detection and for influenza detection in this cohort and could have utility in hospital emergency departments.

Table 1. Diagnostic accuracy of FebriDx in distinguishing viral ARI from non-viral ARI

	All patients, n=111	Excluding Rhinovirus and Mycoplasma, n=97
Sensitivity	64%	75%
Specificity	88%	91%
PLR	4.5	7.5
NLR	0.4	0.3
PPV	88%	92%
NPV	59%	72%
Accuracy	72%	81%

PLR, positive likelihood ratio. NLR, negative likelihood ratio. PPV, positive predictive value. NPV, negative predictive value

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655. Detection of Antibiotic Resistance Genes in Clinical Samples using T2 Magnetic Resonance

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Background. Antibiotic-resistant bacteria are spread through selective pressure from the use of broad-spectrum empirical therapies, mobile genetic elements that pass resistance genes between species, and the inability to rapidly and appropriately respond to their presence. Resistance gene identification is often performed with post culture molecular diagnostic tests. The T2Resistance Panel, which detects methicillin resistance genes *mecA/C*; vancomycin resistance genes *vanA/B*; carbapenemases bla_{KPC}, bla_{OXA-48},bla_{NDM}, bla_{VIM}, and bla_{IMP}; AmpC β-lactamases bla_{CMY} and bla_{DHA}; and extended-spectrum β-lactamases bla_{CTX-M} directly from patient blood samples, is based on T2 magnetic resonance (T2MR), an FDA-cleared technology with demonstrated high sensitivity and specificity for culture-independent bacterial and fungal species identification. Here we report the clinical performance of T2MR detection of resistance genes directly from patient blood samples.

Methods. Patients with a clinical diagnosis of sepsis and an order for blood culture (BC) were enrolled in the study at two sites. BCs were managed using standard procedures and MALDI-TOF for species identification. Resistance testing with the T2MR assay was performed on a direct patient draw and compared with diagnostic test results from concurrent BC specimen and BC specimen taken at other points in time. The potential impact on therapy was evaluated through patient chart review.

Results. T2MR detected the same resistance genes as detected by post culture diagnostics in 100% of samples from concurrent blood draws. Discordant results occurred when T2MR was taken ≥48 hours after BC for patients on antimicrobial therapy. The average time to positive result was 5.9 hours with T2MR vs. 30.6 hours with post-culture molecular testing.

Conclusion. The T2Resistance Panel detected antibiotic resistance genes in clinical samples and displayed agreement with post culture genetic testing. T2MR results were achieved faster than culture-dependent diagnostic testing results and may allow for an earlier change from empiric to directed therapy. The use of culture-independent diagnostics like T2MR could enable a quicker response to antibiotic-resistant organisms for individual patients and developing outbreaks.

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656. Prioritizing Gram-Negative Bacteremia (GNB) Cases for Rapid Detection by β-Lactam Resistance (BLR) and Patient Outcomes

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Background. GNB is associated with significant morbidity and mortality. The availability of rapid diagnostic tests (RDTs) provides an opportunity to improve outcomes. Our goal was to review GNB and its empiric treatment at our center in order to devise rational approaches to diagnostic stewardship and use of RDTs.

Methods. All patients with GNB from 2010 to 2018 were evaluated. BLR was defined by 2019 CLSI breakpoints; phenotypes are shown in Table 1.

Results. A total of 2795 GNB cases were included (Table 2); 57% occurred within the first 24 hours of hospitalization and 29.3% in the ICU. The median length of stay (LOS) was 12 days; 17.2% of patients were re-admitted within 30 days. Fourteen- and 30-day mortality rates were 13.7% and 19.5%, respectively. Rates of death were higher (30 days; 26.3% vs. 17.1%; $P < 0.001$) and median LOS longer (17 vs. 11 days; $P < 0.001$) among patients with BLR compared with susceptible GNB. Thirty-day mortality rates were highest for CRE (30.1%) and BLR *P. aeruginosa* (BLR-Pa; 32.8%, Figure 1). 47.7% of BLR GNB were non-CRE/ESBL, which demonstrated higher mortality rates than CRE/ESBL (30 days; 27.6% vs. 21.2%; $P = 0.048$). Most common empiric regimens prescribed were piperacillin–tazobactam (TZP; 50.3%), cefepime (FEP; 24.2%), carbapenem (9.3%), or other agents (16.2%). 21.6% of GNB patients received inactive empiric treatment (IET). Empiric TZP (21.9%) was more likely to be inactive than FEP (17.5%; $P = 0.05$), but not a carbapenem (20.7%; P = NS). 57.6% of patients with inhibitor-resistant Enterobacteriaceae (IRE) received TZP empirically. Receipt of IET was associated with higher rates of death (30 days; 22.5% vs. 16.7, $P = 0.03$) and longer LOS (14 vs. 11 days; $P < 0.001$) than receipt of active ET. Rates of IET varied by pathogen (Figure 1).

Conclusion. IET is common against BLR GNB and associated with poor pt outcomes, highlighting the potential for RDTs and diagnostic stewardship teams (DSTs) to improve care. Genotypic RDTs detect most CRE/ESBL, but may miss nearly 50% of BLR GNB cases at our center. BLR-Pa and IRE are pathogens associated with prolonged LOS, and high rates of IET and death. These pathogens could be detected earlier by phenotypic RDTs and prioritized by DSTs to optimize early treatment regimens.

