Vancomycin Dosing Guidelines for Adults

**Necessary Patient Information for Dosing**
- Actual body weight – the use of actual body weight is recommend for vancomycin dosing
- CrCl – vancomycin is almost exclusively renally cleared and must be renally adjusted
  - \( \text{CrCl} = (140 - \text{age}) \times (\text{wt in kg}) \times 0.85 \) if female
  - \( 72 \times \text{SCr} \)
- Type of infection being treated
  - Are there any cultures?
  - This may affect how aggressively vancomycin is dosed

**Initial Dosing of Vancomycin**

<table>
<thead>
<tr>
<th>Cr Cl (ml/min)</th>
<th>Suggested Dose</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 50</td>
<td>15 mg/kg every 12 hours (or 30 mg/kg/d)</td>
<td>- Use ACTUAL body weight&lt;br&gt;- Dosing in morbidly obese patients is not well studied → consider consulting infectious disease pharmacist or infectious diseases</td>
</tr>
<tr>
<td>30 – 49</td>
<td>15 mg/kg every 24 hours</td>
<td>- Round to nearest 250 mg</td>
</tr>
<tr>
<td>&lt;29</td>
<td>15 mg/kg X 1, then dose by levels</td>
<td></td>
</tr>
<tr>
<td>IHD</td>
<td>Load: 15 – 20 mg/kg X 1&lt;br&gt;Maintenance: 500 mg – 1 g after each dialysis</td>
<td>In patients receiving IHD give the “load” dose now followed by “maintenance” dose after subsequent dialysis</td>
</tr>
<tr>
<td>CRRT</td>
<td>15 mg/kg every 24 hours</td>
<td>If patient stopping CRRT for any reason may want to do dose X 1 and follow by levels</td>
</tr>
</tbody>
</table>

- Loading doses
  - Some patients may require a loading dose
    - Patients where rapid attainment of therapeutic levels is essential (ie, meningitis or septic shock)
    - Morbidly obese patients that require initial high doses to reach therapeutic levels
  - Loading dose: 25-30 mg/kg x 1, maintenance dose should follow at suggested interval

**Vancomycin Monitoring**
- Monitoring consists of troughs; peaks are NOT recommended
  - Troughs should be drawn **30 minutes prior to 4th dose**
    - For patients on every 24 hour dosing troughs prior to 4th dose is still recommended
    - If patient has severe renal failure a trough may be checked prior to 2nd dose; however, this level is NOT at steady state and will go up with subsequent doses
Random levels with scheduled vancomycin regimens cannot be interpreted
Random levels should only be ordered on patients with severe renal impairment not on scheduled vancomycin dosing and dialysis patients
Doses will not be held awaiting trough level unless specifically requested by the provider
Routine monitoring is NOT recommended for patients only on ORAL vancomycin

- **Goal trough: 10-20 mcg/mL;** vancomycin troughs < 10 mcg/mL may lead to resistance
  - Some serious infection may require higher troughs of 15-20 mcg/mL
    - Pneumonia
    - Endocarditis
    - Meningitis
    - Osteomyelitis
    - Bacteremia
    - Sepsis/septic shock
    - Known MRSA infections
  - **NOTE:** For some serious infections Infectious Diseases may even allow a trough of 20-25; please check with them prior to holding doses if they are managing vancomycin

- **Key points for dosage adjustment**
  - **FIRST:** make sure level was drawn appropriately and all previous doses were given
  - **SECOND:** be aware of changing renal function
    - Today’s level is reflective of how the patient cleared the vancomycin in the past 24-48 hours and may not reflect how it will be cleared tomorrow
    - If renal function is improving/declining, anticipate this in your adjustment
  - **THIRD:** if high levels require holding of doses **DO NOT restart the same regimen**
    - This indicates the patient cannot clear this much vancomycin
    - High levels require a dosage/interval adjustment!!!!!
  - **FOURTH:** adjusting vancomycin is not rocket science, it’s mostly trial and error

