Guy's and St Thomas'
NHS Foundation Trust

Clinical Guideline

Antibiotic Use in Adults

This guidance provides recommendations on the initial empirical treatment of infections in adult, non-pregnant patients with normal renal function who attend the Emergency Department or who are in-patients, with the following exceptions:

- Critical Care; Haematology/Oncology; Women's; Renal; Paediatrics; Surgical Prophylaxis

Who must follow their own current approved guidance, available via GT*i*

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Change History		
Date	Change details, since approval	Approved by

Summary

This guidance is an extended version of the GSTFT "Infections" App available for both Apple and Android devices. Click here for further information on how to download the App.

This guidance provides recommendations on the initial empirical treatment of infections in adult, non-pregnant patients with normal renal function who attend the Emergency Department (ED) or who are in-patients with the following exceptions:

- Critical Care
- Haematology / Oncology
- Women's Services
- Renal
- Paediatrics
- Surgical Prophylaxis

These specialist areas must follow their own current approved antibiotic guidance available via the intranet.

Please note: All doses quoted in this guidance apply to adult patients with normal renal function. For dosing in renal impairment, refer to specialist guidance via the Intranet or contact Pharmacy.

Contact Pharmacy for advice on antibiotic use in pregnancy.

Prescribing in Penicillin Allergy:
Antibiotics within this guidance are colour coded in relation to their risk or otherwise in patients who are penicillin allergic.

- **Drugs in RED are contra-indicated – DO NOT USE**
- **Drugs in ORANGE may only be prescribed with documented approval of a senior member of the attending team**
- **Drugs in GREEN are considered safe**

For Further Advice Contact	
Infection StRs Mon-Fri 9am-5.30pm or via switchboard out of hours	
STH – **Non-urgent** general advice	Ext 83100 or 83101 between 12-1pm or 2-4pm
STH - **Urgent** advice	Ext 83100 or 83101 *If StR unavailable contact the on-call Consultant Microbiologist via switchboard*
STH - **Ward Consult ONLY**	Bleep 1026
Guy's - General advice & Ward Consult	Ext 83156 or Bleep 1300
Infection Pharmacy Team Mon-Fri 9am-5.30pm or via on-call pharmacist out of hours	
STH	Bleep 2388
Guy's	Bleep 0897

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1. Introduction

Patients in our Trust (and indeed worldwide) currently face a huge threat from highly antibiotic-resistant bacteria. Carbapenem resistant organisms (CROs), bacteria that may only be susceptible to one or two antibiotics, are now endemic in the UK and are isolated from our patients regularly[1]. In 2018 most of the CROs we isolated were *Klebsiella*, *E. coli*, *Enterobacter* species or *Acinetobacter baumanii*. In addition we are still faced with the more familiar challenges of controlling MRSA and *C. difficile* infection (CDI) [2].

One arm of the response to these threats is to use antibiotics prudently – only start when really needed, use the most narrow spectrum agent, and stop as soon as the infection has been effectively treated. Our antibiotic choices and suggested durations have been chosen with all these concerns in mind.

A Trust-wide point prevalence survey carried out in 2013 found that 54% of inpatients are on antimicrobials at any one time. Historical estimates show that up to 50% of antimicrobial use in hospitals is inappropriate[3], so there is a clear need for guidance and control around the use of antimicrobials.

