

Combining rapid diagnostics with pharmacy resident-led antimicrobial stewardship to optimize outcomes for bacteremia with methicillin-resistant *S. aureus* (MRSA-B), methicillin-susceptible *S. aureus* (MSSA-B), and coagulase-negative *Staphylococcus* (CoNS) at Yale New Haven Hospital (YNHH)

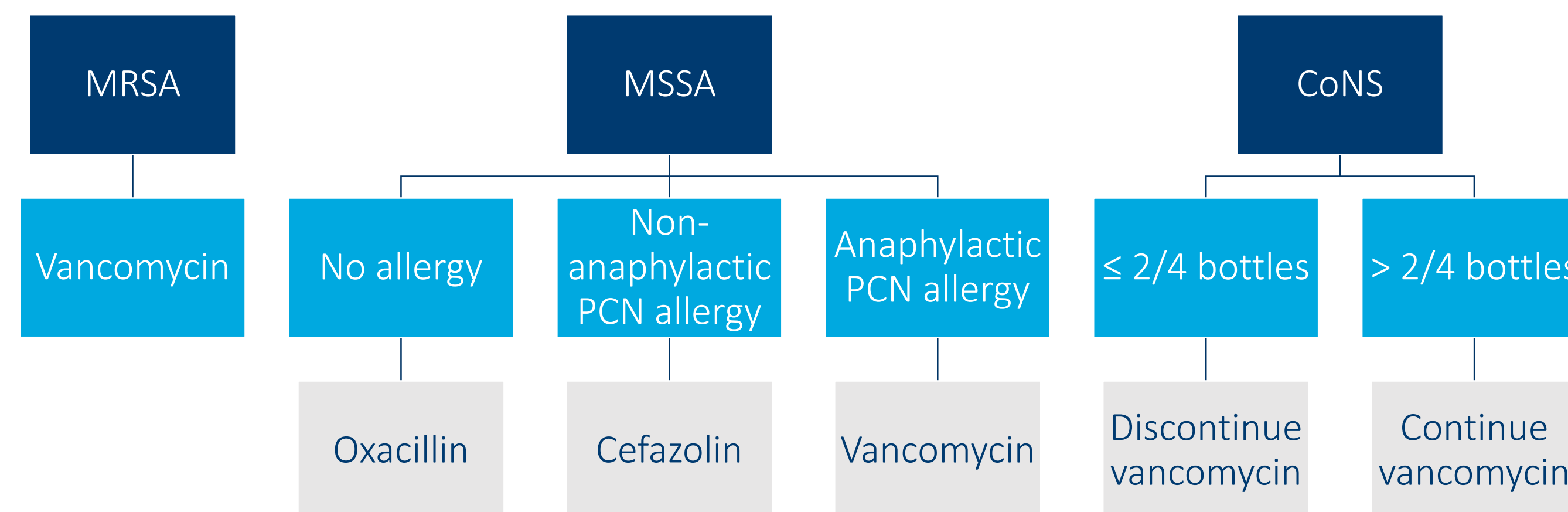
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Background

- Given the severity and high risk of complications associated with *S. aureus* bacteremia, prompt initiation of appropriate antibiotics is crucial¹
- YNHH implemented the Cepheid® Xpert MRSA/SA PCR to decrease the time needed to identify MRSA-B, MSSA-B, and CoNS
- The clinical impact of rapid diagnostics has been limited without involvement from the antimicrobial stewardship team (AST) and/or infectious disease (ID)¹
- Our notification algorithm utilized on-call pharmacy residents to allow for 24/7 coverage

Objectives

- Primary Endpoint:** Time to optimal antibiotic therapy (OAT) before and after implementation of the PCR and algorithm, with time to OAT defined as:



- Secondary Endpoints:** Time to blood culture clearance (BCC), acceptance rate of pharmacist interventions, days of vancomycin therapy saved, and 30-day mortality

Methods

A retrospective chart review was conducted utilizing the electronic medical record. There were 2 patient cohorts:

- Pre-implementation, control group (CG):** included patients from April 2017 – October 2017 before implementation of the rapid PCR and algorithm
- Post-implementation, intervention group (IG):** included patients from October 2017 – April 2018 after implementation of the rapid PCR and algorithm

Inclusion Criteria	Exclusion Criteria
<ul style="list-style-type: none"> Adult inpatients (age ≥ 18 years) Blood cultures positive for GPC in clusters 	<ul style="list-style-type: none"> Pediatric patients CoNS results identified from 11 pm – 7 am Polymicrobial blood cultures Deceased before PCR result Comfort measures only (CMO) within 72 hrs

Data collected in addition to primary and secondary outcomes included baseline demographics, allergies and empiric antibiotics. Continuous data was then analyzed using the Welch's t-test and categorical data using chi-squared analysis.

