Hospital Sungai Buloh Vancomycin Protocol

Launched: 15 August 2022, Updated: 17 April 2024

APPLICATION OF THIS PROTOCOL:

- Intravenous Vancomycin for the treatment of selective gram-positive organisms including but not limited to:
  1. Methicillin-resistant Staphylococci (eg: MRSA/MRCONS)
  2. Enterococci (eg: *Enterococcus faecium*)
  3. Rhodococci (eg: *Rhodococcus hoagii)*
- This protocol is **NOT** applicable to the treatment of *Clostridioides difficile* infection (CDI) using **Oral** Vancomycin

If in any doubt, call:
TDM Pharmacy at Ext 4124 (Office Hours)
or
Refer to ID

Step 1: Loading Dose (LD)

Administer the Loading Dose (LD) as soon as possible!

TABLE A: Loading Dose for Normal Renal Function or Renal Impairment but NOT on Haemodialysis (HD)

TABLE A	Renal Function*		Remarks
	CrCl < 30, NOT on HD	CrCl ≥ 30	
Actual Body Weight	20 mg/kg IV STAT	20-25 mg/kg IV STAT	
< 50 kg	1,000 mg	1,000 mg	1. Loading Dose - To be given to **ALL** patients regardless of renal function 2. Vancomycin doses should be calculated based on **Actual Body Weight** 3. Max Vancomycin dose: **2 g/DOSE** or **4 g/DAY**
50 – 59 kg	1,250 mg	1,250 mg	
60 – 69 kg	1,500 mg	1,500 mg	
70 – 79 kg	1,500 mg	1,750 mg	
80 – 89 kg	1,750 mg	2,000 mg	
90 – 99 kg	2,000 mg	2,000 mg	
≥ 100 kg	2,000 mg	2,000 mg	

** Renal Function - CrCl (ml/min)* → *[Click here for CrCl Calculator]*

TABLE B: Loading Dose for ESRF Patients on Haemodialysis (HD)

TABLE B	Vancomycin initiated or planned to be initiated BEFORE dialysis starts		Vancomycin planned to be given DURING dialysis	Remarks
Actual Body Weight	15-20 mg/kg IV STAT If HD occurs on the same day as the loading dose, administer a TOP-UP DOSE* post-HD	*TOP-UP DOSE (5 mg/kg) (to be given 1 hour before HD ends)	25 mg/kg IV STAT (to be given 1 hour before HD ends)	
< 50 kg	1,000 mg	250 mg	1,250 mg	1. Vancomycin doses should be calculated based on **Actual Body Weight** 2. Max Vancomycin dose: **2 g/DOSE** or **4 g/DAY**
50 – 59 kg	1,000 mg	300 mg	1,500 mg	
60 – 69 kg	1,250 mg	350 mg	1,750 mg	
70 – 79 kg	1,250 mg	400 mg	1,750 mg	
80 – 89 kg	1,500 mg	450 mg	2,000 mg	
90 – 99 kg	1,500 mg	500 mg	2,000 mg	
≥ 100 kg	2,000 mg	500 mg	2,000 mg	

** Hospital Sungai Buloh uses high-flux membrane dialyzers for haemodialysis*

Prepared by: AMS Pharmacists (Izyana Munirah Idham, Hannah Md Mahir, Tan Wai Leong & Adam Ashraf Ja'afer) & TDM Pharmacist (Anna Hon Mei Yee)

Step 2: Maintenance Dose (MD)

TABLE C: Vancomycin Maintenance Dose Based on Body Weight and Renal Function

TABLE C	Renal Function*				
	CrCl <15 or HD	CrCl 15-29	CrCl 30-49	CrCl 50-59	CrCl > 60
Actual Body Weight	-	**7.5 mg/kg Q24H**	**7.5-15 mg/kg Q12-24H**	**15 mg/kg Q12H**	**15-20 mg/kg Q8-12H**
40 – 49 kg	The maintenance dose is based on Vancomycin TDM after the loading dose.	500 mg OD	500 mg OD	750 mg OD	500 mg BD
50 – 59 kg		500 mg OD	750 mg OD	750 mg OD	750 mg BD
60 – 74 kg		500 mg OD	750 mg OD	500 mg BD	1,000 mg BD
75 – 89 kg		750 mg OD	500 mg BD	750 mg BD	750 mg TDS
> 90 kg		750 mg OD	750 mg BD	1,000 mg BD	1,000 mg TDS**

