Empirical Adult Antimicrobials Guidelines

Classification :	Guideline		
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To be read in conjunction with the following documents: **Please see links embedded throughout the document**		
Required CQC evidence? Yes	**Key CQC Question: Outcomes 2, 4, 9** Safe/Effective/Responsive/Caring/Well Led	

Disclaimer
Since every patient's history is different, and even the most exhaustive sources of information cannot cover every possible eventuality, you should be aware that all information is provided in this document on the basis that the healthcare professionals responsible for patient care will retain full and sole responsibility for decisions relating to patient care; the document is intended to supplement, not substitute for, the expertise and judgment of physicians, pharmacists or other healthcare professionals and should not be taken as an indication of suitability of a particular treatment for a particular individual.

The ultimate responsibility for the use of the guideline, dosage of drugs and correct following of instructions as well as the interpretation of the published material **lies solely with you** as the medical practitioner.

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Guideline Statement

This guideline was developed in response to the Department of Health recommendations contained in the document Healthcare associated infections[1], in particular infection caused by C. diff and The Code of Practice for the Prevention and Control of Healthcare Associated Infections.

Criterion 9 of The Health and Social Care act; Code of practice for Health and Adult Social Care on the Prevention and Control of Infections, is a legal requirement against which the CQC can assess. It states that procedures should be put in place to ensure prudent antimicrobial prescribing and antimicrobial stewardship[2]; this includes having local evidence based prescribing guidelines and adopting a start smart and then focus approach for all antibiotic prescription.

This is supported by the Department of Health's Advisory Committee on Antimicrobial Resistance and Healthcare Associated Infection document "Antimicrobial stewardship: "Start smart – then Focus" (Public Health England, 2015) which recommends each organisation develop local antimicrobial guidelines based on national guidance (for example from the British National Formulary, NICE or Public Health England). All antimicrobials should be prescribed in line with Public Health England's Start Smart and then Focus- Antimicrobial Stewardship Toolkit for English Hospitals [(2)].

Executive Summary

Current evidence demonstrates that the inappropriate use of broad spectrum antibiotics is associated with the selection of antibiotic-resistant bacteria, the development of C. diff and can cause long-lasting harmful changes to the body's protective microbial flora. This can contribute to increased length of stay and poor patient outcomes. Evidence based antimicrobial guidelines are produced taking into account local antibiotic resistance and sensitivity patterns.

The aim of the antimicrobial guidelines is:

- To provide a simple, empirical approach to the treatment of common infections for adults based on local resistance and sensitivity patterns
- To ensure appropriate use of antimicrobials prior to surgical procedures
- To minimise the emergence of bacterial resistance
- To reduce the incidence of toxicity and other adverse effects
- To reduce the incidence of health care associated infections such as Clostridium difficile and MRSA
- To encourage the rational and cost effective use of antimicrobials

1. Roles and Responsibilities:

All Clinical staff are responsible for ensuring the guideline is adhered to. The Consultant Microbiologist and Antimicrobial Pharmacists are responsible for reviewing and updating the policy. For responsibilities in auditing and monitoring the process please see Audit and monitoring

2. Implementation and dissemination of document

This document will be widely disseminated via the intranet and will be accessible via the Trust's intranet home page, Pharmacy home page and Formulary home page. The guidelines will also be accessible via RxGuidelines website through a URL link accessible via the intranet home page. Furthermore the RxGuidelines App can be downloaded via the App store and Google Play allowing for the guidelines to be viewed on both smartphones and tablets. The guidelines will be a feature of New Doctors Induction. Consultants' mandatory training and Non-Medical Prescribers training, Medicines Management training and new pharmacy staff induction. Financial implications will be monitored by the Pharmacy Department using Drug Usage Review.

3. Antimicrobials Guidelines Processes and Procedures

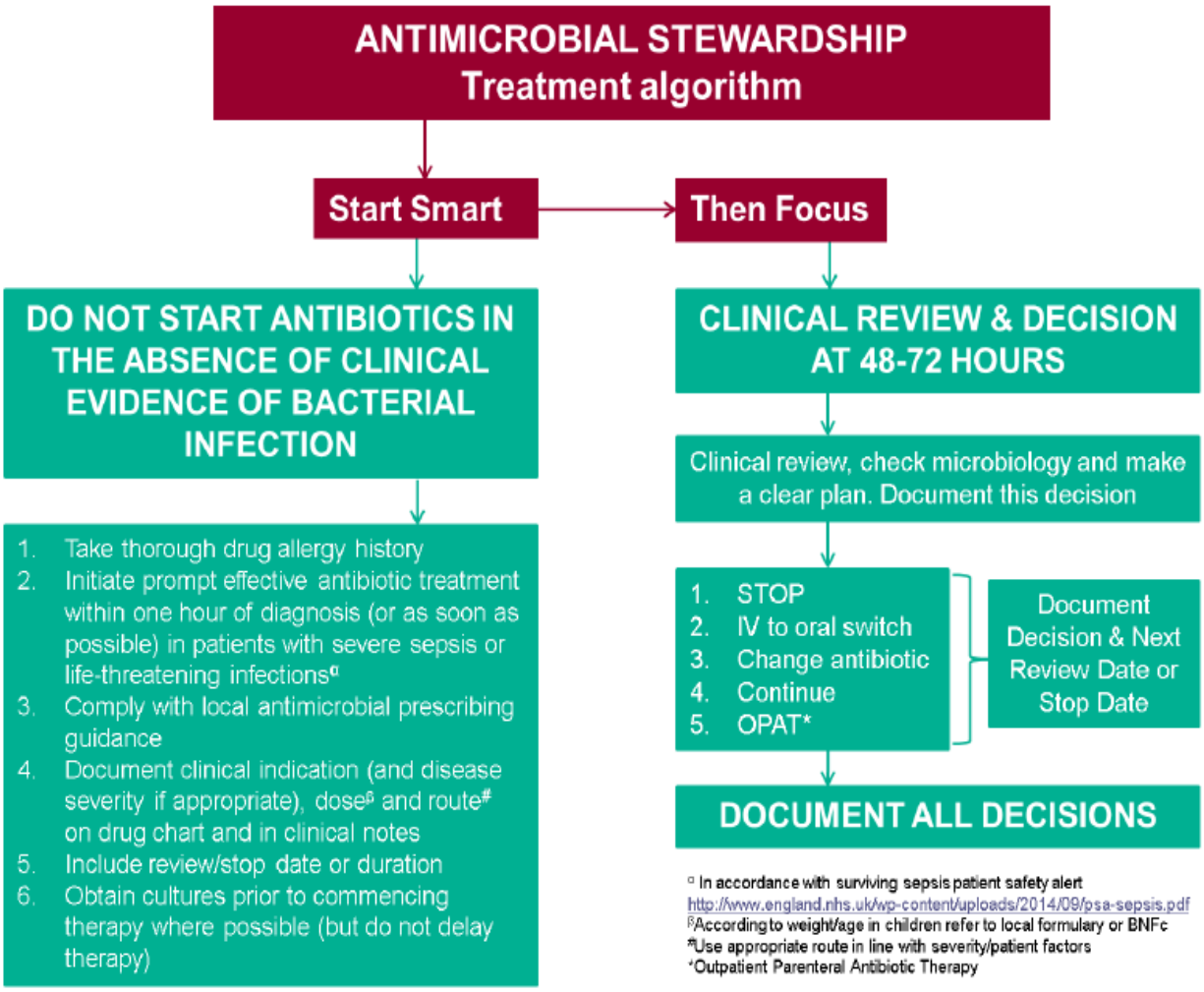
This guidance is based on the best available evidence but its application must be modified by:

- Professional judgement
- Recent microbiology results or antibiotic treatment
- **Known carrier status of patients e.g. MRSA, *Clostridium difficile* toxin and resistant organisms such as ESBL producing coliforms**
- Severity of illness
- Immunosuppression
- Age
- Renal/hepatic function
- Potential drug interactions (including oral contraceptive pill)
- **Drug allergies and nature of allergic reaction**
- Pregnancy, breastfeeding

ALL antimicrobials should be prescribed in line with Start Smart and *then Focus*[1]

3.1 Prudent Antimicrobial Prescribing and Use: Start Smart-*Then Focus*

The Department of Health Guidelines, March 2015, entitled Antimicrobial Stewardship "Start Smart – Then Focus" gives the following advice on prescribing and reviewing antibiotic prescriptions:



3.2 Additional Antimicrobial Prescribing Guidance

1. **Avoid use of topical antibiotics** (especially those agents which are also available as systemic preparations as this will encourage resistance) except for eyes/ears or MRSA eradication.

2. **Prolonged treatment with broad-spectrum antimicrobials increases selection pressure for multi-resistant microorganisms** and limits options for salvage therapy in patients who later relapse. Unnecessarily prolonged intravenous therapy exposes patients to risks of intravascular device-related infection, bacteraemia and thrombophlebitis, and has been shown to delay discharge from hospital [1, 2].

3. **Antibiotic therapy in meningitis, endocarditis, septic arthritis, osteomyelitis and severe sepsis should also be reviewed regularly but will require prolonged courses of IV antibiotics.** If not reviewed, the ward pharmacist will consult a member of the team starting with the FY1 and escalate to the Consultant if needed to obtain a review. Consideration should be given to the use of oral antibiotics where appropriate and where a suitable oral alternative is available.

4. **Antimicrobial therapy must be prescribed at an appropriate dose, as recommended in the guidelines or other specialist guidelines where Trust guidelines do not exist**. The dose must be appropriate for the patient's weight, renal and hepatic function. Consult a pharmacist if a patient is obese or has renal or hepatic impairment. Trust guidelines for dosing of aminoglycoside (e.g. gentamicin) and glycopeptide (e.g. vancomycin) antimicrobials must be followed to minimise the risk of treatment failure or toxicity.

5. Oral cephalosporins do not have the same therapeutic cover or indications as IV cephalosporins. **Please discuss IV to oral switch with the Consultant Microbiologist if sensitivity data is not available.**

3.3 IV to PO Switch Policy

Please see Appendix 10

3.4 Penicillin Allergies

Allergic reactions are the most important adverse effect of the penicillin family of antibiotics; in severe cases these reactions can cause anaphylaxis and even death. Anaphylactic reactions occur in less than 0.05% of patients treated with a penicillin.

Healthcare professionals should be able to distinguish non-allergic adverse reactions from true allergic reactions. Some people report that they are allergic to penicillin when actually they have had a non-allergic side effect. As a result, the person may be treated for a particular infection with a less effective or more toxic antibiotic.

An **"adverse reaction"** is the medical term for any undesirable reaction caused by a medication. Both allergic and non-allergic adverse reactions can occur, however non-allergic reactions are much more common. Examples of common non-allergic adverse reactions include nausea, stomach upset and diarrhoea.

An **"allergic reaction"** occurs when the immune system begins to recognise a drug as something "foreign". Several different symptoms can indicate that a person is allergic to a penicillin. The nature of an allergic reaction can vary depending on the body part involved and the severity of the reaction. Some reactions may be localised and limited, while others could involve multiple body systems. Symptoms can include an urticarial rash, swelling, wheezing, coughing, and shortness of breath.

A past history of these types of reactions is important to identify, as the patient is at risk of developing a more severe reaction, such as anaphylaxis, if they were exposed to the antibiotic again.

Adverse reactions to penicillins

When assessing adverse reactions with medications, it is important to obtain as much detail as possible about the type and time of onset of the reaction. If unable to take a history, alternative antibiotics should be given and reviewed later. A proper history should be taken and should include:

- If severe reaction (anaphylaxis, laryngeal oedema, bronchospasm or non-severe reactions such as isolated urticarial/rash/itching etc.)
- When (age) and why the medication was taken?
- When symptoms began?
- Description of symptoms.
- How long did the symptoms last?
- Any other concurrent infections?
- Whether hospital admission was needed

*Non-severe Penicillin Allergy	**Severe Penicillin Allergy
Normally after 24 hours Maculopapular/morbilliform rash Serum Sickness (fever, rash, arthralgia/glomerulonephritis)	**Normally within 1 hour (up to 12 hours)** Anaphylaxis Angiodema Urticarial rash/pruritus Wheezing/stridor

It is essential that staff know which antibiotics can safely be administered to patients who report an allergic reaction to penicillin and which antibiotics are contraindicated in these patients.

CONTRAINDICATED **Do not use in severe and non-severe penicillin allergy**	**Amoxicillin** **Flucloxacillin** **Penicillin G** **Penicillin V** **Co-amoxiclav** **Piperacillin/Tazobactam**	
CAUTION **Do NOT use in severe penicillin allergy,** **Use with caution in non-severe allergy e.g. minor rash**	**Cephlasporins:** Cephalexin Cephadrine Cefaclor Cefotaxime Ceftriaxone Cefuroxime Ceftazidime Cefixime	**Carbapenem:** Meropenem Ertapenem Aztreonam Pivmecillinam
CONSIDERED SAFE	Aminoglycosides Glycopetides Macrolides Linezolid Sodium Fusidate Tigecycline Colistin Nitrofurantoin	Co-trimoxazole Rifampicin Tetracycline Clindamycin Quinolones Chloramphenicol Metronidazole Trimethoprim

Individuals with **Severe allergy to penicillin **SHOULD NOT** receive a penicillin, cephlasporin or another beta lactam antibiotic. Individuals with a *non-severe penicillin allergy **SHOULD NOT** receive a penicillin BUT cephlasporins, carbapenems, and other beta lactams can be used for these patients with caution as the risk of cross sensitivity is low

3.5 Carbapenemase Producing Enterobacteraciae (CPE)

Carbapenems are a valuable family of antibiotics normally reserved for serious infections caused by drug-resistant Gram-negative bacteria (including Enterobacteriaceae). They include meropenem, ertapenem, imipenem and doripenem. Carbapenemases are enzymes that destroy carbapenem antibiotics, conferring resistance.

Enterobacteriaceae are a large family of bacteria that usually live harmlessly in the gut of all humans and animals. However, these organisms are also some of the most common causes of opportunistic urinary tract infections, intra-abdominal and bloodstream infections. They include species such as Escherichia coli, Klebsiella spp. and Enterobacter spp.

There are different types of carbapenemases, of which KPC, OXA-48, NDM and VIM enzymes are currently the most common.

Countries and regions with reported high prevalence of healthcare-associated carbapenemase-producing Enterobacteriaceae are as follows;
Bangladesh, North Africa (all), The Balkans, Malta, China, Middle East (all), Cyprus, Pakistan, Greece, South East Asia, India, South/Central America, Ireland, Turkey, Israel, Taiwan, Italy, USA, and Japan.

