Trust Guideline for the Use of Gentamicin in Adults

<table>
<thead>
<tr>
<th>In:</th>
<th>All clinical areas</th>
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<tr>
<td>By:</td>
<td>All grades of medical staff prescribing aminoglycosides.</td>
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<tr>
<td>For:</td>
<td><strong>Adult</strong> patients that require gentamicin as the antibiotic of choice (see exclusion criteria)</td>
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<td>Division responsible for document:</td>
<td>Medical Division</td>
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<td>Compliance links: (is there any NICE related to guidance)</td>
<td>None</td>
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<td>If Yes – does the strategy/policy deviate from the recommendations of NICE? If so, why?</td>
<td>N/A</td>
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This guideline has been approved by the Trust's Clinical Guidelines Assessment Panel as an aid to the diagnosis and management of relevant patients and clinical circumstances. Not every patient or situation fits neatly into a standard guideline scenario and the guideline must be interpreted and applied in practice in the light of prevailing clinical circumstances, the diagnostic and treatment options available and the professional judgement, knowledge and expertise of relevant clinicians. It is advised that the rationale for any departure from relevant guidance should be documented in the patient's case notes.

The Trust's guidelines are made publicly available as part of the collective endeavour to continuously improve the quality of healthcare through sharing medical experience and knowledge. The Trust accepts no responsibility for any misunderstanding or misapplication of this document.
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This clinical guidance covers the prescribing of intravenous (IV) gentamicin for treatment of infections in adults using the 5mg/kg dosing guidance.

The guidance does not apply to gentamicin use in the following:

- Synergistic treatment of endocarditis.
- Synergistic treatment of staphylococcal bone infection.
- Patients treated in Renal units or receiving haemodialysis or haemofiltration.
- Major burns.
- Ascites.
- Age < 16 years.
- Cystic fibrosis.

Contra-indications and cautions:

- Hypersensitivity.
- Myasthenia gravis.
- Pregnancy.

Cautions to gentamicin therapy:

Patients with decompensated liver disease - aminoglycosides are associated with an increased risk of renal failure.

Chronic Kidney Disease (CKD) Stage 4 or more.
Known or suspected acute kidney injury in the previous 48 hours (50% increase in baseline serum creatinine or oliguria > 6 hours).

Concurrent administration of neurotoxic and/or nephrotoxic agents increases the risk of gentamicin toxicity. Avoid co-administration of the following:

- Neuromuscular blockers.
- Other potentially nephrotoxic (e.g. NSAIDs and ACE Inhibitors) or ototoxic drugs.
- Potent diuretics.
- Other aminoglycosides.

**How to Prescribe Gentamicin:**

**STEP 1: Calculate, prescribe and administer the first dose**

- To reduce the risk of mortality, commence gentamicin administration within 1 hour of recognising sepsis.
- If creatinine is known – use the online Gentamicin calculator (preferred method) or the guidelines in Table 1 (below). The dose and the dosage interval are based on estimated creatinine clearance and actual body weight except in pregnancy where the booking weight should be used.
- If creatinine is not known – give an initial dose of 5 mg/kg gentamicin (maximum 400 mg) or, if patient has Chronic Kidney Disease (CKD) 5, give 2.5 mg/kg (maximum 180 mg) on advice of senior staff. Calculate the dose using actual body weight except in pregnancy where the booking weight should be used.
- Give the recommended dose by infusion in 100 mL sodium chloride 0.9% over 30 minutes and ensure the time of administration is noted on the medicine chart.