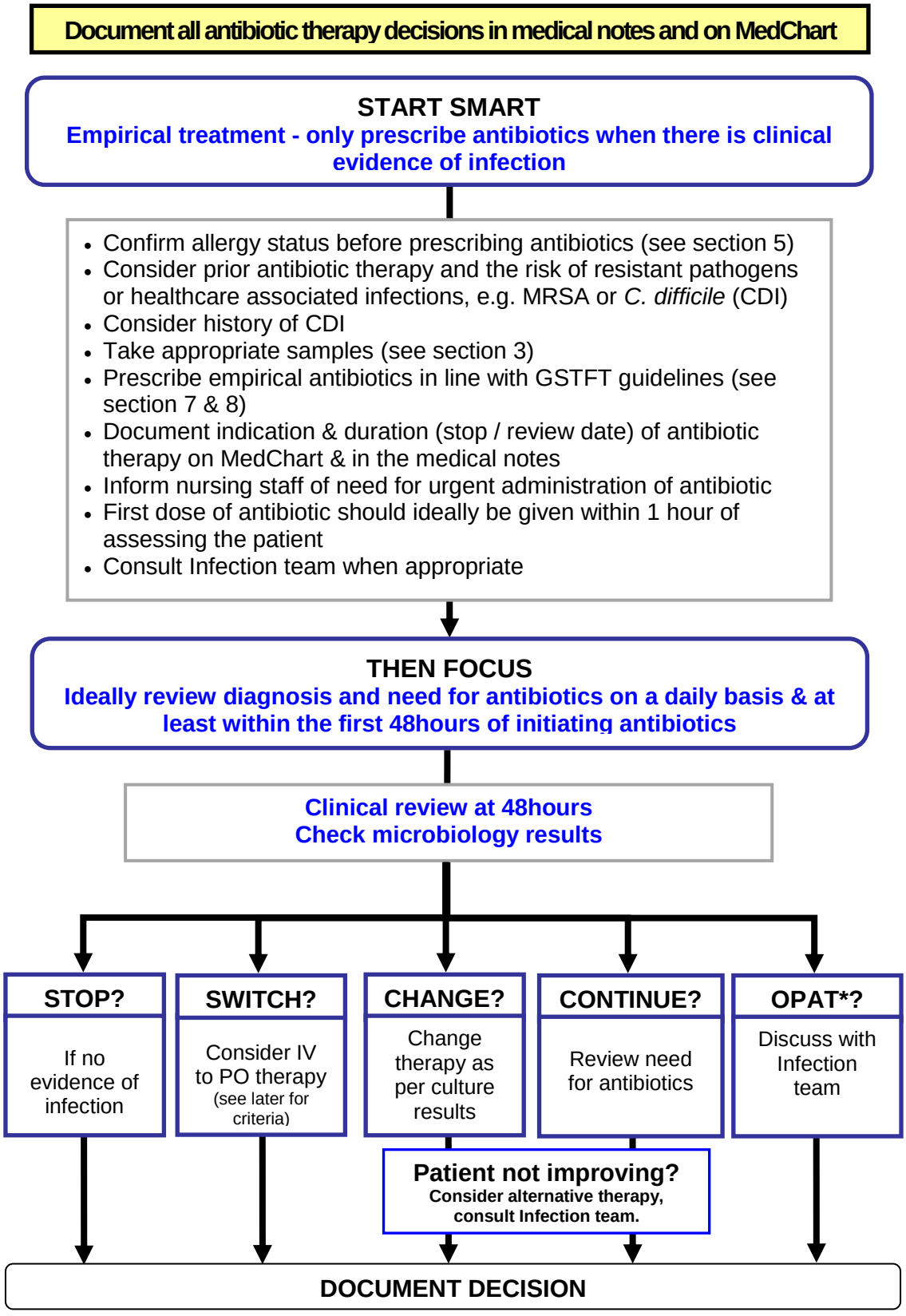
Aims of these guidelines:

- To promote the safe, effective and cost effective use of antibiotics
- To provide a simple, initial, empirical approach to the treatment of bacterial infections
- To prevent the emergence of antibiotic resistance and healthcare-associated infections (HCAIs)

2. Antimicrobial Stewardship

2.1. "Start Smart, Then Focus"

This guidance follows the Department of Health antimicrobial stewardship principles of good antibiotic prescribing[4].



