Assessment of Implementation of a Rapid Blood Culture Diagnostic Panel at a Veterans Affairs Medical Center

U.S. Department of Veterans Affairs
Veterans Health Administration
VA North Texas Health Care System

Jordan Chiasson, PharmD[1]; Tomasz Jodlowski, PharmD, BCPS-AQ ID[1;]; James B. Cutrell, MD[2,3]; Winter Smith, PharmD, BCPS[4]; Marcus Kouma, PharmD, BCPS[1]

[1]Pharmacy Service; VA North Texas Health Care System; Dallas, TX; [2]Medical Service, VA North Texas Health Care System, Dallas ,TX; [3]Assistant Professor, Department of Medicine, UT Southwestern; Dallas, TX; [4]University of Texas at Tyler – Tyler, TX

TEXAS TECH UNIVERSITY HEALTH SCIENCES CENTER
Jerry H. Hodge School *of* Pharmacy

BACKGROUND

- Rapid blood culture diagnostics can improve patient outcomes, particularly when paired with robust interventions such as 24/7 stewardship coverage [1,2]
- We sought to determine the clinical impact of a rapid blood culture identification (BCID) panel (BioFire® FilmArray Multiplex PCR) in an established antimicrobial stewardship program (ASP)
- In addition to clinician education, BCID results were reviewed by the ASP team during weekday business hours, for an average of 2 hours daily based on availability

OBJECTIVES AND STUDY DESIGN

Study Objective

This retrospective cohort study evaluated patients treated at VA North Texas Healthcare System (VANTHCS) to determine the clinical impact of the implementation of a rapid blood culture identification panel on time to optimal antimicrobial therapy, length of hospital stay, and mortality.

Study Design

Retrospective cohort study conducted at a single VA medical center during the study period:

- *Pre-intervention*; prior to BCID implementation
  - March 2017 through June 2017
- *Post-intervention*; after BCID implementation
  - March 2018 through June 2018

Chart review performed using VA medical electronic health records on patients identified through microbiology data.

Inclusion Criteria	Exclusion Criteria
• Age ≥ 18 years • Patients admitted with at least one positive blood culture for either bacterial or yeast isolates	• Death or discharge within 24 hours of positive culture result • Polymicrobial blood cultures

STUDY ENDPOINTS

Primary Endpoint: Time to Optimal Therapy

Defined as time from blood culture draw to one of the following:

- Escalation from inappropriate therapy to broader agent(s)
- De-escalation from broad spectrum therapy to targeted agent(s)
- Discontinuation of therapy due to identified organism being an identified contaminant
- Optimization of regimen to preferred antimicrobial agent based on consensus guidelines

Secondary Endpoints:

Time to effective therapy, total days of therapy (DOT), DOT of select antimicrobials, length of stay, 30-day mortality and readmission rates.

