Blackpool Teaching Hospitals
NHS Foundation Trust

# Antimicrobial Formulary – For the Management of Common Infections in Adults within General Medicine and Surgery

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|---|---|---|---|---|---|
| **Unique Identifier:** | CORP/GUID/309 | | | | |
| **Version Number:** | 18 | | | | |
| **Type of Update / Status:** | Final Approval with Major Changes / Complete Rewrite | | | | |
| **Division and Department:** | Pharmacy and Microbiology Department | | | | |
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| **Replaces:** | CORP/GUID/309, Version 17, Antimicrobial Formulary – For the Management of Common Infections in Adults Within General Medicine and Surgery | | | | |
| **Description of amendments:** | Changes throughout to reflect most up-to-date national guidelines and local sensitivity | | | | |
| **Approved by:** | Medicine Management and Safety Review committee | | | | |
| **Approved Date:** | 18/04/2024 | | | | |
| **Issue Date:** | 18/04/2024 | | | | |
| **Review Date from Date of Approval:** | 1 Year<br>☐ | 2 Years<br>☒<br>18/04/2026 | 3 Years<br>☐ | 4 Years<br>☐ | 5 Years<br>☐ |

| Version Control Sheet | | | |
|---|---|---|---|
| This must be completed and form part of the document appendices each time the document is updated and approved | | | |
| **Date dd/mm/yy** | **Version** | **Author** | **Reason for changes** |
| 17/06/21 | 16 | Dr Achyut Guleri (Consultant Microbiologist)<br>Dr Ruth Palmer (Consultant Microbiologist)<br>Michelle Wong (Lead Pharmacist – Antimicrobials)<br>Michael Dooney (Lead Pharmacist – CF/antimicrobials) | Updated advice around the management of leg ulcers, animal and human bites, insect bites/stings as per NICE<br>Removed the use of dipstick in over 65years in the management of UTI. Updated MHRA warning on quinolones |
| 22/10/21 | 17 | Dr Ruth Palmer (Consultant Microbiologist)<br>Michelle Wong (Lead Pharmacist – Antimicrobials)<br>Michael Dooney (Lead Pharmacist – CF/antimicrobials) | Updated advice around the management of Clostridium difficile infection as per latest NICE Guideline |
| 18/04/24 | 18 | Dr Ruth Palmer (Consultant Microbiologist)<br>Dr Celestine Eshiwe (Consultant Microbiologist)<br>Michelle Wong (Lead Pharmacist – Antimicrobials)<br>Michael Dooney (Lead Pharmacist – CF/antimicrobials) | Changes throughout to reflect most up-to-date national guidelines and local sensitivity |

| Consultation / Acknowledgements with Stakeholders | | |
|---|---|---|
| **Name** | **Designation** | **Date Response Received** |
| Microbiologists directorate meeting | Consultant microbiologists | 14/2/24 |
| Dr Saba | Respiratory Consultant | 20/02/24 |
| Jo Marshall | Divisional Director of Nursing -SACCT | 20/02/24 |
| Jenny Walters | Lead Pharmacist – Surgery | 21/02/24 |
| Natalie Appleyard | Lead Pharmacist – Nutrition Support | 21/02/24 |
| Minhaaz Chavan | Lead Pharmacist - AMU | 22/2/24 |
| Chris Barben | Medical Director | 22/2/24 |
| Dr Laycock | Associate Medical Director Mortality/Audit | 27/2/24 |
| Dr Rhys Butcher | Gastroenterology Consultant – Head of Dept | 1/4/24 |
| Dr Salman | Diabetes Foot lead and endocrine consultant | 12/3/24 |
| Anneka Wan | Endocrine lead pharmacist | 12/3/24 |
| Urology Directorate Meeting | Members | 11/3/24 |
| Dr Grahame Goode | Deputy Medical Director (On behalf of Dr Chris Barben – Chair of antimicrobial stewardship committee) – chairman's action | 09/4/24 |

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# 18th Edition

# Antimicrobial Formulary – for the Management of Common Infections in Adults within General Medicine and Surgery


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Approved by: Medicines Management Committee

Ratification date: 18th April 2024

Review date: 18th April 2026

# 1 Introduction / Purpose

## 1.1 Major Changes to the 18th Edition of the Antimicrobial Formulary

- Changes throughout to reflect latest National Guidelines and local sensitivity

# 2 General Principles / Target Audience

Trust wide

# 3 Definitions and Abbreviations

| | |
|---|---|
| CDI | C. difficile infections |
| SIRS | Systemic Inflammatory Response Syndrome |
| CrCl | Creatinine clearance |

## 4 Clostridium Difficile and Antimicrobial Resistance

- Prompt and appropriate treatment of patients with sepsis should not be delayed on account of an undue anxiety regarding C. difficile infection.
- Co-amoxiclav, Quinolones, 2nd / 3rd generation Cephalosporins are considered high risk drivers for C. difficile infections [CDI]. However, CDI may be associated with most other antibiotics.
- Their use should be as per formulary after assessing patient's risk for CDI and following discussion or on advice of Consultant Microbiologist or ID physician during working hours.
- Co-amoxiclav and Ciprofloxacin will now be restricted to Consultant Microbiologist approval for non-formulary indications.
- High dose Clindamycin: Higher dose (600mg QDS) of Clindamycin has been shown to offer protective effect against C. difficile infection.
- Risk factors for C. difficile infection: (High risk if 2 or more).
    - Elderly patients (>70 years of age).
    - Long length of stay in healthcare settings.
    - Recent use of high-risk antibiotics (Co-amoxiclav, Quinolones, 2nd / 3rd generation Cephalosporins).
    - Recent major surgery (especially gastrointestinal surgery).
    - Serious underlying disease or illness.
    - Immuno- compromising conditions.
- Previous C. difficile infection (PCR+/CDT+) or C. difficile carriage (PCR+/CDT-ve) is classified as high risk. Microbiologist input for antibiotic management is essential.
- Meropenem resistant Pseudomonas and Enterobacteriaceae are a much more serious problem globally and are being encountered in the region including Blackpool Teaching Hospitals. This has resulted from unrestricted and overuse of carbapenems. Meropenem use in this formulary is hence restricted to responsible primary Consultant or Consultant Microbiologist / ID Physician approval only.

# 5 Guide to Antibiotic Use for Adult Patients

The primary objective of this formulary is to ensure the appropriate selection of antimicrobials for the treatment of common infections. The choices of antimicrobials included in the formulary have been carefully selected to move to equally efficacious agents with a lower risk of precipitating health care associated infections, including MRSA, *Clostridium difficile* and multidrug / pan drug resistant *Enterobacteriaceae / Pseudomonas.*

These guidelines are evidence based and the antibiotic choices reflect local health care associated problems, epidemiology and antibiograms. These guidelines specify the recommended antimicrobial, dose, route and duration of treatment for common infections encountered in General Medicine and Surgery.

The doses mentioned in this formulary are for adults with normal renal, hepatic function and of usual normal body build. Please speak to your ward pharmacist or contact Pharmacy Medicines Information for advice on dosing in renal or hepatic impairment or in patients with extremes of weight.

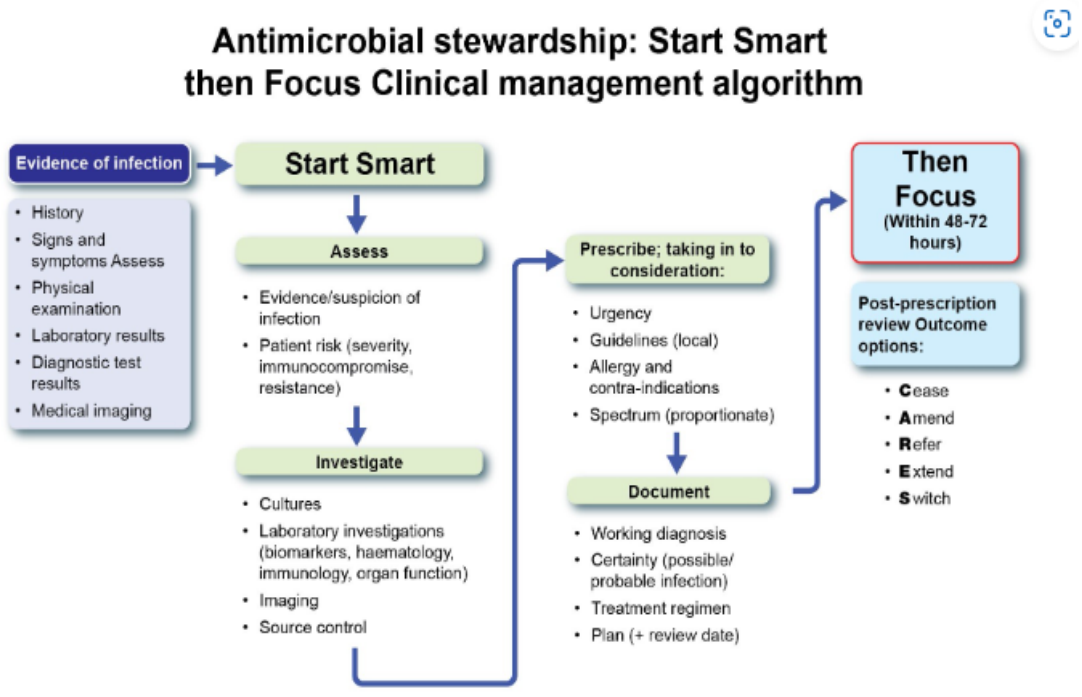
## 6 Principles of Good Antimicrobial Prescribing – See Start Smart Then Focus Algorithm

- Prior to prescribing an antibiotic the prescriber MUST consult all available information on previous isolates to ensure there is no information on prior resistance which might preclude the choice of empiric organism and consider previous antimicrobial use. If this is the case, please discuss with Microbiologist / ID Physician for advice on alternative agents during working hours.
- Antimicrobials should only be prescribed where there are good clinical indications.
- Every effort should be made to collect relevant specimens for microbiological investigations prior to starting antimicrobial therapy.
- ALL antimicrobials should be reviewed DAILY as best practice. Empiric antimicrobial prescriptions should be reviewed DAILY (or definitely at 48 / 72 hours and correlated with patient's response and/or available diagnostics). Broad spectrum antimicrobial agents should be deescalated to narrow spectrum agents and /or oral agents as per sensitivity results. All antimicrobials have an automatic stop date at 5 days so should reviewed and re-prescribed if necessary
- When prescribing an antibiotic prescription / Use medchart antimicrobial formulary protocols
- The Choice of agent (as per formulary), dose, route, start date, indication / working diagnosis, date of review / stop, name and contact / bleep information and GMC number of prescriber MUST be clearly documented.
- Times of administration (e.g., 0600h, 1200h, 1800h, etc.) instead of morning, midday, evening should be written.
- Above information should be clearly documented in both the medical notes and on medchart presciption chart.
- Review date must be written.
- The stop date and anticipated course length should be clearly documented as per the formulary recommendation or otherwise specified by microbiologists.
- The above will be considered for audit standards.
- Antimicrobial therapy should be prescribed according to the formulary which is informed by local pathogen epidemiology and local antimicrobial sensitivity patterns.
- Narrow spectrum antimicrobials should be prescribed in preference to broad spectrum antimicrobials where possible in conjunction with microbiology results or discussion with a microbiologist.
- Indications requiring longer treatment require re-writing of prescription [indicating the original start date of the antibiotic and planned duration].
- Oral agents with excellent bioavailability can be used instead of intravenous agents – discussed with microbiologists.
- Responsible consultant should consider risk of *C. difficile* infection in high-risk patients. Antimicrobials with a high risk of precipitating Clostridium difficile infection

(e.g., Co-amoxiclav, Cephalosporins and Quinolones) should be avoided for safer alternatives or used with caution, where benefits outweigh risks.

- Antimicrobials with a lower risk of subsequent Clostridium difficile infection (Clarithromycin, Doxycycline and Gentamicin) should be used instead.
- Do NOT prescribe from restricted list antimicrobials without Consultant Microbiologist approval and document this in the medical notes.
- Expert advice should be sought from a medical microbiologist for complicated infections, interpretation of culture and sensitivity results or in the case of failure of empiric treatment.
- Choice of antimicrobials must be carefully considered when prescribing for patients with previously/ currently known carriage/ infections with MRSA, multi-drug resistant coliforms or C. difficile. Discuss with Microbiologist during working hours if patient specific advice required.
- Offer advice about important side effects for antimicrobials as per BNF.

**Figure 1: AMS clinical management algorithm**




Antimicrobial stewardship: Start smart - then focus

## 7 Antibiotic Allergies

Patients commonly report adverse reactions to antibiotics, especially the Penicillin group. It is therefore very important to clarify the nature of the adverse reaction.

Patients often report to being “allergic” to an antibiotic, when in fact they experienced a common adverse drug reaction (e.g., diarrhoea or vomiting) rather than an allergic reaction (e.g., rash, angioedema or anaphylaxis). In these cases the benefits of using a Penicillin-based regimen probably outweigh the risks.

1) When assessing whether the person is presenting with a **NEW** possible drug allergy - take a history and undertake a clinical examination as per NICE guidance on drug allergy (1).

   Document the following:

   - The generic and proprietary name of the drug or drugs suspected to have caused the reaction including the strength and formulation.
   - The reaction.
   - A description of the reaction.
   - The indication for the drug being taken (if there is no clinical diagnosis, describe the illness).
   - The date and time of the reaction.
   - The number of doses taken or number of days on the drug before onset of the reaction.
   - The route of administration.
   - Which drugs or drug classes to avoid in future.

2) For **existing** drug allergy status, record all of the following at a minimum:

   - The drug name.
   - The signs, symptoms and severity of the reaction.
   - The date when the reaction occurred.

For all patients reporting an adverse reaction to an antibiotic (or any drug), the above should be documented in the drug allergy box on the front of the prescription chart. Check with the patient, the patient’s GP or in old medical notes to find the nature/ severity of the allergy.

The type of hypersensitivity reaction with Penicillin or other antimicrobials (e.g. rash, anaphylaxis, etc.) **MUST** be obtained (when possible) and clearly documented in case notes and drug chart.

- **Allergy de-labelling**.
  British Society of Allergy and Clinical Immunology (BSACI) has issued guideline on the suitability of de-labelling allergy – see link here (2), cases should be discussed with microbiologists as no official Trust Guideline on this as yet.

## 7.1 Crossover allergy

Patients with a true allergy to penicillins should be considered allergic to other Penicillin's (e.g., Augmentin® (Co-amoxiclav), Tazocin® (Piperacillin-tazobactam) and Amoxicillin).

The risk of crossover allergy is reported as 10% for Cephalosporins, though review of published evidence suggests a much lower chance of crossover allergy. Crossover has also been reported with Carbapenems (e.g., Meropenem, Ertapenem and Imipenem), approximately 8-11%.

Use of any Cephalosporins or Carbapenems without adverse event in a Penicillin allergic patient should be clearly noted in case notes and drug chart. This can be achieved by review of notes or discussion with the GP. If the patient has a non-serious allergy to Penicillins (e.g., mild rash), Cephalosporins/ Carbapenems could still be used with caution as an alternative to Penicillins and the patient should be closely monitored.

Individuals with a history of anaphylaxis, urticaria, or rash immediately after penicillin administration are at risk of immediate hypersensitivity to a penicillin; these individuals should not receive a penicillin. As patients with a history of immediate hypersensitivity to penicillins may also react to the cephalosporins and other beta-lactam antibiotics, they should not receive these antibiotics, if no documentation of receipt of Cephalosporins is available and the patient has an anaphylactic allergy to Penicillins; then Cephalosprins or Carbapenems should not be used.

## 8 Restricted antimicrobial list

As a part of the trust antibiotic stewardship programme to reduce C. difficile, MRSA and other multi-drug resistant infections some high-risk antimicrobial agents have been designated as “restricted drugs” and their use must be discussed with microbiologist.

Pharmacy will **NOT** supply antimicrobials on the restricted list unless there is documented evidence of Consultant Microbiologist/ ID Physician approval in the medical notes and / or medchart.

- **Non-formulary antimicrobials**.
  Consultant may discuss with microbiologist and then obtain approval from the Chair of the Drugs and Therapeutics Committee on a named patient basis for any non-formulary antibiotics.

## 8.1 Red Restricted Antimicrobials

These antimicrobials may only be prescribed and supplied after approval from a named Consultant Microbiologist or Infectious Disease Physician. Pharmacists are required to confirm Microbiology approval before dispensing red restricted antimicrobials.

**Red** restricted antimicrobials are:

- **Amikacin**
- **Amphotericin B (Fungizone®)**
- **Anidulafungin**
- **Aztreonam**
- **Ceftaroline**
- **Ceftazidime-avibactam**
- **Ceftolozane-tazobactam**
- **Cefiderocol**
- **Colistin IV**
- **Chloramphenicol IV/PO**
- **Dalbavancin**
- **Daptomycin**
- **Ertapenem**
- **Fidaxomicin**
- **Flucyctosine**
- **Fosfomycin PO/IV**
- **Ivermectin (unlicensed)**
- **Linezolid**
- **Pivmecillinam**
- **Quinine IV**
- **Ticarcillin- clavulanic acid (Timentin)**
- **Tigecycline**
- **Temocillin**

## 8.2 Amber Restricted Antimicrobials

These antimicrobials maybe prescribed without discussion with a Consultant Microbiologist / ID Physician only if they are being used for an approved indication / specialty as listed below. Consultant Microbiologist/ ID Physician can authorize off-guideline use of amber restricted antimicrobials for individual patients; this should be documented in the medical notes and/ or on the prescription chart. Pharmacists will discuss with Microbiologists all unauthorized off-guideline use of amber restricted antimicrobials.

**Amber** restricted antimicrobials are:

- **Amphotericin (AmBisome®) ..... Consultant Microbiologist / Haematologist approval for Haematology / Oncology treatment of invasive fungal infections**
- **Anti-tuberculosis drugs..... Tuberculosis as advised by Consultant Respiratory Physician**
- **Azithromycin ..... GUM, Pertussis prophylaxis, indications specified in formulary, exacerbation prophylaxis in bronchiectasis/COPD by Respiratory**
- **Caspofungin ..... Consultant Microbiologist / Haematologist approval for Haematology / Oncology**
- **Cefixime ..... Paediatrics / GUM / Oral cephalosporin step down if H.influenzae isolates and other agents cannot be used.**
- **Cefotaxime..... SCBU only**
- **Ceftazidime ..... Indications specified in the antimicrobial formulary.**
- **Ceftriaxone ..... GUM or indications specified in the Antimicrobial Formulary**
- **Ciprofloxacin ..... SBP prophylaxis, Meningococcal prophylaxis, prophylaxis in patients at high risk of neutropenic sepsis, indications specified in the antimicrobial formulary.**
- **Co-amoxiclav..... Indications as specified in the Antimicrobial Formulary**
- **Colistin nebs..... Respiratory only**
- **Co-trimoxazole ..... Prophylaxis and treatment of PCP**
  **Prophylaxis for SBP where sensitivity has been confirmed**
  **Listeria meningitis**
  **(3nd line serious penicillin allergy)**
  **Treatment of Stenotrophomonas**

- **Dapsone ..... Prophylaxis and treatment of PCP / Toxoplasma**
- **Famciclovir ..... GUM only**
- **Itraconazole ..... Posaconazole is now used instead for the prophylaxis in Haematology/ Oncology patients.**
- **Levofloxacin ..... Indications specified in the antimicrobial formulary.**
- **Meropenem ..... Indications specified in the antimicrobial formulary.**
- **Micafungin ..... Consultant Microbiologist / Haematologist approval for Haematology / Oncology**
- **Minocycline..... Dermatology only**
- **Ofloxacin..... GUM / Prostatitis and Epididymo-orchitis as per formulary**
- **Posaconazole ..... Consultant Microbiologist/ Haematologist approval for Haematology/ Oncology**
- **Rifaximin ..... Hepatic encephalopathy - recurrence as per gastroenterology**
  **Tuberculosis as advised by Consultant Respiratory Physician**
- **Rifampicin..... Combination therapy for deep seated MRSA infections as advised by microbiologist.**
- **Sodium fusidate ..... Combination therapy for osteomyelitis on microbiologist advice only**
  **Combination therapy for MRSA**
- **Tazocin (piperacillin-tazobactam)**
  **Specific indications as in formulary**
- **Teicoplanin ..... Specific indication listed in formulary.**
- **Terbinafine..... Dermatology only**
- **Tobramycin..... Cystic fibrosis**
- **Valaciclovir ..... GUM only**
- **Vancomycin (oral) ..... Clostridium difficile infection – all severity**
- **Voriconazole..... Consultant Microbiologist / Haematologist approval for Haematology / Oncology**

## 9 Sepsis Definitions

- **Infection:** Presence of microorganisms in a normally sterile site.
- **Bacteraemia:** Cultivable bacteria in the bloodstream.
- **Sepsis**: Infection associated with organ dysfunction (distant from infection site), hypoperfusion or hypotension (systolic BP <90mmHg, MAP <70mmHg or reduction of 40mmHg from baseline).
- Sofa score
  Sequential Organ Failure Assessment (SOFA) Score (mdcalc.com) can be used to predict suspected sepsis cases that may require prolonged critical care stay. Please refer to Trust Sepsis Pathway (3)
  Sepsis Pathway and Tooklit.pdf (xfyldecoast.nhs.uk)
- **Septic shock:** Sepsis with hypotension requiring pressor therapy despite adequate fluid resuscitation. In addition, there are perfusion abnormalities that may include lactic acidosis, oliguria, altered mental status and acute lung injury.
- **Septicaemia:** Sepsis associated with bacteraemia.

## 10 Indications for Intravenous Antimicrobial Therapy

- For patients who are strictly Nil-By-Mouth.
- For patients with non-functional GI tract or malabsorption.
- For life-threatening infections or severe sepsis.
- For patients with bacteraemia.
- For patients with serious deep-seated infections requiring intravenous antimicrobials to guarantee adequate drug levels at the site of infection as listed below:
    - Bone and joint infections
    - Peritonitis
    - Spreading cellulitis
    - Osteomyelitis
    - Lymphadenopathy and high fever
    - Septicaemia
    - Endocarditis
    - Septic arthritis
    - Encephalitis
    - Severe pneumonia
    - Febrile neutropenia
    - Staphylococcal bacteraemia
    - Infective gangrene
    - Meningitis

Please note some agents such as Clindamycin and Linezolid are well absorbed orally and substantially cheaper. There is little benefit to using them IV where oral route can be used.

Intravenous antimicrobial therapy must be reviewed at 48 hours and switched to oral alternatives when clinically appropriate.