* Outpatient Parenteral Antimicrobial Therapy – Refer to GSTFT OPAT Policy

Adapted from the PHE Start Smart, Then Focus Toolkit March 2015

2.2. Principles of Antimicrobial Stewardship

The primary goal of antimicrobial stewardship is "to optimise clinical outcomes while minimising unintended consequences of antimicrobial use, including toxicity, selection of pathogenic organisms (such as *C. difficile*), and the emergence of resistance"[5]. The Trust has a clear mandate to reduce HCAIs and adhering to ***all*** aspects of good antibiotic prescribing is essential for this.

"Start Smart - then Focus"[4] recommends that antibiotics are:

- started only if there is clinical evidence of bacterial infection;
- prescribed according to local guidance, and the clinical indication & duration/ review date is documented
- reviewed at 48 hours

At 48 hours, the diagnosis and need for continued antibiotic treatment should be re-evaluated - if continuation is necessary then, where possible, oral antibiotics with the narrowest spectrum of cover should be given.

2.2.1. Prescribing of Antibiotics

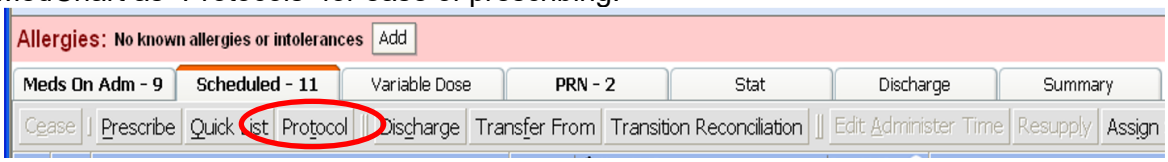
In the Emergency Department (ED)

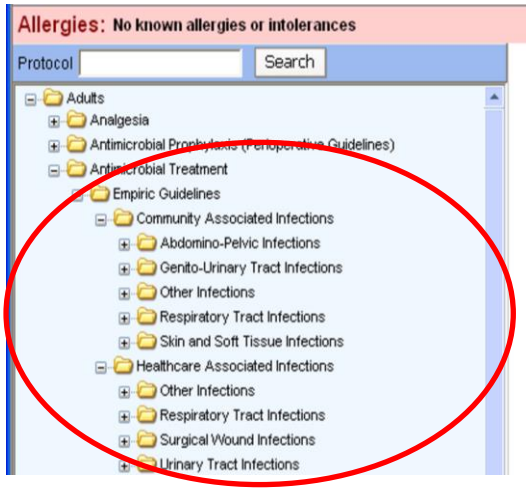
This applies **only** to patients admitted to the Trust via ED and therefore does not include patients discharged from ED without admission, or those admitted to the Clinical Decision Unit who remain under the care of the ED team.

Only a single, first dose of antibiotic(s) should be given in the ED, prescribed on the single page ED prescribing record. ***It is the responsibility of the admitting speciality team that accepts the patient to prescribe regular antibiotic treatment thereafter.*** This will help ensure that the decision to prescribe antibiotics is reviewed by the admitting team and modified if new clinical/laboratory information is available and will assist in the audit of antibiotic administration against Trust standards.

On Inpatient Wards using MedChart

All empirical antimicrobial treatment guidelines within this document are available on MedChart as "Protocols" for ease of prescribing.





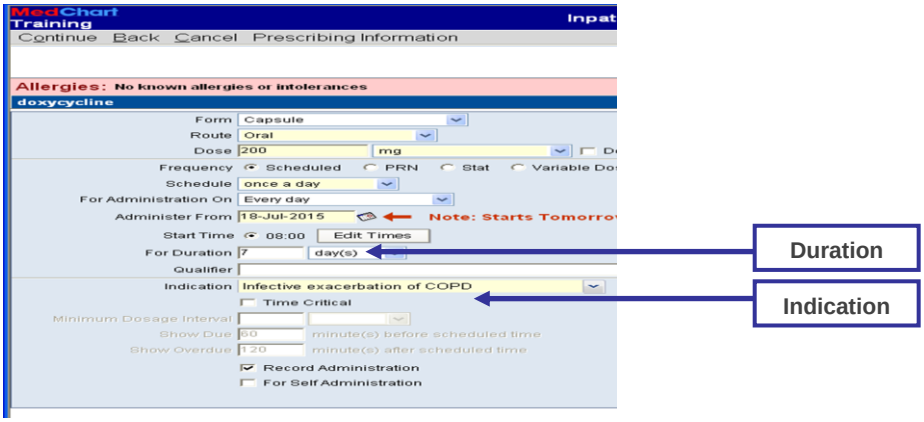
- Go to: Protocol > Adults > Antimicrobial Treatment > Empiric Guidelines
- Choose either "Community Associated" or "Healthcare Associated" infections
- Or search for a protocol e.g. UTI, CAP

