

ADULT CONTINUOUS VANCOMYCIN INFUSION INFORMATION FOR PHARMACISTS ONLY

BACKGROUND

Vancomycin pharmacokinetic/pharmacodynamic index that best predicts clinical efficacy is the area under the serum concentration-time curve over 24 hours (AUC₀₋₂₄) exceeding 400 mg*h/L for *S. aureus* with an MIC \leq 1 mg/L. Due to the simplicity of monitoring trough concentrations, trough concentrations of 15-20 mg/L are used in clinical practice as a surrogate to ensure the attainment of the AUC₀₋₂₄ target for complicated infections, such as bacteremia, endocarditis, osteomyelitis, meningitis, and pneumonia. However, achieving trough concentrations of 15-20 mg/L in patients who have a high vancomycin clearance may require a high total daily dose resulting in unnecessary drug exposure and a corresponding increased risk of nephrotoxicity. To balance risk and benefit, continuous infusion of vancomycin, an alternative mode of administration, can be used to achieve an optimal daily exposure (AUC₀₋₂₄ of 500 -740 mg*h/mL) while requiring a lower total daily dose than vancomycin intermittent infusion that aims for trough concentration of 15-20 mg/L in patients with high vancomycin clearance.

CRITERIA FOR THE USE OF VANCOMYCIN CONTINUOUS INFUSION

For patients requiring vancomycin >4 grams/day

Required to be monitored by Antimicrobial Stewardship Pharmacist, Critical Care Pharmacist or LLT Pharmacist

Vancomycin continuous infusion must be administered via Central line or Midline

LOADING DOSE

If the continuous infusion cannot be started within 4 hours of the last dose of intermittent infusion (please take into consideration of the lag time for pharmacy to deliver the medication), give a loading dose of 20 mg per kg (use actual body weight).

Maximum loading dose = 2 gram per dose over 2 hours.

DOSING

Start infusion immediately after loading dose is complete if one is given

If patient's estimated pharmacokinetic parameters are NOT known:

Initial infusion rate = 200 mg per hour (4800 mg in 24 hours) = 40 mL/hr of 5 mg/mL vancomycin intravenous solution

If patient's estimated pharmacokinetic parameters are known:

Infusion Rate (mg/hr) = Van CL (L/hr) x C_{plateau ss} (mg/L)

Example: Target C_{plateau ss} of 25 mg/L and patient has Van CL of 7 L/hr

Infusion Rate (mg/hr) = 7 L/hr X 25 mg/L = 175 mg/hr (35 mL/hr)

PHARMACY PREPARATION OF VANCOMYCIN CONTINUOUS INFUSION

Standard Concentration:

Vancomycin 5 grams in 1000 mL Normal Saline (approximately 5 mg/mL) (pharmacists will not remove extra fluid when compounding the infusion)

Screen shot of the vancomycin continuous infusion order:

The screenshot displays a 'Verify Continuous Order' window. At the top, a table lists the drugs to be infused:

| Vol | Drug | Dose | Normalized Rate | Concentration | Frequency | Ordered As |
|-------|--------------------------------|----------|-----------------|---------------|-----------|--------------|
| 1.000 | Sodium Chloride 0.9% NS 1000mL | 1,000 mL | | | Every Bag | Sodium C... |
| 1.000 | vancomycin | 5,000 mg | | | Every Bag | vancomyci... |
| | vancomycin 1000 mg Inj | | | | | |

Below the table, patient information is entered: Route: Continuous IV, Weight: 75 kg, BSA(m2): [blank], Physician: ZTESTBOBEK, ROSA. The rate is set to 40 mL/hr, and the duration is 28 days. The start date is 08/06/2018 at 15:25, and the stop date is 09/03/2018 at 15:24. The stop type is 'Soft Stop'. The order priority is 'Routine', and the initial dose is '1'. The dosage form is 'LVP', and the communication type is 'Written'. The pharmacy is 'SUNY Pharmacy'. The price is \$250.77, and the cost is \$83.59. The 'Auto calculate initial dose' checkbox is checked.

MONITORING

With continuous infusion, the vancomycin concentration will remain relatively constant after steady state is reached. Continuous infusion does not produce peak and trough concentrations.

“Random” level taken 24 hours after the same continuous infusion rate in a patient with vancomycin half-life 4-6 hours reflects steady state “Plateau” vancomycin concentration

Target “Random” level: 20-30 mcg/mL (AUC₀₋₂₄ of 480 to 740 mg*h/L)

First Random level to be taken 24 hours after start of infusion.

If first level is within range:

- Redraw level in 48 hours if no change to renal function

If level is not within range

- Make adjustments based on chart below and redraw in 18 -24 hours

Laboratory order and specimen collection:

Order “Random” level only since this is not a trough level.

To prevent multiple blood draws, vancomycin random levels may be taken with morning labs if the patient has been on the same infusion rate for at least 18 hours

- Preferred Specimen Collection Method: obtain blood specimen via peripheral vein either opposite to the infusion site or distal from the infusion site
- Option if peripheral venous access not possible:
 - Stop infusion
 - Flush Line well
 - Draw level
 - Restart infusion immediately post draw
 - Attempt to complete this process within 5 minutes

**SUGGESTIONS FOR DOSE ADJUSTMENT DURING OFF-HOUR
(MUST NOTIFY CORRESPONDING DAY-SHIFT PHARMACY SERVICE TO FOLLOW)**

| Vancomycin Random level (mg/L) | ACTION |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <15 | Repeat random level during day shift and reassess |
| 15 to 20 | <ul style="list-style-type: none"> • Increase the infusion rate proportionally to achieve 25 mg/L (round infusion rate down to the nearest 5 mg/hr) <p><u>Example</u> Infusion rate 160 mg/hr produces random level of 15 mg/L New rate = $160 \text{ mg/hr} \times 25 \div 15 = 267 \text{ mg/hr}$ Round to 265 mg/hr</p> <ul style="list-style-type: none"> • Repeat random level in 18 - 24 hrs |
| >20 to 27 | <ul style="list-style-type: none"> • No change • Repeat random level in 48 hours |
| >27 to 30 | <ul style="list-style-type: none"> • Hold infusion for 2 hours • Decrease the infusion rate proportionally to achieve 25 mg/L (round infusion rate down to the nearest 5 mg/hr) <p><u>Example</u> Infusion rate 200 mg/hr produces random level of 30 mg/L New rate = $200 \text{ mg/hr} \times 25 \div 30 = 167 \text{ mg/hr}$ Round to 165 mg/hr</p> <ul style="list-style-type: none"> • Repeat random level in 18 - 24 hrs |
| >30 to 37 | <ul style="list-style-type: none"> • Hold infusion for 4 hours • Decrease the infusion rate proportionally to achieve 25 mg/L (round infusion rate down to the nearest 5 mg/hr) <p><u>Example</u> Infusion rate 200 mg/hr produces random level of 35 mg/L New rate = $200 \text{ mg/hr} \times 25 \div 35 = 143 \text{ mg/hr}$ Round to 140 mg/hr</p> <ul style="list-style-type: none"> • Repeat random level in 18 - 24 hrs |
| >37 | <ul style="list-style-type: none"> • Hold infusion for 6 -12 hours • Repeat random level in 6 -12 hours (the goal is to have the result of the repeat level during day shift when there is available resources for proper follow-up) |