The Impact of a Rapid Diagnostic for Bloodstream Infections Without Antimicrobial Stewardship Intervention

#1862

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Background

- Bloodstream infections (BSIs) remain a significant cause of morbidity and mortality among hospitalized patients, often leading to prolonged length of stay and increased healthcare costs. [1,2,6]
- Early, appropriate antimicrobial therapy for BSIs is associated with improved outcomes, including decreased mortality.[3]
- Rapid molecular diagnostics facilitate earlier identification of organisms causing BSIs.[4,5]
- The impact on clinical outcomes and antimicrobial use with rapid testing is variable and often contingent upon antimicrobial stewardship (AS) review of results with guidance on antimicrobial prescribing.[7]
- The FilmArray© Blood Culture Identification (BCID) panel utilizes 27 total targets (3 are resistance genes) with results available within one hour of a positive Gram stain.[5]
- Given local resource constraints, we aimed to evaluate the impact of the BCID with template reports and results called to ordering providers in the absence of AS support.

Methods

Setting The University of Utah Hospital is a 530 bed academic medical center serving patients throughout the Intermountain West.

Design Pre-post quasi-experimental study

Patient Population Patients were included if they had at least one positive aerobic blood culture during the study period (3 months pre- and post-BCID). Patients with positive blood cultures within two weeks of a previously evaluable episode with the same organism were excluded.

Data Extracted Data collected included patient demographics, ward location, comorbidities, immune status, infectious diseases (ID) consultation, time of Gram stain, time of BCID result, empiric and definitive antimicrobial therapy and order times.

Outcomes We evaluated the impact of the BCID with customized template reports on time to appropriate antimicrobial therapy, defined as the narrowest spectrum antimicrobial while taking into consideration evidence-based treatment guidelines, patient allergies and need for polymicrobial coverage. Secondary outcomes included length of stay (LOS) and in-hospital mortality.

Results

Variable	Pre BCID (n = 144)	Post BCID (n = 134)	Significance
Median time to organism identification, hours	39.6	1.9	P<0.001
*Median time to appropriate antimicrobial therapy, days	2.0	1.5	p=0.007
ID Consult	52.1%	55.2%	NS
In-hospital mortality	12.5%	12.7%	NS
LOS, days	16.5	15.2	NS
ICU LOS, days	7.3	10.3	NS

BCID independently associated with shortened time to appropriate therapy on multivariable Cox proportional hazards modeling (HR=1.37, 95% CI 1.06-1.76, P=0.02).

Organisms Identified

Organism	N	%
Enterococcus	15	11.2%
Staphylococcus	29	21.6%
Staphylococcus aureus	26	19.4%
Streptococcus	9	6.7%
Streptococcus agalactiae	2	1.5%
Streptococcus pneumoniae	4	3.0%
Streptococcus pyogenes	3	2.2%
Pseudomonas aeruginosa	4	3.0%

Organism	N	%
Enterobacteriaceae	6	4.48%
Enterobacter cloacae	1	0.75%
Escherichia coli	21	15.67%
Klebsiella oxytoca	3	2.24%
Klebsiella pneumoniae	8	5.97%
Serratia marcescens	1	0.75%
Candida albicans	4	2.99%
Candida glabrata	1	0.75%
Candida parapsilosis	2	1.49%
Candida krusei	1	0.75%

Results

- 278 patients with BSIs were included: 144 pre-BCID and 134 post-BCID.
- Use of the BCID led to more rapid organism identification as compared to standard methodologies (1.9 vs. 39.6 hours, P<0.001).
- The BCID panel was associated with reduced median time to appropriate antimicrobial therapy (1.5 vs. 2 days, P = 0.007).
- BCID was independently associated with shortened time to appropriate antimicrobial therapy in multivariable Cox proportional hazards modeling adjusting for age, ICU admission, severity of illness and immunosuppression (HR=1.37, 95% CI 1.06-1.76, P=0.02).

Conclusions

- Use of the BCID panel led to more rapid organism identification and shorter time to appropriate antimicrobial therapy for BSIs.
- We found no impact of rapid organism identification on in-hospital mortality or length of stay. We hypothesize these improvements may only be achieved when the BCID is paired with AS real time review of results and intervention.
- Although AS review of BCID results paired with guidance on therapy is likely to contribute to further improvements in antimicrobial use and clinical outcomes, our results suggest use of the BCID with customized template result reports alone can improve antimicrobial therapy.
- Our findings support recommendations advocating for rapid diagnostic testing on blood specimens to optimize antimicrobial therapy.

References

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