2.2.2 Documentation

It is the prescriber's responsibility to **ALWAYS** document the indication and duration in the medical notes and on MedChart or a paper drug chart at the time of prescribing. This is mandatory in order to allow clinical judgement of the appropriateness of, and ongoing need for, antibiotic prescriptions.

Prescribers **MUST**:

- State indication in the "Indication" box on MedChart (see below) / paper chart
- State duration in the "For duration" box on MedChart (see below) / "Valid Period" box on the paper chart
- All immediate doses must be prescribed on the "Stat" tab of MedChart or in the "Time Critical" section on the front of the paper chart with a specified time of administration. Inform nursing staff of the need for urgent administration.



2.2.3 Duration

Antibiotics should be used for the shortest effective time. There is good evidence that the longer the duration of antibiotic courses, the higher the risk of developing *C. difficile* infection (CDI)[6]. Prolonged unnecessary use of antibiotics can encourage antimicrobial resistance and increase risk of side effects.

Prescribers **MUST** consider that:

- There are few indications to continue antibiotics beyond five to seven days. Examples include:
  - Meningitis
  - Endocarditis
  - Pyelonephritis
  - Diabetic Foot infections
  - *Staphylococcus aureus* bacteraemia
  - *Pneumocystis* pneumonia
  - Bone and Joint Infections (including implants or prostheses)
  - Long term antibiotic prophylaxis (e.g. for splenectomy)
  - Infection-approved prescriptions
- Unless treatment is for an indication listed above, or has been formally recommended by Infection, **ALL** antibiotic courses **MUST** be reviewed, and if appropriate, discontinued at seven days.
- Contact Infection if continued antibiotic therapy is considered necessary.

2.2.4. Review

Antibiotic therapy should ideally be **REVIEWED AT LEAST DAILY** and at every Consultant ward round.

Prescribers **SHOULD**:

- Switch from IV to oral route as soon as possible (see pages 12 & 13 for criteria).
- Review choice of therapy in light of laboratory results (cultures, sensitivities, renal function, markers of response) as soon as these are available.
- Review previous microbiology results where appropriate.

2.2.5. Additional Antibiotic Prescribing Information

Deviation from Guideline

- Where deviation from the guideline is clinically indicated, rationale for deviation must be clearly documented in the medical notes. Common examples of this would include advice from Infection, empirical treatment of sepsis in a patient known to have resistant organisms, treatment of a microbiologically documented antibiotic-resistant infection (e.g. UTI).

Spectrum of Activity

- **Piperacillin + tazobactam (Tazocin®)**, **co-amoxiclav** and **meropenem** all have anaerobic activity – consequently **metronidazole** should NOT be added to these agents.
- **Co-amoxiclav** is active against meticillin-sensitive *S. aureus* – consequently **flucloxacillin** should NOT be added to this agent.

