Monograph	
Amikacin Monograph - Paediatric	
Scope (Staff):	Clinical Staff – Medical, Nursing , Pharmacy
Scope (Area):	Clinical Staff – Medical, Nursing , Pharmacy

This document should be read in conjunction with this DISCLAIMER

DESCRIPTION High Risk Drug	Amikacin is an aminoglycoside antibiotic that inhibits protein synthesis by irreversibly binding to the 30S ribosomal subunit, resulting in cell membrane damage.(1, 2) Amikacin is reserved for the treatment of infections due to organisms that are resistant to other aminoglycosides or documented infection with mycobacterial organisms susceptible to amikacin.(1, 2)
INDICATIONS AND RESTRICTIONS	**IV: Restricted (red) antibiotic** ChAMP approval is required prior to prescription. As it is nephrotoxic, consider alternative agents, especially in patients with any degree of renal impairment.
CONTRAINDICATIONS	Amikacin is contraindicated in patients with a history of serious allergic reaction to an aminoglycoside.(1, 9, 12)
PRECAUTIONS	Unless deemed essential, amikacin should be avoided in those patients with a previous vestibular or auditory toxicity due to an aminoglycoside.(5, 9, 12, 13) The injection contains sodium bisulfite which may cause allergic reactions in susceptible people.(8) Amikacin should be used with caution in patients with renal impairment due to the risks of further ototoxicity and nephrotoxicity.(1, 10)
FORMULATIONS	**Available at PMH:** 500mg/2mL solution for injection vial **Other formulations available:** Nil
DOSAGE	The doses listed below fall within the standard range. Higher doses may be prescribed for certain situations. This should be in consultation with Infectious Diseases or Clinical Microbiology consultants. **Dosing should be based on IDEAL body weight for overweight or obese children.**(1-5) **Neonates (<1 month of age):** Please refer to neonatal clinical care drug protocols

	Once daily dosing: **All ages:** 30mg/kg/dose (to a maximum of 1.25grams) given ONCE daily.(2) **Cystic fibrosis patients:** Initial dose of 30mg/kg ONCE daily to a maximum of 1.5grams. Subsequent doses will be calculated according to area under the curve determinations. Dose may be increased to 35mg/kg to a maximum of 1.5grams.(3) **Inhalation:** Please refer to separate inhaled amikacin protocol
DOSAGE ADJUSTMENT	**Dosage adjustment required in renal impairment:** 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: $\text{eGFR (mL/min/1.73m}^2\text{)} = \frac{36.5 \times \text{height (in cm)}}{\text{Serum creatinine (micromol/L)}}$ Where possible, consider using a less nephrotoxic agent. Trough levels should be collected and reviewed prior to any subsequent doses to avoid toxicity and consider calculating the Area under the curve to optimise dosing. Where amikacin is required, initial dosing intervals are: **CrCl > 60mL/minute**: 24 hourly dosing interval **CrCl 40-60mL/minute**: 36 hourly dosing interval with monitoring prior to any further doses **CrCl <40mL/minute**: If essential, give a single dose and monitor for clearance before any further doses are administered. Contact clinical microbiology or infectious diseases for advice on alternative agents..(2) **Dose adjustment required in overweight or obese patients:** Dosage adjustments may be required in overweight or obese patients with doses calculated on ideal body weight (IBW). If a patient is greater than 20% above the ideal body weight for their age and height, dosing should be calculated on the ideal body weight. Refer to the appropriate growth chart for the calculation of a patients body mass index (BMI). A BMI above the 95th centile indicates a patient is obese, a BMI over the 85th centile indicates a patient is overweight.(6, 7) To calculate ideal body weight use the formula below(5) $\text{Ideal body weight} = \frac{(\text{height in cm})^2 \times 1.65}{1000}$

