Vancomycin Monitoring and Dosing Guideline
(Feb. 2009 Revision)*

Background

Routine monitoring of vancomycin levels is NOT recommended because there is:

- Little literature evidence to support it.
- No clear evidence that nephrotoxicity and ototoxicity associated with vancomycin are prevented by adherence to specific concentration ranges.

Peak (post) levels are NOT needed because:

- Vancomycin exhibits time dependent (TIME>MIC) killing as opposed to concentration-dependent killing (e.g. aminoglycosides); Vancomycin distributes slowly into peripheral tissues, making it difficult to identify the true peak.
- They have not been correlated with improvements in clinical outcome.

Inclusion Criteria for Vancomycin Trough Serum Level Monitoring

- Deteriorating/unstable renal function
- Morbidly obese patients (≥190% IBW) (measure trough before 2nd dose)
- Patients with anticipated therapy > 2 weeks
- Infants and children with serious infections
- Cerebrospinal fluid shunt infections, meningitis
- Patients with rapid clearance of drug (e.g. cystic fibrosis, burns >20 % BSA)
- Selected dialysis patients [e.g. high flux and continuous hemodialysis/filtration (CAVH, CVVH, CVVHDF)]

Procedure

Step 1  Recommended Initial Dose and Dosing Interval

A. Pediatrics

- CNS infections: 60 mg/kg/day divided q6h (maximum 2 g/day)
- Other infections: 40 mg/kg/day divided q6h (maximum 2 g/day)
- Administration:
  - ≤ 1 g: Infuse over 60 minutes
  - > 1 g - 1.5 g: Infuse over 90 minutes
  - > 1.5 g: Infuse over 120 minutes

* approved by AHS Edmonton Zone Therapeutic Drug Management Working Group, Chemistry Test Optimization Committee, Antimicrobial Stewardship Committee, Drugs and Therapeutics Committee
B. Adults

1. Dose
   - 15 mg/kg (based on actual body weight [ABW]/dose to maximum of 2 g/dose)
   - Doses > 500 mg - round to the nearest 250 mg
     Doses < 500 mg - round to the nearest 50 mg
   - Administration:
     ≤ 1 g - Infuse over 60 minutes
     > 1 g - 1.5 g - Infuse over 90 minutes
     > 1.5 g - Infuse over 120 minutes

2. Dosing interval determination:
   a) Determine creatinine clearance (Clcr):
      i. Calculated Creatinine Clearance (CrCl) [mL/min]
         Clcr (females) = (140 – age) x IBW*
         Scr (µmol/L)
         Clcr (males) = Clcr (females) x 1.2

         *IBW (females) = 45.5 kg + [2.3 x (inches > 5 feet)]+
         IBW (males) = 50 kg + 2.3 x (inches > 5 feet)]+
         +or [0.92 x cm > 150cm]
         If ABW < IBW, use ABW in Clcr calculations.
         If obese (ABW > 30% above IBW), use dosing weight (DW)
         DW = 0.4 (ABW – IBW) + IBW

      ii. Creatinine clearance measured quantitatively from urine collections.
         (Creatinine clearance will be reported in SI units of mL/s. See Adult Dosing Chart below)

      b) Choose dosing interval based on chart below:

      | Calculated Clcr (mL/min) | Measured Creatinine Clearance (mL/s) | Dosing Interval |
      |--------------------------|--------------------------------------|-----------------|
      | ≥80                      | ≥1.33                                | q12h**          |
      | 50 – 79                  | 0.83 – 1.32                          | q24h            |
      | 35 – 49                  | 0.58 – 0.82                          | q36h***         |
      | 25 – 34                  | 0.42 – 0.57                          | q48h            |
      | <25                      | <0.42                                | Obtain pharmacist consult |

      ** Consider q8h if treating CNS infections, osteomyelitis, endocarditis, or pneumonia
      *** Note: Caution is required due to an increased potential for medication administration errors with q36h interval.