3. How to Use the Microbiology Laboratory

3.1. Community-associated Respiratory Tract Infections

- Community-acquired pneumonia (CAP), infective exacerbations of COPD (IECOPD) and infective exacerbations of bronchiectasis – if muco-purulent sputum can be collected *prior* to starting antibiotics, send for culture and sensitivity (the lab does not perform Gram stains for sputa). Send sample for acid-fast bacilli (AFB) if mycobacterial infection is a possibility
- Send urine for legionella antigen if severe CAP, recent travel, or relevant exposure/outbreak setting
- ONLY send urine for pneumococcal antigen if patient being admitted to ITU/HDU for severe CAP (not cost-effective to use in other settings)
- In patients with CAP, send blood cultures if significant systemic upset including sepsis/septic shock
- Suspected bacterial tonsillitis – send throat swab for culture and sensitivity. Culture of *Strep. pyogenes* (Group A strep) or *Strep. dysgalactiae* (Group C/G) likely to be clinically significant
- Parapharyngeal abscess/quinsy – send aspirated pus for microscopy, culture & sensitivity (MC&S)

3.2. Genito-urinary Tract Infections

- Send a carefully collected mid-stream urine (MSU) sample, before giving antibiotics, in all patients suspected of having a urinary tract infection (UTI)
- Epididymo-orchitis – send MSU. If patient sexually active send patient to GUM Department for sexual health screen (including molecular tests for chlamydia and gonorrhoea)

3.3. Skin and Soft Tissue Infections

- Cellulitis – send swab from the affected area if there is a break in the skin +/- exudate
- Diabetic foot infections – swab relevant ulcerated areas. Refer to the Foot Health Team (bleep 1952 or 2105) to ensure appropriately-taken deep tissue samples are also collected for MC&S
- Suspected necrotising fasciitis – send swab of affected area if skin broken; tissue taken in theatre at the time of debridement should be **sent urgently to the Microbiology lab** for Gram stain (always contact the Microbiology lab and/or medical staff to inform them of the specimen)

3.4. Abdomino-pelvic Infections

- Pelvic inflammatory disease – if patient is sexually active, always ensure they are investigated for STIs (including sending urine for chlamydia/gonococcal detection, and high vaginal swab (HVS)/cervical swab for gonococcal culture)

3.5. Other community-associated infections

- **Bacterial meningitis** – the most useful diagnostic test is cerebrospinal fluid (CSF). This is best collected prior to starting antibiotics, although still yields useful information for a few days afterwards. Remember always to send a protein and paired glucose (CSF and plasma) as well as to Microbiology/Virology. Also always send an EDTA sample for "Meningococcal PCR". See "Lumbar Puncture Protocol for Adults" on GT*i* for further guidance
- **Infective endocarditis** – aim to collect at least three sets of blood cultures **drawn at intervals of at least 2-4 hours apart** in a clinically stable patient. At least one (and ideally two) sets of cultures should be drawn prior to starting antibiotics even in unstable patients
- **Bone and joint infections** – collect at least 2 sets of blood cultures. Aspirate the affected joint urgently for MC&S

3.6. Hospital-associated Pneumonia (HAP)

- This is frequently over-diagnosed (e.g. in patients with pulmonary oedema or sepsis from other sources such as vascular access devices or urosepsis) – consider alternative diagnoses
- Consider sending blood and urine cultures; sputum cultures from hospitalised patients are often not informative so are not routinely advised

3.7. Hospital-associated UTI (including catheter-associated UTI)

- These infections are very common and are easily over- and under-diagnosed
- Asymptomatic bacteriuria should **NOT** be treated except in patients undergoing urological procedures and in pregnant women – in all other settings therefore (e.g. "positive dipstick" or "smelly urine") urine should not be sent for MC&S
- A MSU or catheter specimen urine (CSU) should be sent for culture in all patients with suspected symptomatic UTI
- As resistance rates are currently high in this setting (see page 24), antibiotics should **NOT** be prescribed for patients before culture confirmation (this takes 24-48hrs) – unless there are signs of sepsis

3.8. *Clostridium difficile* infection

- This test should be sent in all patients with a suspected infectious diarrhoea (≥ 2 loose stools in 24hours), even if antibiotics have not been administered in the recent past
- The test should **NOT** be ordered where loose stools are easily otherwise explained (e.g. laxatives, overflow)
- The current two stage test has very high negative predictive value – so does not usually need to be repeated if the initial test is negative

4. Restricted Antibiotics

Antibiotic resistance is increasing. Infections caused by resistant bacteria are associated with higher rates of death, illness and prolonged hospital stay. Bacteria often become resistant as a direct consequence of unnecessary or inappropriate antimicrobial use.

