



| MONOGRAPH | |
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| Gentamicin Monograph - Paediatric | |
| Scope (Staff): | Clinical Staff – Medical, Nursing, Pharmacy |
| Scope (Area): | Perth Children's Hospital (PCH) |

This document should be read in conjunction with this [DISCLAIMER](#)

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| <p>DESCRIPTION</p>  | <ul style="list-style-type: none"> Gentamicin is an aminoglycoside antibiotic that inhibits bacterial protein synthesis by irreversibly binding to the 30S ribosomal subunit, resulting in cell membrane damage. Gentamicin is rapidly bactericidal with a concentration dependent effect.⁽¹⁻³⁾ Gentamicin is a High Risk Medicine |
| <p>INDICATIONS AND RESTRICTIONS</p> | <p>IV: Monitored (orange) antibiotic</p> <ul style="list-style-type: none"> If the use is consistent with a standard approved indication, this must be communicated to ChAMP by documenting that indication on all prescriptions (inpatient and outpatient). The ChAMP team will review if ongoing therapy is required and/or if the order does not meet ChAMP Standard Indications If use is not for a standard approved indication, phone approval must be obtained from ChAMP before prescribing. |
| <p>CONTRAINDICATIONS</p> | <ul style="list-style-type: none"> Gentamicin is contraindicated in patients with serious previous allergic reaction to aminoglycosides or any components of the formulation.^(3, 4) |
| <p>PRECAUTIONS</p> | <ul style="list-style-type: none"> Care should be taken in patients with a previous vestibular or auditory toxicity due to an aminoglycoside.⁽³⁻⁶⁾ Use aminoglycoside with caution in patients with neuromuscular disease e.g. myasthenia gravis as the risk of muscle weakness and respiratory depression is increased.⁽¹⁾ Use aminoglycosides with caution in patients with renal impairment and reduce the dose of aminoglycoside as recommended under 'dose adjustment' and seek ID/ChAMP/Pharmacy advice. Risk factors for nephrotoxicity include length of treatment, high plasma concentrations, dehydration and treatment with other nephrotoxic medications.⁽¹⁾ |
| <p>FORMULATIONS</p> | <p>Available at PCH:</p> <ul style="list-style-type: none"> 80mg/2mL ampoule |

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| | <p>Other formulations:</p> <ul style="list-style-type: none"> • 10mg/mL ampoule • 3mg/mL eye drops (not covered in this monograph) • 5mg/mL intrathecal injection (not covered in this monograph) – SAS restrictions also apply. |
| <p>DOSAGE</p> | <ul style="list-style-type: none"> • The doses listed below fall within the standard range. • Higher doses may be prescribed for certain situations in consultation with the Infectious diseases or clinical microbiology consultant. • Dose adjustment required in overweight or obese patients please refer to: Guidelines For Drug Dosing in Overweight and Obese Children <p><u>Neonates (<1 month of age):</u></p> <ul style="list-style-type: none"> • Please refer to Neonatal Medication Protocols for dosing in infants <1 month of age. <p><u>IV/IM:</u></p> <p>General once daily dosing:</p> <ul style="list-style-type: none"> • Children ≥ 1 month old to 10 years old: 7.5mg/kg ONCE daily to a maximum of 320mg.^(1,2) • Children >10 years to 18 years: 6-7mg/kg ONCE daily to a maximum of 560mg.^(1,2) • No further dose increases should be made without consulting infectious diseases, ChAMP or clinical microbiology.⁽²⁾ <p>Streptococcal and enterococcal endocarditis:</p> <ul style="list-style-type: none"> • All ages: 1mg/kg (to a maximum dose of 80mg) given 8 hourly in combination with other agents.^(1, 2) • Multiple daily dosing of gentamicin is only recommended for directed therapy of confirmed streptococcal and enterococcal endocarditis. • Once daily dosing (as per general once daily dosing stated above) should be used for the empiric therapy of endocarditis.^(1, 2) • Refer to ChAMP empiric guidelines for further advice regarding recommended combination therapy. Contact infectious diseases, clinical microbiology or pharmacy for advice. <p>Cystic Fibrosis:</p> <ul style="list-style-type: none"> • Tobramycin is the aminoglycoside of choice in patients with cystic fibrosis. Refer to the ChAMP tobramycin monograph for further information. |

