# GUIDELINES FOR THE USE OF ANTIBIOTICS IN ADULTS TRAUMA AND ORTHOPAEDIC SURGERY

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## ANTIBIOTIC PROPHYLAXIS-TRAUMA AND ORTHOPAEDIC SURGERY

### Elective Orthopaedics

| Procedure | Recommendation | Serious penicillin allergy or MRSA carrier |
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| **Arthroplasty** | Cefuroxime 1.5g IV followed by 750mg at 8 hour intervals **(three doses in total).** | Teicoplanin 800mg IV **one dose only**<br><br>(600mg if ≤60 kg)<br><br>(**Add** Gentamicin 3mg/kg IV if Gram negative organism infection suspected. If patient obese- use ideal body weight for calculation. |
| **Orthopaedic surgery (without implant)** | Nil | Nil |

### Trauma Orthopaedics

| Procedure | Recommendation | Alternative for serious penicillin allergy or MRSA carrier |
|---|---|---|
| **Open fracture or penetrating injury into joint cavity** | Cefuroxime 1.5g IV at 8 hour intervals until wound closed or covered. (*)<br><br>**If contused and dirty trauma**<br><br>**Add** Gentamicin 5mg/kg IV. If patient obese- use ideal body weight for dose calculation. Patient specific dose to be calculated using the NHS Lothian intranet gentamicin calculator.<br><br>**Plus** metronidazole 500mg IV every 8 hours. Switch to oral formulation 400mg every 8 hours once patient transferred to the ward and oral | Teicoplanin 800mg IV loading dose (600mg if ≤60 kg) and then follow the standard protocol until wound closed or covered. (*)<br><br>**If contused and dirty trauma**<br><br>**Add** Gentamicin 5mg/kg IV. If patient obese- use ideal body weight for dose calculation. Patient specific dose to be calculated using the NHS Lothian intranet gentamicin calculator.<br><br>**Plus** metronidazole 500mg IV every 8 hours. Switch to oral formulation 400mg every 8 hours once patient transferred to the ward and oral |

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| | route available. (*)<br><br>Metronidazole has excellent oral bioavailability.<br><br>**(*)Regimen needs to be reviewed daily and if antimicrobial cover is needed for longer than 3-5 days- follow the culture results and amend the regimen accordingly.** | route available.(*)<br><br>Metronidazole has excellent oral bioavailability.<br><br>**(*)Regimen needs to be reviewed daily and if antimicrobial cover is needed for longer than 3-5 days- follow the culture results and amend the regimen accordingly.** |
| **Open surgery for closed fracture where foreign material is implanted** | Cefuroxime 1.5g IV **one dose only** | Teicoplanin 800mg IV **one dose only**<br><br>(600mg if ≤60 kg) |
| **Hip fracture**<br><br>**If the fracture is involving the site with prosthetic joint replacement in situ- please follow prophylaxis guidelines as for arthroplasty.** | Cefuroxime 1.5g IV **one dose only** | Teicoplanin 800mg IV **one dose only**<br><br>(600mg if ≤60 kg) |

## ANTIBIOTIC INITIATION IN ADULT TRAUMA AND ORTHOPAEDIC SURGERY

Antibiotics should only be prescribed in orthopaedic patients after discussion with an orthopaedic registrar, staff grade or consultant.

1. **Do not prescribe antibiotics for post-operative pyrexia**

Systemic inflammatory response syndrome (SIRS) can occur post operatively or in infection. Post-operative pyrexia is a physiological occurrence lasting for up to 72 hours and in the majority of cases does not require antibiotics.

2. **Do not prescribe antibiotics for positive bacteriology results ( in isolation)**

The presence of an underlying infection that requires antimicrobial treatment needs to be established first. Results may often represent bacterial colonisation, rather that infection. Treat the patient not the result.

3. **Do not prescribe antibiotics for unconfirmed infections.**

4. **Do not prescribe antibiotics before adequate specimens (blood culture, MSU, sputum, wound aspirate) have been obtained.**

Antibiotics are not required to be given promptly unless the patient is showing systemic signs of sepsis (specimen first!!).