      If CrCl estimate allows for q24h or q48h interval instead, suggest using one of these alternatives.
Step 2  Order Appropriate Laboratory Tests

- **Serum Creatinine Levels**
  - A baseline level should be ordered
  - Once weekly (more frequently if renal function changing or if concurrent nephrotoxic drugs)
  - If creatinine changes, refer to adult dosing interval chart (Step 1) for appropriate adjustment.

- **Vancomycin Serum Trough Levels**
  - Order ONLY if patient meets the criteria outlined on page 1.
  - Collect serum specimen 30 minutes or less before dose.
  - Provide dosing information (on ROUTINE requisition or test order entry field) including dose regimen, time last dose started, time last dose completed, time of next dose, and how long on this dose regimen.
  - **DO NOT** use a STAT requisition.
  - **Frequency of Collection:**
    - First level at steady state (in 1-2 days after at least 2 doses)
    - For morbidly obese (≥190% IBW), measure trough before 2nd dose (as clearance is enhanced).
    - Subsequent levels once per week (more frequently if renal function changes or patient on concurrent nephrotoxic drugs)
    - Intermittent hemodialysis (IHD) with high flux filters:
      Draw specimen at 48 and 96 hours after the dose (assuming HD at 72 hours).
      Obtain pharmacist consult for regimen calculation.

  **NOTE:** Peak (post) levels are NOT NECESSARY

Step 3  Interpret Vancomycin Serum Trough Level*

Desired trough levels for vancomycin are 5 – 15 mg/L.
Note: For combined therapy with aminoglycosides, desired trough levels are 5 – 10 mg/L

However, there are desired trough levels for specific clinical indications:
- Urinary tract infection (UTI): 5 mg/L
- Methicillin resistant staphyloccal infection: 10 – 15 mg/L
- Central Nervous system (CNS) infection, endocarditis, osteomyelitis, pneumonia:
  - With aminoglycoside: 10 – 15 mg/L
  - Vancomycin alone: 15 – 20 mg/L
<table>
<thead>
<tr>
<th>Therapy*</th>
<th>Measured Trough (mg/L)</th>
<th>Dosing Interval Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>VANCOMYCIN</td>
<td>&lt; 5</td>
<td>If patient on ≥ q24h, decrease interval by a 12h increment. If patient on q12h, consider a q8h interval in patient with good renal function or obtain pharmacist consult.</td>
</tr>
<tr>
<td></td>
<td>5 - 10</td>
<td>No change unless methicillin resistant staphylococcal (MRS) infection (target 10 - 15 mg/L) or central nervous system (CNS) infection, osteomyelitis, endocarditis, or pneumonia (target 15 - 20 mg/L).</td>
</tr>
<tr>
<td></td>
<td>10 – 15</td>
<td>No change unless CNS infection, osteomyelitis, endocarditis, or pneumonia. For these four specific infections, target 15 - 20 mg/L.</td>
</tr>
<tr>
<td></td>
<td>15 – 20</td>
<td>Increase interval by a 12h increment unless central nervous system (CNS) infection, osteomyelitis, endocarditis, or pneumonia. For these four specific infections, target 15 - 20 mg/L.</td>
</tr>
<tr>
<td></td>
<td>&gt;20</td>
<td>Obtain pharmacist consult</td>
</tr>
<tr>
<td>VANCOMYCIN with AMINOGLYCOSIDE</td>
<td>&lt; 5</td>
<td>If patient on ≥ q24h, decrease interval by a 12h increment. If patient on q12h, consider q8h interval in patient with good renal function or obtain pharmacist consult.</td>
</tr>
<tr>
<td></td>
<td>5 – 10</td>
<td>No change</td>
</tr>
<tr>
<td></td>
<td>10 – 20</td>
<td>Increase interval by a 12h increment unless methicillin resistant staphylococcal infection, CNS infection, endocarditis, osteomyelitis, or pneumonia. For these five specific infections, target 10 - 15 mg/L BUT monitor renal function closely.</td>
</tr>
<tr>
<td></td>
<td>&gt;20</td>
<td>Obtain pharmacist consult</td>
</tr>
</tbody>
</table>

*ADULT patients only.* For neonatal and pediatric patients, obtain a pharmacist consult.

**References**