CLINICAL GUIDELINE

Orthopaedic Surgical Prophylaxis

A guideline is intended to assist healthcare professionals in the choice of disease-specific treatments.

Clinical judgement should be exercised on the applicability of any guideline, influenced by individual patient characteristics. Clinicians should be mindful of the potential for harmful polypharmacy and increased susceptibility to adverse drug reactions in patients with multiple morbidities or frailty.

If, after discussion with the patient or carer, there are good reasons for not following a guideline, it is good practice to record these and communicate them to others involved in the care of the patient.

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Important Note:

The Intranet version of this document is the only version that is maintained.
Any printed copies should therefore be viewed as 'Uncontrolled' and as such, may not necessarily contain the latest updates and amendments.

NHS Greater Glasgow and Clyde recommendations for antibiotic prophylaxis in Orthopaedic Surgery

See GGC Recommendations for Antibiotic Prophylaxis in Surgery /Procedures, for information in antibiotic timing, re-dosing for long operations and **gentamicin** dosing. [Principles of Surgical Prophylaxis (1039) | Right Decisions (scot.nhs.uk)](#)

IV **Teicoplanin#**

- Give 800 mg teicoplanin by slow IV injection over 3-5 minutes.
- Teicoplanin and gentamicin are **incompatible** when mixed directly and must not be mixed before injection.

If patient have had previous infection with multi drug resistant bacteria – contact microbiology.

Obesity (BMI > 30 Kg/m^2 [1-3])
Consider increasing the dose of co-amoxiclav as below:

	Weight > 100 Kg
Co-amoxiclav	Add 1 g IV amoxicillin to 1.2 g Co-amoxiclav

Orthopaedic Procedure	Antibiotic	Comment
Elective Arthroplasty **and** primary surgery involving insertion of Implant Revision surgery: joint infection **not** suspected	IV **Cefuroxime** 1.5 g *If true penicillin/ beta-lactam allergy or high MRSA risk -* IV **Teicoplanin#** 800mg	Single dose Includes the use of antibiotic impregnated cement.
Revision surgery: joint infection suspected	If previous positive microbiology discuss with microbiology regarding antibiotic choice Withhold antibiotics until after ≧ 5 specimens for culture have been taken, intra-operatively give	Includes the use of revision antibiotic impregnated cement +/- additional antibiotics in cement Post operatively Gentamicin and Vancomycin are to be used unless otherwise advised. Gentamicin is to be prescribed at treatment dose. Post-operative gentamicin

	IV **Gentamicin*** (See Appendix 1 for prophylactic dosing) **and** IV **Teicoplanin#** 800mg Single intra-operative dose, followed by IV vancomycin *on the ward see note ii)*	prescribing should take into account intra-operative dose. i) **For subsequent gentamicin dosing on the ward** use the 2016 11 Copy of v2 Gentamicin Calculator.xls (sharepoint.com) and prescribe gentamicin on GGC prescription chart ii) Vancomycin loading dose should be given 6-12 hours post intra-operative teicoplanin, use the vancomycin-online-calculator.xlsm (live.com) and prescribe vancomycin on GGC prescription chart iii) Discuss antibiotic choice with microbiology at 72 hours post-surgery
Elective Surgery without implant (clean) Soft tissue surgery of hand *(for hand bite wound treatment/ prophylaxis see Infection Management Guidelines)* Arthroscopy Open reduction internal fixation Hemiarthroplasty*	 Not recommended Not recommended Not routinely recommended^ If implant inserted consider antibiotics as per arthroplasty section at the discretion of the operating surgeon IV **Cefuroxime** 1.5 g *If true penicillin/ beta-lactam allergy or high MRSA risk* IV **Teicoplanin#** 800mg	 ^ If previous implant e.g. ACL reconstruction, prophylaxis as per arthroplasty. includes antibiotic impregnated cement

Trauma [4] Cephalosporins started by ambulance staff should be **stopped**, and the guidelines below followed. **Open fracture**		
i) At presentation Antibiotics ideally within 1 hour of injury. Continue antibiotics for 24 hours post initial debridement (excision) If > 48 hours between presentation in (initial) hospital and skeletal stabilisation with definitive tissue closure, continue antibiotic until skeletal stabilisation with definitive tissue closure.	i) IV **Co-amoxiclav** 1.2 g 8 hourly *If true penicillin/ beta-lactam allergy –* IV **Clindamycin** 600 mg 6 hourly **If Gustilo grade III fracture add** Single dose IV **Gentamicin*** (see appendix 1 for prophylactic dosing) **Usual maximum duration co-amoxiclav /clindamycin +/- gentamicin 24 hours post initial debridement (excision).**	If known or high risk of MRSA add IV **Teicoplanin** 800mg If IV **gentamicin** in the previous 24-48 hours contact antimicrobial pharmacist or give IV co-amoxiclav 1.2g or IV clindamycin 600mg
ii) At surgery for skeletal stabilisation and definitive tissue closure Single doses only – do not continue post-surgery, unless concerns about a deep seated infection, discuss with microbiology, see over	ii) **If no Teicoplanin in the last 12 hours** IV **Teicoplanin** 800mg Plus IV **Gentamicin*** (see appendix 1 for prophylactic dosing) **If Teicoplanin in the last 12 hours** IV **Co-amoxiclav** 1.2 g *If true penicillin/ beta-lactam allergy –-* IV **Clindamycin 600 mg**	If concerns about a deep seated infection, check gentamicin level 6-14 hours post prophylactic dose and start treatment with IV Gentamicin for 72 hours (– dosing info here) - prescribe on GGC Gentamicin Prescription, Administration and Monitoring form) + IV Vancomycin (see dosing info here) + IV Metronidazole 500 mg 8 hourly

