Aminoglycoside Dosing and Therapeutic Monitoring

Conventional Aminoglycoside Dosing

It is recommended to use **"Extended Interval Dosing" (see below)** if possible for optimal bactericidal activity, convenience, potentially reduced risk of nephrotoxicity and reduced cost for administration.

Recommended calculations:

Body weight calculation (kg)	**Creatinine clearance (mL/min)**
ABW =actual body weight **IBW** = ideal body weight IBW (male) = 50.0 kg + [2.3 kg x (each inch greater 5 feet)] IBW (female) = 45.5 kg + [2.3 kg x (each inch greater 5 feet)] **DBW** = dosing body weight DBW = 0.4 x (ABW – IBW) + IBW	CrCl (male) = (140 – age*) x weight* x 60 / 50 x serum creatinine (umol/L) CrCl (female) = CrCl (male) x 0.85 *age (years) weight (kg) = **ABW** if non-obese = **DBW** if obese
For **"non-obese"** patients use: **ABW** For **"obese"** patients use: **DBW** • Consider **"obese"** if (ABW – IBW) / IBW greater than 0.2	

IV Aminoglycoside dosing (see next page for synergy):

Aminoglycoside	Dose	Creatinine Clearance (mL/min)	Frequency
Gentamicin or Tobramycin	**Non-obese patients** 2 mg/kg x **ABW** **Obese patients** 2 mg/kg x **DBW**	Greater or equal 80	Q8H
		50 – 79	Q12H
		20 - 49	Q24H and consult pharmacist
		Less than 20 or PD*	Give first dose and consult pharmacist
		IHD*	Give first dose then 50% of dose after every dialysis. Consult pharmacist
	Loading dose for CRRT 3 mg/kg x **ABW** (or **DBW** if obese) then usual dose (2 mg/kg) as above	CRRT	Loading dose then usual dose Q24 - 48H Consult pharmacist
Amikacin	**Non-obese patients** 7.5 mg/kg x **ABW** **Obese patients** 7.5 mg/kg x **DBW**	Greater or equal 50	Q12H
		20 - 49	Q24H and consult pharmacist
		Less than 20 or PD*	Give first dose and consult pharmacist
		IHD*	Dose after every dialysis. Consult pharmacist
	Loading dose for CRRT 10 mg/kg x **ABW** (or **DBW** if obese) then usual dose (7.5mg/kg) as above	Continuous renal replacement therapy (CRRT)	Loading dose then usual dose Q24 - 48H Consult pharmacist
Gentamicin/tobramycin round to the nearest 20 mg; Amikacin round to the nearest 50 mg			

***** Alternate dosing strategies are available for IHD/PD patients; please consult with a renal pharmacist

Serum Drug Concentrations:

	Desired trough levels	Desired peak levels
Gentamicin	< 2 mg/L	4 to 10 mg/L
Tobramycin	< 2 mg/L	4 to 10 mg/L
Amikacin	< 8 mg/L	20 to 30 mg/L

- Consult Pharmacist for monitoring and dose adjustments
- Desired trough concentration (taken prior to the 3rd dose)
- Desired peak concentration (taken 30 minutes after the complete infusion of the 3rd dose)
    - Lower concentrations may be adequate for less severe infections (i.e. UTI)

Synergy Dosing:

Gentamicin – 1mg/kg x ideal body weight (**IBW**) IV every 8 hours for select Gram positive infections. **(Not interchangeable with tobramycin or amikacin)**

- Recommended target peak is 3 to 4 mg/L and trough is < 1 mg/L
- Consult Pharmacist for dosing to achieve desired target serum concentration monitoring and renal adjustments.

- See **"Extended Interval Aminoglycoside Dosing"** for alternate dosing regimen

Follow-up Monitoring:

If therapy is to be continued for **greater than 7 days** then:

- Twice weekly serum creatinine and BUN to assess for changes in renal function and risk for nephrotoxicity. A rise in serum creatinine of 25% from baseline requires reassessment of continued aminoglycoside use
- Weekly serum trough concentrations to assess for drug accumulation and risk for nephrotoxicity
- Close monitoring for ototoxicity is required. Onset of auditory and vestibular symptoms cannot be readily predicted and may be irreversible once they occur.
    - Consider baseline and ongoing audiometric / vestibular testing in patients who are anticipated to have a prolonged duration of therapy (> 14 days) if possible
    - If unable to perform testing for ototoxicity, assess regularly for symptoms related to changes in cochlear (e.g. tinnitus, sense of fullness in ears, loss of hearing) and vestibular (e.g. dysequilibrium, oscillopsia, cognitive dysfunction, visual sensitivity, nausea/vomiting, vertigo, headache, nystagmus) function
- Avoid concurrent nephrotoxic or ototoxic drugs (e.g. furosemide) whenever possible

