Impact of Discrepant Rapid Diagnostic Test (RDT) Results on Antimicrobial Stewardship Program (ASP) Interventions in Patients with Bloodstream Infections (BSI) due to Gram-Negative Bacilli (GNB)

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BACKGROUND

- Rapid diagnostic tests (RDT) paired with ASP intervention project to improve time to definitive institutional-preferred antimicrobial therapy (IPT).
- Accelerate Pheno™ (AXDX) is a RDT which provides organism identification (ID) within 2 hours and antimicrobial susceptibility testing (AST) within 7 hours.
- Interim analysis of our first year of deployment demonstrated AST results available a median 29.4 hours earlier for on-panel organisms and patients received IPT a median of 21.2 hours earlier compared to a historical period.
- Few data describe the impact of discrepant RDT results from standard of care (SOC) susceptibility methods.

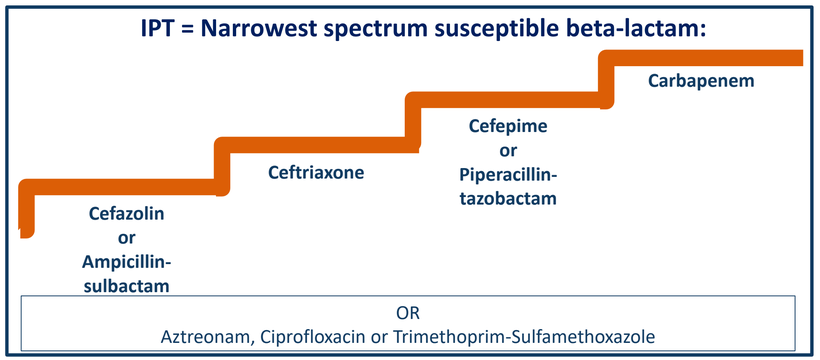
OBJECTIVE

- Evaluate the prescribing outcomes for discrepant results following the first year of AXDX + ASP implementation.

METHODS

- **Study Design**: Retrospective review of consecutive, non-duplicate blood cultures for adult inpatients with GNB BSI following combined RDT + ASP intervention (July 2018 – July 2019).
- **Exclusion criteria**: 1) No GNB ultimately isolated; 2) non-inpatient at time of Gram stain; 3) discharge, death or comfort measures only within 24 hours of gram stain.
- **Intervention**: RDT results were emailed to ASP pharmacists and physicians and reviewed during business hours along with chart review. ASP provided direction to clinical microbiology on RDT results to release (all AST, modified AST, ID only, withhold) and contacted treating team with results and accompanying antimicrobial recommendations. SOC identification (ID; Vitek® MS/Vitek® 2) and antimicrobial susceptibility testing (AST; Trek Sensititre™) followed RDT as the reference standard.
- **Discrepancy analysis:** The following situations were reviewed – RDT provided 1) no or 2) incorrect ID for on-panel organisms, 3) Missed polymicrobial specimen for on-panel organisms, 4) RDT ID without AST results, or a disagreement in designation of IPT as follows: 5) False susceptible – IPT by RDT found to be non-susceptible on SOC. 6) False resistance – Narrower-spectrum agent found to be susceptible by SOC.

Figure 1. Institutional Preferred Therapy (IPT) Definition



RESULTS

Table 1. Discrepancy in antimicrobial susceptibility results

Antimicrobial Agent	Total no. susceptibility tests	Minor errors	Major errors	Very major errors
Amikacin	192	0	0	0
Ampicillin-sulbactam	154	35 (23)	0	0
Aztreonam	180	4 (2)	1 (0.5)	2 (1)
Cefazolin	147	18 (12)	0	0
Cefepime	191	16 (8)	2 (1)	1 (0.5)
Ceftazidime	192	30 (16)	3 (2)	1 (0.5)
Ceftriaxone	180	4 (2)	0	3 (2)
Ciprofloxacin	193	6 (3)	0	0
Ertapenem	180	0	0	0
Gentamicin	192	4 (2)	2 (1)	0
Meropenem	189	3 (2)	0	0
Piperacillin-tazobactam	193	18 (9)	4 (2)	1 (0.5)
Tobramycin	192	3 (2)	0	0
All agents	**2375**	**141 (6)**	**12 (0.5)**	**8 (0.3)**
All beta-lactams	**1606**	**128 (8)**	**10 (0.6)**	**8 (0.5)**