## Presumed sites of infection:

### Urinary Tract infection

**i. Do not treat every positive urine culture.**

Urethral catheterisation and MSUs carry a high risk of contamination and may give a false positive result. Unless you know that it represents a properly collected MSU, do not treat. In routine practice true MSUs are rarely done. For example, a pure growth of a coliform in a urine sample may represent contamination in some cases.

**ii. Do not give antibiotic for turbid or smelly urine sample.**

Antibiotics should only be given following clinical examination and confirmation of urinary symptoms.

**iii. Do not send routine urine samples for microscopy culture and sensitivities**

Tests for bacteriuria or pyuria do not establish the diagnosis of UTI. Do not treat asymptomatic bacteriuria in elderly as it is very common.

**iv. Do not send routine catheter urines**

All patients with long term catheters have bacteriuria.

Arthroplasty patients who require post-operative catheterisation (not covered by post-operative cefuroxime) should be given a single IV dose of gentamicin on insertion and removal of catheter.

This is according to local consensus among orthopaedic surgeons that gentamicin should be given for catheter insertion, change or manipulation during the early post-operative phase (up to six weeks) to minimise the risk for infection of the postoperative wound haematoma by catheterisation induced bacteraemia.

### Pneumonia

- Antibiotics should not be started until clinical assessment, chest X-Ray, sputum and blood cultures have been taken.
- Post-operative chest X-Rays can be misleading and commonly reflect poor air entry.

### Wound Infection

- Post-operative wound swabs or sinus swabs should not be taken
  The gold standard is aspiration to obtain fluid (swabs should only be obtained if instructed by a Consultant Orthopaedic Surgeon)
- Positive results for wound swabs should not prompt antibiotic treatment unless discussed with the treating Orthopaedic team. This is extremely important. The treating team must be involved in the decision-making process.

### Sepsis (SIRS plus documented site of infection)

Identifying the primary source, use of early and appropriate antibiotics are the mainstays of treatment.

Systemic inflammatory response syndrome (SIRS) is a physiological response to infection or insult and is defines by presence of two or more of the following:

- Temperature > $38^0$C or < $36^0$C
- Heart rate >90 beats/min
- Respiratory rate > 20 breaths/min $PaCO_2$ < 4KPa
- White cell count >12,000 cells/$mm^3$ or < 4,000 cells/$mm^3$

**Severe Sepsis**

Sepsis associated with organ dysfunction, hypoperfusion or hypotension (septic shock). Hypoperfusion and perfusion abnormalities may include, but are not limited to, lactic acidosis, oliguria or an acute alteration in mental state.

Please refer to intranet (antimicrobial management team page → antimicrobial guidelines) for guidance on how to assess and manage patients with suspected sepsis.

## MANAGEMENT OF SUSPECTED BONE AND JOINT INFECTION, INCLUDING IMPLANT ASSOCIATED INFECTION

This guideline is aimed at FY1/2 doctors and orthopaedic registrars on call for emergency admissions. It is for guidance only and the actual steps may vary from patient to patient.

The primary goal for these patients is to make a diagnosis. The cornerstone of this is obtaining an appropriate sample for microbiological culture. Culturing organisms in this situation is often very difficult and 'no growth' can be found in up to 20% of patients where all other indices point to infection. There are many reasons for this, some of which are:

- Fastidious organisms: the organisms causing these infections can be difficult to grow.
- Delay in transporting sample to the lab/not informing lab staff to expect specimens.
- Antibiotics: patients are often given antibiotics by the first doctor who sees them.

Therefore, wherever possible antibiotics should be withheld until appropriate specimens are obtained (this may not be until the time of surgery). If the patient already on antibiotics, these should be stopped.

An exception to this is where patients are systematically unwell/toxic due to infection, for example: HR>100 beats/min, systolic BP<100mmHg, temp>$39^0$C, acute confusion. In these cases, aspirate should be attempted immediately under strict sterile technique, and at the very least blood cultures should be obtained.

Antibiotics should be started immediately thereafter. For full guidance regarding assessment and management of septic patient please refer to Antimicrobial Management Team page on intranet.