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| | <p>Surgical prophylaxis:</p> <ul style="list-style-type: none"> All patients ≥1 month old: 2mg/kg to 5mg/kg as a single dose given 15 to 60 minutes before surgical incision.⁽²⁾ Refer to ChAMP surgical prophylaxis guidelines for specific recommendations. |
| <p>DOSAGE ADJUSTMENT</p> | <p>Dosage adjustment required in renal impairment (once daily dosing):</p> <ul style="list-style-type: none"> Where possible, consider using a less nephrotoxic agent. Dosage adjustment may be required in cases of impaired renal function (with creatinine clearance of less than 60mL/min).⁽²⁾ To calculate the estimated glomerular filtration rate (eGFR) use the following formula: $\text{eGFR (mL/min/1.73m}^2\text{)} = \frac{36.5 \times \text{height (in cm)}}{\text{Serum creatinine (micromol/L)}}$ <ul style="list-style-type: none"> In cases where gentamicin is required, suggested initial dosing intervals as stated below. All future doses and intervals will be determined based on therapeutic drug monitoring. CrCl > 60mL/minute: 24 hourly dosing interval CrCl 40-60mL/minute: 36 hourly dosing interval CrCl < 40 mL/minute: consider alternative agents. If essential, give initial dose then contact Pharmacy/ChAMP/ID for advice on monitoring and further doses.⁽²⁾ For dosing adjustment for multiple daily dosing for endocarditis, contact Pharmacy/ChAMP/ID for advice. <p>Dosage adjustment required in hepatic impairment:</p> <ul style="list-style-type: none"> No dosage adjustment is required. <p>Dose adjustment required in overweight or obese patients please refer to: Guidelines For Drug Dosing in Overweight and Obese Children</p> |
| <p>RECONSTITUTION</p> | <ul style="list-style-type: none"> Not applicable |
| <p>ADMINISTRATION</p> | <p>Once daily dosing:</p> <ul style="list-style-type: none"> <u>IV infusion</u>: Dilute to a final volume of 10mg/mL or weaker with compatible fluid and infuse over 20 minutes or longer.^(9, 10) <p>Multiple daily dosing:</p> <ul style="list-style-type: none"> <u>IV bolus</u>: May be administered undiluted or diluted to a suitable volume and given over 3 to 5 minutes.⁽⁹⁾ |

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| | <p>IM injection:</p> <ul style="list-style-type: none"> • If IV access is not available this medication may be given undiluted by IM injection into a large muscle mass. • However the IV route is preferred for patients with suspected shock or sepsis.⁽⁵⁾ • IM injection is NOT suitable for premature neonates due to small muscle mass and unreliable absorption.⁽¹¹⁾ • Refer to Intramuscular (IM) Injection for further information. |
| <p>MONITORING</p> | <p>A capillary blood sample is preferred for drug levels wherever possible (i.e. finger prick or heel prick for infants <6months).</p> <p>If unable to obtain via this method a venous sample can be used.</p> <p>Note: levels should not be taken from a CVAD lumen used to administer gentamicin.</p> <p>Collection tube:</p> <ul style="list-style-type: none"> • Paediatric - Lithium Heparin (Green top) 3mL (PST gel) or Serum (Red top) 1 mL (No Gel) • Neonatal - Lithium Heparin (Green top) 1mL (PST gel) • Minimum volume required: 300microlitres⁽¹²⁾ • For further information, refer to the PathWest test directory. <p>Monitoring in Neonates:</p> <ul style="list-style-type: none"> • Please refer to Neonatal Medication Protocols <p>Therapeutic drug monitoring – ONCE daily dosing:</p> <p>Initial monitoring:</p> <ul style="list-style-type: none"> • Trough level should be taken immediately prior to the 4th dose and should be below the limit of detection (0.6mg/L). • If the trough level is greater than 0.6mg/L, contact Pharmacy/ChAMP/ID for advice as cessation or dose adjustment is required. • Follow-up levels should be performed twice weekly unless the clinical situation dictates otherwise (e.g. impaired renal function and concurrent use of nephrotoxic drugs). <p>Patients with altered pharmacokinetics:</p> <ul style="list-style-type: none"> ○ Cystic fibrosis ○ Oncology ○ Severe burns ○ Impaired renal function |