UK regions / areas where problems have been noted in some hospitals:
North West especially (Manchester) and London

Mortality associated with these organisms is higher than 40%. Therapeutic options are limited. Combination antibiotic treatment may be considered the optimal option for severely ill patients or with severe infections.

If CPE infection is suspected antibiotic options should be discuss with Consultant Microbiologist as soon as possible.

For screening policies, please refer to infection control via the following link: **CPE**

3.6 A Guide to MRSA Eradication Therapy Prescribing

This guide contains the essential prescribing information for initiating therapies to eradicate MRSA from the nose, skin, throat and wounds.

Prescribing Overview

- All patients having MRSA isolated from any screened site (nose perineum/groin, axilla & skin breaks/wounds/ medical devices) or from a clinical specimen (e.g. blood, sputum, urine) will be potentially eligible for treatment.
- Patients with MRSA INFECTION may require systemic antibiotics in addition to eradication therapy.
- Treatment of throat colonisation will only be initiated where there is a positive throat swab. It does not form part of the routine eradication regimen for all colonised patients.
- If the patient has had MRSA identified in a clinical specimen (e.g. blood, sputum, urine) as opposed to in a routine screen, a full MRSA screen MUST be completed before eradication treatment begins. Commence eradication treatment for those over 14 years of age: Mupirocin to nose and Octenisan washes. Please see infection and prevention control nursing care plan for details (available on every ward).
- If the patient is known to have MRSA colonisation in a wound, the wound must be assessed, so as to determine whether there are signs of infection (as opposed to mere colonisation). Such signs include erythema around the wound, purulent discharge, cellulitis, fever, elevated white blood cell count and/or pain in the tissues surrounding the wound. Infected wounds may require systemic antibiotics in addition to formal treatment. Contact Consultant Microbiologist for advice.

MRSA Eradication		
Clinical Condition/Site Infected	**Treatment Recommendations**	**Duration/Notes/Comments**
MRSA	IV Vancomycin as per protocol	**Duration: 2 weeks** minimum but actual duration would depend upon source/complication – discuss individual case with Microbiology Consultant.
Wound colonization or infection	**PO Doxycycline 200mg OD– check sensitivities**	**Duration: 7-10 days Contact tissue viability nurse**
Nasal Carriage	Mupirocin nasal ointment three times daily (only repeat course on advice of microbiology)	**Duration: 5 days**
Skin Carriage	Octenisan Skin wash - use once a day, as a soap and use as shampoo on days 2 and 4	**Duration**: **5 days**

Please see Infection control policy for further information Methicillin Resistant Staphylococcus Aureus (MRSA)

3.7 Clostridium difficile Infection

C. *diff* infection (CDI) causes serious illness and outbreaks among hospital in-patients. Approximately 3-5% of the general populations carry *Clostridium difficile* asymptomatically. This rises to over 40% in hospitalized patients, due to nosocomial transmission. *Clostridium difficile* spores can survive for several months or even years on environmental surfaces on wards. Factors which place patients most at risk are:

- Antimicrobial use (multiple/long courses of broad spectrum and high risk antimicrobials)
- > 65 years of age (almost 10-fold higher than that for younger patients)
- Hospital admission (recent admission/increased length of stay/multiple admissions) and long term care facilities such as nursing homes
- Receiving acid suppressing medications such as Proton Pump Inhibitors (PPIs) e.g. omeprazole/lansoprazole or H_2 receptor antagonists such as ranitidine
- Receiving chemotherapy/immunosuppression
- Presence of nasogastric tube/feeding tubes
- Comorbidities
- Critical care patients
- Use of laxatives/surgery/non-surgical gastro-intestinal procedures (e.g. endoscopy)

Clinical teams should review antibiotic prescribing regularly and adhere to the Trust Antimicrobial Guidelines. All unnecessary antibiotic prescriptions should be stopped and those that do not comply with guidelines should be changed to do so. Where guidelines have not been adhered to please ensure this has been documented in the patient's medical notes including reasons for deviation. Prudent use of antibiotics should be practiced by all concerned – 'Start Smart then Focus'.

Early diagnosis and treatment is crucial in managing cases of CDI. Apply the following mnemonic (**SIGHT**) protocol when managing suspected potentially infectious diarrhoea:

Suspect that a case may be infective where there is no clear alternative cause of diarrhoea.
Isolate the patient
Gloves and aprons must be used for all contacts with patient and their environment
Hand washing with soap and water before and after patient and patient's environment.
Test the stool for toxin by sending a specimen immediately

The role of antibiotics in *Clostridium difficile* associated disease

There are sufficient reports in the literature to merit discontinuation of widespread use of **Quinolones, Cephlapsorins, Clindamycin and Co-amoxiclav** , especially in those at high risk of developing the infection such as patients above the age of 65. **Wherever possible use low risk antibiotics.**

High Risk	Moderate Risk	Low Risk
Quinolones	Macrolides	Benzylpenicillin
Cephlasporins	Amoxicillin Piperacillin/tazobactam	Pivmecillinam Flucloxacillin Aztreonam
Clindamycin	Carbapenems	Trimethoprim
Co-amoxiclav		Nitrofurantoin
		Aminoglycosides
		Tetracyclines Glycopepetides Metronidazole

Assessment of CDI Severity and Treatment of First Episodes, Recurrence and High Risk Patients

MILD

- Not associated with raised WCC
- Associated with <3 stools of type 5-7 on **Bristol Stool Chart per day

MODERATE

- Associated with raised WCC that is < 15X 10^9/L
- Associated with 3-5 stools type 5-7 **Bristol stool chart per day

SEVERE

- Associated with a WCC > 15 X 10^9/L
- Or an acute rising serum creatinine (>50% increase above base line)
- Or a temperature of > 38.5^0 C
- Or evidence of severe colitis (abdominal or radiological signs)
- The number of stools may be less reliable indicator of severity

LIFE THREATENING

- As above plus hypotension, partial or complete ileus
- Or toxic megacolon
- Or CT evidence of severe disease

RECURRENCE

Adults who experience a recurrence of CDI
- At least 3 consecutive type 5-7 episodes AND
- CD Toxin positive

High Risk Group with first episode of confirmed CDI
- Patients with co-morbidities and are likely to have repeated courses of antibiotics.

Such cases will be discussed and a decision will be made by the Consultant Microbiologist and Gastroenterologist.

Antimicrobial Recommendations		
Clinical Condition	**Recommended Empirical Treatment**	**Duration/Comments**
MILD	If treatment required: Metronidazole PO 400mg TDS	Duration: 10-14 days May not require specific *C. difficile* antibiotic treatment
MODERATE	Metronidazole PO 400mg TDS	Duration 10-14 days
SEVERE	Vancomycin PO 125mg QDS	Duration 10-14 days If no response, discuss with a Consultant Microbiologist.
	Following discussion with Consultant Microbiologist: Vancomycin PO up to 500mg QDS PLUS or MINUS Metronidazole IV 500mg TDS	Determined by response
LIFE THREATENING	Vancomycin PO up to 500mg QDS via NG tube or rectal instillation PLUS Metronidazole IV 500mg TDS	10-14 days Patients should be closely monitored with surgical input. • Measure blood lactate. • Colectomy considered if caecal dilatation is >10cm • Colectomy is best performed before blood lactate rises >5 mmmo/L, when survival is extremely poor
RECURRENCE and HIGH RISK With 1st episode of C. diff	Following discussion with Consultant Microbiologist: Fidaxomicin PO 200mg BD	10 days All cases should be discussed with Consultant Microbiologist and Gastroenterologist

Persistent Diarrhoea

There may be persistent diarrhoea due to post-infective irritable bowel syndrome.
The patient may be treated with an anti-motility agent such as loperamide 2mg PRN.

ALL of the following apply:

- diarrhoea persists despite 20 days' treatment
- the patient is stable
- the daily number of type 5–7** motions has decreased
- the WCC is normal
- there is no abdominal pain or distension

The patient should be closely observed for evidence of a therapeutic response and to ensure there is no evidence of colonic dilatation. **NOTE: Anti-motility agents must not be prescribed in acute CDI**

Bristol Stool Scale available at Intranet web link: http://en.wikipedia.org/wiki/Bristol_Stool_Scale
Please refer to Infection Control, CDI for further information about sampling

Algorithm 1: First episode *C. Difficile* Infection

Diarrhoea AND one of the following:
Positive *C difficile* toxin test OR
result of *C difficile* toxin test pending AND clinical suspicion of CDI

If clinically appropriate discontinue non-C. difficile antibiotics to allow normal intestinal flora to be re-established
Suspected cases must be isolated

Signs and symptoms of MILD/MODERATE CDI-

Oral metronidazole 400 mg tds for 10 –14 days

DAILY ASSESSMENT

Symptoms Improving
Diarrhoea should resolve in 1-2 weeks
Recurrence occurs in ~20% after 1st episode; 50-60% after 2nd episode

Symptoms not improving or worsening:

Should not be deemed treatment failure until 1 week of treatment

However: if evidence of severe CDI (defined p15**) treat as per severe CDI**

Switch to oral vancomycin 125mg qds 10-14 days

DO NOT PRESCRIBE ANTIMOTILITY AGENTS IN ACUTE CDI

Symptoms and signs of SEVERE CDI (see page 15 for definition)
Oral vancomycin 125mg qds 10-14 days if no improvement may need to increase the dose up to 500mg qds and +/- IV metronidazole after discussion with Consultant Microbiologist
Refer to gastroenterologist & Dietician

DAILY ASSESSMENT

Symptoms not improving or worsening:

Should not be deemed treatment failure until 1 week of treatment

However: if evidence of severe CDI (defined p15**) continues or worsens** treat as below

Surgery/GI/Micro consultation

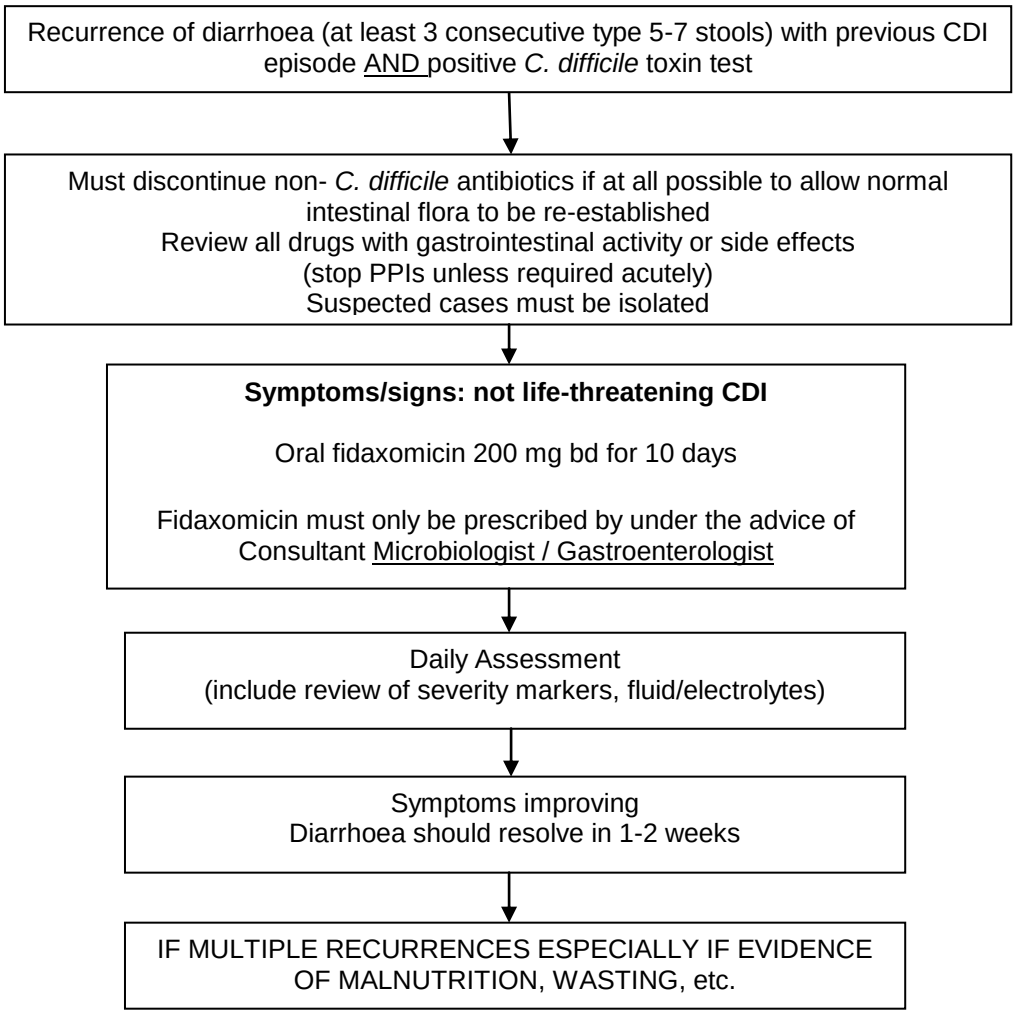
AND, depending on degree of ileus/ prior treatment
Vancomycin 125-500mg PO/NG qds +/-Metronidazole 500mg IV tds for 10 -14days
PLUS CONSIDER intracolonic Vancomycin (500mg in 100-500ml saline 4-12hourly) given as a retention enema

Further Surgery/GI/Micro consultation
Depending on choice of therapy (see above) consider:

1. High dose oral/ NG Vancomycin (500mg PO qds).
2. IV immunoglobulin 400mg/kg 1 dose, consider repeat

Algorithm 2: Recurrent *C. Difficile* Infection

Recurrent CDI occurs in 15-30% of patients treated with metronidazole or vancomycin and First Episode in High Risk Group.



1. Review ALL antibiotic and other drug therapy (consider stopping PPIs and/or other GI active drugs)

2. Consider supervised trial of anti-motility agents alone
(no abdominal symptoms or signs of severe CDI)

3. In recurrent cases course of tapering dose/pulse therapy of C.diff antibiotics may be prescribed after discuss with consultant microbiologist

Plus other options to be considered in consultation with Consultant Microbiologist/ Gastroenterologist.

