Antibiotic Prophylaxis in Orthopaedic Surgery
Antibiotic Guidelines

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Applies to: Salford Care Organisation
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It is your responsibility to check on the intranet that this printed copy is the latest version
1. Overview

This guideline recommends surgical prophylaxis options for adult patients undergoing specific orthopaedic surgical procedures.

It applies to Salford Royal patients undergoing orthopaedic surgery at both Salford and Trafford sites.

For treatment (rather than prophylactic) doses of gentamicin please refer to the trust gentamicin policy

2. Scope

This policy applies to all clinical staff involved the prescribing of antimicrobials.

Associated Documents

- 144TD(C)25(A5) - Issue No 3.1 - Antimicrobial Stewardship Policy
  
  [link](http://intranet.srht.nhs.uk/policies-resources/trust-policy-documents/topics-prescriptions/antibiotic/antibiotic-prescribing-principles/144tdc25a5/)

- 163TD(C)(33) – Issue No. 14 - Medicines Policy
  
  [link](http://intranet.srht.nhs.uk/policies-resources/trust-policy-documents/trust-wide-clinical/gen/163tdc33/?locale=en)

3. Background

Antimicrobial agents are among the most commonly prescribed drugs and account for 20% of the hospital pharmacy budget. Unfortunately, the benefits of antibiotics to individual patients are compromised by the development of bacterial drug resistance. Resistance is a natural and inevitable result of exposing bacteria to antimicrobials.

Good antimicrobial prescribing will help to reduce the rate at which antibiotic resistance emerges and spreads. It will also minimise the many side effects associated with antibiotic prescribing, such as Clostridium difficile infection. It should be borne in mind that antibiotics are not needed for simple coughs and colds. In some clinical situations, where infection is one of several possibilities and the patient is not showing signs of systemic sepsis, a wait and see approach to antibiotic prescribing is often justified while relevant cultures are performed.

This document provides treatment guidelines for the most common situations in which antibiotic treatment is required. The products and regimens listed here have been selected by the Trust's Medicines Management Group on the basis of published evidence. Doses assume a weight of
60-80kg with normal renal and hepatic function. Adjustments may be needed for the treatment of some patients.

This document provides treatment guidelines for the appropriate use of antibiotics. The recommendations that follow are for empirical therapy and do not cover all clinical circumstances. Alternative antimicrobial therapy may be needed in up to 20% of cases. Alternative recommendations will be made by the microbiologist in consultation with the clinical team.

This document refers to the treatment of adult patients (unless otherwise stated).

Please refer to up to date BNF/SPC for a full list of cautions, contra-indications, interactions and adverse effects of individual drugs

4. What is new in this version?

- MHRA warning on serious adverse effects with fluoroquinolones

5. Guideline

5.1 Surgical Prophylaxis Principles

Antimicrobial prophylaxis is indicated during selected clean surgical procedures and during procedures which involve incision of non-sterile mucosal surfaces (oral mucosa, respiratory tract, gastrointestinal tract and female genito-urinary tract). Local departmental protocols should be followed where available. Prophylactic antibiotics should be prescribed on the EPMAR (using the relevant prescribing order set where available).

Where a patient is at high risk of post-operative MRSA infection, teicoplanin should be included in the prophylaxis regimen.

Patients at high risk of MRSA infection include:

- Patients with a history of any MRSA colonisation or infection (EVEN IF SUBSEQUENT NEGATIVE SCREENS)

- Patients without a negative MRSA screen from this admission or pre-op clinic who
  - Are admitted from a residential or nursing home
  - Are healthcare workers
  - Have had an inpatient admission in the past 12 months (UK or overseas)
  - Have had a prolonged pre-operative hospital inpatient stay
General Principles

1. The final decision regarding the benefits and risks of antibiotic prophylaxis for an individual patient will depend on:
   - the patient’s risk of surgical site infection
   - the potential severity of the consequences of surgical site infection
   - the effectiveness of prophylaxis in that operation
   - the consequences of prophylaxis for that patient (e.g. increased risk of *C. difficile* colitis)

2. Prophylaxis should be administered ≤ 60 minutes prior to surgical incision (administration must be complete before the surgical incision, and before inflation of the tourniquet when used).

