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PRESCRIBING HABITS OF VANCOMYCIN IN THE EMERGENCY DEPARTMENT: ARE WE DOSING APPROPRIATELY?

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☐ **Abstract—Background: To prevent the development of bacterial resistance, current guidelines recommend vancomycin dosages of 15–20 mg/kg based on actual body weight. Objective: Our aim was to determine if two community teaching Emergency Departments followed the new recommendations for a weight-based dosing regimen for vancomycin. Methods: A retrospective cohort study was conducted on the prescribing habits of vancomycin in the Emergency Department. During a 6-month time period, 1,734 doses of vancomycin were dispensed and a subsequent random sample of 240 doses was reviewed. Data collection included age, gender, weight, creatinine clearance, vancomycin dose, and indication for vancomycin therapy. Mean values, standard deviations, and ranges were computed to illustrate current prescribing practices. Results: The mean vancomycin dose was 1,117 ± 325 mg. Based on actual body weight, the calculated mean dose was 14.6 ± 5.7 mg/kg. Only 19.6% (47 of 240) of all patients received an appropriate dose based on the recommended 15–20 mg/kg vancomycin dose. Conclusions: Our Emergency Department is inappropriately dosing vancomycin in the majority of patients. Educating clinicians regarding appropriate vancomycin dosing is recommended to achieve compliance with the latest consensus guidelines.** © **2013 Elsevier Inc.**

☐ **Keywords—vancomycin; weight-based; Emergency Medicine; dosing; MRSA**

INTRODUCTION

Vancomycin demonstrates time-dependent killing of susceptible bacteria. The decision to use vancomycin can vary depending on the type of bacteria to be eradicated. In methicillin-susceptible *Staphylococcus aureus*–bacteremic patients, vancomycin increases the complication and mortality rates when compared with β-lactams nafcillin and cefazolin (1,2). However, for treatment of methicillin-resistant *S. aureus* (MRSA) infections, the Infectious Diseases Society of America (IDSA) asserts in their consensus guidelines that the potential benefits of vancomycin administration outweigh the risk of adverse events (3,4). As the cornerstone of treatment for MRSA infections, vancomycin use has increased with the increasing rates of MRSA (5). Limitations such as its slow bactericidal activity, poor penetration into certain tissues, and potentially increasing minimum inhibitory concentrations have been associated with this agent. It is prudent that we tailor the dosing of vancomycin to increase its efficacy while simultaneously decreasing its potential complications.

In order to provide a better clinical approach for health care providers, the American Society of Health-System Pharmacists (ASHP), the Society of Infectious Diseases Pharmacists (SIDP), and the IDSA published a consensus

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statement of vancomycin therapeutic guidelines in January 2009 (3,4). Evidence within the consensus statement suggests that the area under the concentration curve divided by the minimum inhibitory concentration is the primary pharmacodynamic parameter for the effective use of vancomycin (6,7).

The IDSA suggests that when exposed to vancomycin serum concentrations <10 mg/L, bacteria with vancomycin-intermediate *S. aureus* or vancomycin-resistant *S. aureus*–like characteristics may be selected (3). Although vancomycin-intermediate *S. aureus* and vancomycin-resistant *S. aureus* strains are relatively rare, they increase the rate of vancomycin treatment failures (1). To prevent the development of bacterial resistance, higher doses of vancomycin (15–20 mg/kg) are recommended to achieve serum trough concentrations of 15–20 μg/mL (3,8).

For many patients, the ED is the gateway to the hospital and an area where therapeutic decisions are initiated. Although body weight is the preferred method of calculating the appropriate initial vancomycin dosage, a fixed dose of 1,000 mg is commonly used. This flat dosing regimen might result in a delay in achieving therapeutic concentrations and thereby impact eventual outcomes.

Utilizing effective antibiotics at adequate doses is paramount in obtaining successful clinical outcomes. It is well documented that delays in appropriate antimicrobial selection and dosing increase rates of patient morbidity and mortality (9–12). A delay in achieving therapeutic tissue concentration exists due to the lag time for vancomycin concentration in serum to reach steady state. To achieve these therapeutic levels, vancomycin dosages of 15–20 mg/kg based on actual body weight administered every 8–12 h are needed for most patients with normal renal function (3).

Theoretically, rapid achievement of therapeutic vancomycin levels would be ideal to decrease morbidity and mortality in at-risk patients. We hypothesize that our current ED prescribing practice of vancomycin in most patients will lead to inadequate dosing via the recommended weight-based dosing regimen. This retrospective review will describe the current prescribing practices of vancomycin in our ED.

METHODS

This is a retrospective cohort analysis conducted at two community teaching EDs with an annual census of 160,000 visits within our health care system. This study was approved by the Institutional Review Board. Eligible doses included intravenous doses of vancomycin received in either ED between July and December 2009.

Patients were identified using a computerized list generated through query of all ED automated dispensing cabinets of vancomycin doses dispensed. During this 6-month time period, 1,734 doses of vancomycin were dispensed. A random sample of 240 doses was reviewed to evaluate the prescribing habits of vancomycin in the ED. The doses were block randomized into four groups of approximately 430. Because the doses spanned a 6-month period, the doses were block randomized to enhance the variety of infections treated. For example, pneumonias tend to be more dominant in the winter and cellulitis in the summer. With this randomization scheme, we were able to select a more diverse population. The researchers then randomly chose 60 doses from each block.

Doses were excluded if the patient was younger than 18 years of age or if the dose was not administered. The following baseline characteristics were collected: age, gender, weight, creatinine clearance, and indication for vancomycin therapy. If a weight or any measure needed to calculate a creatinine clearance was not available in the ED, the first value collected upon admission was utilized.

The collected data were analyzed using descriptive statistics computed with SPSS Statistics 17.0.0 software (WinWrap Basic, Polar Engineering and Consulting, Nikiski, AK). Mean values, standard deviations, and ranges were computed to illustrate current prescribing practices of vancomycin in our ED.

RESULTS

During this 6-month time period, 1,734 doses of vancomycin were dispensed from the automated dispensing cabinets in the ED. Patient characteristics are presented in Table 1. Mean age of patients was 62.3 ± 18.3 years

Table 1. Patient Population

Age (years), mean ± SD (range)	62.3 ± 18.3 (18–97)
Male, n (%)	124/240 (51.7)
Weight (kg) (Powerchart), mean ± SD (range)	83.2 ± 30.2 (33–278)
Calculated CrCl (mL/min), mean ± SD (range)	68.0 ± 50.0 (2–268)
CrCl <20 mL/min, n (%)	36/239 (15.1)
CrCl 20–49 mL/min, n (%)	72/239 (30.1)
CrCl 50–69 mL/min, n (%)	35/239 (14.6)
CrCl ≥70 mL/min, n (%)	93/239 (40.2)
Indication for vancomycin, n (%)	
Skin and soft tissue infection	64/240 (26.7)
Pneumonia	86/240 (35.8)
Sepsis	37/240 (15.4)
Bacteremia	12/240 (5)
Other	41/240 (17.1)

CrCl = creatinine clearance; SD = standard deviation.

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