Implementation of a Prospective, Pharmacist-Led Methicillin-Resistant *Staphylococcus aureus* Nasal PCR Screening Protocol to Reduce Overutilization of Vancomycin

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MAGNET RECOGNIZED

BACKGROUND

- Vancomycin is the preferred agent for methicillin-resistant *Staphylococcus aureus* (MRSA) infections
- De-escalation of vancomycin when appropriate decreases resistance, improves patient outcomes, and reduces adverse effects
- The MRSA nasal PCR has a negative predictive value of 95.2-99.2% for MRSA pneumonia
- Negative MRSA nasal PCR results can be used as an effective tool to discontinue unnecessary empiric vancomycin therapy

METHODS

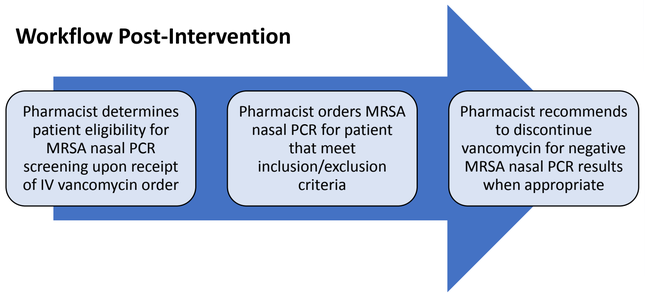
- Pre-post quasi-experimental study
- Inclusion criteria: patients ≥ 18 years old admitted to a non-intensive care unit that are receiving vancomycin for a suspected or confirmed respiratory tract infection
- Exclusion criteria: patients receiving vancomycin for a concomitant infection, transitioned to hospice, or receipt of nasal mupirocin during hospital stay

Primary objective
- Vancomycin days of therapy (DOT) for a respiratory tract infection

Secondary objectives
- Hospital length of stay (LOS)
- Vancomycin monitoring (e.g. random and trough concentrations)
- Inpatient mortality
- Escalation in therapy
- Acute kidney injury (AKI)
- Adherence to recommendations

Statistical Analysis
- Descriptive statistics: continuous and categorical data
- Categorical Data: Pearson Chi-Square/Fisher's Exact Test
- Continuous Data: Student's *t* test/Mann-Whitney *U* Test
- Sample size 63 patients per group to achieve 80% power
- A two-tailed *p* value of <0.05 was considered statistically significant in all analyses

Workflow Post-Intervention



RESULTS

Table 1: Baseline Demographics

Characteristic	Pre-Intervention (n=65)	Post-Intervention (n=65)	*p*
Age, yr, median (IQR)	78 (65 – 88)	79 (70 – 87)	0.48
Male, n (%)	31 (47.7)	32 (49.2)	0.86
Weight, kg, median (IQR)	67.8 (57.4 – 81.8)	69.5 (56 – 84.6)	0.79
NH or ECF resident, n (%)*	28 (43)	33 (50.8)	0.48
COPD, n (%)	19 (29.2)	19 (29.2)	0.99
Antimicrobial ≤ 90 days, n (%) - IV Antimicrobials, n (%)	41 (63.1) 24 (36.9)	33 (50.8) 29 (44.6)	0.22 0.48
Hospitalized ≥ 2 days ≤ 90 days, n (%)	30 (46.2)	36 (55.4)	0.38
Hospitalized ≥ 5 days, n (%)	2 (3)	4 (6.2)	0.68
Chronic dialysis, n (%)	5 (7.7)	6 (9.2)	0.99
Immunosuppressive drugs, n (%)	9 (13.8)	9 (13.8)	0.99
Temperature, (°C), median (IQR)	37.7 (37 – 38.4)	37.1 (36.5 – 38.6)	0.12
White blood cell count (cells/mm^3), median (IQR)	12.2 (7.2 – 17.5)	11.1 (7.6 – 15.7)	0.57

* NH = nursing home; ECF = extended care facility
- 64/65 (98.5%) patients were receiving vancomycin empirically for treatment of pneumonia (72.3% were being treated for "HCAP")
- 12/65 (18.5%) patients had a respiratory culture
- No patients in the post-intervention group had a diagnosed MRSA respiratory tract infection