Unnecessarily prolonged intravenous therapy is associated with an increased risk of superinfection, extravasation and thrombophlebitis, and has been shown to delay discharge from hospital. Switch to oral antimicrobial therapy should be considered for patients who meet the criteria outlined in the Change to ORAL Antibiotics Guideline (CHORAL).

# 11 Change to ORAL Antibiotics Guideline (CHORAL)

## 11.1 Purpose

To provide guidance for the rational conversion of patients from parenteral antibiotic therapy to oral after 48 hours wherever possible.

## 11.2 Rationale

To reduce the risk of complications associated with parenteral antibiotic use:

- Morbidity associated with IV access (superinfection, extravasation, thrombophlebitis)
- Delayed discharge from hospital
- Increased nursing time
- Increased expenditure
- Increased adverse effects

## 11.3 Guideline

For most infections and most patients, intravenous antibiotic therapy can be converted to oral 24-48 hours after the start of treatment, as long as the following criteria are met:

- The infection is no longer life-threatening or able to cause major disability.
- Temperature and other signs of infection appear to be returning to normal.
- It is recommended that the following inclusion criteria are checked before a decision is taken:

i. Signs and symptoms of infection are resolving.

ii. Oral fluids are well tolerated.

iii. There is a functioning GI tract, with no signs of malabsorption.

iv. Oral formulation to be used has adequate and reliable absorption profile.

Patients presenting with any of the following should **NOT** be converted to oral antibiotics without discussing with responsible consultant / Microbiologist during working hours:

- Ongoing / potential GI absorption problems (vomiting, GI surgery or ileus)
- Immuno-compromised patients
- Patients suffering from SEVERE infections e.g.
  - Bone and joint infections
  - Peritonitis
  - Spreading cellulitis

- Osteomyelitis
- Lymphadenopathy and high fever
- Septicaemia
- Endocarditis
- Septic arthritis
- Encephalitis
- Severe pneumonia
- Febrile neutropenia
- Staphylococcal bacteraemia
- Infective gangrene
- Meningitis

N.B. in **ALL** these cases targeted / planned duration of parenteral antibiotics should be used.

THINK COMMIT: Intravenous antibiotics for medically stable adult patients with any infectious condition requiring IV antibiotics is available from South Shore primary care centre based IV clinic or home administration. Please contact consultant microbiologists or ID physician to discuss and refer suitable patients.

This list is **NOT** exhaustive, but shows the step down oral therapy for commonly prescribed intravenous antibiotics. Where a dose range is stated, the dose should be selected based on the severity and site of infection.

| Intravenous antibiotic | Oral antibiotic and dose |
|---|---|
| Amoxicillin | Amoxicillin 500mg – 1g 8 hourly |
| Benzylpenicillin | Phenoxymethylpenicillin 500mg 6 hourly |
| Cephalosporin (UTI) | Cephalexin 500mg 8 hourly |
| Cephalosporin (LRTI) | Cefaclor 500mg 8 hourly |
| Clindamycin | Clindamycin 600mg 6 hourly |
| Clarithromycin | Clarithromycin 500mg 12 hourly |
| Ertapenem | Discuss with Microbiologist during working hours |
| Flucloxacillin | Flucloxacillin 500mg-1g 6 hourly |
| Gentamicin | Discuss with Microbiologist during working hours |
| Metronidazole | Metronidazole 400mg 8 hourly |
| Meropenem | Discuss with Microbiologist during working hours |
| Piperacillin-tazobactam | Co-amoxiclav 625mg 8 hourly (only if not used before – otherwise - discuss with microbiologist |
| Teicoplanin | Discuss with Microbiologist during working hours |
| Vancomycin | Discuss with Microbiologist during working hours |

# 12 Gastrointestinal

## Gastro-intestinal System

**Microbiological specimens**

- Acute diarrhoea: single stool sample (plus blood culture if pyrexial / immunocompromised or enteric fever) If the patient has travelled overseas please provide details of countries of travel as the laboratory testing protocol requires this information.
- Amoebiasis: fresh sample transported to laboratory ASAP.
- Chronic diarrhoea / Giardia / helminth infections: 3 or more stool samples maybe required.
- Stool sample (which takes the shape of the container) for all suspected cases of Clostridium difficile infection ASAP.
- The choice of agent should take into account the patient's risk for C. difficile infection.
- PLEASE note faecal samples or Blood culture are appropriate tests for enteric fever, serology is no longer used.

C. difficile infection: Discuss all cases (primary or recurrent) with Microbiologist during working hours; Where possible – stop antibiotics and PPIs; maintain daily bowel chart; fluid and electrolyte monitoring; and emphasize on nutrients intake.

## Acute Non-inflammatory Diarrhoea

*Toxigenic* E. coli; Rotavirus; Norovirus; Enteric *adenovirus; Astrovirus*

| 1st Line | *Comments* |
|---|---|
| No antibiotics indicated | Notify Infection Control Immediately Ext. 53874.<br>Mainstay of treatment is fluid replacement. |

## Clostridium Difficile Infection (CDI)

***C difficile infection, CDT toxin positive and all PCR positive, cases MUST be discussed with Microbiology/ID physician during working hours and assessed for trial eligibility. Regimes below are for dosing details as directed by the above team.***
***See*** *CDI policy* (4)

- IV vancomycin is not indicated for the treatment of C. difficile infection.
- Vancomycin capsules are available for oral use for C difficile infections, however following risk assessment - ward 8 (isolation ward) may use the vancomycin injections orally, which is more cost effective.
- For oral or nasogastric administration, a 500mg vancomycin vial should be reconstituted with 10mls of water for injection to give a concentration of 125mg in 2.5ml. The required dose of the reconstituted vial is to be further diluted with water to approximately 30ml. Squash may be added at the time of administration to improve taste if taken orally. The reconstituted solution should be labelled with an oral vancomycin sticker, stored in the fridge, and used within 24 hours. See protocol on ward 8 for full details.

| Clostridium Difficile Infection – Mild / Moderate Infection | |
|---|---|
| • i.e. ≤ 5 stools in 24 hours, WCC ≤15 x 10 cells/L; and no features of severe disease* (see below).<br>• Review signs and symptoms and follow **SEVERE** Clostridium difficile protocol if patient has severe disease.<br>• Immunocompromised patients should be discussed with microbiologist during working hours.<br>***Pathogen(s):*** *Clostridium difficile.* | |
| **1st Line** | ***Comments*** |
| Vancomycin 125mg PO/NG QDS for 10 days **If no improvement in stool frequency / consistency at 6 days, discuss with microbiologist during working hours**. | Commence bowel chart.<br>Daily review of nutrition, fluid and electrolyte balance.<br>Use Metronidazole 500mg q8h IV if Nil-By-Mouth, no NG or PEG-tube access, or if patient has ileus.(IV metronidazole is not as effective as oral for treating CDI) |

## Clostridium Difficile Infection (CDI) - Severe Disease

***Severe disease (if any of the following below):**

- Critically ill;
- WBC > 15 x $10^9$ cells/L;
- Acute rise serum creatinine >50% above baseline;
- Temperature > 38.5ºC;
- Albumin < 25g/L;
- Impending ileus;
- Colonic dilatation;
- Abdominal pain / distension;
- Pseudomembranous colitis;
- Radiology: Caecal dilatation >10cm. If present requires urgent surgical review

Number of stools maybe a less reliable indicator of severity.

Immunocompromised patients should be discussed with microbiologist during working hours.

**Pathogen(s):** *Clostridium difficile.*

| 1st Line | 2nd Line | Comments |
|---|---|---|
| All cases of severe disease **MUST** be discussed with microbiologist at 1st opportunity during working hours<br><br>Vancomycin 125mg PO/NG QDS 10 days. | Life threatening CDI must be discussed with Microbiologists at 1st opportunity during working hours<br><br>Vancomycin 500mg NG/PO QDS +/- metronidazole IV 500mg TDS for 10days | Commence bowel chart. Daily review of nutrition, fluid and electrolyte balance.<br>Severe cases require MDT input from Microbiologist, Gastroenterologist and General surgeon as definitive management beyond caecal dilatation >10cm is surgical. |

## Clostridium difficile infection (CDI)
## Further episode within 12weeks of symptom resolution (relapse)

**1st line**

Discuss all relapses with Microbiologist during working hours before commencing treatment so that trial eligibility can be assessed. If not on trial.

Fidaxomicin PO 200mg BD for 10days

Discuss all primary and recurrent episodes with Microbiologist at 1st opportunity during working hours.

## Clostridium difficile infection (CDI)
## Further episode more than 12 weeks of symptom resolution (recurrence)

**1st line**

Discuss all recurrences with Microbiologist during working hours before commencing treatment so that trial eligibility can be assessed. If not on trial.

Vancomycin PO / NG 125mg QDS 10 days.

Discuss all primary and recurrent episodes with Microbiologist at 1st opportunity during working hours.

If failed vancomycin – discuss with microbiologist

## Clostridium Difficile Infection (CDI) - Subsequent Recurrence

Discuss with Consultant Microbiologist during working hours. Review regularly. If failure to respond to treatment, urgent Microbiology / Gastroenterology review required.

**Indiscriminate vancomycin can result in selection of Vancomycin Resistant strains. Vancomycin Tapering Course should be used only after discussion with microbiologist during working hours**

Further recurrences should be treated individually. The options include

1) Multidisciplinary approach to explore Faecal Microbiota Transplant (FMT) – The most cost effective
2) Vancomycin Taper-Pause Course should be discussed with microbiologist during working hours
3) Fidaxomicin PO 200mg BD for 10days
4) Further course of vancomycin PO 125mg QDS for 10days

Further recurrences must be discussed with Microbiology/ Gastroenterology at 1st opportunity during working hours.

## Campylobacter Enteritis

MOSTLY self-limiting AND DOES NOT REQUIRE ANTIBIOTIC TREATMENT; treat if dysentery, immunocompromised or if severe infection.

**1st line**

Azithromycin 500mg PO OD for 3 days

**2nd line**

Ciprofloxacin 500mg PO BD for 5 days (If sensitive -otherwise discuss with microbiologist- see link on MHRA warning on quinolones (5))

## Helicobacter Pylori

**Pathogen(s):** *Helicobacter pylori.*

Refer to NICE (6) and BNF (7)

**Comment**

Urea breath test for diagnosis.

If eradication therapy fails, discuss with Consultant Gastroenterologist.

Maintenance PPI regimes MAY be required as indicated by Gastroenterologist.

For Helicobacter recurrence CLO or breath tests may not be reliable as they are positive with bacterial overgrowth scenarios as well as H pylori, consider faecal antigen test and biopsy with cultures.

## Giardiasis

**Pathogen(s):** *Giardia lamblia.*

| 1st Line | 2nd Line |
|---|---|
| Metronidazole PO 400mg TDS for 5 days<br>**or**<br>Metronidazole PO 2g OD for 3 days. | Discuss with Consultant Microbiologist during working hours |

## Amoebiasis

**Pathogen(s):** Entamoeba histolytica.

*Diarrhoea*

The invasive intestinal disease includes dysentery, colitis, appendicitis, toxic megacolon, amebomas.

Extra-intestinal infections e.g., liver abscess

| 1st Line | 2nd Line |
|---|---|
| Metronidazole PO 800mg TDS for 5 days (5-10 days if infection is extra-intestinal)<br>**Plus (after treatment with metronidazole is completed)**<br>**(omit metronidazole if asymptomatic)**<br>Paromomycin PO 10mg/kg TDS for 7 days<br>Or<br>Diloxanide Furoate PO 500mg TDS for 10 days. | Discuss with Consultant Microbiologist during working hours |

**Comment**
Discuss with Consultant Microbiologist during working hours if Amoebiasis suspected.

## Salmonella / Shigella Gastroenteritis

Common Pathogen(s) Non-typhoidal Salmonella (food poisoning); Shigella spp.

**1st line**

Antibiotics only recommended in immunocompromised patients, febrile neutropenia, asplenia, Sickle cell disease febrile elderly patients, immunocompetent with invasive disease or typhoid / paratyphoid. Discuss with Consultant Microbiologist.

## Enterohaemorrhagic E Coli (0157 and Other Serotypes)

Entero Haemoragic E coli (O157 and other serotypes) and shiga toxin 1/2 without Shigella PCR positive result MUST not be treated with antimicrobials in the absence of Perforation. MUST be discussed with microbiologist

| Diverticulitis | | | |
|---|---|---|---|
| **Common Pathogen(s)** Polymicrobial gastrointestinal flora Gram-negative bacilli, including *Enterobacteriaceae* Anaerobes, including bacteroides. | | | |
| | **1st Line** | **Mild penicillin allergy** | **Severe penicillin allergy/ Anaphylaxis** |
| **Uncomplicated disease** | Co-amoxiclav PO 625mg TDS for 5 days | Cefalexin PO 500mg TDS<br>**Plus**<br>Metronidazole PO 400mg TDS<br>**Duration** - 5 days | Ciprofloxacin***PO 500mg BD (5)<br>**Plus**<br>Metronidazole PO 400mg TDS<br>**Duration** - 5 days |
| **Complicated disease** (Bleeding, intra-abdominal abscess, perforation, peritonitis, intestinal obstruction, stricture and fistula formation, sepsis)<br>***Gentamicin Note:** If serum creatinine is not yet known then 5mg/kg may still be initiated unless 70 years or above or there is evidence of existing severe renal impairment. CrCl must still be calculated once U+Es are available. **ALL SUBSEQUENT DOSES MUST BE ADJUSTED AS PER CrCl once known. Must check pre-dose level as per policy.** | Gentamicin* IV<br>(Refer to gentamicin policy (8) and gentamicin calculator)<br>**Plus**<br>Amoxicillin IV 1g TDS<br>**Plus**<br>Metronidazole IV 500mg TDS<br>**Or if gentamicin contraindicated/ renal impairment (<30ml/min - check for dose adjustment)**<br>Cefuroxime IV 1.5g TDS<br>**Plus**<br>Metronidazole IV 500mg TDS | Metronidazole IV 500mg TDS<br>**Plus**<br>Gentamicin* IV (Refer to gentamicin policy (8) and gentamicin calculator)<br>**Or if gentamicin contraindicated/ renal impairment (<30ml/min- check for dose adjustment)**<br>Cefuroxime IV 1.5g TDS<br>**Plus**<br>Metronidazole IV 500mg TDS | Metronidazole IV 500mg TDS<br>**Plus**<br>Gentamicin* IV (Refer to gentamicin policy (8) and gentamicin calculator)<br>**Or if gentamicin contraindicated/ renal impairment (<30ml/min – check for dose adjustment) –**<br>discuss with microbiologist |
| **Oral step down****<br>This would also depend on significant pathogens isolated in the laboratory.<br>**Discuss duration with consultant microbiologist if complications suspected.** | Empiric choice if no significant pathogen isolated:<br>Co-amoxiclav PO 625mg TDS to complete 7 days | Cefalexin PO 500mg TDS<br>**Plus**<br>Metronidazole PO 400mg TDS to complete 7 days | Ciprofloxacin*** PO 500mg BD (5)<br>**Plus**<br>Metronidazole PO 400mg TDS to complete 7 days |
| ****(If no complications like perforation, peritonitis, gangrene, abscess). Also note that acalculous cholecystitis has a worse prognosis as well.**<br>Extend treatment if abscess present, 14 days may suffice if well drained collection, otherwise may need 4-6 weeks (discuss with infection specialist).<br>***see MHRA warning | | | |

| Appendicitis | | | | |
|---|---|---|---|---|
| **Common Pathogen(s)** *Coliforms;* Enterococci; Anaerobes. | | | | |
| | **Antibiotic - 1st Line** | **Recurrent episode / Mild penicillin allergy** | **Severe penicillin allergy / Anaphylaxis** | **Duration** |
| **IV** ***Note:** If serum creatinine is not yet known then 5mg/kg may still be initiated unless 70years or above or there is evidence of existing severe renal impairment. CrCl must still be calculated once U+Es are available. **ALL SUBSEQUENT DOSES MUST BE ADJUSTED AS PER CrCl once known. Must check pre-dose level as per policy.** | Gentamicin* IV (Refer to gentamicin policy (8) and gentamicin calculator) **plus** Amoxicillin IV 1g TDS **plus** Metronidazole IV 500mg TDS Review after 48 hours. **If Gentamicin contra-indicated / renal impairment (<30ml/min –** check for dose adjustment), Co-amoxiclav (consider *C difficile* risk) IV 1.2g TDS | Cefuroxime IV 1.5g TDS **plus** Metronidazole IV 500mg TDS | Gentamicin and metronidazole may be used without amoxicillin – see 1st line for doses<br><br>Review after 48 hours<br><br>Or if gentamicin contraindicated / **renal impairment (<30ml/min) –** check for dose adjustment) – discuss with microbiologist | Based on clinical progress - discuss with consultant microbiologist |
| **Oral step down** - also depend on significant pathogens isolated in the laboratory. | Empiric choice if no significant pathogen isolated: Co-amoxiclav PO 625mg TDS | Cefalexin PO 500mg TDS **plus** Metronidazole PO 400mg TDS | Ciprofloxacin** 500mg BD (5) **plus** Metronidazole PO 400mg TDS **See MHRA leaflet. Ensure no history of recurrent seizures, drug-drug interactions. Warn patient of Clostridium difficile risk. | Based on clinical progress - discuss with consultant microbiologist |
| Extend treatment if abscess present, 14 days may suffice if well drained collection, otherwise may need 4-6 weeks (discuss with infection specialist). | | | | |

# 13 Hepatobiliary

## Hepato-biliary System

**Microbiological specimens**

**For complicated infections such as pancreatic necrosis and liver abscess it is important to remember that the regimes are initial recommendations and discussion with Microbiologist during working hours is essential.**

- Blood culture
- Intra-abdominal pus
- Ascitic fluid tap
- Guided aspirates from abscess cavities
- MRSA screen as per policy
- The choice of agent should take into account the patient's risk for C. difficile infection.

## Uncomplicated Cholecystitis / Biliary Colic

**Common Pathogen(s)**

*Coliforms*; Enterococci; Anaerobes.

**Antibiotic - 1st line**

No antibiotics required unless evidence of impending sepsis.

| Acute Cholecystitis / Cholangitis | | | |
|---|---|---|---|
| **Common Pathogen(s)** *Coliforms;* Enterococci; Anaerobes. | | | |
| | **1st Line** | **Recurrent episode / Mild penicillin allergy** | **Severe penicillin allergy/ Anaphylaxis** |
| **IV**<br>* **Note:** If serum creatinine is not yet known then 5mg/kg may still be initiated unless 70years or above or there is evidence of existing severe renal impairment. CrCl must still be calculated once U+Es are available. **ALL SUBSEQUENT DOSES MUST BE ADJUSTED AS PER CrCl once known. Must check pre-dose level as per policy.** | Co-amoxiclav<br>(consider C difficile risk factor)<br>IV 1.2g TDS<br>**Plus**<br>Gentamicin stat dose<br>Gentamicin* IV<br>(Refer to gentamicin policy (8) and gentamicin calculator) if patient is septic or systemically unwell. | Cefuroxime IV 1.5g TDS<br>**Plus**<br>Metronidazole IV 500mg TDS<br>Review after 48 hours | Ciprofloxacin*** IV 400mg BD<br>**plus**<br>Metronidazole IV 500mg TDS<br>**If septic –** add in Teicoplanin 12mg/kg IV 12hourly for 3 doses and then OD<br>(round to nearest 100mg) |
| **Non severe / complicated / septic Oral step down****<br>-also depend on significant pathogens isolated in the laboratory. | Empiric choice if no significant pathogen isolated:<br>Co-amoxiclav PO 625mg TDS to complete 7 days total | Cefalexin PO 500mg TDS<br>**plus**<br>Metronidazole PO 400mg TDS<br>**Duration** - 7 days | Ciprofloxacin*** PO 500mg BD<br>**plus**<br>Metronidazole PO 400mg TDS<br>**Duration** - 7 days<br>Ensure no history of recurrent seizures, drug-drug interactions. Warn patient of Clostridium difficile risk. |
| **(If no complications like perforation, peritonitis, gangrene, abscess). Also note that acalculous cholecystitis has a worse prognosis as well.**<br>**Discuss duration with consultant microbiologist if complications suspected.** Extend treatment if abscess present, 14 days may suffice if well drained collection, otherwise may need 4-6 weeks (discuss with infection specialist).<br>***see MHRA warning | | | |

| Acute Pancreatitis | | | | |
|---|---|---|---|---|
| **Acute Alcoholic (without necrosis) pancreatitis** | | | No antibiotics required. | |
| **Acute Pancreatitis: Mild to moderate**<br>Oedematous or mild acute pancreatitis (predominant form / self-limiting | | | No antibiotics required | |
| | **Antibiotic - 1st Line** | **Mild penicillin allergy / Renal impairment CrCl <30ml/min – check for dose reduction)** | **Severe penicillin allergy / Anaphylaxis** | **Duration** |
| **Acute Pancreatitis with Sepsis and/or necrosis**<br>***Note:** If serum creatinine is not yet known then 5mg/kg may still be initiated unless 70 years or above or there is evidence of existing severe renal impairment. CrCl must still be calculated once U+Es are available.<br>**ALL SUBSEQUENT DOSES MUST BE ADJUSTED AS PER CrCl once known. Must check pre-dose level as per policy.**<br>CT evidence of necrotising or severe acute pancreatitis or associated sepsis (high mortality). | First Episode:<br>Gentamicin* IV<br>(Refer to gentamicin policy (8) and gentamicin calculator)<br>**plus**<br>Amoxicillin IV 1g TDS<br>**plus**<br>Metronidazole IV 500mg TDS | Cefuroxime 1.5g IV TDS<br>**plus**<br>Metronidazole IV 500mg TDS | Teicoplanin IV 12mg/kg 12hourly for 3 doses, then 12mg/kg OD (round to nearest 100mg)<br>**plus**<br>Metronidazole IV 500mg TDS<br>**plus**<br>Gentamicin*IV<br>(Refer to gentamicin policy (8) and gentamicin calculator)<br>Or if gentamicin contraindicated / **renal impairment (<30ml/min)** – discuss with microbiologist | 7 -14 days |
| **Oral step down**** | Discuss with microbiologist | | | |
| **Comment**<br>Diagnosis requires CT scan.<br>Early referral to Critical Care Team recommended.<br>Discuss with Microbiologist during working hours if previous results show MRSA / ESBL / CDI. | | | | |

