

Aminoglycoside Dosing Guidelines for Adults

Necessary Patient Information for Dosing

- **Ideal body weight (IBW)**
 - Use of IBW is recommended for aminoglycoside dosing unless patient meets criteria for utilization of ABW or AdBW (below)
 - Males = $50 + 2.3 \times [\text{height (in)} - 60]$
 - Females = $45.5 + 2.3 \times [\text{height (in)} - 60]$
- **Actual body weight (ABW)**
 - Use of ABW is recommended for aminoglycoside dosing IF $ABW < IBW$
- **Adjusted body weight (AdBW)**
 - Use of AdBW is recommended for aminoglycoside dosing IF $ABW > 130\% IBW$
 - $AdBW = IBW + 0.4(ABW - IBW)$
- **CrCl** – aminoglycosides are exclusively renally cleared and must be renally adjusted
 - $CrCl = \frac{(140 - \text{age}) \times (\text{wt in kg})}{72 \times SCr} \times 0.85$ if female
- **Indication** - What are the aminoglycosides being used for?
 - Gram positive synergy?
 - Serious gram negative infection?
 - Extended interval vs convention dosing

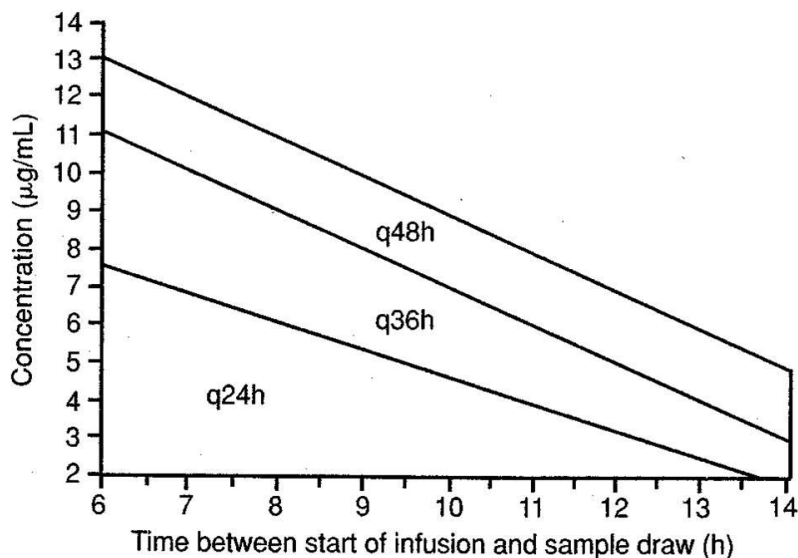
Gram Positive Synergy in Enterococcal or Staphylococcal Infections

- Only **gentamicin** is routinely utilized for this indication (below recommendations reflect gentamicin dosing and monitoring)
 - Streptomycin may be utilized for this indication but ID consult is highly recommended
- Use conventional dosing of **1 mg/kg every 8 hours** (always use IBW)
- In elderly and patients with renal impairment consider increasing interval to every 12 hours
- Peaks are not routinely recommended, but if taken, target peak should be **3-5 mcg/mL**
- Routinely recommended: Target trough **< 1 mcg/mL**
- Check trough +/- peak with **3th dose**
 - Once peak in therapeutic range it is not necessary to continue monitoring peaks
 - If trough > 1 mcg/mL increase interval to every 12 hours then every 24 hours if necessary
 - Goal of monitoring is to **avoid toxicity** which is associated with troughs > 1 mcg/mL
- Check trough twice a week if stable and more often if clinically indicated or with changing renal function

Serious Gram Negative Infections

Extended Interval Dosing (CrCl \geq 30 mL/min)

- Initial Dosing
 - Gentamicin/tobramycin: **5 – 7 mg/kg** (IBW, ABW or AdBW)
 - Consider 5 mg/kg in elderly and those with marginal renal function or treatment of urinary tract infection
 - Consider 7 mg/kg in young patients with good clearance and those with known multidrug resistant organisms
 - Consider infectious diseases consult or contacting clinical pharmacist for morbidly obese patients
 - Round to the **nearest 10 mg**
 - Amikacin: **15-20 mg/kg** (IBW, ABW or AdBW)
 - Round to the **nearest 25 mg**
- Monitoring
 - Therapeutic drug monitoring of extended interval aminoglycosides can be done by **EITHER** utilizing a nomogram or by troughs
 - Nomogram
 - Order **random level 8 hours post infusion**
 - Plot serum concentration and time of level on nomogram (below) to determine interval
 - Wherever this point lies is the recommended dosing interval
 - If the serum level is above the q48h interval, convert the patient to conventional dosing (see below)
 - To use nomogram for amikacin, divide the actual serum level of amikacin in half, and then apply it to the nomogram



