Incidence of acute kidney injury in patients receiving vancomycin and piperacillin-tazobactam compared to other antibiotic combinations

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Introduction
Acute kidney injury (AKI) is seen very commonly among hospitalized patients. The etiology of AKI is often multi-factorial and sometimes a diagnostic challenge. Inpatient antibiotic use is extremely common and often includes the combination of vancomycin and piperacillin-tazobactam. Individually they each have a minor association with AKI. A recent cohort study and abstract suggested the rates of AKI were higher with vancomycin and piperacillin-tazobactam than alone or with other antibiotic combinations. Our aim was to evaluate the rates of AKI with patients receiving five separate antibiotic combinations.

Material and Methods
We reviewed inpatient records from July 2012 through December 2013 for patients at Huntsville Hospital, a 881-bed regional hospital in Northern Alabama, who had received one of the following antibiotic combinations for at least 48 hours: vancomycin (V), piperacillin-tazobactam (Z), vancomycin and piperacillin-tazobactam (VZ), vancomycin and doripenem, (VD) and daptomycin and piperacillin-tazobactam (ZD). Exclusion criteria were concurrent intravenous acyclovir, amphotericin, aminoglycosides, end stage renal disease or if they received vancomycin between October to December of 2012 per manufacturer reports of higher concentrations. From these patients we recorded creatinine levels, dosage of antibiotics, concurrent diuretics, ACE inhibitors and contrast dyes, vancomycin troughs, history of diabetes and any need for vasopressors. We evaluated the number of patients who developed acute kidney injury, defined as a rise in creatinine by 0.5 mg/dl or 50% above baseline.

Results
Among the 391 patients, 28% (26/94) of patients in the VZ group developed AKI compared to 7% (3/44) of vancomycin alone and 8% (8/101) of piperacillin-tazobactam alone. In addition 12% (12/100) of patients receiving DZ and 9% (5/53) of those on VD developed AKI. All 5 groups had similar average initial creatinine (ranging between 1 and 1.4 mg/dl). The average age of each group was also similar ranging between 59 and 66. The average daily dose of the antibiotics were comparable between all the groups. The average vancomycin trough ranged between 14.53 and 15.88 mcg/ml. There were differences in the percent of patients with diabetes, with the ZD group having the most (61%) and V having the least (23.25%). Additionally the VZ group had a higher percentage of patients requiring vasopressors at 29.78% compared to 16.28% of V, 12.87% of Z, 10% of ZD and only 1.9% of VD.

Conclusions
• Vancomycin and piperacillin-tazobactam are associated with higher incidence of AKI than either antibiotic on their own
• This higher incidence is also associated with simultaneous use of nephrotoxic medications and vasopressors
• More studies are needed to further characterize the risk of AKI when using vancomycin and piperacillin-tazobactam concurrently

References

Discussion
Based on this observational data study, we found patients receiving vancomycin and piperacillin-tazobactam had a higher incidence of acute kidney injury compared to vancomycin alone, piperacillin-tazobactam alone, daptomycin and piperacillin-tazobactam and vancomycin and doripenem. This increased incidence of AKI was also associated with vasopressor use, more days of concurrent ACE inhibitor and diuretic use, and slightly higher vancomycin troughs.

More studies are needed to further explore how the concurrent use of vancomycin and piperacillin-tazobactam may be associated with an increased risk of acute kidney injury above the risk of either drug alone. This is of particular value as the combination of the two drugs is a common empiric hospital antibiotic regimen.