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Evaluation of acute kidney injury with vancomycin therapy in adult

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Evaluation of acute kidney injury with vancomycin therapy in adults

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OBJECTIVE

To evaluate the outcomes and risk of acute kidney injury (AKI) associated with a pharmacy-driven vancomycin dosing protocol at a community hospital

BACKGROUND

- Nephrotoxicity related to vancomycin use is estimated to occur in 5-7% of patients.[1,2]
- AKI was defined for this study using KDIGO criteria: a 50% rise in serum creatinine (SCr) within 7 days from baseline.[3]
- AKI can occur through many different exposures including sepsis, hydration status, comorbid conditions, and concomitant nephrotoxic medications.[3]
- Vancomycin is a known nephrotoxic medication (NTM) but the risk of AKI increases when combined with other nephrotoxic exposures.[1]
- In order to determine the risk of AKI associated with the pharmacy driven vancomycin protocol, a detailed evaluation of both vancomycin treatment and other AKI exposures was conducted.

METHODS

- Clinical information pertaining to patients receiving vancomycin & additional encounter information was extracted from a relational database that is supported by the electronic medical record.
- Queries to this database included:
  - Patient identifiers and demographics
  - Vancomycin order details
  - Pertinent laboratory values
  - Concomitant nephrotoxic agents[4]

Condition	Time Frame Definition
NTM given prior to vancomycin start	Within 48 hours Within 7 days (IV contrast only)
NTM given during vancomycin duration	NTM start OR end date included within vancomycin duration
NTM given during vancomycin duration	NTM start AND end date not included within vancomycin duration

- This information was the basis for a focused critical evaluation through manual data collection including:
  - Preliminary indication
  - Trough goals
  - Evaluation of hydration status
  - Pre-existing conditions, such as chronic kidney disease (CKD)
  - Culture data
  - Duration of acute kidney injury

RESULTS

Figure 1. Patients evaluated for inclusion

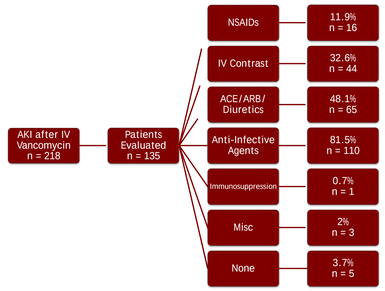

Figure 2. Concomitant NTM use; may have received multiple NTM

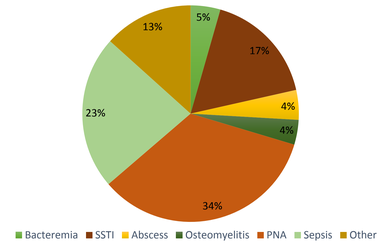

Figure 3. Indication distribution

Data Point	Number of patients (%) Total n = 135
Pharmacist managed	134 (99.3%)
At least 1 concomitant NTM	130 (96.3%)
SCr drawn same day of supratherapeutic trough (n = 42)	40 (95.5%)
Initial trough goal 15-20	114 (84.4%)
No known CKD/AKI prior to vancomycin initiation	107 (79.3%)
AKI occurring days 0-4 of vancomycin	99 (73.3%)
Normal hydration status	90 (66.7%)
Obesity (BMI > 30)	85 (63.0%)
Positive cultures	80 (59.3%)
Initial serum trough > 20	42 (31.1%)
Trough goal - indication mismatch	10 (7.4%)

Table 1. Results from collected data

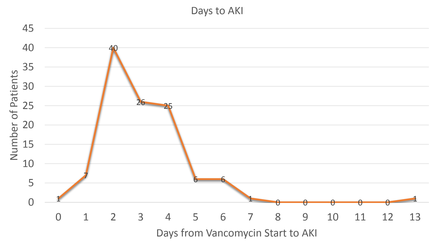

Figure 4. Days to AKI occurrence (n=113)

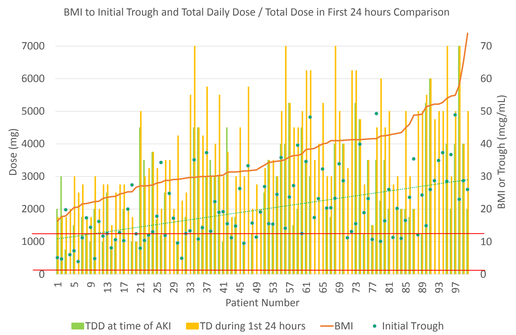

Figure 5. Distribution of initial trough concentrations compared to BMI and TDD or 1st 24 hours cumulative dose (n=100)

BMI	Number of Patients	Subtherapeutic Initial Trough (%)	Initial Trough in Range (%)	Supratherapeutic Trough (%)
≤ 30	37	10 (27%)	22 (59.4%)	5 (13.5%)
> 30	63	1 (1.6%)	26 (41.3%)	36 (57.1%)

Table 2: Vancomycin trough levels compared to BMI

CONCLUSIONS

- Overall, the vancomycin-related AKI rate is similar to published rates.
- When AKI occurs, it is most likely to occur in first 4 days of therapy.
- 96.3% of patients receiving vancomycin experiencing AKI also received concomitant nephrotoxic agents.
- The majority of patients experiencing AKI have a goal trough range of 15-20 mcg/mL.
- As BMI increases in patients with AKI, the potential for initial trough > 20 mcg/mL also increases.

OPPORTUNITIES

- More frequent patient monitoring in the first 4 days of therapy
- Reduced dosing in obese patients*
- Reduced dosing in patients with concomitant nephrotoxic agents*
- Re-evaluation of loading dose*
- Assessment of indications requiring higher trough range goals*

*Pending data collection and analysis of patients without AKI

NEXT STEPS

- Collect and analyze data for matched patients without AKI
- Update dosing protocol with monitoring requirements for initial 4 days of therapy
- Investigate and update initial and maintenance dosing changes for patients with BMI > 30
- Complete comparison for differences between AKI and non-AKI groups

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4. Goldstein SL, Mottes T, Simpson K, et al. A sustained quality improvement program reduces nephrotoxic medication-associated acute kidney injury. *Kidney Int* 2016; 90: 212-221.

Disclosure
The authors of this presentation have the following to disclose concerning possible financial or personal relationships with commercial entities that may have a direct or indirect interest in the subject matter of this presentation:
Sarah Shields: Nothing to disclose | Sarah Pfaehler: Nothing to disclose