   During induction of anaesthesia great care must be taken to prevent drug substitution errors between anaesthetic drugs and antibiotics (which has the potential to lead to unintentional awareness).

3. Penicillin Allergy

Patients with a history of angioedema, anaphylaxis, or severe skin reaction to any beta lactam antibiotics, are likely to have a true penicillin allergy and are therefore at an increased risk of immediate hypersensitivity to penicillins. They should not receive prophylaxis with a beta–lactam antibiotic (these include penicillins, cephalosporins, monobactams and carbapenems).

Patients with a minor or delayed rash, may not have a true penicillin allergy and can therefore receive prophylaxis with a cephalosporin, monobactam or carbapenem but not a penicillin.

4. Teicoplanin, gentamicin and ciprofloxacin have long half-lives and additional doses during surgery are not required. Where other antibiotics are used, an additional dose of prophylactic antibiotic during the operation is indicated if:
   - there is major intra-operative blood loss blood loss of > 1500 ml during surgery. In this case, additional dose of the prophylactic antibiotic should be given after fluid replacement.
   - haemodilution up to 15ml/kg
   - surgery has lasted for more than 4 hours
5.2. Guideline for Antibiotic Prophylaxis in Orthopaedic Surgery

- Record antibiotics given on EPMAR where available
- Give flucloxacillin as a slow IV injection over a minimum of 3-4 minutes.
- Give gentamicin as an infusion over 20 minutes

<table>
<thead>
<tr>
<th>Operation</th>
<th>1st line prophylaxis</th>
<th>Penicillin allergy or MRSA cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed clean orthopaedic procedures without prosthesis/implants e.g. arthroscopy</td>
<td>No prophylaxis recommended</td>
<td>No prophylaxis recommended</td>
</tr>
<tr>
<td>Joint replacement surgery (hip, knee, shoulder, elbow, ankle)</td>
<td><strong>Flucloxacillin</strong> 2g IV (1g if GFR ≤10) PLUS <strong>Gentamicin</strong> IV at induction <strong>Followed by</strong> Flucloxacillin 1g IV at 6, 12 and 18 hours post induction <strong>If surgery &gt;3 hours</strong> Give an additional dose of flucloxacillin 1g IV in theatre 3 hours post-induction</td>
<td>Teicoplanin IV PLUS <strong>Gentamicin</strong> IV at induction No further post-operative doses required</td>
</tr>
<tr>
<td>Prosthetic joint revision surgery</td>
<td><strong>Teicoplanin</strong> IV PLUS <strong>Gentamicin</strong> IV at induction</td>
<td></td>
</tr>
<tr>
<td>All other procedures requiring prophylaxis e.g. Internal fixation of fractures with pins, screws, joint surgery other than the above (e.g. day case hand)</td>
<td><strong>Flucloxacillin</strong> 2g IV (1g if GFR ≤10) PLUS <strong>Gentamicin</strong> IV at induction No further post-operative doses required</td>
<td></td>
</tr>
</tbody>
</table>
*Gentamicin and teicoplanin doses:

