THE NEBRASKA MEDICAL CENTER
CLARKSON HOSPITAL • UNIVERSITY HOSPITAL

IBW (males) = 50 + (2.3 x inches > 5')
IBW (females) = 45.5 + (2.3 x inches > 5')

$$\% \text{ over IBW} = \frac{(ABW - IBW)}{IBW} \times 100$$

DBW (AG) = 0.4 (ABW - IBW) + IBW

use DBW for AG's if >20% over IBW

CrCl—Cockroft-Gault (ml/min)

Adult:

$$CrCl_{(male)} = \frac{(140 - age) * IBW\ (kg)}{72 * Cr_s}$$

$$CrCl_{(female)} = CrCl_{(male)} * 0.85$$

CrCl—Jelliffe (ml/min)

Adult:

$$CrCl_{(male)} = \frac{114 - (0.8 \times age)}{Cr_s}$$

$$CrCl_{(female)} = CrCl_{(male)} \times 0.9$$

**If patient > 65 y/o and Cr_s < 1.0, then round up to 1.0. If no Cr_s, use 1.0.*

Cr/Cl—(ml/min)

Pediatrics: $\frac{(0.48)\ (ht\ in\ cm)}{Cr_s}$

Neonates: (full term) $\frac{(0.45)\ (ht\ in\ cm)}{Cr_s}$

kel ($^{-hr}$) AG = $(CrCl_{ml/min} \times 0.00285) + 0.015$ Vanco = $(CrCl_{ml/min} \times 0.00083) + 0.0044$

$$t_{1/2} = \frac{0.693}{kel}$$

Tau (τ)

AG= 3 x $t_{1/2}$ VANCO= 1.5 x $t_{1/2}$ (usually 1 interval longer than AG)

Vd (L/kg) (adults)

AG (ABW or DBW if obese)	Low (0.15–0.21)	Norm (0.22-0.25)	Large (0.26-0.35)
VANCO (ABW)	Low (0.3-0.6)	Norm (0.6-0.75)	Large (0.75-1.0)

***Usual* Dose Range (per dose)** (adults)

G,T 1.5-2.5 mg/kg (ABW or DBW) [G+ synergy (G) 1-1.5mg/kg] VANCO 10-15 mg/kg (ABW) sometimes up to 19mg/kg

AK 5-7.5mg/kg (ABW or DBW)

$$Cmax\ (\text{after } 1^{st} \text{ dose}) = \frac{Dose\ (mg/kg)}{Vd\ (L/kg)}$$

AMINOGLYCOSIDES $t_{1/2} \geq 3$ hr
VANCOMYCIN $t_{1/2} \geq 6$ hr
(Bolus model)

EMPIRIC

$$D = (Cmax_{ss})(Vd)(1 - e^{-kel\ (\tau)})$$

$$Cmax_{ss} = \frac{D}{(Vd)(1 - e^{-kel\ (\tau)})}$$

$$Cmin_{ss} = Cmax_{ss}(e^{-kel\ (\tau - ti)})$$

AFTER LEVELS

$$kel = \frac{\ln \frac{Cmax}{Cmin}}{\tau - (t_{end} + t_{before} + t_i)} \quad \text{or } \frac{}{t_2 - t_1}$$

$$Cmax_{actual} = \frac{Cmax}{e^{-kel\ (tend)}}$$

$$Vd = \frac{D}{Cmax_{actual}(1 - e^{-kel\ (\tau)})}$$

If drawn at the correct time, Cmax = the peak
$Cmax_{actual}$ is used to calculate Vd (can also use this equation to back-extrapolate to the actual peak if drawn late—substitute time drawn – time supposed to be drawn instead of t_{end})

AMINOGLYCOSIDES $t_{1/2} < 3$ hr
VANCOMYCIN $t_{1/2} < 6$ hr
(Infusion model)

EMPIRIC

$$D = \frac{(t_i)(kel)(Vd)(Cpk_{desired})\ (1 - e^{-kel\ (\tau)})}{(1 - e^{-kel\ (ti)})(e^{-kel\ (tend)})}$$

$$Cpk_{ss} = \frac{D(1 - e^{-kel\ (ti)})(e^{-kel\ (tend)})}{(t_i)(kel)(Vd)(1 - e^{-kel\ (\tau)})}$$

$$Cmin_{ss} = Cpk_{ss}(e^{-kel\ (\tau - ti)})$$

AFTER LEVELS

$$kel = \frac{\ln \frac{Cmax}{Cmin}}{\tau - (t_{end} + t_{before} + t_i)} \quad \text{or } \frac{}{t_2 - t_1}$$

$$Cmax_{actual} = \frac{Cmax}{e^{-kel\ (tend)}}$$

$$Vd = \frac{D(1 - e^{-kel\ (ti)})}{(t_i)(kel)(Cmax_{actual})(1 - e^{-kel\ (\tau)})}$$

HIGH-DOSE EXTENDED-INTERVAL AMINOGLYCSIDE DOSING GUIDELINES

1. Calculate the dose of the aminoglycoside (use ABW or DBW for obese). The dose is infused OVER 1 HOUR.
   - Gentamicin/Tobramycin: preferred 7mg/kg (4-7 mg/kg)
   - Amikacin: 15mg/kg

2. Choose the interval based on the calculated CrCl: ml/min

CrCl	Interval
>60	q24h
40.60	q36h
20.40	q48h
<20	PRN (redose when random < 1mcg/ml)

3. Order a random serum concentration 6-14 hours after the start of infusion of the first dose.

4. Apply the serum concentration to the Hartford Nomogram [time the serum concentration was obtained (x-axis) versus serum concentration (y-axis)].
   - Hartford Nomogram is designed for 7mg/kg dosing
   - Gentamicin/Tobramycin: use actual serum concentration
   - Amikacin: use ½ the actual serum concentration

5. Follow-up monitoring:
   - Daily or every other day serum creatinine
   - If treatment continues for more than 5 days, obtain a random level 6-14 hours post-dose weekly.

6. Once daily aminoglycoside dosing is not intended for the treatment of infections in patients with a large volume of distribution or a rapid elimination rate. (ie burns, dialysis, pregnancy, pediatrics, patients with ascites or endocarditis, solid organ transplant, cystic fibrosis)

7. Another antibiotic may be necessary to provide adequate gram negative coverage during the drug-free period which occurs during once-a-day dosing, with the possible exception of UTIs.

Adapted from Nicolau et al. *Antimicrob Agents Chemother.*1995;39:652