4 Empirical Antimicrobial Guidelines

Sepsis

1. **Identify the likely source of septicaemia and refer to the appropriate section of this policy where possible**
2. **If the source of infection is unclear e.g. elderly patient with possible LRTI and/or UTI use the antibiotic treatment suggested below**
3. **Review antimicrobial therapy after 24 hours and step down to appropriate antimicrobial(s) as per guidelines**
4. **BEFORE starting treatment, where possible, ensure that a 'septic screen' of all relevant specimens has been taken as appropriate e.g. blood cultures, CSF, pus, urine culture, sputum culture, stool culture, wound swabs**
5. **Prompt treatment within 1 hour of suspected diagnosis/diagnosis**

Please refer to: Sepsis First Stage Revised

5.1 Sepsis			
Clinical Condition and likely pathogen	**Empirical/ First Line Guidance**	**2nd Line Guidance or Alternative Guidelines due to penicillin allergies**	**Duration/comments**
Sepsis of Unknown Origin, initial blind therapy- including severe sepsis EXCLUDING neutropenic sepsis	IV Co-amoxiclav 1.2g TDS + IV Gentamicin OD as per protocol	**Penicillin non-anaphylaxis and/or if Gentamicin not appropriate** IV Meropenem 1g TDS **Penicillin anaphylaxis** IV Ciprofloxacin 400mg BD + IV Metronidazole 500mg TDS +/- IV Gentamicin OD as per protocol	**Duration: 7-10 days** **Prompt treatment within 1 hour of suspected diagnosis/diagnosis** **NOTE:** once source identified step down to appropriate antibiotic as per guidelines below
Sepsis in the presence of a intravascular line	Add IV Teicoplanin as per protocol to initial blind therapy	Add IV Teicoplanin as per protocol to initial blind therapy	**Duration: 7-10 days** Longer duration if Staph aureus **Note:** Consider line removal
Sepsis: suspected MRSA	IV Co-amoxiclav 1.2g TDS + IV Gentamicin OD as per protocol + IV Teicoplanin as per protocol	**Penicillin non-anaphylaxis and/or if Gentamicin not appropriate** IV Meropenem 1g TDS + IV Teicoplanin as per protocol **Penicillin anaphylaxis** IV Teicoplanin as per protocol +/- IV Gentamicin OD as per protocol +/- IV Metronidazole 500mg TDS	**Duration: Minimum 14 days** **Stop Teicoplanin** if not MRSA, discuss further with microbiology

Sepsis: suspected ESBL	IV Meropenem 1g TDS	**Penicillin allergy** Discuss with microbiologist	**Duration: 7-10 days**
Sepsis associated with pneumonia	Treat as for severe CAP or HAP as appropriate: **Respiratory Infections**		
Suspected/Confirmed Sepsis Secondary to UTI	IV Co-amoxiclav 1.2g TDS +/- IV Gentamicin OD as per protocol	**Penicillin allergy:** IV Gentamicin OD as per protocol + IV Teicoplanin as per protocol ONLY if sensitivities available, patient is MRSA positive or high risk of MRSA	**Duration: 7-10 days**
Intra-abdominal Sepsis • **Diverticulitis** • **Peritonitis** • **Perforated gut** • **Undiagnosed gastrointestinal source**	IV Amoxicillin 1g TDS + IV Gentamicin OD as per protocol + IV Metronidazole 500mg TDS for perforated gut	**Failure to respond to 1st Line treatment / Penicillin allergy** IV Ciprofloxacin 400mg BD + IV Gentamicin OD as per protocol + PO/IV Metronidazole 400mg/500mg TDS	**Duration: 7-10 days**
Confirmed Biliary Sepsis, antibiotic choice should be guided by MC&S. If not available, please follow the guidance below.			
Including: • **Cholecystitis** • **Cholangitis**	IV Amoxicillin 1g TDS + IV Gentamicin OD as per protocol	**Penicillin allergy** IV Ciprofloxacin 400mg BD + IV Gentamicin OD as per protocol	
Neutropenic Sepsis (Febrile Neutropenia) **For Neutropenic Sepsis policy, please follow link** Neutropenic Sepsis	IV Piperacillin/ Tazobactam 4.5g TDS + IV Gentamicin OD (for 2 doses) If Hickman line present **ADD** IV Teicoplanin as per protocol	**Penicillin allergy** IV/PO Ciprofloxacin 400mg/ 500mg BD + IV Gentamicin OD as per protocol	**Duration: 7-10 days**
Glycopepide resistant Sepsis (e.g. VRE)	**Discuss with Microbiologist and treat according to sensitivities. Please see Management of Patients with Glycopeptide Resistant Enterococci Including Vancomycin Resistant Enterococci**		

5.2 Central Nervous System Infections

Please also refer to "Initial management Guidelines on Suspected Bacterial Meningitis in adults"
Adjust regimen in light of MC&S. Pneumococcal and meningococcal meningitis DO NOT **require the concurrent use of two beta-lactams (i.e.** ceftriaxone **and benzylpenicillin).** Notify all cases of meningitis to Consultant in communicable disease control via switch board.

Clinical Condition and likely pathogen	Empirical/ First Line Guidance	2nd Line Guidance or Alternative Guidelines due to penicillin allergies	Duration/comments
Bacterial Meningitis	IV Ceftriaxone 2g BD	IV Chloramphenicol 25mg/kg QDS reduced to 12.5mg/kg as soon as clinically indicated	**Duration: dependent on pathogen/culture results, see below.** Contact microbiologist for advice
Suspected Listeria Meningitis • >50 years of age • immunocompromised	Add IV Amoxicillin 2g every 4 hours	**Penicillin allergy** Discuss with microbiologist	**Duration: 21 days** **Listeria Sp.** Always resistant to ceftriaxone
Bacteriology confirmed by the laboratory			
Pneumococcal meningitis	IV Benzylpenicillin 2.4 g 4 hourly **Add** IV Vancomycin as per protocol if penicillin resistant pneumococcal infection present		**Duration: 14 days** Contact microbiologist for further advice
Meningicoccal meningitis	IV Benzylpenicillin 2.4g 4 hourly		**Duration: 7 days**
Listeria meningitis	IV Amoxicillin 2g every 4 hours + IV Gentamicin OD as per protocol	IV or PO Co-trimoxazole 960mg BD In severe infections increase IV Co-trimoxazole dose to 1.44g BD	**Duration: 21 days**
Suspected Encephalitis If the patient has altered mental state and there is suspicion of viral encephalitis	**Add IV Aciclovir** 10mg/kg TDS (use ideal body weight in obese patients)		**Duration: 14-21 days** **Note:** Review dose in patients with renal impairment

5.3 Ophthalmology and ENT

Clinical Condition and likely pathogens	Empirical/ First Line Guidance	2nd Line Guidance or Alternative Guidelines due to penicillin allergies	Duration/comments
Purulent Conjunctivitis	**Chloramphenicol** eyedrops 0.5% or ointment 1%		**Duration 5-7 days** If gonococci or chlamydia suspected discuss with consultant microbiologist
Pharyngitis	PO Phenoxymethylpenicillin 500mg QDS	PO Clarithromycin 500mg BD	**Duration 7 days**
Uncomplicated acute Otitis Media	Antibiotics not routinely recommended/required. Prescribe pain relief and review patient.		
Sinusitis or complicated Otitis Media	PO Amoxicillin 500mg TDS	PO Doxycycline 200mg stat then 100mg OD	**Note:** If no improvement after 48 hours or if severe contact microbiology for further advice

Acute epiglottitis bacterial tracheitis	IV Ceftriaxone 2g OD if severe increase frequency to BD	IV Chloramphenicol 12.5 mg/kg QDS	**Duration: 10-14 days**

5.4 Respiratory Infections

For Community Acquired Pneumonia (CAP) or Infective Exacerbation of COPD severity scoring and Bronchiectasis Diagnostic Criteria please see Appendix 5 **APPENDIX 5: Adult Community Acquired Pneumonia (CAP) Severity Assessment and Infective Exacerbation of COPD and Bronchiectasis criteria**

<table>
<tr><th colspan="4">Respiratory Infections</th></tr>
<tr><th>Clinical Condition and likely pathogens</th><th>Empirical/ First Line Guidance</th><th>2nd Line Guidance or Alternative Guidelines due to penicillin allergies</th><th>Duration/comments</th></tr>
<tr><td rowspan="5">S.Pneumoniae

CURB65
• Confusion
• Urea >7mmol/L
• Respiratory Rate ≥30/min
• Blood pressure (SBP <90mmHg or DBP ≤60mmHg)
• Age ≥65</td><td colspan="3">CAP: MILD CURB65: 0-1 <3%mortality risk</td></tr>
<tr><td>PO Amoxicillin 500mg-1g TDS</td><td>PO Clarithromycin 500mg BD

Or

PO Doxycycline 200mg stat then 100mg BD there after</td><td>Duration: 5 days
NICE recommends 5 days treatment for low severity CAP, consider extending the course if no improvement after 5 days.</td></tr>
<tr><td colspan="3">CAP: Moderate CURB65: 2 3-5% mortality risk</td></tr>
<tr><td><u>Oral route suitable</u>
PO Amoxicillin 500mg-1g TDS
+/-
PO Clarithromycin 500mg BD

If NBM give IV as per severe CAP</td><td>Oral route suitable:
PO Clarithromycin 500mg BD</td><td>Duration: 5-10 days</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td>S.Pneumoniae
Atypical pneumonia
H. influenza</td><td colspan="3">CAP: Severe CURB65: 3 15% mortality risk</td></tr>
<tr><td>IV Amoxicillin 1g TDS
+
IV/PO Clarithromycin 500mg BD</td><td rowspan="2">Penicillin allergy:
IV Levoflovacin 500mg BD</td><td rowspan="2">Duration: 10-14 days</td></tr>
<tr><td>If previous exposure to amoxicillin</td><td>IV Co-amoxiclav 1.2g TDS
+
PO/IV Clarithromycin 500mg BD</td></tr>
<tr><td>If recent hospitalisation and/or recent antibiotics</td><td colspan="3">CAP: Severe CURB65: 4-5 and Immunosuppressed</td></tr>
<tr><td colspan="2">IV Levofloxacin 500mg BD</td><td>Duration: 5-10 days</td></tr>
<tr><td>If S. aureus suspected
e.g. post-influenza</td><td>Add IV Flucloxacillin 2g IV QDS to current treatment unless/until MC&S are available</td><td>Penicillin allergy:
Add IV Vancomycin or Teicoplanin as per protocol and obtain</td><td>Duration: 10 days
If PVL suspected contact microbiologist</td></tr>
</table>

		MRSA screen). Discuss with Microbiology within 24hours	
If legionella suspected	**Contact Microbiology**		
Hospital Acquired Pneumonia (HAP) Early Onset < 5 days admission S. Pneumonia H. Influenza	PO Doxycycline 200mg stat then 100mg BD there after **Or** PO Co-trimoxazole 960mg BD		**Duration 5-7 days**
Late Onset ≥5 days admission S. pneumoniae H. influenza Enterobacteraciae MRSA	IV Levofloxacin 500mg BD If **MRSA positive** **Add** IV Teicoplanin as per protocol		**Duration: 5-10 days** **Comments** **If no response after 48-72 hours or pseudomonas suspected add IV Gentamicin OD as per protocol**
Aspiration Pneumonia If secondary infection suspected (after 48hours of aspiration)	PO/IV Amoxicillin 1g TDS + PO Metronidazole 400mg TDS	**Penicillin allergy:** PO/IV Co-trimoxazole 960mg BD + PO/IV Metronidazole 400mg/500mg TDS **2nd Line** PO/IV Levofloxacin 500mg BD + PO/IV Metronidazole 400mg/500mg TDS	**Duration: 5-7 days**
Empyema	IV Ceftazidime 1g TDS + IV Teicoplanin as per protocol + IV Metronidazole 500mg TDS	According to culture results/discuss with microbiologist	**Duration: 3 weeks** sometimes prolonged courses may be required
Lung Abscess	IV Ceftazidime 1g TDS + IV Teicoplanin as per protocol + IV Metronidazole 500mg TDS	According to culture results/discuss with microbiologist	**Duration: 4-6 weeks** Discuss with microbiologist
Infective exacerbation of Bronchiectasis /COPD Please see link above for diagnostic criteria	Guided by previous microbiology, If unavailable: PO/IV Co-amoxiclav 625mg/1.2g TDS	**Pencillin allergy** PO/IV Levofloxacin 500mg BD	**Duration: 14 days** Review IV at 24-48 hours

If recent hospitalisation and or recent antibiotics	PO/IV Levofloxacin 500mg BD	

5.5 Cardiovascular System			
Clinical condition and likely pathogen	**Empirical/ First Line Guidance**	**2nd Line Guidance or Alternative Guidelines due to penicillin allergies**	**Duration/comments**
Infective Endocarditis: Review regularly and repeat blood cultures weekly : For prophylaxis refer to APPENDIX 9: Protocol for the use of Prophylaxis against Infective Endocarditis (IE)			
Native Valve	IV Amoxicillin 2g every 4-6 hours + IV Gentamicin 80mg BD	IV Vancomycin/Teicoplanin as per protocol + IV Gentamicin 80mg BD	**Duration: determined by response, discuss with microbiologist**
Prosthetic Valve	IV Vancomycin as per protocol + PO Rifampicin 300mg-600mg BD + IV Gentamicin 80mg BD (measure pre and post dose levels around the 3rd dose)		**Duration: determined by response, discuss with microbiologist**
Culture Positive Infection	Discuss with Consultant Microbiologist, antibiotic choice will depend on the organism isolated		

5.6 Gastrointestinal System			
Clinical condition and likely pathogen	**Empirical/ First Line Guidance**	**2nd Line Guidance or Alternative Guidelines due to penicillin allergies**	**Duration/comments**
Gastro-enteritis	**Generally non-bacterial aetiology, if due to bacterial infectionit usually resolves spontaneously in most cases-antibiotics not indicated. If antibiotics required check laboratory sensitivities**		
Campylobacter enteritis Usually resolves spontaneously. If severe, prolonged or patient immunocompromised	PO Erythromycin 500mg QDS	PO Ciprofloxacin 500mg BD only if MC&S positive	**Duration: 5 days** **Samples: Stool**
Invasive salmonella/ Typhoid fever Salmonella typhi, S.parathyphi	IV Cefotaxime 1g-2g BD		**Duration: 10-14 days** **Samples: Stool and blood cultures**
Typhoid Carriage Salmonella typhi	Consult microbiologist for advice		
Non-typhoidal Salmonella or Shigella	Treat only if clinically indicated, symptomatic management may suffice PO/IV Ciprofloxacin 500mg/400mg BD		**Duration:5-7 days, if immunocompromised up to 14 days treatment may be required** Samples: Stool Not all Shigella Sp requires antibiotic treatment

