Improving Outcomes and Antibiotic Stewardship for Patients with Bacteremia (IOAS): A Quasi-Experimental Multicenter Analysis of Time to Optimal Therapy

A. A. Bhalodi[1], S. H. MacVane[1], M. A. Morgan[2] , M. A. Ben-Aderet[2], M. Madhusudhan[2], J. Kolev[2], R. K. Dare[3], E. Rosenbaum[3], K Wolfe[3], B. Ford[4], D. Ince[4], P. M. Kinn[4], K. M. Percival[4], R. M. Humphries[1]

[1]Accelerate Diagnostics, Inc., Tucson, AZ, [2]Cedars-Sinai Med. Ctr., Los Angeles, CA, [3]Univ. of Arkansas for Med. Sci., Little Rock, AR, [4]Univ. Of Iowa., Iowa City, IA

Contact:
Amira Bhalodi
abhalodi@axdx.com

Wednesday Jan 22, 2020

Poster #:04

ABSTRACT (MODIFIED)

Objective: Measuring impact of diagnostic technologies on patient care can be complex. Effect of antibiotic optimization for patients with bloodstream infections (BSI) was evaluated in the Accelerate PhenoTest™ BC kit (AXDX) registry program, with emphasis on time to optimal therapy (TTOT).

Methods: This multicenter, quasi-experimental study compares clinical and antimicrobial stewardship metrics, prior to and after implementation of AXDX, to evaluate the impact this technology has on patients with BSI. Laboratory and clinical data from hospitalized patients with BSI (excluding contaminants) were compared between two groups, one that underwent testing on AXDX (post-AXDX) and one that underwent alternative microorganism identification and susceptibility testing (pre-AXDX). Interim analysis of data collected from 3 centers was performed. Pre-AXDX methods for each of the 3 sites were: Verigene®, MALDI-TOF MS, and BD Phoenix™ at Hospital A; MALDI-TOF MS and VITEK® 2 at Hospital B; and MALDI-TOF MS, VITEK® 2, and Sensititre™ at Hospital C. All institutions had active antimicrobial stewardship programs throughout the study period. Primary outcome was TTOT; multiple linear regression analysis was performed to identify clinical factors associated with TTOT.

Results: 464 patients with BSI (239 pre-AXDX, 225 post-AXDX) were included in this analysis. Patient demographics, comorbidities, and severity of illness (median Pitt bacteremia score of 2) were similar between groups, as were distributions of gram negative (~60%), gram positive (~30%), and polymicrobial (~10%) BSI. The most prevalent gram-negative and gram-positive organisms were *E. coli* and *S. aureus*, respectively. Median TTOT was 1.75 days (interquartile range [IQR], 0.86-2.72) in the pre-AXDX group and 1.17 days (IQR, 0.53-2.05) in the post-AXDX group (P=0.003). Independent factors associated with shorter TTOT were BSI with AXDX on-panel organisms (P=0.01), absence of intravenous vasopressors (P=0.01), and post-AXDX group (P=0.01).

Conclusion: Implementation of AXDX improves antimicrobial stewardship in patients with BSI reducing both TTOT and unnecessary antimicrobial exposure.

OBJECTIVES

- The Accelerate Pheno™ system provides fast ID and AST of organisms that cause bacteremia. From a positive blood culture, the system identifies organisms within ~2 hours, and provides AST results in an additional ~5 hours.
- This Improving Outcomes and Antibiotic Stewardship (IOAS) study examines and compares data prior to, and following implementation, of the AXDX system across several hospital clinical microbiology laboratories to determine the effects of the AXDX system in treating bacteremia.
- The objective of this interim analysis is to compare the average time to optimal antibiotic therapy (considered the institution's most preferred treatment option for this patient based on AST, patient's condition and comorbidities, hospital policy, etc.) among patients with bloodstream infection, pre- and post-AXDX implementation.

Inclusion Criteria

- Positive blood culture deemed not to be a contaminant
- Hospitalized at the time of positive blood culture

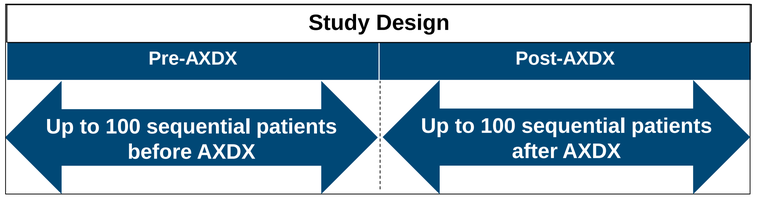
Exclusion Criteria

- Positive blood culture in the 14 days prior to positive blood culture collection that contained the same organism
- Patient expired less than 48 hours of positive blood culture

METHODS

- This is an interim analysis of a multicenter, quasi-experimental study designed to compare clinical and antimicrobial stewardship metrics, before and after implementation of AXDX, to evaluate the impact of AXDX on patients with BSI.
- Optimal therapy was assessed during the first 96 hours after blood culture positivity

