Evaluating the Impact of the Accelerate PhenoTest® BC Kit (AXDX) on Patients with Bloodstream Infections Receiving Ineffective Empirical Antibiotic Treatment: IOAS Study Experience of 4 Hospitals

Contact: Shawn MacVane
smacvane@axdx.com
Abstract number: 664

S. H. MacVane[1], A. A. Bhalodi[1], R. M. Humphries[2], M. A. Ben-Aderet[3], J. Kolev[3], M. Madhusudhan[3], M. A. Morgan[3], R. K. Dare[4], E. R. Rosenbaum[4], K Wolfe[4], D. N. Bremmer[5], D. R. Carr[5], T. L. Walsh[5], P. M. Kinn[6], K. M. Percival[6], D. Ince[6], B. Ford[6]

[1]Accelerate Diagnostics, Inc., [2]Vanderbilt University Medical Center, [3]Cedars-Sinai Med. Ctr., [4]Univ. of Arkansas for Med. Sci., [5] Allegheny Health Network, Pittsburgh, PA, [6]Univ. Of Iowa., Iowa City, IA

ABSTRACT

Background: Bloodstream infections (BSI) are a leading cause of morbidity and mortality in hospitalized patients. Ineffective empirical antibiotic treatment (IET) is associated with higher mortality and is one of the only potentially modifiable risk factors. The objective of this arm of the Improving Outcomes and Antibiotic Stewardship (IOAS) study was to measure the effect of AXDX on antibiotic modifications and 30-day all-cause mortality among patients with BSI who did not receive appropriate empirical antibiotic treatment.

Materials/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 and one that underwent alternative organism identification and susceptibility testing (SOC). An interim analysis of patients who received IET (defined as ≥ 1 pathogen isolated from the index positive blood culture that was not susceptible to all antibiotics administered prior to blood culture positivity) from 4 centers was performed.

Results: Of 750 patients with BSI, 182 (24.3%) received IET [SOC: 82/377 (21.8%) vs. AXDX: 100/373 (26.8%); P=0.11]. Patient demographics, comorbidities, and Pitt bacteremia score (PBS) were similar between SOC and AXDX patients who received IET, as were the distributions of gram-negative (71%) and gram-positive (20%) BSI. Median time (hours) to effective therapy [SOC: 12.6 (2.7-37.1) vs. AXDX: 5.9 (2.9-13.6); P=0.027] was faster for patients with IET in the AXDX group. The percentage receiving effective antibiotic treatment at 24 hours following blood culture positivity was significantly higher in AXDX (83.0%) than in SOC (64.6%; P=0.005). Among patients who received IET, 30-day mortality was lower in AXDX (6.0%; 6/100) than in SOC (15.9%; 13/82; P=0.03). A PBS ≥4 (adjusted odds ratio [aOR], 14.33; 95% CI, 4.67-44.03) and use of SOC (aOR, 4.29; 1.36-13.46) were independent risk factors for 30-day mortality.

Conclusions: In patients who receive IET for BSI, use of AXDX was associated with decreased time to effective therapy and 30-day mortality. These findings underscore the effect of fast organism identification & phenotypic AST on optimizing antibiotic therapy & improving patient care.

BACKGROUND

- 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.

OBJECTIVES

- Examination and comparison of data prior to, and following implementation, of the AXDX system to determine effects of the AXDX system in treating bacteremia.
- Performance of an interim analysis of patients from 4 centers who received IET (defined as ≥ 1 pathogen isolated from the index positive blood culture that was not susceptible to all antibiotics administered prior to blood culture positivity).

METHODS

- Laboratory and clinical data from hospitalized patients with BSI were compared between two groups, one that underwent testing on AXDX and one that underwent alternative organism identification and susceptibility testing (SOC).

Inclusion Criteria
- ✓Positive blood culture deemed not to be a contaminant
- ✓Hospitalized at the time of positive blood culture
- ✓Received ineffective empirical antibiotic treatment (IET)

Exclusion Criteria
- × Positive blood culture < 14 days prior to positive blood culture collection that contained the same organism
- × Patient expired < 48 hours of positive blood culture

RESULTS

- Patient demographics, comorbidities, and Pitt bacteremia score (PBS) were similar between SOC and AXDX patients who received IET (Table 1), as were the distributions of gram-negative (71%) and gram-positive (20%) BSI.
- Time to effective therapy (Figure 1) and other antimicrobial modifications (Table 2) occurred faster for patients with IET in the AXDX group.
- Among patients who received IET, 30-day mortality was lower in AXDX (6.0%; 6/100) than in SOC (15.9%; 13/82; *P*=0.03).
- Pitt Bacteremia Score ≥4 and SOC group were independent risk factors for 30-day mortality (Table 3)

Table 1. Patient Characteristics

Variable	SOC (n=82)	AXDX (n=100)	*P*
Charlson Comorbidity Score	5.4 ± 3.1	5.5 ± 3.4	0.69
Pitt Bacteremia Score	2.1 ± 2.1	2.5 ± 2.2	0.25
ICU admission, n (%)	17 (20.7)	22 (22.0)	0.84

Data are reported as mean ± SD, unless otherwise noted

RESULTS

Fig 1. Kaplan-Meier analysis of time to effective therapy

Median time (hours) to effective therapy: SOC: 12.6 (2.7-37.1) vs AXDX: 5.9 (2.9-13.6)

***P*=0.027**

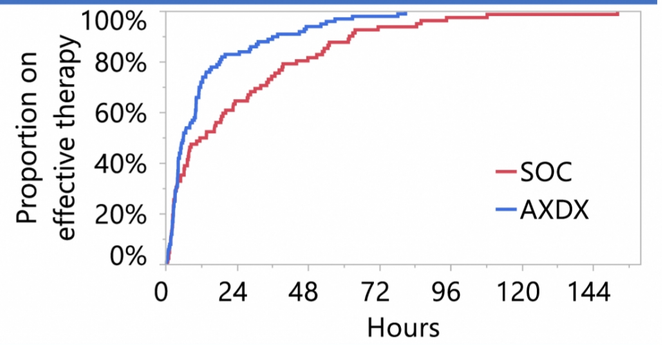

Table 2. Antimicrobial modifications

Parameter*	SOC (n=82)	AXDX (n=100)	Difference	*P*
Achievement of effective therapy within 24h, n (%)	53 (64.6)	83 (83.0)	18.4%	**0.005**
Time to first gram-positive antimicrobial modification	18.2 (7.6-44.7)	9.9 (4.0-28.4)	8.3 h	0.10
Time to first gram-negative antimicrobial modification	25.4 (6.3-53.2)	10.2 (4.0-20.4)	15.2 h	**0.004**
Time to first de-escalation	44.4 (25.5-59.1)	31.1 (17.3-49.2)	13.3 h	**0.05**
Time to optimal therapy	40.5 (17.1-62.9)	12.4 (5.3-12.4)	28.1 h	**<0.0001**

**Evaluated at 96h after blood culture positivity and reported as median (IQR), unless otherwise noted*

Table 3. Risk factors for 30-day mortality in patients who received IET*

Factor	Adjusted Odds Ratio (95% Conf. Int.)	*P*
SOC group	4.29 (1.36-13.46)	0.013
Pitt Bacteremia Score ≥ 4	14.33 (4.67-44.03)	<0.0001

*As determined by multivariable logistic regression

CONCLUSION

In this interim analysis of patients who received IET for BSI, use of AXDX was associated with decreased time to effective therapy and 30-day mortality. Additional patient enrollment is ongoing.

This study was funded by Accelerate Diagnostics, Inc.