Background

This policy covers the use of intravenous vancomycin prescribed as a continuous Infusion. The evidence for this guidance is detailed below.

Continuous infusion of vancomycin is for treatment only and is preferred, when practical, for patients with severe or deep-seated infections (e.g. pneumonia, endocarditis, bone and joint infections).

Vancomycin can also be administered as an intermittent (pulsed) infusion – refer to separate guidance.

This policy does not apply to the use of vancomycin in patients treated in Renal units or receiving haemodialysis or haemofiltration.

An Antimicrobial app and/or an online calculator is available in all boards and should be used to calculate the initial dose requirements.

Contra-indications and cautions

- Contra-indications to vancomycin therapy – hypersensitivity
- Cautions for vancomycin therapy:
  - To avoid the risk of “red-neck/red-man syndrome”, pain or muscle spasm, ensure that the administration rate is not faster than 500 mg per hour.
  - Concurrent administration of neurotoxic and/or nephrotoxic agents increases the risk of vancomycin toxicity. Review therapy and consider amending or withholding nephrotoxic drugs during treatment with vancomycin. Where possible, avoid co-administration with the following:
    - amphotericin
    - potent diuretics
    - aminoglycosides
    - NSAIDs
    - ACE inhibitors
  - The above list is not exhaustive – consult the Summary of Product Characteristics eSPC for a full list (www.medicines.org.uk).
  - Due to potential ototoxicity, vancomycin should be avoided in patients with previous hearing loss.

Reference:
Intravenous Vancomycin Use in Adults (Continuous Infusion)

**STEP 1:** Prescribe the loading dose and maintenance continuous infusion

- To reduce the risk of mortality, commence vancomycin administration within 1 hour of recognition of sepsis.
- *If creatinine is known* – use the online calculator or app (preferred method). The guidelines (below) in Table 1 (loading dose) and Table 2 (maintenance continuous infusion dose) can be used if the online calculator is not available. The dose amount and dosage interval are based on estimated creatinine clearance (Box 1) and **actual** body weight.
- *If creatinine is not known* – calculate and prescribe a loading dose based on actual body weight (Table 1). Calculate the maintenance continuous infusion dose once the creatinine is available.

**Box 1: Estimation of creatinine clearance (CrCl)**

The following ‘Cockcroft Gault’ equation can be used to estimate creatinine clearance (CrCl)

\[
\text{CrCl} = \frac{[140 - \text{age (years)}] \times \text{weight (kg)} \times 1.23 \text{ (male)} \ OR \times 1.04 \text{ (female)}}{\text{serum creatinine (micromol/L)}}
\]

**Cautions**

- Use actual body weight or maximum body weight whichever is lower.
- In patients with low creatinine (< 60 micromol/L), use 60 micromol/L.
- Note: Use of estimated glomerular filtration rate (eGFR) is not recommended

**LOADING DOSE**

**Table 1: Initial vancomycin LOADING dose**

<table>
<thead>
<tr>
<th>Actual body weight</th>
<th>Dose</th>
<th>Volume of sodium chloride (0.9%) *</th>
<th>Duration of infusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 40 kg</td>
<td>750 mg</td>
<td>250 mL</td>
<td>90 minutes</td>
</tr>
<tr>
<td>40 – 59 kg</td>
<td>1000 mg</td>
<td>250 mL</td>
<td>2 hours</td>
</tr>
<tr>
<td>60 – 90 kg</td>
<td>1500 mg</td>
<td>500 mL</td>
<td>3 hours</td>
</tr>
<tr>
<td>&gt; 90 kg</td>
<td>2000 mg</td>
<td>500 mL</td>
<td>4 hours</td>
</tr>
</tbody>
</table>

* Glucose 5% may be used in patients with sodium restriction.
Intravenous Vancomycin Use in Adults (Continuous Infusion)

**STEP 1:** Prescribe the loading dose and maintenance continuous infusion

**MAINTENANCE CONTINUOUS INFUSION**

- Start the continuous infusion **immediately** after the loading infusion is complete.

