# Standard dose gentamicin extended interval guideline (patients >16 years)

## STEP 1: CHECK FOR EXCLUSIONS AND CONTRAINDICATIONS

### EXCLUSIONS:

- Patients receiving haemodialysis, haemofiltration, or creatine clearance (CrCl) <20ml/min
- Patients on critical care
- Major burns
- Ascites
- Cystic fibrosis
- Endocarditis or Synergistic use of gentamicin
- Surgical prophylaxis
- Neutropenic Sepsis
- Pregnancy and breast feeding

### CONTRAINDICATIONS:

- Hypersensitivity
- Myasthenia gravis
- Previous vestibular or auditory toxicity whilst on aminoglycosides
- Decompensated liver disease (jaundice, ascites, encephalopathy, variceal bleeding or hepatorenal syndrome).
- Known family history of aminoglycoside induced auditory toxicity or a maternal relative with deafness due to mitochondrial mutation A1555G.
- Patients with a known mitochondrial mutation.
- Patients with major limb amputation

### CAUTIONS

- CrCl <20 ml/min, ≥50% increase in serum creatinine from baseline or oliguria for >6 hours in the past 48 hours (If gentamicin is clinically indicated, give one dose as per guidance and check with microbiology before giving a second dose)
- Patients with pre-existing auditory, vestibular impairment.

- Co-administration with neurotoxic or nephrotoxic agents, e.g. neuromuscular blockers, nonsteroidal anti-inflammatory drugs, ACE Inhibitors; potent diuretics; other aminoglycosides (see http://www.medicines.org.uk/).
- Patients with known conditions characterised by muscular weakness.

## STEP 2: CALCULATE AND PRESCRIBE 1ST GENTAMICIN DOSE

Obtain patient's height, weight, age, sex, and serum creatine.

Use Eolas Gentamicin Calculator to calculate first dose.

If unable to access the Eolas Gentamicin Calculator, follow instructions in Appendix 1 to calculate manually.

Prescribe gentamicin on the initial 'acute antimicrobial section' of the medication chart. The gentamicin dose should be infused in 100ml sodium chloride 0.9% over 30 minutes.

Specify the time at which the dose is to be given.

Nursing staff must record the time at which it was given.

**If the patient's CrCl >60ml/min (CrCl is calculated by the Eolas Gentamicin Calculator):**
Prescribe gentamicin to be given at 24-hour intervals.
Do not wait for the level to come back before giving the second dose. Review serum gentamicin before giving 3rd dose (see section below).

**If the patient's CrCl <60ml/min (CrCl is calculated by the Eolas Gentamicin Calculator):**
Review serum gentamicin level before giving second dose (see section below)

## STEP 3: MONITORING LEVELS & SUBSEQUENT DOSING

Two methods of gentamicin serum level monitoring can be used to allow levels to be taken within working hours. These are:

A. Trough level monitoring

B. Nomogram guided level monitoring **(NB must not be used for critical care patients or if using 3mg/kg due to impaired renal function)**

The table below suggests which method can be used to achieve this.

| Time of gentamicin dose | Take Level at: | Interpret level using: |
|---|---|---|
| 12.00(midnight) – 8.59 am | 6-14 hours post-dose | Nomogram Guided Level Monitoring |
| 9am – 5.59pm | 18-24 hours post-dose | Trough Level Monitoring |
| 6pm – 11.59pm | 6-14 hours post-dose | Nomogram Guided Level Monitoring |
| N.B for patients with a CrCl of 20-30ml/min when a reduced dose of 3mg/kg using the Eolas Calculator is given, levels must be taken 18-24 hours post-dose as the nomogram is only validated for doses of 5mg/kg | | |

## A. TROUGH LEVEL MONITORING

Take a blood sample 18-24 hours after the start of the first gentamicin infusion. Record the exact time a gentamicin sample is taken.

If serum gentamicin levels are satisfactory (see table below) and renal function is normal and stable – repeat levels every 2 – 3 days.

Recheck trough/pre-dose gentamicin serum levels after any dose modification.