RESULTS

Figure 1 Patient Inclusion

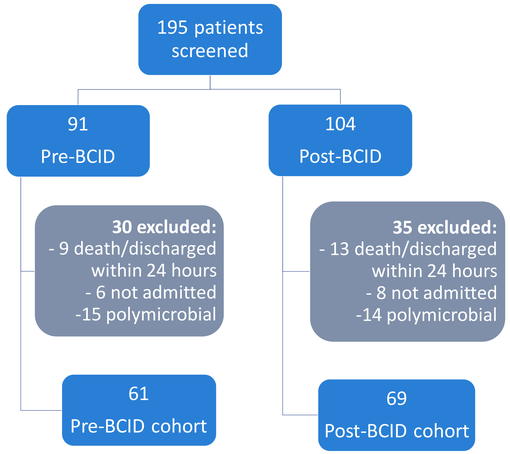


Figure 2 Suspected Sources of Infection

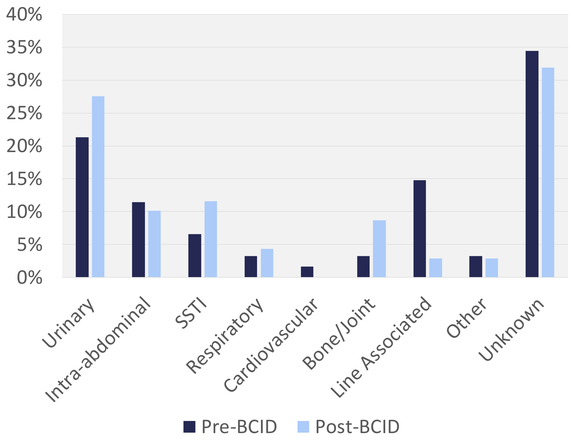


Table 1 Baseline Characteristics

Characteristic	Pre-BCID (n=61)	Post-BCID (n=69)	p-value
Age median (IQR)	67 (63-73)	67 (61-72)	0.596
Sex, Male % (n)	98% (60)	96% (66)	0.372
Race % (n)			
White	54% (33)	57% (39)	0.781
African American	36% (22)	39% (27)	0.719
Other	10% (6)	4% (3)	0.219
Baseline SCr > 1.5 mg/dl % (n)	25% (15)	23% (16)	0.852
Active Cancer % (n)	15% (9)	7% (5)	0.168
Causative Organism % (n)			
Gram-positive	52% (32)	51% (35)	0.843
Gram-negative	46% (28)	46% (32)	0.684
Yeast	2% (1)	3% (2)	0.488
MDRO History* % (n)	16% (10)	23% (16)	0.334

*Multidrug resistant organism – MRSA, VRE, ESBL

Table 2 Clinical Outcomes

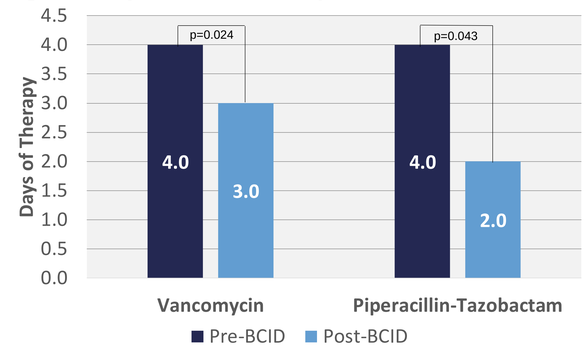
Outcome	Pre-BCID (n=61)	Post-BCID (n=69)	p-value
Time to Optimal Therapy hours, median (IQR)	**82.9 (12.8 -99.8)**	**33.9 (11.2-64.8)**	**0.005**
Time to Effective Therapy hours, median (IQR)	6.2 (2.1 – 16.7)	2.6 (1.1 -15.5)	0.294
Length of hospitalization days, median (IQR)	11 (8-19)	10 (6-13)	0.059
Total days of therapy; days, median (IQR)	8 (6-14)	9 (6-12)	0.332
30 day mortality % (n)	11.5% (7)	4.3% (3)	0.128
30 day readmission rate % (n)	19.7% (12)	10.1% (7)	0.125

Table 3 Days of Therapy of Select Antimicrobials

Days of Therapy Median days (IQR)	Pre-BCID (n=61)	Post-BCID (n=69)	p-value
Vancomycin	4 (2-5)	3 (1-4)	0.024
Piperacillin/tazobactam	4 (0-5)	2 (0-4)	0.043
Cefepime	0 (0-0)	0 (0-0)	-
Meropenem	0 (0-0)	0 (0-0)	-
Ertapenem	0 (0-0)	0 (0-0)	-
Fluoroquinolones	0 (0-1)	0 (0-0)	-

RESULTS (CONTINUED)

Figure 3 Days of Select Broad Spectrum Antimicrobials



DISCUSSION

- The present study was limited by its retrospective nature and lack of randomization, although besides slight differences in suspected sources of infection, baseline characteristics were fairly well balanced
- Concurrent other antimicrobials for other concurrent infections may affect impact of this intervention, as patients may have extended inpatient courses of antimicrobials for other infectious sources other than the bacteremia
- Even with more rapid optimization of antimicrobials, other patient outcomes were not negatively impacted as time to effective therapy, length of hospitalization, mortality and readmission rates were all reduced in the post-BCID cohort

CONCLUSIONS

- Introduction of BCID into the daily workflow of our ASP resulted in a significant reduction in time to optimal therapy for bloodstream infections
- DOT for select broad spectrum antibiotics were also significantly reduced
- This study highlights the potential benefit of rapid diagnostics without negative impact to patient care even in settings without resources for 24/7 ASP review

REFERENCES

1. Timbrook TT, Morton JB, McConeghy KW et al. The effect of molecular rapid diagnostic testing on clinical outcomes in bloodstream infections: a systematic review and meta-analysis. Clin Infect Dis. 2017; 64:15-23.
2. Banerjee R, Teng CB, Cunningham SA, et al. Randomized Trial of Rapid Multiplex Polymerase Chain Reaction-Based Blood Culture Identification and Susceptibility Testing. Clin Infect Dis. 2015;61(7):1071-80.