Then, adjust subsequent maintenance doses based on TDM level (refer to Step 4)
(While waiting for the TDM result, continue serving the Vancomycin unless pt has severe AKI or poor Urine Output)

** Renal Function - CrCl (ml/min) ➔ [Click here for CrCl Calculator]*
*** Consider conservative dosing for patients at risk for Acute Kidney Injury (AKI) (e.g., elderly, concurrent nephrotoxic drugs) – refer ID if in doubt*

TABLE D	Standardized Administration Time for Vancomycin Maintenance Dose in HSgB
Vancomycin Frequency	**Administration Time**
OD	**6 AM**
BD	**6 AM, 6 PM**
TDS	**6 AM, 2 PM, 10 PM**
QID	**6 AM, 12 PM, 6 PM, 12 AM**

Step 3: Administration (Dilution & Infusion Rate)

TABLE E: Vancomycin Administration: Dilution & Infusion Rate by Dose

Dose	Volume of diluents (NS or D5)		Duration of infusion
	Central line *(max conc: 10 mg/mL)*	Peripheral line *(max conc: 5 mg/mL)*	
500 mg	50 mL	100 mL	1 hour
750 mg	100 mL	200 mL	1.5 hour
1,000 mg	100 mL	200 mL	2 hours
1,250 mg	200 mL	250 mL	2.5 hours
1,500 mg	200 mL	500 mL	2.5 hours
1,750 mg	200 mL	500 mL	3 hours
2,000 mg	200 mL	500 mL	4 hours

MAXIMUM INFUSION RATE: 10 mg/min.

Infusing too fast may cause rapid infusion-related reactions (Red Man Syndrome*).

***RED MAN SYNDROME / VANCOMYCIN INFUSION REACTION (VIR):**

- Red Man Syndrome is commonly used to describe vancomycin infusion reaction (VIR) & is the most commonly reported Vancomycin adverse reaction.
- VIR is not an allergic reaction and is not a contraindication to vancomycin use
- Symptoms of VIR: itching, flushing and erythematous rash, usually involving the face, neck, and trunk.
- Slowing the infusion rate will alleviate symptoms in most cases & giving antihistamines may also help.

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Step 4: Therapeutic Drug Monitoring (TDM)

TDM level is MEANINGLESS unless the dose is properly served & sampling time is recorded!

1. Record the **time each infusion started & ended** on Vancomycin AUC Monitoring Form (eg: infusion started at 6 am & completed at 7.30 am)
2. Record the **time sample was taken** on Vancomycin AUC Monitoring Form (eg: pre-level taken at 5.30 am & post-level taken at 9 am)

For any TDM enquiries, kindly call Pharmacy:
TDM - Ext 4124 (Office Hour)
or
ED Pharmacy- Ext 3210 (AOH)

WHEN TO TAKE TDM SAMPLE?

Time of the first Vancomycin level depends on the **frequency** of Vancomycin **MAINTENANCE DOSE:**

Vancomycin Regimen:	Loading Dose (LD)	Maintenance Dose (MD)	
Load (ESRF not on HD)	✓ LD	+ 🩸 **24H**	(Take random TDM level after **24H** of Loading Dose)
Load (ESRF, regular HD)	✓ LD	+ 🩸 **HD**	(Take random TDM level in the morning **pre-HD**)
Load + EOD Dosing	✓ LD	+ ✓ MD 1 🩸 **MD 2**	(TDM 30 mins before the **2nd** Maintenance Dose)
Load + OD Dosing	✓ LD	+ ✓ MD 1 ✓ MD 2 🩸 **MD 3**	(TDM 30 mins before the **3rd** Maintenance Dose)
Load + BD Dosing	✓ LD	+ ✓ MD 1 ✓ MD 2 ✓ MD 3 🩸 **MD 4**	(TDM 30 mins before the **4th** Maintenance Dose)
Load + TDS Dosing	✓ LD	+ ✓ MD 1 ✓ MD 2 ✓ MD 3 🩸 **MD 4**	

If the sampling time falls after office hours (AOH), it is advisable to recommend taking the TDM sample the next morning (on a working day)

EXAMPLE:

Mr Unknown was prescribed with IV Vancomycin 2 g STAT and 750 mg **TDS** at 9.45 pm on 13/8/22.

Based on the guide above, the first Vancomycin level should be taken **30 minutes before the 4th Maintenance Dose**.