RECONSTITUTION	**Solution for infusion:** Further dilution is required (see administration section below), use the solution prepared in CIVAS where possible.
ADMINISTRATION	**IV infusion**: Dilute to a final concentration of 5mg/mL or less with a compatible fluid. Infuse over 30 to 60 minutes for children. For infants a longer infusion time of 1 to 2 hours is recommended.(8-10) In fluid restricted patients, a concentration of 10mg/mL may be used.(8) **IM injection:** If IV access is not available this medication may be given by IM injection. Refer to the Clinical Practice Manual – Intramuscular Injections (IM), Including Vaccinations.
MONITORING	**A capillary blood sample is preferred for drug levels wherever possible (i.e. finger prick or heel prick for infants <6months). If unable to obtain via this method a venous sample can be taken. Note: levels should not be taken from any lumen used to administer the amikacin.** **Collection tube:** **Paediatric -** Lithium Heparin (Green top) 1mL (PST gel) or Lithium Heparin (Dark Green top) 1mL (no gel) **Neonatal -** Lithium Heparin (Green top) 1mL (PST gel) **Minimum volume required:** 1mL whole blood.(11) For futher information, refer to the PathWest test directory. **General monitoring** Trough level should be taken immediately prior to the 4th dose and should be less than 5mg/L. Follow-up levels should be performed twice weekly unless the clinical situation dictates more frequent monitoring is required. (e.g. impaired renal function and concurrent use of nephrotoxic drugs).(4) **ALL** patients require repeat levels to be done after each dose change and trough levels should be repeated every 3 days thereafter.(2) **Patients with altered pharmacokinetics:** • Cystic Fibrosis patients • Oncology Patients • Severe burns • Patients with impaired renal function 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). AUC measurements require a mathematical calculation that requires the recording of 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 MR860.92 Aminoglycoside Dosage Calculation with the resultant AUC level.

	Ongoing monitoring: **ALL** patients (including those on HiTH) require further amikacin trough levels and renal function monitoring to be conducted every 3 to 5 days whilst on therapy. Trough amikacin levels should be less than 5mg/L. If the trough level is greater than 5mg/L, contact Pharmacy for advice as dose adjustment is required. **Neonates:** Please refer to neonatal clinical care drug protocols **Additional monitoring:** Renal function and electrolytes should be performed twice weekly whilst on treatment. Patients receiving prolonged treatment (greater than 72 hours) with amikacin must be monitored for hearing loss and vestibular toxicity every 1 to 2 weeks.(1)
ADVERSE EFFECTS	**Common:** Nephrotoxicity (usually reversible but often occurs in treatment extending longer than 7 to 10 days), vestibular and cochlear toxicity.(1, 9) **Rare:** Anaphylaxis, bronchospasm, oliguria, peripheral neuropathy, neuromuscular blockade, nausea, vomiting, stomatitis, electrolyte disturbances, blood disorders, CNS effects (convulsion, encephalopathy, headache).(1)
COMPATIBLE FLUIDS	Sodium chloride 0.9% Glucose 5% and 10% Sodium chloride/glucose solutions Hartmann's Mannitol 20% Ringer's(8)
STORAGE	500mg/2mL vial (DBL brand) should be stored below 25˚C Products prepared by CIVAS should be stored between 2 and 8˚C(9, 12)
INTERACTIONS	**Amikacin has a number of drug interactions; please consult PMH approved references, your ward pharmacist or Pharmacy on extension 8703 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.(8, 10, 12) • There is an increased risk of ototoxicity and/or nephrotoxicity when amikacin is used with other ototoxic or nephrotoxic agents (e.g. loop diuretics and vancomycin), especially in patients with pre-existing

	renal impairment.(1, 9, 13) • Amikacin used in conjunction with IV magnesium sulphate has an addtitive 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, 10) • Use of amikacin with ataluren results in a reduction in the activity of ataluren and an increased risk of nephrotoxicity.(9)
COMMENTS	
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 **amikacin.** Any variations to the doses recommended should be clarified with the prescriber prior to administration

Related policy, procedures and guidelines.
Antimicrobial Stewardship Policy

Resources
ChAMP Empiric Guidelines

References
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File Path:	W:\Safety & Quality\CAHS\CLOVERS MEDICAL Pharmacy\Procedures Protocols and Guidelines\ChAMP		
Document Owner:	Head of Department – Infectious Diseases		
Reviewer / Team:	Children's Antimicrobial Management Program (ChAMP) Pharmacist		
Date First Issued:	April 2013	Version:	4
Last Reviewed:	June 2016	Review Date:	01/06/2019
Approved by:	Medication Safety Review Group	Date:	16/06/2016
Endorsed by:	Drug and Therapeutics Committee	Date:	20/06/2016
Document Sponsor:	Executive Director (Medical) - PMCCU		
Standards Applicable:	NSQHS Standards:		
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