If an orthopaedics doctor sees a patient who they suspect to have an infected joint or joint replacement or other orthopaedic implant infection (i.e. where they would consider giving the patient antibiotics) the appropriate steps are:

- Obtain a full history: time of joint replacement surgery, wound problems after that operation, onset/duration of symptoms, scar breakdown/sinus formation, use of antibiotics, co-existing risk factors (other disease states, for example, diabetes or other medicines, for example, steroids).

- Examination: heat, redness, swelling, abscess formation, wound breakdown, temperature observations.
- Blood tests: CRP/ESR – the CRP should be less than 20 at 3 weeks after an uncomplicated joint replacement that does not have infection. Obtain blood cultures if pyrexia.
- Joint aspiration for fluid. This is possible in most joints except the hip. The registrar on call is expected to help with this where the junior doctor on call does not have the experience. Strict sterile technique must be used. Hip joint aspiration usually requires image guidance and can be done in the department of radiology. The lab staff should be alerted, and the sample should be transported immediately.

In cases where infection is localised to the joint or orthopaedic implant, do not give antibiotics straight away, discuss with the registrar on call who should review the patient and then discuss with the appropriate consultant on call regarding advice for further management.

If patient is systematically unwell – ensure blood cultures are taken and the joint has been aspirated for fluid (except the hip) then start antimicrobial treatment as per Lothian Antimicrobial Guidance (see Antimicrobial Management Team page on intranet). If there is a previous history of MRSA, high risk for MRSA or presence of an implant then vancomycin should be added.

If prolonged treatment with intravenous antibiotics is planned, PICC line insertion should be considered.

Cases with suspected joint infection and negative culture should be discussed with microbiology.

## ANTIMICROBIAL TREATMENT OF IMPLANT ASSOCIATED INFECTIONS IN ACCORDANCE WITH COMMON PATHOGENS

**Note:** In appropriate circumstances, an early switch at 7-10 days to oral antimicrobials may be suitable[20], at discretion of Consultant Orthopaedic Surgeon. Follow empirical guidance as below until discussed by multidisciplinary team.

| **Microorganism** | **Antimicrobial Agent**<br><br>(Choice of the antimicrobial depends on the susceptibilities of the isolated microorganism) | **Comments** |
|---|---|---|
| **Organism not known; culture results awaited** | **Empirical treatment:**<br><br>Vancomycin IV (patient specific dose to be calculated using the NHS Lothian intranet vancomycin dosage calculator, See comments)<br><br>**PLUS**<br><br>Rifampicin 450mg every 12 hours Orally | Vancomycin loading and maintenance dose to be calculated using on-line calculator with **target trough levels 15- 20 mg/L**.<br><br>(intranet: Home>Directory>Antimicrobial Management Team>Vancomycin)<br><br>In patients aged >75 years consider reducing rifampicin dose to 300mg |

| Microorganism | Antimicrobial Agent<br>(Choice of the antimicrobial depends on the susceptibilities of the isolated microorganism) | Comments |
|---|---|---|
| | **followed by:**<br><br>regimen agreed with microbiologist (based on culture results) | every 12 hours orally. |
| ***Staphylococcus aureus* or coagulase negative staphylococci**<br><br>**Methicillin-susceptible** | Flucloxacillin[1] 2g every 6 hours IV<br><br>**PLUS**<br><br>Rifampicin 450mg every 12 hours Orally for ≥2 Weeks<br><br>**followed by**:<br><br>Ciprofloxacin 750mg every 12 hours Orally<br><br>**PLUS**<br><br>Rifampicin 450mg every 12 hours Orally | Patients with immediate hypersensitivity reactions to penicillin should be treated with IV vancomycin instead of flucloxacillin. Please refer to Lothian Antimicrobial Guidance on intranet for full guidance regarding assessment of patients with penicillin allergy.<br><br>Rifampicin IV should only be used if no oral route is available.<br><br>See MHRA fluoroquinolone guidance (Ciprofloxacin)Fluoroquinolone antibiotics: new restrictions and precautions for use due to very rare reports of disabling and potentially long-lasting or irreversible side effects - GOV.UK (www.gov.uk) |
| **Methicillin-resistant** | Vancomycin[3] IV (patient specific dose to be calculated using the NHS Lothian intranet vancomycin dosage calculator, See comments)<br><br>**PLUS**<br><br>Rifampicin 450mg every 12 hours Orally<br><br>for ≥ 2 weeks<br><br>**followed by:**<br><br>Rifampicin 450mg every 12 hours Orally<br><br>**PLUS one of the following agents:**<br><br>Ciprofloxacin 750mg every 12 hours orally | |