- Troughs
 - Order a trough 24 hours after dose
 - Redose aminoglycoside if **level ≤ 1 mcg/mL for gent/tobra or ≤ 5 mg/mL for amikacin**
 - If serum concentrations are above these thresholds, repeat random levels and redose when levels fall below above stated serum concentration
 - Dosing interval can be determined when level falls below above stated serum concentration
 - **NOTE:** If it takes > 48 hours to fall below stated levels, convert to conventional dosing (below)
- Nomogram vs Troughs
 - Some prefer utilizing the nomogram as it is easy to use and immediately gives you a dosing interval
 - Some prefer utilizing troughs as the timing of 8 hour levels may be difficult but troughs may not always give you an immediate dosing interval
 - No matter which method is chosen, levels should be followed with every dose in patients with changing renal function and at least twice weekly in stable patients
 - Peaks are not routinely recommended because of the high doses given with this dosing regimen
 - Peaks may be utilized in special circumstances such as patients with severely altered pharmacokinetics

Conventional Dosing (CrCl < 30 mL/min)

- Initial Dosing
 - Septic shock dosing
 - Gentamicin/Tobramycin: **3 mg/kg** (IBW, ABW or AdBW)
 - Amikacin: **7.5 mg/kg** (IBW, ABW or AdBW)
- Monitoring
 - Order peak level **30 min post infusion** of the **FIRST dose**
 - Goal
 - Gent/tobra: **8-10 mcg/mL**
 - Amikacin: **25-30 mcg/mL**
 - Peaks correlate with **EFFICACY**
 - Use the peak to calculate your patient's volume of distribution (Vd)
 - $Vd (L) = \frac{\text{dose (mg)}}{\text{peak (mcg/L)}}$
 - Was peak level at goal? (Gent/tobra = **8 – 10** mcg/mL, Amikacin = **25 – 30** mcg/mL)
 - **If Yes...**
 - Continue same dose
 - Empiric dosing interval = **Q24h** for CrCL 10-30 mL/min, **Q48h** for CrCL < 10 mL/min
 - Check trough to make sure **≤ 2 mcg/mL for gent/tobra and ≤ 10 mcg/mL for amikacin**
 - If renal function unstable, anuria, or other clinical situations, check level every 24 hours and re-dose when level falls below stated level

- **If No...**
 - Calculate new dose – **New dose = Vd x desired peak**
 - Dosing interval = **Q24h** (CrCL 10-30 mL/min), **Q48h** (CrCL < 10 mL/min)
 - Check trough to make sure **≤ 2 mcg/mL for gent/tobra and ≤ 10 mcg/mL for amikacin**
 - If renal function unstable, anuria, or other clinical situations, check level every 24 hours and re-dose when level is **≤ 2 mcg/mL**
- Continue monitoring peaks and troughs until patient on a stable regimen
- Once on stable regimen monitor peaks and troughs twice a week or more often if clinically indicated or renal function changes

Indication Specific Dosing

Ob/gyn or Urology pts with any CrCl – Conventional dosing

- Initial dose: **1-2.5 mg/kg (IBW, ABW or AdBW) every 8 hours**
 - Renal adjustment:
 - ≥ 60 mL/min : every 8 hours
 - 40 – 60 mL/min: every 12 hours
 - 20 – 40 mL/min: every 24 hours
 - < 20 mL/min: dose by levels
- Monitoring
 - Use similar dose adjustments as with above conventional dosing
 - Peak and trough with 3rd dose
 - Target peak (30 min after infusion): **6-8 mcg/mL** (8-10 mcg/mL in serious infections)
 - Target trough (30 min prior to next dose): **< 2 mcg/mL**

Hemodialysis Dosing

- **Gent/tobra = 1.5-2 mg/kg after every HD session**
- **Amikacin = 5-7.5 mg/kg after every HD session**
- Aminoglycosides are removed by dialysis
- Check peaks for efficacy and troughs **2 hours post dialysis** periodically to avoid accumulation
 - Pre-dialysis levels can also be used in place of troughs to assess for accumulation
- For patients on CRRT consider infectious diseases consult

Reference:

Nicolau, et al. *Antimicrob Agents Chemother.* 1995; 39:650-5.

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