<table>
<thead>
<tr>
<th>Weight</th>
<th>Gentamicin dose</th>
<th>Teicoplanin dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;70 kg</td>
<td>120 mg</td>
<td>400 mg</td>
</tr>
<tr>
<td>≥70 kg</td>
<td>160 mg</td>
<td>600 mg</td>
</tr>
<tr>
<td><strong>Max 120mg if GFR&lt;30</strong></td>
<td><strong>No need to adjust for GFR unless continuing on regular teicoplanin (see BNF)</strong></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Operation</th>
<th>1st line prophylaxis regimen</th>
<th>Regimen for true penicillin allergy</th>
<th>If MRSA cover needed (see principles above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open fractures</td>
<td></td>
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<tr>
<td></td>
<td><strong>Initial management (within 3 hours of injury)</strong></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>IV co-amoxiclav 1.2g tds</td>
<td>IV clindamycin 600mg qds</td>
<td>IV teicoplanin* 12hrly x3 doses followed by once daily, and IV metronidazole 500mg tds</td>
</tr>
<tr>
<td></td>
<td>Continue for 24 hours only</td>
<td>Continue for 24 hours only</td>
<td>Continue for 24 hours only</td>
</tr>
<tr>
<td></td>
<td>Continue until definitive soft tissue closure or maximum 72 hours, whichever is sooner</td>
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</tr>
<tr>
<td></td>
<td><strong>At induction for first debridement</strong></td>
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</tr>
<tr>
<td></td>
<td>Single dose of IV gentamicin*, and (if ≥4 hrs since last dose) IV co-amoxiclav 1.2g</td>
<td>Single dose of IV gentamicin*, and (if ≥4 hrs since last dose) IV clindamycin 600mg</td>
<td>Single dose of IV teicoplanin* and IV gentamicin* on induction</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Single dose of IV teicoplanin* and IV metronidazole 500mg tds</td>
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<tr>
<td></td>
<td><strong>At time of skeletal stabilisation &amp; definitive soft tissue closure</strong></td>
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<tr>
<td></td>
<td>Single dose of IV teicoplanin <strong>800mg</strong> and IV gentamicin* on induction</td>
<td>Single dose of IV teicoplanin <strong>800mg</strong> and IV gentamicin* on induction</td>
<td>Single dose of IV teicoplanin* and IV gentamicin on induction (if already on regular teicoplanin then max daily dose is 800mg)</td>
</tr>
<tr>
<td>Amputation following major trauma - Uninfected</td>
<td>IV Co-amoxiclav 1.2g at induction</td>
<td>IV Clindamycin 600mg and IV gentamicin* at induction</td>
<td>Single dose of IV teicoplanin*, IV gentamicin* and IV metronidazole 500mg at induction.</td>
</tr>
</tbody>
</table>
Amputation following major trauma - Infected

If previous cultures and sensitivities are known, seek advice from microbiology.

IV Co-amoxiclav 1.2g at induction and continue IV Co-amoxiclav 1.2g 8 hourly for 5 days. If appropriate, consider switching to oral 625mg 8 hourly

IV Clindamycin 600mg and IV gentamicin* at induction. Continue IV clindamycin 900mg 8 hourly (or oral 450mg qds) and oral ciprofloxacin 500mg twice daily for up to 5 days

IV Teicoplanin*, IV gentamicin* and IV metronidazole 500mg on induction.

Post-op, give further doses of IV teicoplanin* at 12 and 24 hours after induction followed by once daily, plus co-amoxiclav (IV or oral) 8 hourly, for 5 days.

If GFR <20 refer to BNF for ongoing teicoplanin dosing.

*Gentamicin and teicoplanin doses:

<table>
<thead>
<tr>
<th>Weight</th>
<th>Gentamicin dose</th>
<th>Teicoplanin dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;70 kg</td>
<td>120 mg</td>
<td>400 mg</td>
</tr>
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<td>160 mg</td>
<td>600 mg</td>
</tr>
<tr>
<td><strong>Max 120mg if GFR&lt;30</strong></td>
<td><strong>No need to adjust for GFR unless continuing on regular teicoplanin (see BNF)</strong></td>
<td></td>
</tr>
</tbody>
</table>

For *treatment* doses of gentamicin please refer to the trust gentamicin policy

6. Roles and responsibilities

All clinical staff involved in the prescribing of antimicrobials to adhere to this policy including full documentation on EPMAR as detailed.

7. Monitoring document effectiveness

Key standards:

- Document the Indication/rationale for antimicrobial therapy.
- Review and document the patient’s allergy status.
- Ensure the choice of antibiotic complies with the antibiotic guidelines.
- Prescribe single dose antibiotics for surgical prophylaxis, unless policy states otherwise.
- Administer antibiotic prophylaxis within 60 minutes prior to surgical incision (administration must be complete before the incision, and before inflation of the tourniquet when used)

The guidelines will be reviewed on a two-yearly basis. Audits of compliance with the guideline will be conducted on a regular basis.

