Early de-escalation of vancomycin in patients with pneumonia based on a nasal methicillin-resistant staphylococcus aureus polymerase chain reaction screening tool

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BACKGROUND

Current Infectious Diseases Society of American/American Thoracic Society (IDSA/ATS) pneumonia guidelines recommend methicillin-resistant staphylococcus aureus (MRSA) coverage in patients with risk factors such as those with high healthcare contact.[1,2] Therefore, many patients receive empiric vancomycin, which frequently results in prolonged therapy as current guidelines do not provide official recommendations for de-escalation. Extended vancomycin therapy is associated with acute kidney injury (AKI), antimicrobial resistance, and increased cost and utilization of healthcare resources, illustrating the importance of a strategy to reduce unwarranted anti-MRSA therapy. [3]

Nasal polymerase chain reaction (PCR) testing for MRSA has been shown to have a high negative predictive value (NPV) in pneumonia patients, with studies consistently showing a NPV ranging from 94 to 99 percent.[3-5] Compared with culture methods that take 18 to 48 hours to result, PCR offers a more rapid turnaround time of about 2 hours. If the PCR is ordered when vancomycin is started, it is possible to avoid all but the first dose in patients with a negative PCR result with suspected pneumonia. However, this requires that the sample is obtained, and the result is communicated to the physician efficiently.

Baby et al[4] performed a retrospective analysis of patients before and after the implementation of a nasal MRSA PCR testing protocol. The authors found that the use of PCR reduced the mean MRSA-targeted therapy by 46.6 hours (27.3 vs 65.8 hours; p<0.0001) without increasing adverse clinical outcomes. Patients in the PCR group had a significantly lower incidence of AKI (3.3% vs 26%) and they required less serum levels and dose adjustments (16.7% vs 48.1%).

OBJECTIVES

1. The primary objective was duration of vancomycin treatment in hours.
2. The secondary objectives were incidence of acute kidney injury (serum creatinine increase in 0.5mg/dL from baseline), time elapsed from PCR order to PCR result, and time elapsed from PCR order to sample collection.

METHODS

This retrospective chart review, approved by the ethics committee, included adult inpatients with a diagnosis of suspected pneumonia who were ordered intravenous (IV) vancomycin from July 1, 2016 through December 31, 2017 (control group) and January 1, 2018 through June 30, 2019 (intervention group). Patients were excluded if they had an extrapulmonary indication for vancomycin therapy, initially admitted to the ICU, hospital length of stay for more than ten days or less than 48 hours and discontinuation of vancomycin therapy before PCR result. Additionally, patients in the control group were excluded if they received a PCR nasal swab.

Demographic data included: age, gender, weight, serum creatinine (baseline and peak during vancomycin treatment), primary diagnosis, nephrotoxic agents, and positive pulmonary cultures.

Hospital data for the intervention group included: times of PCR order, collection, and result.

Descriptive statistics were used to report demographic data. Student's t-test was used to evaluate the difference in vancomycin therapy duration. A Chi-square test was used to evaluate the incidence of AKI.

RESULTS

Baseline Demographics	Pre-PCR (n=83)	PCR (n=46)	P-value
Age, years	69	72	0.19
Male, n (%)	44 (53%)	22 (48%)	0.59
Weight, kg	69.1	80.0	0.01
SCr, mg/dL	1.14	1.02	0.48
Presence of additional nephrotoxin, n (%)	30 (36%)	23 (50%)	0.14
Length of Stay, days	4.5	4.8	0.37
Admitting dx PNA, n (%)	29 (34.9%)	14 (30.4%)	0.70
Admitting dx Sepsis, n (%)	23 (27.7%)	18 (39.1%)	0.24
Positive nasal MRSA test, n (%)	6 (7.2%)	6 (13.0%)	0.28

Outcome	Pre-PCR (n=83)	PCR (n=46)	P-value
Duration of therapy, hours	58.8	46.0	0.02
Number of vancomycin doses	4.7	3.8	0.07
Incidence of AKI	4 (4.8%)	1 (2.2%)	0.46

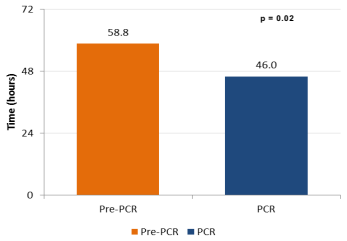
PCR Timeline

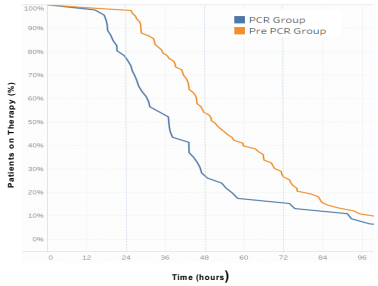
Average PCR Process Times

Phase	Hours
PCR order	11.7
PCR collection	6.3
PCR result	2.3
Discontinue therapy	17.8*

*Excluding patients with a positive nasal PCR test

Duration of Therapy





ANALYSIS

- The use of nasal MRSA PCR significantly reduced the average duration of vancomycin therapy (p=0.02)
- Nasal PCR use resulted in the avoidance of about one vancomycin dose per patient, however this did not reach statistical significance (p=0.07)
- The incidence of AKI was lower in the PCR versus pre-PCR group, although not statistically significant (p=0.46)
- There were delays in PCR ordering (11.7h) and collecting times (6.3h)
- There was no observed difference in length of stay between the two groups (p=0.37)

CONCLUSION

The use of nasal MRSA PCR testing significantly reduced the duration of vancomycin therapy in patients with suspected pneumonia despite a higher rate of positive MRSA nasal tests. Although not statistically significant, AKI was less common in the PCR group despite a higher frequency of concomitant nephrotoxins. A greater reduction in duration of vancomycin therapy and AKI may have been observed with shorter delays in PCR order and collection.

Limitations of this study include the retrospective design, small sample size, and lack of nasal culture data. Additionally, patients in the intervention group had a larger total body weight and were more frequently admitted with a primary diagnosis of sepsis.

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DISCLOSURE

Authors of this presentation have nothing 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.