Initial vancomycin dosing in critically ill burn patients
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Background
Critically ill patients often display altered pharmacokinetic parameters when compared to an average, healthy adult, leading to a significant impact on the dosing of antimicrobials. Patients’ with severe burn injuries have demonstrated creatinine clearances well above 120 mL/min. This enhanced creatinine clearance can lead to subtherapeutic medication levels. Vancomycin is an antibiotic that is primarily eliminated renally and one would expect enhanced clearance of vancomycin leading to subtherapeutic trough concentrations in this patient population.

Objective
The primary objective of this study was to determine if using population pharmacokinetics is appropriate for initial vancomycin dosing in critically ill burn patients. This will be determined by comparing the predicted vancomycin trough, elimination rate constant, and half-life to the observed values.

Methods
This study was a single-center retrospective chart review of critically ill burn patients admitted between April 14, 2014 and May 31, 2015 on vancomycin therapy. The observed pharmacokinetic parameters were compared to the predicted pharmacokinetic parameters based on population data.

Results
Twenty-six patients met the inclusion criteria. The median day from admission to the initiation of vancomycin therapy was 4 days. Dosing ranged from 14.6-18.0 mg/kg with a median dose of 16.5 mg/kg every 12 hours. The predicted serum vancomycin concentration was 16.0 mcg/mL, which is within the therapeutic range. The measured serum vancomycin concentration was significantly less than the predicted at 9.0 mcg/mL. The patient specific elimination rate was significantly higher at 0.128 hr⁻¹ compared to the predicted at 0.102 hr⁻¹. The elevated elimination rate led to a shorter half-life at only 5.4 hours compared to the predicted 6.8 hours.

Conclusion
Critically ill burn patients exhibited pharmacokinetic alterations favoring increased elimination of vancomycin when compared to predicted parameters. Utilizing population pharmacokinetics to calculate the initial vancomycin dose for critically ill burn patients leads to subtherapeutic levels. Prospective pharmacokinetic studies are needed to determine the most appropriate initial dosing for patients with severe burn.