gram Negative susceptibility Testing John Toney, MD
March 3, 2010 H1N1: The Mortality in Pregnancy and Beyond John Greene, MD
October 31, 2009 MRSA: From Humanosis to

Social Media in S. Africa

cellphones for HIV

- Only 77 million own computers
- 333 million own cellphones
 - Use text messaging- SMS
increases adherence to ART
reduce loss to follow up
- Instant messaging (Mxit) Stellenbosch University
350 million messages a day
27 million users (more than Facebook!)

The Stewardship Goal