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| | <ul style="list-style-type: none"> • These patients should have their monitoring based on calculating the drug concentration in the body relative to time, i.e. area under the curve (AUC). • An AUC measurement involves a mathematical calculation that requires the recording of the drug concentration at a number of specific times. • Refer to the form MR860.91 Aminoglycoside Reporting Form for the specific times required. • This form should be kept in the patients notes on the ward and it will be collected and interpreted by the ward pharmacist who will then provide form Aminoglycoside Dosage Calculation MR860.92 Aminoglycoside Dosage Calculation with the resultant AUC level. <p>Ongoing monitoring:</p> <ul style="list-style-type: none"> • ALL inpatients require further gentamicin trough levels and renal function monitoring to be conducted every 3 to 5 days whilst on therapy. HiTH patients on stable therapy may have levels conducted every 7 days. • Trough gentamicin levels should be undetectable (<0.6mg/L.) • If the trough level is > 0.6mg/L, contact Pharmacy/ChAMP/ID for advice as cessation or dose adjustment is required. <p>Therapeutic drug monitoring - three times daily regimen:</p> <ul style="list-style-type: none"> • Trough levels should be conducted throughout therapy, aiming for levels <1mg/L.⁽¹⁾ The first trough level should be taken prior to the 4th dose then every 3 to 5 days if patient is stable. <p>Additional monitoring for once daily dosing AND three times daily regimen:</p> <ul style="list-style-type: none"> • Renal function and electrolytes should be performed twice weekly whilst on treatment. • Patients receiving treatment > 2 weeks (e.g. for osteomyelitis or endocarditis) with gentamicin must be monitored for hearing loss and vestibular toxicity every 1 to 2 weeks.⁽¹⁾ |
| <p>ADVERSE EFFECTS</p> | <p>Common:</p> <p>Nephrotoxicity (usually reversible, but may be anticipated if treatment extends beyond 7-10 days), vestibular and cochlear toxicity.^(1, 6)</p> <p>Rare:</p> <p>Anaphylaxis, bronchospasm, oliguria, peripheral neuropathy and neuromuscular blockade.^(1, 6)</p> <p>There is an increased risk of muscle weakness and respiratory insufficiency in patients with neuromuscular disease, in cases of hypocalcaemia or hypermagnesaemia and when used in conjunction with general anaesthesia or infusion of citrated blood products.⁽¹⁾</p> |

