Once Daily Intravenous Amikacin:

Administration and Monitoring in Adults Policy

(excludes patients receiving renal replacement therapy)

April 2025

Gloucestershire Hospitals NHS Foundation Trust

Once Daily Intravenous Amikacin: Administration and Monitoring in Adults Policy

Objective

Policy for the administration and monitoring of once-daily amikacin at Gloucestershire Hospitals NHS Foundation Trust (GHNHSFT). This policy is for the use of amikacin for the treatment of infection only in adults.

Background/policy statement:

Amikacin is an aminoglycoside antibiotic and is normally reserved for treatment of Gram-negative bacterial infections that are resistant to gentamicin and/or tobramycin, which remain amikacin sensitive, or on the advice of a Consultant Microbiologist. Sensitivities should be reviewed where available before prescribing. Amikacin exhibits a concentration-dependent bactericidal activity and a post-antibiotic effect: administration of a large, once-daily dose could therefore maximize the rate of bacterial killing, with the post-antibiotic effect preventing re-growth of bacteria.

Aminoglycoside antibiotics such as amikacin must be administered parenterally as they are poorly absorbed from the gastro-intestinal (GI) tract. Once daily administration is now recommended in most clinical situations; this has been the standard accepted regimen for use of iv amikacin for the last two decades.

Once daily is:

- As effective as multiple dosing regimes
- Less toxic (less nephrotoxicity & ototoxicity)
- More convenient to administer and monitor
- More economical

Cautions and Contraindications

This guidance **does not apply** to the following patient groups:

- Pregnant and post-partum – discuss with pharmacist or consultant microbiologist
- Patients treated in Renal units or receiving haemodialysis or haemofiltration – (see The Renal Handbook for dosage information in renal replacement therapies or contact nephrologist or renal pharmacist).
- Ascites
- Major burns (>20% total body surface area)
- Age less than 18 years (contact paediatrician or paediatric pharmacist for advice)

Contraindications

- Myasthenia gravis
- Myeloma
- Patients allergic (hypersensitive) to amikacin or other aminoglycoside

Cautions

- **Chronic Kidney Disease (CKD) Stage G4 or more,** known or suspected acute kidney injury (AKI) in the previous 48 hours (50% increase in baseline serum creatinine or oliguria > 6 hours). If amikacin is clinically indicated, give one dose as per guidance and check with ward pharmacist or senior clinician before giving a second dose. Amikacin should be used with caution in patients with renal impairment. See **Table 1** for dosage recommendations in renal impairment.
- **Auditory or vestibular dysfunction** - Ototoxicity secondary to amikacin is independent of drug concentration. Likely signs and symptoms may include: new tinnitus, dizziness, poor balance, hearing loss or oscillating vision (nystagmus). 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.
  There have also been observed cases of an increased risk of ototoxicity with aminoglycosides administered to patients with mitochondrial mutations, particularly the m.1555A>G mutation, including cases where the patient's aminoglycoside serum levels were within the recommended range. Some cases were associated with a maternal history of deafness and/or mitochondrial mutation. Mitochondrial mutations are rare, and the penetrance of this observed effect is unknown.
- **Concurrent administration of neurotoxic and / or nephrotoxic agents increases the risk of amikacin toxicity.** Review therapy and consider amending or withholding nephrotoxic drugs during amikacin treatment. Avoid co-administration with the following where possible:
  - neuromuscular blockers
  - other potentially nephrotoxic (e.g. NSAIDs and ACE Inhibitors) or ototoxic drugs
  - potent diuretics
  - other aminoglycosides

This list is not exhaustive – consult the Summary of Product Characteristics (SPC) for a full list (Home - electronic medicines compendium (emc)

- **Conditions characterised by muscular weakness** (aminoglycosides may impair neuromuscular transmission)
- **Dehydration** should be corrected before starting an aminoglycoside
- **Course length** - Wherever possible, parenteral therapy should not exceed 7 days. If amikacin is expected to continue beyond 7 days, consider referring to Audiology for assessment.

