Workflow Analysis for Vancomycin Dosing and Monitoring

Lifang Wei[1,2]; Waryaam Singh[1]; Mehdi Kashani[1]; Supawadee Suppadungsuk[3]; Nasrin Nikravangolsefid[1,4]; Erin F. Barreto[5]; Kianoush B. Kashani[1,6*] ;Yue Dong[7*]

[1]Division of Nephrology and Hypertension, Department of Medicine, Mayo Clinic, Rochester, MN, United States. [2]The Third People's Hospital Affiliated to Fujian University of Traditional Chinese Medicine, Fuzhou, Fujian 350122, China. [3]Chakri Naruebodindra Medical Institute, Faculty of Medicine Ramathibodi Hospital, Mahidol University, Samut Prakan 10540, Thailand. [4] Department of Internal Medicine, Saint Agnes Medical Center, Fresno, CA, United States. [5]Division of Pharmacy, Mayo Clinic, Rochester, MN, United States. [6]Division of Pulmonary and Critical Care Medicine, Department of Medicine, Mayo Clinic, Rochester, MN, United States. [7]Department of Anesthesiology and Perioperative Medicine, Mayo Clinic, Rochester, MN, United States

BACKGROUND

Vancomycin remains a cornerstone treatment for treating methicillin-resistant Staphylococcus aureus (MRSA) infections, which account for a significant proportion of infections among ICU patients. Despite its widespread use, limited evidence exists on how pharmacists allocate time to vancomycin-related tasks during critical care rounds and how these activities influence workflow and therapeutic decision-making.

OBJECTIVES

To define the vancomycin management workflow and quantify the time spent by pharmacists and physicians on related tasks, providing insights to improve ICU practices.

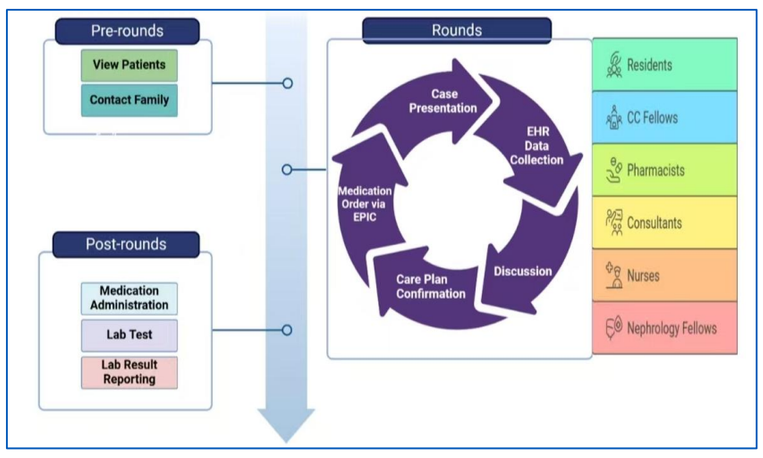

Figure 1: Study Design

METHODS

This prospective workflow analysis was conducted at the Mayo Clinic between June 17, 2023, and February 13, 2025. Structured observations of 52 ICU rounds were performed to capture pharmacist and physician interactions related to vancomycin dosing, monitoring, and documentation.

Task durations were recorded using REDCap and summarized as medians and interquartile ranges (IQR).

RESULTS

- Among 52 enrolled ICU patients, 42% initied vancomycin therapy and 58% were already on it at enrollment. Vancomycin levels were measured in 38% of patients.
- The median vancomycin level was 15.25 (IQR 12.95–19.55) mcg/dL, and the median serum creatinine was 1.01 (IQR 0.67–1.93) mg/dL.
- Pharmacists spent a median of 11 (IQR 6.8–15.0) minutes to appropriately dose vancomycin. Vancomycin was ordered 29.1 (IQR 2.7–156.9) hours from ICU admission and administered in 1.0 (IQR 0.5–2.0) hour after order entry.
- Trough levels were ordered 29.8 (IQR 20.5–49.2) hours following administration, and results were received in 13.0 (IQR7.4–14.5) hours after test order entry.
- The most frequent pharmacist activities included EHR review (88.5%), care plan discussions (82.6%), and case presentations (61.5%). Vancomycin-specific tasks, including indication review (80%), dosing finalization (71%), and eGFR calculation (69.2%), were frequently performed

