

Impact of Multiplex Polymerase Chain Reaction (PCR) Testing and Automatic Infectious Disease Consultation in Patients with Gram-Negative Bacteremia

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BACKGROUND

- Strategies to improve early recognition and treatment of bacteremia are necessary to reduce mortality secondary to bacterial and fungal infections.
- The FilmArray[®] Blood Culture ID (BCID) Panel is an FDA approved multiplex PCR system that can detect up to 24 different bacterial and fungal pathogens and 3 antibiotic-resistant genes (i.e., *mecA*, *vanA/B*, and *KPC*)
- Rapid PCR testing has been shown to decrease the time required for pathogen identification, resulting in more rapid delivery of effective antimicrobial therapy.^{1,2}
- A growing body of evidence suggests that mandatory ID consultation for complicated infections results in greater adherence to evidence-based treatment guidelines, lower in-hospital mortality, and earlier discharge.³⁻⁵

OBJECTIVES

- **Primary** : To determine the impact of multiplex PCR testing and automatic ID consultation on in-hospital mortality in patients with gram-negative bacteremia
- **Secondary**: Overall and intensive care unit (ICU) length of stay (LOS), readmission within 30 days of discharge, total cost per case, and average time to speciation

METHODS

- **Study Design**: Retrospective, observational, cohort study
- **Site Description**: 433-bed tertiary care medical center
- **Timeline of Interventions**:
 - FilmArray[®] Blood Culture ID (BCID) Panel – Jan 2015
 - Automatic ID Consultation Policy – May 2015
- **Pre-Policy Cohort**: January 2014 – December 2014
- **Post-Policy Cohort**: June 2015 – April 2016
- **General Description of Cohorts**:
 - Adult inpatients with microbiological evidence of gram-negative bacteremia within 48 hours of admission

BCID PANEL & INTERPRETIVE GUIDELINES



Gram-Positive Bacteria

- *Enterococcus* sp.
- *L. monocytogenes*
- *Staphylococcus* genus
- *Staphylococcus aureus*
- *Streptococcus* genus
- *S. agalactiae*
- *S. pneumoniae*
- *S. pyogenes*



Gram-Negative Bacteria

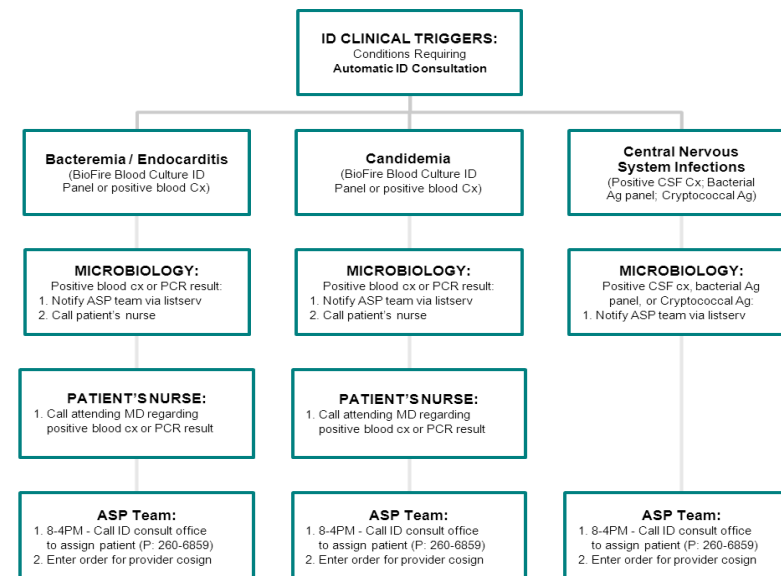
- *A. baumannii*
- *H. influenzae*
- *Neisseria meningitidis*
- *P. aeruginosa*
- *Enterobacteriaceae*
- *E. cloacae* complex
- *Escherichia coli*
- *Klebsiella oxytoca*
- *K. pneumoniae*
- *Proteus* sp.
- *S. marcescens*