<table>
<thead>
<tr>
<th>Actual body weight/book ing weight (kg)</th>
<th>40-49</th>
<th>50-59</th>
<th>60-69</th>
<th>70-80</th>
<th>&gt;80</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cr Clearance (mL/min) ↓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;21</td>
<td>2.5mg/kg (max 180mg) then take a sample after 24 hours</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21-30</td>
<td>180mg 48-hourly</td>
<td>200mg 48-hourly</td>
<td>240mg 48-hourly</td>
<td>240mg 48-hourly</td>
<td>260mg 48-hourly</td>
</tr>
<tr>
<td>31-40</td>
<td>200mg 48-hourly</td>
<td>240mg 48-hourly</td>
<td>280mg 48-hourly</td>
<td>300mg 48-hourly</td>
<td>320mg 48-hourly</td>
</tr>
</tbody>
</table>
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<tr>
<th>Weight (kg)</th>
<th>240mg 48-hourly</th>
<th>280mg 48-hourly</th>
<th>320mg 48-hourly</th>
<th>360mg 48-hourly</th>
<th>400mg 48-hourly</th>
</tr>
</thead>
<tbody>
<tr>
<td>41-50</td>
<td>240mg 24-hourly</td>
<td>280mg 24-hourly</td>
<td>320mg 24-hourly</td>
<td>360mg 24-hourly</td>
<td>400mg 24-hourly</td>
</tr>
<tr>
<td>51-60</td>
<td>200mg 24-hourly</td>
<td>240mg 24-hourly</td>
<td>280mg 24-hourly</td>
<td>300mg 24-hourly</td>
<td>320mg 24-hourly</td>
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<tr>
<td>&gt;60</td>
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<td>280mg 24-hourly</td>
<td>320mg 24-hourly</td>
<td>360mg 24-hourly</td>
<td>400mg 24-hourly</td>
</tr>
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**CAUTION:** If the patient weighs < 40 kg and CrCl is ≥ 21 mL/min, give a single dose of 5 mg/kg then take a sample 6 – 14 hours after the dose and follow the instructions in Step 2.

**STEP 2:** Monitor creatinine and gentamicin concentrations and reassess the dosage regimen:

Concentrations are meaningless unless the dose & sample times are recorded accurately.

A) If creatinine clearance is ≥ 21 mL/min

- Take a blood sample 6-14 hours after the start of the first gentamicin infusion.
- Record the exact time of all gentamicin samples on the sample request form.
- Plot the concentration measurement on the graph and reassess the dose / dosing interval as indicated.
- This will indicate one of 3 options:
  1) Continue the present dosage regimen.
  2) Adjust the dosage interval.
  3) Withhold and resample after 24 hours.
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B) If creatinine clearance is < 21 mL/min:

- Take a blood sample 24 hours after the start of the first gentamicin infusion.
- Record the exact time of all gentamicin samples on the sample request form.
- If therapy is to continue, take additional blood samples at least every 24 hours and give a further dose once the measured concentration is < 1 mg/L.

**General points:**

- Document the action taken in the medical notes.
- Undertake pre-prescribing checks to assess the risk of renal toxicity and ototoxicity.
- Prescribe the next dose as appropriate.
- Seek advice from pharmacy or microbiology if you are unsure how to interpret the result or if the concentrations are very low. Doses up to 600 mg may be required for some patients.
- If a blood sample is not taken, is lost or is taken at wrong time and if there is any concern about the patient’s renal function, take a sample 20-24 hours after the start of the gentamicin infusion and wait for the result before giving the next dose. Give a further dose once the measured concentration is < 1 mg/L. Otherwise, take a blood sample after the next dose.

**If the measured concentration is unexpectedly HIGH or LOW, consider the following:**

- Were dose and sample times recorded accurately?
- Was the correct 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?

If in doubt, take another sample before re-prescribing and / or contact pharmacy for advice.

**STEP 3: Assess daily the ongoing need for gentamicin and signs of toxicity**
• Take a further blood sample 6-14 hours after the dose, at least every 2 days.

• If the gentamicin concentration is unexpectedly high or if renal function alters, daily sampling may be necessary.

• To minimise the risk of toxicity, duration of treatment should normally be limited to 72 hours. All gentamicin prescriptions that continue beyond 3 days of treatment must be discussed with microbiology. Consider switching to an oral alternative as appropriate.

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**Renal toxicity**

- Monitor creatinine daily. Seek advice if renal function unstable (e.g. change in creatinine of > 15-20%), or if patient becomes oliguric.

- Signs of renal toxicity include increase in creatinine or decrease in urine output/oliguria.

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**Ototoxicity**

- Ototoxicity secondary to gentamicin is independent of drug concentration. Monitor for new tinnitus, dizziness, poor balance, hearing loss or oscillating vision.

- Toxicity is associated with prolonged aminoglycoside use (usually > 10 days but may be > 72 hours) and is secondary to drug accumulation within the inner ear.

- Stop treatment if ototoxicity is suspected and refer to microbiology or an infection specialist for advice on future therapy.

- If gentamicin continues for > 7 days, consider referring to audiology for assessment.