| Microorganism | Antimicrobial Agent<br>(Choice of the antimicrobial depends on the susceptibilities of the isolated microorganism) | Comments |
|---|---|---|
| | or Teicoplanin[4] 12mg/ kg daily IV (Note: first 3 doses every 12 hours as loading regimen)<br><br>or Doxycycline 100mg every 12 hours orally<br><br>or Co-trimoxazole (4mg/kg/dose - trimethoprim component) every 12 hours orally or IV. See comments (**)<br><br>**Without rifampicin**<br><br>Linezolid 600mg every 12 hours orally alone following micro advice and check interactions with ward pharmacist.<br><br>Please discuss with infection specialist if Staphylococci are resistant to antimicrobial agents above | Teicoplanin should be administered as 12 mg/ kg rounded off to the nearest 200mg at 12-hour intervals for the first 3 doses and then once a day. For over-weight/obese patients use ideal body weight for calculations. Levels should be sent for all patients on prolonged therapy (>1 week). First level (pre-dose level) should be checked on day 5. For bone and joint infections aim for pre-dose levels >20-40mg/L but <60 mg/l.<br><br>For alternative regimen of teicoplanin, please refer to specific OPAT guidelines on intranet: (Home>Directory>Regional Infectious Diseases Unit> OPAT-WGH >OPAT Teicoplanin dosage guidance)<br><br>(**)Co-trimoxazole can be given orally or IV, depending on the route available. Prescribe orally if this is a switch from IV to oral after initial period of IV antimicrobial treatment. If Co-trimoxazole is prescribed as initial treatment because the organism is very resistant and first line options are not available - then prescribe IV at the start of the treatment. |
| ***Streptococcus group A*** | Benzylpenicillin 1.2g to 2.4g every 4-6 hours IV for 4 weeks<br><br>**PLUS**<br><br>Clindamycin 600mg every 6 hours orally for 2-4 weeks<br><br>**followed by**:<br><br>Amoxicillin[5] 1g every 8 hours Orally<br><br>(consider suppression for ≥ 1 year | Patients allergic to penicillin should be treated with vancomycin initially (instead of benzylpenicillin). Refer to note above for dosing.<br><br>Please refer to Lothian Antimicrobial Guidance on intranet for full guidance regarding assessment of patients with penicillin allergy. |

| Microorganism | Antimicrobial Agent<br>(Choice of the antimicrobial depends on the susceptibilities of the isolated microorganism) | Comments |
|---|---|---|
| ***Streptococcus group B, C & G*** | Benzylpenicillin 1.2g to 2.4g every 4-6 hours IV[5,16] for 4 weeks<br>**PLUS**<br>Synergistic Gentamicin[6,7] 1mg/kg 12 hourly or 24 hourly IV depending on renal functions for 2 weeks<br>**followed by**:<br>Amoxicillin 1g every 8 hours orally<br>(consider suppression for ≥ 1 year[18,19] | Low dose adjunctive/synergistic gentamicin treatment should be monitored with levels done twice a week once stable, aiming for trough levels < 1 mg/L and peak levels 3 – 5 mg/L. Refer to Lothian antimicrobial guidelines for gentamicin synergistic use. |
| ***Enterococcus species*** **(amoxicillin-susceptible)**<br>***(Amoxicillin MIC≤ 8mg/L, Gentamicin MIC ≤ 128mg/L)*** | Amoxicillin 2 g every 6 hours IV<br>**PLUS**<br>Synergistic Gentamicin 1mg/kg 12 hourly or 24 hourly IV depending on renal functions for 2 weeks<br>**followed by:**<br>Amoxicillin 1g every 8 hours Orally | For detailed guidance regarding Synergistic Dosing of Gentamicin in Adults refer to Lothian antimicrobial guidelines.<br>For *Enterococcus faecalis* - if gentamicin high-level (HL-Gent) resistance detected (MIC>128mg/L) – replace gentamicin with ceftriaxone (2g every 12 hours) |
| ***Enterococcus species*** **(amoxicillin-resistant)** | Vancomycin[3] IV See comments)<br>**PLUS**<br>Synergistic Gentamicin[6,7] 1mg/kg 12 hourly or 24 hours IV depending on renal functions for 2 weeks<br>**followed by:**<br>OPAT or oral regimen after discussion with infection specialist. | For treatment of resistant Enterococci consider adding IV Fosfomycin for first 2 weeks. |

