Efficacy & Safety of Pharmacist-Driven AUC-Based Vancomycin Dosing:
Using Metrics to Monitor Success

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OBJECTIVE

To help clinicians improve patient outcomes and minimize patient harm by improving antibiotic prescribing at Mary Greeley Medical Center (MGMC).

BACKGROUND

Vancomycin is the drug of choice for methicillin-resistant Staphylococcus aureus (MRSA) infections but has been associated with significant nephrotoxicity.[1] Acute Kidney Injury (AKI) can lead to increased morbidity, extended hospitalization, and increased healthcare costs.[2]
MGMC provides a pharmacist-driven vancomycin dosing consult service. Pharmacists transitioned from trough-based dosing to Bayesian area under the curve (24-h AUC) dosing in June 2019 using InsightRx software. In 2021 MGMC Infectious Disease physicians gave feedback patients were too slow to reach goal targets causing a delay in care concern for the patient. Under-dosing also contributes to antimicrobial resistance.

ACTION TAKEN

Education to the pharmacists targeted the following main points: severe infections should target an AUC of 500-600 and to get an AUC in the 400-600 range within 24 hours. To do this give a loading dose and check levels sooner.

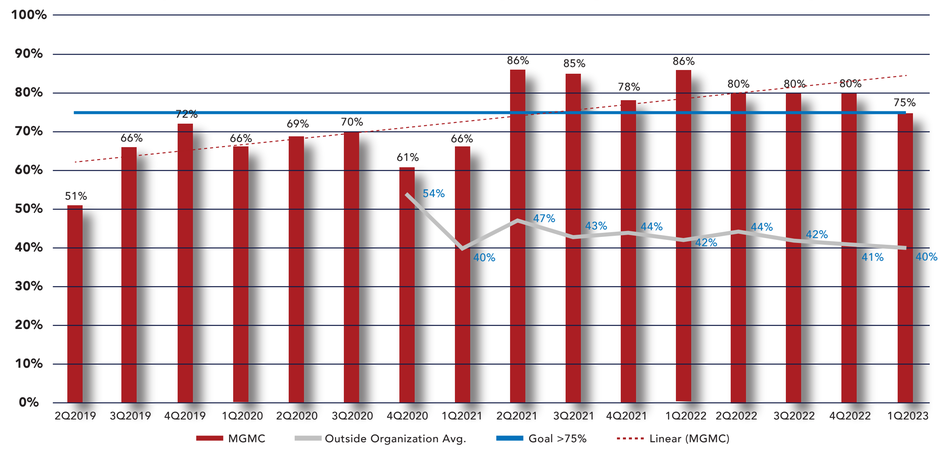
A standardized smart phrase was used in the pharmacist notes to guide the pharmacist to the recommended dosing strategy leading to consistent results.

Added efficacy and adverse drug reaction metrics to antimicrobial stewardship program.

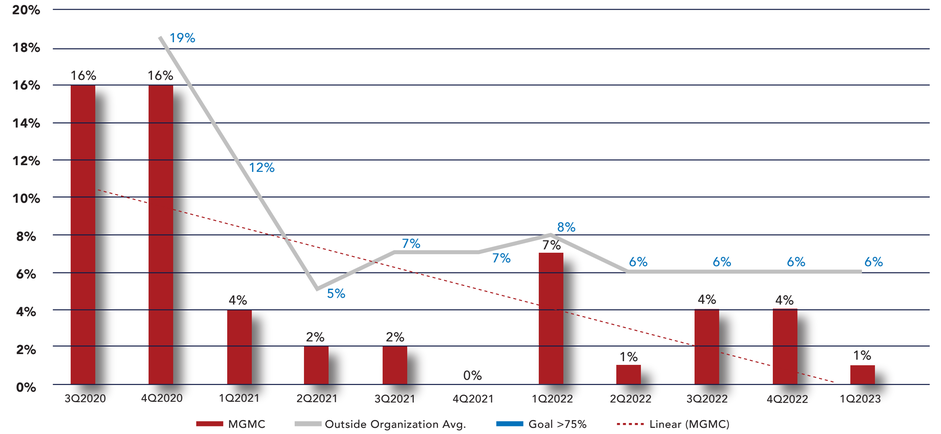
METRICS

The primary predictor of vancomycin activity is the ratio of area under the curve over 24 hours to minimum inhibitory concentration (AUC/MIC) of ≥400. Furthermore, in vitro data suggest that an AUC of <400 potentiates emergence of MRSA resistance and vancomycin-intermediate S. aureus strains. AUC describes patient exposure to the drug. An AUC24 above 700 mg-h/L is associated with significantly increased incidence of nephrotoxicity.[3] It is considered unlikely for fewer than 48 hours of vancomycin treatment to cause an acute kidney injury.[1]

Vancomycin AUC24 within the target range of 400-600 mg*hr/L



Vancomycin AKIs occuring after 48 hours into therapy



ANALYSIS

Currently, MGMC pharmacists' dose on average 135 treatment courses per quarter Q12021-Q12023. Impact of the vancomycin dosing service after educational efforts on how to effectively dose vancomycin measured by AUC target attainment within 24-48 hours was improved and sustained. The adverse effect acute kidney injury (AKI) after 48 hours is low as compared to other healthcare facilities using similar dosing methods.

NEXT STEPS

- Monitor Quarterly
- Take action ot review if AKI rate > 6%.
- Take action if Target AUC in 24 h below 75%.

REFERENCES

1. Filippone, EJ, et al. "The Nephrotoxicity of Vancomycin." Clinical Pharmacology and Therapeutics, vol. 102, no. 3, 2017, pp. 459–69, https://doi.org/10.1002/cpt.726.

2. Finberg, Robert W., et al. Clinical Use of Anti-Infective Agents A Guide on How to Prescribe Drugs Used to Treat Infections. 2nd ed. 2021.., Springer International Publishing: Imprint: Springer, 2021.

3. Neely, Michael N., et al. "Are Vancomycin Trough Concentrations Adequate for Optimal Dosing?" Antimicrobial Agents and Chemotherapy, vol. 58, no. 1, 2014, pp. 309–16, https://doi.org/10.1128/AAC.01653-13.

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