| Liver abscess | | | |
|---|---|---|---|
| **Common Pathogen(s)** *Enterobacteriaceae;* Streptococci; Enterococcus; *Anaerobes;* Entamoeba histolytica; Echinococcus. | | | |
| | **Antibiotic - 1st Line** | **Mild penicillin allergy** | **Severe penicillin allergy/ Anaphylaxis** |
| **IV**<br>***Note:** If serum creatinine is not yet known then 5mg/kg may still be initiated unless 70years or above or there is evidence of existing severe renal impairment. CrCl must still be calculated once U+Es are available. **ALL SUBSEQUENT DOSES MUST BE ADJUSTED AS PER CrCl once known. Must check pre-dose level as per policy.** | Co-amoxiclav (*C difficile* risk) IV 1.2g TDS<br>Plus Stat dose of Gentamicin if patient is septic or systemically unwell. | Cefuroxime IV 1.5g TDS<br>**plus**<br>Metronidazole PO 400mg TDS | Ciprofloxacin** IV 400mg BD (see MHRA warning)<br>**plus**<br>Metronidazole PO 400mg TDS<br>**Ensure no history of recurrent seizures, drug-drug interactions. Warn patient of Clostridium difficile risk.<br>**If septic or not improving –** add in Teicoplanin 12mg/kg IV 12hourly for 3 doses and then OD (round to nearest 100mg) and review culture results |
| **Oral step down and Duration** | Discuss with Microbiologist during working hours for any oral switch or targeted therapy | | |
| **Comment**<br>Discuss **ALL** cases and duration of therapy with a microbiologist during working hours. (usually 6 weeks)<br>MUST review and treat as per sensitivity.<br>For single abscesses with a diameter ≤5 cm, either percutaneous catheter drainage or needle aspiration is acceptable. For percutaneous management of single abscesses with diameter >5 cm, catheter drainage is preferred over needle aspiration.<br>For single abscesses with diameter >5 cm, surgical intervention over percutaneous drainage should be considered.<br>Please send pus for culture and sensitivity and parasitology and also Faecal sample for Ova cysts and parasites. | | | |

| Spontaneous Bacterial Peritonitis - Treatment | | | | |
|---|---|---|---|---|
| **Common Pathogen(s)** E.coli; *Streptococci; Enterococci.* Secondary: Polymicrobial; Anaerobes. | | | | |
| | **Antibiotic - 1st Line** | **Recurrent / Severe sepsis / Mild penicillin allergy** | **Severe penicillin allergy / Anaphylaxis** | **Duration** |
| IV | Co-amoxiclav IV (consider C difficile risk) 1.2g TDS<br>Review after 48 hours and refer to culture results if available.<br>If no culture and patient is not improving after 48 hours – switch to<br>Piperacillin-tazobactam IV 4.5g TDS<br>If septic – discuss microbiologist | Cefuroxime IV 1.5g TDS<br>+/- Metronidazole IV 500mg TDS | Ciprofloxacin IV 400mg BD (see MHRA warning)<br>+/- Metronidazole IV 500mg TDS | 5-7 days |
| **Oral step down****<br>ONLY mild cases without systemic involvement and inflammatory markers improving | Co-amoxiclav PO 625mg TDS<br>If already switched to piperacillin – tazobactam - discuss oral step down with microbiologist | Ciprofloxacin PO 500mg BD<br>(See MHRA warning)<br>+/-<br>Metronidazole PO 400mg TDS | | |
| **Comment**<br>Diagnosis:<br>Ascitic neutrophil count >250 cells/$mm^3$. | | | | |

| Spontaneous Bacterial Peritonitis – Primary and Secondary Prophylaxis | |
|---|---|
| **1st line** | **2nd line (if no renal impairment)** |
| Ciprofloxacin 500mg PO OD indefinitely<br>(see link on MHRA warning on quinolones). | Co-trimoxazole 960mg PO OD indefinitely<br>(Only if co-trimoxazole sensitive) |
| **Comment**<br>Primary = patients with ascitic fluid protein ≤10g/l AND bilirubin ≥ 50micromole/l who are potential liver transplant candidates<br>Secondary = all previous SBP patients<br>Please note that some patients who are on Liver transplant list may be receiving rifaximin for prevention of bacterial overgrowth/hepatic encephalopathy | |

| Variceal Bleeding and Severe Liver Disease | | | | |
|---|---|---|---|---|
| To prevent SBP and reduce mortality, bacterial infections, rebleeding and length of stay | | | | |
| | **Antibiotic - 1st Line and 1st Episode** | **Mild penicillin allergy / recurrent episode** | **Severe penicillin allergy / Anaphylaxis** | **Duration** |
| | Co-amoxiclav IV<br>(consider *C difficile* risk)1.2g TDS | Cefuroxime IV 1.5g TDS<br>+/- Metronidazole IV 500mg TDS | Ciprofloxacin IV 200-400mg BD (see link on MHRA warning on quinolones)<br>+/-<br>Metronidazole IV 500mg TDS | minimum for 48 hrs after variceal bleed has been controlled |
| **Oral step down**** | Co-amoxiclav PO 625mg TDS | Ciprofloxacin PO 500mg BD (see link on MHRA warning on quinolones) +/-<br>Metronidazole PO 400mg TDS | | |

# 14 Respiratory

## Respiratory System

- Microbiological specimens (Where Tuberculosis is not under consideration)
- Sputum for culture and sensitivity.
- Urine sample for Pneumococcal antigen for ALL patients with CXR evidence of consolidation.
- Urinary test for Legionella is performed only for patients with CURB Score of 3, all patients admitted to critical care, or where risk factors for Legionella are present (Epidemiological link to outbreak situation, recent travel/hotel residence, exposure to aerosolised water sources, compost). The reason for test (as above) must be indicated on request while sending the sample.
- However, if Legionella test is requested for other reasons and following discussion with Microbiologist/ID physician, then this must be indicated on the request.
- Blood culture.
- Pleural fluid culture and sensitivity plus a separate sample for TB [since this is sent to reference laboratory].
- For infections in immune-compromised patients, atypical pneumonia or PCP discuss investigations with Microbiologist or ID Physician during working hours.
- The choice of agent should take into account the patient's risk for C. difficile infection.

**Tuberculosis (TB)**

**All suspected cases of TB should be drawn to the attention of Microbiologist/IC Team and TB Lead**

- If Tuberculosis suspected: 3 separate sputum samples for TB.
- For miliary TB - EMU x 3 and citrated blood/Bone Marrow for TB culture required.
- Discuss Quantiferon assay with Microbiologist during working hours.

Discuss Mantoux test with TB Health Visitor and TB Lead.

| Acute exacerbation COPD<br>(Non-pneumonic LRTI) NO new CXR infiltrates [consolidation] | |
|---|---|
| **Common Pathogen(s)**<br>*Haemophilus influenzae; Streptococcus pneumoniae; Moraxella catarrhalis*; *Viruses;*<br>Occasionally *S. aureus* (post viral episode). 20-40% episodes of non-infective aetiology and up to 30% of viral origin. | |
| **Antibiotic - 1st line, Penicillin allergy / MRSA colonised or high risk of MRSA (review with sensitivity)** | **2nd line** |
| Doxycycline PO 100mg BD for 5 days (up to 7 days if for MRSA) | Amoxicillin PO 500mg TDS for **5 days**<br><br>**Severe penicillin allergy/Anaphylaxis**<br>Clarithromycin PO 500mg BD for 5days<br>Only If organisms are sensitive. If Haemophilus, gram negatives - review sensitivities/discuss with microbiologist |
| **If patient has frequent use of antibiotics (for instance, due to frequent exacerbations). Please review previous sputum mcs results or contact microbiologist.**<br>**Comment**<br>Antibiotics **ARE** indicated in the following:<br>↑ sputum volume;<br>↑ purulence of sputum;<br>Dyspnoea.<br>Review treatment with culture and sensitivity results and switch to targeted antibiotic therapy.<br>Consider pertussis if non-resolving cough – contact microbiologist. | |

## Community Acquired Pneumonia

**CURB 65:**

**C**onfusion (Acute new onset) (AMT≤8); **U**rea*>7 mmol/L; **R**esp rate 30/min; **B**P <90 systolic or ≤60 diastolic; **65:** Age ≥65 years.

*no history of renal impairment or known cause for increased urea

**Assessing Severity of Community Acquired Pneumonia**

- Calculate CURB-65 score (see above).
- Caution with CURB-65 scores on the borderline between non-severe and severe pneumonia classifications.
- Clinical judgment required depending on presence of additional adverse prognostic factors (see below).

**Additional adverse prognostic factors**

- Unstable co-morbidities;
- $PaO_2$< 8kPa on air;
- Multilobar or bilateral involvement on CXR;
- Positive Legionella urine antigen test;

**Discuss with On Call Physician / Critical Care Physician / Respiratory Physician any patients with a CURB-65 score > 3.**

**Microbiological specimens for Community Acquired Pneumonia**

- Blood cultures before antibiotics are given;
- Sputum cultures if bringing up purulent sputum;
- Urine for Pneumococcal and Legionella (see above) antigen;
- If not responding to 1st line treatment, discuss further investigations including serology with Consultant Microbiologist during working hours;

The choice of agent should take into account the patient's risk for C. difficile infection.

**Comment**

**Severe Legionella / MRSA / previous C. diff or MDR Gram negatives -**
**Discuss with Consultant Microbiologist during working hours**

De-escalate therapy once microbiological results available. Negative urinary antigen for Legionella may be used to de-escalate/ or stop Clarithromycin if on duo therapy. Start treatment as soon as possible (within 4 hours) of admission

| Mild (CURB-65 Score 0-1) with No Adverse Prognostic Factors | | |
|---|---|---|
| **1st Line** | **Mild / Severe penicillin allergy / Anaphylaxis** | **Duration** |
| Amoxicillin PO 500mg TDS | Doxycycline PO 100mg BD | 5 days - guided by the clinical progress |

| Moderate (CURB-65 score 2) | | | |
|---|---|---|---|
| with no adverse prognostic factors. If Legionella urine antigen negative, stop Clarithromycin if on dual therapy. If adverse prognostic factors, treat as severe. | | | |
| | **1st Line** | **Mild / Severe penicillin allergy / Anaphylaxis** | **Duration** |
| | Amoxicillin PO/IV 500mg- 1g TDS<br>**plus**<br>Clarithromycin PO/IV 500mg BD | Doxycycline PO 100mg BD<br>**or**<br>If IV needed, then Clarithromycin IV 500mg BD | 5 days -<br>guided by the clinical progress |
| **Oral step down** | Oral options as above | | |

| Severe (CURB-65 score 3-5) | | | | |
|---|---|---|---|---|
| | **1st Line** | **Mild** | **Severe penicillin allergy / Anaphylaxis** | **Duration** |
| | Co-amoxiclav IV 1.2g TDS (consider C diff risk)<br>**plus**<br>Clarithromycin IV 500mg BD | Cefuroxime IV 1.5g TDS<br>**Plus**<br>Clarithromycin IV 500mg BD | Levofloxacin PO/IV 500mg BD. Contact microbiologist within working hours if no response in 48 hours. (see link on MHRA warning on quinolones (5)) | **7 days - guided by clinical progress** |
| **Oral step down** | Co-amoxiclav PO 625mg TDS<br>**Plus**<br>Clarithromycin PO 500mg BD | Cefaclor PO 500mg TDS<br>**Plus**<br>Clarithromycin PO 500mg BD | Levofloxacin PO 500mg BD (see link on MHRA warning on quinolones (5)) | |

| Pneumonia Post Influenza Infection and/or Cavitating Pneumonia | | | | |
|---|---|---|---|---|
| | **1st Line** | **Mild Penicillin allergy** | **Severe penicillin allergy / Anaphylaxis** | **Duration** |
| | Co-amoxiclav iv 1.2g TDS | Cefuroxime IV 1.5g TDS | Linezolid PO/IV 600mg BD<br>(check for contra-indications / interactions (9))<br>**Plus**<br>Ciprofloxacin PO 500mg BD or IV 400mg BD<br>(see MHRA warning (5)) | Discuss with microbiologist |
| **If risk of PVL or risk of PVL or confirmed PVL** | Add linezolid PO/IV 600mg BD<br>If linezolid contraindicated – add clindamycin PO/IV 600mg QDS | | Linezolid PO/IV 600mg BD<br>(check for contra-indications / interactions (9))<br>**Plus**<br>Ciprofloxacin PO 500mg BD or IV 400mg BD<br>(see MHRA warning (5))<br>If linezolid contraindicated – discuss with microbiologist | Discuss with microbiologist |
| PVL = Panton Valentine Leukocidin | | | | |

## Hospital Acquired Pneumonia [Post 48 hours of hospital Administration]

**Severe Legionella / MRSA / previous C. diff or MDR Gram negatives - Discuss with Consultant Microbiologist during working hours**

**Severe HAP:** RR>30/min;

Hypoxia ($PaO_2$ <8 kPa or <92% on any $FiO_2$);

CXR changes;

BP systolic <90 or diastolic □ 60;

New mental confusion

| Non-severe Hospital Acquired Pneumonia (HAP) | | | | |
|---|---|---|---|---|
| | **1st Line** | **Mild Penicillin allergy** | **Severe penicillin allergy / Anaphylaxis** | **Duration** |
| **Early onset [2-5 day of hospital admission] & no previous antibiotic** | Co-amoxiclav (Consider *C difficile* risk) IV 1.2g TDS<br>**Oral step down**<br>Co-amoxiclav PO 625mg TDS | Cefuroxime IV 1.5g TDS<br>**Oral step down**<br>Cefaclor PO 500mg TDS | Doxycycline PO 100mg BD **or** If IV needed, Levofloxacin* IV 500mg OD<br>**Oral step down**<br>Doxycycline PO 100mg BD or<br>If already tried doxycycline and no improvement – Levofloxacin* PO 500mg OD | 7 days-guided by clinical progress |
| **Late onset [>5d hospital admission or early onset and received previous antibiotic}.** | Co-amoxiclav IV (Consider *C difficile* risk)1.2g TDS<br>**If not improving in 48 hours** switch to piperacillin-tazobactam IV 4.5g TDS.<br>**Oral step down**<br>Co-amoxiclav PO 625mg TDS | Cefuroxime IV 1.5 g TDS<br>If not improving in 48 hours switch to Levofloxacin* PO/IV 500mg BD<br>**Oral step down**<br>Cefaclor PO 500mg TDS or<br>Levofloxacin* PO 500mg BD if not improving on cefuroxime | Doxycycline PO 100mg BD<br>if no improvement after 48hrs – switch to levofloxacin* **or** If IV needed, Levofloxacin* 500mg BD<br>**Oral step down**<br>Doxycycline 100mg PO BD or if already tried doxycycline and no improvement - Levofloxacin* PO 500mg BD | |
| **If MRSA is suspected** | Please discuss with microbiologist if not improving after 48 hours on above treatment | | | |
| *(see link on MHRA warning on quinolones) | | | | |

| Severe Hospital Acquired Pneumonia (HAP) | | | | |
|---|---|---|---|---|
| *(see link on MHRA warning on quinolones)* | **1st Line** | **Mild Penicillin allergy** | **Severe penicillin allergy / Anaphylaxis** | **Duration** |
| **No previous antibiotic** | Co-amoxiclav (Consider *C difficile* risk) IV 1.2g TDS<br>**If not improving in 48 hours** switch to Piperacillin-tazobactam 4.5 IV TDS.<br>**Oral step down**<br>Co-amoxiclav PO 625mg TDS | Cefuroxime IV 1.5 g TDS<br>**If not improving in 24-48 hours** please discuss with microbiologist.<br>**Oral step down**<br>Cefaclor PO 500mg TDS | Levofloxacin* IV/PO 500mg BD<br>**Oral step down**<br>Levofloxacin* PO 500mg BD | 7 days |
| **Previous antibiotic and NOT known to be colonised with pseudomonas or other resistant organisms** | Cefuroxime IV 1.5g TDS<br>Review in 24-48hours, if not improving please discuss with microbiologist.<br>**Oral step down**<br>Cefaclor PO 500mg TDS | | Levofloxacin* PO/IV 500mg BD<br>**Oral step down**<br>Levofloxacin* PO 500mg BD | |
| **Patients KNOWN to be colonized with at least 2 consecutive Pseudomonas in sputum or other relevant samples.**<br>**NB** - Please review sensitivities before prescribing | Piperacillin-tazobactam IV 4.5g QDS<br>Review in 24-48hours, if not improving please discuss with microbiologist.<br>**Oral step down**<br>Levofloxacin* PO 500mg BD | **Penicillin allergy (of all severity)**<br>Levofloxacin* PO/IV 500mg BD<br>Review in 24-48hours, if not improving please discuss with microbiologist. | | 7 days and guided by clinical response |
| **If MRSA is suspected** | Add Teicoplanin IV to above regime - and review in 48 hours<br>Oral step down – discuss microbiologist | | | |

| Aspiration Pneumonia | | | | |
|---|---|---|---|---|
| | **1st Line** | **Mild Penicillin allergy** | **Severe penicillin allergy / Anaphylaxis** | **Duration** |
| **Admission**<br>**< 5 DAYS:** | Amoxicillin IV 1g TDS<br>**plus**<br>Metronidazole IV 500mg TDS (PO if swallowing assessment is approves) | Clindamycin 600mg IV QDS if Penicillin allergy (Mild or severe)<br>(PO if swallowing assessment approves) | | 5 days [guided by clinical progress] |
| **Admission**<br>**> 5 DAYS** | Co-amoxiclav IV 1.2g TDS(PO if swallowing assessment is approves) | **Mild penicillin allergy**<br>Cefuroxime IV 1.5g TDS<br>**plus**<br>Metronidazole IV 500mg TDS (PO if swallowing assessment approves | **Severe Penicillin allergy:**<br>Levofloxacin* IV/PO 500mg OD<br>**plus**<br>Metronidazole IV 500mg TDS (400mg TDS PO if swallowing assessment approves) | |
| *(see link on MHRA warning on quinolones)<br>**Comments**<br>Aspiration pneumonitis is chemical and often self-limiting. Treatment not needed unless major aspiration or if chest x-ray confirms pneumonia (new consolidation). | | | | |

<table>
<tr><th colspan="5">Ventilator Associated Pneumonia</th></tr>
<tr><td colspan="5">(> 48 hours of mechanical ventilation.)<br>Common Pathogen(s) Must discuss with Microbiologist during working hours for:Legionella, MRSA, ESBL coliforms, C. difficile, Pneumocystis, Neutropenic patients, multidrug resistant pathogens, and all haematology patients.</td></tr>
<tr><td></td><td>1st Line</td><td>Mild Penicillin allergy</td><td>Severe penicillin allergy / Anaphylaxis</td><td>Duration</td></tr>
<tr><td>VAP<br>(< 5 days from admission):</td><td>Co-amoxiclav (consider C diff risk) IV 1.2g TDS</td><td>Cefuroxime IV 1.5g TDS</td><td>Levofloxacin* IV/PO 500mg BD</td><td rowspan="2">5 days [guided by clinical progress]</td></tr>
<tr><td>VAP<br>(≥5 days from admission, prior treatment with intravenous antibiotics, septic shock, acute respiratory distress syndrome, acute renal replacement therapy, immunocompromised-steroid use):</td><td>Piperacillin- tazobactam IV 4.5g TDS</td><td colspan="2">2nd line/ Penicillin allergy (mild or severe)<br>Levofloxacin* IV/PO 500mg BD</td></tr>
<tr><td colspan="5">All cases on ITU, HDU and Cardiac ITU should be reviewed regularly with Consultant Microbiologist.<br>*(see link on MHRA warning on quinolones)</td></tr>
</table>

| Lung Abscess | | | | |
|---|---|---|---|---|
| **Common Pathogen(s)** *Streptococcus milleri; Anaerobes; Staphylococcus aureus;aerobic/ microaerophilic Streptococci.* | | | | |
| | **1st Line** | **Mild Penicillin allergy** | **Severe penicillin allergy / Anaphylaxis** | **Duration** |
| **Community acquired:** | Co-amoxiclav IV 1.2g TDS (contact Microbiologist during working hours for oral switch) | Clindamycin IV 600mg QDS (contact Microbiologist during working hours for oral switch) | | **guided by radiological and clinical response. [4- 6 weeks].** |
| **Hospital acquired:** | Co-amoxiclav IV 1.2g TDS (contact Microbiologist during working hours for oral switch)<br>If not improving after 72hours – discuss with microbiologist | Cefuroxime IV 1.5g TDS **plus** Metronidazole IV 500mg TDS (contact Microbiologist during working hours for oral switch). | Clindamycin IV 600mg QDS **Plus** Ciprofloxacin* IV 400mg BD Or Clindamycin PO 600mg QDS **Plus** Ciprofloxacin* PO 500-750mg BD | |
| **Comment**<br>All cases should be discussed with Microbiologist and a Respiratory Physician during working hours.<br>**De-escalate** to appropriate narrow spectrum antibiotic once culture/ sensitivity available<br>*see MHRA warning | | | | |

| Empyema | | | |
|---|---|---|---|
| **Common Pathogen(s)** *Streptococcus milleri; Anaerobes; Staphylococcus aureus;aerobic / microaerophilic Streptococci.* | | | |
| **1st Line** | **Mild Penicillin allergy** | **Severe penicillin allergy / Anaphylaxis** | **Duration** |
| Co-amoxiclav (consider C diff risk) IV 1.2g TDS<br>Use IV for up to 1 week and discuss with respiratory team for chest drain / further management | Cefuroxime IV 1.5g TDS<br>**plus**<br>Metronidazole IV 500mg TDS<br>Use IV for up to 1 week and discuss with respiratory team for chest drain/further management | Clindamycin IV 600mg QDS<br>**Plus**<br>Ciprofloxacin* IV 400mg BD<br><br>**ORAL step down**<br>Clindamycin PO 600mg QDS<br>**Plus**<br>Ciprofloxacin* PO 750mg BD | Minimum of 2 weeks depending on radiological / surgical intervention / clinical response |
| **Comment**<br>All cases should be discussed with Microbiologist and a Respiratory Physician during working hours.<br>**De-escalate** to appropriate narrow spectrum antibiotic once culture/ sensitivity available.<br>*see MHRA leaflet | | | |

## Bronchiectasis

***Treatment should be individualised for each patient and sputum should be sent for culture before initiating empiric antibiotic therapy –***

***Common Pathogen(s)*** *Haemophilus Influenzae; Streptococcus pneumoniae; Moraxella catarrhalis; Viruses; Occasionally S. aureus (post viral episode) Pseudomonas – see below*

| | | 1st Line | Mild Penicillin allergy | Severe penicillin allergy / Anaphylaxis | Duration |
|---|---|---|---|---|---|
| **if no previous growth of pseudomonas** | **Oral** | Doxycycline PO 100mg BD for 14 days (depending on clinical response). | | | **total duration 14 days (IV plus oral de-escalation if possible)** |
| | **IV** | If IV antibiotics indicated, treatment should be guided by previous results.<br>Amoxicillin IV 1g TDS | Clarithromycin IV 500mg BD<br>Only If organisms are sensitive. If Haemophilus, gram negatives - review sensitivities/discuss with microbiologist | | |
| | | If poor therapeutic response, discuss with Microbiologist during working hours | | | |
| **If fails first line treatment above, or Pseudomonas detected** | | Piperacillin-tazobactam IV 4.5g QDS (for OPAT / oral please discuss with microbiologist) | Ciprofloxacin PO 750mg BD<br>(see link on MHRA warning on quinolones) | | |
| | | **Discuss with Microbiology / Respiratory physician during working hours.** | | | |
| **MRSA or high risk of MRSA (review with sensitivity)** | | Doxycycline PO 100mg BD<br>**If severe – discuss with microbiologist** | | | |
| **If multiple organisms isolated – discuss with microbiologist** | | | | | |

**Comment**

IV antibiotics should be considered when patients are particularly unwell, have resistant organisms or have failed to respond to oral therapy.