| Microorganism | Antimicrobial Agent<br><br>(Choice of the antimicrobial depends on the susceptibilities of the isolated microorganism) | Comments |
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| ***Enterobacteriaceae***<br><br>***(e.g. E.coli, Klebsiella spp)***<br><br>**(fluoroquinolone-susceptible)** | Ciprofloxacin 750mg every 12 hours orally<br><br>**PLUS**<br><br>Gentamicin[9,10] 5mg/kg as single daily dose IV (see dosing guide and monitor for signs of toxicity) (***)<br><br>for first postoperative days (until wound is dry)<br><br>or<br><br>Piperacillin-tazobactam 4.5g every 6 hours IV | (***)Dosing guide: Gentamicin treatment should be monitored with levels. Refer to Lothian antimicrobial guidelines –NHS Lothian gentamicin treatment dosage calculator on intranet.<br><br>**Prolonged gentamicin courses can cause nephrotoxicity and permanent ototoxicity, which is not dose dependent.**<br><br>Also note that there are no randomized controlled trials for use of gentamicin in infections with streptococci/enterococci or non-fermenters. |
| **Non fermenters**<br><br>**(For example, *Pseudomonas aeruginosa*)** | Ciprofloxacin 750mg every 12 hours orally<br><br>or<br><br>Piperacillin-tazobactam 4.5g every 6 hours IV<br><br>or<br><br>Meropenem 1g every 8 hours IV<br><br>**PLUS**<br><br>Gentamicin[9,10] 5mg/kg as single daily dose IV for 2-3 weeks – (see dosing guide and monitor for signs of toxicity) (***)<br><br>**followed by:**<br><br>Ciprofloxacin 750mg every 12 hours orally | |

| Microorganism | Antimicrobial Agent<br>(Choice of the antimicrobial depends on the susceptibilities of the isolated microorganism) | Comments |
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| **Cutibacterium spp (formerly Propionibacterium spp)**[17] | Benzylpenicillin 1.2g to 2.4g every 4-6 hours IV<br>**PLUS**<br>Rifampicin 450mg every 12 hours orally<br>**followed by:**<br>Amoxicillin 1g every 8 hours orally<br>**PLUS**<br>Rifampicin 450mg every 12 hours orally[18] | In patients aged >75 years consider reducing rifampicin dose to 300mg every 12 hours orally. |
| **Candida species (fluconazole sensitive)** | Fluconazole IV or orally (excellent oral bioavailability)<br>- Loading dose **12mg/kg on day 1 (Up to 800mg once a day), followed by 6mg/kg (to nearest 200mg)**<br>Note: same dose for IV and oral administration | For Candida species not sensitive to fluconazole, please discuss with microbiologist. |

## DURATION OF TREATMENT FOR IMPLANT ASSOCIATED INFECTIONS

| Procedure | Duration of Antimicrobial Treatment |
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| Debridement with retention | • 3 months for hip prosthesis<br>• 3-6 months for knee prosthesis<br>• Switch to oral antimicrobials at discretion of consultant orthopaedic surgeon, often after discussion with multidisciplinary team. Usual contributing factors taken into account encompass:<br>- oral antimicrobial with good bone penetration is available |