**Table 2: Vancomycin MAINTENANCE continuous infusion dose**

<table>
<thead>
<tr>
<th>CrCl (mL/minute)</th>
<th>Daily dose</th>
<th>Dose for continuous infusion over 12 hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 20</td>
<td>Use pulsed infusion or follow Renal Unit guidelines</td>
<td></td>
</tr>
<tr>
<td>20 – 29</td>
<td>500 mg</td>
<td>250 mg</td>
</tr>
<tr>
<td>30 – 39</td>
<td>750 mg</td>
<td>375 mg</td>
</tr>
<tr>
<td>40 – 54</td>
<td>1000 mg</td>
<td>500 mg</td>
</tr>
<tr>
<td>55 - 74</td>
<td>1500 mg</td>
<td>750 mg</td>
</tr>
<tr>
<td>75 - 89</td>
<td>2000 mg</td>
<td>1000 mg</td>
</tr>
<tr>
<td>90 - 110</td>
<td>2500 mg</td>
<td>1250 mg</td>
</tr>
<tr>
<td>&gt;110</td>
<td>3000 mg</td>
<td>1500 mg</td>
</tr>
</tbody>
</table>

- Dilute doses up to 1250 mg in 250 ml sodium chloride (0.9%) and doses above 1250 mg and up to 2000 mg in 500 mL sodium chloride (0.9%). Glucose 5% may be used in patients with sodium restriction.

Note that patients who have unusual clinical characteristics, e.g. weight < 40 kg, weight >120 kg, age >90 years may require dose adjustments and require close monitoring. Contact pharmacy for advice.

**STEP 2:** Monitor the vancomycin concentration and reassess the continuous infusion dose

- Due to wide variability in the handling of vancomycin, early analysis of a vancomycin concentration is required to ensure that the dosage regimen is appropriate.
- Take a sample after 12 – 24 hours of starting the continuous infusion then every 1 - 2 days, or daily if the patient has unstable renal function.
- Monitor creatinine daily.
- Record the time of the blood sample on the request form and the sample tube.

**Target vancomycin concentrations**

- **Target steady state concentration range:** 15 – 25 mg/L
- If the patient is **seriously ill** (severe or deep-seated infections), the target range is **20 – 25 mg/L**. If the measured concentration is < 20 mg/L, consider increasing the dose amount.
- If the patient is failing to respond, seek advice from microbiology or an infection specialist.
Intravenous Vancomycin Use in Adults (Continuous Infusion)

**STEP 2:** Monitor the vancomycin concentration and reassess the continuous infusion dose

**Adjustment of vancomycin doses - continuous infusion**
- Always check that the dosage history and sampling time are appropriate before interpreting the result.
- Seek advice from pharmacy or microbiology if you need help to interpret the result.

**If the measured concentration is unexpectedly HIGH or LOW, consider the following:**
- Were the dose and sample times recorded accurately?
- Was the correct dose administered?
- Was the sample taken from the line used to administer the drug?
- Has renal function declined or improved?
- Does the patient have oedema or ascites?

**Table 3: Adjustment of Vancomycin Doses – continuous infusion**

<table>
<thead>
<tr>
<th>Vancomycin concentration</th>
<th>Suggested dose change</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;15 mg/L</td>
<td>Increase the 12 hourly dose by 250 mg</td>
</tr>
<tr>
<td>15 - 25 mg/L</td>
<td>If the patient is responding, maintain the present dosage regimen. If the patient is seriously ill, consider increasing the dose amount to achieve a steady state concentration of 20 – 25 mg/L.</td>
</tr>
<tr>
<td>26 - 30 mg/L</td>
<td>Decrease the 12 hourly dose by 250 mg</td>
</tr>
<tr>
<td>&gt;30 mg/L</td>
<td>Stop until &lt; 25 mg/L then restart at a lower dose</td>
</tr>
</tbody>
</table>

If in doubt, take another sample before modifying the dosage regimen and / or contact pharmacy for advice

**General points**
- Document any action taken in the medical notes.
- Undertake pre-prescribing checks (Box 2) to assess the risk of toxicity.
- Review the need for vancomycin daily.

**Box 2: Toxicity**
- Monitor creatinine daily. Seek advice if renal function is unstable (e.g. a change in creatinine of > 15-20%)
- Signs of renal toxicity include increase in creatinine or decrease in urine output / oliguria
- Consider an alternative agent if creatinine is rising or the patient becomes oliguric.
- Vancomycin may increase the risk of aminoglycoside induced ototoxicity