Trauma Surgery without implant (clean)	Not recommended	
Trauma Contaminated hand trauma (without bite) Antibiotics within 3 hrs of injury. Continue antibiotics until first debridement. Following debridement continue for max duration 72 hrs (or stop when soft tissue closure whichever is sooner).	IV **Co-amoxiclav** 1.2 g 8 hourly *If true penicillin/ beta-lactam allergy –* IV **Clindamycin** 600 mg 6 hourly **If grossly contaminated add in IV gentamicin****	If high MRSA risk discuss with microbiology regarding antibiotic choice ****IV gentamicin dose -** use the 2016 11 Copy of v2 Gentamicin Calculator.xls (sharepoint.com) and prescribe gentamicin on GGC gentamicin prescription, administration and monitoring form.
Major Malignant Bone resection	IV **Co-amoxiclav** 1.2g Plus IV **Gentamicin*** (see appendix 1 for prophylactic dosing) *If true penicillin/ beta-lactam allergy* IV **Clindamycin** 600 mg Plus IV **Gentamicin*** (See Appendix 1 for prophylactic dosing)	**Post operation** IV **co-amoxiclav 1.2 g** 8 hourly (for 2 doses only) then switch to oral **co-amoxiclav** 625mg 8 hourly *If true penicillin/ beta-lactam allergy* **Post operation** IV **clindamycin** 600 mg 6 hourly (for 2 doses only) then switch to oral **clindamycin** 600mg 8 hourly + oral **ciprofloxacin** 500mg 12 hourly **Post Operation Duration:** up to 24 hours (The surgeon may wish to extend duration based on surgical patient risk factors. If prophylaxis is extended,

		please record rationale and intended duration) **Ciprofloxacin** • Risk of serious drug interactions and may prolong QTc interval. • Absorption reduced by oral iron, calcium, magnesium and some nutritional supplements • (See BNF).
Spinal surgery	**Cefuroxime 1.5g** **or** **Flucloxacillin 2 g** *If true penicillin/ beta-lactam allergy* **IV Teicoplanin[#] 800mg**	

Principles of Adding Antimicrobials to Bone Cement

Based on Royal Orthopaedic Hospital, Birmingham, Guidelines 2021

1. Adding antibiotics to bone cement should be **planned in advance and discussed at the Ortho MDT, with microbiology and antimicrobial pharmacist.**
2. Certain antimicrobials may not be available as a sterile powder. Discuss with local antimicrobial pharmacist in advance
3. Adding antimicrobials to bone cement is an unlicensed indication and each clinician must take individual responsibility for adding the antimicrobial.
4. Contact microbiology to discuss addition of non-standard antimicrobial e.g. daptomycin or antifungals.
5. When additional antimicrobials are admixed, industrially impregnated cements (e.g. gentamicin impregnated cement or clindamycin impregnated cement) are preferred over plain cements (better mechanical properties and elution due to synergistic release).
6. Antimicrobial susceptibility testing results are applicable for systemic antimicrobial application and might not be valid for local antimicrobial application due to high local concentrations and synergistic activity.
7. Side effects and interactions of local antimicrobials are rare. However, serum concentrations of vancomycin and gentamicin should be monitored in patients with kidney insufficiency and/or intravenous application.
8. Only use sterile antimicrobials in powder form. Liquid antimicrobials are **not** recommended due to inhomogeneous distribution in PMMA. Antibiotics that interfere with the polymerization process (rifampicin or metronidazole) or which are thermolabile or sensitive to oxidation (e.g. some beta lactams) should not be used.

9. Data on mechanical stability are not available for combinations of more than two antimicrobials*. If possible, the total amount of antimicrobials should not exceed 10% of the PMMA powder weight (= 4 g per 40 g).
10. The amount of antibiotic that can be added may vary depending on the temperature and humidity of the theatre.