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| | - wounds are dry<br><br>- local conditions are satisfactory- CRP is back to normal or almost normal values (<30)<br><br>• Please note - longer IV treatment is needed for infections caused by Streptococci<br>• For infections caused by Streptococci and yeasts consider suppression[18]. |
| One-stage exchange | As above |
| 2-stage exchange with short interval (2-4 weeks); with or without spacer | • IV antimicrobials during the prosthesis free interval and shortly after the re-implantation aiming to maximally reduce bacterial load<br>• No antimicrobials free period before re-implantation<br>• Post re-implantation continue antimicrobials to complete 12 weeks treatment (counting from the time when prosthesis was removed, with IV/PO switch as appropriate) if re-implantation intra-operative cultures are negative.<br>• If intra-operative cultures from re-implantation are positive - extend antimicrobial treatment to 12 weeks from the date of re-implantation. Adjust antimicrobial choice as per culture result.<br>• Longer IV treatment needed for infections caused by Streptococci<br>• For infections caused by Streptococci and yeasts consider suppression[18] |
| 2-stage exchange with long interval (4-6 weeks); | • If interval 4-6 weeks, antimicrobials should be given for the whole interval, usually with IV for 2 first weeks, IV/oral switch at discretion of consultant orthopaedic surgeon. Please note - no antibiotic free period before re-implantation.<br>• Post re-implantation continue antimicrobials for 6 weeks (IV/oral switch as appropriate) if intra-operative cultures are negative. Aim for the total course of antimicrobial treatment of minimum 12 weeks[21].<br>• If intra-operative cultures from re-implantation are positive extend antimicrobial treatment to 12 weeks from the date of re-implantation. Adjust antimicrobial choice as per culture result. |
| 2-stage exchange with extended interval<br><br>(6 weeks plus); | • Exact duration of antimicrobial treatment to be agreed on case-by-case basis at discretion of consultant orthopaedic surgeon, often after discussion with multidisciplinary team.<br>• General guidance:<br>➢ Post first-stage- antimicrobial treatment for 12 weeks, usually with IV for first 2 weeks, IV/oral switch at discretion of consultant orthopaedic surgeon<br>➢ Longer antimicrobial treatment may be required if infection caused by certain organisms. For example, streptococci or fungi<br>➢ Post second-stage procedure – antimicrobial treatment for up to 3 weeks while awaiting extended culture results. If culture negative – stop antimicrobials. If culture positive – |

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| | treat with antimicrobials as per culture results. Note– consider long term suppression if the organism from 1st and 2nd stage is the same.<br><br>• Prolonged antimicrobial treatment may be appropriate when suppression with antimicrobials is needed.<br>• For two-stage revision of prosthetic knee infections, duration of antimicrobials at discretion of consultant orthopaedic surgeon. |
| Implant removal without replacement | Minimum 6 weeks. Longer duration may be needed for residual chronic osteomyelitis or if some implant elements or cement still in situ. |
| Long term suppressive treatment | Long term |

* If causative organism is a yeast, then implant removal is strongly recommended. Three-stage exchange can be considered (spacer exchange after 3 weeks). Please discuss with microbiologist regarding duration of antifungal treatment[14]

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| Considerations against day 7-10 IVOS | • No suitable oral option<br>• Staph aureus bacteraemia (up to 1 month prior)<br>• Endocarditis<br>• Septic shock (severe sepsis)<br>• Staphylococcus resistant to rifampicin<br>• Additional concurrent deep-seated sites of infection<br>• Leaking wound<br>• Clinical concern |
| Considerations for extending treatment duration past 12 weeks | • Poor bone stock<br>• Vascular insufficiency<br>• Streptococcal and fungal infections<br>• Staphylococcus resistant to rifampicin<br>• Slow resolution<br>• Operative difficulty in complete source control (for example, retained cement, incomplete debridement)<br>• Delays or interruptions in antimicrobial therapy<br>• Clinical concern |