Dosage

15mg/kg* once daily, up to a maximum dose of 1.5g/day.
Amikacin has a maximum dose of 15 grams per course. Consult Microbiologist or other consultant specialist if treatment is continued beyond the maximum cumulative dose per course.

See **table 1** below for guidance on dosing in renal impairment.

*For **non-obese patients** (BMI 30 or less, or actual body weight lower than 120% of ideal body weight), **use ideal body weight** (IBW) rather than actual body weight (ABW) to calculate the dose. For **obese patients** (BMI >30 or >120% of ideal body weight) it is recommended that the dose is calculated using the patient's **adjusted/obese dosing body weight** (ODBW) because amikacin distributes poorly in fat.

Which body weight to use?

* **For non-obese patients,** use ideal body weight (IBW) rather than actual body weight (ABW).
To calculate **ideal body weight**, use the following equation or see IBW table in **appendix 2**:

Ideal body weight (Male) = 50kg + (2.3kg x height in inches over 5 feet)
Ideal body weight (Female) = 45.5kg + (2.3kg x height in inches over 5 feet)

For obese patients (BMI greater than 30 or more than 120% of ideal body weight) it is recommended that the dose is calculated using the patient's **obese dose body weight** because amikacin distributes poorly in fat.
Obese dose body weight is also known as adjusted body weight.

To calculate **adjusted/obese dose body weight**, use the following equation or use the Ideal Body Weight and Adjusted/Obese dose Body Weight calculator (appendix 2)
(NOTE: Do not use calculator if patient is under 5ft or 152.5cm in height.

Adjusted/Obese dose body weight (ODBW) = IBW + 0.4 (ABW - IBW)

Dosage in renal impairment:
See **appendix 1** for advice on calculating renal function
If creatinine clearance 80mL/min or less, a reduced dose should be calculated as per table below.

Table 1 – dose in renal impairment

Creatinine Clearance (ml/min)	**Dose**
Greater than 80 ml/min	15 mg/kg every 24 hours
41-80 ml/min	10 mg/kg every 24 hours
20-40 ml/min	10 mg/kg every 48 hours
Less than 20 ml/min	**Do not use amikacin**

Therapeutic Dose Monitoring (TDM)

Only a pre-dose (trough) level is needed for routine monitoring purposes normally.

Trough (pre-dose) levels should be taken immediately prior to the 2nd dose and results should be reviewed before the 3rd dose is given.

Amikacin levels are a MICROBIOLOGY request – samples should be sent to the Microbiology Laboratory at GRH. Levels are sent from there for processing at the Antimicrobial Reference Laboratory in Southmead Hospital (Bristol). Results are generally available the following day. However, results can sometimes be delayed – if the levels are not back before the next dose of amikacin is due to be given, please discuss with the duty / on call Consultant Microbiologist whether the next dose should be given.
Please note that the time taken to test and report results back to GHNHSFT Microbiology is affected by factors such as patient location (CGH vs GRH), and whether the sample is taken and transported to Southmead on a weekday or at a weekend/bank holiday. It is prudent to try to avoid taking levels between Friday evening and Monday morning for these logistical reasons. If you plan to do levels during this time period, please discuss your request in advance with the Serology Section in Microbiology during normal working hours Monday to Friday – extension 5069.
The Antimicrobial Reference Laboratory in Southmead Hospital (Bristol) need to be informed about any levels that need testing at weekends or on bank holidays.

Interpretation

- **If trough level < 5 mg/L**, continue at the same dose. Thereafter, monitor amikacin level and U&Es twice weekly.
- **If trough level > 5 mg/L**, **omit next dose** and discuss with duty/on call Microbiologist, Antimicrobial pharmacist or Medicines information about

options for dose / regimen adjustment or whether the amikacin should be discontinued.