References

1. Dosing of antibiotics in Obesity, B Janson and K Thursky, Current Opinion Infectious diseases December 2012 Vol 25:6:634-649
2. www.medscope.com/viewarticle/742992
3. Salm L *et al,* Impact of bodyweight-adjusted antimicrobial prophylaxis on surgical-site infection rate. BJS Open, 2020, 5(1), 1-6
4. BAPRAS guideline, STANDARDS FOR THE MANAGEMENT OF OPEN FRACTURES Sept 2020 BAPRAS open fracture guideline.pdf

Appendix 1: Gentamicin* dosing regimens for surgical prophylaxis in adult male and female patients

- Avoid gentamicin if CrCl < 20 ml/min: seek advice on alternative from microbiology.
- In renal transplant patients avoid gentamicin and seek advice from microbiology or renal team.
- Use GGC CrCl calculator to assess renal function. Do not use eGFR in patients at extremes of body weight.
- Use the patient’s actual body weight and height to calculate the gentamicin dose, using table below. This prophylactic gentamicin dosing table is based on approximately 5 mg/kg actual body weight/ adjusted body weight.[5]
- Doses of up to 600 mg gentamicin can be given undiluted by slow IV injection over 3 – 5 minutes, or diluted to 20 ml with 0.9 % saline and given slowly over 3-5 minutes, administer via large peripheral vein or central line. [1-4]
- Monitor for signs of extravasation or infiltration e.g. swelling, redness, coolness or blanching at the cannula insertion site.

HEIGHT \ WEIGHT	30 – 39.9 kg	40 – 49.9 kg	50 – 59.9 kg	60 – 69.9 kg	70 – 79.9 kg	80 – 89.9 kg	90 – 99.9 kg	100 – 109.9 kg	110 - 119.9 kg	120 - 129.9 kg	130 - 139.9 kg	140 - 149.9 kg	150 - 159.9 kg	160 - 169.9 kg	170 - 179.9 kg	180 - 189.9 kg	≥190 kg
142 - 146 cm 4’8’’ - 4’9’’	180 mg	200 mg	220 mg	240 mg	260 mg	280 mg	300 mg	320 mg	340 mg	360 mg							
147 - 154 cm 4’10’’ - 5’0’’	180 mg	200 mg	240 mg	260 mg	280 mg	300 mg	320 mg	340 mg	360 mg	380 mg	400 mg						
155 - 164 cm 5’1’’ - 5’4’’	180 mg	200 mg	260 mg	280 mg	300 mg	320 mg	340 mg	360 mg	380 mg	400 mg	420 mg	440 mg	480 mg				
165 - 174 cm 5’5’’ - 5’8’’		200 mg	280 mg	300 mg	320 mg	340 mg	360 mg	380 mg	400 mg	420 mg	460 mg	480 mg	480 mg	520 mg	540 mg		
175 - 184 cm 5’9’’ - 6’0’’		200 mg	280 mg	320 mg	360 mg	380 mg	400 mg	420 mg	440 mg	460 mg	480 mg	500 mg	520 mg	540 mg	560 mg	580 mg	600 mg
185 - 194 cm 6’1’’ - 6’4’’			280 mg	320 mg	360 mg	400 mg	420 mg	440 mg	460 mg	480 mg	500 mg	540 mg	560 mg	580 mg	600 mg	600 mg	600 mg
≥195 cm ≥6’5’’				320 mg	360 mg	420 mg	460 mg	480 mg	500 mg	520 mg	540 mg	560 mg	580 mg	600 mg	600 mg	600 mg	600 mg

References

1. Metro South Antimicrobial Stewardship Network (2019) *Gentamicin Dosing, Administration & Monitoring Guidelines for Adults for Empirical Therapy*. Available at: Fact sheet template (portrait) | Metro South Health (mshprescribe.com) (Accessed: 07 July 2022).
2. Spencer S et al, Intravenous Push Administration of Antibiotics: Literature and Considerations, *Hosp Pharm.* 2018 Jun; 53(3): 157–169.
3. Loewenthal MR, Dobson PM. Tobramycin and gentamicin can safely be given by slow push. *J Antimicrob Chemother*. 2010;65(9):2049–2050.
4. Gentamicin Injection 40mg/ml SPC, eMC, (Gentamicin 40mg/ml Solution for Injection/Infusion - Summary of Product Characteristics (SmPC) - (emc) (medicines.org.uk)) (Accessed 30 August 2023)
5. Bratzler, D.W., Dellinger, E.P., Olsen, K.M., Perl, T.M., Auwaerter, P.G., Bolon, M.K., Fish, D.N., Napolitano, L.M., Sawyer, R.G., Slain, D., Steinberg, J.P. and Weinstein, R.A. (2013) 'Clinical practice guidelines for antimicrobial prophylaxis in surgery'. *American Journal of Health-System Pharmacy*, 70(3), pp. 195-283.
6. Co-amoxiclav SPC, Co-Amoxiclav 1000 mg/200 mg Powder for Solution for Injection/Infusion - Summary of Product Characteristics (SmPC) - (emc) (medicines.org.uk) (Accessed 30 August 2023)