Giardia Giardia intestinalis	PO Metronidazole 2g daily for 3 days or 400mg TDS		**Duration: Discuss with Microbiologist**
Amoebic Dysentry Entamoeba Histolytica (Protozoan)	PO Metronidazole 800mg TDS Followed by PO Diloxanide Furoate 500mg TDS		**Duration: 5 days** **Duration: 10 days**
Ulcerative Colitis: Please see Acute Colitis Management			
Moderate to severe relapse	IV Amoxicillin 1g TDS + IV Gentamicin OD as per protocol + IV Metronidazole 500mg TDS	**Penicillin allergy:** Discuss with microbiologist	**Duration: 7-10 days**
Crohn's Disease: Please see Crohn's disease Management			
	IV Amoxicillin 1g TDS + IV Gentamicin OD as per protocol + IV Metronidazole 500mg TDS	**Penicillin allergy:** IV Ciprofloxacin 400mg BD + IV Gentamicin OD as per protocol + IV Metronidazole 500mg TDS	**Duration: 7- 10 days**
Ascites please see Management of Malignant and Non-Malignant Ascites-Adults			
Spontaneous Bacterial Peritonitis (see also link above)	IV Amoxicillin 1g TDS + IV Gentamicin **do not use OD Protocol** (contact Microbiologist/Pharmacist for dosing) + IV Metronidazole 500mg TDS	**Penicillin allergy:** IV Ciprofloxacin 400mg BD + IV Gentamicin **do not use OD Protocol** (contact Microbiologist/Pharmacist for dosing) + IV Metronidazole 500mg TDS	**Duration: 7-10 days**
GI and Variceal Bleeding please see Upper GI Bleeding			
Treatment of upper gastro-intestinal (GI) bleed caused by cirrhosis or varices	IV Ciprofloxacin 400mg BD		**Duration: discuss with microbiologist**
Colitis/Pseudomembranous Colitis please see Clostridium difficile Infection			
Acute Pancreatitis	If there are signs or clinical evidence of infection/newly developed sepsis/ raised CRP IV Meropenem 500mg – 1g TDS	**Penicillin non-anaphylaxis:** IV Meropenem 500mg – 1g TDS **Penicillin anaphylaxis:** IV Ciprofloxacin 400mg BD	**Duration: 7-10 days** Determined by patients response
Intra-abdominal Infections • **Diverticulitis** • **Peritonitis** • **Perforated gut** • **Undiagnosed gastrointestinal**	IV Amoxicillin 1g TDS + IV Gentamicin OD as per protocol + IV Metronidazole 500mg TDS	**Failure to respond to 1st Line treatment / Penicillin Allergy** IV Ciprofloxacin 400mg BD + IV Gentamicin OD as per protocol + PO/IV Metronidazole	**Duration: 7-10 days**

source		400mg/500mg TDS	
Follow link for Intra-abdominal and Biliary Sepsis			

5.7 Urinary Tract Infections: Uncomplicated and Complicated

Clinical condition and likely pathogen	Empirical/ First Line Guidance	2nd Line Guidance or Alternative Guidelines due to penicillin allergies	Duration/comments
Samples: MSU/CSU/Blood Cultures if appropriate **For pregnant females, please see Pregnancy Related Infections**			
Uncomplicated/Simple UTI in otherwise healthy females <65 years of age	PO Nitrofurantoin 100mg MR BD **Avoid if CrCl <40mls/min** Or PO Pivmecillinam 400mg STAT followed by 200mg TDS **if CrCl< 40mls/min**	PO Nitrofurantoin 100mg MR BD **Avoid if CrCl <40mls/min** Or PO Trimethoprim 200mg BD **if CrCl< 40mls/min** AND sensitivities available Or PO Ciprofloxacin 500mg BD **if CrCl< 40mls/min**	**Duration: 3 days** **Samples : Send urine samples for culture and sensitivities**
For uncomplicated ESBL	PO Fosfomycin 3g STAT		**Duration: 1 dose**
Complicated UTI Or Pyelonephritis Including: • Catheter associated UTI • UTI in men (excluding STD, symptoms of prostatitis) • Immunocompromised • Elderly with co-morbidities	PO Nitrofurantoin 100mg MR BD **Avoid if CrCl <40mls/min** Or PO Pivmecillinam 400mg TDS **if CrCl< 40mls/min** **Or if IV therapy required** IV Co-amoxiclav 1.2g TDS +/- IV Gentamicin OD as per protocol	PO Nitrofurantoin 100mg MR BD **Avoid if CrCl <40mls/min** **Or if IV therapy required** IV Gentamicin OD as per protocol Or IV Ciprofloxacin 400mg BD	**Duration: 7 days** **For Pyelonephritis duration 10-14 days**
Follow link for Suspected/Confirmed Sepsis Secondary to UTI			
Prostatitis E.coli Anaerobes	PO Ciprofloxacin 500mg BD	OR PO Metronidazole 400mg TDS **+** PO Amoxicillin 500mg TDS if systemically unwell	**Duration: up to 28 days** (chronic infection may require longer treatment)

5.8 Genital Tract Infections

Clinical condition and likely pathogen	Empirical/ 1st Line Guidance	2nd Line Guidance or Alternative Guidelines due to penicillin allergies	Duration/comments
Genital Infections: HVS, endocervical swab for chlamydia/ urine for GC and Chlamydia PCR			
Gonorrhoea, uncomplicated N. gonoorrhoeae	IM Ceftriaxone 500mg single dose + PO Azithromycin 1g single dose	**Penicillin anaphylaxis:** PO Ciprofloxacin 500mg single dose + PO Azithromycin 1g single dose	**Duration: Single dose of each**
Epididymo-orchitis Due to any sexually transmitted pathogen	IM Ceftriaxone 500mg single dose + PO Doxycycline 100mg BD	**Penicillin allergy:** Discuss with microbiologist	**Duration: 14 days**
Due to enteric organisms	PO Ciprofloxacin 500mg BD Or PO Co-amoxiclav 625mg TDS if sensitivities available		**Duration: 10 days**
Pelvic Inflammatory Disease (PID) / Acute salpingitis			
Outpatient regimen *N. gonorrhoeae*, *C. trachomatis* and a variety of aerobic and anaerobic bacteria commonly isolated from the upper genital tract in women with PID	IM Ceftriaxone 500mg single dose + PO Doxycycline 100mg BD + PO Metronidazole 400mg BD	**2nd Line when 1st Line fails/not tolerated:** IM Ceftriaxone 500 mg STAT followed by azithromycin 1 g per week for 2 weeks **Penicillin alllergy:** PO Ofloxacin 400mg BD + PO Metronidazole 400mg BD	**Duration: Total 14 days**
Inpatient regimen *N. gonorrhoeae*, *C. trachomatis* and a variety of aerobic and anaerobic bacteria commonly isolated from the upper genital tract in women with PID	I.V Ceftriaxone 2g OD + PO Doxycycline 100mg BD followed by PO Doxycycline 100mg BD + PO Metronidazole 400mg BD to complete 14 days	**Penicillin allergy:** IV Clindamycin 900mg TDS + IV Gentamicin (2mg/kg loading dose) followed by1.5mg/kg TDS followed by PO Doxycycline 100mg BD + PO metronidazole 400mg BD to complete 14 days	**Duration: Total 14 days** **IV therapy should be continued until 24 hours AFTER clinical improvement and then switched to PO.**
Vaginal Candidiasis C. albicans/candida species	Clotrimazole 500mg vaginal pessary STAT Or PO Fluconazole 150mg STAT		
Trichomoniasis	PO Metronidazole 2g STAT Refer patient to sexual health department		**Not During Pregnancy or breastfeeding**

5.9 Pregnancy Related Infections

Clinical condition and likely pathogen	Empirical/ First Line Guidance	2nd Line Guidance or Alternative Guidelines due to penicillin allergies	Duration/comments
Samples: MSU, CSU, Blood cultures			
Post-Partum infection Mixed including Anaerobes	IV Cefuroxime 1.5g TDS + IV Metronidazole 500mg TDS	**Penicillin allergies:** Discuss with microbiologist	**Duration: 7-10 days** **Samples:** Blood cultures, HVS, Endocervical swabs
Simple UTI E.Coli Other gram negative Staph saprophyticus	PO Nitrofurantoin 100mg BD (Not at term (37+ wks) Or PO Trimethoprim 200mg BD only if sensitivities available (not to be used in the 1st trimester)	PO Cephalexin 500mg TDS if neither 1st line recommended antimicrobials not suitable	**Duration: 7 days** **Samples:** MSU for culture
Complicated UTIs	**Please discuss with Consultant Microbiologist**		

5.10 Skin and Soft Tissue Infections

Clinical condition and likely pathogen	Empirical/ 1st Line Guidance	2nd Line or Alternative Guidelines in Cases of True Penicillin Allergies	Duration/comments
Samples: wound swabs and blood cultures			
Cellulitis Mild/Moderate S. aureus S. pyogenes	PO Flucloxacillin 1g QDS	**Penicillin allergy:** PO Clarithromycin 500mg BD	**Duration: 7 days**
Cellulitis Severe S. aureus S. pyogenes	IV Flucloxacillin 1g QDS + IV Benzylpenicillin 1.2g QDS	**Penicillin allergy:** PO/IV Clarithromycin 500mg BD Or IV Teicoplanin as per protocol	**Duration: 7-10 days** Patients may be discharged on OPAT
Diabetic Foot Infections/Leg Ulcers S. aureus S. pyogenes Gram negative organisms Pseudomonas	PO Co-amoxiclav 625mg TDS OR if septic give IV 1.2g TDS	**Penicillin anaphylaxis:** PO Doxycyline 200mg OD Or IV Tigecycline 100mg then 50mg BD	**Duration: 7-10 days** deep seated infections may require longer treatment This excludes MRSA infected leg ulcers. If identified then discuss with consultant microbiologist
Necrotising fasciitis Mixed organism Discuss with Consultant microbiologist	IV Piperacillin/ Tazobactam 4.5g TDS + IV Metronidazole 500mg TDS +/- IV Clindamycin 600mg TDS/QDS if severe	**Penicillin allergy:** Consult Microbiologist	**Duration 7-14 days** For antibiotic advice and refer for surgical review
Gas Gangrene Discuss with Consultant	IV Piperacillin/ Tazobactam 4.5g TDS	**Penicillin anaphylaxis:** Consult microbiologist	**Duration 7-14 days** **Surgical referral is**

microbiologist Clostridium Perfringens Group A Strep S. aureus	+ IV Metronidazole 500mg TDS +/- IV Clindamycin 600mg TDS/QDS		**necessary**
Animal or Human Bites Pasteurella multocida Staph aureus Anaerobes	PO Co-amoxiclav 625mg TDS	**Penicillin anaphylaxis:** PO Doxycycline 100mg OD + PO Metronidazole 400mg TDS	**Duration 5-7 days**

5.11 Musculoskeletal Infections

Clinical condition and likely pathogen	Empirical/ 1st Line Guidance	2nd Line or Alternative Guidelines in Cases of True Penicillin Allergies	Duration/comments
Samples:Blood cultures, aspirates and bone curettings			
Septic Arthritis Complicated cases please discuss with Microbiologist	IV Flucloxacillin 1g QDS + IV Benzylpenicillin 600mg-1.2g QDS	**Penicillin anaphylaxis:** Discuss with consultant microbiologist	**Duration: 6-8 weeks including 2 weeks of IV** **Antibiotics should be reviewed when microscopy and culture results are back**
Osteomyelitis	IV Flucloxacillin 1g QDS + PO Rifampicin 600mg BD Or according to culture results	**Penicillin anaphylaxis:** IV Teicoplanin as per protocol + PO Rifampicin 600mg BD	**Duration: Consult Microbiologist** **Antibiotics should be reviewed when microscopy and culture results are back** Patients may be discharged on OPAT
Open Fractures	IV Co-amoxiclav 1.2g TDS +/ - IV Gentamicin OD as per protocol	**Penicillin anaphylaxis:** IV Gentamicin OD as per protocol + IV Metronidazole 500mg TDS And discuss with microbiologist	**Duration: 7-10 days**

5.12 Post-Operative Surgical Infections

Clinical condition and likely pathogen	Empirical/1st Line guidance	2nd Line or Alternative Guidelines in Cases of True Penicillin Allergies	Duration/Comments
Necrotising Fascitis Mixed organisms Discuss with Consultant microbiologist	IV Piperacillin/ Tazobactam 4.5g TDS + IV Metronidazole 500mg TDS If severe add IV Clindamycin 600mg TDS/QDS	**Penicillin allergy:** Consult Microbiologist	**Duration: 7-14 days**

Gas Gangrene Clostridium perfringens Discuss with Consultant microbiologist	IV Piperacilin/Tazobactam 4.5g TDS + IV Metronidazole 500mg TDS +/ IV Clindamycin 600mg TDS/QDS if severe	**Penicillin allergy:** Consult Microbiologist	**Duration: 7-14 days**
Biliary Tract infection	IV Amoxicillin 1g TDS + IV Gentamicin OD as per protocol	**Penicillin allergy:** IV Ciprofloxacin 400mg BD + IV Gentamicin OD as per protocol	**Duration: 7-10 days**
Faecal Peritonitis secondary to diverticulitis E.Coli Enterobacteriacea spp Bacteroides enterococci	IV Amoxicillin 1g TDS + IV Gentamicin OD as per protocol + IV Metronidazole 500mg TDS	**Penicillin allergy:** PO/IV Ciprofloxacin 500mg/400mg BD + PO/IV Metronidazole 400mg /500mg TDS + IV Gentamicin OD as per protocol	**Duration: 7-10 days**
Acute Pancreatitis	**See Gastrointestinal Infections**		
Abdominal Sepsis	IV Amoxicillin 1g TDS + IV Gentamicin OD as per protocol + IV Metronidazole 500mg TDS for perforated gut	**Failure to respond to 1st Line treatment / Penicillin allergy** IV Ciprofloxacin 400mg BD + IV Gentamicin OD as per protocol + PO/IV Metronidazole 400mg/500mg TDS	**Duration: 7-10 days**

5.13 Malaria Treatment

Clinical condition and likely pathogen	Recommendations	Duration/Comments
Falciparum Malaria Uncomplicated P. falciparum	PO Quinine 600mg every 8 hours + PO Doxycycline 200mg OD **Alternative reserved ONLY for patients who cannot tolerate quinine**: PO Artemether 20mg/120 mg lumefantrine (Riamet®): if weight >35kg, Four tablets initially, followed by 5 further doses of 4 tablets each given at 8, 24, 36, 48 and 60 hours	**Duration: 7 days**
Falciparum Malaria Complicated P. falciparum	Quinine dihydrochloride IV infusion (in 5% dextrose) Loading dose 20mg/kg over 4 hours followed by 10mg/kg infused over 4 hours every 8 hours for first 48 hours. If IV quinine needs to be continued for greater than 48 hours the frequency should be reduced to 12 hourly. + Doxycycline 200mg PO OD **Note: Do not give loading dose if quinine or mefloquine therapy has been taken within the previous 12 hours**	**Duration: 7 days**