Extended Interval Aminoglycoside Dosing

Extended interval aminoglycoside dosing is the preferred dosing regimen but should **NOT TO BE USED** in the following:

- Burns >20% TBSA (total burn surface area)
- Ascites
- Pregnancy
- Renal impairment (creatinine clearance < 40 mL/min)
- Endocarditis (unless synergy for *Streptococcus spp.*)

If excluded, refer to "**Conventional Aminoglycoside Dosing" (above)**.

Recommended calculations:

Body weight calculation (kg)	**Creatinine clearance calculation (mL/min)**
ABW =actual body weight **IBW** = ideal body weight IBW (male) = 50.0 kg + [2.3 kg x (each inch greater 5 feet)] IBW (female) = 45.5 kg + [2.3 kg x (each inch greater 5 feet)] **DBW** = dosing body weight DBW = 0.4 x (ABW – IBW) + IBW	CrCl (male) = (140 – age*) x weight* x 60 / 50 x serum creatinine (umol/L) CrCl (female) = CrCl (male) x 0.85 *age (years) weight (kg) = **ABW** if non-obese = **DBW** if obese
For **"non-obese"** patients use: **ABW** For **"obese"** patients use: **DBW** • Consider **"obese"** if (ABW – IBW) / IBW greater than 0.2	

IV Aminoglycoside dosing (see next page for synergy):

Aminoglycoside	Dose	Creatinine Clearance (mL/min)	Frequency
Gentamicin or Tobramycin*	**Non-obese patients** 7 mg/kg x actual body weight (**ABW**) **Obese patient** 7 mg/kg x dosing body weight (**DBW**)	≥ 60	Q24H
		40 – 59	Q36H
		< 40	Use conventional multiple daily dosing. Consult pharmacist
		IHD / CRRT / PD	Use conventional multiple daily dosing. Consult pharmacist
Amikacin	**Non-obese patients** 15 mg/kg x actual body weight (**ABW**) **Obese patients** 15 mg/kg x dosing body weight (**DBW**)	≥ 60	Q24H
		40 – 59	Q36H
		< 40	Use conventional multiple daily dosing. Consult pharmacist
		IHD / CRRT / PD	Use conventional multiple daily dosing. Consult pharmacist
Gentamicin/tobramycin round to the nearest 20 mg; Amikacin round to the nearest 50 mg			

***** Dose can range from 5mg/kg (i.e. simple urinary infection) to 10mg/kg (i.e. cystic fibrosis)

Synergy Dosing:

- **Gentamicin** – 3mg/kg x ideal body weight (**IBW**) IV once daily for *Streptococcus species* only. Optimal drug concentration is not well studied. Consider consulting Infectious Diseases Service.
  (Not interchangeable with tobramycin or amikacin)
- See **"Conventional Aminoglycoside Dosing"** for alternate dosing regimen

Serum Drug Concentrations:

	Desired trough levels
Gentamicin	< 0.5 mg/L
Tobramycin	< 0.5 mg/L
Amikacin	< 1 mg/L

- Consult Pharmacist for monitoring and dose adjustments
- May consider drawing a trough concentration after the 1st dose to assess for potential drug accumulation, or drawing a trough concentration if there are concerns with renal function

Follow-up Monitoring:

If therapy is to be continued for **greater than 7 days** then:

- Twice weekly serum creatinine and BUN to assess for changes in renal function and risk for nephrotoxicity. A rise in serum creatinine of 25% from baseline requires reassessment of continued aminoglycoside use
- Weekly serum trough concentrations to assess for drug accumulation and risk for nephrotoxicity
- Close monitoring for ototoxicity is required. Onset of auditory and vestibular symptoms cannot be readily predicted and may be irreversible once they occur.
  - Consider baseline and ongoing audiometric / vestibular testing in patients who are anticipated to have a prolonged duration of therapy (> 14 days) if possible
  - If unable to perform testing for ototoxicity, assess regularly for symptoms related to changes in cochlear (e.g. tinnitus, sense of fullness in ears, loss of hearing) and vestibular (e.g. dysequilibrium, oscillopsia, cognitive dysfunction, visual sensitivity, nausea/vomiting, vertigo, headache, nystagmus) function
- Avoid concurrent nephrotoxic or ototoxic drugs (e.g. furosemide) whenever possible