Electronic requests for serum amikacin levels should include the following information:

- Date and time of last dose
- Date and time sample taken
- Dose given and frequency (e.g. once daily)

If amikacin levels are within the recommended range with normal renal function, then monitor levels and U&Es twice weekly

Information on sample requirements for amikacin levels can be found at:
Amikacin levels

For further advice or clarification during normal office hours please contact:

☎ Medicines Information:	CGH ext. 3030	GRH ext. 6108
☎ Duty Microbiologist:	CGH ext. 4430	GRH ext. 5054

Out of hours
Please contact the on-call pharmacist or on call consultant microbiologist

References

Summary of Product Characteristics. Amikacin 250mg/ml injection from Association of British Pharmaceutical Industries Electronic Medicines Compendium (eMC). Accessed online 27/02/25 https://www.medicines.org.uk/emc

Ashley, C., Dunleavy, A., Ed. 2019. The Renal Drug Handbook 5th Ed. CRC Press

Renal drug database Accessed online 27/02/25

British National Formulary Accessed online 27/02/25

WHO operational handbook on tuberculosis - Drug-resistant tuberculosis treatment 2022 update 9789240065352-eng.pdf

Appendix 1

Calculating renal function

Cockroft-Gault equation for estimating creatinine clearance:

$$\text{Creatinine Clearance (GFR)} = \frac{(140 - \text{Age}) \times \text{Weight (Kg)} \times F}{\text{Serum Creatinine (µmol/litre)}}$$

Where F = 1.23 (For Men)
1.04 (For Women)

Online calculator (CrCl calculator)

Appendix 2

Calculating ideal body weight and obese dose body weight

Ideal Body Weight and obese dose Body Weight calculator

(NOTE: Do not use calculator if patient is under 5ft or 152.5cm in height.

Alternatively, obtain the ideal body weight from the table below and use the following equation to calculate an obese dosing body weight:

Obese dose body weight = IBW + 0.4 (ABW - IBW)

Males

Height (ft'in)	Height (cm)	IBW (kg)
4'10	147	45.4
4'11	150	47.7
5'0	152.5	50.0
5'1	155	52.3
5'2	157.5	54.6
5'3	160	56.9
5'4	162.5	59.2
5'5	165	61.5
5'6	167.5	63.8
5'7	170	66.1
5'8	172.5	68.4
5'9	175	70.7
5'10	177.5	73.0
5'11	180	75.3
6'0	183	77.6
6'1	185.5	79.9
6'2	188	82.2
6'3	190.5	84.5
6'4	193	86.8
6'5	195.5	89.1
6'6	198.5	91.4
6'7	201	93.7

Females

Height (ft'in)	Height (cm)	IBW (kg)
4'8	142	36.3
4'9	144.5	38.6
4'10	147	40.9
4'11	150	43.2
5'0	152.5	45.5
5'1	155	47.8
5'2	157.5	50.1
5'3	160	52.4
5'4	162.5	54.7
5'5	165	57.0
5'6	167.5	59.3
5'7	170	61.6
5'8	172.5	63.9
5'9	175	66.2
5'10	177.5	68.5
5'11	180	70.8
6'0	183	73.1
6'1	185.5	75.4
6'2	188	77.7

DOCUMENT: Once Daily Intravenous Amikacin: Administration and Monitoring in Adults Policy

Authorisation	**Name and Position**	**Date Approved**
Responsible Authors	Delyth Ahearne Antimicrobial Pharmacist Dr Robert Jackson Consultant Microbiologist	Policy last revised 27/2/25 With minor alterations 3/4/25
Policy Sponsor	Dr Robert Jackson Consultant Microbiologist Medical Lead for Antimicrobial Stewardship in GHNHSFT	Policy last revised 27/2/25 With minor alterations 3/4/25
Assured by	GHNHSFT Antimicrobial Stewardship Group	**05/03/2025** With post-meeting agreement by the CMMs – April 2025 **07/05/25** and follow up meeting with RJ/DA/Ali on 9/5/25

Consideration at authorised groups (e.g. Board, Board sub committees, Policy Group, Clinical policies Sub Group, Departmental meetings etc)

Name of Group	**Date considered**
Respiratory unit meeting	13/05/25