	When patient stable or able to swallow tablets switch to PO Quinine 600mg every 8 hours + PO Doxycycline 200mg OD **Alternative reserved ONLY in the following cases (available on a named patient basis on advice of the antimicrobial consultant):** • Contraindications to Quinine • Very severe disease (parasite count >20%) • Deterioration on optimal doses of quinine • cardiovascular disease that increases the risks from quinine • Patients with falciparum malaria from SE Asia where relative quinine resistance is most likely. Artesunate (IV injection) 2.4mg/kg given at 0, 12 and 24 hours then daily thereafter + PO Doxycycline 200mg OD for 7 days When patient is able to tolerate oral therapy give a full course of: • Artemether 20mg/120 mg lumefantrine (Riamet®) if Quinine is contraindicated- see dosing above **OR** • Quinine 600mg PO every 8 hours plus • Doxycycline 200mg PO OD	**Note:** Parenteral therapy should be given for a minimum of 24 hours once started
Falciparum Malaria in pregnancy	Quinine dihydrochloride IV infusion (in 5% dextrose) Loading dose 20mg/kg over 4 hours followed by 10mg/kg infused over 4 hours every 8 hours for first 48 hours. If IV quinine needs to be continued for greater than 48 hours the frequency should be reduced to 12 hourly + PO Clindamycin 450mg PO TDS Note:- Do not give loading dose if quinine or mefloquine therapy has been taken within the previous 12 hours When patient stable or able to swallow tablets switch to PO Quinine 600mg PO every 8 hours + PO Clindamycin 450mg PO TDS	Duration 7 days
Non-Falciparum Malaria P. ovale P. vivax P.malariae	PO Chloroquine (dose expressed as base) Initial dose of 620mg followed by a single dose of 310mg after 6-8 hours then 310mg OD for 2 days Chloroquine alone is adequate for P. malariae infections In vivax and ovale after treatment of acute infection use the following for hypnozite eradication: PO Primaquine **P. Vivax**: 30mg OD for 14 days **P. Ovale:** 15mg OD for 14 days Note : G6PD must be measured before primaquine is started.	
Non-Falciparum Malaria in pregnancy	Chloroquine PO (dose expressed as base) initial dose of 620mg followed by a single dose of 310mg after 6-8 hours then	

	310mg OD for 2 days In vivax and ovale after treatment of acute infection use the following for hypnozite eradication: PO Chloroquine 310mg ONCE WEEKLY until delivery.	

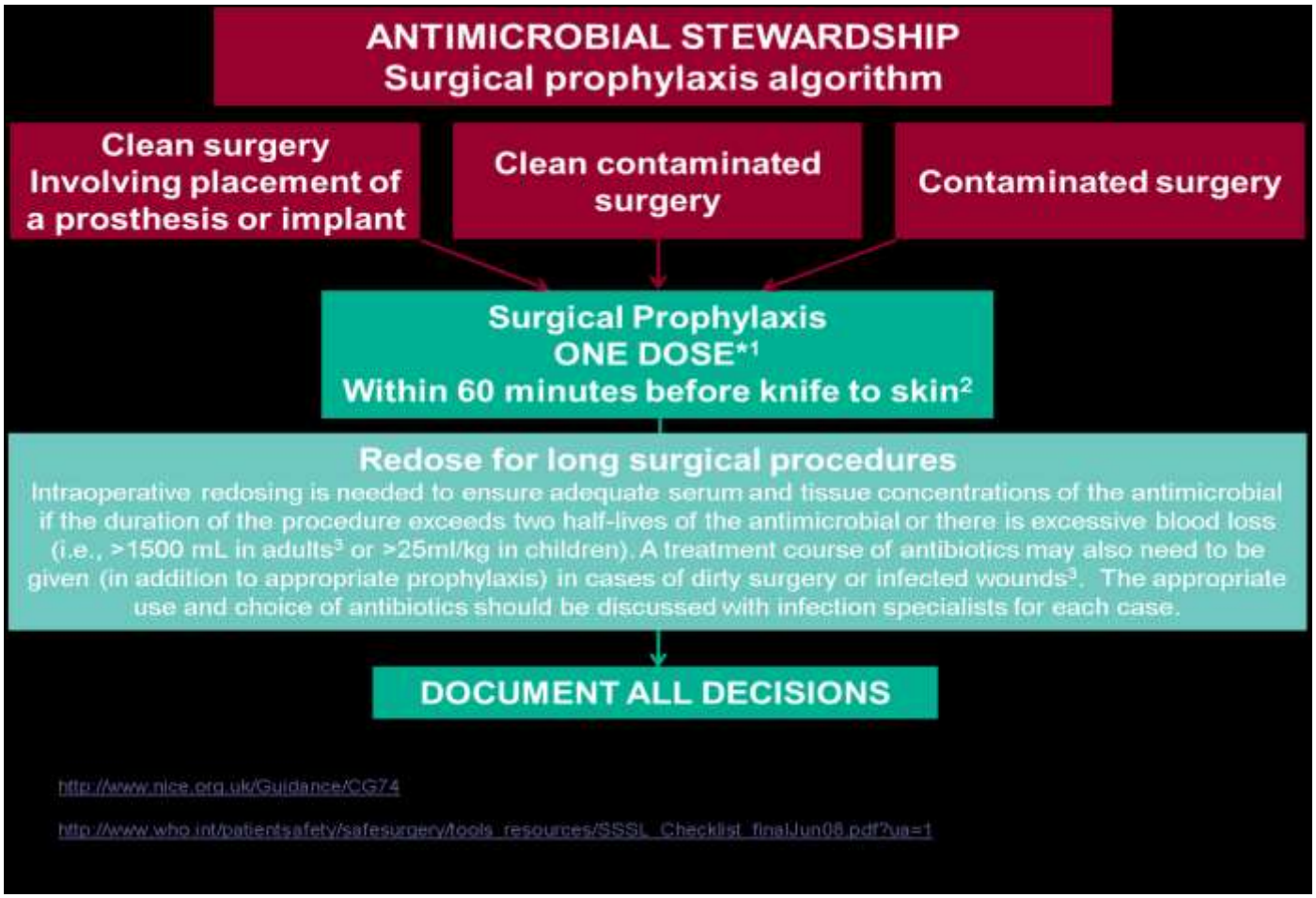
6. Surgical Prophylaxis

Prophylactic administration of antibiotics represents their most common use in surgery. Designed to reduce the incidence of post-operative infection, antibiotic prophylaxis may reduce overall costs and length of patient hospital stay. On the other hand, inappropriate and indiscriminate use of prophylactic antibiotics may increase costs through selection of resistant organisms, unnecessary drug use, and requisite laboratory monitoring and adverse events.

This guideline is not intended to be construed or to serve as a standard of care. Standards of care are determined on the basis of all clinical data available for an individual case and are subject to change as scientific knowledge and technology advance and patterns of care evolve. The ultimate judgment must be made by the appropriate clinician responsible for decisions regarding a particular clinical procedure or treatment plan. It is advised however that significant deviations from the guideline should be fully documented in the patient's notes at the time the relevant decision is taken. As with other adjunctive measures in surgery, the use of antibiotic prophylaxis is not a substitute for good infection control practices, appropriate patient preparation, clinical judgment, an adequate operating environment and good technique.

6.1 Principles of Antimicrobial Use in Surgery

The basic considerations underlying the use of antimicrobial prophylaxis in surgery include the type of surgery performed; the timing, duration and route of antimicrobial administration and selection of the most appropriate agent.



Antimicrobial prophylaxis for surgical procedures should be limited to a single dose in most instances. This is a fundamental measure to control the incidence of C. difficile, MRSA, ESBL and other multi-resistant pathogens.
The relevant exceptions to single dose prophylaxis would be:

- When duration of surgery is >2hours (extra intra-operative dose administered)
- When blood loss exceeds 1.5 litres (extra dose administered after fluid replaced)
- Emergency surgery for contaminated or dirty operations
- Infections already pre-existing pre-operatively

1. Type of surgery

Prophylaxis is generally indicated in procedures associated with a high rate of infection (clean-contaminated or contaminated procedures) and those in which post-operative infection, regardless of its incidence, can be severe or fatal (e.g. orthopaedic implant surgery). However most clean procedures have a very low incidence of post-operative infection and the use of antimicrobials is usually not justified. Antimicrobial prophylaxis may be justified for any procedure if the patient is immunocompromised (e.g. neutropenic or receiving immunosuppressive agents).

2. Timing of antimicrobial administration

To be most effective, antimicrobial agents should be present in the potentially contaminated tissues before the surgical incision is made and must persist in tissues throughout the period of potential contamination. When antimicrobials are given after bacterial contamination, their ability to prevent infection is substantially reduced. If prophylactic antimicrobials are given three to four hours after bacterial contamination their efficacy is negligible for prophylactic purposes. Therefore intravenous antibiotics are given at induction of anaesthesia, and oral antibiotics are given 1-2 hours prior to the procedure. This involves the surgical team prescribing the antibiotic before the patient arrives in theatre.

3. Duration of antimicrobial prophylaxis

The duration of the regimen should be as short as possible; in most cases current recommendations support the efficacy of a single pre-operative dose. If the duration of the operation exceeds four hours a 'top-up' intra-operative antibiotic dose may be necessary.
If blood loss exceeds 1500ml additional intra-op dose may need to be given.

4. Route of antimicrobial prophylaxis

Antimicrobials should be administered intravenously at induction of anaesthesia.

5. Selection of antimicrobial agents

In drawing up these guidelines antimicrobials have been selected based on an understanding of likely organisms, patterns of antimicrobial resistance, and the spectrum and efficacy of each agent, as well as consideration of product cost.

6. Cost

Cost is appropriately the last item considered in the choice of prophylactic antibiotics. Among otherwise equal antibiotics in the selection criteria, the least expensive agent has been chosen. The least expensive is not always the drug with the lowest procurement cost. Total expenses include the costs of laboratory monitoring, drug administration consumables, adverse effects and failure of prophylaxis (e.g. wound infection).

A repeat dose of chosen agent should be given after two hours if the procedure is not completed.

Only continue antibiotic therapy at the direction of the surgical team or to TREAT infection.

6.2 Common errors in antimicrobial prophylaxis

Common errors include:

- Extending the course for longer than is necessary
- Choosing the wrong agent
- Administering the initial dose too early
- Omitting critical intra-operative doses in long operations
- Usage of valuable therapeutic agents with expanded spectrum

The implementation and use of these guidelines by surgical staff and professional support by clinical pharmacists and nursing staff will all combine effectively to minimise these errors.

6.3 Recommended Prophylaxis

Procedure	Empirical/1st Line Guidance	2nd Line or Alternative Guidelines in Cases of True Penicillin Allergies	Duration/Comments
Appendectomy Or Colorectal Surgery Clean op	IV Amoxicillin 1g STAT + IV Gentamicin 120mg STAT + IV Metronidazole 500mg STAT	**Penicillin allergy:** IV Gentamicin 120mg STAT + IV Metronidazole 500mg STAT + IV Teicoplanin 400mg STAT	**Note:** If perforation/ contamination of the wound then a longer duration of treatment may be necessary
Dirty op	IV Gentamicin 120mg STAT + IV Co-amoxiclav 1.2g STAT + IV Metronidazole 500mg STAT	**Penicillin allergy:** IV Gentamicin 120mg STAT + IV Metronidazole 500mg STAT + IV Teicoplanin 400mg STAT	
ERCP	PO Ciprofloxacin 750mg STAT 60 minutes prior to procedure		
Biliary Surgery	IV Co-amoxiclav 1.2g bolus as a single dose only at time of induction	**Penicillin allergy:** PO Ciprofloxacin 250mg/ IV 400MG STAT + IV Metronidazole 500mg STAT	**Note:** Add Teicoplanin 400mg IV at induction in case of history of MRSA
Gastroduodenal Surgery	IV Co-amoxiclav 1.2g bolus as a single dose	**Penicillin allergy:** IV Gentamicin 120mg IV STAT	

		+ IV Metronidazole 500mg STAT + Teicoplanin IV 400mg STAT	
Vascular Surgery	IV Teicoplanin 400mg at induction +/- IV Gentamicin 120mg at induction		**Note:** Second dose of Teicoplanin can be given if prolonged procedure
Endovascular Surgery	IV Teicoplanin 400mg at induction		
Breast Surgery	IV Co-amoxiclav 1.2g at induction if no implant OR IV Flucloxacillin 1g at induction if implant	**Penicillin allergy:** Discuss with microbiologist	
Hernia Repair	IV Co-amoxiclav 1.2g at induction if mesh placed		
Laparoscopic Cholecystectomy	IV Co-amoxiclav 1.2g if bile spilt		

6.4 Obstetric Procedures

Procedure	**Empirical/1st Line Guidance**	**2nd Line or Alternative Guidelines in Cases of True Penicillin Allergies**	**Duration/Comments**
Caesarean Section	IV Cefuroxime 750mg bolus as a single dose at INDUCTION	**Penicillin allergy:** IV Clindamycin 600mg as a single dose at INDUCTION	
Pre-term and or Prolonged Rupture of Membranes (>18 hours)			
During Labour	IV Benzylpenicillin 3g stat followed by 1.5g every 4 hours until birth + IV Gentamicin 120mg stat if mum has pyrexia >39^{o}C	**Penicillin allergy:** IV Clindamycin 900mg every 4 hours until birth	
If not in Labour	PO Erythromycin 250mg QDS		**Duration: 10 days**
Please see: Pre-Labour Rupture of Membranes at Term and Prevention of Neonatal Strep B			
Term Prolonged Rupture of Membranes (>18 hours) + pyrexia	IV Cefuroxime 1.5g TDS + IV Metronidazole 500mg TDS		**Duration: until birth**
Group B Streptococcal (GBS) Prophylaxis during intrapartum	IV Benzylpenicillin 3g STAT followed by 1.5g every 4 hours until birth	**Penicillin allergy:** IV Clindamycin 900mg every 8 hours until birth	
Clinical Chorioamnionitis Please see: Pre-Labour Rupture of Membranes at Term and Prevention of Neonatal Strep B			
Perineal tear repair: 3rd/4th degree tear	PO Cefalexin 500mg TDS + PO Metronidazole 400mg TDS	**Penicillin allergy:** Discuss with microbiologist	**Duration: 7 days**

6.5 Gynecological Procedures

Procedure	**Empirical/1st Line guidance**	**2nd Line or Alternative Guidelines in Cases of**	**Duration/Comments**

		True Penicillin Allergies	
Hysterectomy:Vaginal or abdominal	IV Co-amoxiclav 1.2g bolus only at time of induction.	**Penicillin allergy:** IV Gentamicin 120mg + IV Metronidazole 500mg	**Duration: Discuss with microbiologist**
For PID, Vaginal Candidiasis, Trichomoniasis please see Genital Tract Infections			

6.6 Urological Antibacterial Prophylaxis

Procedure	**Recommendations**
Trans-Urethral Resection of Prostate Gland (TURP)	
Pre-op MSU negative	Single antibiotic dose prior to procedure: IM/IV Gentamicin 120mg at induction
MSU unavailable and no symptoms of UTI	Single antibiotic dose prior to procedure: IM/IV Gentamicin 120mg at induction
Pre-operative MSU positive	Discuss patient with Consultant Urologist pre-procedure. Treat infection with short course antibiotics, guided by the sensitivity results. Repeat MSU after catheter removal.
Indwelling Catheter	If urinary catheter in situ for 7 days or more take a CSU. State a pre-op sample on form and ask microbiology to report sensitivities to if CSU positive. IM/IV Gentamicin 120mg at induction in all cases.

