

Waterford: Antimicrobial Guidelines - Antimicrobial Guideline: Gentamicin Dosing Schedule

Gentamicin

General Information

- Gentamicin is an aminoglycoside antibiotic and has a narrow therapeutic index.
- Weight-based dosing** and **therapeutic drug monitoring** (TDM) are essential to ensure therapeutic efficacy and to minimise the risk of adverse effects such as nephrotoxicity, vestibular toxicity and ototoxicity.
- Standard Once Daily regimen** is recommended for the treatment of sepsis and most other infections.
- These recommendations do not apply to the use of gentamicin in cystic fibrosis, renal replacement therapy, or those on multiple daily dosing schedules.
- Use dose calculations as outlined below; however **do not delay 1st doses** in patients requiring urgent therapy if renal function information is not available.
- A **stat or single dose** is often sufficient.
- Review need for ongoing treatment with gentamicin on a daily basis. Treatment courses extending beyond **3-5 days** are rarely required and are associated with an increased risk of adverse effects.
- Please discuss patients on extended treatment courses of gentamicin with the clinical microbiology team.

Adverse Effects

- Vestibular and ototoxicity** can occur independently of serum gentamicin levels and duration of treatment however the risk increases significantly with higher cumulative doses and courses of longer durations.
- Nephrotoxicity**: Consider renal function, volume status, and the use of concomitant nephrotoxic agents such as NSAIDs, ACE inhibitors, and diuretics, when prescribing aminoglycosides.

Cautions and Contraindications

- Caution is advised in patients with auditory and vestibular disorders, and conditions characterised by muscular weakness.
- Aminoglycosides (Gentamicin, Amikacin, Tobramycin) are contraindicated in patients with **myasthenia gravis** as they may impair neuromuscular transmission in these patients.

Endocarditis:

3mg/kg once daily

Multiple daily dosing may be warranted in certain instances – please consider consulting Microbiology/Infectious Diseases.

Pregnancy:

3-5mg/kg once daily

Please discuss with the microbiology team if needed and see the algorithm

Dose Calculations

Step 1: Weigh patient (kg) to determine **Actual Body Weight**. Record height.

Step 2: Calculate the **Body Mass Index** and/or **Ideal Body Weight** to determine if the patient is obese. [\(Please see formula for weight calculation\)](#)

Step 3: **Obese Dosing Weight/Adjusted Body Weight** should be used in CrCl and dose calculations if **BMI >30 kg/m²** or Actual Body Weight is 20% more than Ideal Body Weight. [\(Please see formula for weight calculation\)](#)

Step 4: Calculate **Creatinine clearance** using **Cockcroft-Gault equation** using either **Actual Body Weight** or **Obese Dosing Weight/Adjusted Body Weight** as indicated above. The Cockcroft Gault formula is less reliable in children, acute renal failure, oedematous states, muscle wasting, amputees, and malnourished patients.

[\(Please see MdCalc Creatinine Clearance Calculator\)](#)

Step 5: Calculate the **gentamicin dose to be administered** based on CrCl AND weight (Actual Body Weight or Obese Dosing Weight/Adjusted Body Weight) as per the table below.

Creatinine Clearance	Dose
>50 ml/min	5 mg/kg q24h (max 480mg)
10-50 ml/min	3 mg/kg q24h
<10 ml/min	1.5 mg/kg stat and redose when level <1 mcg/ml.
Dialysis	Seek specialist advice

Monitoring and Dose Adjustment

- Order serum trough level to be taken 16-24h post first dose. Monitor renal function.
- Gentamicin trough (pre-dose) level should be **≤1 mcg/ml**.
- Ensure laboratory request form is labelled with **sample time and date** and gentamicin dose time is recorded accurately.
- Check and interpret trough level result, renal function AND review need for continued treatment prior to prescribing subsequent doses. **NB. Doses should never be held** whilst awaiting trough levels in patients with sepsis or severe infection.
- These recommendations do not apply to TDM and target trough levels for patients on multiple daily dosing schedules. Discuss these patients with pharmacy and/or clinical microbiology.

Trough level	Action
< 1mcg/ml	Review need for further dose. Administer same dose again if ongoing aminoglycoside treatment indicated and renal function is stable.
≥ 1mcg/ml (high)	Check the dose and time the sample was taken. Was it taken at the correct time i.e. 16 – 24 hours post dose? If the trough level >1micrograms/mL but < 2micrograms/mL and treatment is still indicated, then consider holding the next dose until level <1micrograms/mL and then reduce dose by 1mg/kg. Discuss with pharmacy if required. If the trough is >2micrograms/mL and treatment is still indicated, discuss with pharmacy.

References

- Gentamicin: Guidelines for Once Daily Usage in Adult and Paediatric Settings. HSE/RCPI 2016.
- BNF <https://doi.org/10.18578/BNF.632013114> . 20th October 2020

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Gentamicin Dosing Algorithm

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Step 1: Select Patient Appropriately

For *empiric* therapy (pathogen not known), use Amikacin instead of Gentamicin in patients with:

- A history of gentamicin resistant gram negative pathogens (review previous microbiology test results).
- Sepsis requiring ICU review/admission, or septic shock.
- Sepsis when using concomitant ciprofloxacin in patients with IgE-mediated/anaphylaxis/severe penicillin allergy (due to risk of co-resistance)

Cautions : Age ≥ 65 , renal impairment (CrCl < 80 ml/min), obesity (use obese dosing weight), concomitant nephrotoxins, volume depletion, auditory and vestibular disorders.

Contraindications: Myasthenia gravis

Step 2: Prescribe Dose

Max Gentamicin Daily Dose = 480mg

Obese Dosing Weight should be used in CrCl and dose calculations if BMI > 30 kg/m² or Actual Body Weight is 20% more than Ideal Body Weight.

In oliguria (urine output < 500 mL/day), dose as per CrCl < 10 mL/min.

[\(Please see formulae for BMI and weight calculations \)](#)

(Please see [MdCalc Creatinine Clearance Calculator](#))

Creatinine Clearance	Dose
> 50 ml/min	5 mg/kg q24h (max 480mg)
10-50 ml/min	3 mg/kg q24h
< 10 ml/min	1.5 mg/kg stat and <u>redose</u> when level < 1 mcg/ml.
Dialysis	Seek specialist advice

Step 3. Order Trough Level

- Order trough level 16-24 hours after first dose
- Ensure request form and serum sample are labelled with date and time of the last dose AND date and time level was taken
- Monitor renal function

Step 4. Check and Interpret Trough Level

Trough level	Action
< 1mcg/ml	Review need for further dose. Administer same dose again if ongoing aminoglycoside treatment indicated and renal function is stable.
≥1mcg/ml (<i>high</i>)	Check the dose and time the sample was taken. Was it taken at the correct time? If the trough level >1micrograms/mL but < 2micrograms/mL and treatment is still indicated, then consider holding the next dose until level <1micrograms/mL and then reduce dose by 1mg/kg. Discuss with pharmacy if required. If the trough is >2micrograms/mL and treatment is still indicated, discuss with pharmacy.