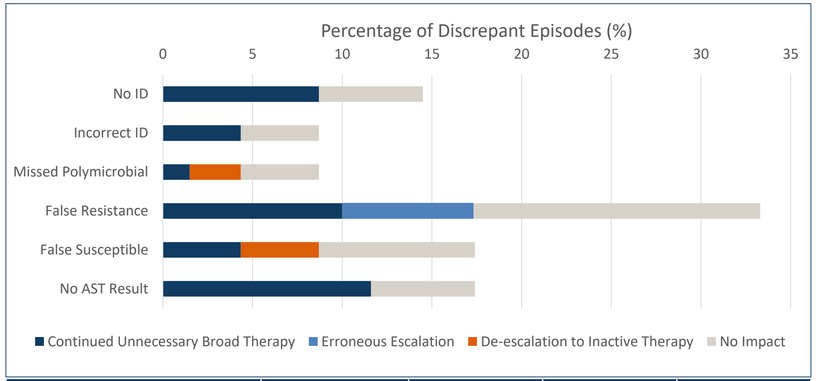
All values expressed as No. (% row). **Minor errors**: intermediate by one method and susceptible or resistant by the other method. **Major errors**: resistant by RDT and susceptible by SOC method. **Very major errors**: susceptible by RDT and resistant by SOC method.

Table 2. Antimicrobial Stewardship Program Interventions

Intervention	Number (% cases)	-
AXDX Results Released (n = 196)[1]		
Full	160 (82)	-
Partial	19 (10)	
Withheld	17 (9)	
Recommendations (n = 235)[2]	Number (% cases)	N (%) accepted[3]
De-escalate GN therapy	82 (35)	57 (70)
Escalate GN therapy	25 (11)	25 (100)
Add non-GN therapy	8 (3)	7 (88)
Stop non-GN therapy	20 (9)	15 (75)
ID consultation	25 (14)[4]	16 (64)

[1]Excluding cases without results to release (n = 39) or ASP review (n = 15).
[2]Excluding cases without ASP review (n = 15).
[3]Accepted within 24 hours of RDT result
[4]Out of n = 174 episodes where ID consult service/ID attending on General Medicine service not already following.
Abbreviations: GN, Gram-negative; ID, Infectious Diseases

Figure 2 / Table 3. Discrepant RDT Results and Outcomes



Discrepancy Type	Continued Unnecessary Broad Therapy	Erroneous Escalation	De-escalation to Inactive Therapy	No Impact
Identification				
No ID* (10)	6 (60)	-	-	4 (40)
Incorrect ID (6)	3 (50)	-	-	3 (50)
Missed Polymicrobial* (6)	1 (17)	-	2 (33)	3 (50)
Susceptibility				
False Resistance (23)	7 (30)	5 (22)	-	11 (48)
False Susceptible (12)	3 (25)	-	3 (25)	6 (50)
No AST Result (12)	8 (67)	-	-	4 (33)
Total (69)	28 (41)	5 (7)	5 (7)	31 (45)

Data presented as n (% of row).
*On-panel organisms only
Abbreviations: ID; Identification, AST; Antimicrobial susceptibility testing

DISCUSSION

- During the first year of deployment, 69/250 (28%) of episodes had a discrepancy in organism ID or AST, and a prescribing impact occurred in 55% of discrepant cases.
- 5/25 (20%) recommendations to escalate therapy were unnecessary and 5/82 (6%) recommendations to de-escalate were incorrect.
- In-hospital mortality occurred in 4 cases, none of which followed an inappropriate transition to inactive therapy.
- Although uncommon (2% of total cases), the potential for de-escalation to inactive therapy following RDT results warrants further investigation. Whether or not erroneous de-escalation influenced the acceptance of subsequent ASP recommendations was not evaluated.
- Though the AXDX platform provides rapid ID and AST results, close coordination with Clinical Microbiology and continued ASP follow up are needed to account for potential errors in rapid susceptibility testing.

Disclosures: Dr. Amy Mathers serves as a consultant for Accelerate Diagnostics, Inc. All other authors have nothing to disclose with commercial entities that may have a interest in the subject matter of this presentation.