6.7 Urological Antibacterial Prophylaxis

Procedure	**Recommendations**	
Cystoscopy of E.S.W.L.		
MSU negative	No antibacterial prophylaxis indicated	
MSU positive	Treat infection according guided by sensitivities and discuss with Consultant Urologist whether procedure should proceed	
Stent insertion/removal Endo-urological procedures: stone removal	As for TURP, give antibiotics even if MSU negative IM/IV Gentamicin 120mg at induction	
Trans Rectal Biopsy of the Prostate	Ciprofloxacin 500mg BD PO for 3 days.	
Major open procedures	**1st Line** IV Gentamicin 120mg + Amoxicillin 1g IV at induction	**2nd Line** IV Piperacillin/ Tazobactam 4.5g IV at induction

7. Guidelines for Prophylactic Antibiotics for the Orthopaedic Patients

- Previous usage of Cephalosporins at Milton Keynes Hospital resulted in higher incidence of MRSA related infections. Teicoplanin was chosen instead of Vancomycin because of its shorter infusion time, which made it suitable for pre-operative application.
- A single dose of Teicoplanin does not select resistant micro-organism.
- If blood loss exceeds 1500ml additional intra-op dose may need to be given.
- If operation time exceeds three to four hours additional intra-operative dose may need to be given.
- Antibiotics are fully administered prior to tourniquet inflation.

7.1 Recommendations

Procedure	**1st line**	**2n Line/Alternative**
THR/THR Hip fractures	IV Teicoplanin 600 mg at induction + IV Gentamicin 120mg at induction	**Penicillin allergy:** Discuss with Microbiologist

	Intraoperative second dose only if indicated	
Revision of THR &TKR Samples X 5 plus Samples for histology Taken using sterile forceps for each sample	Discuss with Consultant Microbiologist/Orthopaedic Surgeon	Discuss with Microbiologist/Orthopaedic Surgeon
Open fractures BOA guidelines	As soon as possible after injury IV Co-amoxiclav 1.2g TDS + IV Gentamicin 1.5mg/kg/day until soft tissue closure or up to a maximum of 72 hours. Add: IV Teicoplanin 800mg infusion at induction at skeletal stabilisation	**Penicillin allergy** IV Teicoplanin 800mg IV infusion + IV Metronidazole 500mg TDS + IV Gentamicin 1.5mg/kg/day
ORIF	With fixation of prosthetic material including foot and ankle; At induction IV Teicoplanin 400mg single dose	**Penicillin allergy:** Discuss with Consultant microbiologist
Clean surgery with no implants (Arthroscopy, carpel tunnel release etc)	No antibiotic prophylaxis required	
Discectomy + spinal fusion	IV Teicoplanin 600mg at induction single dose	
Catheterisation post joint replacement	No antibiotics	

7.2 Summary of Treatment of Post-op Orthopaedic Infections

Post-op infection	Empirical/First Line guidance	2nd Line or Alternative Guidelines in Cases of True Penicillin Allergies	Duration/Comments
Septic Arthritis Native	IV Benzylpenicillin 600mg-1.2g QDS + IV Flucloxacillin 1-2 g QDS	Check culture results discuss with microbiologist	**Duration: 6 weeks minimum** Send joint aspirates/blood cultures
Prosthetic	IV Teicoplanin as per protocol + IV Piperacillin/ Tazobactam 4.5g TDS	Check culture results discuss with microbiologist	**Duration: determined by response** Send samples
Osteomyelitis Acute	IV Benzylpenicillin 600mg-1.2g QDS + IV Flucloxacillin 1-2 g QDS Send samples	Check culture results discuss with microbiologist	**Duration: discuss with microbiologist**
Chronic	Start antibiotics according to culture & sensitivities	Check culture results discuss with microbiologist	**Duration: discuss with Microbiologist**
For Cellulitis and Animal Bites please Skin and Soft Tissue Infections			

8. Statement of evidence/references

Statement of evidence:

1. Health and Social Care Act: Code of Practice for Health and Adult social care Act
2. Start Smart then Focus, Antimicrobial stewardship toolkit for English hospitals, PHE March 2015
3. http://www.evidence.nhs.uk/formulary/bnf/current/
4. Public Health England (2013). Revised: May 2013. Updated guidance on the management and treatment of Clostridium difficile infection. London: Public Health England.
5. British Infection Society (2006). UK Malaria Treatment Guidelines. London: Elsevier.
6. Heart (1998). 79:207-2I0. Working Party of the BSAC.
7. Nice Paneumonia diagnosis and management of community and hospital acquired pneumonia in adults (2009)
8. 2015-annotated BTS guidelines for the management of community Acquired pneumonia in adults issued Dec 2014
9. Dryden, M. Hand, K. Davey, P. Antibiotics for community acquired pneumonia BSAC
10. SIGN 88 Management of suspected bacterial urinary tract infection in adults
11. C Bignell et all. UK national guideline for the management of gonorrhoea in adults, 2011. International Journal of STD & AIDS 2011; 22: 541–547 (BASSH Guidelines)
12. UK National Guideline for the Management of Pelvic Inflammatory Disease 2011 (updated June 2011) Clinical Effectiveness Group British Association for Sexual Health and HIVhttp://www.bashh.org/documents/3572.pdf

9. Governance

9.1 Record of changes to document

Version number: 6.4		**Date:** 30/06/2015		
Section Number	**Amendment**	**Deletion**	**Addition**	**Reason**
4.7	UTI, different classifications, options for renally impaired patients added		Teicoplanin Protocol	Patient safety regarding dosing
Appendix 5 and 4.4	RTI- addition of 0-1, 2 and > 3 scoring along with appropriate treatment			
Appendix 3	Updated and clearer guidance, reformat			
Entire Guideline	Reformatted tables			
Appendix 2	Inclusion of 'DO NOT PRESCRIBE GENTAMICIN' sentence			Incident
5.5	Section reviewed (July 2016)			Addition of Levofloxacin to Formulary
Entire Guideline	15/12/16 Removal of Piperacillin-tazobactam from certain appropriate conditions			Piperacillin-tazobactam shortage: interim plan for

				reservation of stocks
Entire Guideline	17/05/17 Review of guideline and removal of Piperacillin-tazobactam from further appropriate conditions			Piperacillin-tazobactam shortage: interim plan for reservation of stocks
Surgical prophylaxis	Minor amendments, dosage, route and choice		**Amoxicillin 1g** **Teicoplanin STAT appendectomy/colorectal surgery** **Teicoplanin STAT Gastroduodenal surgery**	

9.2 Consultation History

Stakeholders Name/Board	Area of Expertise	Date Sent	Date Received	Comments	Endorsed Yes/No
All Acute Consultants		October 2008		Comments received from: Janet Corbett, Dr Sandro Lanzon-Miller, Mr Richard O'Hara, Ann Carr, Dr Denise White, Dr Vasantha Kumar	
Members of Medicines & Therapeutics Committee					
Surgical CIG members					
Clinical Trust Board members					
Members of Antibiotic Stewardship Group, Cardiologist Mr Gregg				ASG members Cardiologists Mr Gregg Dr S LM Dr Mehdi	Revised policy
Members of Antibiotic Stewardship Group,		June 2011		Comments received from Geraldine Sharratt (Antibiotic Pharmacist)	
Members of Medicines Management and Medicines Incident Committee,		July 2011		Comments received from Members of Medicines Management and Medicines Incident Committee	Revised Policy
Milton Keynes Prescribing Advisory Group	Pharmaceutical and medical staff; system wide overview	15th July 2014	22nd July 2014	Changes from previous document highlighted and agreed	Document updated
Milton Keynes Prescribing Advisory Group		19th March 2015	25th March 2015	Comments received from: Janet Corbett	Amendments made
Antimicrobial Stewardship Group	Pharmaceutical and medical staff; Reformat and review	26th June 2015	30th June	Comments received from J. Northfield, J McDonald and P Thampi	Revised guidelines, document updated and reformatted
Clinical Trust Board Members		03rd July 2015	08th July 2015	Approved	
Members of Prescribing and Medicines Governance Committee		19th July 2016	3rd August 2016	Approved	
All Trust Respiratory Consultants Dr A Kavidasan; Dr R Randhawa; Dr M Bhattacharya; Dr C McGeary; Somani Dr S Vikas; Dr M Deshpande		19th July 2016		No comments received, Approved	

9.3 Audit and monitoring

This Guideline outlines the process for document development will be monitored on an ongoing basis. The centralisation of the process for development of documents will enable the Trust to audit more effectively. The centralisation in recording documents onto a Quality Management database will ensure the process is robust.

Audit/Monitoring Criteria	Tool	Audit Lead	Frequency of Audit	Responsible Committee/Board
Compliance with the policy- Documenting indication, appropriate drug for indication, documenting review dates/stop dates in notes and drug chart, restricted antibiotic use	Audit on policy adherence – Divisional level	Antimicrobial Pharmacists / Consultant Microbiologist	Annual presentation at Trust wide Audit Plenary Sessions. Reports to Committees as requested/appropriate.	Antimicrobial Stewardship Group (AMSG)
Drug usage & Financial Expenditure	Statistical reports from the Pharmacy department showing drug usage and financial expenditure (drug usage review).	Antimicrobial Pharmacists / Consultant Microbiologist	Every 4 months	Antimicrobial Stewardship Group

9.4 Equality Impact Assessment

This document has been assessed using the Trust's Equality Impact Assessment Screening Tool. No detailed action plan is required. Any ad-hoc incident which highlights a potential problem will be addressed by the monitoring committee.

Impact	Age	Disability	Race	Gender	Religion or Belief	Sexual Orientation
Do different groups have different needs, experiences, issues and priorities in relation to the proposed Guideline?	No	No	No	No	No	No
Is there potential for or evidence that the proposed Guideline will not promote equality of opportunity for all and promote good relations between different groups?	No	No	No	No	No	No
Is there potential for or evidence that the proposed Guideline will affect different population groups differently (including possibly discriminating against certain groups)?	No	No	No	No	No	No
Is there public concern (including media, academic, voluntary or sector specific interest) in potential discrimination against a particular population group or groups?	No	No	No	No	No	No

APPENDIX 1: TDM

There is an obligation to monitor potentially toxic drugs with a narrow therapeutic index such as Amikacin, Gentamicin and Vancomycin.

There are TWO main reasons for monitoring levels:-
- to ensure that the peak levels are high enough to be effective
- to detect accumulation as evidenced by high trough levels

Dosing and Monitoring should be performed in accordance with local protocols (where they exist) or following the general principles highlighted below.

Amikacin

Monitoring is important in the following situations:-
- Therapy greater than 5 days
- Acute or Chronic renal impairment
- Use of concomitant nephrotoxic drugs
- Higher doses / interval adjustment (e.g. cystic fibrosis or endocarditis}
- Signs of nephrotoxicity or ototoxicity
- Obese patients
- Patients with extracellular fluid volume changes.

Time to draw Trough	Time to Steady State	Therapeutic Range
Immediately before next dose	2.5 -15 hours	Amikacin: Trough less than 5mg/L

Ref= Therapeutic Drug monitoring Clinical guide, Abbott Laboratories 2nd Edition

Gentamicin

Please refer to Gentamicin Protocol – See Appendix 1.

Renal toxicity with Gentamicin is more likely in the elderly, those who are septic or those on other nephrotoxic drugs such as NSAIDs, ACE inhibitors or diuretics, regardless of initial creatinine. In such patients the continued need for Gentamicin should be reviewed daily and should not generally exceed 7 days.

Regimen	TIME TO DRAW TROUGH	TIME TO STEADY STATE	THERAPEUTIC RANGE
Once Daily Dosing	1 hour before the next dose	Does not occur each dose is a bolus	Gentamicin Trough less than 1mg/L
Multiple Daily Dosing	Immediately before next dose	2.5 – 15 hours	Gentamicin Trough less than 2mg/L

Ref= Therapeutic Drug monitoring Clinical guide, Abbott Laboratories 2nd Edition

APPENDIX 2 Treatment Protocol for Once Daily Gentamicin in Adults

For use in (clinical areas):	All Clinical Areas
For use by (staff groups):	All Medical, Nursing and Pharmacy Staff
For use for (patients):	Adult Patients (NB. See Exclusion Criteria below)
Document owner:	Pharmacy Department
Status:	Approved

This policy applies to adult patients unless one of the following exclusion criteria applies. If one does apply, **DO NOT PRESCRIBE GENTAMICIN** and please discuss alternative antibiotic therapy with the Consultant Microbiologist

Exclusion Criteria
Creatinine Clearance (<10mL/min)
Hypersensitivity to aminoglycosides
Ascites
Myasthenia Gravis
Infective endocarditis
Major burns (>20% of body surface area)
Pregnancy (see guidance on obstetrics and gynaecology antibiotic guideline)

Prescribing Gentamicin
Prescribe gentamicin dose (rounded to the nearest 40mg) on the adult once daily intravenous gentamicin prescribing chart and attach to the drug chart. Also, prescribe gentamicin on the antibiotics section of the drug chart documenting "as per gentamicin chart" under dose.

- Empirical treatment should be reviewed after 48 hours
- No patient should be given gentamicin for greater than 7 days without discussion with Microbiology, suggest referral for audiology assessment for those patients receiving treatment for >7 days
- Gentamicin should be stopped in all patients after 14 days unless discussed with microbiology

Gentamicin Once Daily Dosing Regimen
The once daily gentamicin dose can be calculated using the gentamicin calculator (insert link) available on the intranet or manually, you will need the patient's height, weight and creatinine. If the gentamicin dose is being calculated manually, follow the steps below. Select the appropriate dosing regimen from the table below based on the patient's renal function. Use Cockcroft and Gault CrCl as an estimate of renal function **NOT eGFR**. If the serum creatinine is not known then give 5mg/kg or if known renal impairment give 3mg/kg stat dose. No further doses should be administered until the patient's creatinine clearanceand gentamicin levels are established.

