

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

## 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<sup>2</sup>.
- 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  $\geq 15$  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>.

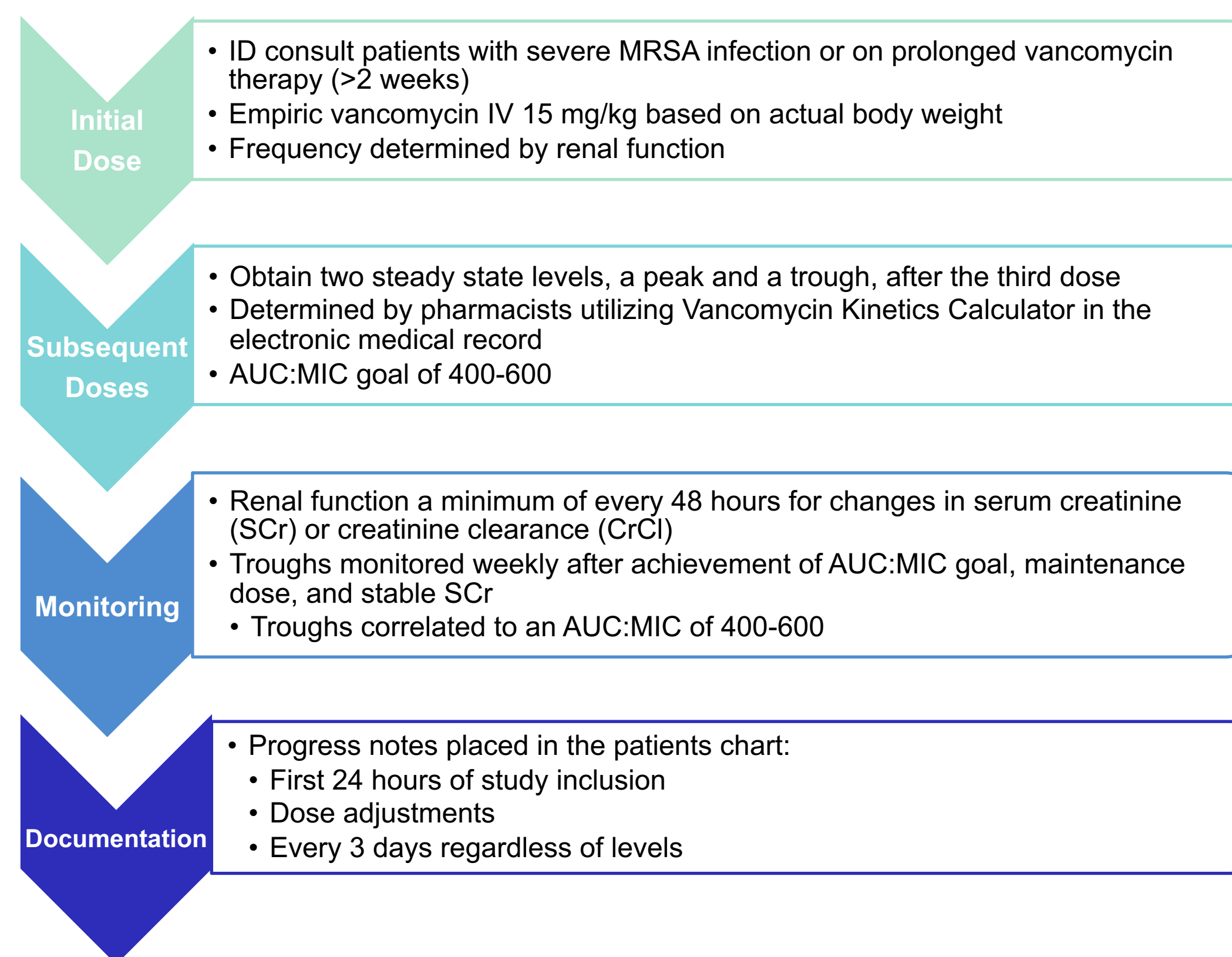
## OBJECTIVE

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.
- 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  $\geq 400$  in Patients With Presumed MRSA Infection? *J Pharm Pract*. 2017 Jun;30(3):329-335.

## METHODS



### 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

### 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

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)

## RESULTS

**Table 1: Primary Outcome**

Primary Outcome	AUC:MIC group (n=27)	Trough group (n=37)	P value
Mean time to goal in days, n ( $\pm$ SD)	4.13 ( $\pm$ 2.08)	4.19 ( $\pm$ 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 ( $\pm$ SD)	1 ( $\pm$ 1)	2 ( $\pm$ 2)	p = 0.037
Incidence of AKI, n (%)	5 (21.7%)	11 (29.7%)	p = 0.765
Mean number of levels drawn, n ( $\pm$ SD)	5 ( $\pm$ 3)	5 ( $\pm$ 3)	p = 0.682
Mean length of stay (days), n ( $\pm$ SD)	18 ( $\pm$ 11)	23 ( $\pm$ 24)	p = 0.024

## CONCLUSIONS

- Vancomycin AUC:MIC Monitoring led to significantly fewer dose adjustments and length of stay, in addition to less nephrotoxicity when compared to trough monitoring.
- Our small pilot study has shown that AUC pharmacy to dose is feasible and can be safely implemented for specific patient populations including prolonged vancomycin use and severe MRSA infections.
- Larger studies are needed to evaluate reduction in time to therapeutic goals.