Policy category	BC – Best Care		
Best care goals	☒ Safe ☐ Personal ☐ Connected ☐ Effective		
Applies to	National		
Version	**Approval authority**	**Effective from**	**'Review by' date**
2	National Medical Director, WA	31/08/2023	31/08/2026

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1. Rationale

The purpose of this clinical protocol is to provide a guiding framework for the administration of aminoglycosides within Hospital at the Home services by Medical Practitioners and clinical staff.

2. Scope

The clinical protocol applies nationally for HATH clients treated with aminoglycoside medications. The protocol covers adult treatment regimes. Paediatric information is not included in this protocol. Silverchain services that might require paediatric information on aminoglycosides should reference external specialist paediatric guidelines.

3. Acceptance to HATH criteria and pathway

RED Unacceptable for community admission to HATH. Refer to ED/ Inpatient management. (May become suitable for HATH after ED or inpatient stabilisation).	• Clients with previous vestibular or auditory toxicity related to aminoglycoside therapy • Serious hypersensitivity reaction to an aminoglycoside • Pregnancy • Myasthenia Gravis
ORANGE Requires discussion with Medical Governance prior to acceptance.	• Chronically impaired kidney function (adults with a creatinine clearance less than 40 mL/minute and children with an estimated glomerular filtration rate less than 50 mL/minute/1.73 m2) • Rapidly deteriorating kidney function unrelated to sepsis • Request for treatment > 48 hours requires discussion with an Infectious Diseases consultant/appropriate specialist • Frail and elderly (e.g. 80 years or older)
GREEN Accepted for HATH.	• Short- term empirical therapy of less than 48 hrs for serious gram negative infections (e.g. complex UTI) pending the outcome of investigations to instigate alternative treatment • Over 13 years, suitable for adult dosing and not under the care of a Paediatrician • Client's medical condition has been assessed as stable, has a clear diagnosis and prognosis and is at a low risk of rapid deterioration

4. Pathology work up

- Serum creatinine levels to be confirmed and creatinine clearance calculated using Cockcroft–Gault Equation prior to commencement of aminoglycoside therapy and monitored regularly.
- Liver function tests

- FBC and CRP
- Any relevant M C and S results to be obtained during admission

5. General management

- Collect medical history including potential contraindications or risks such as:
  - pre-existing auditory problems
  - pre-existing vestibular problems (i.e. dizziness, vertigo or tinnitus)
  - neuromuscular disorders (myasthenia gravis, Parkinsonism)
  - decompensated liver disease
  - severe cholestasis (serum bilirubin >90 micromol/L)
  - chronic renal failure or deteriorating renal function
  - recent and current medication history
- Aminoglycosides should **not generally** be used in patients with:
  - pre-existing significant auditory impairment
  - a pre-existing vestibular condition
  - a first-degree relative with aminoglycoside-induced auditory toxicity, since some people have a rare inherited genetic predisposition
- Note increased risk for clients
  - >65 years
  - those with recent history of aminoglycoside therapy
  - concurrent use of nephrotoxic medications such as NSAIDs, ACE inhibitors, diuretics etc.
- A **single** dose of an aminoglycoside **can** be used in patients:
  - with chronically impaired kidney function (adults with a creatinine clearance less than 40 mL/minute) [NB2]
  - with rapidly deteriorating kidney function unrelated to sepsis
  - who are frail and elderly (e.g. 80 years or older)
- Ensure pathology results from referral source and results reported to medical governance doctor.
- Collaborate with medical governance doctor regarding any abnormal results.
- Complete nursing assessment, including weight and calculation of ideal body weight and Creatinine Clearance (as per Cockcroft-Gault formula below)
- Initiate intravenous access and commence intravenous therapy as prescribed.
- Educate client regarding medication, side effects.
- Access further investigations as requested by medical governance doctor.
- Liaise with medical governance doctor regarding ongoing management or referral to Infectious Diseases Physician (IDP) if clinically indicated prior to 48hours elapsing post commencement of treatment.