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8. Abbreviations and definitions

BNF – British National Formulary
EPMAR – Electronic prescribing medication administration record
GFR – Glomerular Filtration Rate
MHRA - Medicines and Healthcare products Regulatory Agency
MRSA – Methicillin-resistant *Staphylococcus aureus*
SPC – Summary of Product Characteristics

9. References and Supporting Documents

References

3. Bratzler DW, Houck PM. Surgical Infection Prevention Guidelines
   http://www.bapras.org.uk/downloaddoc.asp?id=141

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## 10. Document Control Information

<table>
<thead>
<tr>
<th>Lead Author:</th>
<th>Sue Wei Chong Antibiotic Pharmacist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead author contact details:</td>
<td>01612 065819 <a href="mailto:Suewei.chong@srt.nhs.uk">Suewei.chong@srt.nhs.uk</a></td>
</tr>
<tr>
<td>Consultation</td>
<td></td>
</tr>
<tr>
<td>List the persons or groups who have contributed to this guideline. (please state which Care Organisation)</td>
<td></td>
</tr>
<tr>
<td>Name of person or group</td>
<td>Role / Department / Committee (Care Org)</td>
</tr>
<tr>
<td>Antibiotic Steering Group</td>
<td>Antibiotic Steering Group</td>
</tr>
<tr>
<td>Consultant Microbiologists</td>
<td>Salford CO</td>
</tr>
<tr>
<td>Orthopaedic surgeons</td>
<td>Salford CO</td>
</tr>
<tr>
<td>Endorsement</td>
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<tr>
<td>List the persons or groups who have seen given their support to this guideline. (please state which Care Organisation)</td>
<td></td>
</tr>
<tr>
<td>Name of person or group</td>
<td>Role / Department / Committee (Care Org)</td>
</tr>
<tr>
<td>Dr Richard Cooper</td>
<td>Medicines Management Group SCO - Chair</td>
</tr>
<tr>
<td>Dr Alex Peel</td>
<td>Antibiotic Steering Group, SCO - Chair</td>
</tr>
<tr>
<td>Victoria Dickens</td>
<td>Clinical Director Orthopaedics</td>
</tr>
<tr>
<td>Dr Paul Chadwick</td>
<td>Medicines Management Group SCO - Chair</td>
</tr>
<tr>
<td>Dr John MacDonald</td>
<td>Medicines Management Group SCO - Chair</td>
</tr>
<tr>
<td>Dr Paul Chadwick</td>
<td>Antibiotic Steering Group, SCO - Chair</td>
</tr>
<tr>
<td>Keywords / phrases:</td>
<td>Antibiotics, Infection, ortho, orthopaedic, prophylaxis, surgery</td>
</tr>
<tr>
<td>Communication plan:</td>
<td>The guideline will form part of the Trust Antibiotic Policy and thus can be accessed via the Antibiotic and Infection Control hotlinks area on the front page of Synapse. In addition, adherence to the policy will be encouraged through FY1 and FY2 teaching sessions.</td>
</tr>
<tr>
<td>Document review arrangements:</td>
<td>This document will be reviewed by the author, or a nominated person, at least once every three years or earlier should a change in legislation, best practice or other change in circumstance dictate.</td>
</tr>
</tbody>
</table>

This section will be completed following committee approval

<table>
<thead>
<tr>
<th>Guideline Approval:</th>
<th>Name of Approving Committee: Medicines Management Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chairperson:</td>
<td>Dr Richard Cooper</td>
</tr>
<tr>
<td>Approval date:</td>
<td>17/06/2019</td>
</tr>
<tr>
<td>Formal Committee decision</td>
<td></td>
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</table>

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11. Equality Impact Assessment (EqIA) screening tool

Legislation requires that our documents consider the potential to affect groups differently, and eliminate or minimise this where possible. This process helps to reduce health inequalities by identifying where steps can be taken to ensure the same access, experience and outcomes are achieved across all groups of people. This may require you to do things differently for some groups to reduce any potential differences.

<table>
<thead>
<tr>
<th>1a) Have you undertaken any consultation/involvement with service users, staff or other groups in relation to this document?</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Email distribution to consultant staff for comments. Discussions at Antibiotic Steering Group and Medicines Management Group.</td>
<td></td>
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</tbody>
</table>

| 1b) Have any amendments been made as a result? | No |

| 2) Does this policy have the potential to affect any of the groups listed below differently? | |