Figure 1: Primary Outcome

2.9 days (1.8 – 4.1) *vs* 1.5 days (0.7 – 2.3), *p*<0.001

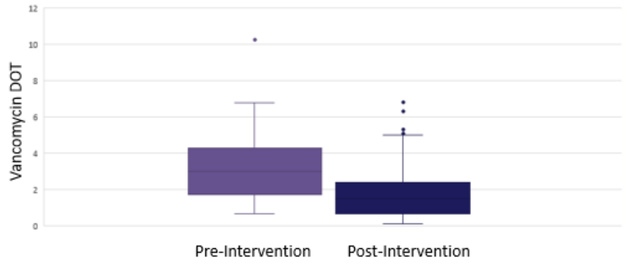
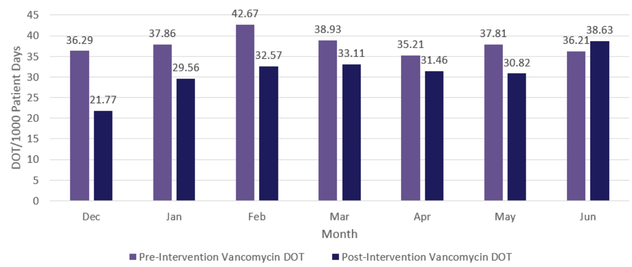


Figure 2: Overall Vancomycin Days of Therapy



Vancomycin pneumonia indication pre-intervention 22.0% *vs* post-intervention 16.0% (*p*<0.001)

RESULTS

Table 2: Secondary Outcomes

Outcome	Pre-Intervention (n=65)	Post-Intervention (n=65)	*p*
Vancomycin-associated AKI, no. (%)	2 (3.1)	0	0.50
Length of hospitalization, days, median (IQR)	5.8 (4.0 – 7.9)	5.6 (3.6 – 8.7)	0.45
Inpatient mortality, no.	0	0	0.99

*One patient in the post-intervention group had vancomycin re-initiated after vancomycin was discontinued due to a negative MRSA nasal PCR result. Vancomycin was again discontinued after one dose with no adverse effects.

Table 3: Vancomycin Monitoring
- 51 levels pre-intervention *vs* 15 levels post-intervention

Outcome	Pre-Intervention (n=65)	Post-Intervention (n=65)	*p*
Serum vancomycin levels, median, no.	1	0	**<0.001**
Patients with levels drawn, no. (%)	42 (64.6)	12 (18.5)	**<0.001**
Patients with ≥ 2 serum levels, no. (%)	7 (10.8)	3 (4.6)	0.32
Patients with serum level >20 µg/mL, no. (%)	9 (13.8)	3 (4.6)	0.13

Figure 3: Pharmacist Recommendation Acceptance Rate
- Recommendation to discontinue vancomycin per negative PCR result was performed in 30/53 (56.6%) patients

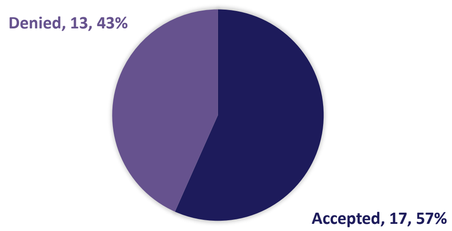
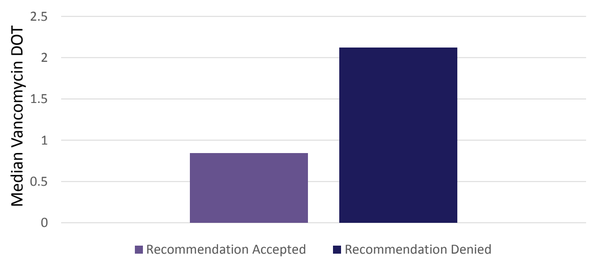


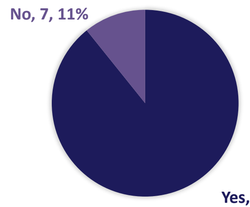
Figure 4: Vancomycin DOT Stratified by Recommendation Acceptance



RESULTS

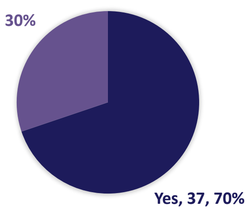
Protocol Compliance

Figure 5: MRSA Nasal PCR Ordered Appropriately



- 4 patients did not have MRSA nasal PCR ordered
- 3 patients had MRSA nasal PCR ordered after 48 hours

Figure 6: Vancomycin De-escalation Per Negative Result Within 24 Hours



- 53/61 (86.9%) patients had a negative MRSA nasal PCR result providing opportunity for vancomycin de-escalation within 24 hours
- Overall Protocol Compliance: 67.9%

CONCLUSIONS

- Implementation of a pharmacist-led MRSA surveillance protocol significantly reduced vancomycin days of therapy for a respiratory tract infection
- Protocol implementation was associated with a significant reduction in serum vancomycin levels obtained
- De-escalation of vancomycin following a negative MRSA nasal PCR was not associated with worsening of clinical outcomes
- Although sample size was small, there were no cases of AKI post-implementation compared to two pre-implementation

Future Directions
- Expand intervention to other sites within our 12-hospital system

LIMITATIONS

- Pathogen etiology unknown for majority of patients
- Severity of infection not assessed
- Incomplete compliance with pharmacist recommendations
- Single center study
- Not powered to detect changes in secondary outcomes such as acute kidney injury