Take the following actions in regards to serum gentamicin level result.

| Serum Gentamicin Level | Action |
|---|---|
| **Level <1mg/L** | If renal function is normal and stable, continue current dosing interval and recheck every 2 to 3 days |
| **HIGH level >1mg/L** | Ensure timing of level taken correctly in relation to dose (trough/pre-dose level)<br><br>If level timing correct, omit next dose and repeat gentamicin level in 24 hours.<br><br>If repeat level <1mg/L, continue dosing gentamicin at 48-hour intervals. If repeat level >1mg/L discuss with pharmacy/microbiology.<br><br>**Do not restart gentamicin until trough level <1mg/L** |

## B. NOMOGRAM GUIDED LEVEL MONITORING (NB MUST NOT BE USED FOR CRITICAL CARE PATIENTS OR IF USING 3MG/KG)

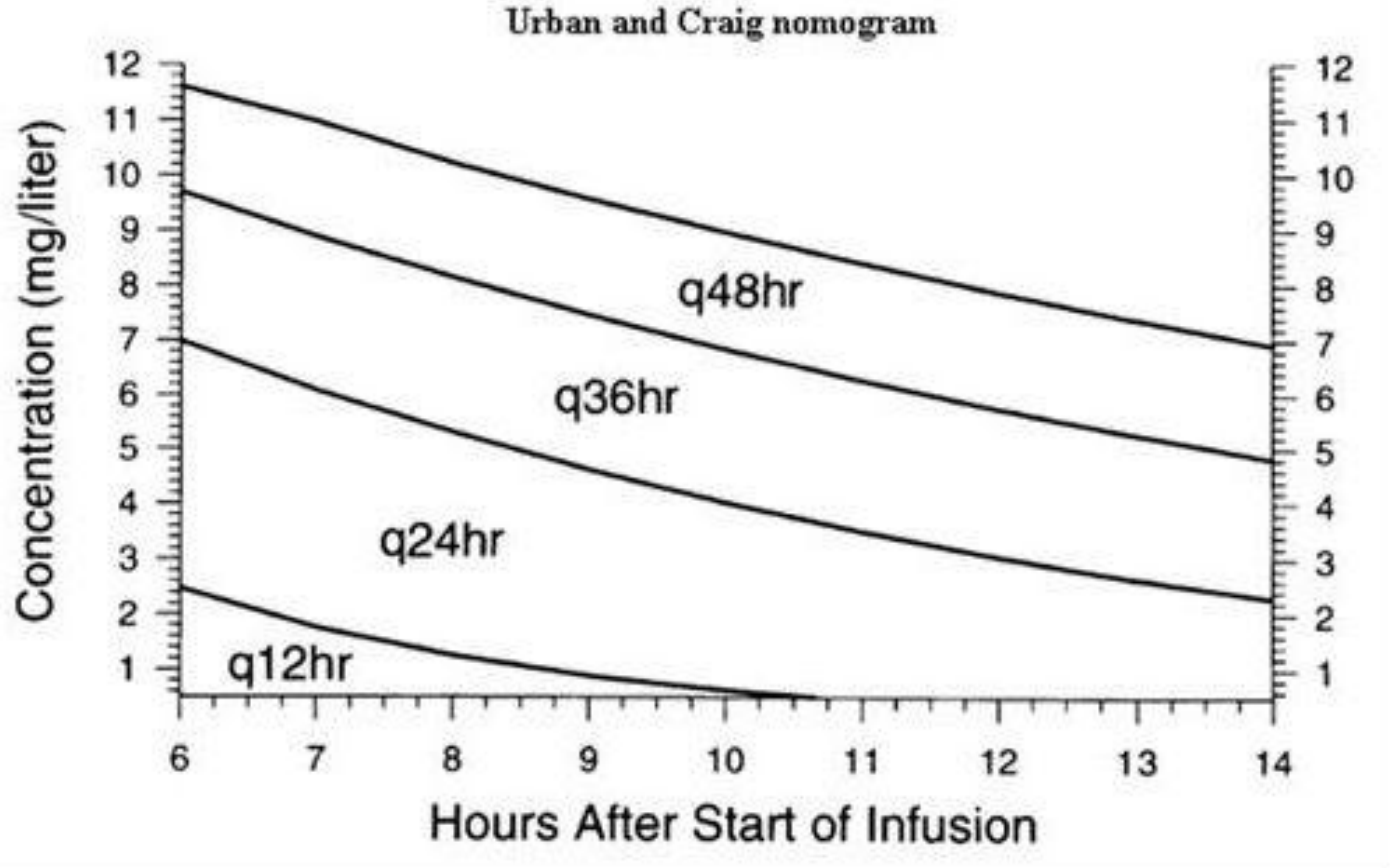
Take a blood sample 6-14 hours after the start of the first gentamicin infusion. Record the exact time a gentamicin sample is taken.