<table>
<thead>
<tr>
<th>Protected Group</th>
<th>Yes</th>
<th>No</th>
<th>Unsure</th>
</tr>
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<tbody>
<tr>
<td>Age (e.g. are specific age groups excluded? Would the same process affect age groups in different ways?)</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Sex (e.g. is gender neutral language used in the way the policy or information leaflet is written?)</td>
<td></td>
<td>X</td>
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<tr>
<td>Race (e.g. any specific needs identified for certain groups such as dress, diet, individual care needs? Are interpretation and translation services required and do staff know how to book these?)</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Religion &amp; Belief (e.g. Jehovah Witness stance on blood transfusions; dietary needs that may conflict with medication offered.)</td>
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<td>X</td>
<td></td>
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<tr>
<td>Sexual orientation (e.g. is inclusive language used? Are there different access/prevalence rates?)</td>
<td></td>
<td>X</td>
<td></td>
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<tr>
<td>Pregnancy &amp; Maternity (e.g. are procedures suitable for pregnant and/or breastfeeding women?)</td>
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<td>X</td>
<td></td>
</tr>
<tr>
<td>Marital status/civil partnership (e.g. would there be any difference because the individual is/is not married/in a civil partnership?)</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Gender Reassignment (e.g. are there particular tests related to gender? Is confidentiality of the patient or staff member maintained?)</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Human Rights (e.g. does it uphold the principles of Fairness, Respect, Equality, Dignity and Autonomy?)</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Carers (e.g. is sufficient notice built in so can take time off work to attend appointment?)</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Socio/economic (e.g. would there be any requirement or expectation that may not be able to be met by those on low or limited income, such as costs incurred?)</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Disability (e.g. are information/questionnaires/consent forms available in different formats upon request? Are waiting areas suitable?) Includes hearing and/or visual impairments, physical disability, neurodevelopmental impairments e.g. autism, mental health conditions, and long term conditions e.g. cancer.</td>
<td></td>
<td>X</td>
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<table>
<thead>
<tr>
<th><strong>3) Where you have identified that there are potential differences, what steps have you taken to mitigate these?</strong></th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>4) Where you have identified adjustments would need to be made for those with disabilities, what action has been taken?</td>
<td>N/A</td>
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</tbody>
</table>

**Will this policy require a full impact assessment? No**

<table>
<thead>
<tr>
<th>Author: Sue Wei Chong</th>
<th>Date: 10/5/2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sign off from Equality Champion:</td>
<td>Date:</td>
</tr>
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</table>
### 12. Appendices

**Appendix 1: Gustilo classification of open fractures**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade I</td>
<td>Open fracture with a skin wound less than 1 cm long and clean</td>
</tr>
<tr>
<td>Grade II</td>
<td>Open fracture with a laceration more than 1 cm long without extensive soft tissue damage, flaps or avulsions</td>
</tr>
<tr>
<td>Grade III</td>
<td>Either an open segmental fracture, an open fracture with extensive soft tissue damage, or a traumatic amputation</td>
</tr>
<tr>
<td>Grade IIIa:</td>
<td>Adequate soft tissue coverage of a fractured bone despite extensive soft tissue laceration or flaps, or high energy trauma irrespective of the size of the wound</td>
</tr>
<tr>
<td>Grade IIIb:</td>
<td>Extensive soft tissue destruction with periosteal stripping and bone exposure, usually associated with massive contamination</td>
</tr>
<tr>
<td>Grade IIIc:</td>
<td>Open fractures associated with arterial injury requiring repair</td>
</tr>
</tbody>
</table>
Appendix 2: Fluoroquinolones adverse effects

*Fluoroquinolones warning*
Please note that serious adverse events affecting musculoskeletal and nervous systems have been reported very rarely with fluoroquinolone antibiotics (ciprofloxacin, levofloxacin, moxifloxacin, ofloxacin). Fluoroquinolone treatment should be discontinued at the first signs of a serious adverse reaction, such as tendinitis or tendon rupture, muscle pain, muscle weakness, joint pain, joint swelling, peripheral neuropathy, and central nervous system effects. Prescribe with special caution for people older than 60 years, with renal impairment, or solid-organ transplants as they are at a higher risk of tendon injury. The MHRA recommends avoiding use of a corticosteroid with a fluoroquinolone since co-administration could exacerbate fluoroquinolone-induced tendinitis and tendon rupture.

Fluoroquinolones may be associated with a small increased risk of aortic aneurysm and dissection, particularly in older patients. They should only be used after careful benefit-risk assessment and after consideration of other therapeutic options in patients with, or at risk for, aortic aneurysm and dissection.

For further information see November 2018 & March 2019 MHRA alerts.