



PAEDIATRIC

**Vancomycin
Therapeutic Drug Monitoring**

(Affix patient identification label here)

URN:

Family Name:

Given Names:

Address:

Date of Birth:

Sex: M F I

Purpose

The purpose of this worksheet is to provide specific drug dosing and therapeutic drug monitoring information to assist with safe prescribing of Vancomycin in our paediatric patient population.

This worksheet is intended to be used by medical, nursing and pharmacy staff.

All patients receiving Vancomycin should have appropriate drug levels ordered **at the time of prescribing**. All patients requiring more than 48 hours of Vancomycin, need Infectious Diseases (ID) input and approval to receive ongoing therapy.

Instructions

Dosing – all patients:

Commence dose of intravenous (IV) Vancomycin at age appropriate mg/kg dose.

Starting doses:

Neonates 29 to 44 weeks post conceptional age:

- Week 1 and 2 of life: 15mg/kg/dose every 12 hours.
- Week 3 of life: 15mg/kg/dose every 8 hours.

Infants and children <18 years:

- General dosing: 15mg/kg/dose (max. initial dose 500mg) every 6 hours.
- For critically ill patients/severe sepsis: 15mg/kg/dose (max. initial dose 750mg) every 6 hours.

Note: A loading dose of 30mg/kg (max. 1500mg) can be considered in patients with severe sepsis. If a loading dose is given, it should be counted as the first dose.

Special dosing considerations

- For critically ill patients OR patients with renal impairment, contact Pharmacist or ID team for advice on dosing prior to commencing Vancomycin.
- Dose using actual body weight for calculation of initial Vancomycin dose. Cap dose at maximum adult dose.
- For continuous infusion: Seek ID Consultant and Pharmacist advice PRIOR to commencement. Dose calculation/conversion and monitoring require expert input.

Administration

It is recommended that the Vancomycin dose is diluted to a maximum concentration for administration of 5mg/mL (if fluid restricted 10mg/mL via central line only) and infused over at least 2 hours (due to risk of rate-related red man syndrome).

Infusions can be given over a shorter time if necessary, however check with Pharmacist first, and monitor carefully.

Maximum rate 10mg/minute or over at least 60 minutes, whichever is longer.

Rapid infusion may cause red man syndrome; symptoms include flushing or rash on the upper body and neck, muscle spasm of the chest and back.

If this occurs:

- STOP infusion and inform medical staff
- check dosage and infusion rate
- wait for symptoms to resolve
- reduce infusion concentration, if possible
- resume infusion at a slower rate
- report and document adverse reaction

Your Clinical Pharmacist or ID Consultant is available for advice on all dose adjustments.

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Information about Therapeutic Drug Monitoring

Patients on intermittent dosing:

- Time to steady state: 1-2 days.
- Sampling time: Trough level (blood sample taken 30 minutes prior to dose) on day 2 of therapy (ideally just before the third or fourth dose to coincide with achievement of steady state).

For electronic prescribing:

- Prescriber to use Paediatric Vancomycin Powerplan to prescribe Vancomycin and order first Vancomycin level by placing an electronic pathology order.
- The pharmacist can also place a 'Medication Level placeholder' which will appear on the Medication Administration Record (MAR) - this acts as a reminder to the nursing staff when a medication level is due.
- Vancomycin level must be checked and dose adjustments made (if needed) before next dose is given. Do not withhold Vancomycin dose unless specified by Medical officer/prescriber or if concerned about renal impairment/delayed clearance of the previous dose.
- **In patients with stable renal function**, Vancomycin exhibits linear pharmacokinetics; an increase or decrease in dose should result in a proportionate increase or decrease in plasma concentrations.
 - Repeat levels once or twice a week in patients with stable renal function
- **In critically ill patients** (for example: patients with septic shock, oncology patients, cardiac patients), renal clearance may be altered (either impaired or augmented renal clearance observed). Take care with dose adjustments in these patient groups.
 - Repeat levels every 48 to 72 hours or more frequently if rapidly changing renal function or critically ill patient.
- **In patients with renal impairment**, the frequency of dosing should be extended and levels should be checked before the next dose is administered. Seek specialist advice.
- Dose recommendations are based on attainment of the targets. Consider patient's clinical condition and risk factors for toxicity (for example, concomitant nephrotoxic agents, IV contrast media, dehydration/fasting status, existing renal dysfunction).

Therapeutic Range

Patients receiving intermittent dosing:

- Uncomplicated infections: trough level of 10-15mg/L
- Complicated infections (Septic shock/Meningitis/MRSA/Endocarditis/osteomyelitis): trough level of 15-20mg/L

Patients receiving continuous infusion (on Infection Specialist advice only):

- Sampling time: 24 hours post commencement of continuous infusion (steady state)
- Aim for Vancomycin steady state (C_{ss}) level of 20-25mg/L
- Sampling method: Vancomycin infusion should be paused for 10 minutes, before sample is taken. Draw back and discard 5-10mL blood, before taking sample for level to reduce risk of contamination.
- Repeat levels every 48 to 72 hours or more frequently if rapidly changing renal function or critically ill patient.

