Vancomycin area under the curve and trough correlation in pediatric oncology patients

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Problem

- Pediatric oncology patients can exhibit higher vancomycin clearance compared to the general pediatric population.
- Initial dosing recommendations (15 mg/kg IV every 6-8 hours) may not achieve therapeutic trough goal 10-15 mcg/mL or area under the curve (AUC) goal >= 400 mg*hr/L.
- Frequently, dosing regimens >= 20 mg/kg IV every 6 hours have been required to achieve therapeutic trough and/or AUC.
- Obtaining vancomycin AUC to monitor efficacy has become standard of care, but sometimes only a trough can be obtained.

Goal

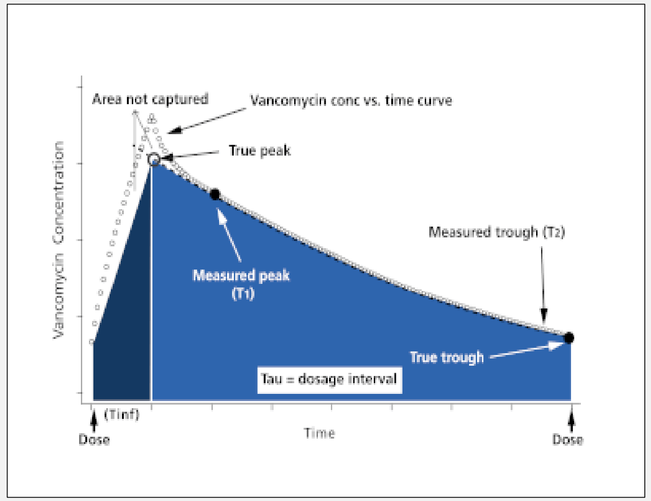
- Primary objective was to examine the total daily vancomycin dose required to achieve a therapeutic AUC of 400 – 600 mg*hr/L.
- Secondary objective was to determine the extrapolated vancomycin trough concentration from patients with a therapeutic AUC.
- Identifying higher initial dosing regimen may decrease time to achieve therapeutic goals

Intervention Methodology

- Single center, retrospective chart review (Quality Improvement status)
- Comer patients with oncology diagnosis and documented vancomycin AUC between May 31, 2018 and June 30, 2022 were included
- Data collected: patient demographics, vancomycin regimen and pharmacokinetic variables
- Statistical analysis was performed using STATA software
- Several PDSA cycles over time: prior implementation of AUC monitoring based on literature review; now testing effectiveness of AUC, identifying correlation with trough; likely future testing of higher initial dosing regimen

VANCOMYCIN AUC

https://www.sanfordguide.com/vanco_auc/



Results

AUC Results (N=41)			
Variable	AUC < 400 (n=14)	AUC 400-600 (n=21)	AUC > 600 (n=6)
TDD (mg/kg/day), median (IQR)	81.4 (60.0-90.9)	75.4 (60.0-107.7)	81.8 (58.9-82.8)
Trough (mcg/mL), median (IQR)	7.1 (6.7-8)	9.7 (8.5-11.1)	17.0 (13.8-18.9)

AUC Stratified by Age Group		
Variable	Age < 12 y/o (n=34)	Age > 12 y/o (n=7)
eGFR* (mL/min/1.73 m^2), mean (SD)	168.9 (40.1)	129.6 (17.9)
AUC < 400, n (%) AUC 400-600, n (%) AUC > 600, n (%)	14 (41.2) 16 (47.0) 4 (11.8)	0 (0) 5 (71.4) 2 (28.6)
TDD at Goal (mg/kg/day), median (IQR)	82.1 (65.1-110.1)	51.7 (48.6-54.5)
*eGFR data N=26		

- Major demographics: 26 patients (41 AUC results), 46% male, median age 5.5 years
- AUC analysis (top table): approx. 50% therapeutic (median vanco total daily dose 75 mg/kg/day, median trough 9.7 mcg/mL)
- AUC by age (bottom table): patients <12 years had higher mean eGFR and median vanco total daily dose, and more frequent sub-therapeutic AUC
- Less than 50% of patients received loading doses as recommended by guidelines.

Conclusions and Next Steps

- Pediatric oncology patients <12 years exhibit augmented renal clearance and often require higher vanco total daily dose to achieve therapeutic AUC.
- In the absence of data to calculate AUC, findings support extrapolated trough goal range 8-15 mcg/mL.
- Guidelines will likely be modified to recommend higher starting dose of 20 mg/kg IV q6h in this patient population.

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