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Vancomycin Monitoring: A Review of Current Recommendations

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Vancomycin is a narrow-spectrum glycopeptide antibiotic with action primarily against gram-positive cocci and bacilli. Chemically distinct from the aminoglycoside family of antibiotics (gentamicin, tobramycin, amikacin), vancomycin acts by inhibiting bacterial cell wall synthesis, a process that is relatively independent of drug concentration. Therefore, it is not necessary to achieve vancomycin concentrations of 4-5 times the minimum inhibitory concentration (MIC); instead, simply maintaining a concentration above the MIC for the entire dosing interval is sufficient.

*A common misconception has been that peak and trough serum concentrations of vancomycin should be monitored in all patients treated with this drug in order to determine efficacy of treatment and avoid toxicity. This clinical practice originated when general guidelines for aminoglycoside monitoring were also applied to vancomycin without supporting clinical evidence. It is now recognized that the incidences of nephrotoxicity and ototoxicity are relatively low with current vancomycin preparations and that there is not a clear relationship between toxicity and serum drug concentrations. As a result, most clinicians currently agree that **routine vancomycin monitoring is not necessary for the majority of adult patients with normal renal function** and that empirical dosing methods are generally effective and safe in these*

patients. Those patients who do require monitoring (see below) should be followed with ***trough levels only***, since peak vancomycin levels are poorly correlated with efficacy or toxicity.

The following guidelines are recommended for patients treated with vancomycin:

- ***Monitor serum creatinine*** prior to initiation of vancomycin therapy and repeat at least weekly based on patient status and clinical judgment.
- ***Consider more frequent monitoring of renal function*** when vancomycin is being co-administered with other potentially nephrotoxic drugs.
- For those patients in whom vancomycin monitoring is indicated:
 - ⇒ ***Monitor only trough levels*** (draw 30 min prior to next dose) once steady state is achieved ($t_{1/2} = 4-6$ h with normal renal function; therefore it will take 20-30 hours to achieve steady state).
 - ⇒ ***Peak concentrations are not recommended*** because of lack of correlation with either efficacy or toxicity. There is also extreme inter-patient variability in the time at which peak levels occur with vancomycin.

- **Perform vancomycin monitoring in the following types of patients:**
 - ⇒ Patients with impaired or rapidly changing renal function
 - ⇒ Patients receiving another nephrotoxic drug
 - ⇒ Hemodialysis patients
 - ⇒ Neonatal and pediatric patients
 - ⇒ Pregnant patients
 - ⇒ IV drug abusers
 - ⇒ Cancer patients
 - ⇒ Patients in whom the volume of distribution may be altered, e.g., burn patients
 - ⇒ Long-term administration of the drug, when vancomycin may accumulate, thus giving higher trough levels.

- ***The acceptable therapeutic range for vancomycin trough levels is generally considered to be 5-10 mg/L for the treatment of most gram-positive organisms. Higher trough levels may be beneficial in certain clinical situations such as endocarditis and meningitis. The appropriate therapeutic range in these clinical situations has not been established and the appropriate vancomycin level should be at the discretion of the treating physician. Consultation with an expert is advised for these situations.***

- ***Vancomycin levels >40 mg/L have been associated with toxic or adverse reactions; these results are reported immediately to the nursing unit by the laboratory as critical values.***

- ***As a result of the above guidelines, “vancomycin peak” will no longer be an orderable test at Danbury Hospital.*** The Clinical Chemistry Laboratory will continue to perform testing for trough levels of vancomycin. When entering orders for blood to be drawn for vancomycin monitoring (or any other therapeutic drug testing), it is very important to indicate the “time of last dose” in the computer system for accurate interpretation of test results. Please contact Dr. Nee (x7413) or Dr. Sena (x7622) with any questions.

References:

1. Hammett-Stabler C, Johns T. Antibiotic drug monitoring. In: Warner A, Annesley T, eds. Standards of laboratory practice: guidelines for therapeutic drug monitoring services. National Academy of Clinical Biochemistry. Washington, DC, AACC Press, 1999, pp. 18-28.
2. Hammett-Stabler C, Johns T. Laboratory guidelines for monitoring of antimicrobial drugs. *Clin Chem* 1998;44:1129-40.
3. Cantu TG, Yamanaka-Yuen, NA, Lietman PS. Serum vancomycin concentrations: reappraisal of their clinical value. *Clin Inf Dis* 1994;18:533-43.

Premarital Testing Updates

Effective immediately, the patient who wishes to have blood tests performed for the purpose of obtaining a marriage license will require an order from his/her physician. Laboratory test results will be forwarded to the ordering physician for review with the patient.