6. Medical management/treatment plan

6.1 Background

Advantages of aminoglycosides

- Aminoglycosides are bactericidal and associated with rapid control of Gram-negative infections.
- Most community and healthcare-associated Gram-negative pathogens are susceptible to aminoglycosides.
- Aminoglycosides have a 'post-antibiotic effect' that allows for effective once-daily therapy with reduced rates of toxicity.
- When combined with cell-wall–active drugs (e.g. beta lactams, glycopeptides), aminoglycosides are synergistic for enterococcal and streptococcal infections.
- Aminoglycosides rarely cause hypersensitivity reactions.
- Aminoglycosides are rarely associated with *Clostridium difficile* infection.

- **Disadvantages of aminoglycosides**
- Aminoglycosides cause nephrotoxicity, usually associated with prolonged treatment courses (longer than 5 to 7 days) and pre-existing kidney impairment. Nephrotoxicity is generally reversible.
- Aminoglycosides cause vestibular and, less commonly, auditory toxicity, mostly associated with prolonged treatment courses. Vestibular and auditory toxicity are generally irreversible.
- Aminoglycosides are therefore primarily used for short-term empirical therapy of serious Gram-negative infections, pending the outcome of investigations.
- In a limited number of circumstances, they also have a role in directed therapy. These include:
  - treatment of pathogens confirmed, or suspected to be, resistant to antibiotics more appropriate for longer term use
  - initial combination therapy for *Pseudomonas aeruginosa* infections, until susceptibility results are available
  - combination therapy for brucellosis, nontuberculous mycobacterial infections, and tuberculosis
  - combination therapy for synergistic therapy of streptococcal, enterococcal and *Bartonella* endocarditis.

6.2 Dosing requirements

When used for empirical therapy, aminoglycoside dosing should not continue beyond 48 hours (i.e. a maximum of three empirical doses at 0, 24 and 48 hours).

Given the 'post-antibiotic effect' of aminoglycosides, whereby bacterial killing continues for many hours after plasma concentration is undetectable, this effectively provides 72 hours of therapy.

- Once daily dosing is recommended for those with normal renal function (exceptions include; endocarditis, ascites and major burns). The dosing interval should be extended in clients with renal impairment.
- Appropriate dosage is determined by the client's weight (see below instructions around ideal, actual and adjusted body weight for dosing) and creatinine clearance [CrCl] estimated using the Cockcroft–Gault formula;

Use ideal body weight (IBW) or actual weight for dosing, whichever is less when BMI is <30kg/m2.

Calculate ideal body weight

Males: IBW (kg) = [Height (cm) - 152] x 0.9 + 50 Females: IBW (kg) = [Height (cm) - 152] x 0.9 + 45.5 See Appendix A for Estimated Ideal Body Weight Table.

In obese clients (BMI of 30 to 34.9kg/m²) use adjusted body weight (AdjBW) for dosing up to 100 kg.

Note: If the AdjBW is > 100kg a dose should be calculated using a weight of 100kg.

Seek specialist advice if BMI >35.

Calculating the dose using adjusted body weight better reflects the mass of the client's metabolically active tissue.

Calculate Adjusted Body Weight (AdjBW): AdjBW = IBW + 0.4 x (actual body weight – IBW)

Cockroft Gault Calculation

Use Ideal/actual body weight, whichever is less. See Appendix A for Estimated Ideal Body Weight Table.

Calculate Creatinine Clearance from serum creatinine:

$$\text{Adult males: CrCl (mL/min)} = \frac{(140 - \text{age}) \times \text{weight (kg)}}{0.814 \times \text{serum creatinine (micromol/L)}}$$

Adult females: Multiply the above formula by 0.85

Initial adult aminoglycoside dosage

Gentamicin or Tobramycin

Creatinine clearance	Dose	Dosing interval	Maximum number of doses
>60 mL/min	4 to 5 mg/kg (up to 480mg)	24 hourly	3 doses (at 0, 24 and 48 hours)
40-60 mL/min	4 to 5 mg/kg (up to 480mg)	36 hourly	2 doses (at 0 and 36 hours)
<40 mL/min	4 mg/kg (up to 400mg)	Single dose: give initial dose **once** then seek advice from IDP or Microbiologist	

Amikacin

Creatinine clearance	Dose	Dosing interval	Maximum number of doses
>60 mL/min	16 to 20 mg/kg (up to 2000mg)	24 hourly	3 doses (at 0, 24 and 48 hours)
40-60 mL/min	16 to 20 mg/kg (up to 2000mg)	36 hourly	2 doses (at 0 and 36 hours)
<40 mL/min	16 mg/kg (up to 1500mg)	Single dose: give initial dose **once** then seek advice from IDP or Microbiologist	

6.3 Further doses beyond 48 hrs

No further doses should be administered beyond 48 hours unless there is a clear indication and/or there is no alternative from a safer antibiotic class.