- **How to adjust vancomycin based on troughs**
  - Vancomycin has linear pharmacokinetics
    - Assuming stable renal function, to double the level, double the dose
    - To halve the level, halve the dose
  - Use the following proportion equation to estimate the required daily vancomycin dose to attain the desired trough (or random level if on continuous infusion)
    - Divide estimated daily vancomycin dose every 8 to 12 hours and round to the nearest 250 mg

\[
\text{Current daily vanc dose} = \frac{\text{Estimated daily vanc dose}}{\text{Current trough level}} \times \text{Desired trough level}
\]

- **Example:** Patient is on 1g every 12 hrs with a trough of 10mcg/mL. My desired trough is 15 mcg/mL. What is the recommended daily vancomycin dose to attain this level?

\[
2000mg = \frac{Xmg}{10mcg/mL} \times 15mcg/mL
\]

Total daily dose of vancomycin would be 3000mg or 1500mg every 12 hrs or 1000 mg every 8 hrs.
Example: Patient is on 1g every 12 hrs with a trough of 30mcg/mL. My desired trough is 15 mcg/mL. What is the recommended daily vancomycin dose to attain this level?

\[
\frac{2000\text{mg}}{30\text{mcg/mL}} = X\text{mg} \quad \frac{15\text{mcg/mL}}{
\]

Total daily dose of vancomycin would be 1g every 24 hrs or 500mg every 12 hrs.

- **Remember to account for changing renal function!!**
  - If renal function is getting better, add on a little more vancomycin
  - If renal function is getting worse, decrease the dose a little bit
  - Also remember that old kidneys do not clear vancomycin efficiently

- **Monitoring of vancomycin in Intermittent hemodialysis (IHD) patients**
  - Pre-dialysis levels are recommended for IHD patients with following recommendations
  - Standard 4 hour dialysis session can remove approximately 30-50% of vancomycin

<table>
<thead>
<tr>
<th>Pre-dialysis level (mcg/mL)</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 20</td>
<td>Increase post-dialysis dose by 250-500 mg</td>
</tr>
<tr>
<td>20-25</td>
<td>No change</td>
</tr>
<tr>
<td>&gt; 25</td>
<td>Decrease post-dialysis dose by 250-500 mg</td>
</tr>
<tr>
<td></td>
<td>If &gt; 30 may consider skipping one post-dialysis dose</td>
</tr>
</tbody>
</table>

**Continuous Infusion (CI) Vancomycin**

- Occasionally patients may be started on or switched to continuous infusion vancomycin
  - Patients requiring frequent dosing of vancomycin (clearing vancomycin more quickly than expected)
  - Convenience for home infusion therapy

- Initial dosing
  - Loading dose: 15 mg/kg of vancomycin given over 1-2 hours
  - 25-30 mg/kg of vancomycin as a continuous infusion over 24 hours

- Switching from intermittent dosing to CI vancomycin
  - **NOTE** patients on CI vancomycin tend to accumulate vancomycin and require a lower total daily dose than intermittent therapy
  - If patient therapeutic on intermittent therapy:
    - Add up total dose of vancomycin and reduce by 10-20%
    - Round to nearest 250 mg
    - This will be the recommended starting dose for CI vancomycin
  - If patient supra- or sub-therapeutic on intermittent therapy:
    - Estimate intermittent dose needed to make therapeutic and reduce by 10-20%
    - Round to nearest 250 mg
    - This will be the recommended starting dose for CI vancomycin

- Monitoring
  - Random level 24 hours after start of infusion
  - Goal level: 20-30 mcg/mL
  - Ensure level is collected from a site OTHER THAN vancomycin infusion site
Vancomycin Clinical Dosing Pearls

- Adjusting vancomycin dose based on levels is an art...not an exact science
- Always make sure the trough was drawn appropriately and no previous doses were held
- Be aware of changing renal function (improving or declining)
- When an individual dose becomes over 2g start considering every 8 hr dosing rather than increasing the dose every 12 hrs
- When a trough is just above goal (20-25mcg/mL for a goal of 15-20mcg/mL), rather than holding dose, just start the new regimen (this prevents patient from becoming subtherapeutic)
  - [http://www.ajhp.org/content/66/1/82.full.pdf+html](http://www.ajhp.org/content/66/1/82.full.pdf+html)