Renal Function (CrCl)	Dosing Regimen
>40mL/min	5mg/kg (max 480mg)
10-40mL/min	3mg/kg (max 320mg)

<10mL/min	Seek micro advice

Gentamicin dosing in obese patients
Gentamicin distributes poorly into adipose tissue. If you are calculating the dose yourself i.e. not using the gentamicin calculator, then you need to take into consideration whether the patient is obese.

- If the patient is underweight than use their actual body weight to calculate the dose
- If the patient's actual bodyweight is more than their Ideal Body Weight (IBW) then use their IBW to calculate the dose
- If the patient is obese (actual body weight >20% above ideal body weight (IBW)) than gentamicin should be dosed according to their adjusted body weight* (Adjusted Body Weight (ABW)).

The gentamicin calculator available on intranet and can be used to calculate IBW and ABW.

Ideal body weight (IBW) in kg	
Male	50kg + (2.3kg x (height in inches – 60 inches))
Female	45.5kg + (2.3kg x (height in inches – 60 inches))
* Use adjusted body weight (ABW) if actual body weight is > IBW+20%	
ABW in kg	ABW = IBW + 0.4 x (actual weight – IBW)

Serum Gentamicin Levels

Serum gentamicin levels must be regularly monitored

- Levels should be taken 1 hour before the next dose, but can be taken up to 6 hours before
- Request forms must state:
    1. Time at start of infusion
    2. Time of sample taken
    3. Dose

First Serum Level

- Take pre-dose gentamicin level between 6 hours and 1 hour before the second dose is due
- Levels should be <1mg/l
- Patients aged <75 with normal renal function: give the next dose without waiting for levels. The result should be checked and interpreted before the third dose is due to be given
- Patients aged >75 or in renal impairment: DO NOT give the next dose until a level is known

Subsequent Monitoring

- Patients aged <75 with normal renal function: monitor levels every 48 hours (before 4th and 6th dose) and doses can be administered before the results are known
- Patients aged >75 or in renal impairment: monitor levels daily and DO NOT administer the next dose until a level is known

Gentamicin level interpretation

Trough level	Interpretation	Action
<1mg/L	Satisfactory	Continue
1-2mg/L	Caution	Give the next dose 36 hours after the previous dose
>2mg/L	High Risk	Do not give a further dose. Discuss with microbiology/pharmacy or consider alternative agent

Renal Function

- Renal function must be checked at least three times a week for patients with normal kidney function
- If renal function deteriorates (e.g. a change in creatinine by more than 15-20%) monitor levels daily and seek advice from Microbiologist or pharmacist
- If the patients serum creatinine is increasing (>50% from baseline), review gentamicin usage and consider switching to an appropriate alternative agent if necessary

If further advice is needed on any of these issues contact a clinical pharmacist or microbiologist without delay.

References

- Ashley & Currie (eds). The Renal Drug Handbook 2nd edition. Radcliffe Medical Press, 2004.
- Renal database http://www.renaldrugdatabase.com/monographs/gentamicin last accessed 28/10/2014
- Medicines compendium, gentamicin monograph http://www.medicines.org.uk/emc/medicine/14420 last accessed 30/10/2014
- Injectable Medicines Administration Guide, University College London Hospitals, Third edition, Wiley-Blackwell 2010
- Banerjee et al. Monitoring aminoglycoside level. BMJ 2012;6354: doi

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File name:	"[document file name based on document ref. no.]"
Supercedes:	Gentamicin once-a-day dosing schedule
Additional Information:	"[any other information relating to this document]"
Joint Trusts Guidelines Steering Group	
Date	13/05/2015

APPENDIX 3: Treatment Protocol for Prescribing, Administration & Monitoring of Vancomycin

Caution – nephrotoxic drugs: Concurrent or sequential systemic use of potentially nephrotoxic drugs requires careful monitoring of serum creatinine and vancomycin concentrations.

Examples of nephrotoxic drugs: amikacin, amphotericin B, ciclosporin, cisplatin, colistin, gentamicin, methotrexate, tobramycin, radio-contrast media and tacrolimus.

Caution also with aciclovir, ACE-inhibitors, furosemide and bumetanide.

Contact Ward Pharmacist or Microbiology for advice or interpretation of levels

1. Loading dose: 1g IV for all patients (prescribe in 'once only' section of drug chart)

2. Determine Creatinine Clearance (CrCl) **CrCl** (mL/min) = $\frac{F \times (140-age) \times weight\ (kg)}{Serum\ Cr\ (\mu mol/L)}$

F=1.04 (females), F=1.23 (males)

3. Select initial maintenance dose and dose interval from box below:

Calculated CrCl (mL/min)	**Starting dose**	**Dose interval**	**Administration** (sodium chloride 0.9% or glucose 5%)
above 50	1gram	12 hours (10:00+22:00)	250mL over 100 minutes
31-50	500mg	12 hours (10:00+22:00)	100-250mL over 60 minutes
20-30	750mg	**24 hours** (10:00)	250mL over 80 minutes
below 20 or CAPD or acute HD	Monitor level every 24 hours. When concentration is 20mg/L or below give another 1g IV dose.		250mL over 100 minutes
Out-patient HD	500mg after each HD unless level is >20mg/L (then omit dose and repeat level next HD)		give over 100 minutes

Abbreviations: HD, haemodialysis; CAPD, continuous ambulatory peritoneal dialysis

4. Monitor serum vancomycin concentration (aim pre-dose concentration 10-20mg/L)

Take first blood sample before the morning dose, ~48 hours after starting vancomycin.

Take blood sample immediately before the morning dose is due, then give the dose, and then check the result before the next dose. There is usually no need to monitor peak levels.

Trough concentration	**Dosage adjustment needed**
below 10mg/L	Increase dose by ~25% e.g. 500mg *bd* to 650mg *bd* (round to nearest 50mg). Monitor concentration again in ~24 hours (before morning dose).
10-20mg/L	Desirable concentration - no adjustment needed. Monitor weekly if patient has stable renal function.
20.1-25mg/L	Reduce dose by ~25% e.g. 500mg *bd* to 400mg *bd* (round to nearest 50mg). Monitor concentration again in ~24 hours (before morning dose).
over 25mg/L	In patients with normal renal function, check timing of sampling versus drug administration. If sample timing does not account for high level: 1. Omit further doses. 2. Monitor concentrations at 24 hour intervals until 20mg/L or below. 3. Restart vancomycin with ~25% dose reduction (round to nearest 50mg).

APPENDIX 4: Treatment Protocol for Prescribing, Administration & monitoring of IV Teicoplanin

1. Loading and maintenance dose:

Mild/moderate infections:

- **<70mg**: 400mg every 12 hours for 3 doses (loading), then 400mg once daily
- **>70kg**: 6mg/kg every 12 hours for 3 doses (loading), then 6mg/kg once daily

Severe/deep seated infections (e.g. bone/joint infections, endocarditis)

- 10mg/kg every 12 hours for 3 doses, then 10mg/kg once daily. Round up or down to nearest 100mg. maximum dose of teicoplanin should not exceed 1.2g

NOTE: Dose calculated using actual body weight

Given as **intravenous injection,** doses up to 400mg over 3-5minutes, doses above 400mg over 6-10 minutes, *(or 30 minute* **infusion**). Add the supplied diluent to the vial and swirl gently or roll to ensure the powder fully dissolves. If a froth forms, leave for 15 minutes to settle.

2. Determine creatinine clearance (CrCl)

CrCl (mL/min) = $\frac{F \times (140-age) \times weight\ (kg)}{Serum\ Cr\ (\mu mol/L)}$ F=1.04 (females), F=1.23 (males)

Then select the appropriate frequency for maintenance dose from the table below

CrCl (mL/min)	Maintenance dose frequency
>60	Once daily
40-60	Once daily until the 4th day of treatment then reduce frequency to every 48 hours
<40	Once daily until the 4th day of treatment then reduce frequency to every 72 hours

3. Monitoring

For the majority of patients monitoring is not required – discuss with microbiology if levels are appropriate.

If levels are required, an initial pre-dose level should be checked after day 4 of treatment. DO NOT withhold doses whilst waiting for levels - continue treatment until the level is available for evaluation.

Indication	Target plasma concentration
Mild/moderate infections	15-60mg/L
Bone and joint infections	20-60mg/L
Endocarditis	30-60mg/L

Contact microbiology or the ward pharmacist for advice regarding interpretation of levels and dose adjustments.

APPENDIX 5: Adult Community Acquired Pneumonia (CAP) Severity Assessment and Infective Exacerbation of COPD and Bronchiectasis criteria

The recommendations in this guideline are based on those made in the BTS, BSAC, NICE guidelines and on local epidemiology plus expert opinion. These guidelines are only applicable to adults with CAP, and are not applicable to patients with a normal chest X-ray and patients with an exacerbation of chronic obstructive pulmonary disease (COPD)

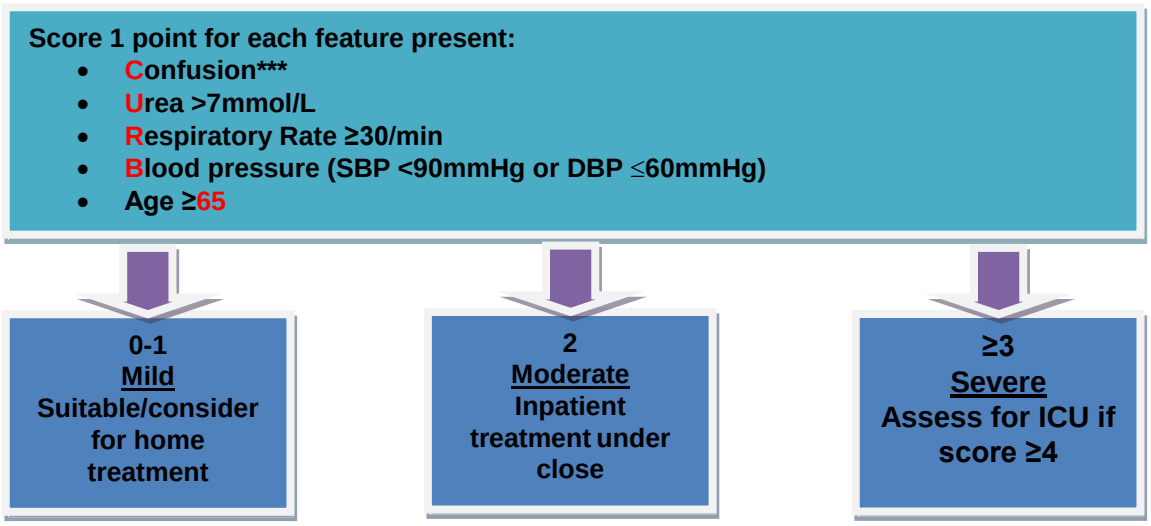
All patients admitted to hospital with suspected CAP should have a chest x-ray performed as soon as possible to confirm or refute diagnosis[1, 2]. The chest x-ray should be performed in time for antibiotics to be administered within 4 hours of presentation to hospital should the diagnosis of CAP be confirmed.

All patients with CAP should be assessed using the CURB-65 severity index. See guidelines below on making a CURB-65 assessment.

In elderly patients care should be taken not to assume that there is pneumonia when there is no clear x-ray evidence of consolidation as gram negative sepsis of urinary tract or gut origin can present with some features that may be confused with chest infection, e.g. crackles in chest. It is important that these patients have gram negative cover, for example gentamicin.

Severity Assessment of CAP: CURB-65[1, 2]

These severity assessment guidelines relate to the inpatient management of CAP. **They ARE NOT applicable to the management of infective exacerbations of chronic lung conditions such as COPD, bronchiectasis and asthma**.



*** Defined as a Mental Test Score of 8 or less, or new disorientation in person, place or time**Caution**

The CURB-65 Score is **NOT** a substitute for good clinical judgement and clinicians should also take account of other prognostic factors such as severe hypoxaemia, multilobar involvement on CXR, and raised Early Warning Score prior to deciding on treatment pathway. *CURB-65 score can seriously underestimate severity of pneumonia in young previously fit adults.*

MICROBIOLOGICAL INVESTIGATIONS

All patients with moderate (CURB-65 ≥2) to severe pneumonia should have blood and sputum cultured and CRP measured. In severe pneumonia (CURB-65 ≥ 3) request urinary test for pneumococcal antigen and in selected cases legionella antigen.

Specific Pathogens

It is not possible to categorically identify a microbiological cause of pneumonia from clinical features. However in patients with severe pneumonia consider:

- **MRSA** in patients especially elderly, known to be currently or previously positive, and those with chronic illness or recent hospital attendance.
- **Legionnaires' Disease** in middle aged, smokers, absence of co-morbidity, diarrhoea, neurological symptoms, more severe infection and evidence of multi-system involvement (e.g. abnormal liver function tests, elevated serum creatine kinase). In UK about 50% are travel associated.
- **PVL positive *Staphylococcus aureus*** causes a rare necrotising pneumonia – severe illness, blood stained sputum, multi-organ failure, and lung cavitation.
- Post influenza ***Streptococcus pneumoniae*** is the commonest cause of secondary bacterial pneumonia, but staphylococcal infection is relatively more likely, and may be **MRSA** in patients with risk factors – see above.

Infective Exacerbation of COPD and Bronchiectasis Diagnostic criteria
Ref: Anthonisen Criteria

One or more of the following symptoms:

- Increased volume of sputum
- Increased purulence of sputum
- Increased or new shortness of breath
- +/- other features of sepsis

Notes:
- Review treatment against cultures and sensitivities
- Consult Microbiologist if penicillin anaphylaxis
- Only prescribe IV Clarithromycin if the patient is unable to swallow

APPENDIX 6: Prevention and treatment of seasonal influenza infection

Ordinary, seasonal flu resulting from infection with influenza virus is very infectious and prevention and early treatment is crucial in certain group of patients. Influenza A & B are the virus types circulating during most seasonal flu epidemics. When influenza activity begins and reaches above a certain level in the UK, Public Health England (PHE) – formerly the Health Protection Agency (HPA), which carries out surveillance activity, will alert the Hospital through a weekly Influenza bulletin.

Seasonal flu affects about 10-15% of the UK population, causing around 12,000 deaths. Most recover within 1-2 weeks without requiring medical treatment. Flu symptoms are generally sudden in onset and include fever, cough, headache, severe weakness and fatigue, muscle and joint aches, sore throat and runny nose. Incubation period is usually from 1 to 3 days. Infectious period begins just before symptoms till 4-5 days after onset of symptoms in adults and up to 7 days in children. It spreads from person to person, by droplets airborne and contaminated hands by touching an infected person or contaminated surface.