Refer to the medication chart below:

IN-PATIENT PRESCRIPTION		TIME:	DATE: 13/8	14/8	15/8	16/8	17/8	19/8	20/8
Start Date: **13/08/22**	End Date: **21/08/22**								
Name: **Mr Unknown**	Ward: **5A**			*Start of Maintenance Dose*					
R/N: **SB00123456**	Bed No: **28**	**6 am**		1 **750mg**	4				
Rx:		**2 pm**		2 **750mg**					
IV Vancomycin 2g STAT, then 750mg TDS x 1/52		**10 pm**		3 **750mg**					
(Wt: 80kg, CrCl: 115 ml/min)			**2 g** *Loading Dose*						
Prescribed by:	Authorized by:								
Dr MO	*Dr Specialist*								

Take TDM Vancomycin trough level here, at **5.30 am, 30 minutes before** the **4th maintenance dose**.

WHICH SAMPLING METHOD TO CHOOSE: TROUGH VS AUC?

TABLE F — Vancomycin Sampling Method: Trough vs AUC

Indication of Vancomycin	Target Vancomycin Level	Samples to be Taken: Pre-level (Trough)	Samples to be Taken: Post-level (Peak)
1. MRSA Infection ○ Bacteremia ○ Endocarditis ○ Pneumonia ○ Bone/Joint Infection ○ Neutropenic fever	**For pts with stable renal function, including stable CKD:** • AUC_{24} 400 - 600 mg.h/L	✓ 30 minutes **BEFORE** the dose is served	✓ 1 hour after **COMPLETION** of Vancomycin Infusion
	For pts with unstable renal function (eg: AKI or HD): • Trough of 15- 20 mg/L (10.4 - 13.8 µmol/L)	✓ 30 minutes **BEFORE** the dose is served	×
2. CNS Infection	• Trough of 15 - 20 mg/L (10.4 - 13.8 µmol/L)	✓ 30 minutes **BEFORE** the dose is served	×
3. SSTI or UTI	• Trough 10 - 15 mg/L (6.9 – 10.4 µmol/L)	✓ 30 minutes **BEFORE** the dose is served	×
4. MRCONS *or* ***Enterococcus faecium***	• Trough of 10 - 20 mg/L (6.9 - 13.8 µmol/L)	✓ 30 minutes **BEFORE** the dose is served	×

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Step 5: Patient / Laboratory Monitoring

1. Renal Profile (RP) ➔ *Seek advice if pt has signs of renal toxicity - increase in SCr by 26 µmol/L or increase in SCr of 50% or more from baseline within 48 Hours [refer to KDIGO].*	**Every 2-3 days** ➔ *For haemodynamically stable patients.* **Daily** ➔ *For patients with rapidly changing renal function or critically ill.* ➔ *For patients with risk factor(s) for nephrotoxicity. Eg: Elderly, concurrent nephrotoxic drug, TDM Vancomycin trough > 15 mg/L.*
2. Urine Output (Input/Output Chart) ➔ *Seek advice if Urine Output reduced to < 0.5 ml/kg/H for > 6 Hours.*	**Daily** ➔ *A decrease in urine output can be detected earlier than increases in SCr, enabling dose adjustment before further vancomycin accumulation can occur.*
3. White Blood Cell count (WBC)	**Twice a week**
4. C-Reactive Protein (CRP)	**Weekly**
5. Vital Signs: • Temperature • Heart rate • Blood pressure	**Daily**

DISCLAIMER:

- This protocol provides general advice based on published evidence and expert opinion for hospital-wide standardization of practice. This guide may not cover all aspects of clinical practice, thus healthcare practitioners are encouraged to review patient details and professionally assess the relevance of this protocol to each clinical situation.
- Referral to ID or AMS Team is strongly recommended for all MRSA or Vancomycin cases.
- This guide is subject to periodic updates. We assume no responsibility for any party who referred to an outdated version of this protocol.

References:

1. MOH Clinical Pharmacokinetics Pharmacy Handbook 2nd Edition
2. Detroit Medical Center Vancomycin Dosing in Adults – Clinical Guidelines
3. Therapeutic monitoring of vancomycin for serious MRSA infections: A revised consensus guideline and review by the ASHSP, the IDSA, the PIDS, and the SIDP. *Am J Health-Syst Pharm*. 2020;77:835-864
4. Hospital Sungai Buloh Dilution Protocol

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