Methods

Pharmacy Resident On-Call Algorithm:

	Weekdays 07:00-23:00	Weekdays 23:00-07:00	Weekends
MRSA	PGY2 ID Pharmacy Resident	Non-Formulary Pager	ID Non-Formulary Pager
MSSA	PGY2 ID Pharmacy Resident	Non-Formulary Pager	ID Non-Formulary Pager
CoNS	PGY2 ID Pharmacy Resident	No Calls	ID Non-Formulary Pager

Pharmacy Resident Workflow:



Results

544 Total Patients	CG: 191	IG: 353
110 Patients Excluded	CG: 9*	IG: 101 ^o
434 Patients Included	CG: 182	IG: 252

* Exclusions in the control group included: 9 pediatric patients

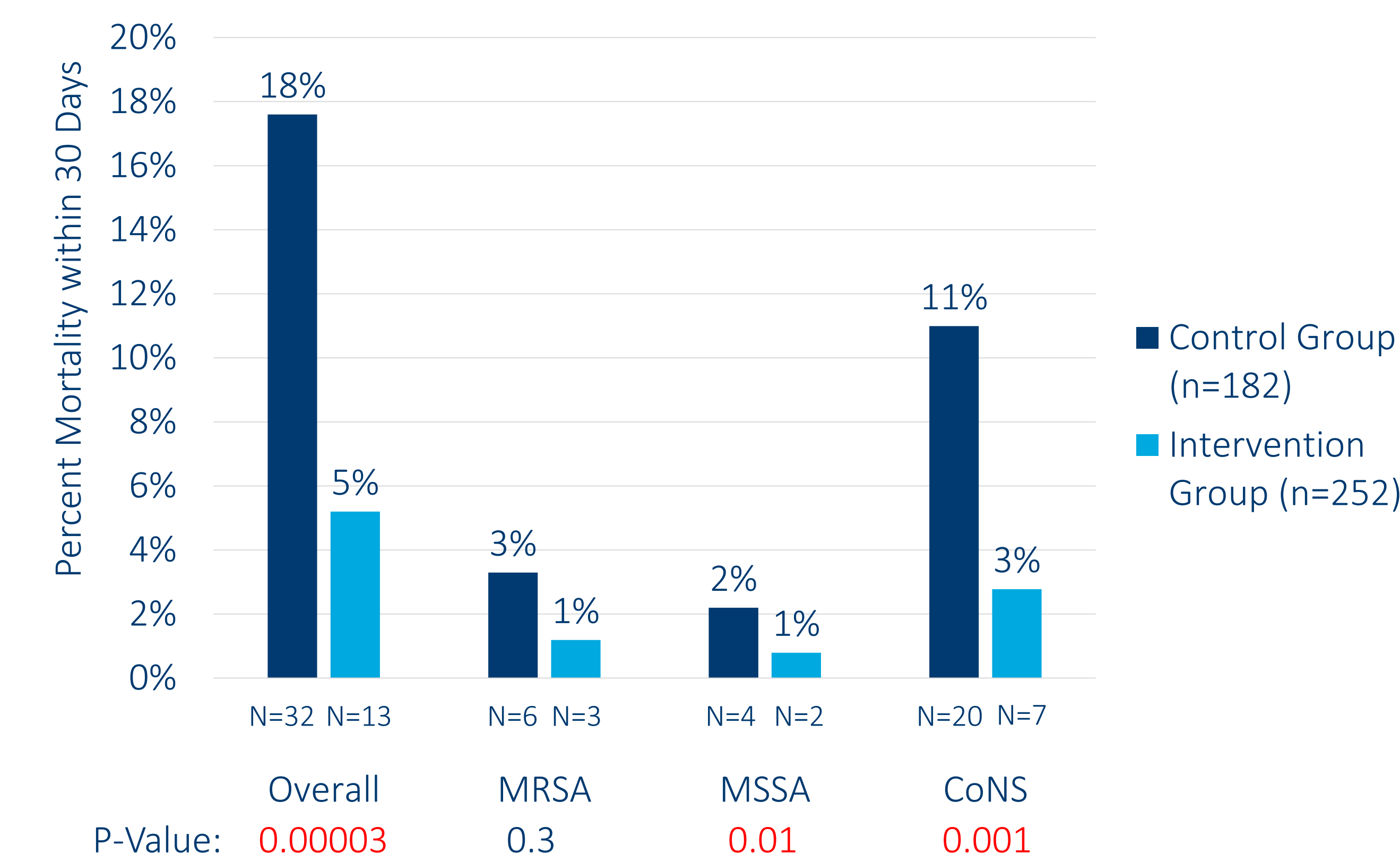
^o Exclusions in the intervention group included: 13 pediatric patients, 80 CoNS results identified from 11 pm – 7 am, 6 polymicrobial bacteremias, 2 deceased patients, 1 CMO patient

