Characterization of Vancomycin Use at a Community Hospital

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BACKGROUND

- Vancomycin is a bactericidal glycopeptide antibiotic that inhibits cell wall synthesis. The spectrum of activity is limited to only gram-stain positive bacteria; however, it is effective against methicillin resistant Staphylococcus aureus (MRSAs) for which it is the mainstay of treatment.¹

- Currently, pharmacodynamic monitoring of vancomycin efficacy and safety is by drug trough evaluation when at steady state (typically prior to the fourth dose). For patients who have specific renal function (i.e., new onset acute kidney injury, rapidly declining chronic kidney disease, or undergoing hemodialysis), a random drug level may be drawn for closer monitoring.²

- Infectious Disease Society of America (IDSA) guidelines cite some evidence that an AUC:MIC dosing strategy may allow clinicians to evaluate vancomycin dosing before steady state (as soon as the second dose), promoting quicker times to therapeutic range and decreased incidence of vancomycin induced nephrotoxicity.²

- Monitoring via AUC:MIC is especially beneficial in those with critical illness. For all, the acceptable AUC:MIC therapeutic range is 400 – 600 mg-hr/L, whereas a ratio > 650 mg-hr/L has been associated with an increased incidence of acute kidney injury.²

METHODS

- Retrospective analysis at PRMC between January 1, 2021 through May 31, 2022

- Inclusion criteria: > 18 years of age, ≥ 2 doses of vancomycin received

- Exclusion criteria:
  - Transfer from another facility
  - Dialysis
  - Concomitant nephrotoxic medications
  - Random drug level
  - AUC:MIC monitoring

- Data was extracted from the institution’s electronic medical record system and manually validated

- Using a random number generator in Microsoft Excel, a subset of 300 patients were chosen to analyze. Upon further review, an additional 36 patients met criteria were not met for many patients empirically being treated for pneumonia.

- A small percentage of patients received MRSA nasal swabs (including nasal cultures and nasal PCR tests) although a larger percentage of patients had an indication of rhinorrhea, nasal congestion, and rhinorrhea criteria are met (IV antibiotics within 90 days or prior positive culture of MRSA). These patients were removed from the analysis.

- Among those who possibly experienced AKI due to vancomycin, each were exposed to at least one prespecified concomitant nephrotoxic drug class during their admission.

- The cost benefit debate of purchasing Bayesian software against manually validating lower-cost alternatives for AUC:MIC vancomycin dosing will require further discussion primarily based around the relatively short time to de-escalation and low incidence of positive MRSAs cultures.

RESULTS

- 3386 subjects screened → 1973 subject pool → 300 subject random sample → 264 subject final random sample

- Most excluded due to transfer from other facility (43%) or dialysis orders (39%)

- Incidence of acute kidney injury (AKI) was evaluated with respect to AKI was defined as a rise of serum creatinine by 0.3 mg/dL or more within 48 hours of a vancomycin dose being given

- Only 3.3% of patients received nasal swabs (including nasal cultures and nasal PCR tests) although a larger percentage of patients had an indication of rhinorrhea, nasal congestion, and rhinorrhea.

- Using a random number generator in Microsoft Excel, a subset of 300 patients were chosen to analyze. Upon further review, an additional 36 patients met criteria were not met for many patients empirically being treated for pneumonia.

- A small percentage of patients received MRSA nasal swabs (including nasal cultures and nasal PCR tests) although a larger percentage of patients had an indication of rhinorrhea, nasal congestion, and rhinorrhea.

- The cost benefit debate of purchasing Bayesian software against manually validating lower-cost alternatives for AUC:MIC vancomycin dosing will require further discussion primarily based around the relatively short time to de-escalation and low incidence of positive MRSAs cultures.

OBJECTIVE

- To characterize the use of vancomycin medication therapy at a non-profit community hospital (Parkview Regional Medical Center) in preparation for a potential change to AUC:MIC dosing and monitoring.

REFERENCES


DISCUSSION & CONCLUSIONS

- Parkview Health’s vancomycin dosing protocol of a 25 mg/kg loading dose for serious infections and a 15 mg/kg (actual body weight) maintenance dose resulted in an AKI incidence of 9.5%, and a median time to de-escalation of 2 days within the study period.

- Most commonly, vancomycin was started for indications of fever & illness of unknown etiology, followed by skin and soft tissue infections, and pneumonia. According to IDSA pneumonia guidelines, empirical coverage of MRSAs is not warranted unless specific criteria are met (IV antibiotics within 90 days or prior positive culture of MRSAs). These criteria were not met for many patients empirically being treated for pneumonia.

- A small percentage of patients received MRSAs nasal swabs (including nasal cultures and nasal PCR tests) although a larger percentage of patients had an indication of rhinorrhea, nasal congestion, and rhinorrhea.

- The cost benefit debate of purchasing Bayesian software against manually validating lower-cost alternatives for AUC:MIC vancomycin dosing will require further discussion primarily based around the relatively short time to de-escalation and low incidence of positive MRSAs cultures.

Data were gathered.

Concomitant Nephrotoxic Medications Among Patients with AKI During this Admission (n = 25)

Among those who possibly experienced AKI due to vancomycin, each were exposed to at least one prespecified concomitant nephrotoxic drug class during their admission.

The cost benefit debate of purchasing Bayesian software against manually validating lower-cost alternatives for AUC:MIC vancomycin dosing will require further discussion primarily based around the relatively short time to de-escalation and low incidence of positive MRSAs cultures.