When dose change is indicated

Consider patient comorbidities, risk factors and renal function.

Modified Schwartz formula is used to calculate Paediatric Creatinine Clearance (CrCl)**:

CrCl (mL/min/1.73m²) = **[36.5 x Height (cm)] / Creatinine (micromol/L)** = _____ mL/min/1.73m²

**Not validated to be used in children <1 year of age. Cap CrCl at maximum of 120mL/min/1.73m².

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Queensland
Government



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Adjusting doses in patients with normal renal function

* Ensure timing of samples and sampling method is appropriate, when interpreting results.

	Uncomplicated infections Target trough 10-15mg/L	Complicated infections Target trough 15-20mg/L
Measured Trough (mg/L) (30 minutes pre-dose)*	Dose adjustment	Dose adjustment
<5	Increase dose by 20% and repeat level pre 4th dose. Notify ID team if levels remain <10mg/L despite dose adjustment.	Increase dose by 20-25% and repeat level pre 4th dose. Notify ID team if levels remain <15mg/L despite dose adjustment.
5-10	Increase dose by 15% and repeat level pre 4th dose. Notify ID team if levels remain <10mg/L despite dose adjustment.	Increase dose by 20% and repeat level pre 4th dose. Notify ID team if levels remain <15mg/L despite dose adjustment.
10-15	Remain on current dose and repeat level in 72 hours.	Increase dose by 15-20% and repeat level pre 4th dose. Notify ID team if levels remain <15mg/L despite dose adjustment.
15-20	Reduce dose by 15-20% OR change dose interval (for example from 6-hourly to 8-hourly). Repeat level pre 4th dose.	Remain on current dose and repeat level in 48 to 72 hours.
20-25	Withhold dose and repeat level in 6-8 hours. If level <15mg/L, then restart at 20-25% lower dose (or adjust dosing interval). If level >15mg/L, continue to withhold and repeat level in 6 hours.	Reduce dose by 20% OR change dose interval (for example from 6-hourly to 8-hourly). Repeat level pre 3rd or 4th dose.
>25	Withhold 2 doses and repeat level in 12 hours. If level <15mg/L, then restart at 50% lower dose (or adjust dose interval) and repeat level before the next dose. If level >15mg/L, continue to withhold and repeat level in 6 hours and seek ID advice.	Withhold dose and repeat level in 6-8 hours. If level <20mg/L, then restart at 25% lower dose (or adjust dose interval). If level >20mg/L, continue to withhold and repeat level in 6 hours and seek ID advice.

Further reading:

- Vancomycin dosing and monitoring – Therapeutic guidelines (Antibiotics):
<https://online-tg-org-au.cknservices.dotsec.com/ip/desktop/index.htm>
- Lomaestro BM. Vancomycin Dosing and Monitoring 2 Years After the Guidelines. Expert Rev Anti Infect Ther. 2011;9(6):657-667
- Schwartz GJ and Work DF. Measurement and estimation of GFR in children and adolescents. J Am Soc Nephrol. 2009; 4(11): 1832-643

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Therapeutic Drug Monitoring Recording

Indication for therapy:

Patient's target level:

- Check vancomycin level before fourth dose is given, and whenever 'trough level' indicated on medication form.
- Discuss results with doctor (or pharmacist) to ensure prescribed dose can be given.
- If Vancomycin result is not available prior to next dose, notify doctor immediately and discuss whether to withhold pending results, or administer with or without taking a trough level prior. Document decision on this form (*Record management plan* section)
- Accurate recording of times for administration and blood sampling is essential as small deviations can alter the interpretation of trough level results and accuracy of dose recommendations. If administration duration/ time variations occur, please note details and reason on this form.

Nurse to complete

Pharmacist/Doctor to complete

Date of blood test	Time bloods taken	Dose (mg)	Dosing interval (specify)	Patient's target level (e.g. 15-20mg/L)	AUSCARE/AUSLAB collection time correlates <input type="checkbox"/> Yes <input type="checkbox"/> No	Level result (mg/L)	Pharmacy management plan		Plan communicated to (specify Doctor's name, date and time)	Plan acknowledged by
							Sign:	Date:		
					<input type="checkbox"/> Yes <input type="checkbox"/> No		Sign: _____ Date: _____	Sign: _____ Date: _____	Sign: _____ Date: _____	Sign: _____ Date: _____
					<input type="checkbox"/> Yes <input type="checkbox"/> No		Sign: _____ Date: _____	Sign: _____ Date: _____	Sign: _____ Date: _____	Sign: _____ Date: _____
					<input type="checkbox"/> Yes <input type="checkbox"/> No		Sign: _____ Date: _____	Sign: _____ Date: _____	Sign: _____ Date: _____	Sign: _____ Date: _____
					<input type="checkbox"/> Yes <input type="checkbox"/> No		Sign: _____ Date: _____	Sign: _____ Date: _____	Sign: _____ Date: _____	Sign: _____ Date: _____

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