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| COMPATIBLE FLUIDS | <ul style="list-style-type: none"> • Sodium chloride 0.9% • Glucose 5%, 10% • Hartmann's and Ringer's • Mannitol⁽⁹⁾ |
| STORAGE | <ul style="list-style-type: none"> • 80mg/2mL ampoule (Pfizer brand) should be protected from light and stored below 25°C, any excess should be discarded after opening the ampoule.⁽⁴⁾ |
| INTERACTIONS | <ul style="list-style-type: none"> • Gentamicin may interact with other medications; please consult PCH approved references (e.g. Clinical Pharmacology), your ward pharmacist or Pharmacy on extension 63546 for more information. • IV aminoglycoside antibiotics are inactivated by IV penicillins and cephalosporins. Aminoglycoside antibiotics are rapidly bactericidal and should be administered first. The line should then be flushed well with a compatible fluid and the penicillin administered. In patients with renal impairment, the two agents should be separated by several hours.^(4, 9) • There is an increased risk of ototoxicity and/or nephrotoxicity when gentamicin is used with other ototoxic or nephrotoxic agents (e.g. loop diuretics and vancomycin), especially in patients with pre-existing renal impairment, use with caution.^(1, 5, 6) • Gentamicin used in conjunction with IV magnesium sulphate has an additive neuromuscular blocking effect and should be used with caution.⁽¹⁾ • Aminoglycosides prolong the effect of neuromuscular blockers (both non-depolarising and depolarising). A dose reduction may be required and patients should be monitored closely for respiratory insufficiency.⁽¹⁾ |
| COMMENTS | <ul style="list-style-type: none"> • Ototoxicity can rarely occur as an idiosyncratic reaction after single-dose aminoglycoside exposure in individuals who are genetically predisposed. Ototoxicity is associated with the A1555G gene (notably in Asian populations). Under certain circumstances, genetic testing <i>prior</i> to treatment with long course aminoglycosides or in children requiring repeated course can be considered following consultation with the infectious diseases team.⁽¹⁾ • Ototoxicity is more commonly the result of cumulative aminoglycoside exposure.⁽¹⁾ |
| MANUFACTURER SAFETY DATA SHEET (SDS) | To access to the manufacturer SDS for this product, use the following link to ChemAlert . |

****Please note: The information contained in this guideline is to assist with the preparation and administration of *gentamicin*. Any variations to the doses recommended should be clarified with the prescriber prior to administration****

| Related internal policies, procedures and guidelines |
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| Antimicrobial Stewardship Policy |
| ChAMP Empiric Guidelines |
| Intramuscular Injections (Medication Management Manual) |

| References |
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| <ol style="list-style-type: none"> 1. Rossi S, editor. Australian Medicines Handbook 2019. Adelaide, S. Aust.: Australian Medicines Handbook; 2019. 2. Antibiotic Writing Group. Therapeutic Guidelines - Antibiotic. West Melbourne: Therapeutic Guidelines Ltd; 2019. Available from: http://online.tg.org.au.pklibresources.health.wa.gov.au/ip/. 3. Taketomo CK, Hodding JH, Kraus DM, Hodding JH. Pediatric and Neonatal dosage handbook with international trade names index. 24th ed. Ohio: Lexi-comp; 2017-2018. 4. MIMS Australia. MIMS online [full product information]. St Leonards, N.S.W: CMP Medica Australia.; 2019. p. 1v. (various pagings). 5. Micromedex 2.0 [Internet]. Truven Health Analytics. 2019 [cited 21/08/2019]. 6. Lee Carlton, McMillan JA, Siberry GK, KC. C. Harriet Lane Handbook of Pediatric Antimicrobial Therapy 2nd edition. 2nd edition ed: Elsevier; 2014. 7. Paediatric Formulary Committee. BNF for Children: 2019. London: BMJ Group Pharmaceutical Press; 2015. 8. Centers for Disease Control and Prevention NCfHS. Clinical Growth Charts: CDC; 2015 [updated 4th August 2009. Available from: http://www.cdc.gov/growthcharts/clinical_charts.htm. 9. Burrige N. Symons K. (editors). Australian injectable drugs handbook. Collingwood: The Society of Hospital Pharmacists of Australia; 2019. 10. Lilley L, Legge D. Paediatric Injectable Guidelines 5th ed. Melbourne: Royal Children's Hospital Melbourne; 2019. 11. Clinical Pharmacology [Internet]. Elsevier BV. 2019 [cited 21/08/2019]. Available from: http://pklibresources.health.wa.gov.au/login?url=http://www.clinicalpharmacology-ip.com/?id=24317714. 12. PathWest. PathWest - test directory Perth2019 [cited 2019. Available from: http://www.pathwest.com.au/testdirectory/. |

| Useful resources (including related forms) |
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| Neonatal Medication Protocols (WNHS) |
| Pathwest Directory |
| Clinical Pharmacology |

This document can be made available in alternative formats on request for a person with a disability.

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| File Path: | W:\Safety & Quality\CAHS\CLOVERS MEDICAL Pharmacy\Procedures Protocols and Guidelines\ChAMP | | | | |
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