Review antibiotics once culture results are available.

## Pulmonary Exacerbation of Cystic Fibrosis

Pulmonary exacerbations of cystic fibrosis (CF) can be treated with oral or intravenous antibiotics. When IV therapy is needed patients are usually managed with a combination of two or more IV antibiotics. Common organisms in the sputum of **adult** CF patients are *Pseudomonas aeruginosa* and *Burkholderia cepacia*.

Ideally an aminoglycoside in combination with an anti-pseudomonal beta-lactam should be used first line. For those colonised with *Burkholderia* species, a third IV antibiotic should normally be prescribed. IV treatment is normally continued for 14 days depending on response.

Please refer to another trust document for antibiotic prescription in CF patients with pulmonary exacerbations.

Also See the CF Trust's 'Antibiotic Treatment for Cystic Fibrosis' consensus document for further information (10).

Patients with CF have a high prevalance of antibiotic intolerance (check the allergy card in the medical notes) and alternative antibiotic regimens may be needed; if in doubt discuss with the CF doctors or the CF specialist pharmacist in normal working hours, or the CF consultant on call out of hours.

If the patient uses a maintenance nebulised antibiotic (e.g., tobramycin) and the same antibiotic is also being used for IV treatment, the nebulised form of the antibiotic would usually be withheld.

If you need information on how to administer a particular IV antibiotic for a patient with CF please contact the CF specialist pharmacist.

See the CF Trust's 'Antibiotic Treatment for Cystic Fibrosis' consensus document for further information (10).

**First Line**

Tobramycin IV 5mg/kg OD

If patient is obese (20% over ideal body weight), use adjusted body weight to calculate dose – see below for details

***plus***

Ceftazidime IV 3g QDS (unlicensed dose)

***or***

Meropenem IV 2g TDS

***or***

Piperacillin/Tazobactam IV 4.5g QDS (max 14 days)

If colonised with *Burkholderia* **add** a 3rd IV antibiotic, preferably:

Co-trimoxazole IV 960mg BD

## Pulmonary Exacerbation of Cystic Fibrosis

**Alternatives**

In those with allergy, intolerance or previous failure on the above first line agents alternatives may be needed.

**Other agents sometimes used for CF exacerbation**

All doses assume normal renal and hepatic function - discuss with the CF pharmacist in hours, or the on call pharmacist out of hours if there is concern regarding renal or hepatic clearance of antibiotics. The list below is in alphabetical order, not order of preference.

Amikacin IV 15mg/kg OD (do NOT use in combination with other aminoglycosides) - If patient is obese (20% over ideal body weight), use adjusted body weight to calculate dose – see below for details

- Aztreonam IV 3g QDS (or 4g TDS) - both doses are unlicensed
- Chloramphenicol IV 1g QDS (with alternate day FBC monitoring)
- Ciprofloxacin IV 400mg BD or TDS (see link on MHRA warning on quinolones)
- Colistimethate Sodium (Colistin) IV 2MU TDS
- Flucloxacillin IV 1-2g QDS
- Fosfomycin IV 4g TDS (can give higher doses on discussion with consultant)
- Teicoplanin IV 12mg/kg kg 12hourly for 3 doses then continue OD (round to nearest 100mg)
- Temocillin IV 2g BD
- Ticarcillin with Clavulanic Acid (Timentin) IV 3.2g QDS
- Tigecycline 100mg stat dose followed by 50mg BD (12 hours after initial dose)
- Vancomycin IV as per Trust guidance

**Pregnancy and breastfeeding**

If a patient is pregnant or breastfeeding and requires IV antibiotics please discuss treatment options with a CF consultant or the CF specialist pharmacist ***before*** commencing treatment.

## Pulmonary Exacerbation of Cystic Fibrosis

**Antibiotic desensitisations**

These can be arranged by contacting the CF specialist pharmacist during working hours. Desensitisations should not be attempted outside of normal working hours.

Following a successful desensitisation, the patient must receive the antibiotic regularly. If the antibiotic is withheld for more than 24 hours a repeat desensitisation will be required and it must be given by intravenous infusion (not bolus).

**Calculating Ideal and Adjusted Body Weight**

Calculate the ideal body weight (IBW) first and then use this to calculate the adjusted body weight (AdjBW).

IBW men (kg) = 50 + (2.3 x every inch over 5 feet)

IBW women (kg) = 45.5 + (2.3 x every inch over 5 feet)

AdjBW = IBW + 0.4 x (actual body weight – IBW)

# 15 Urinary Tract

## Urinary Tract

**Microbiological specimens**

- Urine dipstick is not recommended in age over 65years and catheters. Check for symptoms of UTI.
- Asymptomatic bacteruria (bacteria in urine greater than $10^5$ colony forming unit/ml) in the elderly female does not need treatment in the absence of symptoms
- MSSU prior antibiotics for culture and sensitivity and review empiric antibiotic once results available (if STD suspected send a first void urine for chlamydia PCR)
- EMU x3 on consecutive days if TB considered
- For diagnosis of prostatitis an MSSU post prostatic massage is indicated
- The choice of agent should take into account the patient's risk for C. difficile infection.
- Self care – use simple analgesia such as paracetamol for pain, ensure adequate hydration

If urine specimen is positive for MRSA – discuss with microbiologist

**Reference:**

PHE. Diagnosis of urinary tract infections. May 2020 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/927195/UTI_diagnostic_flowchart_NICE-October_2020-FINAL.pdf <accessed 25/1/24> (11)

# Uncomplicated Lower Urinary Tract Infection (Cystitis)

Lower urinary tract infection (UTI) is an infection of the bladder usually caused by bacteria from the gastrointestinal tract entering the urethra and travelling up to the bladder.

If there are symptoms of pyelonephritis or the person has a complicated UTI (associated with a structural or functional abnormality, or underlying disease, which increases the risk of a more serious outcome or treatment failure – consider the options as per pyelonephritis.

**Common Pathogen(s)** E. coli; Proteus sp. Klebsiella sp. Staphylococcus saprophyticus. Recent increase in ESBL+ve *E. coli.*

| | 1st Line / 2ND Line | Mild Penicillin allergy | Severe penicillin allergy / Anaphylaxis | Duration |
|---|---|---|---|---|
| **Female** | **1st line**<br>Nitrofurantoin PO 50mg QDS (caution if renal impairment --table 13)<br>or<br>Trimethoprim PO 200mg BD (please check prior urine sensitivity-high proportion of isolates may be resistant.<br>Wherever possible, use trimethoprim only if sensitivity is available. If using empirically – monitor after 24hour for patient's response<br>**2nd Line**<br>Co-amoxiclav PO 625mg TDS | Cefalexin PO 500mg TDS | Nitrofurantoin PO 50mg QDS (caution if renal impairment - see table 13)<br>or<br>Trimethoprim PO 200mg BD (please check prior urine sensitivity-high proportion of isolates may be resistant.<br>Wherever possible, use trimethoprim only if sensitivity is available. If using empirically – monitor after 24hour for patient's response | 3 days |
| **Male – Lower UTI**<br>If any systemic symptoms at all or failures follow the Upper UTI guidance<br>Refer to genital guidance system if prostatitis suspected. | **1st line** Trimethoprim PO 200mg BD (please check prior urine sensitivity-high proportion of isolates may be resistant) Wherever possible, use trimethoprim only if sensitivity is available. If using empirically – monitor after 24hour for patient's response<br>**2nd Line**<br>Co-amoxiclav PO 625mg TDS<br>**plus**<br>amoxicillin PO 500mg TDS | **1st line – Penicillin Allergy- all severity**<br>Trimethoprim PO 200mg BD please check prior urine sensitivity-high proportion of isolates may be resistant.<br>Wherever possible, use trimethoprim only if sensitivity is available. If using empirically – monitor after 24hour for patient's response<br>**2nd line - mild penicillin allergy**<br>Cefalexin PO 500mg TDS<br>**2nd line - severe penicillin allergy**<br>Ciprofloxacin PO 500mg BD (see MHRA alert) | | 7 days |

Consider previous culture results for recurrent infections or previous antimicrobial use

**If history of Multidrug resistant organisms e.g., AMP C or ESBL, CPE, VRE** -Discuss with microbiologist

**If urine specimen is positive for MRSA – discuss with microbiologist**

*There is no evidence to support cranberry products or urine alkalinising agents to treat lower UTI*

## Upper Urinary Tract infection / Pyelonephritis / Septicaemia

**Common Pathogen(s)** Enterobacteriacea.
Acute pyelonephritis is an infection of one or both kidneys usually caused by bacteria travelling up from the bladder
**If urine specimen is positive for MRSA – discuss with microbiologist**
Take account of: severity of symptoms, the risk of developing complications, which is higher in people with known or suspected structural or functional abnormality of the genitourinary tract or immunosuppression

| | 1st Line | 2nd Line or Mild penicillin allergy or 1st line for pregnant patients | Severe penicillin allergy / Anaphylaxis |
|---|---|---|---|
| **IV** | Co-amoxiclav IV 1.2g TDS<br>**plus**<br>Gentamicin* IV<br>(Refer to gentamicin policy and gentamicin calculator) stat<br>After 48 hours -step down to oral therapy according to sensitivities | Cefuroxime IV 1.5g TDS<br>+/-<br>Gentamicin* IV (Refer to gentamicin policy and gentamicin calculator) stat | Gentamicin* IV<br>(Refer to gentamicin policy and gentamicin calculator) stat and discuss with microbiologist<br>Consider restricting Gentamicin to initial 48hrs and step down to oral therapy according to sensitivities. |
| **Oral Options / step down:** | Co-amoxiclav PO 625mg TDS **plus** Amoxicillin PO 500mg TDS for 7-10 days<br>or<br>Cefalexin PO 500mg TDS for 7-10days<br><br>**Where sensitive** and renal function allows CrCl>30ml/min – Trimethoprim 200mg PO BD for 14 days<br>Do not use quinolones without discussing with microbiologists and providing patients with appropriate BNF warnings. | Cefalexin PO 500mg TDS for 7-10 days<br>**Where sensitive** and renal function allows CrCl>30ml/min – Trimethoprim 200mg PO BD for 14 days | **Where sensitive** and renal function allows CrCl>30ml/min – trimethoprim 200mg PO BD for 14 days<br>Or<br>Discuss with microbiologist |

***Note:** If serum creatinine is not yet known then 5mg/kg may still be initiated unless 70years or above or there is evidence of existing severe renal impairment. CrCl must still be calculated once U+Es are available.
**ALL SUBSEQUENT DOSES MUST BE ADJUSTED AS PER CrCl once known. Must check pre-dose level as per policy.**

**Bacteruria (Pregnant Patients)**

- Asymptomatic or symptomatic bacteriuria [Duration 7d]
- Treatment choice should be reviewed based on recent urine culture and sensitivity results and previous antibiotic use

**Common Pathogen(s)**
Enterobacteriacea.

| 1st Line | 2nd Line | Duration |
|---|---|---|
| Nitrofurantoin PO 50mg QDS (<36 weeks).<br>**Or**<br>Amoxicillin PO 500mg TDS (if susceptible) | Cephalexin PO 500mg TDS<br>Or Trimethoprim PO 200mg BD (if urine culture is sensitive to this).<br>**NOT** in first trimester and ONLY if no other alternative.<br>Caution if low folate status or on known folate (e.g., antiepileptic drugs). | 7 days |

**Comment**
REF: 1: NICE Urinary Tract Infection (lower): antimicrobial prescribing. NG109 31st Oct 2018. Overview | Urinary tract infection (lower): antimicrobial prescribing | Guidance | NICE <accessed 29/1/24>
2: UKTIS. Trimethoprim and nitrofurantoin in pregnancy Exposure in pregnancy (toxbase.org) <accessed 29/1/24>

## Catheterised Patients

A catheter-associated UTI is a symptomatic infection of the bladder or kidneys in a person with a urinary catheter

The longer a catheter is in place the more likely bacteria will be found in the urine; after 1 month nearly all people have bacteriuria

**Comment**

- Urine dipsticks are NOT indicated for catheter urine.
- Antibiotics are NOT required unless the patient is febrile or systemically unwell – discuss with microbiologists
- Send CSU if patient systemically unwell – mark specimen with comment about current clinical presentation of patient and need for sensitivity test. Treat according to culture.
- Consider removing or, if this cannot be done, changing the catheter as soon as possible in people with a catheter-associated UTI if it has been in place for more than 7 days
- Do not routinely offer antibiotic prophylaxis to prevent catheter-associated UTI in people with a short-term or a long-term (indwelling or intermittent) catheter.
- Indiscriminate use of antibiotics in patients with long-term catheter leads to selection of ESBL+ve, MRSA and other multi-drug-resistant bugs.

## Asymptomatic Bacteruria (Low Risk Patients)

**Comment**

Asymptomatic bacteriuria is very common in elderly patients and rarely requires antibiotic treatment

Do not use urine dipstick in >65 years - urine samples may give positive dipsticks, but antibiotics are usually NOT required unless the patient is systemically unwell or with UTI symptoms.

## Acute prostatitis

Acute prostatitis is a bacterial infection of the prostate, usually caused by bacteria entering the prostate from the urinary tract, can occur spontaneously or after medical procedures such as prostate biopsy, can last several weeks and can cause complications such as acute urinary retention and prostatic abscess.

Common pathogens: *Escherichia coli* (in up to 50% of cases), then by *Pseudomonas aeruginosa, Klebsiella, Enterococcus*, *Enterobacter*, *Proteus* and *Serratia* species.

Rarely by sexually transmitted pathogens: *Neisseria gonorrhoea, Chlamydia trachomatis*

| | 1st Line | 2nd Line<br>Severe penicillin allergy / Anaphylaxis | Duration |
|---|---|---|---|
| **Oral** | Ciprofloxacin* PO 500mg BD<br>or<br>Ofloxacin* 200mg PO BD<br>*see MHRA warning | Cotrimoxazole PO 960mg BD (only if bacteria in MCS is sensitive) | review after 14 days and either stop or continue for a further 14 days if needed depending on clinical response |
| **Severe infection** | **requiring parenteral therapy: Please discuss with microbiologist.** | | |

**If not improving on antibiotics above – discuss with microbiologist to consider atypical cover for *C. trachomatis and genital mycoplasma***

**NB:**

**Please send mid-stream urine for MCS.**

**Also request sexual screen (urine for men) for gonorrhoea and Chlamydia NAAT test especially for patients <35 years of age. Please discuss with virology lab for the appropriate test kit. If sexual screen is positive, please refer patient to GUM clinic.**

| Epididymo-orchitis | | |
|---|---|---|
| Link to BASHH guidelines - please note it is essential to check gonococcal sensitivity as resistance pattern in UK are changing. This regime may not be effective for resistant strains.<br>**Common Pathogen(s)** Gonococci; Chlamydia; Enteric organisms (uncommon).<br>Refer to GUM clinic for diagnosis, treatment and contact tracing<br>Treat sexual partners as well. | | |
| | **1st Line** | **2nd Line**<br>**Severe penicillin allergy / Anaphylaxis** |
| **Likely sexually transmitted**<br>(Younger age(e.g.<35yrs), high risk sexual history, contact of an STI, no previous UTI or urological procedure, urethral discharge, urine dipstick positive for leucocytes only)<br>First voided urine sample,<br>urethral swab, and culture.<br>* Common risk factors for gonorrhoea are: previous *N. gonorrhoeae* infection; known contact of gonorrhoea; presence of purulent urethral discharge, men who have sex with men and black ethnicity | Doxycycline PO 100mg BD for 10-14 days<br>**plus**<br>Ceftriaxone IM 1g single dose | If most probably due to chlamydia or other non-gonococcal organisms (i.e. where Gonorrhoea considered unlikely as microscopy is negative for Gram negative intracellular diplococci and no risk factors for gonorrhoea identified*) could consider<br><br>Doxycycline PO 100mg BD for 10-14 days.<br>Or<br>Ofloxacin** PO 200mg BD for 14days |
| **Likely due to enteric pathogens**<br>(older age(e.g. >35yrs), low risk sexual history, history of previous UTI or urological procedure, no urethral discharge, urine dipstick positive for leucocytes and nitrites, men engaged in insertive anal sex, known abnormalities of the urinary tract)<br>Treat according to culture/ sensitivity results. | Ofloxacin** PO 200mg BD for 14 days.<br>Please check culture sensitivity and change to a sensitive narrow spectrum agent. If not available, consider step down to oral ofloxacin alone.<br>Or<br>Levofloxacin** PO 500mg OD for 10 days<br>**2nd Line (If quinolones contraindicated)**<br>Co-amoxiclav PO 625mg TDS for 10 days | Ofloxacin** PO 200mg BD for 14 days.<br>Please check culture sensitivity and change to a sensitive narrow spectrum agent. If not available, consider step down to oral ofloxacin alone.<br>Or<br>Levofloxacin** PO 500mg OD for 10 days |
| **Likely sexually transmitted and enteric pathogens (STI risks in men that practice insertive anal sex**<br>Treat according to culture/ sensitivity results. | Ceftriaxone IM 1g stat<br>**Plus**<br>Ofloxacin** PO 200mg BD for 14 days | Ofloxacin** PO 200mg BD for 14 days |
| **see link on MHRA warning on quinolones | | |

# 16 Ear Nose and Throat

| Conjunctivitis |
|---|
| **Common Pathogen(s)** Usually viruses; Also other bacteria including Chlamydia |
| **Antibiotic - 1st line**<br>Chloramphenicol 0.5% eye drops 2-hourly until infection controlled, then 6 hourly until 48 hours after healing.<br>Chlamydia: Doxycycline PO 100mg BD for 7- 10 days.<br>**If eye specimen is positive for MRSA – please discuss with microbiologist** |
| **Comment**<br>Viral, Chlamydia, and bacterial swabs are required |

| Periorbital Cellulitis – Low Grade Preseptal<br>(Non-Immunocompromised or Diabetic / Non-Severe – so only superficial and not actively spreading) | | |
|---|---|---|
| **Orbital cellulitis** is a medical emergency requiring Ophtho / Micro input immediately | | |
| **1st Line** | **Mild / Severe penicillin allergy / Anaphylaxis** | **Duration** |
| Co-amoxiclav (consider *C difficile* risk)<br>IV 1.2g TDS<br>MRSA colonised, add in Vancomycin IV<br>(dosed as per trust vancomycin guideline)<br>**If not improving within 48hours – please discuss with microbiologist** | Levofloxacin* PO/IV 500mg BD<br>MRSA colonised, add in Vancomycin IV<br>(dosed as per trust vancomycin guideline)<br>**If not improving within 48 hours – please discuss with microbiologist**<br>*see MHRA warning | **10-14 days** |

| Orbital Cellulitis and High grade preseptal cellulitls | | |
|---|---|---|
| **Orbital cellulitis** is a medical emergency requiring Ophtho / Micro input immediately. | | |
| **1st Line** | **Penicillin allergy / Anaphylaxis** | **Duration** |
| Ceftriaxone IV 2g BD<br>**Plus**<br>Metronidazole IV 500mg TDS<br>**Plus**<br>Linezolid **IV/PO 600mg BD (if no significant interactions AND if MRSA or PVL or spreading severe infection/associated sepsis / haemodynamically compromised/IVDU) –<br>if linezolid is not suitable – discuss with microbiologist | Linezolid** IV/PO 600mg BD<br>**Plus**<br>Ciprofloxacin* IV<br>400mg BD<br>**Plus**<br>Metronidazole IV 500mg TDS | **Discuss with microbiologist** |
| **If not improving – especially immunocompromised consider possibility of invasive fungal disease – discuss with microbiologist** | | |
| ***see link on MHRA warning on quinolones ** Check for contra-indications/interactions**<br>**PVL = Panton Valentine Leukocidin** | | |

## Acute Otitis Media

**Common Pathogen(s)** *Strep pneumoniae; H influenzae.*

| 1st Line | Penicillin allergy | Duration |
|---|---|---|
| Amoxicillin PO 500mg TDS<br>Or Co-amoxiclav PO 625mg TDS<br>(If not responding in 48-72hours, or if received amoxicillin in past 30days or concurrent purulent conjunctivitis or history of recurrent acute otitis media that did not to amoxicillin) | Clarithromycin PO 500mg BD | 5 days |

**Comment**
If mastoiditis, discuss with Microbiologist / ENT during working hours.

## Otitis Externa

**Common Pathogen(s)** Polymicrobial colonisation.

**Antibiotic - 1st line**
Antibiotics not usually required, discuss with ENT

**Comment**
If severe or malignant otitis externa suspected, discuss with ENT consultant.

## Malignant Otitis Externa

**Common pathogens** pseudomonas, staph aureus

| 1st Line | Mild penicillin allergy | Severe penicillin allergy / Anaphylaxis | Duration |
|---|---|---|---|
| Piperacillin -tazobactam IV 4.5g QDS<br>**Plus**<br>Ciprofloxacin* PO 750mg BD (MHRA warning) or history of CDI - | Ceftazidime IV 2g TDS<br>**Plus**<br>Ciprofloxacin* PO 750mg BD | Ciprofloxacin* PO 750mg BD | 6 weeks |
| | If staph aureus isolated – discuss with microbiologist | | |

**Must check for history of MRSA or if history of MRSA – discuss with microbiologist**
**Must send swabs from ear canals**