Plot the gentamicin level on the nomogram below. Prescribe subsequent doses at the recommended dosing interval i.e. every 12, 24, 36 or 48 hours. If the result is on the line, choose the longer interval.

If the level is above the 48 hourly line (Q48h), stop gentamicin and discuss with microbiology.

If renal function is normal and stable – repeat levels every 2 – 3 days.

Recheck trough/pre-dose gentamicin serum levels after any dose interval modification.




If Levels unexpectedly HIGH or LOW Consider the following:

- Were dose and sample times recorded accurately?
- Was the correct and full dose administered?
- Was the sample taken from the line used to administer the drug?
- Was the sample taken during drug administration?
- Has renal function declined or improved?
- Does the patient have oedema or ascites?
- Is the patient severely underweight or overweight?

## STEP 4: ONGOING MONITORING

### Renal Toxicity

- Monitor creatinine daily. Seek advice if renal function is unstable (e.g. a change in creatinine of >15-20%).
- Signs of renal toxicity include an increase in creatinine or decrease in urine output / oliguria.
- Consider an alternative agent if creatinine is rising or the patient becomes oliguric.

### Ototoxicity

- Ototoxicity secondary to gentamicin is independent of drug concentration. It may be suggested by any of the following: new tinnitus, dizziness, poor balance, hearing loss or oscillating vision.
- Toxicity is associated with prolonged aminoglycoside use (usually >10 days but may occur at any time). Stop treatment if ototoxicity is suspected and refer to an infection specialist for advice on antibiotic therapy.
- In prolonged courses of gentamicin (greater than 5 days of therapy), refer to audiology for ongoing assessment.

## STEP 5: IMPORTANT GENERAL CONSIDERATIONS

To minimise the risk of toxicity, duration of treatment should normally be limited to 5 days. All gentamicin prescriptions that continue beyond 5 days of treatment must be discussed with a consultant microbiologist.

Standard gentamicin doses are usually capped at 480mg.

Counsel the patient on the signs and symptoms of ototoxicity and the need to self-report. Provide the patient/carer with a patient information leaflet.

## APPENDIX 1: CALCULATIONS BEHIND GENTAMICIN CALCULATOR

1. **Patient Parameters**

Collect patient's sex, age, height and actual body weight.

2. **Calculate Ideal Body Weight (IBW)**

Male: IBW (kg) = [(height (cm) – 152) x 0.9] + 50
Female: IBW (kg) = [(height (cm) – 152) x 0.9] + 45.5

## 3. Calculate Weight to Be Used for Gentamicin Dosing

If actual body weight is <120% of ideal bodyweight then use actual body weight to calculate gentamicin dose.

If actual body weight is >120% of ideal bodyweight then calculate adjusted body weight and use this to calculate gentamicin dose.

Adjusted body weight (ABW) (kg) = IBW + 0.4 (actual weight (kg) – IBW)

## 4. Calculate Cockcroft Gault Estimated Renal Clearance

If actual weight <120% of IBW then calculate CrCl using the following formula:

Male: $\frac{\text{140-age in years x actual body weight (kg)}}{\text{Serum creatinine (µmol/L)}}$ x1.23

Female: $\frac{\text{140-age in years x actual body weight (kg)}}{\text{Serum creatinine (µmol/L)}}$ x1.04

If actual weight >120% of IBW then calculate CrCl using the following formula:

Male: $\frac{\text{140-age in years x adjusted body weight (kg)}}{\text{Serum creatinine (µmol/L)}}$ x1.23

Female: $\frac{\text{140-age in years x adjusted body weight (kg)}}{\text{Serum creatinine (µmol/L)}}$ x1.04

## 5. Calculate Gentamicin Dose per Kg

If CrCl >30ml/min dose = 5mg/kg

If CrCl 20-30ml/min dose = 3mg/kg

## 6. Round Dose Down & Capping

Dose rounded down to nearest 40mg increment.

If using 5mg / kg maximum dose =480mg

If using 3mg/ kg maximum dose =300mg.