Treatment beyond 48 hours must be discussed with Medical Governor who must be an Infectious Diseases Physician or an appropriate specialist.

7. Monitoring

- Routine monitoring of aminoglycoside plasma levels is not required if the clinical plan is to cease therapy within 48 hours.
- Monitoring of plasma aminoglycoside levels following the first dose should be considered if clients are to receive prolonged therapy i.e.
  - longer than 48hrs
    OR
  - kidney function is changing rapidly (e.g. suspected acute kidney failure)
  - for clients with altered pharmacokinetics such as:
    - clients treated with renal replacement therapy
    - clients with cystic fibrosis
    - clients with ascites
    - Obese clients (BMI >30)
    - Clients treated with chemotherapy that causes kidney dysfunction (e.g. cisplatin).

In these situations, dosing should be based on a 24-hour Area under the Curve (AUC) based computerised method.

Please consult a Clinical Pharmacist if aminoglycoside monitoring is required. Most computerised methods require two plasma concentration measurements (usually 30 minutes after completion of the infusion, and 6 to 8 hours after) Some software only required one measurement. The Clinical Pharmacist will advise depending on which software they will use to interpret the result.

- Nomograms for plasma aminoglycoside concentration monitoring that appeared in older versions of the “Antibiotic Therapeutic Guidelines” are no longer recommended. Likewise, trough concentrations are not recommended for monitoring as they underestimate exposure to aminoglycosides and potential for toxicity.

8. Medical governance

- The client must have access to medical governance support for 24 hours per day, 7 days per week.
- Primary medical governance can be by referring medical specialists, credentialed referring GPs or by Silver Chain medical staff.
- Care delivery is planned and provided in consultation with the client, medical officer/specialist holding medical governance and nursing staff. Where the primary medical governor is unavailable a Silver Chain medical officer will provide the medical governance.
- In the instance when a client's condition deteriorates the Silver Chain medical officer or nursing staff can confer with a hospital specialist colleague or an emergency department medical officer.
- The ED is not the primary escalation point unless it is an emergency.

When governance is retained by a Silver Chain medical officer the client will have a medical review within 24 hours of admission and the medical officer will determine when the scheduled follow up and discharge will occur. A summary of the episode of care is sent to the referrer or the client's GP at discharge.

9. Discharge planning

- Ensure the client has an appointment arranged with own General Practitioner (GP) prior to discharge to ensure continuity of care.
- Ensure discharge summary has highlighted the key clinical concerns/risks you wish to hand over
- Fax client discharge summary to GP.

10. Supporting documents

Silverchain policy and related documents that directly relate to and inform this procedure are available with this document in the Policy Document Management System (PDMS).

Other documents that directly relate to and inform this procedure are as follows:

- Principles of Aminoglycoside Use; eTG complete [Internet]. Published April 2019. Amended March 2020. © Therapeutic Guidelines Ltd (eTG March 2021 edition).

11. Document details

Document owner	Executive Medical Director, East Coast
Consumer participation	☐ Yes ☒ Not applicable
Document type	CP - Clinical Protocol
Functional area	Acute
Risk rating	Moderate
Periodic review	36 months

Silverchain's policies align with relevant legislation and standards and are based on providing a fair, inclusive, and safe working environment free from bullying and discrimination and one that enables equal opportunity for all Silverchain staff.

Our policies embody our values of integrity, respect, trust, and compassion.

Appendix A

Ideal body weight (estimates based on height)

Height		Ideal body weight in kg	
cm	Feet (‘) & Inches (“)	Female	Male
155	5’	48	53
160	5’ 2”	53	57
165	5’ 4”	57	62
170	5’ 6”	62	66
175	5’ 7”	66	71
180	5’ 9”	71	75
185	6’	75	80
190	6’ 2”	80	84
195	6’ 4”	84	89
200	6’ 6”	89	93
205	6’ 7”	93	98
210	6’ 9”	98	102
215	7’	102	107
220	7’ 2”	107	111