*see link on MHRA warning on quinolones

## Severe Throat infections / Quinsy

**Common Pathogen(s)** Strep. Pyogenes.

| | 1st Line | Penicillin allergy | Duration |
|---|---|---|---|
| **Oral** | Phenoxymethyl penicillin PO 500mg QDS<br>**Plus**<br>Metronidazole PO 400mg TDS | Clindamycin PO 600mg QDS<br>If not responding in 48 hrs –<br>please discuss with microbiologist | minimum 10 days |
| **IV** | Benzylpenicillin 1.2g IV QDS if NBM<br>**Plus**<br>Metronidazole IV 500mg TDS<br>**If** severe, replace metronidazole with Clindamycin IV 600mg QDS. | Clindamycin IV 600mg QDS<br>If severe, please discuss with microbiologist<br>If not responding in 48 hrs –<br>please discuss with microbiologist | |

**Comment**
If Fusobacterium *necroforum* (**Lemierre's disease) or oesophageal perforation** is suspected, discuss with microbiologist

| Sinusitis– Acute | | |
|---|---|---|
| **Common Pathogen(s)** Commonly - Rhinovirus and other viruses *S. pneumoniae* **;** *Haemophilus influenzae*. Less common pathogens include: *M. catarrhalis*, *S. aureus* and anaerobes; fungi are rare pathogens for acute infection. | | |
| **1st Line** | **Penicillin allergy** | **Duration** |
| Amoxicillin PO 1g TDS for 5-7 days<br>**(if severe or not improving within 48 hours please discuss with microbiologist as there is increasing resistance to amoxicillin)** | Doxycycline PO 100mg BD<br>Or<br>Clarithromycin PO 500mg BD | **5-7 days** |
| **Comment**<br>Antibacterial should usually be used only for persistent symptoms and purulent discharge lasting at least 7 days or if severe symptoms. Also, consider antibacterial for those at high risk of serious complications (e.g., in immunosuppression, cystic fibrosis). | | |

| Dental Abscess | | |
|---|---|---|
| **1st Line** | **Penicillin allergy** | **Duration** |
| Amoxicillin PO 500mg TDS<br>**If severe/spreading** - add Metronidazole PO 400mg TDS | Clindamycin PO 600mg QDS | **5 days** |
| Antibacterial required only in severe disease with cellulitis or if systemic features of infection. | | |

# 17 Skin and soft tissue

## Skin and soft tissue

**Microbiological specimens**

- New HOSPITAL ADMISSIONS MUST RECEIVE A MSSA/MRSA SCREEN. nose and perineal swab for Chromogenic culture as per hospital policy (see CORP/PROC/408 (12))
- Deep tissue, pus/ aspirates are best specimens from wounds. Surface swabs are sub-optimal and if collected these should be obtained after cleaning wound surface with saline.
- Blood culture [if signs of systemic sepsis].
- If recurrent boils or severe sepsis present consider possibility of *PVL MRSA or MSSA.* Discuss with Consultant Microbiologist during working hours as standard regimes may be sub-optimal (see CORP/GUID/519 link (13))
- Gangrene / necrotising fasciitis / abscess: send tissue or aspirate.
- The choice of agent should take into account the patient's risk for C. difficile infection.

| Cellulitis | | | |
|---|---|---|---|
| **Common Pathogen(s)** Streptococcus pyogenes;Staphylococcus aureus; Occasionally *Strep Grp B, C, G.*<br>*******MRSA colonised must not be treated with Flucloxacillin********* | | | |
| | **1st Line** | **Penicillin allergy** | **Duration** |
| **Oral** | Flucloxacillin IV/ PO 1g QDS<br>Review after 48 hours and step down to oral therapy once margin of cellulitis begins to recede. Target treatment if significant positive culture results are available.<br>Addition of Benzyl Penicillin or amoxicillin to Flucloxacillin is NOT required as flucloxacillin offers Streptococcal cover as well. | Doxycycline PO 100mg BD<br>Or<br>Clindamycin IV/ PO 600mg QDS<br>Review after 48 hours and step down to oral therapy once margin of cellulitis begins to recede. If response is poor consider resistance and call microbiology | 5-7 days [guided by clinical progress] |
| **Severe cases of skin / soft tissue infections / or high suspicion of MRSA** | Teicoplanin IV 6mg/kg 12hourly for 3 doses and then OD (round to nearest 100mg)<br>Please check recent MRSA sensitivities and discuss with microbiologist<br>If diabetic or immunocompromised and not responding in 48hrs – discuss with microbiologist | | 7-14 days |
| **Comment**<br>Local data demonstrates higher dosage reduces association with C*. difficile*. Please note that where prior results are available these should be checked. If isolate is Erythromycin resistant, then clindamycin should be used with caution and response checked as in such situation resistance can emerge rapidly. | | | |

# Leg Ulcers and Pressure Sores Non-Diabetic

**Comment**

- There are many causes of leg ulcers: underlying conditions, such as venous insufficiency and oedema, should be managed to promote healing
- Most leg ulcers are not clinically infected but are likely to be colonised with bacteria ****Avoid antibiotics*****
- Pseudomonas or Enterobacteriaceae from surface wound swabs may represent colonisation.
- Antibiotics do not help to promote healing when a leg ulcer is not clinically infected.
- Consider sending a sample from the leg ulcer (after cleaning with saline) for microbiological testing if symptoms or signs of the infection are worsening or have not improved as expected.
- Use local cleansing and topical antiseptics if required. Involve Tissue Viability Nurse.

If or signs of infection (for example, redness or swelling spreading beyond the ulcer, localised warmth, increased pain or fever). Take account of:

- the severity of symptoms or signs
- the risk of developing complications
- previous antibiotic use.

Treat as cellulitis and review antimicrobial choice with microbiological results

Reassess an infected leg ulcer in adults if:

- symptoms or signs of the infection worsen rapidly or significantly at any time, or do not start to improve within 2 to 3 days
- the person becomes systemically unwell or has severe pain out of proportion to the infection.

Be aware that it will take some time for a leg ulcer infection to resolve, with full resolution not expected until after the antibiotic course is completed.

Consider referring or seeking microbiologists during working hours for adults with an infected leg ulcer if:

- they have any symptoms or signs suggesting a more serious illness or condition, such as sepsis, necrotising fasciitis or osteomyelitis.
- have a higher risk of complications because of comorbidities, such as diabetes or immunosuppression
- have lymphangitis
- have spreading infection that is not responding to oral antibiotics
- cannot take oral antibiotics (exploring locally available options for giving intravenous or intramuscular antibiotics at home or in the community, rather than in hospital, where appropriate).
- Reference: NICE guideline NG 152. Leg ulcer infection: antimicrobial prescribing.Feb 2020 https://www.nice.org.uk/guidance/ng152 < 25/3/21> (14)

## Impetigo

**Common Pathogen(s)** *Staphylococcus aureus;* Streptococcus pyogenes.

| | 1st Line | Penicillin allergy of all severity | Duration |
|---|---|---|---|
| | Mupirocin 2% ointment TDS topically<br>**or**<br>Hydrogen peroxide 1% cream TDS topically. | | **5 days** |
| If widespread | Flucloxacillin PO 500mg QDS | Clarithromycin PO 500mg BD<br>Review with culture and sensitivity in 48hr or if not responding in 48hrs – discuss with microbiologist | |

**Comment**
Do **NOT** use topical Fucidin® empirically, most community MSSA are resistant.

## Insect Bites and Stings

Most insect bites and stings do not need antibiotics – see NICE guidelines for further details

**Reference:**

NICE guideline NG 182. Insect bites and stings: antimicrobial prescribing https://www.nice.org.uk/guidance/ng182 <accessed 25/3/21> (15)

## Human and Animal Bites – Assessment and Treatment

- Assess the type and severity of the bite, including what animal caused the bite, the site and depth of the wound, and whether it is infected
- assess the risk of tetanus, rabies or a bloodborne viral infection and take appropriate action
- manage the wound with irrigation and debridement as necessary
- be aware of potential safeguarding issues in vulnerable adults and children
- Seek advice from a microbiologist for bites from a wild or exotic animal (including birds and non-traditional pets) because the spectrum of bacteria involved may be different, and there may be a risk of other serious non-bacterial infections.
- Consider seeking specialist advice from a microbiologist for domestic animal bites (including farm animal bites), that you are unfamiliar with.
- Treating infected bites
- Take a swab for microbiological testing to guide treatment if there is discharge (purulent or non-purulent) from the human or animal bite wound.
- Offer an antibiotic for people with a human or animal bite if there are symptoms or signs of infection, such as increased pain, inflammation, fever, discharge or an unpleasant smell.
- Review daily and be aware non-verbal signs of pain such as a change of behaviour

**Reference**

NICE. NG184. Human and animal bites: antimicrobial prescribing Nov 2020. https://www.nice.org.uk/guidance/ng184 <accessed 25/3/21> (16)

# Human and Animal Bites

## Whether Antibiotic prophylaxis is needed for an uninfected bite

| Type of Bite | Bite has not broken the Skin | Bite has Broken the Skin but not Drawn Blood | Bite has Broken the Skin and Drawn Blood |
|---|---|---|---|
| Human bite | Do not offer antibiotics | Consider antibiotics if it is in a high-risk area or person at high risk* | Offer antibiotics |
| Cat bite | Do not offer antibiotics | Offer Antibiotics | Offer antibiotics |
| Dog or other traditional pet bite | Do not offer antibiotics | Do not offer antibiotics | Offer antibiotics if it has caused considerable, deep tissue damage or is visibly contaminated (for example, with dirt or a tooth) Consider antibiotics if it is in a high-risk area or person at high risk* |

*High-risk areas include the hands, feet, face, genitals, skin overlying cartilaginous structures or an area of poor circulation People at high risk include those at risk of a serious wound infection because of a co-morbidity (such as diabetes, immunosuppression, asplenia or decompensated liver disease
**Animal bites - Common Pathogen(s)** *P. multocida; Capnocytophaga; Staphylococcus aureus.*
**Human bites - Common Pathogen(s)***Strept, Peptostrep, Bacteroides; Staphylococcus aureus*

| | 1st Line | Mild Penicillin Allergy | Severe Penicillin Allergy / Anaphylaxis | Duration |
|---|---|---|---|---|
| Oral is preferred | Co-amoxiclav (Consider *C difficile* risk) PO 625mg TDS | Doxycycline PO 100mg BD **Plus** Metronidazole PO 400mg TDS | Doxycycline PO 100mg BD **Plus** Metronidazole PO 400mg TDS | Prophylaxis (3 days) and treatment (5 days-7days based on clinical assessment e.g., if significant tissue destruction or penetrated bone, joint, tendon or vascular structures) |
| If IV is needed | Co-amoxiclav IV 1.2g TDS and review after 48hours | Cefuroxime IV 1.5g TDS **Plus** Metronidazole IV 500mg TDS Review after 48hours | Discuss with microbiologists | |

If pregnant please discuss with microbiologist
Comment
Topical cleansing, irrigation and debridement are significant and as indicated.
Animal bites - Is tetanus immunisation up-to-date?
Human bite - Is Hepatitis B vaccine required?

## Diabetic Foot Ulcer - Mild

**Classification definitions - mild**

- Infected: at least two of these items are present
- Local swelling or induration
- Erythema >0.5 but <2cm (in any direction – from rim of the wound) around the wound
- Local tenderness or pain
- Local increase warmth
- Purulent discharge

And no other cause of an inflammatory response of the skin ( e.g trauma, gout, acute Charcot neuro-arthropathy, fracture, thrombosis, or venous stasis)

**Send tissue swab after cleaning with saline (preferably prior antibiotic initiation)**

**Check for previous sensitivity**

| 1st Line | Mild Penicillin allergy | Severe Penicillin Allergy / Anaphylaxis | Duration |
|---|---|---|---|
| Flucloxacillin PO 1g QDS | Cefalexin PO 500mg TDS | Doxycycline PO 100mg BD | 1 – 2 weeks |
| **If MRSA colonised / high risk – discuss with microbiologists** | | | |

## Diabetic Foot Ulcer - Moderate

**Classification definitions - moderate**

- Infection with no systemic manifestations and involving:
  - erythema extending ≥ 2 cm from the wound margin (in any direction – from rim of the wound), and/or
  - tissue deeper than skin and subcutaneous tissues (e.g., tendon, muscle, joint, and bone
  - Infection involving bone (osteomyelitis)

****Send deep tissue sample** after cleaning with saline/debridement (preferably prior antibiotic initiation) Check for previous sensitivities

| *see link on MHRA warning on quinolones | 1st Line | Mild Penicillin Allergy | Severe Penicillin Allergy / Anaphylaxis | Duration |
|---|---|---|---|---|
| **Moderate diabetic foot ulcer WITHOUT risk factors for pseudomonas** | Co-amoxiclav PO 625mg TDS<br>or IV 1.2g TDS | Cefuroxime IV 1.5g TDS<br><br>**Oral option**<br>Cefaclor PO 500mg TDS | Teicoplanin IV 12mg/kg 12hourly for 3 doses and then OD (round to nearest 100mg)<br>**Plus**<br>Ciprofloxacin* IV 400mg BD<br><br>**Oral option**<br>Clindamycin PO 600mg QDS (please review with sensitivity)<br>**Plus**<br>Ciprofloxacin* PO 500mg every 12 hours | 2 wks – depending on response |
| **If risk factors for pseudomonas –**<br>history of failed recurrent infections, previous broad antibiotics in 90days, recent hospitalisation>2days in 90days and recent open water exposure<br><br>Superficial swab with pseudomonas does not necessarily need treatment – discuss with microbiologist | Piperacillin-tazobactam IV 4.5g QDS<br>**Oral option**<br>Levofloxacin* 500mg PO BD | Teicoplanin IV 12mg/kg 12hourly for 3 doses and then OD (round to nearest 100mg)<br>**Plus**<br>Ciprofloxacin* IV 400mg BD<br>**Oral option**<br>Clindamycin PO 600mg QDS (please review with sensitivity)<br>Plus<br>Ciprofloxacin* PO 750mg BD | | |
| *If MRSA colonised / high risk – add in teicoplanin if not already part of regimen* | | | | |

## Diabetic Foot Ulcer - Severe

**Classification definitions - Severe**

- Any foot infection with associated systemic manifestations (of the systemic inflammatory response syndrome [SIRS]), as manifested by ≥ 2 of the following:
  - temperature, > 38°C or < 36°C
  - heart rate, > 90 beats/min
  - respiratory rate, >20 breaths/min, or PaCO2 < 4.3 kPa (32 mmHg)
  - white blood cell count >12,000/mm3, or < 4G/L, or > 10% immature (band) forms
- Infection involving bone (osteomyelitis)

| 1st Line | Penicillin Allergy | Duration |
|---|---|---|
| Piperacillin-tazobactam IV 4.5g QDS<br><br>**If MRSA colonised –** add in teicoplanin 12mg/kg IV 12hourly for 3 doses then 12mg/kg OD (round to nearest 100mg)<br><br>**If necrotising fasciitis –** add in clindamycin IV 900mg QDS | Teicoplainin 12mg/kg IV 12hourly for 3 doses then 12mg/kg OD (round to nearest 100mg)<br>**Plus**<br>Ciprofloxacin IV 400mg BD (see MHRA warning on quinolones)<br>**Plus**<br>Metronidazole IV 500mg TDS<br>**If necrotising fasciitis –** replace teicoplanin with linezolid* if no significant interactions OR add in clindamycin IV 900mg QDS if linezolid not suitable | **2-4 wks** (up to 6wks if associated with bone infection) |
| Oral step down | Discuss with microbiologist | |

*Reference - Microsoft Word - 04 - Infection Guideline.docx (iwgdfguidelines.org) and MFT and Leeds AB guideline *Check for contra-indications / interactions*

## Necrotising Fasciitis / Gas Gangrene / Fournier's Gangrene

**Urgent surgical review. Debridement main stay of treatment.**

| | 1st Line | Mild Penicillin Allergy | Severe Penicillin Allergy / Anaphylaxis | Duration |
|---|---|---|---|---|
| **Empiric treatment** | Piperacillin/tazobactam IV 4.5g QDS<br>**Plus**<br>Clindamycin 900mg IV QDS<br><br>If Fournier's gangrene – add metronidazole IV 500mg TDS to above | Linezolid* IV 600mg BD<br>**plus**<br>Ceftazidime IV 2g TDS<br>**plus**<br>Metronidazole IV 500mg TDS | Linezolid* 600mg BD IV<br>**Plus**<br>Ciprofloxacin** IV 400mg BD<br>**Plus**<br>Metronidazole IV 500mg TDS | Min 7 days post last debridement |
| **If common Pathogen Identified**<br>Group A Strept;<br>*Staphylococcus aureus* | Clindamycin IV 900mg QDS (if organism is resistant to Clindamycin use Linezolid IV 600mg BD instead if no significant drug interactions)<br>**Plus**<br>**If Group A Streptococcus (GAS)**<br>Benzylpenicillin IV 2.4g QDS<br>**or**<br>**If MSSA**<br>flucloxacillin IV 2g QDS IV or<br>**or**<br>**If PVL MSSA/risk of PVL MSSA**<br>linezolid IV 600mg BD | Clindamycin IV 900mg QDS<br>(if organism is resistant to Clindamycin use Linezolid IV 600mg BD instead if no significant drug interactions)<br>**Plus**<br>**If MSSA or Group A Streptococcus (GAS)**<br>Teicoplanin IV 12mg/kg 12hourly for 3 doses and then OD (round to nearest 100mg)<br>**or**<br>**If PVL MSSA/risk of PVL MSSA**<br>linezolid IV 600mg BD<br><br>PVL = Panton Valentine Leukocidin | | Min 7 days post last debridement |

**If Clostridium sp identified Please discuss with consultant microbiologist.**
**If GAS – inform UKHSA**

**Review at 48 hours.**

NB: Higher doses of Clindamycin/ immunoglobulin may be required in patients on intensive care – esp for GAS, PVL MSSA associated Necrotising fasciitis. Urgent discussion with on-call microbiologist is required.

**Comment** - Theatre samples are precious and must be sent for culture & sensitivity.
*discuss with microbiologist if there is a significant drug reaction. For instance SSRIs/Opioids)
** see MHRA warning

# 18 Surgical Site Infections

**Check MRSA status and contact microbiologist if positive.**

| Graft / Stump Infection | | | |
|---|---|---|---|
| **1st Line** | **Mild Penicillin allergy** | **Serious penicillin allergy and/or high risk of MRSA**** | **Duration** |
| Co-amoxiclav IV 1.2g TDS<br><br>**Oral option**<br>Co-amoxiclav PO 625mg q8h | Cefuroxime IV 1.5g TDS<br>**Plus**<br>Metronidazole IV 500mg TDS<br><br>**Oral option**<br>Cefaclor 500mg PO TDS<br>**Plus**<br>Metronidazole PO 400mg TDS | Teicoplanin IV 12mg/kg* 12hourly for 3 doses then OD (round to nearest 100mg)<br>**plus**<br>Metronidazole IV 500mg TDS<br>**plus**<br>Ciprofloxacin IV 500mg BD (See MHRA warning)<br>**Review with microbiologist after 48hours and for oral option**<br>*Review dose once deep seated infection excluded | Ongoing management and duration of therapy to be discussed with Microbiology during working hours |

| Wound Infection Post Clean Procedures | | | |
|---|---|---|---|
| **1st Line** | **Mild Penicillin allergy** | **Serious penicillin allergy** | **Duration** |
| Flucloxacillin IV 1g QDS or<br>PO 500mg QDS.<br>Review IV antibiotics at 48 hours | Cefalexin PO 500mg TDS | Doxycycline PO 100mg BD<br>OR<br>Clindamycin IV/PO 600mg QDS (review with previous microbiology results and discuss with microbiologist if not improving in 48 hours) | 5 days (guided by clinical response**)** |
| **Check MRSA status and contact microbiologist if positive.** | | | |

| Wound Infection Post Clean-Contaminated Procedures | | | |
|---|---|---|---|
| **1st Line** | **Mild Penicillin allergy** | **Severe penicillin allergy or risk of MRSA / MRSA** | **Duration** |
| Co-amoxiclav IV 1.2g TDS<br>if severely unwell/septic - add<br>Metronidazole IV 500mg TDS<br>Plus<br>Gentamicin* IV **one stat dose** Refer to gentamicin policy and gentamicin calculator) | Cefuroxime IV 1.5g TDS<br>+/-<br>Metronidazole IV 500mg TDS | Teicoplanin IV 12mg/kg** 12hourly for 3 doses then OD (round to nearest 100mg)<br>**+/-**<br>Metronidazole IV 500mg TDS<br>**plus**<br>Gentamicin*IV **one stat dose** (Refer to gentamicin policy and gentamicin calculator)<br>**If deep source is excluded – review teicoplanin dose | Duration of therapy, the need for further gentamicin after 24 hours and oral option to be discussed with microbiologist in working hours<br>Consider CT scan to guide management |
| **Note**: If serum creatinine is not yet known then 5mg/kg may still be initiated unless 70 years or above or there is evidence of existing severe renal impairment. CrCl must still be calculated once U+Es are available. ALL SUBSEQUENT DOSES MUST BE ADJUSTED AS PER CrCl once known. Must check pre-dose level as per policy. | | | |

| Wound infection post contaminated procedures and dirty procedures or trauma | | | |
|---|---|---|---|
| **1st Line** | **Mild Penicillin allergy** | **Severe penicillin allergy or risk of MRSA** | **Duration** |
| Co-amoxiclav IV 1.2g TDS<br>**Plus**<br>Metronidazole IV 500mg TDS<br>**plus**<br>Gentamicin* stat (Refer to gentamicin policy and gentamicin calculator) | Cefuroxime IV 1.5g TDS<br>**plus**<br>Metronidazole IV 500mg TDS | Teicoplanin IV 12mg/kg 12hourly for 3 doses then OD (round to nearest 100mg)<br>**PLUS**<br>Metronidazole IV 500mg TDS<br>**plus**<br>Gentamicin* (Refer to gentamicin policy and gentamicin calculator)<br>******Ensure patient is discussed with microbiologist after 1st dose for further management****** | **Discuss with Microbiology during working hours** |
| ***Note:** If serum creatinine is not yet known then 5mg/kg may still be initiated unless 70years or above or there is evidence of existing severe renal impairment. CrCl must still be calculated once U+Es are available. **ALL SUBSEQUENT DOSES MUST BE ADJUSTED AS PER CrCl once known. Must check pre-dose level as per policy.** | | | |

# 19 Central Nervous System

## Central Nervous System

**ALL suspected cases of meningitis MUST be discussed with Consultant Microbiologist at first opportunity (during working hours) and reported to UKHSA. Meningococcal sepsis and H influenzae require prophylaxis of contacts**

**Microbiological specimens**

- CSF
- Blood culture
- Throat swab for meningococci
- Urine for pneumococcal antigen
- EDTA blood for meningococci PCR

Serology viruses / cryptococcus [HIV / Immunocompromised] as appropriate

**The choice of agent should take into account the patient's risk for C. difficile infection**

## Meningitis WITH NO FEATURES OF ENCEPHALITIS: initial blind therapy - Notifiable disease

Meningococcal meningitis suspected and accompanied with purpuric non-blanching rash or signs of meningitis

**Common Pathogen(s)** *Streptococcus pneumoniae; Neisseria meningitides;* Haemophilus influenzae; Listeria monocytogenes.