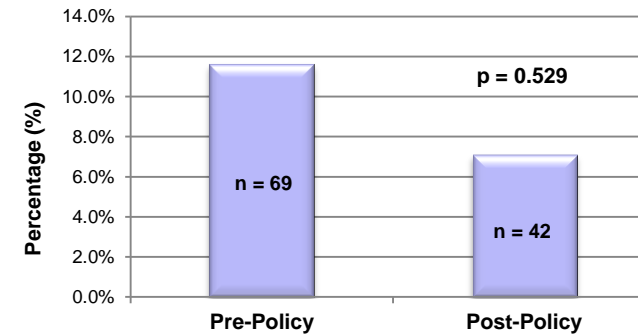
Yeast / Candida Species

- *Candida albicans*
- *Candida glabrata*
- *Candida krusei*
- *Candida parapsilosis*
- *Candida tropicalis*

AUTOMATIC ID CONSULTATION POLICY



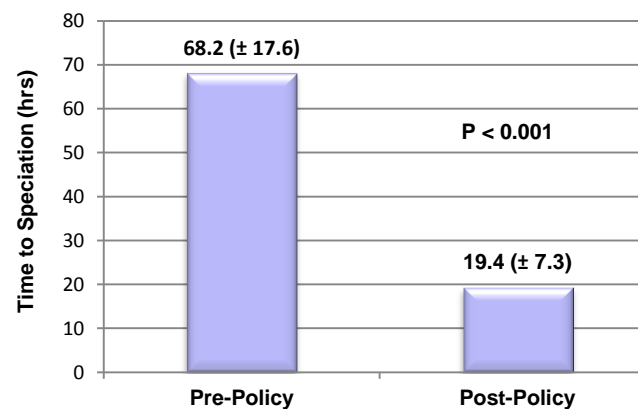
IN-HOSPITAL MORTALITY



SECONDARY OUTCOMES

	Pre-Policy	Post-Policy	P-value
Overall LOS, days (SD)	8.5 (5.8)	6.9 (5.0)	0.145
ICU LOS, days (SD)	6.8 (4.6)	4.4 (4.2)	0.122
30-day readmission, no. (%)	7 (11.5)	8 (20.5)	0.217
Total cost per case	\$12,559	\$9,032	0.101

AVERAGE TIME TO SPECIATION



SUMMARY

- A total of 111 patients were included in the study (69 patients in the pre-policy cohort and 42 patients in the post-policy cohort). Baseline characteristics were similar between groups.
- Non-significant reductions in all-cause, in-hospital mortality (11.6% vs. 7.1%, p = 0.529), overall LOS (8.5 vs. 6.9 days, p = 0.145), and ICU LOS (6.8 vs. 4.4 days, p = 0.122) were observed after policy implementation. Total cost per case was reduced by approximately \$3,527, but the difference was not statistically significant.
- After implementing the FilmArray[®] Blood Culture ID (BCID) Panel, overall time to speciation was reduced by approximately two days (68.2 hours vs. 19.4 hours, p < 0.001).

CONCLUSIONS

- Implementation of a multiplex blood culture PCR system at our facility reduced the time required for pathogen identification in patients with gram-negative bacteremia.
- When combined with automatic ID consultation, additional benefits may be seen, such as improved clinical and economic outcomes among patients with complicated infections.
- The lack of statistical significance with several outcomes that were measured in this study may be attributed to a relatively small sample size or a higher incidence of ESBL-producing organisms in the post-policy cohort.
- Additional studies are needed to determine the true impact of this combined approach to antimicrobial stewardship.

REFERENCES

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4. Schmitt et al. Infectious Diseases Specialty Intervention Is Associated With Decreased Mortality and Lower Healthcare Costs. *Clin Infect Dis.* 2014;58(1):22-28.
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