## FURTHER INFORMATION ON THE MOST COMMON ANTIBIOTICS PRESCRIBED IN ORTHO/TRAUMA WARDS

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| **Flucloxacillin**<br><br>• To be used with caution in patients with hepatic dysfunction.<br>• Risk of nephrotoxicity.<br>• Renal, hepatic and haematological status to be monitored during therapy.<br>• For oral administration patient should be advised to take with empty stomach, either an hour before food or 2 hours after food. | **Rifampicin**<br><br>• Risk of hepatic dysfunction.<br>• Monitor LFTs weekly.<br>• Drug interactions.<br>• Must never be used as monotherapy as resistance develops rapidly.<br>• Patients and carers should be advised rifampicin discolours soft contact lenses and colours the urine bright yellow/orange. |
| **Vancomycin**<br><br>Note: use the correct loading dosage calculator (dependent on target trough level- normally for joint infections target trough: 15 to 20 mg/L)<br><br>• Ototoxic and nephrotoxic.<br>• Monitor levels as per antimicrobial guidelines.<br>• Monitor renal functions.<br>• Slow IV administration. | **Gentamicin**<br><br>• Ototoxic (please provide information to patients on signs/symptoms of ototoxicity) and nephrotoxic. Monitor levels and renal functions.<br>• Note: Different dosing regimens exist: synergistic gentamicin and gentamicin adult standard dosing. |
| **Clindamycin**<br><br>• Can cause diarrhoea (*C.difficile* associated). Discuss alternative options with microbiologist. | **Benzylpenicillin**<br><br>• CNS toxicity, including convulsions, with high doses or in severe renal impairment. |
| **Teicoplanin**<br><br>Note: Different dosing regimens exist for an inpatient and OPAT- check dose with ward pharmacist<br><br>• Trough levels should be monitored every 6-8 days in long term use.<br>• Discuss trough targets with microbiology and adjust dose with advice from the pharmacist. | **Ciprofloxacin**<br><br>• Can very rarely cause long-lasting, disabling, and potentially irreversible side effects affecting multiple systems, organ classes, and senses<br>• Can cause tendonitis leading to rupture of tendons, which may be exacerbated by co-administration of a corticosteroid<br>• Can reduce seizure threshold for patients with neurological problems (not to be used in such cases).<br>• Can cause diarrhoea (*C.difficile* associated).<br>• Can prolong QT interval<br>• May be associated with an increased risk of aortic aneurysm, particularly in older patients<br><br>See MHRA fluoroquinolone guidance<br>• Fluoroquinolone antibiotics: new restrictions and precautions for use due to very rare reports of disabling and potentially long-lasting or irreversible side effects - GOV.UK (www.gov.uk) |

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| **Co-trimoxazole**<br><br>Risk of hyperkalaemia | **Daptomycin**<br><br>• Monitor FBC (for eosinophils), U&Es, LFTs and CK weekly.<br>• May cause eosinophilic pneumonitis, nephrotoxicity, hepatitis and rhabdomyolysis – Consider withholding statins while patient on daptomycin. |
| **Doxycycline**<br><br>• Caution in hepatic impairment.<br>• Monitor hepatic function weekly.<br>• Patient should be advised to avoid exposure to sunlight or sun lamps.<br>• Oral iron and calcium decreases absorption of doxycycline. Advise patient to separate doses by 2 to 3 hours. | **Linezolid**<br><br>• Monitor platelets count weekly.<br>• Closely monitor in patients with renal impairment.<br>• Prolonged treatment can cause visual disturbances and peripheral neuropathy.<br>• Not licensed for use > 4 weeks.<br>• Linezolid is a MAOI and causes significant interactions with various drugs. Discuss with ward pharmacist. |

For:

- Treatment of Musculoskeletal System and Treatment of Skin and Soft Tissue Infection – Refer to Antimicrobial Prescribing Guidelines in Adults(http://intranet.lothian.scot.nhs.uk/NHSLothian/Healthcare/A-Z/amt/AntimicrobialGuidelines/Pages/default.aspx)