**If recent travel – please discuss with microbiologist**

**Dexamethasone IV 10mg before or at the same time as initial antibiotic therapy should be given. Dexamethasone can be initiated up to 12 hours after the first dose of antibiotics**

**Continue 6 hourly for 4 days only if pneumococcal meningitis confirmed or likely.**

| 1st Line | Mild Penicillin allergy | Severe penicillin allergy / Anaphalysis | Duration |
|---|---|---|---|
| Ceftriaxone IV 2g BD<br><br>**If high risk for Listeria e.g. immunocompromised, >55 years, pregnant, history of alcohol abuse or diabetes**<br>**Add in**:<br>Amoxicillin IV 2g every 4 hours | Ceftriaxone IV 2g BD<br>**If high risk for Listeria e.g. immunocompromised, >55 years, pregnant or history of alcohol abuse or diabetes**<br>Add in:<br>Co-trimoxazole IV120mg/kg/day in 2-4 divided doses<br>**Or**<br>Meropenem IV 2g TDS (Meropenem also covers Listeria alone – so do not add co-trimoxazole or ceftriaxone) | Chloramphenicol may be used if history of immediate hypersensitivity reaction to penicillin or cephalosporins. Choramphenicol IV 25mg/kg QDS (providing high doses reduced as clinically indicated) (plasma concentration monitoring required in elderly and hepatic impairment)<br><br>Add in:<br>Co-trimoxazole IV 120mg/kg/day in 2-4 divided doses if high risk for Listeria. (when using chloramphenicol) | **Depends on organism** |

**If no features of encephalitis -**
**NO aciclovir even if HSV positive as this increases risk of recurrent meningitis**

| Meningitis Caused by *Meningococci* | | | |
|---|---|---|---|
| **Common Pathogen(s)** *Meningococci*<br>Notifiable disease – Please inform UKHSA | | | |
| **1st Line** | **Mild Penicillin allergy** | **Severe penicillin allergy / Anaphylaxis** | **Duration** |
| Benzylpenicillin IV 2.4g every 4 hours | Ceftriaxone IV 2g BD | Discuss with microbiologist | 7 days |

| Meningitis Caused by Pneumococci | | |
|---|---|---|
| **Common Pathogen(s)** *Pneumococci*<br>Notifiable disease – Please inform UKHSA | | |
| **1st Line / Mild Penicillin allergy** | **Severe penicillin allergy / Anaphylaxis** | **Duration** |
| Ceftriaxone IV 2g BD | Discuss with microbiologist | 14 days |
| **Comment**<br>Dexamethasone 10mg q6h PO for 4 days started with first dose of antibiotics. | | |

| Meningitis Caused by Haemophilus Influenzae | | |
|---|---|---|
| **Common Pathogen(s)** *Haemophilus influenzae*<br>Notifiable disease – Please inform UKHSA | | |
| **1st Line / Mild Penicillin allergy** | **Severe penicillin allergy / Anaphylaxis** | **Duration** |
| Ceftriaxone IV 2g BD | Discuss with microbiologist | 10 days |

| Meningitis Caused by Listeria | | | |
|---|---|---|---|
| **Common Pathogen(s)** *Listeria*<br>Notifiable disease – Please inform UKHSA<br>**Comment**<br>Consider this as a possible cause if history of alcohol abuse | | | |
| **1st Line** | **Mild Penicillin allergy** | **Severe penicillin allergy / Anaphylaxis** | **Duration** |
| Amoxicillin IV 2g every 4hours<br>**plus**<br>Gentamicin*[stop gentamicin after 7-days].<br>(Refer to gentamicin policy and gentamicin calculator) | Meropenem IV 2g TDS | Co-trimoxazole IV 120mg/kg/day in 3-4 divided doses | 21 days |
| ***Note:** If serum creatinine is not yet known then 5mg/kg may still be initiated unless 70year or above or there is evidence of existing severe renal impairment. CrCl must still be calculated once U+Es are available. **ALL SUBSEQUENT DOSES MUST BE ADJUSTED AS PER CrCl once known. Must check pre-dose level as per policy.** | | | |

| Brain Abscess / Subdural Empyema | | |
|---|---|---|
| **1st Line / Mild Penicillin allergy** | **Severe penicillin allergy / Anaphylaxis** | **Duration** |
| Ceftriaxone IV 2g BD<br>**plus**<br>Metronidazole IV 500mg TDS (PO 400mg TDS) | Linezolid IV 600mg BD (if Contra -indicated – see BNF - use vancomycin IV instead)<br>**Plus**<br>Ciprofloxacin IV 400 BD (See MHRA warning)<br>**Plus**<br>Metronidazole IV 500mg TDS | Min 6 weeks - discuss duration of therapy with Neurosurgery / Microbiology during working hours |
| **Comment** Refer to Neurosurgery**.** | | |

| Intracranial abscess - Post Surgical / Penetrating craniocerebral injuries / Contiguous spread from nearby tissues (Ear Infections) | |
|---|---|
| **1st Line** | **Duration** |
| Ceftazidime IV 2g TDS<br>**Plus**<br>Linezolid IV 600mg BD (if Contra -indicated – see BNF - use vancomycin IV instead)<br>**Plus**<br>Metrondazole IV 500mg TDS | Min 6 weeks - discuss duration of therapy with Neurosurgery / Microbiology during working hours |

| Encephalitis | |
|---|---|
| **Common Pathogen(s)** *Herpes simplex(HSV): Varicella zoster (VZV)*<br>**Encephalitis means brain parenchyma has been infected which can lead to manifestations such as altered consciousness/behavior, confusion, focal deficits, seizures.** | |
| **1st Line** | **Duration** |
| Aciclovir* IV 10mg/kg TDS<br>All treatment must be IV.<br>*To avoid excessive dosage in obese patients parenteral dose should be calculated on the basis of ideal weight for height | **VZV – 10-14days**<br>**HSV -**<br>• If good clinical response - treat for 14days -repeat lumbar puncture around day 14 and if PCR negative – can stop treatment or if PCR positive – continue for another 7 days - repeat lumbar puncture and discuss with microbiologist.<br>• If good clinical response and LP not possible - treat for 21days.<br>• If a good response is not seen at 21 days of treatment – continue aciclovir and repeat LP weekly and treat until HSV PCR negative |

| Meningo-Encephalitis | | | |
|---|---|---|---|
| **Encephalitis means brain parenchyma has been infected which can lead to manifestations such as altered consciousness / behavior, confusion, focal deficits, seizures.** | | | |
| **1st Line** | **Mild Penicillin allergy** | **Severe penicillin allergy / Anaphylaxis** | **Duration** |
| Ceftriaxone IV 2g BD<br>**Plus**<br>Aciclovir* IV 10mg/kg TDS All treatment must be IV<br><br>**If high risk for Listeria** e.g. immunocompromised, >55 years, pregnant, history of alcohol abuse or diabetes<br>**Add in**:<br>Amoxicillin IV 2g every 4hours | Ceftriaxone IV 2g BD IV<br>**Plus**<br>Aciclovir* IV 10mg/kg TDS<br>All treatment must be IV.<br><br>**If high risk for Listeria** e.g. immunocompromised, >55 years, pregnant or history of alcohol abuse or diabetes<br>Add in:<br>Co-trimoxazole IV 120mg/kg/day in 2-4 divided doses<br>**Or**<br>Meropenem 2g TDS IV (Meropenem also covers Listeria alone – so do not add co-trimoxazole or ceftriaxone) | Chloramphenicol may be used if history of immediate hypersensitivity reaction to penicillin or cephalosporins.<br>Choramphenicol IV 25mg/kg QDS (providing high doses reduced as clinically indicated) (plasma concentration monitoring required in elderly and hepatic impairment)<br>**Plus**<br>Aciclovir* IV 10mg/kg TDS<br>All treatment must be IV<br><br>**If high risk for Listeria.** e.g. immunocompromised, >55 years, pregnant, history of alcohol abuse or diabetes<br>Add in:<br>Co-trimoxazole IV 120mg/kg/day in 2-4 divided doses | **Depend on organism isolated – see above** |

# 20 Genital Infection

| Genital Infection |
|---|
| Microbiological specimens<br>• Please refer to individual Trust protocols and procedures for Genito-Urinary Medicine. Link to BASHH guidelines.<br>• High level of resistance to Penicillin and Quinolones which favour single dose Ceftriaxone for Gonorrhoea.<br>• The choice of agent should take into account the patient's risk for C. difficile infection.<br>• Most common cause of Epididymo-orchitis is Mumps. Please note this is a notifiable disease to Public Health England. |

| Chlamydia (uncomplicated) | |
|---|---|
| **Common Pathogen(s)** Chlamydia trachomatis BASSH guideline link | |
| **1st Line** | **2nd Line** |
| Doxycycline 100mg BD PO for 7 days (C/I in pregnancy and breastfeeding)<br>**OR**<br>Azithromycin 1g PO as a single dose followed by 500mg OD for 2 days | Ofloxacin PO 200mg BD or 400mg OD PO for 7 days (Non-pregnant). (see link on MHRA warning on quinolones)<br>**or**<br>Erythromycin PO 500mg BD for 14 days (70% cure rate) |
| **Comment**<br>Refer to GUM and treat sexual partners.<br>Women:<br>Vulvo-vaginal swab.<br>Men:<br>First voided urine sample.<br>Urethral swab. | |

| Gonorrhoea (uncomplicated) | |
|---|---|
| **Common Pathogen(s)** Neisseria gonorrhoeae. | |
| **1st Line** | **2nd Line** |
| Ceftriaxone 1g IM as a single dose<br>Or<br>if antimicrobial sensitivities known Ciprofloxacin 500mg as a single dose (see MHRA leaflet)<br><br>**All patients diagnosed with gonorrhoea: advise patients to return for test of cure**<br><br>**If acquired infection in the Asia-Pacific region** (when antimicrobial susceptibility unknown)- Discuss with Genito-Urinary Medicine Clinic (GUM clinic) | Contact GU Medicine/ Treat on basis of susceptibility of isolate |
| **Comment**<br>**Refer to GUM and treat sexual partners.**<br>Women:<br>Vulvo-vaginal swab for NAAT<br>Cervical swab for culture<br>Rectal / oropharnygeal tests if symptomatic/ at risk at these sites/history of anal sex<br>Men:<br>Urine (ideally first pass urine) for NAAT test<br>Urethral swab for microscopy and culture.<br>Rectal swab for MSM<br>Oropharnygeal tests if symptomatic at these sites if hx of travel to Asian-pacific regions or if genital infection shows resistant strains | |

| Pelvic Inflammatory Disease | | |
|---|---|---|
| **Common Pathogen(s)** Neisseria gonorrhoeae; Chlamydia trachomatis; Mixed Anaerobes; Enteric organisms. | | |
| **1st Line** | **2nd Line**<br>**Severe Penicillin Allergy / Anaphylaxis** | **Duration** |
| Ceftriaxone IV 2g BD<br>**plus**<br>Doxycycline PO 100mg BD<br><br>Continue first line treatment for 24 hours after clinical improvement and then follow with:<br><br>Oral switch for total of 14days:<br>Doxycycline PO 100mg BD<br>**plus**<br>Metronidazole PO 400mg BD | Clindamycin IV 900mg TDS<br>**plus**<br>Gentamicin* IV<br>(Refer to gentamicin policy and gentamicin calculator) for 24hours after clinical improve and then switch to oral:<br><br>Oral switch:<br>Clindamycin PO 450mg QDS to complete 14days course<br>**Or**<br>Doxycyline PO 100mg BD<br>**plus**<br>Metronidazole PO 400mg BD to complete14 days course | **Total 14 days of IV and oral** |
| **Outpatient regimen** | Ofloxacin PO 400mg BD (see link on MHRA leaflet)<br>**plus**<br>Metronidazole PO 400mg BD | **14 days** |
| ***Note:** If serum creatinine is not yet known then 5mg/kg may still be initiated unless 70years or above or there is evidence of existing severe renal impairment. CrCl must still be calculated once U+Es are available. **ALL SUBSEQUENT DOSES MUST BE ADJUSTED AS PER CrCl once known. Must check pre-dose level as per policy.**<br>**Comment**<br>Doxycycline and Ofloxacin contraindicated in pregnancy.<br>Link to BASHH guidelines | | |

## Genital Herpes

**Common Pathogen(s)** *Herpes simplex* virus (HSV-1 and HSV-2).

| 1st Line | Duration |
|---|---|
| Aciclovir PO 400 mg TDS<br>**OR**<br>Valaciclovir PO 500mg BD | 5 days |

**Comment**

**NB: All cases of Herpes in pregnancy should be discussed with microbiologist**

Refer to GUM

Oral antivirals are indicated within 5 days of the start of the episode and while new lesions are forming.

Swab taken from base of lesion.

## Early and Late Syphilis

**Antibiotic - 1st line:** Discuss with GUM Clinic

## Vulvovaginal Candidiasis

**Common Pathogen(s)** *Candida albicans.*

| 1st Line | 2nd Line | Recurrent Disease |
|---|---|---|
| Fluconazole 150mg PO as a single dose (not if pregnant) | Clotrimazole vaginal pessary insert 500mg at night as a single dose | send swabs and request ID and Sensitivity of the yeast before initiating alternative treatments |

# 21 Bone and Joint

| Bone and Joint |
|---|
| **Microbiological specimens**<br>Joint aspirates<br>Synovial Tissue/Bone (operative sample)<br>Blood Culture<br>If GC STD samples as directed by GUM<br>The choice of agent should take into account the patient's risk for C. difficile infection |

| Septic Arthritis – (Not Prosethic Joint Infections) | | |
|---|---|---|
| **Common Pathogen(s)** Staphylococcus aureus. | | |
| **1st Line** | **Penicillin allergy and MRSA likely** | **Duration** |
| Flucloxacillin IV 2g QDS<br>**If sickle cell disease or immunocompromised or high risk of gram negatives (recent hospitalisation / procedures) or not responding – discuss with microbiologist** | Teicoplanin IV 12mg/kg 12 hourly for 3 doses then IV 12mg/kg OD<br>(round to nearest 100mg) | **4-6 weeks guided by clinical response (consider oral step down after 2 weeks – guide by sensitivity** |
| **Comment**<br>Clarithromycin should **NOT** be used. | | |

## Osteomyelitis – Acute

**All cases should be discussed Consultant to Consultant Microbiologist during working hours**

**Common Pathogen(s)** Staphylococcus aureus.

| 1st Line | Penicillin allergy and MRSA likely<br>Mild Penicillin Allergy | Duration |
|---|---|---|
| Flucloxacillin IV 2g QDS<br>**If sickle cell disease or immunocompromised or high risk of gram negatives (recent hospitalisation/procedures) or not responding – discuss with microbiologist** | Teicoplanin IV 12mg/kg 12hourly for 3 doses then IV 12mg/kg OD (round to nearest 100mg) | usually 6 weeks |

## Osteomyelitis - Chronic

**Common Pathogen(s)** Staphylococcus aureus; Occasionally coliforms.

**Antibiotic - 1st line**

Empiric regimes inappropriate unless patient is septic

If acute exacerbation, treat as acute osteomyelitis.

NB. Surface swabs are 40% correlated to causal organism. Suggest bone tissue/biopsy sample to be sent to microbiology. Treatment should be targeted to the organisms identified from the bone tissue/biopsy.

## Prosthetic joint infections

**Common Pathogen(s)** Staphylococcus; Propionibacteria.

**Antibiotic - 1st line:** Discuss between primary consultant and Consultant Microbiologist during working hours

| Sternum, Post Op | | |
|---|---|---|
| **All cases should be discussed Consultant to Consultant Microbiologist during working hours.**<br>**Common Pathogen(s)** Staphylococcus *aureus.* | | |
| **1st Line** | **2nd Line** | **Duration** |
| Vancomycin IV (dosed as per trust vancomycin guideline)<br><br>**<u>Oral option (superficial infection)</u>**<br>Doxycycline PO 100mg BD (check for sensitivity)<br>or<br>Clindamycin 600mg PO QDS (check for sensitivity) | Clindamycin IV 600mg QDS<br>**<u>Oral option (superficial infection)</u>**<br>Doxycycline PO 100mg BD<br>or<br>Clindamycin PO 600mg QDS<br>**MUST check on sensitivity for all options above** | **Discuss with microbiologist** |
| **Comment**<br>All cases should be discussed with microbiologist | | |

| Compound fracture |
|---|
| **(See guideline on Surgical Prophylaxis)** |

# 22 Cardiovascular

| Cardiovascular System |
|---|
| **ALL suspected / confirmed cases of endocarditis MUST be discussed with Microbiologists and Cardiologists during working hours and entered to the IE Care Pathway form.** |
| **Discuss with Microbiologist at first opportunity in working hours and daytime during the weekend (within 24 hours of suspected diagnosis)**<br>Microbiological specimens<br>• Three sets of blood cultures need to be taken before initiating antibiotics. If antibiotics already started, blood culture must be collected before next dose of antibiotic. Must LABEL BC AS ENDOCARDITIS for prolonged incubation and endocarditis specific Sensitivity testing and MIC determinations<br>• If blood culture negative endocarditis – send serology for *Coxiella*. Consider urine for Legionella antigen and throat swabs for viral atypical PCR. (Discuss with microbiologist for samples for *Bartonella*).<br>• Valve tissue at operation in sterile dry container without saline and inform the laboratory prior to delivery and deliver by hand to member of the senior laboratory staff for 16s rRNA PCR and other specialist molecular tests<br>• The below recommendations are for empiric therapy only. Targeted regimes will be provided by Consultant Microbiologist and Cardiologist.<br>• Vancomycin plus Gentamicin may accentuate renal impairment. |

## Native Valve Endocarditis:

**Discuss with Microbiologist at first opportunity in working hours and daytime during the weekend (within 24 hours of suspected diagnosis)**

**Initial "blind" therapy**

**Common Pathogen(s)** *Streptococcal spp*

| Line | 1st | Mild Penicillin Allergy / Risk of MRSA | Severe penicillin allergy / MRSA | Duration |
|---|---|---|---|---|
| **No Sepsis** | Amoxicillin 12g/day IV in 4-6 divided doses<br>**Plus**<br>Ceftriaxone IV 2g BD<br><br>*If renal impairment – discuss with microbiologist with gentamicin | Vancomycin IV<br>(see vancomycin policy aim for therapeutic levels of 15-20mg/L)<br>**Plus**<br>Ceftriaxone IV 2g BD | Vancomycin IV<br>(see vancomycin policy intermittent aim for therapeutic levels of 15-20mg/L)<br>**Plus**<br>Gentamicin * (3mg/kg OD – see policy for monitoring, trough level <1mgl/l).<br>*If renal impairment – discuss with microbiologist with gentamicin | **Discuss with microbiologist / refer to endocarditis MDT** |
| **Sepsis with or without MRSA** | Vancomycin IV (see vancomycin policy aim for therapeutic levels of 15-20mg/L)<br>**Plus**<br>ceftriaxone IV 2g BD | | Vancomycin IV (see vancomycin policy aim for therapeutic levels of 15-20mg/L)<br>**Plus**<br>gentamicin * (3mg/kg OD – see policy for monitoring). trough level <1mgl/l).<br>*If renal impairment – discuss with microbiologist with gentamicin | |

**Comment**

Specific management **MUST** be based on organism isolated/ MIC. Gentamicin should not be beyond 2 weeks.

