GRAPHICS

Approach to vancomycin dosing for adults with normal kidney function*

Loading dose (for patients with known or suspected severe *Staphylococcus aureus* infection) ¶	Load 20 to 35 mg/kg (based on actual body weight, rounded to the nearest 250 mg increment; not to exceed 3000 mg). Within this range, we use a higher dose for critically ill patients; we use a lower dose for patients who are obese and/or are receiving vancomycin via continuous infusion.
Initial maintenance dose and interval	Typically 15 to 20 mg/kg every 8 to 12 hours for most patients (based on actual body weight, rounded to the nearest 250 mg increment). In general, the approach to establishing the vancomycin dose/interval is guided by a nomogram.Δ
Subsequent dose and interval adjustments	Based on AUC-guided (preferred for severe infection)[1] or trough-guided serum concentration monitoring.◊

AUC: area under the 24-hour time-concentration curve.

* Refer to the UpToDate topic on vancomycin dosing for management of patients with abnormal kidney function.

¶ For patients with known or suspected severe *S. aureus* infection, we suggest administration of a loading dose to reduce the likelihood of suboptimal initial vancomycin exposure. Severe *S. aureus* infections include (but are not limited to) bacteremia, endocarditis, osteomyelitis, prosthetic joint infection, pneumonia warranting hospitalization, infection involving the central nervous system, or infection causing critical illness.

Δ If possible, the nomogram should be developed and validated at the institution where it is used, to best reflect the regional patient population. Refer to UpToDate topic on vancomycin dosing for sample nomogram.

◊ Refer to the UpToDate topic on vancomycin dosing for discussion of AUC-guided and trough-guided vancomycin dosing. For patients with nonsevere infection who receive vancomycin for <3 days (in the setting of stable kidney function and absence of other risk factors for altered vancomycin kinetics), vancomycin concentration monitoring is often omitted; the value of such monitoring prior to achieving steady state (usually around treatment day 2 to 3) is uncertain.

Reference:

1. *Rybak MJ, Le J, Lodise TP, et al. Therapeutic Monitoring of Vancomycin for Serious Methicillin-Resistant Staphylococcus Aureus Infections: A Revised Consensus Guideline and Review by the American Society of Health-System Pharmacists, the Infectious Diseases Society of America, the Pediatric Infectious Diseases Society, and the Society of Infectious Diseases Pharmacists. Am J Health Syst Pharm 2020; 77:835.*

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Suggested approach to parenteral vancomycin dosing in adults who are not receiving hemodialysis*

1. Loading dose for critically ill patient or severe infection:[¶] 25 mg/kg (rounded to nearest 250 mg)

2. Initial maintenance dose and interval: Based on target trough, patient weight, and estimated creatinine clearance[Δ] as follows:

Creatinine clearance in mL/minute (Cockcroft Gault equation)[Δ]	Weight (actual)[◊]					
	50 to 59 kg	60 to 69 kg	70 to 79 kg	80 to 89 kg	90 to 99 kg	100 kg[◊]
Severe or deep-seated infection:[§] Target trough 15 to 20 mcg/mL						
<10 (not receiving hemodialysis)[¥]	Repeat dose when spot (random) serum concentration ≤20 mcg/mL					
10 to 19 (not receiving hemodialysis)[¥]	750 mg every 48 hours	1000 mg every 48 hours	1000 mg every 48 hours	1250 mg every 48 hours	1250 mg every 48 hours	1500 mg every 48 hours
20 to 29	500 mg every 24 hours	750 mg every 24 hours	1000 mg every 36 hours	1250 mg every 36 hours	1250 mg every 36 hours	1250 mg every 36 hours
30 to 39	750 mg every 24 hours	750 mg every 24 hours	1000 mg every 24 hours	1250 mg every 24 hours	1250 mg every 24 hours	1250 mg every 24 hours
40 to 49	750 mg every 18 hours	750 mg every 18 hours	1000 mg every 18 hours	1250 mg every 18 hours	1250 mg every 18 hours	1250 mg every 18 hours
50 to 59	750 mg every 18 hours	1000 mg every 18 hours	1000 mg every 18 hours	1250 mg every 18 hours	1250 mg every 18 hours	1500 mg every 18 hours
60 to 69	750 mg every 12 hours	750 mg every 12 hours	1000 mg every 12 hours	1000 mg every 12 hours	1250 mg every 12 hours	1250 mg every 12 hours
70 to 79	750 mg every 12 hours	1000 mg every 12 hours	1000 mg every 12 hours	1250 mg every 12 hours	1250 mg every 12 hours	1500 mg every 12 hours
80 to 89	750 mg every 12 hours	1000 mg every 12 hours	1250 mg every 12 hours	1250 mg every 12 hours	1500 mg every 12 hours	1500 mg every 12 hours
90 to 99	1000 mg every 12 hours	1000 mg every 12 hours	1250 mg every 12 hours	1500 mg every 12 hours	1500 mg every 12 hours	1500 mg every 12 hours
≥100 **and** <60 years old[Δ]	750 mg every 8 hours	750 mg every 8 hours	1000 mg every 8 hours	1250 mg every 8 hours	1250 mg every 8 hours	1250 mg every 8 hours
Nonsevere and superficial infection:[§] Target trough 10 to 15 mcg/mL						
<10 (not receiving hemodialysis)[¥]	Repeat dose when spot (random) serum concentration ≤15 mcg/mL					
10 to 19 (not receiving hemodialysis)[¥]	1000 mg every 72 hours	1250 mg every 72 hours	1250 mg every 72 hours	1500 mg every 72 hours	1500 mg every 72 hours	1750 mg every 72 hours
20 to 29	1000 mg every 48 hours	1000 mg every 48 hours	1250 mg every 48 hours	1500 mg every 48 hours	1500 mg every 48 hours	1750 mg every 48 hours
30 to 39	1000 mg every 36 hours	1000 mg every 36 hours	1250 mg every 36 hours	1500 mg every 36 hours	1500 mg every 36 hours	1750 mg every 36 hours
40 to 49	1000 mg every 24 hours	1000 mg every 24 hours	1250 mg every 24 hours	1250 mg every 24 hours	1500 mg every 24 hours	1500 mg every 24 hours
50 to 59	1000 mg every 24 hours	1250 mg every 24 hours	1250 mg every 24 hours	1500 mg every 24 hours	1500 mg every 24 hours	1750 mg every 24 hours