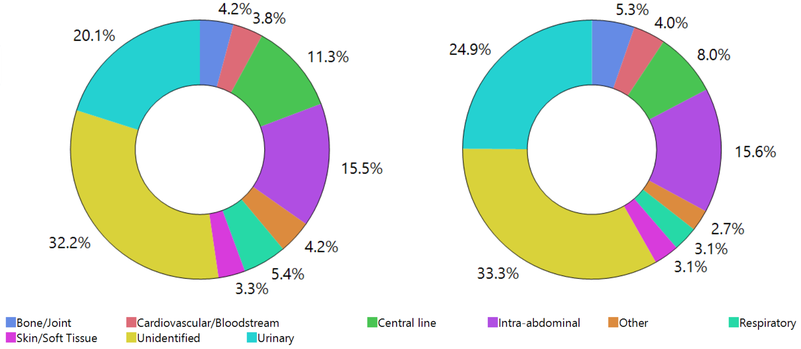
Study Design



RESULTS

- 464 patients with BSI evaluated (239 Pre-AXDX, 225 Post-AXDX)

Source of Bacteremia



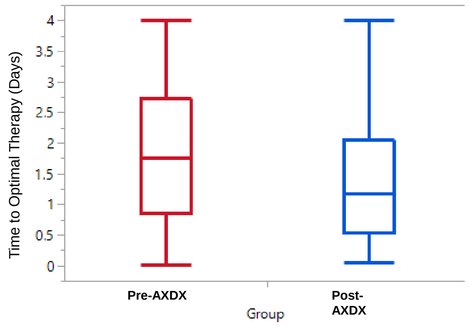
Patient Demographics and Comorbidities

Variable	Pre-AXDX (n=239)	Post-AXDX (n=225)	*P*
Age, y, median (IQR)	62 (47-75)	64 (46.5-74.5)	1.0
Male, n (%)	125 (52.3%)	122 (54.2%)	0.7
Charlson Comorbidity Score, mean ± S.D.	5 (3-8)	5 (3-8)	0.5
Pitt Bacteremia Score, median (IQR)	2 (1-3)	2 (0-3)	0.5
Vasopressor use, n (%)	49 (58.3%)	35 (41.7%)	0.2
ICU admission, n (%)	92 (38.5%)	81 (36.0%)	0.6

RESULTS

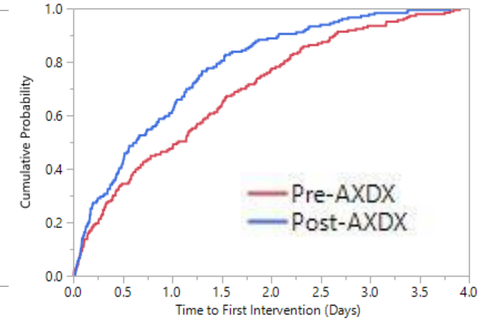
Time to optimal therapy [TTOT] (n=266)

- Median TTOT reduced by ~14 hours (*p*=0.003):
  - Pre-AXDX: 1.75 days (42.0 hours) (IQR, 0.86-2.72)
  - Post-AXDX: 1.17 days (28.2 hours) (IQR, 0.53-2.05)



Time to first intervention [TTFI] (n=362)

- Median TTFI reduced by ~10 hours (*p*=0.001)
  - Pre-AXDX: 1.06 days (25.5 hours) (IQR, 0.31-1.93)
  - Post-AXDX: 0.64 days (15.3 hours) (IQR, 0.18-1.30)



- Independent factors associated with shorter TTOT were:
  - BSI with AXDX on-panel organisms (*p*=0.01)
  - Absence of intravenous vasopressors (*p*=0.01)
  - Post-AXDX group (*p*=0.01)

Outcomes

Variable	Pre-AXDX (n=239)	Post-AXDX (n=225)	*P*
30-day mortality, n (%)	15 (6.3%)	10 (4.4%)	0.4
Post-blood culture length of stay, d, median (IQR)	7.1 (4.2-12.1)	7.2 (4.3-14.1)	0.5

CONCLUSIONS

- The implementation of the Accelerate Pheno System improved antimicrobial stewardship in patients with BSI by reducing both TTOT and TTFI.
- Additional patients are needed to sufficiently power clinical outcomes such as LOS and mortality.
- Enrollment with additional patients and sites is currently ongoing.

REFERENCES

1. Arefian H, Heublein S, Scherag A, Brunkhorst FM, Younis MZ, Moerer O, Fischer D, Hartmann M. 2017. Hospital-related cost of sepsis: A systematic review. J Infect. 74(2):107-117. doi: 10.1016/j.jinf.2016.11.006.
2. Bauer KA, Perez KK, Forrest GN, Goff DA. 2014. Review of rapid diagnostic tests used by antimicrobial stewardship programs. Clin Infect Dis Oct 15;59 Suppl 3:S134-45.

This study was funded by Accelerate Diagnostics, Inc.