# Implementation of AUC:MIC Pharmacy to Dose in an Academic Medical Center: A Pilot Study

**UMassMemorial** Medical Center mber of UMass Memorial Health Care

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### INTRODUCTION

- Intravenous (IV) vancomycin is frequently utilized for treatment of severe methicillin-resistant Staphylococcus aureus (MRSA) infections.
- The ratio of total exposure of the drug, area under the curve (AUC) to the minimum inhibitory concentration (MIC), can be used to predict the bactericidal activity of vancomycin<sup>1</sup>.
- Vancomycin efficacy against S. aureus has been linked to achieving an AUC:MIC ratio of  $>400^2$ .
- UMass Memorial Medical Center (UMMMC) standard practice uses vancomycin troughs targeting 10-20 mcg/mL, to predict vancomycin efficacy.
- At UMMMC, vancomycin is not pharmacy-to-dose but instead dosed by physicians and monitored with pharmacy assistance.
- Recent literature shows troughs ≥15 mcg/mL have not been clearly associated with improved outcomes, shorter duration of bacteremia, or decreased mortality, but have been associated with increased risk of nephrotoxicity<sup>3</sup>.

## **OBJECTIVE**

Determine if a vancomycin AUC:MIC-based pharmacy dosing protocol and calculator using two steady-state serum levels, can safely and effectively be used to dose and manage vancomycin in patients with severe MRSA infections at UMMMC.

## REFERENCES

- Neely, M. N., Youn, G., Jones, B., Jelliffe, R. W., Drusano, G. L., Rodvold, K. A., & Lodise, T. P. (2014). Are vancomycin trough concentrations adequate for optimal dosing? Antimicrobial Agents and Chemotherapy, 58(1), 309-316.
- 2. Rybak M, Lomaestro B, Rotschafer JC, et al. Therapeutic monitoring of vancomycin in adult patients: a consensus review of the American Society of Health-System Pharmacists, the Infectious Diseases Society of America and the Society of Infectious Diseases Pharmacists. Am J Health Syst Pharm. 2009;62:82.
- Hale, C. M., et al. (2016). Are Vancomycin Trough Concentrations of 15 to 20 mg/L Associated With Increased Attainment of an AUC/MIC ≥ 400 in Patients With Presumed MRSA Infection? J Pharm Pract. 2017 Jun;30(3):329-335.



Inclusion Criteria:

- Age  $\geq$  18 years old
- ID consult on prolonged vancomycin therapy (>2 weeks) or with severe MRSA infections including:
- Bacteremia
- Osteomyelitis
- Endocarditis
- Pneumonia

Retrospective chart review of adult patients with severe MRSA infections or on prolonged vancomycin therapy and Infectious Diseases (ID) consults. • Trough group (10/1/2019-12/31/2019) vs. AUC:MIC group (1/1/20-3/6/20)

## **METHODS**

- ID consult patients with severe MRSA infection or on prolonged vancomycin
- Empiric vancomycin IV 15 mg/kg based on actual body weight
- Frequency determined by renal function

• Obtain two steady state levels, a peak and a trough, after the third dose • Determined by pharmacists utilizing Vancomycin Kinetics Calculator in the electronic medical record

- Renal function a minimum of every 48 hours for changes in serum creatinine (SCr) or creatinine clearance (CrCl)
- Troughs monitored weekly after achievement of AUC:MIC goal, maintenance
- Troughs correlated to an AUC:MIC of 400-600

Progress notes placed in the patients chart: • First 24 hours of study inclusion • Dose adjustments

• Every 3 days regardless of levels

- Exclusion criteria:
- Receiving renal replacement therapy (RRT), dialysis
- dependence, CrCl <15 mL/min Expected length of therapy <72 hours
- **Comfort Measures Only**
- Pregnant women
- Prisoners

### **Table 1: Primary Outcome**

Primary Outcome	AUC:MIC group (n=27)	Trough group (n=37)	P value
Mean time to goal in days, n (±SD)	4.13 (±2.08)	4.19 (±2.30)	p = 0.982

### **Table 2: Secondary Outcomes**

Secondary Outcomes	AUC:MIC group (n=27)	Trough group (n=37)	P value
Mean number of dose adjustments, n (±SD)	1 (±1)	2 (±2)	p = 0.037
Incidence of AKI, n (%)	5 (21.7%)	11 (29.7%)	p = 0.765
Mean number of levels drawn, n (±SD)	5 (±3)	5 (±3)	p = 0.682
Mean length of stay (days), n (±SD)	18 (±11)	23 (±24)	p = 0.024

## CONCLUSIONS

- when compared to trough monitoring.
- feasible and can be safely implemented for specific patient MRSA infections.
- Larger studies are needed to evaluate reduction in time to therapeutic goals.





### RESULTS

Vancomycin AUC:MIC Monitoring led to significantly fewer dose adjustments and length of stay, in addition to less nephrotoxicity

Our small pilot study has shown that AUC pharmacy to dose is populations including prolonged vancomycin use and severe