	Baseline Demographics	
	CG (n=182)	IG (n=252)
Age – years	62	60
Male gender – n (%)	109 (59%)	155 (61%)
Allergies – n (%)	-	-
None	144 (79%)	199 (79%)
β-lactam, Non-Anaphylactic	16 (9%)	24 (10%)
β-lactam, Anaphylactic	14 (8%)	14 (5%)
Other	8 (4%)	15 (6%)
Charlson Comorbidity Index Score – n (%)	-	-
Low (0-1)	22 (12%)	54 (21%)
Medium (2-4)	106 (58%)	167 (66%)
High (≥ 5)	54 (30%)	31 (12%)
Source – n (%)	-	-
Skin & soft tissue infection	65 (36%)	108 (43%)
Intravenous catheter	35 (19%)	55 (22%)
Cardiac device	33 (18%)	23 (9%)
Infective endocarditis	38 (21%)	37 (15%)
Bacteremia without focus	11 (6%)	28 (11%)
ID Consult – n (%)	14 (8%)	17 (7%)

Results

	Outcomes		
	Control Group (n=182)	Intervention Group (n=252)	P-Value
Mean Time to OAT:			
MRSA	2.5	1	0.0001
MSSA	11	5.5	0.06
CoNS	9	5	0.7
Mean Time to BCC:			
MRSA	93	30	0.0001
MSSA	209	36	0.0002
CoNS	52.5	56	0.001
Average Days of Vancomycin Saved			
MRSA	N/A	-	-
MSSA		1	
CoNS		2	
Acceptance Rate of Pharmacist Interventions	N/A	95%	-

Secondary Outcome: 30-Day Mortality



Conclusions

- Following the implementation of the Cepheid® PCR and YNHH algorithm and workflow, there were reductions in:
 - Overall mean time to OAT by 5 hours (p = 0.006)
 - Overall mean time to BCC by 57 hours (p = 0.0001)
 - Overall 30-day mortality by 12% (p = 0.00003)
- 93% of patients in the IG did not have an ID consult at the time the rapid PCR assay result was reported
- On average, one day of vancomycin was avoided in patients with MSSA-B and two days in patients with CoNS in the IG
- Overall acceptance of pharmacists' interventions was high at 95% (n = 153/161)
- In the setting of limited stewardship resources, additional members of the health care team, including pharmacy residents, can be used to optimize antibiotic therapy in conjunction with rapid diagnostics

Future Directions

- Expand the use of rapid diagnostics and pharmacist notification algorithm for Gram negative organisms
- Expand the use of the Cepheid® Xpert MRSA/SA PCR to all hospitals across the Yale New Haven Health system

References

- Burnham JP, et al. AAC. 2016; 60(9): 5546-5553.
- Cepheid®. Xpert MRSA/SAUR BC [Package Insert]. Sunnyvale, CA: Publisher; 2017.

Disclosure: The authors of this presentation have the following to disclose concerning possible financial or personal relationships with commercial entities that may have a direct or indirect interest in the subject matter of this presentation: All Authors: Nothing to disclose.