## REFERENCES


1. Zimmerli W, Trampuz A, Ochsner PE. Prosthetic joint infections. N Engl J Med 2004; 351: 1645-54.
2. Bernard l, Hoffmeyer P, Assal M, Vaudaux P, et al. Trends in the treatment of orthopaedic prosthetic infections. J Antimicro Chemo 2004 53, 127-129.
3. Therapeutic guidelines: Antibiotic, version 12, 2003. Therapeutic guidelines limited, Melbourne.
4. Brittish National Formulary. BMJ Group and the Royal Pharmaceutical Society of Great Britain 2022. Last updated 26 May 2022.
5. Trampuz A, Zimmerli,W. Prosthetic joint infections: update in diagnosis and treatment. Swizz Med Wkl 2005; 135: 43–251
6. Davis JS. Management of bone and joint infections due to Staphylococcus aureus. Internal Med J 2005; 35:S79-S96.
7. Gould FK, Denning DW, Elliott TSJ et al Guidelines for the antibiotic treatment of endocarditis in adults: report of the Working Party of the British Society for Antimicrobial Chemotherapy.J Antimicro Chemo 2011.
8. Stengel D, Bauwens K, Sehouli J, Ekkernkamp A, Porzsolt F. Systematic review and meta-analysis of antibiotic therapy for bone and joint infections. Lancet Inf Dis 2001; 1: 175-188.
9. T. S. J. Elliott, J. Foweraker, F. K. Gould, J. D. Perry, J. A. T. Sandoe. Guidelines for the antibiotic treatment of endocarditis in adults: report of the Working Party of the British Society for Antimicrobial Chemotherapy. J Antimicro Chemo 2004 54, 971–981.
10. S. G. Giulieri, P. Graber, P. E. Ochsner, W. Zimmerli Management of Infection Associated with Total Hip Arthroplasty according to a Treatment Algorithm. Infection 2004: 32:222-8.
11. Merrer J, Dupont B, Nieszkowska A, De Jonghe B, Outin H. Candida albicans prosthetic arthritis treated with fluconazole alone. J Infect. 2001 Apr; 42(3):208-9.
12. Whittaker JP, Warren RE, Jones RS, Gregson PA. Is prolonged systemic antibiotic treatment essential in two-stage revision hip replacement for chronic Gram-positive infection? J Bone Joint Surg Br 2009;91:44-51. [Erratum, J Bone Joint Surg Br 2009; 91:700.]
13. Matthews PC, Berendt AR, McNally MA, Byren I. Diagnosis and management of prosthetic joint infection. BMJ 2009; 338: 1378-1383.
14. Khalid Azzam, Javad Parvizi, Donald Jungkind et al. Microbiological, Clinical, and Surgical Features of Fungal Prosthetic Joint Infections: A Multi-Institutional Experience. J Bone Joint Surg Am. 2009;91:142-149.
15. Liu Catherine, Bayer Arnold, Cosgrove Sara E, et al Clinical Practice Guidelines by the Infectious Diseases Society of America for the Treatment of Methicillin-Resistant Staphylococcus Aureus Infections in Adults and Children. CID 2011;52 :1-38
16. Osmon DR, Berbari EF, Berendt AR at al. Diagnosis and Management of Prosthetic Joint Infection: Clinical Practice Guidelines by the Infectious Diseases Society of America. CID 2013; 56(1):e1–25
17. Furustrand Tafin U, Corvec S, Betrisey,B, Werner Zimmerli W, Trampuz A Role of Rifampin against Propionibacterium acnes Biofilm In Vitro and in an Experimental Foreign-Body Infection Model. Antimicrob Agents Chemother. 2012 Apr;56(4):1885-91
18. Izakovicova P, Borens O, Trampuz A. Periprosthetic joint infection: current concepts and outlook. EFFORT Open Rev 2019; 4:482-494
19. Akgun D et al. High failure rates in treatment of streptococcal prosthetic joint infections: results from a seven-year retrospective cohort study. Bone and Joint J, 2017; vol.99-B:653-659.
20. Li H-W et al. Oral versus intravenous antibiotics for bone and joint infection. NEngl J Med 2019; 380:425–36.
21. Bernard et al. Antibiotic Therapy for 6 or 12 Weeks for Prosthetic Joint Infection. N Engl J Med 2021; 3841991-2001.