60 to 69	1000 mg every 18 hours	1250 mg every 18 hours	1250 mg every 18 hours	1500 mg every 18 hours	1500 mg every 18 hours	1750 mg every 18 hours
70 to 79	1000 mg every 18 hours	1250 mg every 18 hours	1250 mg every 18 hours	1500 mg every 18 hours	1500 mg every 18 hours	1750 mg every 18 hours
80 to 89	1000 mg every 18 hours	1250 mg every 18 hours	1250 mg every 12 hours	1250 mg every 12 hours	1500 mg every 12 hours	1500 mg every 12 hours
90 to 99	1000 mg every 12 hours	1000 mg every 12 hours	1250 mg every 12 hours	1500 mg every 12 hours	1500 mg every 12 hours	1500 mg every 12 hours
≥100 **and** <60 years old[Δ]	1000 mg every 12 hours	1000 mg every 12 hours	1250 mg every 12 hours	1500 mg every 12 hours	1500 mg every 12 hours	1500 mg every 12 hours

* This nomogram was developed and validated based on trough targets at Duke University; it is designed to guide determination of initial empiric dose and interval of intravenous (IV) vancomycin in hospitalized adults who are not receiving hemodialysis. Excluded patients included those who exhibit highly variable vancomycin pharmacokinetics (eg, critically ill, burn injured >20 percent body surface, rapidly changing renal function, pregnant, liver failure/ascites, extremes of weight, acutely post-transplant, cystic fibrosis). In general, the clinical utility of nomograms is limited since it is not possible to account for all patient-specific variables. Use of vancomycin dosing nomograms typically produces steady-state serum concentrations within the targeted range in approximately 44 to 76 percent of patients.[1] Ideally, the approach to vancomycin dosing approach at a particular institution should be guided by a nomogram developed and validated at that institution, to best reflect the regional patient population.

¶ We give a loading dose for patients with known or suspected severe *Staphylococcus aureus* infection; this includes (but is not limited to) bacteremia, endocarditis, osteomyelitis, prosthetic joint infection, pneumonia warranting hospitalization, infection involving the central nervous system, or infection causing critical illness.[2] This nomogram was developed with a 25 mg/kg loading dose. In general, we administer a vancomycin loading dose of 20 to 35 mg/kg, based on actual body weight, rounded to the nearest 250 mg increment and not exceeding 3000 mg; within this range, we use a higher dose for critically ill patients. We typically use a loading dose of no more than 2 grams in older patients and patients with risk factors for acute kidney injury.

Δ Creatinine clearance estimates provided by the Cockcroft Gault equation may overestimate renal clearance of vancomycin in patients with low muscle mass and in older adults (eg, ≥60 years). Consider more conservative (ie, less frequent) initial dosing in those patients and/or the use of an alternate method of renal function assessment. A calculator for determination of creatinine clearance by Cockcroft Gault equation is available in UpToDate.

◊ For patients who weigh up to 125% of their ideal body weight (IBW), vancomycin dosing is based on actual body weight. For patients who weigh more than 125% of their ideal body weight, an adjusted dosing weight is used for scaling initial maintenance dose. A calculator is available in UpToDate to determine ideal body weight and adjusted dosing weight. Individual maintenance doses over 2 grams per dose or 4 grams per day should only be given on documentation of sub-therapeutic serum concentrations due to concern for renal injury. The above nomogram has not been validated in patients weighing more than 100 kg. Refer to topic discussion for approach to initial dosing of vancomycin in patients weighing more than 100 kg.

§ A target serum trough concentration of 15 to 20 mcg/mL is warranted for patients with severe or deep-seated infection (such as bacteremia, endocarditis, osteomyelitis, prosthetic joint infection, pneumonia warranting hospitalization, infection involving the central nervous system, or infection causing critical illness). A target trough of 10 to 15 mcg/mL is warranted for patients with nonsevere infection (such as soft tissue infection).

¥ In patients with advanced renal disease (eg, creatinine clearance [CrCl] <29 mL/minute and not receiving dialysis) or unstable renal function, the dosing following the initial vancomycin dose can be determined by measurement of timed "spot" (non-steady state) levels. Refer to UpToDate topic discussion for detail.

Reference:

1. *Elyasi S, Hossein K. Vancomycin dosing nomographs targeting high serum trough levels in different populations: pros and cons. Eur J Clin Pharmacol 2016; 72:777.*
2. *Rybak MJ, Le J, Lodise TP, et al. Therapeutic Monitoring of Vancomycin for Serious Methicillin-Resistant Staphylococcus Aureus Infections: A Revised Consensus Guideline and Review by the American Society of Health-System Pharmacists, the Infectious Diseases Society of America, the Pediatric Infectious Diseases Society, and the Society of Infectious Diseases Pharmacists. Am J Health Syst Pharm 2020; 77:835.*

Adapted from: Duke University Hospital Adult Pharmacokinetics Policy, Department of Pharmacy (June 2014). Courtesy of Richard H Drew, PharmD.

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