Preventive Measures:

1.Vaccination: Annual vaccination is recommended for Healthcare workers and certain group of patients categorised as high risk, which include people >65 years, people with medical condition such as lung disease, diabetes, cancer, kidney or heart problem and the immunocompromised and the very young. Vaccines are considered to be effective against 'ordinary' flu because the virus strain in circulation can be fairly reliably predicted.
2. Prophylaxis: For in-patients, occasionally prophylaxis with oseltamivir may be indicated, please refer to the PHE website for up to date guidelines.

Treatment with Antivirals:

Refer to Public Health England (PHE) website for up to date guidelines on both the treatment and prophylaxis of seasonal influenza infection.

http://www.hpa.org.uk/

APPENDIX 7: Guidelines for the prevention and treatment of infection in patients with an absent or dysfunctional spleen

Please follow the link for guidance.
http://nww.mkhospital.nhs.uk/pathfinder/doc_info.asp?Id=1133&DocType=1&SpeType=45

APPENDIX 8: Restricted Antimicrobial list

Ambisome; after discussion with Consultant Microbiologist, and 2nd line antifungal therapy in neutropenic patients

Amikacin IV: after discussion with Consultant Microbiologist, for suspected or confirmed infections with multi-drug resistant organism e.g. acinetobacter

Azithromycin: GUM and prophylaxis for exacerbation in COPD patients.

Caspofungin: Consultant Microbiologist or Haematologists. Restricted to DoCC and haematology/oncology patients as 2nd line antifungal therapy in neutropenic patients

Cefixime PO: For Epididymo-orchitis due to gonococcal and/or chlamydial infection – GUM only

Cefotaxime IV: On Consultant Microbiologist's recommendation only

Ceftriaxone IM: For gonococcal and/or chlamydial infection and meningococcal prophylaxis. Discuss with CCDC or consultant Microbiologist if for meningococcal prophylaxis.

Ceftriaxone IV: For Acute epiglottitis/Bacterial tracheitis and meningitis only

Cefuroxime IV: For use in maternity for pyelonephritis or Caesarian Section prophylaxis or on Consultant Microbiologist's recommendation

Cefalexin PO: For use in maternity for pyelonephritis or on Consultant Microbiologist's recommendation

Ciprofloxacin PO: Consultant only. Discuss with Consultant Microbiologist or CCDC if for meningococcal prophylaxis

Ciprofloxacin IV: Consultants only - as recommended on the Policy

Clindamycin: Penicillin allergy in obstetrics or if recommended by the Consultant Microbiologists

Linezolid IV/PO: Consultant Microbiologist only. Restricted for MRSA pneumonia on DOCC and other patients on discharge.

Quinupristine with Dalfopristin: On Consultant Microbiologist's recommendation

Sodium fusidate IV: ONLY if strict PO route not available.

Tigecycline IV: Only on Consultant Microbiologist's recommendation

Teicoplannin IV – RESTRICTED for neutropenic sepsis with line and orthopaedic surgical prophylaxis as per guidelines and also for outpatient parenteral therapy (OPAT) and renal impairment (Vancomycin more efficacious & 50% cheaper) or as recommended in the policy

APPENDIX 9: Protocol for the use of Prophylaxis against Infective Endocarditis (IE)

Endocarditis is a term that describes inflammation and or infection of the endocardium, although it particularly involves the heart valves. However, it also can involve other structures such as non-valvular area or implanted mechanical devices (eg. Artificial heart valves, pacemakers, implantable defibrillators). It is a rare condition with significant morbidity and mortality. Previous guidelines have supported the use of prophylactic antibiotics for certain group of patients undergoing certain interventional procedures to prevent endocarditis. This was based on the argument that these procedures may cause bacteraemia with organisms known to cause endocarditis. However, in recent years this practice has been challenged.

Against this background the Department of Health asked the National Institute for Health and Clinical Excellence (NICE) to produce evidence based guidelines which would give clear guidance on best clinical practice for prophylaxis against IE in patients undergoing dental and non-dental interventional procedures. The NICE guideline was published in March 2008 (1) and the local policy has been updated.

Recommendations

1.1 Healthcare professional should offer people at risk of infective endocarditis clear and consistent information about prevention, including;

- The importance of maintaining good oral health
- Symptoms that may indicate infective endocarditis and when to seek expert advice
- The risk of undergoing invasive procedures, including non- medical procedures such as body piercing or tattooing.
- The benefits and risk of antibiotic prophylaxis and an explanation of why antibiotic prophylaxis is no longer routinely recommended

1.2 Infection: Any episode of infection in people at high risk of infective endocarditis should be investigated and treated promptly to reduce the risk of endocarditis developing

1.3 If a person at risk of endocarditis is receiving antimicrobial therapy because they are undergoing a procedure at a site where there is a suspected infection, the person should receive an antibiotic that covers organism that cause infective endocarditis plus the infective organism.

1.4 Table 1 & 2 below show 2 options for prophylaxis. Table 1 is for at risk group should it be considered necessary to give prophylaxis only for endocarditis specific organisms. Table 2 is for at risk patients who are already getting surgical prophylaxis and a comprehensive cover for endocarditis can be achieved by adding Gentamicin.

1.5 Diagnosis of endocarditis should be considered and investigated in high risk cases presenting with evidence of sepsis following any invasive procedures.

1.6 Flow chart below shows:

a) patients considered to be at increased risk of developing IE
b) Categories of interventional procedures not requiring or requiring prophylaxis.

1.7 **Table 1.** Recommended prophylactic antibiotic regimens for at risk group should it be considered necessary to give prophylaxis only for endocarditis specific organisms

Table 1. Antibiotics Dose/Route	Comment
Amoxicillin 1g IV and 500mg IV or orally/IV 6 hours later **+** **Gentamicin 120mg IV**	<30min pre-procedure or at induction
Teicoplanin 400mg IV **+**	<30min pre-procedure or at induction
Gentamicin 120mg IV	For those patients allergic to penicillin or have received more than a single dose of penicillin in the previous month.

Table 2. Prophylaxis for potentially infected procedures	
If on Co-amoxiclav or Piperacillin/Tazobactam prophylaxis for the procedure add Gentamicin 120mg IV	Only for patients undergoing procedures identified as Interventional Procedure on potentially infected unclean areas For penicillin allergy use Teicoplanin, metronidazole and Gentamicin or discuss with Consultant Microbiologist

1.8 Healthcare professionals are expected to exercise their clinical judgement and make decisions appropriate to the circumstances of the individual patient, which in some cases may not be compliant with this guideline.

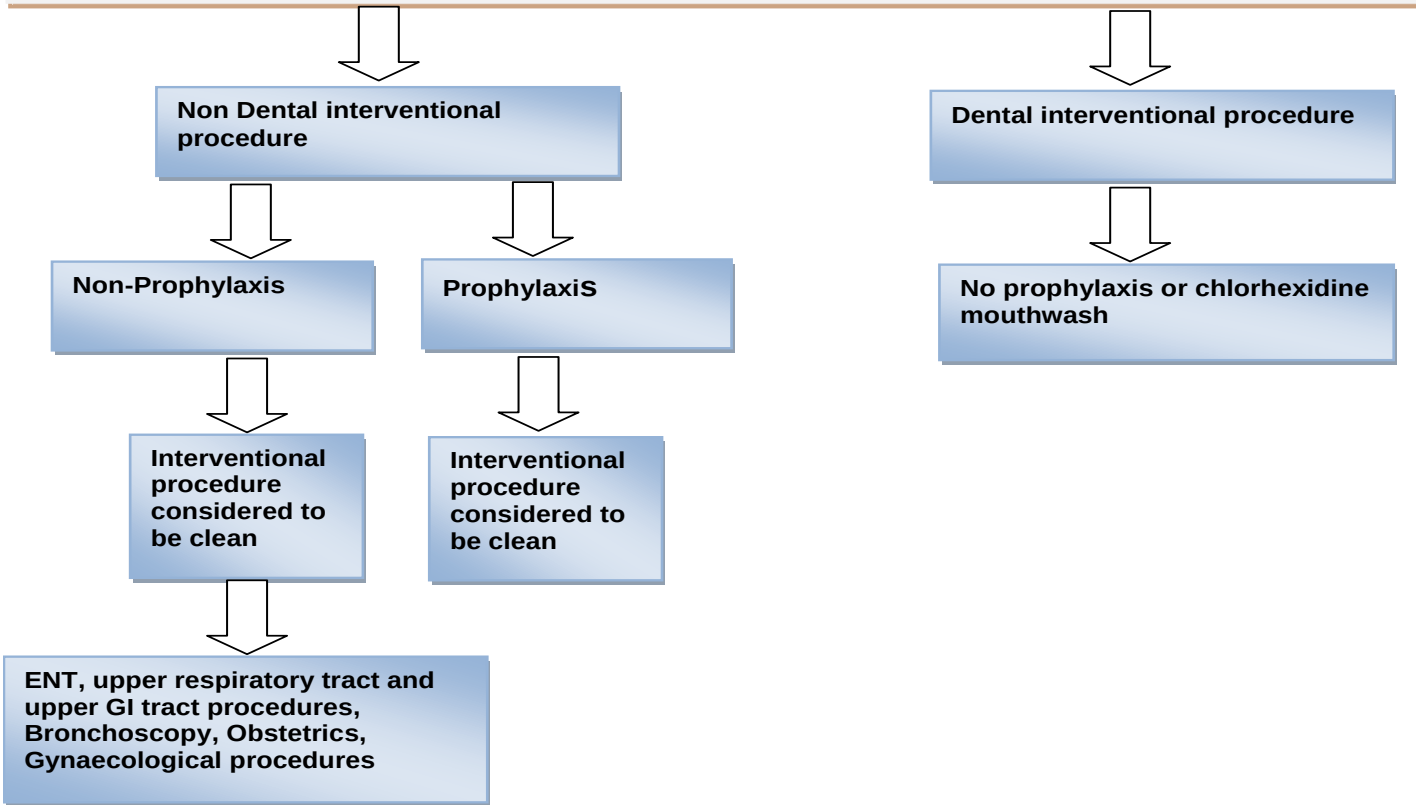
1.9 Any active or potential cases of infective endocarditis should be appropriately investigated and treated.

Flow Chart for Endocarditis Prophylaxis

Those regarded as at increased risk of developing IE:

- Acquired valvular heart disease with stenosis or regurgitation;
- Valve replacement repair;
- Structural congenital heart disease (excluding isolated atrial septal defect, repaired ventricular septal defect or repaired patent ductus arteriosus, *6 months after ASD/PFO percutaneous closure);
- Hypertrophic cardiomyopathhy; and/or
- Previous infective endocarditis.

* - not stipulated in NICE guidelines



Reference

1. Prophylaxis against infective endocarditis, NICE clinical guideline 64 issued March 2008. www.nice.org.uk/guidance/CG

APPENDIX 10: Switching IV antibiotics to Oral and Guide to Antibiotic Switching

Treatment Guidelines: Switching IV antibiotics to oral

For use in (clinical areas):	Medical, Surgical and Orthopaedic Divisions
For use by (staff groups):	Medical and Pharmacy staff in the above divisions
For use for (patients):	All patients in the care of the above Divisions
Document owner:	MEC
Status:	Approved

1. Doctors and pharmacists will be responsible for ensuring the Trust IV to oral switch protocol is adhered to and that appropriate changes in antibiotic therapy are actioned. Exceptions (see point 3) should be identified clearly in the hospital case notes.

2. All IV antibiotic prescriptions should be reviewed within 48 hours by the doctor and switched to oral if appropriate. If not reviewed the pharmacist will consult a member of the team starting with the FY1 and escalate to the consultant if necessary to get a review and also will use stickers (see below for example of the wording on the sticker) on the drug charts as a prompt to review. The stickers will be placed on the drug chart leaving one full day's space or 3 days space if the sticker is placed on the drug chart on a Friday.

3. Some infections e.g. bacterial endocarditis, osteomyelitis, septic arthritis, meningitis, infected implants/prosthetics, severe infections during neutropenic sepsis, severe or necrotising soft tissue infections, severe sepsis, intracranial abscesses, exacerbations of cystic fibrosis, liver abscesses, adequately drained abscesses and empyemas, certain bacteraemias such as MRSA, Pseudomonas, S. aureus, group A streptococcus, fungal, vancomycin resistant enterococcus (VRE), etc will require prolonged courses of IV antibiotics. There may be exceptional cases not included in the list that may require prolonged IV therapy and such decision should be based on clinical grounds.

4. IV to oral switch should be considered in all patients except the critically ill or those unable to absorb or take oral medication (i.e. vomiting, nil by mouth, reduced absorption, mechanical swallowing disorder, unconscious, some post-surgical cases).

   IV therapy should continue in those patients who have signs of continuing sepsis and have at least two of the following indicators

   - Body temperature <36 or >38^{o}C
   - Heart rate >90 beats/min
   - Respiratory rate >20 breaths/min or Pa CO2 <32mmHg (<4.3kPa)
   - WBC >12 or <4 x 10 power of 9/L

5. For follow on oral therapy check the IV duration when deciding on the course length.

6. Oral options available are: amoxicillin, erythromycin, clarithromycin, penicillin, metronidazole, co-amoxiclav, tetracycline, flucloxacillin, ciprofloxacin, cefalexin etc – refer to the antimicrobial policy for dosage.

Wording on antibiotic review sticker:
Dr please review :

☐Choice of antibiotic
☐ IV to oral switch
☐ Indicate a stop date
Pharmacist_____
Bleep_____Date___

Always specify on the drug chart a stop or review date for every antibiotic prescribed. Duration of antibiotic treatment for most conditions is specified on the Trust Antimicrobial Policy – available on the intranet.

Guide to antibiotic Switching

IV Antibiotic	Oral switch alternative
Co-amoxiclav 1.2G TDS	**narrow spectrum if possible** e.g. Amoxicillin (if sensitivities available) 500mg or 1Gram TDS (capsules or suspension) **or** Co-amoxiclav 625mg TDS (tablets or suspension)
Metronidazole 500mg TDS	Metronidazole 400mg TDS (tablets or suspension)
Clarithromycin 500mg BD	Clarithromycin 500mg BD (tablets or suspension)
Benzylpenicillin 1.2G QDS	Amoxicillin 500mg or 1Gram TDS (capsules or suspension) **Or for streptococcal infections** Phenoxymethylpenicillin 500mg QDS (tablets or suspension)
Flucloxacillin 1G QDS	Flucloxacillin 500mg- 1G QDS (capsules or suspension)
Piperacillin/ Tazobactam (Tazocin) IV 4.5g TDS	Switch to Co-amoxiclav 625mg PO TDS if low risk for C difficile If high risk for C diffficile seek microbiology advice

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