(This summary is designed only for the lecture; it never designed for any exam.)

CLINICAL PHARMACOKINETIC FOR VANCOMYCIN:

A-Initial dose determination.

B-Use of vancomycin concentration to change the dose.

Initial dose determination:

1- Pharmacokinetic dosing methods.

2- Moellering nomogram method.

3- Matzke nomogram method

4- Literature-based methods.

Notes:

- ✓ vancomycin dose should be rounded to nearest 100-250
- ✓ Dose interval should be rounded into clinically accepted intervals (12, 18, 24, 36, 48, 72, multiples of 24)

A-Pharmacokinetic dosing methods: You need:

1- Creatinine clearance

CrCl male = $\frac{(140-Age)*wt}{72*Sc}$

CrCl female = ***0.85*** $\frac{(140-Age)*wt}{72*Sc}$

(Cockcroft and Gault Eq. if the Pt within 30% of its IBW (*overweight* % =($ABW-IBW)/IBW$) and have stable renal function, Wt is patient's weight in kg, sc is serum creatinine in mg/dL, Age in years)

CrCl male= $\frac{(137-age)[(0.285*Wt)+(12.1*Ht\text{^}2)]}{(51*Sc)}$

CrCl female= $\frac{(146-age)\{(0.287*Wt)+(9.74*Ht\text{^}2)\}}{(60*Sc)}$

(Salazar and Corcoran Eq. if the Pt above 30% of its IBW (*overweight* % =($ABW-IBW)/IBW$) and have stable renal function, Ht is the height in meter, *Wt* is patient weight in kg, sc is serum creatinine in mg/dL, Age in years)

2- Clearance estimate for vancomycin in term of ml/min/kg

Cl= 0.695(CrCl/kg) + 0.05 (use the total body weight even in obese)

3- Volume of distribution estimate

0.7 mg/kg (Use the ideal body weight in obese)

IBW (male) = 50 + 2.3 (H - 60) ……. IBW (female) = 45.5 + 2.3 (H - 60)

H = height in inches, 5F= 60-inch, Inch=2.54 cm

4-Elimination rate constant & t ½

$$K_{el} = \frac{Cl\ (ml/min\ kg)}{Vd\left(\frac{L}{kg}\right)} \qquad (\times 60/1000 \text{ to get in } h^{-1})$$

(Note: in obese patient, multiply CL by ABW and Vd by ideal body weight)

5- Desired steady state concentration

Condition	Peak in µg/mL	trough in µg/mL
generally,	20-40	5-15

6- Equation to compute the dose

$$\tau = \frac{\mathbf{InCss\ max - InCss\ min}}{\mathbf{Kel}}$$

$$\mathbf{MD = Css\ max * Vd\ (1- e^{-Ke \times \tau})}$$

$$\mathbf{LD = Css\ max * Vd}$$

2-Moellering nomogram method:

1- Compute patient's creatinine clearance (CrCl) using Cockcroft–Gault method for normal weight or Salazar-Corcoran method for obese patients **(assuming patient have stable renal function and adult)**

2- Calculate maintenance dose according to this equation:

D (mg/h/kg) = 0.626 (CrCl/kg) + 0.05

3- If the patient has normal renal function use 12h and his/her weight to get the maintenance dose:

Ex. if MD is 0.85 mg/h/kg & CrCl is 130 ml/min, patient wt is 70…..

Sol: MD=0.85×70×12= 714

But use the standard dose 1000 mg to get the suitable dose interval for patient with compromised renal function

Ex. if MD is 0.32 mg/h/kg & CrCl is 30 ml/min, patient wt is 70…..

Sol:0.32mg/kg/h * 70kg = 22.4 mg/h 22.4mg/1h =1000mg/?

Dose interval=44.64 h ……Or Dose interval = 1000/ wt * D (mg/h/kg)

4- Loading dose of 15 mg/kg should be given for patients with significant renal function impairment

3-Matzke Nomogram Method

1. Compute patient's creatinine clearance (CrCl) using Cockcroft–Gault method: CrCl = [(140 − age) BW] /(Scr × 72). Multiply by 0.85 for females.

2. Nomogram not verified in obese individuals.

3. Dosage chart is designed to achieve peak serum concentrations of 30 µg/mL and trough concentrations of 7.5 µg/mL.

4. Compute loading dose of 25 mg/kg.

5. Compute maintenance dose of 19 mg/kg given at the dosage interval listed in the following chart for the patient's CrCl:

CrCl (mL/min)	DOSAGE INTERVAL (DAYS)
≥120	0.5
100	0.6
80	0.75
60	1.0
40	1.5
30	2.0
20	2.5
10	4.0
5	6.0
0	12.0

4-Literature-based method

	POSTNATAL AGE	
WEIGHT	< 7 DAYS	≥ 7 DAYS
<1.2 kg	15 mg/kg every 24 hours	15 mg/kg every 24 hours
1.2–2 kg	10–15 mg/kg every 12–18 hours	10–15 mg/kg every 8–12 hours
>2 kg	10–15 mg/kg every 8–12 hours	10–15 mg/kg every 6–8 hours

2- Use of vancomycin concentration to change the dose

1- Linear Pharmacokinetics Method

2- Trough only method

Linear Pharmacokinetics Method

Note: it is suitable only if the con. reached the steady state (after 3-5 half-life)

D new = (Css,new/Css,old) Dold

(Css could be peak or trough but usually trough**)**

If the new calculated Dose based on Css tough, then check the peak Css to make sure that it is being safe and effective, but if it is based on peak Css, the check the trough Css.

Css,new = (Dnew/Dold) Css,old

2- Trough only method

Note: it is suitable only if the con. reached the steady state (after 3-5 half-life)

τ new = (Old trough Css/New trough Css) τ old