Table 1. Definitions of β-lactam resistant (BLR) phenotypes

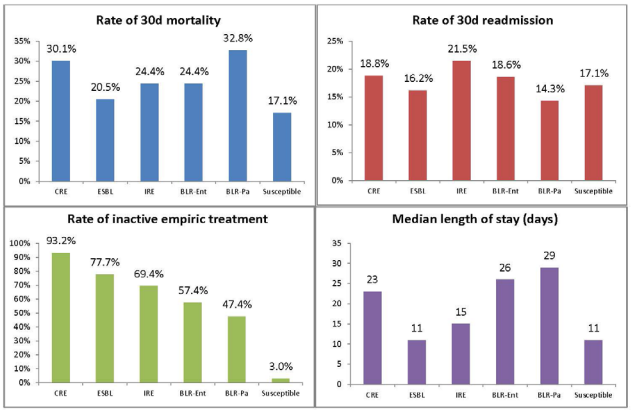
Resistance phenotype	Definition
Carbapenem-resistant Enterobacteriaceae (CRE)	Non-susceptible to ertapenem, meropenem, and/or imipenem
Extended-spectrum β-lactamase (ESBL)	Non-susceptible to aztreonam and/or ceftriaxone
Inhibitor-resistant Enterobacteriaceae (IRE)	Non-susceptible to piperacillin/tazobactam Susceptible to ceftriaxone
BLR Enterobacter species (BLR-Ent)	Non-susceptible to ceftriaxone and/or cefepime Susceptible to carbapenems
BLR Pseudomonas aeruginosa (BLR-Pa)	Non-susceptible to aztreonam, cefepime, ceftazidime, meropenem, and/or piperacillin/tazobactam
BLR Serratia marcescens (BLR-Sm)	Non-susceptible to ceftriaxone and/or cefepime Susceptible to carbapenems
Susceptible	Susceptible to aztreonam, ceftriaxone, cefepime, piperacillin/tazobactam, cefepime, and all carbapenems

Table 2. Patient outcomes stratified pathogen following GNRB

Pathogen (n)	Resistance phenotype	No. of cases	14d mortality, n (%)	30d mortality, n (%)	Median hospital length of stay (days)	30d hospital readmission, n (%)
E. coli (n=1079)	CRE	13	6 (46.2)	7 (53.9)	25	1 (7.7)
	ESBL	158	26 (16.5)	33 (20.9)	10	23 (14.6)
	IRE	57	10 (17.5)	14 (24.6)	15	12 (21.1)
	Susceptible	851	112 (13.2)	161 (18.9)	9	141 (16.6)
K. pneumoniae (n=835)	CRE	104	19 (18.3)	32 (30.8)	29	21 (20.2)
	ESBL	52	7 (13.5)	10 (19.2)	16	11 (21.1)
	IRE	78	12 (15.4)	19 (24.4)	16	17 (21.8)
	Susceptible	601	63 (10.5)	93 (15.5)	12	103 (17.1)
E. cloacae (n=281)	CRE	48	9 (18.8)	12 (25.0)	21	10 (20.8)
	FEP-NS	28	5 (17.9)	5 (17.9)	38	6 (21.4)
	FEP-S, CRO-NS	17	2 (11.8)	3 (17.6)	17	3 (17.6)
	Susceptible	188	14 (7.4)	25 (13.3)	15	46 (16.0)
E. aerogenes (n=90)	CRE	5	0 (0)	1 (20.0)	12	0 (0)
	FEP-NS	4	0 (0)	0 (0)	18	1 (25.0)
	FEP-S, CRO-NS	21	6 (28.6)	8 (38.1)	22	4 (19.0)
	Susceptible	60	10 (16.7)	12 (20.0)	16	12 (20.0)
S. marcescens (n=165)	CRE	6	1 (16.7)	2 (33.3)	19	1 (16.7)
	FEP-NS	5	1 (20.0)	1 (20.0)	51	0 (0)
	FEP-S, CRO-NS	11	3 (27.3)	4 (36.4)	20	2 (18.2)
	Susceptible	143	20 (13.9)	22 (15.4)	19	23 (16.1)
P. aeruginosa (n=345)	NS to ≥ 3 BLs	46	14 (30.4)	18 (39.1)	32	8 (17.4)
	NS to 2 BLs	21	6 (28.6)	7 (33.3)	23	2 (9.5)
	NS to 1 BL	64	10 (15.6)	18 (28.1)	28	8 (12.5)
	Susceptible	214	26 (12.2)	38 (17.8)	14	27 (12.6)
Total		2795	382 (13.7)	545 (19.5)	12	482 (17.2)

Note. BL = β-lactam; CRE = Carbapenem-resistant Enterobacteriaceae; CRO = Ceftriaxone; ESBL = Extended-spectrum β-lactamase; FEP = Cefepime; IRE = Inhibitor-resistant Enterobacteriaceae; NS = Non-susceptible; TZP = Piperacillin-tazobactam

Figure 1. Patient outcomes stratified by BLR GNRB phenotype



Note. BLR-Ent = β-lactam resistant Enterobacter species; BLR-Pa = β-lactam resistant *Pseudomonas aeruginosa;* CRE = Carbapenem-resistant Enterobacteriaceae; ESBL = Extended-spectrum β-lactamase; FEP = Cefepime; IRE = Inhibitor-resistant Enterobacteriaceae; NS = Non-susceptible; TZP = Piperacillin-tazobactam

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