Table1: Lab Values and Timing Metrics

Metrics	Median	IQR
Vancomycin level on the Day of Observation, mcg/dL	15.25	12.95-19.55
Serum Creatinine on the Day of Observation, mg/dL	1.01	0.67-1.93
Observation Duration, minutes	11.0	6.8-15.0
ICU Admission to Vancomycin First Order, hours	29.1	2.7-156.9
Vancomycin Order to Observation, hour	23.8	9.2-64.0
Vancomycin Order to Administration, hours	1.0	0.5-2.0
Administration to Vancomycin Lab Order, hours	29.8	20.5-49.2
Vancomycin Lab Order to Result, hours	13.0	7.4-14.5

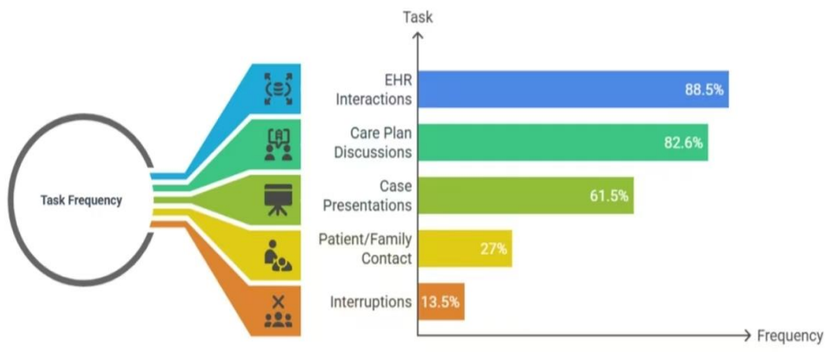

FIGURE 2:Vancomycin Use and RRT Status in ICU Observation

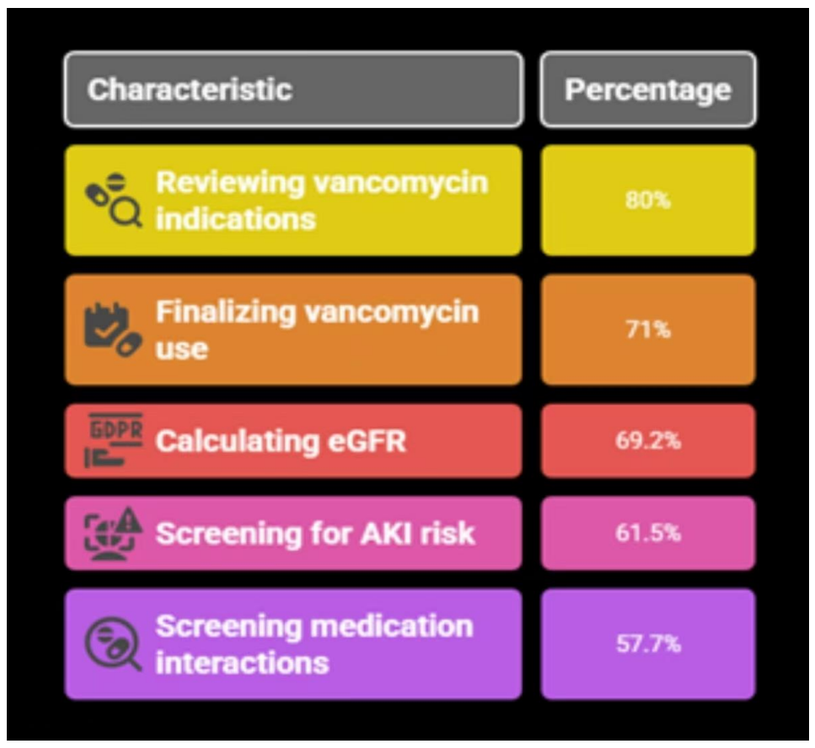

FIGURE 3: Vancomycin-Specific Tasks in EHR Reviews

CONCLUSIONS

- Intensive care pharmacists can play a vital role in vancomycin management during ICU rounds, with the majority of tasks centered around EHR-based activities. These findings provide opportunities for workflow optimization strategies, including enhanced decision-support tools and streamlined interdisciplinary communication, to reduce the burden and enhance the safety and effectiveness of vancomycin therapy.