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Trough-based vs AUC:MIC based Monitoring of Vancomycin: Impact on Nephrotoxicity and Efficacy at PIH Health Good Samaritan Hospital

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Background/Purpose

Vancomycin is widely used in treatment of gram-positive bacterial infections. However, its use can lead to acute kidney injury (AKI), particularly when administered alongside other nephrotoxic antimicrobials. Therapeutic drug monitoring mitigates vancomycin-induced toxicities. At PIH Health Good Samaritan Hospital (PHGSH) trough-based dosing was previously used to assess AKI and monitor efficacy. Recent studies demonstrated trough levels ranging from 15-20 mg/L are associated with increased vancomycin area under the curve exposure. Therefore, PHGSH shifted to area under the curve to minimum inhibitory concentration ratio (AUC:MIC), aiming for a range of 400-600 mg*hr/L.

Methods

This retrospective study aimed to compare the incidence of vancomycin-induced AKI between two dosing methods: trough-based dosing (pre-implementation) and AUC:MIC guided dosing (post-implementation). Additionally, the study evaluated the incidence of AKI in patients concurrently receiving vancomycin and piperacillin-tazobactam. Data from 112 patients in the pre-implementation group and 58 patients in the post-implementation group were analyzed.

Results

AUC:MIC dosing method yielded a higher percentage of patients achieving therapeutic goals (47% of patients post-implementation vs 44% pre-implementation) while showing a lower percentage of subtherapeutic levels. The incidence of vancomycin-induced kidney injury was lower in the post-implementation group (6.9%) compared to the pre-implementation group (8.9%). Additionally, concurrent administration of vancomycin and piperacillin-tazobactam resulted in fewer cases of AKI in the post-implementation group (6.1%) compared to pre-implementation group (13%). These findings suggest that the use of AUC:MIC guided dosing may offer better optimization of vancomycin therapy and reduce the risk of AKI.

Conclusion

The study emphasizes the advantages of AUC:MIC guided dosing as opposed to traditional trough-based dosing. Therapeutic AUC:MIC (400-600 mg*hr/L) were attained in a higher percentage of patients and a decrease incidence of vancomycin-induced AKI was also observed. Particularly, concurrent administration of vancomycin and piperacillin-tazobactam was associated with a lower incidence of AKI. These results support the implementation of AUC:MIC guided dosing protocols to improve the safety and efficacy in clinical practice.