Vancomycin Intermittent dosing target: Pre-dose 15-20mg/L level.

| Prosthetic Valve Endocarditis or Negative Blood Culture | |
|---|---|
| **Discuss with Microbiologist at first opportunity in working hours and daytime during the weekend (within 24 hours of suspected diagnosis)**<br>**Common Pathogen(s)**<br>Staphylococcal spp<br>**Initial "blind" therapy** | |
| **Antibiotic - 1st Line** | **Duration** |
| **Antibiotic - 1st line**<br>Vancomycin IV (dosed as per trust vancomycin guideline)<br>**plus**<br>Rifampicin PO 600mg BD (if weight is <80kg – 450mg BD)<br>**plus**<br>*Gentamicin as per gentamicin policy (8). Discuss continuation of Gentamicin beyond 48 hours with Microbiology.<br>*If renal impairment – discuss with microbiologist with gentamicin | Discuss with microbiologist |
| **Comment**<br>Specific management **MUST** be based on organism isolated/ MIC.<br>Vancomycin target: Pre-dose 15-20mg/L level.<br>Gentamicin should not be beyond 2 weeks. | |

## Cardiovascular System: Pacemaker Infections

**ALL suspected / confirmed cases of infected implantable cardiac electronic devices MUST be discussed with Microbiologists and Cardiologists**

Microbiology specimens

1. For early (<30 days) post implantation inflammation / uncomplicated superficial wound infection without fluctuance, discharge or dehiscence AND without systemic symptoms or signs of infection – address any obvious cause and take blood cultures. Wound should be reviewed by appropriate personnel (ideally implanting physician, if unavailable on-call cardiology registrar)
2. For generator pocket infection – If evidence of severe sepsis take 3 sets of blood cultures within 1h, then give antibiotics. If no evidence of sepsis withhold antibiotics and take three sets of blood cultures at different times >6h apart, organise echocardiography and urgent cardiology review with a view to prompt removal of entire system and temporary pacing if needed. Theatre samples during extraction – lead fragments (proximal and distal), lead vegetation, generator pocket tissue (-2sq.cm) and pus aspirated from generator pocket wound (swabs are least preferred samples)

The below recommendations are for empiric therapy only. Targeted regimes will be provided by Consultant Microbiologist and Cardiologist.

| Superficial Incisional infection of cardiac implantable device | | |
|---|---|---|
| Early post implantation inflammation (<30 days and blood culture negative) Duration 7-10days and review<br>Uncomplicated generator pocket infection - Duration 10-14days and review | | |
| **Antibiotic - 1st Line** | **Penicillin allergy -<br>If risk of MRSA / high risk of MRSA** | **Duration** |
| Flucloxacillin PO 1g QDS | Linezolid PO 600mg BD<br>**If linezolid is not tolerated or contraindicated (review with sensitivity )**<br>Doxycycline PO 100mg BD<br>Or<br>Clindamycin PO 600mg QDS | 7- 10 days |
| **Discuss with microbiologist during working hours** | | |
| **Comment**<br>Specific management **MUST** be based on organism isolated/ MIC.<br>Device may be left in situ. | | |

| Implantable Cardiac Electronic Device -<br>Pocket Infection, lead infection, related infective endocarditis and/or systemic infections |
|---|
| **Common Pathogen(s)** |
| **Antibiotic - 1st line**<br>Discuss with microbiologist and cardiologist |

# 23 Sepsis

| Sepsis |
| --- |
| **Microbiological specimens**<br>• Blood Culture 2 sets (3 if for endocarditis)<br>• For line infection blood cultures should be taken both peripherally and from all lines / lumens at the same time and correctly labelled (send to lab as soon as possible<br>• Line tips should be sent if infected line is removed.<br>• Other samples as indicated under specific organ system investigations.<br>• The choice of agent should take into account the patient's risk for C. difficile infection.<br>• Where source of septicaemia is known, please refer to guidance under relevant body systems. |

## Septicaemia from UNKNOWN origin (non-neutropenic patient)

**If any organ dysfunction is suspected -Refer to Trust Guidelines and Sepsis Pathway**
**Common Pathogen(s) Multiple pathogens.**

| 1st Line | Mild penicillin allergy or patients with liver cirrhosis at risk of hepatorenal syndrome: | Severe penicillin allergy / Anaphylaxis | Duration |
|---|---|---|---|
| Gentamicin* IV Refer to gentamicin policy (8)<br>**Plus**<br>Amoxicillin IV 2g TDS<br>**plus**<br>Metronidazole IV 500mg TDS [if intrabdominal sepsis suspected].<br><br>**Or if gentamicin contraindicated/ renal impairment (<30ml/min)**– check for dose adjustment) – switch to Cefuroxime IV 1.5g TDS<br>**Plus**<br>Metronidazole IV 500mg TDS<br><br>**MRSA/ MSSA colonised:**<br>Replace Amoxicillin with Flucloxacillin IV 2g QDS (MSSA) or Vancomycin IV (dosed as per trust vancomycin guideline) (MRSA). | Cefuroxime IV 1.5g TDS<br>**plus**<br>metronidazole IV 500mg TDS<br>**Plus**<br>Gentamicin* IV **STAT** (Refer to gentamicin policy (8) **(If need to continue gentamicin – please discuss with microbiologist)** | Teicoplanin IV 12mg/kg 12hourly for 3doses then IV 12mg/kg OD (round to nearest 100mg)<br>**Plus**<br>Metronidazole IV 500mg TDS<br>**Plus**<br>Gentamicin*IV (click here for full gentamicin policy (8))<br><br>Or if gentamicin contraindicated/ **renal impairment** (<30ml/min – check for dose adjustment) – discuss with microbiologist | **Review after 48 hours and depending on the source of infection** |

***Note:** If serum creatinine is not yet known then 5mg/kg may still be initiated unless 70years or above or there is evidence of existing severe renal impairment. CrCl must still be calculated once U+Es are available. **ALL SUBSEQUENT DOSES MUST BE ADJUSTED AS PER CrCl once known. Must check pre-dose level as per policy.**

**Comment**
All hospital admissions MUST receive a screen for MSSA/ MRSA as per local policy. All patients with MSSA or MRSA bacteraemia must receive an echocardiogram and at least 14 days of IV treatment with clearance blood culture after 48h

| Sepsis from UNKNOWN Origin (Obstetric Patients), any Gestation or 6 weeks Post-Partum | | |
|---|---|---|
| **Common pathogen(s)** Gram positive, gram negative organisms and anaerobes | | |
| **1st Line and Mild penicillin allergy** | **Severe penicillin allergy / Anaphylaxis** | **Duration** |
| Cefuroxime IV 1.5g TDS [1,2]<br>**Plus**<br>Metronidazole IV 500mg TDS [1,2] (If breastfeeding – review after 3days)<br>**Plus**<br>Gentamicin* **stat only and discuss with microbiologist** [1,2](Refer to gentamicin policy and gentamicin calculator)<br>**Use booking in weight or if patient is obese ie. 20% over ideal body weight - use adjusted body weight**<br>**Consider Listeriosis – consider specific treatment with microbiologist** | Clindamycin IV 600mg QDS<br>**Plus**<br>Gentamicin* IV (Refer to gentamicin guideline and gentamicin calculator) **Use booking in weight or if patient is obese ie. 20% over ideal body weight - use adjusted body weight**<br>**Plus**<br>Teicoplanin IV 12mg/kg 12hourly for 3 doses then IV 12mg/kg OD (round to nearest 100mg) **if severely septic or risk of MRSA**<br>**Consider Listeriosis – consider specific treatment with microbiologist** | Discuss with microbiologist after 24hours and<br>as per clinical response |

**Note:*** If serum creatinine is not yet known then 5mg/kg may still be initiated unless 70years or above or there is evidence of existing severe renal impairment. CrCl must still be calculated once U+Es are available. **ALL SUBSEQUENT DOSES MUST BE ADJUSTED AS PER CrCl once known. Must check pre-dose level as per policy.**

**Comment**

Gentamicin **-** Due to the limited data and the theoretical risk of ototoxicity and nephrotoxicity, the use of parenteral gentamicin in pregnancy is reserved except for the treatment of serious or life-threatening conditions unresponsive to standard antibiotic therapy. If parenteral gentamicin is required in pregnancy, close monitoring of maternal serum concentrations is advised, with the dose being adjusted as necessary.

**References**

Toxbase https://www.toxbase.org/Exposure-in-pregnancy/ <accessed 11/2/24>

Briggs G, Freeman R et al, Drugs in pregnancy and lactation. 9th ed.

Schaefer C, Peters P, et al. Drugs during pregnancy and lactation. 3rd ed.

Specialist Pharmacy Service. Metronidazole during breastfeeding.22nd Dec 23 Using metronidazole during breastfeeding – SPS - Specialist Pharmacy Service – The first stop for professional medicines advice <11/1/24>

## IV Line Associated infections

- Discontinue and discard current TPN bag and monitor blood glucose levels as sudden withdrawal of feeding may lead to hypoglycaemia.
- DO NOT USE the line for administration of any medicines until results of blood cultures are back and discussed results with microbiology
- Collect Cultures:
- Blood cultures through line (all lumens if more than one).
- Peripheral blood cultures.
    - Ensure blood cultures and requests are labelled as central line and peripheral so they can be distinguished.
    - Ensure that cultures taken from separate lumens/ports are labelled clearly. Ideally line and peripheral cultures should be taken simultaneously or within 10 minutes of each other, with at least 10ml being required for each bottle.
- Exit swab if any discharge or erythema present.

- **Remove line if possible / if no longer needed** – if not possible – discuss with microbiologist – especially if considering line locks to appropriate antibiotics based on sensitivities.
- If the patient is on Parenteral Nutrition contact the Nutrition Support Team (NST) as dependent on the pathogen, line salvage could be necessary rather than line removal"
- Line tips should be sent if infected line is removed.

For line infection blood cultures should be taken both peripherally and from all lines.

- Other samples as indicated under specific organ system investigations.
- The choice of agent should take into account the patient's risk for C. difficile infection.

| Line-associated Bacteraemia (peripheral and central cannulae) and Tunnel track infections (Hickman line) | |
|---|---|
| **Common Pathogen(s)**<br>Staphylococcus aureus; Hickman/ long lines may have Enterobacteriaceae | |
| **1st Line** | **Duration** |
| Teicoplanin IV 12mg/kg 12hourly for 3 doses and then OD (round to nearest 100mg)<br>**Plus** Gentamicin for 48hours while awaiting culture results in patients with central line. (click here for full gentamicin policy and gentamicin calculator) | **2 weeks** |
| **Note:** If serum creatinine is not yet known then 5mg/kg may still be initiated unless 70year or above or there is evidence of existing severe renal impairment. CrCl must still be calculated once U+Es are available. **ALL SUBSEQUENT DOSES MUST BE ADJUSTED AS PER CrCl once known. Must check pre-dose level as per policy.** | |

## 24 IV Infusion Sites Infection

| IV infusion sites infections – Exit site infections | | | | |
|---|---|---|---|---|
| | **1st** | **Mild Penicillin Allergy** | **Severe penicillin allergy / Anaphylaxis** | **Duration** |
| **Exit site infections** (inflammation within 2 cm of catheter exit site) **If no systemic features** **If MRSA – discuss with microbiologist** | Flucloxacillin IV 1-2g QDS Or Flucloxacillin PO 1g QDS | Cefuroxime IV 750mg-1.5g TDS or Cefalexin PO 500mg TDS | Cotrimoxazole PO/IV 960mg BD | Ideally for 7 days duration dependent on clinical response with discussion with microbiologist |
| | Swab of exudate at exit site for MCS<br>- Clean site with 0.5 – 2% alcoholic chlorhexidine, tincture of iodine or 70% alcohol.<br>- Redress daily: Choice of dressing depends on the presence of exudate<br>NB: Review with sensitivities if culture positive.<br>If severe infection/not improving despite appropriate treatment – discuss with microbiologist about urgent line removal e.g., pus, cellulitis or tunnel infection are present; | | | |
| **If systemic features including raised temperature:** Blood cultures from each lumen of the intravascular catheter and peripherally | Vancomycin IV (dosed as per trust vancomycin guideline)<br>**Plus**<br>Gentamicin* IV stat<br>(click here for full gentamicin policy and gentamicin calculator)<br>Discuss further treatment with microbiologist | | | |
| ***Note:** If serum creatinine is not yet known then 5mg/kg may still be initiated unless 70year or above or there is evidence of existing severe renal impairment. CrCl must still be calculated once U+Es are available. **ALL SUBSEQUENT DOSES MUST BE ADJUSTED AS PER CrCl once known. Must check pre-dose level as per policy.** | | | | |

| Tunnel Infection | | | | |
|---|---|---|---|---|
| | **1st** | **Mild Penicillin Allergy** | **Severe penicillin allergy / Anaphylaxis or MRSA** | **Duration** |
| **Tunnelled site infections**<br><br>**Swab MCS, if exudate at exit site.**<br>**- Blood culture**<br><br>**REMOVE INTRAVENOUS CATHETER**<br><br>Review with sensitivities if culture positive | Flucloxacillin IV 1-2g QDS<br>or<br>Flucloxacillin PO 1g QDS<br><br>If systemically unwell – add Gentamicin* IV stat<br>(click here for full gentamicin policy and gentamicin calculator) and discuss with microbiologist | Cefuroxime IV 750mg-1.5g TDS<br><br>or<br>Cefalexin PO 500mg TDS | Vancomycin IV (dosed as per trust vancomycin guideline)<br>or<br>Cotrimoxazole PO 960mg BD (review with sensitivity)<br><br>If systemically unwell – add Gentamicin* stat<br>(click here for full gentamicin policy and gentamicin calculator) to vancomycin and discuss with microbiologist | Ideally for 7-14 days – duration dependent on clinical response with discussion with microbiologist |
| ***Note:** If serum creatinine is not yet known then 5mg/kg may still be initiated unless 70year or above or there is evidence of existing severe renal impairment. CrCl must still be calculated once U+Es are available. **ALL SUBSEQUENT DOSES MUST BE ADJUSTED AS PER CrCl once known. Must check pre-dose level as per policy** | | | | |

# 25 Neutropenic / Immunocompromised

| Neutropenic / Immunocompromised patients |
|---|
| Discuss all suspected cases of neutropenic sepsis with Haematologists/acute oncology team and Microbiologists during working hours<br>Microbiological specimens<br>Please refer to individual Trust protocols and procedures for Haematology (CORP/PROT/003 (17))and Oncology<br>**Avoid Gentamicin in patients receiving Platinum based chemotherapy, use Meropenem (in haematology patients), piperacillin-tazobactam alone can be used in oncology in this group of patients** |

## Treatment of fever or sepsis in neutropenic patients

Fever of 38.3°C or more on one occasion, or 38.0°C or more sustained for 1 hour in a patient at risk of neutropenia e.g. post chemotherapy.

**Never wait for results before starting IV antibiotics.**

Refer to Trust Policy for Management of Infection in Neutropenic Patients.

**Common Pathogen(s)**

Gram positive pathogens; Gram negative pathogens which can lead to shock, multiorgan failure and death

**Local decision to use combination of piperacillin-tazobactam and gentamicin outside NICE clinical guidance 151 on Neutropenic Sepsis due to local resistance pattern.

| Antibiotic - 1st Line | 2nd Line with failure / Mild penicillin allergy | Severe penicillin allergy | Duration |
|---|---|---|---|
| Piperacillin-tazobactam IV 4.5g QDS<br>**plus**<br>Gentamicin*(omit gentamicin in all oncology patients- unless signs of severe sepsis – see oncology policy<br>(click here for full gentamicin policy)<br><br>In renal impairment, use one single dose of Gentamicin only.<br>Review Gentamicin at 48 hours unless otherwise instructed. | Meropenem IV 1g TDS (monitor closely if previous penicillin anaphylaxis) | Contact microbiologist | As per clinical response |
| If patient has shared care with other hospitals meropenem may need to be used with Amikacin please discuss with parent unit | | | |

**Note:** If serum creatinine is not yet known then 5mg/kg may still be initiated unless 70year or above or there is evidence of existing severe renal impairment. CrCl must still be calculated once U+Es are available. **ALL SUBSEQUENT DOSES MUST BE ADJUSTED AS PER CrCl once known. Must check pre-dose level as per policy.**

# 26 MRSA / MSSA skin decolonisation regimes

The aim is not to eradicate, but to reduce the MRSA bio-burden to such a level that the cycle of colonisation to infection is prevented for the individual patient. Bio-burden reduction will also reduce patient-to-patient transmission of MRSA. The use of this regime without the removal of IV lines or urinary catheters will reduce the success. MRSA decolonisation regimes are available as quicklists on medchart – under adult – MRSA topicals.

## 26.1 Body procedure (Inpatient)

### 26.1.1 In patient bio-burden reduction (Adults)

- **Mupirocin 2% nasal ointment** – Apply locally into anterior nares (patient should taste it in back of throat) 3 times a day for 5 days.
- 2nd line for mupirocin resistant strain or mupirocin hypersensitivity OR MUPIROCIN UNAVAILABILITY is Naseptin® (chlorhexidine 0.1% + neomycin) apply 4 times a day for 10 days. (IMPORTANT NOTE – some batches of Naseptin contains Arachis oil (peanut oil) and soya and therefore should not be taken / applied by patients known to be allergic to peanuts or soya.)

  Where patients have an allergy to peanuts (or nuts), soya or chlorhexidine, then Prontoderm gel light should be used THREE times daily for FIVE days.
- **Chlorhexidine gluconate 4% – (Hibiscrub® or equivalent) –** Use undiluted as a liquid soap body wash daily for 5 days (paying particular attention to the axilla and groin). Shampoo hair twice during the 5-day period on days 1 and 2. (Self-caring patients should be encouraged to shampoo their hair daily). Recommended contact time of 3-minutes before washing it off with water. (IF INTOLERANCE DEVELOPS DISCONTINUE USE IMMEDIATELY. Please contact the Infection Prevention team or on call Microbiologist for advice).

### 26.1.2 For patients with exfoliative skin conditions or allergy to chlorhexidine

Use Prontoderm as per (Elective Surgery)

## 26.2 Body procedure (Outpatient)

Prontoderm pack as per (Elective Surgery). **This consists of Prontoderm foam for daily skin and hair application for 5 days and Prontoderm Gel Light for nasal application, three times a day for 5 days**.

# 27 Antibiotic Dose in Renal Impairment

The following antibiotics may require dose adjustment in patients with reduced renal function. Recommendations are based on creatinine clearance (CrCl), which is an estimate of renal function (GFR).

**Creatinine Clearance Calculator (click here)**

Note: This calculation is based on the Cockcroft and Gault formula and is suitable for adults only. Creatinine Clearance is an estimation of GFR, but if the patient is morbidly obese, anuric or in acute renal failure, this equation will not give a true reflection of GFR.

Anuric patients can be assumed to have a CrCl<10mL/min.

**For deep seated infections or multi-drug resistant organisms please discuss with a consultant microbiologist. The general advice on doses in renal impairment in the table below may not always be appropriate in these situations. Examples include, but are not limited to:**

- Meningitis
- Infective endocarditis
- Prosthetic joint infections
- Pacemaker infections

**Please bear in mind that sepsis can commonly cause acute kidney injuries. If this is likely, full doses of antibiotics without narrow therapeutic index may be used in the first 24hours and then adjust according to subsequent renal function.**

This list is NOT exhaustive but includes the most commonly used antibiotics at this Trust that require dose adjustment in renal impairment. Please refer to the electronic Medicines Compendium for advice on antibiotic doses in renal impairment if antibiotic not listed here.

# 28 Table of Antibiotic Doses in Renal Impairment

**The dosing regimes below are for patients who are not on dialysis. For dialysis patients, please consult pharmacy.**

| Antibiotic | GFR and Reduction 1 | GFR and Reduction 2 | GFR and Reduction 3 |
|---|---|---|---|
| Aciclovir (IV) | **25-50mL/min:**<br>5-10mg/kg every 12 hours | **10-25mL/min:**<br>5-10mg/kg every 24 hours | **<10mL/min:**<br>2.5-5mg/kg every 24 hours |
| Aciclovir (oral) | **25-50mL/min:**<br>Dose as in normal renal function | **10-25mL/min:**<br>Herpes simplex 200mg 8 hourly or 6 hourly<br>Herpes zoster 800mg 8 hourly or 12 hourly | **<10mL/min:**<br>Herpes simplex 200mg 12 hourly<br>Herpes zoster 400-800mg 12 hourly |
| Amoxicillin | **20-50mL/min:**<br>Dose as in normal renal function | **10-20mL/min:**<br>Dose as in normal renal function | **<10mL/min:**<br>250mg – 1g 8 hourly<br>(max 6g per day in endocarditis) |
| Amphotericin (IV) Ambisome (liposomal) | **20-50mL/min:**<br>Dose as in normal renal function | **10-20mL/min:**<br>Dose as in normal renal function | **<10mL/min:**<br>Dose as in normal renal function |
| Benzylpenicillin | **20-50mL/min:**<br>Dose as in normal renal function | **10-20mL/min:**<br>600mg – 2.4g every 6 hours depending on severity of infection | **<10mL/min:**<br>600mg – 1.2g every 6 hours depending on severity of infection |
| Caspofungin | **20-50mL/min:**<br>Dose as in normal renal function | **10-20mL/min:**<br>Dose as in normal renal function | **<10mL/min:**<br>Dose as in normal renal function |
| Cefalexin | **40-50mL/min**:<br>Dose as in normal renal function | **10-40L/min:**<br>250-500mg 8 hourly or 12hourly | **<10mL/min:**<br>500mg 12hourly or 24hourly |

| Antibiotic | GFR and Reduction 1 | GFR and Reduction 2 | GFR and Reduction 3 |
|---|---|---|---|
| Cefaclor | **20-50ml/min**<br>Dose as in normal renal function | **10-20ml/min**<br>Dose as in normal renal function | **<10ml/min**<br>Dose as in normal renal function |
| Cefixime | **20-50mL/min:**<br>Dose as in normal renal function | **10-20mL/min:**<br>Dose as in normal renal function | **<10mL/min:**<br>200mg daily |
| Cefotaxime | **20-50mL/min:**<br>Dose as in normal renal function | **5-20mL/min:**<br>Dose as in normal renal function | **<5mL/min:**<br>Initial dose 1g then reduce dose by 50% and keep the frequency the same |
| Ceftazidime | **31-50mL/min:**<br>1g-2g 12 hourly | **16-30mL/min:**<br>1-2g every 24hours | **6-15mL/min:**<br>500mg – 1g every 24hours<br><5ml/min: 500mg-1g 48 hourly |
| Ceftriaxone | **20-50mL/min**:<br>Dose as in normal renal function | **10-20mL/min**:<br>Dose as in normal renal function | **<10mL/min:**<br>Dose as in normal renal function (maximum 2g daily) |
| Cefuroxime (IV) | **20-50mL/min**:<br>Dose as in normal renal function | **10-20mL/min**:<br>750mg-1.5g 12 hourly | **<10mL/min:**<br>750mg-1.5g 24 hourly |
| Ciprofloxacin | **30-50mL/min:**<br>Dose as in normal renal function | **10-30mL/min**:<br>50-100% of normal dose | **<10mL/min:**<br>50% of normal dose<br>100% of normal dose may be given for short periods in exceptional circumstances |
| Clarithromycin (IV) | **30-50mL/min:**<br>Dose as in normal renal function | **10-30mLmin:**<br>250-500mg 12 hourly | **<10mL/min:**<br>250-500mg 12 hourly |
| Clarithromycin (oral) | **30-50mL/min:**<br>Dose as in normal renal function | **10-30mL/min**:<br>250-500mg 12 hourly | **<10mL/min:**<br>250-500mg 12 hourly |

| Antibiotic | GFR and Reduction 1 | GFR and Reduction 2 | GFR and Reduction 3 |
|---|---|---|---|
| Clindamycin | **20-50ml/min**<br>Dose as in normal renal function | **10-20ml/min**<br>Dose as in normal renal function | **<10ml/min**<br>Dose as in normal renal function –may need dose reduction |
| Co-amoxiclav (IV) | **30-50mL/min:**<br>Dose as in normal renal function | **10-30mL/min:**<br>1.2g 12 hourly | **<10mL/min:**<br>1.2g stat, then 600mg 8 hourly<br>1.2g BD can be used |
| Co-amoxiclav (oral) | **30-50mL/min:**<br>Dose as in normal renal function | **10-30mL/min:**<br>Dose as in normal renal function | **<10mL/min:**<br>Dose as in normal renal function |
| Erythromycin | **20-50mL/min:**<br>Dose as in normal renal function | **10-20mL/min:**<br>Dose as in normal renal function | **<10mL/min:**<br>Dose as in normal renal function |
| Ethambutol | **20-50mL/min**:<br>Dose as in normal renal function | **10-20mL/min:**<br>15mg/kg every 24-36 hours<br>Another option is 7.5-15mg/kg/day | **<10mL/min:**<br>15mg/kg every 48 hours<br>Another option is 5-7.5mg/kg/day |
| Flucloxacillin | **20-50mL/min:**<br>Dose as in normal renal function | **10-20mL/min:**<br>Dose as in normal renal function | **<10mL/min:**<br>Dose as in normal renal function up to a total daily dose of 4g |
| Fluconazole | **20-50mL/min:**<br>50-100% of normal dose | **10-20mL/min:**<br>50-100% of normal dose | **<10mL/min:**<br>50% of normal dose |
| Gentamicin | Refer to Gentamicin Monitoring Guidelines<br>Once Daily Gentamicin | | |
| Isoniazid | **20-50mL/min:**<br>Dose as in normal renal function | **10-20mL/min:**<br>Dose as in normal renal function | **<10mL/min:**<br>200-300mg daily |

| Antibiotic | GFR and Reduction 1 | GFR and Reduction 2 | GFR and Reduction 3 |
|---|---|---|---|
| Linezolid | **20-50mL/min:**<br>Dose as in normal renal function | **10-20mL/min:**<br>Dose as in normal renal function | **<10mL/min:**<br>Dose as in normal renal function – but monitor closely |
| Levofloxacin | **20-50ml/min**<br>Initial dose 250–500 mg then 125 mg daily to 250 mg 12–24 hourly –* see other information | **10-20ml/min**<br>Initial dose 250–500 mg then 125 mg 12–48 hourly. * see other information | **<10ml/min**<br>Initial dose 250–500 mg then 125 mg 24–48 hourly. *see other information |
| | *other information: Drug Prescribing in Renal Failure 5th edition by Aronoff et al suggests: 10-50ml/min:500-750mg stat, followed by 250-750mg every 24-48hours<br><10ml/min:500mg stat, followed by 250-500mg every 48hours | | |
| Meropenem | **26-50mL/min:** 500mg-2g 12 hourly | **10-25mL/min**: 500mg-1g 12 hourly or 500mg 8 hourly | **<10mL/min:**<br>500mg-1g 24 hourly |
| Metronidazole | **20-50mL/min:**<br>Dose as in normal renal function | **10-20mL/min:**<br>Dose as in normal renal function | **<10mL/min:**<br>Dose as in normal renal function |
| Nitrofurantoin | **45-60mL/min**: Dose as in normal renal function. Use with caution | **<45mL/min** - Contraindicated<br>However, a short course (3 to 7 days) may be used with caution in certain patients with an eGFR of 30 to 44 ml/min/1.73m$^2$. Only prescribe to such patients to treat lower urinary tract infection with suspected or proven multidrug resistant pathogens when the benefits of nitrofurantoin are considered to outweigh the risks of side effects. | |
| Ofloxacin | **20-50ml/min**<br>200-400mg od | **10-20ml/min**<br>200-400mg od | **<10ml/min**<br>100-200mg od |
| Rifampicin | **20-50mL/min:**<br>Dose as in normal renal function | **10-20mL/min:**<br>Dose as in normal renal function | **<10mL/min:**<br>50-100% of normal dose |

| Antibiotic | GFR and Reduction 1 | GFR and Reduction 2 | GFR and Reduction 3 |
|---|---|---|---|
| Sodium fusidate | **20-50mL/min:**<br>Dose as in normal renal function | **10-20mL/min:**<br>Dose as in normal renal function | **<10mL/min:**<br>Dose as in normal renal function |
| Piperacillin-tazobactam | **40-50mL/min:**<br>Dose as in normal renal function | **20-40mL/min**:<br>4.5g 8 hourly | **<20mL/min:**<br>4.5g 12 hourly |
| Teicoplanin | **>80mL/min:**<br>Dose as in normal renal function | **30-80mL/min:**<br>Give as normal for 4 days then on 5th day reduce dose by 50% **or** give current dose every 48 hours | **<30mL/min:**<br>Give as normal for 4 days then on 5th day reduce dose by 66% **or** give current dose every 72 hours |
| Tigecycline | **20-50mL/min:**<br>Dose as in normal renal function | **10-20mL/min:**<br>Dose as in normal renal function | **<10mL/min:**<br>Dose as in normal renal function |
| Trimethoprim | **>25mL/min:**<br>Dose as in normal renal function | **15-25mL/min:**<br>Dose as in normal renal function | **<15mL/min:**<br>50-100% of normal dose |
| Vancomycin (IV) | **Please see link to CORP/GUID/512 Vancomycin Dosing / Monitoring in Adults** (18) | | |

# 29 Antibiotic Assays

Patients receiving intravenous vancomycin, teicoplanin or an aminoglycoside (gentamicin, tobramycin and amikacin) need regular monitoring of serum antibiotic levels.

The Biochemistry department carry out the assays of serum antibiotic levels. All advice and enquires are dealt with by the Microbiology department, Antimicrobial Pharmacist or Pharmacy Medicines Information.

Assays for vancomycin and gentamicin are performed in house. Assays for amikacin, tobramycin and teicoplanin are currently sent away for testing at another laboratory. For assays that require sending away, try to ensure that specimens are collected during the normal working week; if specimens need to be done at weekends, prior arrangement is required.

Collection of blood for monitoring of therapeutic levels of antibiotics must be done from a peripheral vein. Specimens are collected into serum gel tubes (brown cap).

**For aminoglycoside assays**The time the sample is taken and the time the last dose was administered must be stated on the sample bottle to avoid confusion and speed processing. This information should also be recorded in the patient's medical notes.

Patients receiving either aminoglycosides, vancomycin or teicoplanin MUST have their renal function checked at least twice weekly in stable renal function, or daily in patients with impaired or unstable renal function.

**Please see link to CORP/GUID/512 Vancomycin Dosing/Monitoring in Adults** (18)**.**

**Please see link to CORP/GUID/313 Gentamicin Adult Dosing Treatment** (8)

## For teicoplanin assays

## Max teicoplanin single dose 1g

1 Pre – dose level should only be monitored if being treated for more than 7 days or as directed by microbiologist or renal impairment

2 Take the initial level before the dose on the day 7

3 Levels that are in range should be monitored weekly.

4 When dose adjustments have been made due to plasma concentration levels being out of range, take the level on the fifth day after this change.

| Dosing | Level below target range | Target levels (mg/L) | Level about target range |
|---|---|---|---|
| 12mg/kg OD | <20mg/L: increase dose by 50%<br>If 20-30mg/L: increase dose by 25% | 30-40<br>Endocarditis | 40-60mg/L: reduce by 25%<br>>60mg/L: consider reducing by 50% and discuss with antimicrobial pharmacist |
| | <20mg/L: increase dose by 50% | 20-40<br>Bone and joint infection | 30-40mg/L: no action unless adverse effects are reported/renal function deteriorates.<br>40-60mg/L: reduce by 25%<br>>60mg/L: consider reducing by 50% or withholding doses and discussing with an antimicrobial pharmacist |
| 6mg/kg OD | <20mg/L: increase dose by 50% | 15-30<br>Skin and soft tissue infection | 30-40mg/L: no action unless adverse effects are reported/renal function deteriorates.<br>40-60mg/L: reduce by 25%<br>>60mg/L: consider reducing by 50% or withholding doses and discussing with an antimicrobial pharmacis |
| OPAT three times a week | <20mg/l: discuss with microbiologist | 20-30mg/l | >30mg/l : discuss with microbiologist |

Reference: adapted from Leeds antimicrobial formulary Teicoplanin antimicrobial prescribing guidance for Adult Patients (leedsth.nhs.uk) <accessed 1/2/24>

# 30 Quick Reference Guidelines for the management of adults with an absent or dysfunctional spleen

***Please see separate Protocol on 'Vaccination and antimicrobial prophylaxis for patients undergoing elective or emergency splenectomy or those who are asplenic or have a dysfunctional spleen' on the trust intranet site under the document library***

## 30.1 Adult splenectomy antibiotic prophylaxis if NBM following surgery

If NBM following surgery give Benzylpenicillin 1.2g IV 12 hourly UNLESS allergy or patient already receiving antibiotics with appropriate cover, discuss with Microbiology if unsure during working hours.

## 31 References and Associated Documents


1. British National Formulary. Feb 24 https://www.medicinescomplete.com/mc/bnf/current/PHP3268-ear-nose-and-oropharynx.htm <accessed 11/2/24>

1. **NICE.** Drug allergy: diagnosis and management. [Online] Published date: 03 September 2014. [Cited: 29 04 2024.] https://www.nice.org.uk/guidance/cg183. Clinical guideline [CG183].

2. **Louise Savic, Michael Ardern-Jones, Anthony Avery, et al.** BSACI guideline for the set-up of penicillin allergy de-labelling services by non-allergists working in a hospital setting. *Clin Exp Allergy. 2022 Oct;52(10):1135-1141. Epub 2022 Sep 21.* [Online] 10 2022. [Cited: 29 04 2024.] https://pubmed.ncbi.nlm.nih.gov/36128691/. PMID: 36128691 DOI: 10.1111/cea.14217.

3. **BTHFT - Form.** Sepsis Screening Tool. [Online] 05 10 2022. [Cited: 29 04 2024.] http://fcsp.xfyldecoast.nhs.uk/H/HealthRecordsLibrary/Documents/176631_BLA_VS2573_PROOF1.pdf. VS2573.

4. **BTHFT - Guideline.** Management of Clostridium difficile Infection (CDI). [Online] 26 11 2021. [Cited: 29 04 2024.] http://fcsp.xfyldecoast.nhs.uk/trustdocuments/Documents/CORP-GUID-092.docx. CORP/GUID/092.

5. **Medicines and Healthcare products Regulatory Agency.** Fluoroquinolone antibiotics: must now only be prescribed when other commonly recommended antibiotics are inappropriate. [Online] Published: 22/01/2024. [Cited: 29 04 2024.] https://www.gov.uk/drug-safety-update/fluoroquinolone-antibiotics-must-now-only-be-prescribed-when-other-commonly-recommended-antibiotics-are-inappropriate.

6. **NICE.** Gastro-oesophageal reflux disease and dyspepsia in adults: investigation and management. [Online] Last updated: October 2019. [Cited: 29 04 2024.] https://www.nice.org.uk/guidance/cg184. Clinical guideline [CG184].

7. **Medicines Complete.** Helicobacter pylori infection. [Online] Last Update: 14-Jun-2022. [Cited: 29 04 2024.] https://www.medicinescomplete.com/#/content/bnf/_945688461. https://doi.org/10.18578/BNF.945688461.

8. **BTHFT - Guideline.** Gentamicin Adult Dosing Treatment. [Online] 19 01 2024. [Cited: 29 04 2024.] http://fcsp.xfyldecoast.nhs.uk/trustdocuments/Documents/CORP-GUID-313.docx. CORP/GUID/313.

9. **Medicines Complete.** Linezolid. [Online] Last Update: 19-Jul-2021. [Cited: 29 04 2024.] https://www.medicinescomplete.com/#/content/bnf/_743108163. https://doi.org/10.18578/BNF.743108163.

10. **Cystic Fibrosis Trust.** Consensus documents. [Online] [Cited: 29 04 2024.] https://www.cysticfibrosis.org.uk/about-us/resources-for-cf-professionals/consensus-documents.

11. **Public Health England.** Guidance: Urinary tract infection: diagnostic tools for primary careand local adaptation. *Version 3.0.* [Online] Last Update: October 2020. [Cited: 29 04 2024.] https://www.gov.uk/government/publications/urinary-tract-infection-diagnosis. Gateway number: GW-1263.

12. **BTHFT - Procedure.** Management of Staphylococcus Aureus (SA) - Meticillin-Resistant (MRSA) and Meticillin-Sensitive (MSSA). [Online] 18 07 2023. [Cited: 29 04 2024.] http://fcsp.xfyldecoast.nhs.uk/trustdocuments/Documents/CORP-PROC-408.docx. CORP/PROC/408.

13. **BTHFT - Guideline.** Guidance on the diagnosis and management of PVL-associated Staphylococcus aureus infections (PVL-SA). [Online] 17 12 2020. [Cited: 29 04 2024.] http://fcsp.xfyldecoast.nhs.uk/trustdocuments/Documents/CORP-GUID-519.docx. CORP/GUID/519.

14. **NICE.** Leg ulcer infection: antimicrobial prescribing. [Online] Published: 11 February 2020. [Cited: 29 04 2024.] https://www.nice.org.uk/guidance/ng152. NICE guideline [NG152].

15. —. Insect bites and stings: antimicrobial prescribing. [Online] Published: 22 September 2020. [Cited: 29 04 2024.] https://www.nice.org.uk/guidance/ng182. NICE guideline [NG182].

16. —. Human and animal bites: antimicrobial prescribing. [Online] Published: 04 November 2020. [Cited: 29 04 2024.] https://www.nice.org.uk/guidance/ng184. NICE guideline [NG184].

17. **BTHFT - Protocol.** Immediate Management of infection in Haematology Patients at risk of Neutropenic Infection or Immunosuppression. [Online] 15 11 2023. [Cited: 29 04 2024.] http://fcsp.xfyldecoast.nhs.uk/trustdocuments/Documents/CORP-PROT-003.docx. CORP/PROT/003.

18. **BTHFT - Guideline.** Vancomycin Dosing / Monitoring in Adults. [Online] 15 12 2022. [Cited: 29 04 2024.] http://fcsp.xfyldecoast.nhs.uk/trustdocuments/Documents/CORP-GUID-512.docx. CORP/GUID/512.

19. **MD+Calc.** Sequential Organ Failure Assessment (SOFA) Score. [Online] [Cited: 29 04 2024.] https://www.mdcalc.com/calc/691/sequential-organ-failure-assessment-sofa-score.

20. **BTHFT - Pathway.** Infective Endocarditis Pathway. [Online] 2017. [Cited: 29 04 2024.] https://bfwnet/departments/icp/icpgetdetails.asp.

21. **+emc.** electronic medicines compendium. [Online] [Cited: 29 04 2024.] https://www.medicines.org.uk/emc.

22. **The Christie NHS Foundation Trust.** Guidelines for the management of neutropenic sepsis. [Online] 03 2021. [Cited: 29 04 2024.] https://www.christie.nhs.uk/patients-and-visitors/services/acute-oncology/infection-and-fever-advice/guidelines-for-the-management-of-neutropenic-sepsis.

23. **BTHFT - Forms.** Adult Vancomycin Intermittent Infusion: Prescribing, Administration Monitoring Chart (exclude renal replacement). [Online] 27 07 2020. [Cited: 29 04 2024.] http://fcsp.xfyldecoast.nhs.uk/H/HealthRecordsLibrary/Documents/135612_BLA_VS2444_PROOF6%20finalforprint.pdf. VS2444.

24. **NICE.** Clostridioides difficile infection: antimicrobial prescribing. [Online] Published: 23 July 2021. [Cited: 29 04 2024.] https://www.nice.org.uk/guidance/ng199. NICE guideline [NG199].

25. **Masterton RG, et al.** Guidelines for the management of hospital-acquired pneumonia in the UK: report of the working party on hospital-acquired pneumonia of the British Society for Antimicrobial Chemotherapy. *J Antimicrob Chemother. 2008 Jul;62(1):5-34.* [Online] 2008. [Cited: 29 04 2024.] https://pubmed.ncbi.nlm.nih.gov/18445577/. PMID: 18445577 PMCID: PMC7110234 DOI: 10.1093/jac/dkn162.

26. **Gould FK, et al.** Guidelines for the diagnosis and antibiotic treatment of endocarditis in adults: a report of the Working Party of the British Society for Antimicrobial Chemotherapy. *Antimicrob Chemother. 2012 Feb;67(2):269-89. Epub 2011 Nov 14.* [Online] 02 2012. [Cited: 29 04 2024.] https://pubmed.ncbi.nlm.nih.gov/22086858/. doi: 10.1093/jac/dkr450.

27. **Sandoe Jonathan AT, et al.** Guidelines for the diagnosis, prevention and management of implantable cardiac electronic device infection. Report of a joint Working Party project on behalf of the British Society for Antimicrobial Chemotherapy (BSAC, host organization), British Heart Rh. *J Antimicrob Chemother. 2015 Feb;70(2):325-59.* [Online] 2015. [Cited: 29 04 2024.] https://pubmed.ncbi.nlm.nih.gov/25355810/. PMID: 25355810 DOI: 10.1093/jac/dku383.

28. **British Association for Sexual Health and HIV.** BASHH Guidelines. [Online] [Cited: 29 04 2024.] https://www.bashh.org/resources/guidelines.

29. **The Pharmaceutical Journal.** Penicillin allergy: identification and management. [Online] 04 09 2015. [Cited: 29 04 2024.] https://pharmaceutical-journal.com/article/ld/penicillin-allergy-identification-and-management.

30. **NICE.** Urinary tract infection (lower): antimicrobial prescribing. [Online] Published date: 31 October 2018. [Cited: 29 04 2024.] https://www.nice.org.uk/guidance/ng109. NICE guideline [NG109].

31. —. Pyelonephritis (acute): antimicrobial prescribing. [Online] Published date: 31 October 2018. [Cited: 29 04 2024.] https://www.nice.org.uk/guidance/ng111. NICE guideline [NG111].

32. —. Prostatitis (acute): antimicrobial prescribing. [Online] Published: 31 October 2018. [Cited: 29 04 2024.] https://www.nice.org.uk/guidance/ng110. NICE guideline [NG110].

33. —. Urinary tract infection (catheter-associated): antimicrobial prescribing. [Online] Published date: 23 November 2018. [Cited: 29 04 2024.] https://www.nice.org.uk/guidance/ng113. NICE guideline [NG113].

34. **Leeds Community Healthcare NHS Trust.** Leeds Health Pathways. [Online] [Cited: 29 04 2024.] https://nww.lhp.leedsth.nhs.uk/antimicrobials/index.aspx.

35. **Greater Manchester Medcines Management Group.** Greater Manchester Antimicrobial Guidelines. [Online] 01 2024. [Cited: 29 04 2024.] https://gmmmg.nhs.uk/wp-content/uploads/2024/02/GM-Antimicrobial-guidelines-January-2024-v15.pdf. Version 15.

36. **European Committee on Antimicrobial Susceptibility Testing.** Clinical breakpoints and dosing of antibiotics. [Online] [Cited: 29 04 2024.] https://www.eucast.org/clinical_breakpoints.

37. **Victoria Delgado, Nina Ajmone Marsan, Suzanne de Waha, et al.** 2023 ESC Guidelines for the management of endocarditis: Developed by the task force on the management of endocarditis of the European Society of Cardiology (ESC) Endorsed by the European Association for Cardio-Thoracic Surgery (EACTS) and the European Ass. *European Heart Journal, Volume 44, Issue 39, 14 October 2023, Pages 3948–4042.* [Online] 10 2023. [Cited: 29 04 2024.] https://academic.oup.com/eurheartj/article/44/39/3948/7243107. https://doi.org/10.1093/eurheartj/ehad193. .

38. **Éric Senneville, Zaina Albalawi, Suzanne A van Asten, et al.** IWGDF/IDSA Guidelines on the Diagnosis and Treatment of Diabetes-related Foot Infections. *Clinical Infectious Diseases, ciad527.* [Online] Published: 02 October 2023. [Cited: 29 04 2024.] https://www.idsociety.org/practice-guideline/diabetic-foot-infections/. https://doi.org/10.1093/cid/ciad527 .

## Appendix 1: Equality Impact Assessment Form

| **Department** | Pharmacy | **Service or Policy** | CORP/GUID/309 | **Date Completed:** | October 2014 |
|---|---|---|---|---|---|

**GROUPS TO BE CONSIDERED**

Deprived communities, homeless, substance misusers, people who have a disability, learning disability, older people, children and families, young people, Lesbian Gay Bi-sexual or Transgender, minority ethnic communities, Gypsy/Roma/Travellers, women/men, parents, carers, staff, wider community, offenders.

**EQUALITY PROTECTED CHARACTERISTICS TO BE CONSIDERED**

Age, gender, disability, race, sexual orientation, gender identity (or reassignment), religion and belief, carers, Human Rights and social economic/deprivation.

| **QUESTION** | **RESPONSE** | | **IMPACT** | |
|---|---|---|---|---|
| | Issue | Action | Positive | Negative |
| What is the service, leaflet or policy development?<br>What are its aims, who are the target audience? | Formulary for staff | | | |
| Does the service, leaflet or policy/ development impact on community safety<br>• Crime<br>• Community cohesion | No | | | |
| Is there any evidence that groups who should benefit do not? i.e. equal opportunity monitoring of service users and/or staff. If none/insufficient local or national data available consider what information you need. | No | | | |
| Does the service, leaflet or development/ policy have a negative impact on any geographical or sub group of the population? | No | | | |
| How does the service, leaflet or policy/ development promote equality and diversity? | No | | | |
| Does the service, leaflet or policy/ development explicitly include a commitment to equality and diversity and meeting needs? How does it demonstrate its impact? | No | | | |
| Does the Organisation or service workforce reflect the local population? Do we employ people from disadvantaged groups | No | | | |
| Will the service, leaflet or policy/ development<br>i. Improve economic social conditions in deprived areas<br>ii. Use brown field sites<br>iii. Improve public spaces including creation of green spaces? | No | | | |
| Does the service, leaflet or policy/ development promote equity of lifelong learning? | No | | | |
| Does the service, leaflet or policy/ development encourage healthy lifestyles and reduce risks to health? | No | | | |
| Does the service, leaflet or policy/ development impact on transport?<br>What are the implications of this? | No | | | |
| Does the service, leaflet or policy/development impact on housing, housing needs, homelessness, or a person's ability to remain at home? | No | | | |
| Are there any groups for whom this policy/ service/leaflet would have an impact? Is it an adverse/negative impact? Does it or could it (or is the perception that it could exclude disadvantaged or marginalised groups? | No | | | |

| Appendix 1: Equality Impact Assessment Form | | | | |
|---|---|---|---|---|
| Does the policy/development promote access to services and facilities for any group in particular? | No | | | |
| Does the service, leaflet or policy/development impact on the environment<br>3. During development<br>4. At implementation? | No | | | |
| **ACTION:** | | | | |
| **Please identify if you are now required to carry out a Full Equality Analysis** | | **Yes** | **No** | **(Please delete as appropriate)** |
| **Name of Author:**<br>**Signature of Author:** | **Michelle Wong** | | **Date Signed:** | **October 2014** |
| | | | | |
| **Name of Lead Person:**<br>**Signature of Lead Person:** | | | **Date Signed:** | |
| | | | | |
| **Name of Manager:**<br>**Signature of Manager** | | | **Date Signed:** | |
| | | | | |