Vancomycin Therapeutic Drug Monitoring in Non-Pregnant Adults

Key Messages

- Vancomycin therapeutic drug monitoring (TDM) that targets steady-state trough concentrations of 10 to 15 mg/L is recommended.
- Vancomycin trough concentrations between 15 and 20 mg/L are no longer recommended due to increased risk of acute kidney injury (AKI) and lack of clinical benefit.
- Trough-based vancomycin TDM should only be performed when clinically necessary (see Appendix 1).

The Background

- The 2020 American Society of Health-System Pharmacists, Infectious Diseases Society of America, Pediatric Infectious Diseases Society, and the Society of Infectious Diseases Pharmacists vancomycin TDM guidelines recommend AUC:MIC-based vancomycin monitoring and dosage adjustments for serious methicillin-resistant Staphylococcus aureus (MRSA) infections; however, evidence to support this method is lacking.

The Rationale

- Published studies on AUC:MIC-based vancomycin TDM are mainly retrospective and derived from patients managed with trough-based monitoring. Correlation of AUC:MIC with clinical outcomes has not been consistently demonstrated.
- Determination of AUC differs between studies, which makes it difficult to interpret and determine ideal AUC:MIC targets. AUC:MIC monitoring requires additional resources, since it involves further training, specialized software and additional serum concentration testing. Prospective well-designed trials are required to evaluate whether there is any association between AUC:MIC monitoring and clinical outcomes.
- Clinical studies have shown correlations between AUC and trough concentrations, so there may not be any benefit with AUC-based monitoring.
- Previous recommendations for a vancomycin trough range of 15 to 20 mg/L in serious MRSA infections were not supported by high quality evidence.
- There is no clear evidence that better clinical outcomes are associated with higher trough concentrations (i.e. 15 to 20 mg/L) even for serious Gram positive infections, including methicillin-resistant Staphylococcus aureus bacteremia, endocarditis or other deep-seated infections.
- As clinical benefit is unclear with a vancomycin trough range of 15 to 20 mg/L and there appears to be an increased risk of AKI, a target range of 10 to 15 mg/L for serious infections would be appropriate.

Note: For hemodialysis and peritoneal dialysis patients, the optimal range for vancomycin serum concentrations is unclear. Local institutions target pre-dialysis concentrations of 10-20 mg/L based on limited data and because AKI with higher doses is less concerning in the setting of limited residual renal function.
- Overall, trough concentration monitoring appears effective, does not require additional training, and can be achieved with less serum concentration testing.

The Solution

- A target vancomycin trough concentration range of 10 to 15 mg/L for adults is recommended.
- Target vancomycin trough concentrations between 15-20 mg/L are not recommended (except in dialysis patients since risk/benefit remains unclear).
- Alternate monitoring (e.g., AUC:MIC-based vancomycin TDM) is NOT routinely recommended as standard of practice.
Appendix 1: When to Order Vancomycin Trough Concentrations

Order vancomycin troughs only if the patient meets the following criteria:

1) Vancomycin treatment duration is greater than 7 days, where baseline and ongoing TDM may be indicated (e.g. MRSA bacteremia, infective endocarditis, osteomyelitis, septic arthritis)

OR

2) Vancomycin treatment duration is greater than 72 hours WITH one or more of the following:
   - Patient receiving aggressive dosing (where trough concentration is anticipated to target 15 mg/L)
   - Renal function unstable, serum creatinine increased by 30 µmol/L or 1.5 times baseline
   - Patient on dialysis (hemodialysis or peritoneal dialysis)
   - Patient receiving concurrent nephrotoxic or ototoxic drug
   - Patient with altered volume of distribution or clearance, including:
     - Age 65 years or greater
     - Hypermetabolic (e.g. burn patient, cystic fibrosis)
     - Low body weight / muscle mass or frail
     - Obese (125% of ideal body weight or greater)
     - Septic shock
   - Patient not responding to therapy

Notes:
- Avoid ordering unnecessary vancomycin troughs, particularly when vancomycin is not likely to be continued (i.e. when vancomycin is started empirically, but discontinued once returning cultures do not support ongoing use)
- Vancomycin troughs are unlikely to be of benefit when a validated vancomycin dosing nomogram is used, where the above risk factors are absent, and when therapy is less than 7 days in duration

References: