East Lancashire Hospitals NHS
NHS Trust

Antimicrobial Formulary

Secondary Care Guidelines for Management of Infections in Adults

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Contents

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Guide to antibiotic use for adult patients

The primary objective of this Formulary is to ensure appropriate selection of antimicrobials for treatment of common infections. The choice of antimicrobials in the Formulary has been carefully selected to move to agents with a lower risk of precipitating Healthcare Associated Infections, including MRSA, *Clostridium difficile* and ESBLs.

These guidelines are evidence based and reflect nationally agreed practice. They specify the recommended antimicrobial, dose, route and duration of treatment for common infections encountered in secondary care.

The doses mentioned in this formulary are for adults with normal renal and hepatic function. Please speak to your ward pharmacist or contact Pharmacy Medicines Information for advice on dosing in renal or hepatic impairment.

There are separate guidelines for the use of antibiotics in paediatrics (age 1 month – 18 years) and neonates (age birth – 28 days). These should be referred to when prescribing antibiotics for these age groups in conjunction with BNFc.

Principles of good antimicrobial prescribing

1. Antimicrobials must only be prescribed where there are good clinical indications.
2. Every effort must be made to collect relevant specimens for microbiological investigations prior to starting antimicrobial therapy.
3. The indication and choice of antimicrobial agent(s) must be clearly documented in the medical notes. All prescriptions should be written clearly.
4. The anticipated course length or review date must be clearly documented on the prescription chart.
5. Antimicrobial therapy must be prescribed according to the ELHT Formulary which is informed by local pathogen epidemiology and local antimicrobial sensitivity patterns.
6. Antimicrobial therapy must be prescribed at an appropriate dose and frequency.
7. Restrict the use of broad spectrum antimicrobials to the empiric treatment of serious infections when the pathogen is not known, or when other effective agents are unavailable, or patient has known allergies.
8. Narrow spectrum antimicrobials must be prescribed in preference to broad spectrum antimicrobials where possible in conjunction with Microbiology results.
9. Empiric antimicrobial prescriptions must be reviewed no later than 48 hours (automatic stop at 5 days) to consider switching to narrow spectrum agents.
10. Review ALL antimicrobials DAILY.
11. The oral route must be used in preference to the intravenous route wherever possible.
12. Intravenous therapy must be reviewed within 48 hours and switched to oral therapy if appropriate.
13. Antimicrobials with a high risk of precipitating *Clostridium difficile* infection (e.g. cephalosporins and quinolones) must be used with caution.
14. Do NOT prescribe antimicrobials from the restricted list without Consultant Microbiologist approval and document this in the medical notes.
15. Expert advice must be sought from a medical microbiologist for complicated infections, interpretation of culture and sensitivity results or in the case of failure of empiric treatment

Antibiotic allergies

The Trust views drug allergy as a serious patient safety issue.

For all patients reporting an adverse reaction to an antibiotic (or any drug), the nature of this should be documented in the Drug Intolerance section on the front of the prescription chart and on the Alert Sheet in health records.

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.

Crossover allergy

Patients with a true allergy to penicillins should be thought to be allergic to all penicillins.

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), approximately 8-11%.

It is important to document whether cephalosporins have been given without adverse effects in "penicillin –allergic" patients for future reference.

Penicillin and beta-lactam antibiotics

Prescribers commonly forget that the following are penicillin antibiotics, and as a consequence they are sometimes prescribed **inappropriately** in patients with a penicillin allergy:

- Augmentin® (Co-amoxiclav)
- Tazocin® (Piperacillin with tazobactam)

Restricted antimicrobial list

To ensure the prudent use of antimicrobials and reduce the risk of spreading resistance amongst antimicrobial agents, the Trust has designated some antimicrobial agents as 'restricted drugs'.

The Pharmacy Service will NOT supply antimicrobials from the restricted list unless prescribed for a formulary indication or there is documented evidence of Consultant Microbiologist approval in the medical notes and/or prescription chart.

Non-formulary antimicrobials

A Consultant may obtain approval from the Chair of the Drug and Therapeutics Committee on a named patient basis if they wish to use any of these agents.

Restricted antimicrobials

These antimicrobials may only be prescribed and supplied after approval from a Consultant Microbiologist. Pharmacists are required to confirm Microbiology approval or formulary indication before dispensing restricted antimicrobials.

Restricted antimicrobials are:

Amikacin
Amphotericin B (Fungizone® and Liposomal)
Aztreonam
Caspofungin
Ciprofloxacin^
Ceftazidime
Chloramphenicol IV/PO^
Flucytosine
Linezolid
Meropenem^
Nalidixic acid
Sodium fusidate IV
Tazocin^
Tobramycin
Tigecycline
Cefuroxime
Ertapenem

^may be prescribed for specific infections listed within the guidelines, or for patients on critical care without prior approval from a Consultant microbiologist

Recommendations for treatment and prophylactic regimens

If the patient has a non-serious allergy to penicillins (e.g. rash alone, with no anaphylactic symptoms), cephalosporins/carbapenems can still be used as an alternative to penicillins when first line, and the patient closely monitored.

If the patient has had a serious allergic reaction to penicillins (including previous anaphylaxis), cephalosporins and carbapenems must be avoided where possible and alternative agents used.

For further advice on antibiotic choice in these patients, please contact a Consultant Microbiologist.

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

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

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), page 61.

Sepsis definitions

Bacteraemia
Bacteria in the bloodstream

Systemic Inflammatory Response Syndrome (SIRS)
SIRS is the systemic response to a wide range of stresses and is defined in adult patients as TWO or more of:
Temperature >38ºC or <36ºC
Heart rate >90 beats per minute
Respiratory rate > 20 breaths per minute or $PaCO_2$ < 4.3kPa
WBC > 12 x 10^9 cells/mL or < 4 x 10^9 cells/mL

Sepsis
Sepsis is defined as SIRS associated with proven or clinically suspected infection

Severe sepsis
Sepsis associated with organ dysfunction (distant from infection site), hypoperfusion or hypotension (systolic BP <90mmHg, MAP <70mmHg or reduction of 40mmHg from baseline).

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.

Gastro-intestinal System

Microbiological specimens

- Acute diarrhoea (Bristol stool chart 5-7): Stool sample which take the shape of container (plus Blood Culture if pyrexial/immunocompromised or (enteric fever) must be sent ASAP for *C.difficile* toxin testing
- Amoebiasis: fresh sample transported to laboratory ASAP
- Chronic diarrhoea/Giardia/helminth infections: 3 or more stool samples maybe required

Clinical Condition	Common Pathogen(s)	Antibiotic - 1st line	2nd line (Penicillin allergy not anaphylaxis)	Comment
Acute non-inflammatory diarrhoea	Toxigenic *E. coli* *Rotavirus* *Norovirus* Enteric *adenovirus* *Astrovirus*	No antibiotics indicated	No antibiotics indicated	Notify Infection Control immediately Ext 84639 Mainstay of treatment is fluid replacement
***Clostridium difficile* infection (CDI)** Mild Disease/moderate i.e. <5 loose stools in 24 hours, no features of severe disease, Normal WBCs Review signs and symptoms and move to **severe** *Clostridium difficile* diarrhoea protocols if necessary	*Clostridium difficile*	Stop all antibiotics in the first instance. If still symptomatic after 48-72 hrs start Metronidazole 400mg orally 8 hourly Duration of therapy 10-14 days	Vancomycin should be used in the following circumstances: (see vancomycin dose below for severe disease) • Failure to respond to > 6 days metronidazole • Critically ill patients Intolerance/allergy to metronidazole Pregnant Severe colitis	Refer to Trust policy for prevention and management of *Clostridium difficile* infection. Use Metronidazole 500mg IV 8 hourly if Nil-By-Mouth or patient has no NG or PEG-tube access or if patient has ileus.

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Clinical Condition	**Common Pathogen(s)**	**Antibiotic - 1st line**	**2nd line (Penicillin allergy not anaphylaxis)**	**Comment**
***Clostridium difficile* infection (CDI)** Severe disease- Critically ill WBC > 20 x 10^9 cells/L Temperature > 38.5ºC Albumin < 25g/L Acute increase in serum creatinine Impending ileus Colonic dilatation Abdominal pain/distension Pseudomembranous colitis Number of stools maybe a less reliable indicator of severity	*Clostridium difficile*	Vancomycin 125mg orally 6 hourly Duration of therapy 10-14 days Contact Consultant Microbiologist for all severe cases		Failure to respond to 6 days treatment, critically ill, or have impending ileus, colonic dilatation or fulminant pseudo-membranous colitis (urgent surgical review required) Systemic side effects associated with the use of oral vancomycin are rare.

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Clinical Condition	Common Pathogen(s)	Antibiotic - 1st line	2nd line (Penicillin allergy not anaphylaxis)	Comment
***Clostridium difficile* infection (CDI) Recurrence** Initial recurrence	Treat with the same antibiotic that was effective for the treatment of the first episode of CDI (see above) For severe *Clostridium difficile* infection, switch to Vancomycin 125mg orally 6 hourly Duration of therapy 10-14 days			
***Clostridium difficile* infection (CDI)** Second recurrence	If metronidazole has been used twice switch to vancomycin 125mg orally 6 hourly. Discuss with Consultant Microbiologist. Review regularly. If failure to respond to treatment, urgent Microbiology / Gastroenterology review required.			
Helicobacter pylori	Helicobacter pylori	Lansoprozole 30mg orally BD **plus** Amoxicillin 1g orally bd **plus** Clarithromycin 500mg orally bd for 7 days	Lansoprozole 30mg orally bd **plus** Clarithromycin 500mg orally bd **plus** Metronidazole 400mg orally bd for 7 days 2nd line treatment due to metronidazole resistance	Stool antigen test for H.pylori Maintenance PPI regimens are required as indicated by Gastroenterologist

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Clinical Condition	Common Pathogen(s)	Antibiotic - 1st line	2nd line (Penicillin allergy not anaphylaxis)	Comment
Giardiasis	Giardia lamblia	Metronidazole 400mg orally 8 hourly for 5 days **OR** Metronidazole 2g orally every 24 hrs for 3 days	Discuss with Consultant Microbiologist	
Amoebiasis	Entamoeba histolytica	Metronidazole 400mg orally 8 hourly for 5 days **followed by** Diloxanide Furoate 500mg orally 8 hourly for 10 days	Discuss with Consultant Microbiologist	Discuss with Consultant Microbiologist if amoebiasis suspected
Salmonella / Shigella gastroenteritis Invasive salmonellosis, possible typhoid/ paratyphoid fevers	Non-typhoidal Salmonella (food poisoning) Shigella spp	Antibiotics only recommended in elderly patients, those with invasive disease or typhoid/paratyphoid Ceftriaxone 2g IV every 24 hours Oral step down to ciprofloxacin if sensitive		Food poisoning is notifiable Refer to Consultant microbiologist Notifiable
Campylobacter infection	*Campylobacter spp*	Frequently self-limiting. Antibiotics only recommended in severely ill, elderly, immunocompromised or patients with worsening or prolonged symptoms		

Hepato-biliary System

Microbiological specimens

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

- Blood culture
- Peritoneal swab
- Ascitic fluid tap
- Guided aspirates from abscess cavities

Clinical Condition	Common Pathogen(s)	Antibiotic - 1st line	2nd line (Penicillin allergy not anaphylaxis)	Comment
Uncomplicated biliary colic		No antibiotics required unless evidence of impending sepsis	No antibiotics required unless evidence of impending sepsis	
Cholecystitis/Cholangitis	Coliforms *Enterococci Anaerobes*	Amoxicillin1g IV 8 hourly+Metronidazole 500mg IV 8 hourly+Gentamicin* 5mg/kg IV every 24 hours* (max 400mg) Review at 48 hours. Oral step down refer to sensitivities Duration of therapy 5 days	Discuss alternative regimens with Microbiologist or Gastroenterologist	

* please refer to Once Daily Dosing Gentamicin Guidelines Page number 52

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Clinical Condition	**Common Pathogen(s)**	**Antibiotic - 1st line**	**2nd line (Penicillin allergy not anaphylaxis)**	**Comment**
Acute Pancreatitis: Mild to moderate Oedematous or mild acute pancreatitis (predominant form/self limiting)	*Acute alcoholic (without necrosis) pancreatitis*	No antibiotics required		
Acute Pancreatitis: Severe **Prophylactic** antibiotic therapy should ONLY be considered where CT evidence of ≥ 30% pancreatic necrosis Duration of prophylaxis 5-7 days	GI tract derived organism	Amoxicillin1g IV 8 hourly+Metronidazole 500mg IV 8 hourly+Gentamicin* 5mg/kg IV 24 hourly (max 400mg) Review at 48 hours Oral step refer to sensitivities	Discuss with microbiologist if previous results show MRSA/ESBL/CDI.	Diagnosis requires CAT scan Early referral to Critical Care Team recommended
Liver abscess	Enterobacteriaceae *Streptococci* *Enterococcus* Anaerobes	Amoxicillin1g 8 hourly (oral or IV) +Metronidazole 500mg IV 8 hourly +Gentamicin* 5mg/kg IV 24 hourly (max 400mg) Review at 48 hours Oral step down refer to sensitivities	Discuss with Microbiologist	Discuss with Microbiology about ALL cases and duration of therapy

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Clinical Condition	**Common Pathogen(s)**	**Antibiotic - 1st line**	**2nd line (Penicillin allergy not anaphylaxis)**	**Comment**
Spontaneous bacterial peritonitis - treatment	*E.coli* *Streptococci* *Enterococci*	Amoxicillin1g 8 hourly (oral or IV) + Metronidazole 500mg IV 8 hourly + Gentamicin* 5mg/kg IV every 24 hourly (max. 400mg) Review after 48 hours and refer to sensitivities Duration of therapy 5 days	Discuss with Consultant Microbiologist	Diagnosis: Ascitic neutrophil count >250 cells/mm^3
Spontaneous bacterial peritonitis – secondary prophylaxis	Polymicrobial *Anaerobes*	Discuss with Consultant Gastroenterologist	Discuss with Consultant Gastroenterologist	Discuss with Consultant Gastroenterologist

* please refer to Once Daily Dosing Gentamicin Guidelines Page number 52

Respiratory System

Microbiological specimens

- Sputum for culture and sensitivity
- Urine sample for Legionella and Pneumococcal antigen for patients with severe CAP (if CXR evidence of consolidation)
- For CURB-65 of >2 send sample for urinary pneumococcal antigen
- Blood culture severe CAP (except in cases of acute exacerbation of COPD)
- Pleural fluid culture and sensitivity plus separate bottle for TB
- For infections in immunocompromised patients, atypical pneumonia or PCP discuss investigations with microbiologist

Tuberculosis

All suspected cases of TB should be drawn to the attention of Prof. Ormerod (NHS BwD)/ Dr. Hafeez (NHS EL)/Consultant microbiologist

- If Tuberculosis suspected: 3 separate sputum samples for TB
- For miliary TB EMU x3

Clinical Condition	Common Pathogen(s)	Antibiotic - 1st line	2nd line (Penicillin allergy not anaphylaxis)	Comment
Acute exacerbation COPD (non-pneumonic LRTI)	***Haemophilus influenzae, Streptoccus pneumoniae, Moraxella Catarrhalis, Viruses Occasionally S.aureus (post viral exposure)*** **20-40% episodes of non-infective aetiology & up to 30% of viral origin (seasonal variation)**	Amoxicillin 500mg orally 8 hourly Duration of therapy 5 days	Doxycycline 200mg PO stat on day 1 then 100mg orally every 24 hours for 4 days	Antibiotics **ARE** indicated in the following: ↑ sputum volume ↑ purulence of sputum Dyspnoea Review treatment with culture/sensitivity results and switch to targeted oral antibiotic therapy

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CURB 65: Confusion (AMT≤8); **U**rea>7 mmol/L; **R**esp rate ≥30/min; **B**P <90 systolic or ≤60 diastolic; **65:**Age ≥65-yrs.

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 judgement required depending on presence of additional adverse prognostic factors (see below).

Additional adverse prognostic factors

- Co-morbidities
- PaO_2 < 8kPa on air
- Multilobar or bilateral involvement on CXR
- Positive legionella urine antigen test

Consider discussion with Respiratory Physicians patients with a CURB-65 score of 4-5

Microbiological specimens

Non-severe Community Acquired Pneumonia

- Blood cultures only if pyrexial or co-morbidity, before antibiotics are given.
- Sputum cultures if bringing up purulent sputum.
- Atypical Serology if not responding, particularly if epidemiological risk factors are important from Public Health perspective.

Severe Community Acquired Pneumonia

- Blood culture for ALL.
- Sputum for culture and sensitivity if bringing up sputum.
- Atypical pneumonia and viral serologies.
- Urine for Pneumococcal and Legionella antigen.
- Culture including Legionella culture of samples obtained by bronchoscopy.

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Clinical Condition	Common Pathogen(s)	Antibiotic - 1st line	2nd line (Penicillin allergy)	Comment
Community acquired pneumonia **Non-severe** (Admitted for non-clinical reasons or previously untreated in the Community) (CURB-65 score 0-2)	*Streptococcus pneumoniae* *Haemophilus influenzae* *Mycoplasma pneumoniae* Viruses *(Legionella, S. aureus* – usually associated with severe disease)	Amoxicillin 500mg orally 8 hourly Duration of therapy 5 days	Clarithromycin 500mg orally 12 hourly	If MRSA colonised /suspected use Doxycycline PO or Vancomycin IV If Legionella suspected use Clarithromycin
Community acquired pneumonia **Non-Severe** (CURB-65 score 0-2)		Amoxicillin 500mg orally 8 hourly **plus** Clarithromycin 500mg orally 12 hourly (only if atypicals suspected) If oral route not available: Benzylpenicillin 1.2g IV 6 hourly **plus** Clarithromycin 500mg IV 12 hourly Duration of therapy 5 days	Doxycycline 200mg orally stat on day 1, then 100mg orally 24 hourly If oral route not available: Clarithromycin 500mg IV 12 hourly	Doxycycline contraindicated in pregnancy. Discuss with Consultant Microbiologist

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Severe (CURB-65 score 3-5)	*Streptococcus pneumoniae, Haemophilus influenzae, Mycoplasma pneumoniae,* Viruses *(Legionella, S. aureus* – usually associated with severe disease) If Legionella suspected use Clarithromycin	Benzylpenicillin 1.2g IV 6 hourly **plus** Clarithromycin 500mg IV 12 hourly Review IV antibiotics no later than 48 hours. Step down to oral therapy with Amoxicillin 500mg orally 8 hourly **plus** Clarithromycin 500mg orally 12 hourly when appropriate Duration of therapy 7 days	Clarithromycin 500mg IV 12 hourly **plus** Vancomycin 1g IV 12 hourly Review IV antibiotics no later than 48 hours Step down to oral therapy with Doxycycline 200mg 12 hourly when appropriate Duration of therapy 7 days	Severe Legionella/MRSA, Discuss with Consultant Microbiologist

Clinical Condition	Common Pathogen(s)	Antibiotic - 1st line	2nd line (Penicillin allergy)	Comment
Hospital Acquired Pneumonia (not VAP) (>48 hours after admission). **Early onset ≤** 5 days after admission **Non-Severe** Choice of antibiotic based on severity & previous culture results	*Streptococcus pneumoniae* (most common) Sensitive enteric Gram negative bacilli If MRSA colonised /suspected discuss with Microbiology	Amoxicillin 2g 8 hourly IV, review and change to oral after 48hrs +/- Gentamicin* 5mg/kg IV 24 hourly (max. 400mg) Oral step down refer to sensitivities Duration of therapy 5 days	Discuss with Microbiologist	If antibiotics given in last 2 weeks: Discuss with Microbiologist.
Severe/Late onset ≥ 5 days after admission Choice of antibiotic based on severity & previous culture results	(Risk of *Pseudomonas aeruginosa* in immunocompromised patients, those recently on ICU, prior broad-spectrum antibiotic use or structural lung disease)	Tazocin 4.5g IV 8 hourly Review IV antibiotics no later than 48 hours. Step down to oral therapy with Co-amoxiclav 625mg orally 8 hourly Duration of therapy 5 days	Discuss with Microbiologist	**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.

* please refer to Once Daily Dosing Gentamicin Guidelines Page number 52

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Aspiration pneumonia Community acquired Hospital acquired	Aspiration pneumonitis does not require antibiotics. Consider aspiration pneumonia if there is a history of impaired swallowing or vomiting with possible aspiration ≥ 48 hr before. **Infection is indicated by change in sputum quality to purulent / mucopurulent, fever and new chest X-ray changes.** Co-amoxiclav 1.2g IV 8 hourly Treat as for Hospital Acquired Pneumonia Duration of therapy 5 days
Clinical Pulmonary Infection Score (CPIS) (0-2 points each): Fever (>38.5° or <36°C), WBC (>12 x 10^9 or <4 x 10^9 cells/mL), Purulent tracheal secretions, New & persistent CXR changes Impaired Oxygenation; Absence of other obvious source of infection	

Clinical Condition	Common Pathogen(s)	Antibiotic - 1st line	2nd line (Penicillin allergy not anaphylaxis)	Comment
Ventilator associated Pneumonia (> 48 hours of mechanical ventilation)	Vary from sensitive to multidrug resistant pathogens **Must discuss with Microbiologist for**: Legionella, MRSA ESBL+ve coliforms CDAD Pneumocystis Neutropenic pneumonia MDR Acinetobacter, Stenotrophomonas, Pseudomonas Aspergillus or Candida	Discuss with Microbiologist either over the telephone or on daily ward round	Discuss with Microbiologist either over the telephone or on daily ward round	CPIS > 6 Consider VAP
Lung abscess (Empiric treatment) **Empyema –Acute (usually parapneumonic)**	*Streptococcus milleri* *Anaerobes* *Staphylococcus aureus* *Aerobic/microaerophilic Streptococci* *Pneumococci, Gp A Streptococci,* *Staphylococcus aureus*	Clindamycin 600mg IV 6 hourly Review after 48 hours. Discuss oral regimen with Microbiologist Duration of therapy usually 4-6 weeks or until CXR resolution following discussion with microbiologist. Clindamycin 450mg-600mg IV/ 450mg oral 6 hourly Review after 48 hours and modify therapy according to sensitivities Duration of therapy usually 3 weeks with adequate drainage.		Response to treatment can be monitored by clinical response and monitoring inflammatory markers All cases must be discussed with Microbiologist and a Respiratory Physician

Clinical Condition	Common Pathogen(s)	Antibiotic - 1st line	2nd line (Penicillin allergy not anaphylaxis)	Comment
Empyema-subacute/chronic	*Streptococcus milleri* *Anaerobes,Enterobacteriaceae,* *M tuberculosis*	Co-amoxiclav 1.2g IV 8 hourly		
Bronchiectasis	*Haemophilus influenzae,* *Streptococcus pneumoniae* *Moraxella catarrhalis* Viruses Occasionally *S. aureus* (post viral episode) If *Pseudomonas* suspected, discuss with Microbiology	Amoxicillin 500mg orally 8 hourly Duration of treatment 10-14 days. Further need for antibiotics should be guided by clinical response	Clarithromycin 500mg orally 12 hourly	These treatment regimens are empiric and must only be used where the culture / sensitivity results are NOT known Refer to previous culture/sensitivity results for recurrent episodes Discuss with Microbiology/Respiratory if *Pseudomonas* is suspected

Urinary Tract

Microbiological specimens

- For adults dipstick testing should be performed (unless catheter in situ); do not send sample unless either nitrate and leucocyte esterase are positive or urine is cloudy.
- MSU for culture and sensitivity (if STD suspected send a first void urine for chlamydia PCR).
- EMU x3 on consecutive days if TB considered.
- For diagnosis of prostatitis an MSU post prostatic massage may be indicated.

Clinical Condition	Common Pathogen(s)	Antibiotic - 1st line	2nd line (Penicillin allergy not anaphylaxis)	Comment
Uncomplicated Urinary Tract Infection	*E. coli* *Staphylococcus saprophyticus*	Nitrofurantoin 50mg orally 6 hourly for 5-7 days (males), 3 days (females) OR Trimethoprim 200mg orally 12 hourly for 5-7 days (males), 3 days (females)	ESBL+ve coliforms: Contact Microbiologist to discuss management	Refer to previous culture results for recurrent infections. Refer to genital system if prostatitis suspected Trimethoprim must NOT be used in patients taking Methotrexate Resistance is common, refer to culture and sensitivity results when available
Pyelonephritis/Septicaemia	*E .coli also Proteus, Klebsiella (Enterobacteriacea)* Recent increase in ESBL+ve coliforms	Gentamicin* 5mg/Kg IV every 24 hours (max.400mg) Review after 48 hours and step down to oral therapy if appropriate Duration of therapy 10-14 days	Discuss with Microbiologist if antibiotic indicated for multidrug resistant coliform infections.	Discuss ESBL+ve/MRSA colonised/suspected cases with microbiologist Discuss with Consultant Microbiologist

Clinical Condition	Common Pathogen(s)	Antibiotic - 1st line	2nd line (Penicillin allergy not anaphylaxis)	Comment
Catheterised patients	• Urine dipsticks are unreliable for catheter urine. • Antibiotics are NOT required unless the patient is febrile or systemically unwell. • Send CSU if patient systemically unwell. Discuss with Consultant Microbiologist • Indiscriminate use of antibiotics in patients with long-term catheter leads to selection of multi-drug-resistant bugs.			
Asymptomatic bacteriuria (low risk patients)	• Asymptomatic bacteriuria is very common in elderly patients and is NOT related to increased morbidity or mortality. • Urine samples may give Positive dipsticks, but antibiotics are NOT required unless the patient is systemically unwell.			
Asymptomatic bacteriuria (pregnant patients)	*E. coli* Coliforms	Cefalexin 500mg orally 8 hourly for 3 days	Discuss with Microbiologist	
Acute prostatitis **>35 yrs** **<35 yrs**	Enterobactericeae Pseudomonas (rare) *Chlamydia* *N. gonorrhoea* See Genital/STI system	Trimethoprim 200mg orally 12 hourly for 28 days Severe infection requiring parenteral therapy (Cefuroxime 1.5g 8 hourly **PLUS** Gentamicin* 5mg/kg every 24 hours (max:400mg)) Review 48 hours later	Ofloxacin 200mg orally 12 hourly 28 days	Refer to GUM clinic for diagnosis, treatment and contact tracing Treat sexual partners as well Treat according to culture/sensitivity results

* please refer to Once Daily Dosing Gentamicin Guidelines Page number 52

Eye				
Clinical Condition	**Common Pathogen(s)**	**Antibiotic - 1st line**	**2nd line (Penicillin allergy not anaphylaxis)**	**Comment**
Conjunctivitis	Usually viruses *Strep pnuemoniae* *H influenzae* *S aureus*	Antibiotics not effective Chloramphenicol 0.5% eye drops 2-hourly until infection controlled, then 6 hourly until 48 hours after healing		If herpetic seek specialist ophthalmology advice. Both viral and bacterial swabs may be required.
Ear Nose and Throat				
Clinical Condition	**Common Pathogen(s)**	**Antibiotic - 1st line**	**2nd line (Penicillin allergy not anaphylaxis)**	**Comment**
Acute otitis media	*Strep pneumoniae* *H influenzae*	Amoxicillin 500mg orally 8 hourly for 5 days	Clarithromycin 500mg orally 12 hourly for 5 days	If mastoiditis, discuss with Microbiologist/ENT
Otitis externa	Polymicrobial colonisation	Antibiotics not usually required	Antibiotics not usually required	If maliganant otitis externa suspected, discuss with Microbiologist
Severe Throat infections / Quinsy	*Strep pyogenes*	Phenoxymethylpenicillin (Penicillin V) 500mg PO orally 6 hourly for 10 days (or Benzylpenicillin 1.2g IV 6 hourly if NBM)	Clarithromycin 500mg orally 12 hourly for 10 days	If *Fusobacterium necroforum* (Lemierre's disease) suspected, discuss with Microbiologist

Skin and soft tissue

Microbiological specimens

- If wound is weeping pus/serous fluid send swab for culture and sensitivity
- Blood culture if signs of systemic sepsis
- Gangrene/necrotising fasciitis/abscess: send tissue or aspirate

Clinical Condition	Common Pathogen(s)	Antibiotic - 1st line	2nd line (Penicillin allergy not anaphylaxis)	Comment
Cellulitis • Without systemic (PO) • With systemic (IV => PO) • Hospital acquired with risk of MRSA (See separate MRSA section)	*Streptococcus pyogenes* *Staphylococcus aureus* Occasionally *Strep Grp B, C, G.*	Flucloxacillin 1g IV 6 hourly (500mg 6 hourly orally) + Benzylpenicillin IV 1.2 g 4-6 hourly (or Amoxilcillin 500mg orally eight hourly) Review after 48 hours and step down to oral therapy once margin of cellulitis begins to recede See CHORAL guidelines page61 Duration of therapy 5-7 days then review	Clindamycin 450mg orally or 600mg IV 6 hourly Review after 48 hours and step down to oral therapy once margin of cellulitis begins to recede See CHORAL guidelines page 61 Duration of therapy 5-7 days then review	
• Peripheral IV cannula infection	*Staphylococcus aureus* Occasionally MRSA (suspect if colonised, high risk)	Flucloxacillin 1g IV 6 hourly (500mg 6 hourly orally) Duration of therapy 5-7 days, longer if bacteraemic		

Clinical Condition	Common Pathogen(s)	Antibiotic - 1st line	2nd line (Penicillin allergy not anaphylaxis)	Comment
Leg ulcers and pressure sores non diabetic	• Avoid antibiotics • Use local cleansing and topical antiseptics if required. Involve Tissue Viability Nurse. • If cellulitis/fever – treat based on culture and sensitivity results			
Impetigo	*Staphylococcus aureus* *Streptococcus pyogenes*	Mupirocin 2% ointment topically 8 hourly If widespread: Flucloxacillin 500mg orally 6 hourly for 5 days	Clarithromycin 500mg orally 12 hourly for 5 days	Do NOT use topical Fucidin® empirically, many community meticillin sensitive Staphylococus aureus are resistant
Animal bites	*P. multocida* *Capnocytophaga* *Staphylococcus aureus*	Co-amoxiclav 625 mg orally 8 hourly for 5 to 10 days depending on clinical response	Doxycycline 100mg orally 12 hourly **plus** Metronidazole 400mg orally 8 hourly for 5 days	Topical cleansing, irrigation & debridement as indicated Is tetanus immunisation up-to-date? Exotic animals- seek advice from Consultant microbiologist
Human bites	*Strept, Peptostrep, Bacteroides, Staphylococcus aureus*	Co-amoxiclav 625 mg orally 8 hourly for 5 days	Doxycycline 100mg orally 12 hourly **plus** Metronidazole 400mg orally 8 hourly for 5 days	Is Hepatitis B vaccine required?

Clinical Condition	Common Pathogen(s)	Antibiotic - 1st line	2nd line (Penicillin allergy not anaphylaxis)	Comment
Diabetic foot ulcers • **No inflammation**	Colonising skin flora	No antibacterial therapy Cleaning & topical antiseptics As advised by tissue viability team, Podiatry or diabetic foot clinic		If MRSA colonised/high risk, please refer to Treatment of MRSA infections section of policy
If antibiotics are required: **Grade 1 Ulcer with <2cm of superficial inflammation, no osteomyelitis**	*Staphylococcus aureus* *Strept. grp A*, occ gp *B*	Flucloxacillin 1g IV 6 hourly (500mg orally 6 hourly) **plus** Benzylpenicillin 1.2g IV 6 hourly (or Amoxicillin 500mg orally 8 hourly) for 2 weeks (subject to review)	Clindamycin 450mg orally or 600mg IV 6 hourly For 2 weeks (subject to review)	
Grade 2 Ulcer with >2cm of superficial inflammation or wound penetrating to tendon or capsule or lymphangitis or systemic effects or "localised infection" not responding to treatment	*Staphylococcus aureus* *Strept. grp A*, occ *B &* coliforms	Flucloxacillin 1g IV 6 hourly **plus** Gentamicin* 5mg/kg IV 24 hourly (max 400mg) **plus** Metronidazole 500mg IV 8 hourly for 2 to 3 weeks (subject to review)	Clindamycin 600mg IV 6 hourly **plus** Gentamicin* 5mg/kg IV 24 hour single dose (max 400mg) For 2 to 3 weeks (subject to review)	Ulcer swabs only if pus or initial treatment failed Blood cultures if systemic effects; soft tissue biopsy in neuropathic ulcers; ulcer swabs from inflamed margin **Review after 48 hours and change to oral, guided by sensitivities**
Grade 3 Ulcer penetrating to bone or joint +/- X Ray or MR or bone scan evidence of osteomyelitis	*Staphylococcus aureus* Possibly Polymicrobial	Treatment based on culture/sensitivity results Duration of therapy 6-12 weeks	Discuss with Microbiologist	Blood cultures if systemic effects; bone biopsy (whenever possible); deep soft tissue biopsy; deep soft tissue swabs (of limited use)

Clinical Condition	Common Pathogen(s)	Antibiotic - 1st line	2nd line (Penicillin allergy not anaphylaxis)	Comment
Necrotising fasciitis / gas gangrene	Grp A Strept *Staphylococcus aureus.* Possibly polymicrobial	Clindamycin 600mg IV 6 hourly (900mg IV 8 hourly) **plus** Benzylpenicillin 2.4g IV 6 hourly **plus/minus** Gentamicin* 5mg/kg IV 24 hourly (max 400mg) Amoxicillin 2g 8 hourly **plus** Metronidazole 500mg IV 8 hourly **plus** Gentamicin* 5mg/kg IV 24 hourly (max 400mg)	Clindamycin 600mg IV 6 hourly (900mg IV 8 hourly) **plus** Gentamicin* 5mg/kg IV 24 hourly (max 400mg)	Debridement main stay of treatment Clindamycin has additional Group A Strep toxin blocking action

* please refer to Once Daily Dosing Gentamicin Guidelines Page number 52

Central Nervous System

ALL suspected cases of meningitis (discussion with Consultant Microbiologist if required)
(Viral meningitis does not require treatment with antibiotic)

Microbiological specimens

- CSF after CAT/MRI
- Blood culture
- Throat swab for meningococci
- Urine for pneumococcal antigen
- EDTA blood for meningococcal PCR
- Serology viruses/cryptococci as appropriate

Clinical Condition	Common Pathogen(s)	Antibiotic - 1st line	2nd line (Penicillin allergy)	Comment
Meningitis: initial blind therapy Meningococcal meningitis suspected and accompanied with purpuric non-blanching rash or signs of meningitis	*Streptococcus pneumoniae* *Neisseria meningitidis* *Haemophilus influenzae* *Listeria monocytogenes*	Ceftriaxone 2g IV 12 hourly Add in: Amoxicillin 2g IV 6 hourly if high risk for Listeria e.g. immunocompromised or pregnant	Chloramphenicol 1g IV 6 hourly Add in: Co-trimoxazole 1.44g IV 12 hourly if high risk for Listeria	Amend antibiotics on the basis of Microbiology results (see below) Notifiable disease
Meningitis caused by *meningococci*	Meningococci	Benzylpenicillin 2.4g IV 4 hourly Duration of therapy 5-7 days	Chloramphenicol 1g IV 6 hourly	Contact Microbiologist/ HPA for advice regarding contact tracing. Give rifampicin for 2 days to contacts for eradication of carrier state
Meningitis caused by *pneumococci*	Pneumococci	Ceftriaxone 2g IV 12 hourly Use Vancomycin 1g IV 12 hourly ± Rifampicin 600mg orally 12 hourly if pneumococcal penicillin resistance confirmed Duration of therapy 10-14 days	Vancomycin 1g IV 12 hourly **plus** Rifampicin 600mg orally 12 hourly	Dexamethasone 10mg IV 6 hourly for 4 days started with or just before the first dose of antibiotics *(caution, may reduce penetration of vancomycin into the cerebrospinal fluid)*

Clinical Condition	Common Pathogen(s)	Antibiotic - 1st line	2nd line (Penicillin allergy not anaphylaxis)	Comment
Meningitis caused by *Haemophilus influenzae*	*Haemophilus influenzae*	Ceftriaxone 2g IV 12 hourly Duration of therapy 10 days	Chloramphenicol 1g IV 6 hourly	Dexamethasone 10mg IV 6 hourly for 4 days started with or just before the first dose of antibiotics. Contact Microbiologist/ HPA for advice regarding contact tracing
Meningitis caused by *Listeria*	Listeria	Amoxicillin 2g IV 6 hourly plus Gentamicin*5mg/kg IV 24 hourly (max 400mg) Duration of therapy 10-14 days	Co-trimoxazole 1.44g IV 12 hourly	Contact Microbiologist/ HPA for advice regarding contact tracing
Brain abscess **Subdural empyema** **Penetrating craniocerebral injuries**		Ceftriaxone 2g IV 12 hourly **plus** Metronidazole IV 500mg 8 hourly (PO 400mg 8 hourly) Refer to neurosurgery	Discuss with Consultant Microbiologist	
Encephalitis	*Herpes simplex* *Varicella zoster*	Aciclovir 10mg/kg IV 8 hourly for at least 10 days in encephalitis		

Genital Infection

Microbiological specimens

- Please refer to individual Trust protocols and procedures for Genito-Urinary Medicine

Clinical Condition	Common Pathogen(s)	Antibiotic - 1st line	2nd line	Comment
Chlamydia (uncomplicated)	*Chlamydia trachomatis*	Azithromycin 1g orally as a single dose (pregnancy, manufacturer advises use only if adequate alternatives not available)	Doxycycline 100mg orally 12 hourly for 7 days (Contraindicated in pregnancy) OR Erythromycin 500mg orally 12 hourly for 14 days (70% cure rate) OR Ofloxacin 200mg orally 12 hourly or 400mg once a day for 7 day (Contraindicated in pregnancy)	Refer to GUM Treat sexual partners Women: Cervical or vulvo-vaginal swab First voided urine sample Men: First voided urine sample Urethral swab Erythromycin: test of cure required 3/12 after completion of treatment
Gonorrhoea (uncomplicated) Often co-infected with Chlamydia	*Neisseria gonorrhoeae*	Cefixime 400mg orally as a single dose OR Ceftriaxone 250mg IM as a single dose.	Ofloxacin 400mg orally as a single dose (Contraindicated in pregnancy) OR Ciprofloxacin 500mg PO as a single dose (Contraindicated in pregnancy)	Refer to GUM Treat sexual partners Women: Cervical swab Rectal tests if symptomatic/at risk at these sites Men: Urethral swab Rectal/oropharyngeal tests if symptomatic at these sites

Clinical Condition	Common Pathogen(s)	Antibiotic - 1st line	2nd line	Comment
Epididymo-orchitis <35y	*Gonococci* Chlamydia Enteric organisms(uncommon)	Doxycycline 100mg orally 12 hourly for 10-14 days **PLUS** Ceftriaxone 250mg intramuscularly single	Ciprofloxacin 500mg orally as a single dose **PLUS** Doxycycline 100mg orally 12 hourly for 10-14 days	Refer to GUM Urethral swab and culture First voided urine sample
Epididymo-orchitis >35y Most likely due to enteric organisms	*Enteric organisms*	Trimethoprim 200mg orally 12 hourly for 14 days	Ofloxacin 200mg orally 12 hourly for 14 days	Refer to GUM if considered sexually acquired Urethral swab and culture First voided urine sample
Pelvic Inflammatory Disease **inpatient/ severe infection**	*Neisseria gonorrhoeae* *Chlamydia trachomatis* *Mixed Anaerobes, enteric organisms*	Metronidazole 400mg orally 8 hourly **PLUS** Ofloxacin 200mg orally 12 hourly for 10-14 days Clindamycin 900mg IV 8 hourly **PLUS** Gentamicin* IV 5mg/kg 24 hourly (max 400mg) followed by Doxycycline 100mg orally12 hourly plus Metronidazole 400mg orally 12 hourly to complete 14 days	Metronidazole 400mg orally 8 hourly **PLUS** Doxycycline 100mg orally 12 hourly for 10-14 days	As above for Chlamydia and Gonorrhoea Doxycycline and Ofloxacin contraindicated in pregnancy If the risk of *N gonorrhoeae* is high add single dose ceftriaxone 250mg IM

* please refer to Once Daily Dosing Gentamicin Guidelines Page number 52

Clinical Condition	Common Pathogen(s)	Antibiotic - 1st line	2nd line	Comment
Genital Herpes	*Herpes simplex* virus (HSV-1 and HSV-2)	Aciclovir 200mg orally 5 times a day for 5 days OR Valaciclovir 500mg orally 12 hourly for 5 days		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	Discuss with GUM Consultants/Consultant Microbiologist			
Vulvovaginal candidiasis	*Candida albicans*	Clotrimazole 1% cream applied 2-3 times a day for external symptoms **plus** Clotrimazole vaginal pessary insert 500mg at night as a single dose	Fluconazole 150mg orally as a single dose	

Bone and Joint

Microbiological specimens

- Joint aspirates
- Synovial Tissue/Bone (operative sample)
- Blood Culture
- Staphylase serology after discussion with Microbiology
- If GC STD samples as directed by GUM

Clinical Condition	Common Pathogen(s)	Antibiotic - 1st line	2nd line (Penicillin allergy not anaphylaxis)	Comment
Septic arthritis	*Staphylococcus aureus*	Flucloxacillin 2g IV 4-6 hourly (Flucloxacillin 1g orally 6 hourly) No evidence for improved outcome if Sodium Fusidate used with Flucloxacillin Duration of therapy usually 6 weeks	Clindamycin 600mg IV 6 hourly (Clindamycin 450mg orally 6 hourly) **OR** Vancomycin IV 1g 12 hourly **Plus either** Sodium fusidate oral/IV 500mg every 8 hours **OR** Rifampicin PO/IV 600mg 12 hourly	Clarithromycin should NOT be used Switch to oral to complete course. May be prescribed by GP.

Cont…				
Osteomyelitis – acute	*Staphylococcus aureus*	Flucloxacillin 2g IV 4-6 hourly (Flucloxacillin 1g orally 6 hourly) No evidence for improved outcome if Sodium fusidate used with Flucloxacillin Duration of therapy usually 4-6 weeks	Clindamycin 600mg IV 6 hourly (Clindamycin 450mg orally 6 hourly) **OR** Vancomycin 1g IV 12 hourly **Plus either** Sodium fusidate oral /IV 500mg 8 hourly **OR** Rifampicin oral/IV 600mg 12 hourly	Switch to oral to complete course. May be prescribed by GP. IV if nil by mouth
Osteomyelitis - chronic	*Staphylococcus aureus* *Occasionally coliforms*	Empiric treatment not indicated. If acute exacerbation – treat as acute osteomyelitis Duration of treatment at least 12 weeks	Empiric treatment not indicated. If acute exacerbation – treat as acute osteomyelitis Duration of treatment at least 12 weeks	
Prosthetic joint infections		Consult Microbiologist	Consult Microbiologist	
Compound/Open fractures		Flucloxacillin 1g 6 hourly IV + Gentamicin 3mg/kg once daily IV (+ Metronidazole 500mg 8 hourly IV if wound is contaminated)	if penicillin allergic Cefuroxime 1.5g IV 8 hourly (+ Metronidazole 500mg IV 8 hourly if wound is contaminated	for 24 hours after wound closure, starting as soon as possible [NB. If >1 dose of gentamicin is given, measure serum levels before the second dose]

Cardiovascular System

ALL suspected cases of endocarditis MUST be discussed with Microbiologists and Cardiologists

Microbiological specimens

- Blood culture 3 taken if possible at hourly intervals, though 3 samples over 1 hour is acceptable in acute endocarditis
- Samples need not be collected when patient is pyrexial as bacteraemia is constant
- Serology for Legionella/Q Fever if blood culture negative endocarditis
- Valve tissue at operation

Clinical Condition	Common Pathogen(s)	Antibiotic - 1st line	2nd line (Penicillin allergy not anaphylaxis)	Comment
Endocarditis: initial "blind" therapy Acute presentation	*Staphylococcus aureus*	Flucloxacillin 2g IV 4-6 hourly **plus** Gentamicin* 1mg/kg IV 8 hourly (modified according to renal function)	Vancomycin 1g IV 12 hourly **plus** Rifampicin 300 -600mg PO 12 hourly	Specific management **MUST** be based on sensitivity of organism isolated. Discuss with Consultant Microbiologist. Vancomycin Pre-dose 15-20mg/L Gentamicin Pre-dose <1mg/L 1 hr Post-dose 3-5mg/L

Clinical Condition	Common Pathogen(s)	Antibiotic - 1st line	2nd line (Penicillin allergy not anaphylaxis)	Comment
Endocarditis: initial "blind" therapy Indolent presentation	*Streptococci*	Benzylpenicillin 1.2g IV every 4 hours **plus** Gentamicin* 1mg/kg IV every 8 hours(modified according to renal function)	Vancomycin 1g IV 12 hourly **plus** Gentamicin* 1mg/kg IV every 8 hours(modified according to renal function)	Specific management **MUST** be based on sensitivity of organism isolated. Discuss with Consultant Microbiologist. Vancomycin Pre-dose 15-20mg/L Gentamicin Pre-dose <1mg/L 1 hr Post-dose 3-5mg/L (for streptococcal or enterococcal infections)

* please refer to Gentamicin Guidelines Page number 52

Antimicrobial prophylaxis against infective endocarditis in adults undergoing interventional procedures (NICE guidance)

1. Antibacterial prophylaxis and chlorhexidine mouthwash are **NOT** recommended for the prevention of endocarditis in patients undergoing dental procedures.

2. Antibacterial prophylaxis is **NOT** recommended for the prevention of endocarditis in patients undergoing procedures of the:

    - Upper and lower respiratory tract (including ear, nose, and throat procedure and bronchoscopy)

    - Genito-urinary tract (including urological, gynaecological, and obstetrical procedures)

    - Upper and lower gastro-intestinal tract

3. Whilst these procedures can cause bacteraemia, there is no clear association with the development of infective endocarditis. Prophylaxis may expose patients to the adverse effects of antimicrobials when the evidence of benefit is unproven.

4. Any infection in patients at risk of endocarditis must be investigated promptly and treated appropriately to reduce the risk of endocarditis.

5. If patients at risk of endocarditis are undergoing GI or GU tract procedure at a site where infection is suspected, they should receive appropriate antibacterial therapy that includes cover against organisms that cause endocarditis.

Patients at risk of endocarditis should be advised:

- To maintain good oral hygiene
- Told how to recognise signs of infective endocarditis, and advised when to seek expert advise

Risk factors for endocarditis

Valve replacement, acquired valvular heart disease with stenosis and regurgitation, structural congenital heart disease (**excluding:** isolated ASD, fully repaired VSD, fully repaired PDA and closure devices considered to be endothelialised) hypertrophic cardiomyopathy, previous episode of infective endocarditis

Recommended prophylactic antibiotic regimens for suspected infections at these sites.

genitourinary, gastrointestinal, respiratory or obstetric/gynaecological procedures in patients at risk of endocarditis

Antibiotics	**Dose/Route**	**Comment**
Amoxicillin + gentamicin	A single iv dose of 1g amoxicillin Gentamicin 1.5 mg/kg IV Given just before the procedure or at induction or anaesthesia	
<u>If allergic to Penicillin</u>		
Teicoplanin +gentamicin	400mg single dose teicoplanin IV Gentamicin 1.5mg/kg IV	Given just before the procedure or at induction or anaesthesia

Blood

Microbiological specimens

- Blood culture 2-3 samples
- For line infection blood cultures should be taken both peripherally and from all lines
- Line tips should be sent if infected line is removed
- Other samples as indicated under specific organ system investigations

Where source of septicaemia is known, please refer to guidance under relevant body systems

Clinical Condition	Common Pathogen(s)	Antibiotic - 1st line	2nd line (Penicillin allergy not anaphylaxis)	Comment
Septicaemia from UNKNOWN origin (non-neutropenic patient) Diagnosed – organ dysfunction with ≥ 2 of the following: WCC <4 or >12 x 10^9/L Temp <36°C or >38°C Heart rate >90bpm Respiratory rate >20/min or $PaCO_2$ <4.3kPa Refer to Trust Guidelines and pathway on surviving sepsis	Multiple pathogens	Amoxicillin 2g 8 hourly **PLUS** metronidazole 500mg 8 hourly **PLUS** Gentamicin* 5mg/kg IV every 24 hours (max 400mg) **MRSA colonised /suspected:** Change Amoxicillin to Vancomycin 1g IV 12 hourly or Teicoplanin 400mg IV every 24 hours (or Doxycycline 200mg stat orally, then 100mg 12 hourly) Discuss with Microbiologist	Discuss with Consultant Microbiologist	

* please refer to Once Daily Dosing Gentamicin Guidelines Page number 52

IV Line Associated infections

Microbiological specimens

- Blood culture 2-3 samples.
- For line infection blood cultures should be taken both peripherally and from all lines
- Line tips should be sent if infected line is removed

Other samples as indicated under specific organ system investigations

Clinical Condition	Common Pathogen(s)	Antibiotic - 1st line	2nd line (Penicillin allergy not anaphylaxis)	Comment
Line-associated septicaemia (peripheral and central cannulae)	*Staphylococcus aureus* Low MRSA risk	Flucloxacillin 2g IV 8 hourly If known MRSA patient Vancomycin 1g IV 12 hourly Add stat dose *or once daily dose of* gentamicin* 5mg/kg while awaiting culture results in patients with central line Duration of therapy 2 weeks	Vancomycin 1g IV 12 hourly Add stat *or once daily* dose of gentamicin* 5mg/kg while awaiting culture results in patients with central line	Remove line
Peripheral cannula-associated soft tissue infections without sepsis **AND** **Exit site infections in central lines (without sepsis)**	*Staphylococcus aureus* Low MRSA risk	Flucloxacillin 500mg orally 6 hourly Duration of therapy 7 days then review	Doxycycline 200mg stat orally, then 100mg every 12 hours	

* please refer to Once Daily Dosing Gentamicin Guidelines Page number 52

Neutropenic/Immunocompromised patients

Discuss all suspected cases of neutropenic sepsis with Haematologists/Oncologists and Microbiologists

Microbiological specimens

- *Please refer to individual Trust protocols and procedures for Haematology and Oncology*

Clinical Condition	Common Pathogen(s)	Antibiotic - 1st line	2nd line (Penicillin allergy not anaphylaxis)	Comment
Treatment of fever or sepsis in neutropenic patients with haematological malignancies 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 Guidelines for Management of Neutropenic Sepsis	Gram Positive pathogens Gram negative pathogens which can lead to shock, multi-organ failure and death	Tazocin 4.5g IV 6 hourly **plus** Gentamicin* 5mg/kg IV every 24 hours (max 400mg) In renal impairment, use one single dose of Gentamicin only Stop Gentamicin at 48 hours unless otherwise instructed Vancomycin or Teicoplanin indicated if suspected line infection or known to be colonised with MRSA.	Meropenem 1g IV every 8 hours Where previous penicillin anaphylaxis, discuss regimen with Microbiologist Vancomycin or Teicoplanin indicated if suspected line infection or known to be colonised with MRSA.	**Discuss all suspected cases of neutropenic sepsis with Haematologists/Oncologists and Microbiologists** Identify source of infection Patients with pelvic/rectal/tooth symptoms NOT receiving Tazocin/meropenem, should have Metronidazole 400mg orally 8 hourly (500mg IV 8 hourly) added to cover anaerobic organisms Caution when using Vancomycin and Gentamicin together. Discuss with Microbiology/ Haematology. Monitor levels and renal function carefully.

Treatment of MRSA infections

- If there are any MRSA infections in body systems NOT included within this policy, please discuss with Consultant Microbiologist

MRSA skin decolonisation regimens

Please refer to the Trust MRSA Policy

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 regimen without the removal of IV lines or urinary catheters will reduce the success.
Use Octenisan body wash and Mupirocin Nasal ointment concurrently for 5 days

Octenisan®
Bathe daily for 5 days. Use as a shampoo twice in 5 days.

For washing, apply Octenisan® undiluted to a damp washcloth, rub onto the areas of the body to be cleansed with special attention to the axillae, groins and perineum, and any other areas with known carriage (contact time 3 minutes) and wash off.

For showering or hair washing, simply use Octenisan® antimicrobial wash lotion in the same way as other hair and skin washing preparations.

Always observe the recommended contact time of 3 minutes.

For patients with exfoliative skin conditions- Refer to dermatologist

Mupirocin
Apply Mupirocin 2% nasal ointment to inner surface of each nostril using a cotton wool bud or fingers three times a day for 5 days. The nostrils should be closed by pinching the sides of the nose together at each application (to spread the ointment throughout the nares).
Because of emerging problems of MRSA resistance to Mupirocin it is important that a course of Mupirocin is not repeated within a month.
The presence of a Naso-gastric (NG) tube will reduce the efficacy.

Other sites

Where there is little exudates (e.g. impetigo) topical Mupirocin 2% ointment can be used on small wound sites after discussion with microbiologist. Apply up to three times a day.

Mupirocin must NOT be used for IV line sites or urinary catheter colonisation/infection.

Antibiotic doses 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).

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

BNF renal impairment bandings:

CrCl (mL/min)	Degree of renal impairment
50-20	Mild
20-10	Moderate
< 10	Severe

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

Table of antibiotic doses in renal impairment

Click on the antibiotic for details of each dose adjustment.

A B C D E F G H I J K L

M N O P Q R S T U V W X

Y Z

Antibiotic	GFR (mL/min)		
	20 to 50	20 to 10	<10
Aciclovir (IV)	5-10mg/kg every 12 hours	5-10mg/kg every 24 hours	2.5-5mg/kg every 24 hours
Aciclovir (oral)	Dose as in normal renal function	Herpes simplex 200mg 8 hourly Herpes zoster 800mg 8 hourly	Herpes simplex 200mg 12 hourly Herpes zoster 800mg 12 hourly
Amoxicillin	Dose as in normal renal function	Dose as in normal renal function	250mg 8 hourly
Amphotericin (IV) Ambisome (liposomal)	Dose as in normal renal function	Dose as in normal renal function	Dose as in normal renal function
Amphotericin (IV) (Fungizone)	Dose as in normal renal function	Dose as in normal renal function	250 micrograms – 1.5mg/kg every 24-36 hours
Benzylpenicillin	Dose as in normal renal function	75% of normal dose	20-50% of normal dose

Antibiotic	GFR (mL/min)		
	20-50	10-20	<10
Caspofungin	Dose as in normal renal function	Dose as in normal renal function	Dose as in normal renal function
Cefalexin	Dose as in normal renal function	500mg 8 hourly	250-500mg 12 hourly
Cefotaxime	Dose as in normal renal function	Dose as in normal renal function	0.5-1g 8 hourly or 12 hourly
Ceftazidime	1g 12 hourly (GFR 31-50)	1g 24 hourly (GFR 16-30)	0.5 – 1g 24 hourly (GFR 6-15) 0.5 – 1g 48 hourly (GFR <5)
Ceftriaxone	Dose as in normal renal function	Dose as in normal renal function	Dose as in normal renal function
Cefuroxime (IV)	750mg-1.5g 8 hourly	750mg-1.5g 8 hourly or 12 hourly	750mg-1.5g 24 hourly
Ciprofloxacin	Dose as in normal renal function	50% of normal dose	50% of normal dose
Claithromycin (oral)	Dose as in normal renal function	250-500mg 12 or 24 hourly	250mg 12 hourly or 24 hourly
Clarithromycin (IV)	Dose as in normal renal function	250-500mg 12 hourly	250mg 12 hourly
Co-amoxiclav (IV)	Dose as in normal renal function	1.2g stat, then 600mg 12 hourly	1.2g stat, then 600mg 24 hourly
Co-amoxiclav (oral)	Dose as in normal renal function	375-625mg 8-12 hourly	375mg 8-12 hourly
Erythromycin	Dose as in normal renal function	Dose as in normal renal function	50-75% of normal dose, maximum 1.5g daily
Ethambutol	Dose as in normal renal function	15mg/kg every 24-36 hours	15mg/kg every 48 hours
Flucloxacillin	Dose as in normal renal function	Dose as in normal renal function	Dose as in normal renal function up to a total daily dose of 4g
Fluconazole	Dose as in normal renal function	Dose as in normal renal function	50% of normal dose

Antibiotic	GFR (mL/min)		
	20-50	10-20	<10
Gentamicin	Refer to Gentamicin Monitoring Guidelines Once Daily Gentamicin Multiple Daily Dosing gentamicin		
Isoniazid IV/oral	Dose as in normal renal function	Dose as in normal renal function	200-300mg daily
Linezolid	Dose as in normal renal function	Dose as in normal renal function	Dose as in normal renal function monitor closely
Meropenem	500mg-1g 12 hourly	250mg-1g 12 hourly or 500mg 8 hourly	250mg-1g 24 hourly
Metronidazole	Dose as in normal renal function	Dose as in normal renal function	Normal dose every 12 hours
Rifampicin	Dose as in normal renal function	Dose as in normal renal function	50-100% of normal dose
Sodium fusidate	Dose as in normal renal function	Dose as in normal renal function	Dose as in normal renal function
Tazocin (piperacillin/tazobactam)	Dose as in normal renal function	4.5g 12 hourly	4.5g 12 hourly
Trimethoprim	Dose as in normal renal function	Dose as in normal renal function for 3 days, then 50% of dose every 18 hours	Give 50% of normal dose every 24 hours
Vancomycin (IV)	500mg 24 hourly	As advised by Microbiologist/Pharmacist	As advised by Microbiologist/Pharmacist

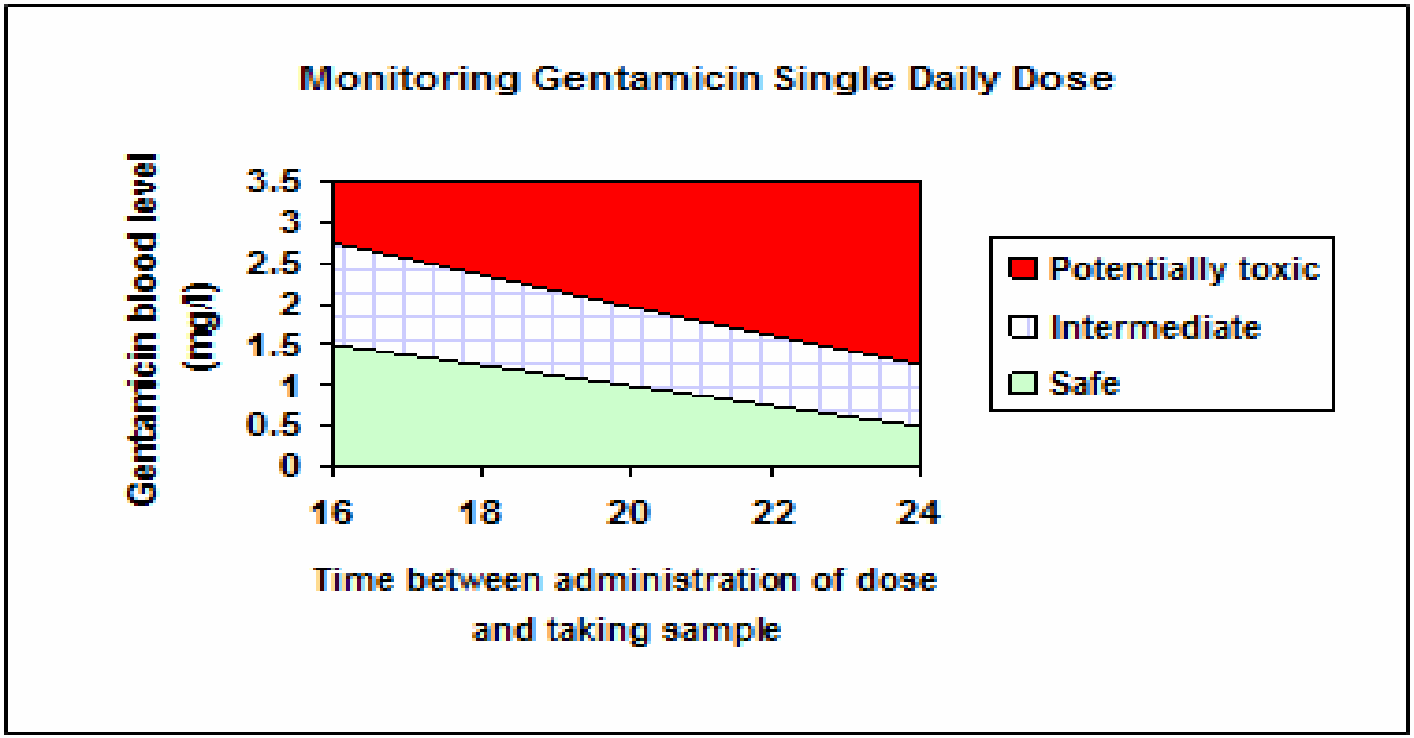
Vancomycin Monitoring Guidelines (Adults) **Summary – for further advice contact Consultant Microbiologist or a Pharmacist**	
Vancomycin is a potentially toxic drug, particularly in the elderly and in renal impairment. Serum levels must be monitored to ensure that safe and effective blood concentrations are achieved during therapy	
Administration	Slow IV infusion in either Sodium chloride 0.9% or Glucose 5% over 2 hours (maximum rate 10mg/min).
What should be monitored?	**Pre-dose (trough) blood concentration** immediately prior to administration of dose There is NO need to routinely monitor peak vancomycin levels
When should blood be taken for levels initially?	**Twice daily dosing** Check pre-dose level before 4th dose **Once daily dosing** Check pre-dose level before 2nd dose
When should I repeat levels?	**If renal function remains stable** Repeat pre-dose levels every 3-4 days **If dose is adjusted** Twice daily dosing – repeat trough level before 4th new dose then every 3-4 days Once daily dosing – repeat trough level before the 2nd new dose then every 3-4 days **If renal function changes** Contact Microbiology
Target assay levels	Pre-dose (trough) level 5-15mg/L *In the case of severe infections such as endocarditis, pre-dose levels can be run at 15-20mg/L, as long as renal function is monitored regularly*
Recommendations for dose adjustment	**Pre-dose <5mg/L** Dose increase or reduction in dosing interval (e.g. once daily to twice daily) required **Pre-dose 5-15mg/L** No dose adjustment necessary **Pre-dose >15mg/L** Dose reduction or increased in dosing interval (e.g. twice daily to once daily) required Beware of accumulation of vancomycin even though levels are still within range. This may require a dose reduction or increase in dosing interval.
Do I need to wait for the level to come back before I give the next dose?	No, not unless specifically advised

Once Daily Dosing Gentamicin Monitoring Guidelines (Adults)

Summary – for further advice contact Consultant Microbiologist or a Pharmacist

Gentamicin is a potentially toxic drug, particularly in the elderly and in renal impairment. Serum levels must be monitored to ensure that safe and effective blood concentrations are achieved during therapy.
When prescribing, bear in mind that a stat dose may already have been given in ED

Introduction	Once daily is the preferred regimen, but **NOT** for: - Endocarditis - Ascites - Renal impairment CrCl <30mL/min - Pregnancy and post-partum - Major burns (>20%) - Patients aged 70 years and above (depending on renal function)
Dose regimen	Gentamicin dose is **5mg/kg***(maximum 400mg): Adjust dose up to the nearest 20mg (e.g. 63kg patient…..dose (mg) = 5 x 63 = 315, therefore prescribe 320mg) **Dose in renal impairment**: adjusted according to creatinine clearance, CrCl (or eGFR) >60-80mL/min – 4mg/kg IBW* every 24 hours CrCl (or eGFR) >40-60mL/min – 3.5mg/kg IBW* every 24 hours CrCl (or eGFR) >30-40mL/min – 2.5mg/kg IBW* every 24 hours **Ideal Body Weight (IBW)** In obese patients (body weight 20% greater than IBW), dosing should be based on the calculated IBW Men IBW (kg) = 50 + 2.3 for each inch over 5ft Female IBW (kg) = 49 + 1.7 for each inch over 5ft Avoid concomitant use with ototoxic diuretics e.g. furosemide. If this is unavoidable, separate the administration of these two drugs as far apart as possible. Do NOT use for longer than 2 weeks
Administration	Dilute with 100mL sodium chloride 0.9% or glucose 5% and give by IV infusion over 30 to 60 minutes.
What must be monitored? **(not required for stat doses)**	**Pre-dose (trough)** gentamicin blood concentration 20 to 24 hours after the first dose and thereafter as below. *Unless renally impaired do not wait for the result before giving the next dose. Results must be reviewed before the third dose can be given* Post-dose (peak) levels are NOT required. Monitor renal, auditory and vestibular function and document in notes (baseline and during therapy)
When to repeat blood assay? **(take samples 18 to 20 hours after dosing)**	Repeat every 3-4 days if renal function remains stable. Recheck daily if dose adjustments are made. If renally impaired, recheck daily.

Target assay levels	**Pre-dose level (trough) <1.0mg/L**
Recommendations for dose adjustment	**Normal pre-dose level:** - Continue current regimen - Repeat pre-dose levels after 3-4 days if renal function remains stable **Pre-dose level 1-2mg/L (and renal function unchanged):** - Reduce dose and keep dose interval at 24 hours. Repeat pre-dose levels before next dose **Pre-dose level >2mg/L:** - Further gentamicin doses should be withheld until discussed with Microbiology - The need for gentamicin therapy should be reviewed
Monitoring Graph *This graph as an alternative tool for assessing safety of gentamicin blood levels with once daily dosing.* **The x-axis denotes the hours elapsed since last dose prior to sampling.** **Safe (stable renal function):** Continue without dose adjustment **Intermediate or toxic:** Contact a Pharmacist or Consultant Microbiologist for advice	

Multiple Daily Dosing Gentamicin Monitoring Guidelines (Adults) **Summary – for further advice contact Consultant Microbiologist or a Pharmacist**	
Introduction	For patients where once daily gentamicin is inappropriate: - Endocarditis - Ascites - Renal impairment CrCl <30mL/min - Pregnancy and post-partum - Patients aged 70 years and above (depending on renal function)
***Dose regimen** **Creatinine clearance calculator**	Normal renal function 1mg/kg 8-hourly CrCl 30-70mL/min 80mg 12-hourly (60mg if <60kg) CrCl 10-30mL/min 80mg 24-hourly (60mg if <60kg) CrCl 5-10mL/min 80mg 48-hourly (60mg if <60kg)
Administration	Dilute with 100mL sodium chloride 0.9% or glucose 5% and give by IV infusion over 30 to 60 minutes.
What must be monitored?	**Pre-dose** (trough) blood gentamicin concentration Pre-dose level must be low to minimise toxicity **One-hour post-dose** (peak) blood gentamicin concentration Post-dose level must be adequate to ensure efficacy Monitor renal, auditory and vestibular function and document in notes (baseline and during therapy)
When should I monitor?	Check around the 3rd or 4th dose (If renally impaired, check around the 2nd dose) Thereafter check levels twice weekly (If renally impaired, contact Microbiologist/Pharmacist for advice)
Target assay levels	**Pre-dose** level <1mg/L for endocarditis **Post-dose** level 3-5mg/L for streptococcal or enterococcal infections e.g. endocarditis)

Recommendations for dose adjustment	**Normal pre-dose** - Regimen can be continued - Further pre-dose levels should be monitored twice weekly so long as renal function is stable **Pre-dose level is between 2-3mg/L (and renal function unchanged)** - Increase the dosing interval e.g. from tds to bd **Pre-dose level >3mg/L** - Further gentamicin doses should be withheld - Discuss with Microbiology before recommencing therapy **Post-dose level is below the target range** - Gentamicin is subtherapeutic - The dose should be increased **Post-dose level is above the target range; pre-dose level is normal** - Reduce the dose **Both the post-dose and pre-dose levels are above the target range** - The next dose(s) should be omitted - Discuss with Microbiology before recommencing therapy

Guidelines for the management of adults with an absent or dysfunctional spleen

Asplenic patients are at a greater risk of developing fulminant, life-threatening sepsis and so must be appropriately vaccinated and receive antibiotic prophylaxis. The main causative organisms are:

- *Streptococcus pneumoniae*
- *Haemophilus influenzae* type b
- *Neisseria meningitidis*

Elective splenectomy
Immunise at least TWO (ideally four to six) weeks prior to surgery.
Prophylactic antibiotics to start post surgery.

Emergency splenectomy
Immunise at least TWO weeks post surgery, or before discharge from hospital.
Prophylactic antibiotics to be started immediately.

Vaccinations

All the necessary vaccines can be given on the same day, rotating the injection site.

- **Pneumococcal vaccine polyvalent (Pneumovax II®)**
  Single dose of 0.5mL im
- **Hib and Meningococcal Conjugate Group C (Menitorix®)**
  Previously unimmunised: Two doses of 0.5mL im of Hib/MenC (Menitorix®) two months apart
  Previously fully immunised: Offer reinforcing dose of 0.5mL im of Hib/MenC (Menitorix®)
- **Influenza**
  Adults should receive yearly immunisation via their G.P. (September to April)
- **Meningococcal ACWY (ACWY Vax®)** ONLY required if travelling to high-risk areas (sub Saharan Africa, the area around Delhi and Nepal, Bhutan and Pakistan, travellers on pilgrimages to the Haj or Umrah).Single dose 0.5mL deep sc of ACWY Vax®

Adult antibiotic prophylaxis summary

Adults should receive lifelong prophylaxis

- First line: Phenoxymethylpenicillin 500mg PO 12 hourly
- If penicillin allergic: Erythromycin 500mg PO 12 hourly

Surgical Prophylaxis

General principles of antibiotic prophylaxis

The final decision regarding the benefits and risks of prophylaxis for an individual patient will depend on:

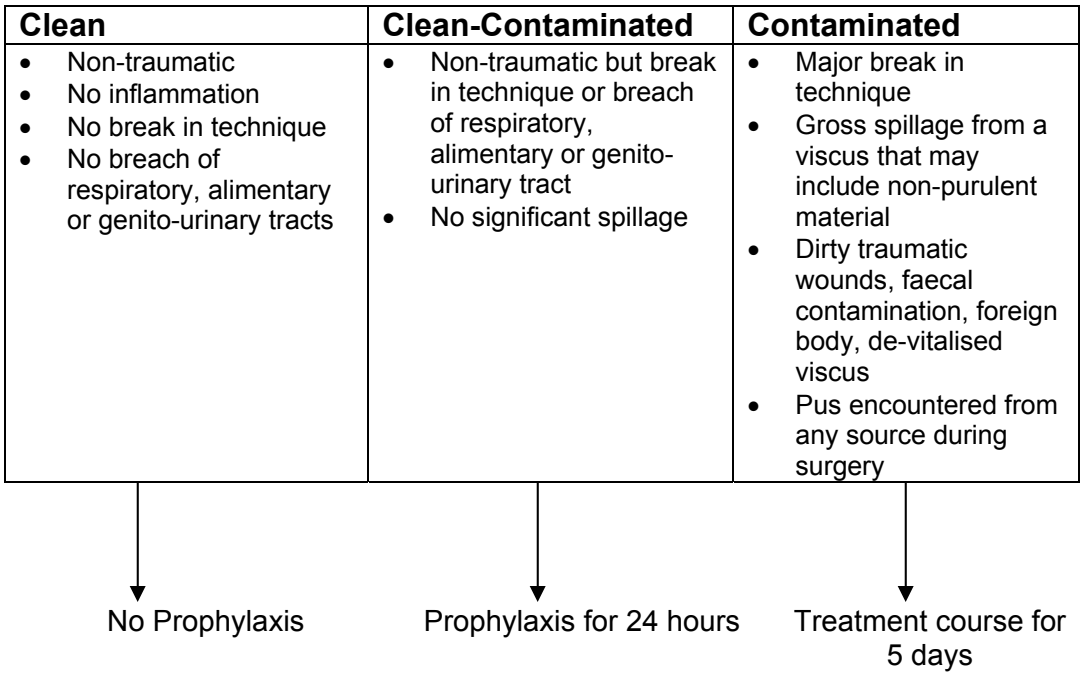
- The patient's risk of Surgical Site Infection (SSI)
- The potential severity of the consequences of SSI
- The effectiveness of prophylaxis for the procedure
  The consequences of prophylaxis for that patient (*for example, increased risk of colitis)*

Antibiotic choice and dosing

Antibiotic prophylaxis is not routinely required for clean non-prosthetic uncomplicated surgery. Antibiotic prophylaxis is required for clean surgery involving the placement of a prosthesis or implant, clean-contaminated surgery, and contaminated surgery

- The antibiotics selected for prophylaxis must cover the expected pathogens for the operative site
- The choice of antibiotic should take into account local resistance patterns
- Narrow spectrum, less expensive antibiotics should be the first choice of prophylaxis during surgery

Where prosthesis is not involved the surgery may simply be classified as Clean, Clean-Contaminated or Contaminated. One dose of antibiotics is usually adequate for clean contaminated surgery, and there is certainly no benefit in prolonging antibiotics beyond 24 hours, after which antibiotic associated risks increase. For contaminated surgery, a 5 day **treatment** course may be required.



Timing of administration

The aim of prophylaxis is to have maximum tissue levels at the time of first incision (the only exception is where microbiological specimens are to be taken, in which case prophylaxis should be given immediately after specimens have been obtained).
For this reason, oral and intramuscular prophylaxis is usually administered 1 hour pre-op, whereas intravenous antibiotics are given so that the infusion or dose has just been completed at the time of incision.

Duration of prophylaxis

A single dose of antibiotic with a long enough half-life to achieve activity throughout the operation is recommended For operations lasting more than 4 hours re-dosing may be necessary depending on the antibiotics used.

Blood loss during surgery

In the event of major intraoperative blood loss in adults (>1,500mL) additional dosage of prophylactic antibiotic should be considered after fluid replacement.

Procedure	Regimen (see footnotes)	Dose timing (see footnotes)
Upper Gastro-Intestinal surgery		
Gastric/ Oesophageal	Gentamicin 3mg/kg I/V	1 dose at induction
Laparoscopic cholecystectomy	Prophylaxis is not recommended Antibiotic prophylaxis should be considered in high risk patients. (high risk: intraoperative cholangiogram, bile spillage, conversion to laparotomy, acute cholecystitis/pancreatitis, jaundice, pregnancy, immunosupression, insertion of prosthetic devices)	
Open biliary tract surgery	Gentamicin 3mg/kg IV + Metronidazole 500mg I/V	1 dose at induction
Endoscopic retrograde cholangiopancreatography (ERCP)	Gentamicin 3mg/kg IV	1 dose at induction
Hernia repair	No prophylaxis necessary	
Hernia repair with mesh	Flucloxacillin 1g IV	1 dose at induction
Lower Gastro-Intestinal surgery		
Colorectal Surgery	Gentamicin 3mg/kg I/V + Metronidazole 500mg I/V	1 dose at induction
Appendicectomy	Gentamicin 3mg/kg I/V + Metronidazole 500mg I/V	1 dose at induction
If gangrenous /ruptured appendix	Gentamicin 3mg/kg I/V + Metronidazole 500mg I/V	d/w consultant microbiologist
Urological procedures		
Transrectal prostate biopsy	Gentamicin 3mg/kg I/V + Metronidazole 500mg I/V	1 dose immediately prior to procedure
Transurethral resection of prostate	Gentamicin 3mg/kg I/V at induction	1 dose immediately prior to procedure
Transurethral resection of bladder tumour	No prophylaxis necessary	

Vascular surgery (Distal limb surgery – antibiotics should be administered at least 15 minutes prior to inflation of tourniquet i.e before induction of anaesthesia)		
a) elective procedures **screen patients for MRSA before surgery according to Trust MRSA guidelines**		
MRSA-negative	Flucloxacillin 1g IV + Gentamicin 3 mg/kg IV (+Metronidazole 500mg iv if at risk of anaerobic infections) if penicillin allergic use cefuroxime 1.5g IV (+metronidazole 500mg IV if at risk of anaerobic infections)	1 dose at induction 1 dose at induction
MRSA-positive follow MRSA eradication protocol	Teicoplanin 400 mg IV + Gentamicin 3 mg/kg IV (+Metronidazole 500mg iv if at risk of anaerobic infections)	risk of anaerobic infection includes patients with diabetes, gangrene or undergoing amputation
b) procedures that are carried out as emergencies and/or on patients who have not been screened	Please ask infection control regarding risk assessment	
Obstetric and Gynaecological Surgery		
Caesarean section	Co-amoxiclav 1.2g IV If penicillin allergic use Cefuroxime 1.5g IV or Clindamycin 600mg IV (if history of immediate hypersensitivity to penicillin/cephalosporins)	immediately after umbilical cord is clamped
Hysterectomy	Gentamicin 3mg/kg IV + Metronidazole 500mg IV	1 dose at induction
Termination of pregnancy	Metronidazole 400mg orally If genital Chlamydial infection cannot be ruled out- postoperative Azithromycin should be given	
Intrapartum prophylaxis against group B streptococcal infection	Benzylpenicillin 3g IV initially then 1.8g IV 4 hourly until delivery	

Trauma and Orthopaedic Surgery Arthroscopy	Prophylaxis not required	
Minor metalwork insertion (e.g. K-wire, screws, small orthopaedic plates)	Flucloxacillin 1g IV + Gentamicin 3 mg/kg IV	1 dose at induction
Open fractures	Flucloxacillin 1g 6 hourly IV + Gentamicin 3mg/kg once daily IV (+ Metronidazole 500mg 8 hourly IV if wound is contaminated) or if penicillin allergic Cefuroxime 1.5g IV 8 hourly (+ Metronidazole 500mg IV 8 hourly if wound is contaminated)	for 24 hours after wound closure, starting as soon as possible [NB. If >1 dose of gentamicin is given, measure serum levels before the second dose]
Elective major procedures involving metalwork, including joint, pelvic or spinal implants Screen patients before surgery according to Trust MRSA guidelines MRSA-negative For patients with penicillin hypersensitivity or MRSA-positive (Follow MRSA eradication protocol.)	Flucloxacillin 1g IV + Gentamicin 3mg/kg IV Teicoplanin 400 mg IV + Gentamicin 3mg/kg IV (for patients >80kg increase the dose of teicoplanin to 600mg)	1 dose at induction and 2 post-operative doses of flucloxacillin at 6 and 12h 1 dose at induction
Major procedures involving metalwork, including joint, pelvic or spinal implants, *carried out as emergencies and/or on patients who have not been screened*	Refer to risk assessment tool chart or check with infection control	

For patients known to be MRSA-positive, replace flucloxacillin with teicoplanin 400mg.

For prolonged operative procedures (>4 hours) additional intra-operative doses must be given for the duration of the procedure: Teicoplanin 400mg 8 hourly, gentamicin 1.5mg/kg 8 hourly and flucloxacillin 500mg 4 hourly.
In the event of major intra-operative blood loss in adults (>1500mL) additional doses of prophylactic antibiotic(s) should be considered after fluid replacement.

If there are concerns about giving gentamicin to a patient (e.g. allergy or poor renal function) please contact a consultant Microbiologist for advice

Change to ORAL Antibiotics Guideline (CHORAL)

Purpose

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

Rationale

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

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

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
- Patient must be haemodynamically stable
- 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 early:

- Ongoing/potential GI absorption problems (vomiting, GI surgery or ileus)
- Immunocompromised 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	Meningitis
Staphylococcal bacteraemia	Infective gangrene

N.B. in **ALL** these cases **extended** or **complete courses** of parenteral antibiotics should be used

Change to ORAL Antibiotics Guideline (CHORAL)

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 to 1g 8 hourly
Benzylpenicillin	Phenoxymethylpenicillin 500mg 6 hourly
Co-amoxiclav	Co-amoxiclav 375 to 625mg 8 hourly
Ciprofloxacin	Ciprofloxacin 500mg 12 hourly (750mg 12 hourly if Pseudomonas spp isolated)
Clindamycin	Clindamycin 600mg 6 hourly
Clarithromycin	Clarithromycin 500mg 12 hourly
Flucloxacillin	Flucloxacillin 500mg to 1g 6 hourly
Gentamicin	Discuss with Microbiology
Linezolid	Linezolid 600mg 12 hourly
Metronidazole	Metronidazole 400mg 8 hourly
Meropenem	Discuss with Microbiology
Tazocin	Co-amoxiclav 375 to 625mg 8 hourly
Teicoplanin	Discuss with Microbiologist

Antimicrobial Formulary 2008: Secondary care guidelines for management of infections in adults

Audit Standards for Prescribing of Antibiotics in Secondary Care

No.	Standard	Target	Exceptions
1	The diagnosis or likely diagnosis of an infection for which the patient is being treated with antibiotics is recorded	100%	Unstable patient with signs of infection (pyrexia, raised WCC etc)
2	Samples for microbiological culture are taken before starting antimicrobial therapy	100%	Patient refused consent
3	Allergies must be considered when prescribing antibiotics	100%	none
4	Metronidazole must not be prescribed with Co-amoxiclav	100%	none
5	Start and finish date for course of antibiotics must be recorded in the designated place on the prescription chart	100%	none
6	A course of antibiotics should be no more than 5 days	100%	Exceptions in table 1
7	IV therapy should be switched to oral therapy after 48 hours	100%	Exceptions in table 2
8	Restricted List Antibiotics can only be prescribed as per Consultant Microbiologist advice (see table 3)	100%	Tobramicin, Amikacin - at Consultant Paediatrician advice Ciprofloxacin – Consultant Urologist/Respiratory Physician advice Tazocin, Meropenem, Chloramphenicol for specific conditions listed with the guidelines or for patients on critical care

A rolling programme of audit will be used to monitor the effectiveness of the antimicrobial guidelines, as will surveillance of local resistance patterns.

Table 1 Exceptions to Standard 6 (greater than 5 days therapy with antibiotic)

Cavitating pneumonia	Liver abscess
Chlamydia	Mediastinitis
Complicated UTI	Meningitis
Empyema	Necrotising soft tissue infections
Endocarditis	Neutropenic sepsis
Exacerbations of cystic fybrosis	Osteomyelitis
Herpes simplex encephalitis	Pelvic inflammatory disease
Herpes simplex sores	
Inadequately drained abscesses	Septic arthritis
Infected implants / prosthetics	Staphylococcus aureus bacteraemia
Intracranial abscess	Suspected (or previously treated) non severe or atypical pnemonias
Intractable oral candiadisis	

Table 2 Exceptions to Standard 7 (IV therapy should be switched to oral therapy after 48 hours)

Oral route compromised	**High risk infections need prolonged IV therapy**
No suitable oral formulation	Staphylococcus aureus bacteraemia
Severe diarrhoea/vomiting	Necrotising soft tissue infections
Unable to swallow (eg Unconscious)	Neutropenic sepsis
No clinical improvement, e.g.	Infected implants / prosthetics
	Meningitis
SIRs i.e. TWO or more of:	Intracranial abscess
Temperature >38ºC or <36ºC	Mediastinitis
Heart rate >90 beats per minute	Endocarditis
Respiratory rate > 20 breaths per minute or $PaCO_2$ < 4.3kPa	Exacerbations of cystic fybrosis
WBC > 12 x 10^9 cells/mL or < 4 x 10^9 cells/mL	Inadequately drained abscesses and emphysema
For deep-seated infections an initial two weeks of therapy may be needed. Eg	
Liver abscess	Cavitating pneumonia
Osteomyelitis	Empyema
Septic arthritis	

Table 3 Standard 8: Antimicrobials restricted to use only when approved by Consultant Microbiologist, with documentation of approval in medical notes

Restricted List Antimicrobials
Amikacin* Amphotericin B (Fungizone® and Liposomal) Aztreonam Caspofungin Ciprofloxacin^ Ceftazidime Chloramphenicol IV/PO^ Flucytosine Linezolid Meropenem^ Nalidixic acid Sodium fusidate IV Tazocin^ Tobramycin* Tigecycline Cefuroxime Ertapenem
*may be initiated by Consultant Paediatrician ^ may be prescribed for specific infections listed within the guidelines, or for patients on critical care without prior approval from a Consultant microbiologist