The **restricted antibiotic list** was implemented at GSTFT as part of the Department of Health "Saving Lives" campaign to preserve those antibiotics that are still active against resistant organisms[7]. Initiation of the following antibiotics requires approval from Infection (***unless use is part of an approved Trust Guideline***).

Amikacin
Ceftazidime
Ceftazidime + Avibactam
Ceftolozane + Tazobactam
Chloramphenicol IV and oral
Colistin
Daptomycin
Doxycycline IV
Ertapenem
Fosfomycin
Fidaxomicin
Imipenem + Cilastatin
Levofloxacin
Linezolid
Meropenem
Moxifloxacin
Piperacillin + Tazobactam
Teicoplanin
Temocillin
Tigecycline

Once approval has been obtained, prescribers **MUST**:

- Document in the medical notes and on MedChart "Infection Approved" **and** state the name of the member of the Infection team who has recommended treatment.

Restricted antibiotics will not be supplied by Pharmacy unless the above information is documented.

5. Penicillin Allergy

Approximately 10% of inpatients report having an "allergy" to penicillin. However, only a very small proportion of these patients can be shown to have a true Type 1 hypersensitivity reaction following skin tests.

True penicillin allergy manifests as rash and/or anaphylactic reactions – including any of hypotension, breathing difficulty, swelling of the mouth, lips or throat. **ALL** beta-lactam agents (e.g. **penicillins**, **cephalosporins** and **carbapenems** – see BNF for full details) should be avoided in these patients.

5.1. Allergy Documentation

It is the admitting prescriber's responsibility to complete the allergy documentation appropriately (see Recording of allergic reactions and serious adverse reactions to medicinal and other products policy on GT*i*)

Prescribers **MUST**:

- Record allergy status of the patient in all of the medical notes, MedChart or paper drug chart and on EPR. For details on how to enter, edit or remove allergies on MedChart, refer to MedChart Guidance and SOPs on GT*i*
- Confirm, where a patient states they are allergic, the causative agent (or therapeutic class), the nature, severity and time course of the reaction
- Affix "Penicillin Allergic" stickers to all sides of any paper documentation (e.g. ED Prescribing Record, Anaesthetic Charts, Pre-Operative Booklet, etc.) where this information may be of benefit

5.2. Treatment of Serious Infections

- **Non-severe Penicillin Allergy (e.g. delayed rash or minor rash)**
  For the treatment of serious infections for which there are no satisfactory alternatives and the history does NOT include anaphylactic features, second or third generation **cephalosporins** or **carbapenems** may be used, **but only with the documented approval of a senior attending doctor (StR or above**).

- **Severe Penicillin Allergy (including anaphylactic features, angioedema, urticaria)**
  For the treatment of serious infections, discuss with Infection to determine if there is an appropriate non-beta-lactam alternative. If there is no suitable alternative (e.g. treatment of endocarditis or osteomyelitis), **refer to Allergy StR for urgent allergy testing** (Mon-Fri 9-5pm Bleep 2275). See "Beta-lactam Allergy Referral Flow Chart" on GT*i* for further information.

5.3. Allergy Testing

See "Beta-lactam Allergy Referral Flow Chart" on GT*i* for further information

- **Non-urgent**
  This should be considered in patients with chronic conditions that necessitate frequent antibiotic treatment (e.g. HIV infection, diabetes, end stage renal failure) and suspected allergies. Refer patients to the outpatient allergy service (order as "Beta-Lactam Allergy Testing Referral" on EPR).
- **Urgent** - See details above
- For further advice contact the Allergy StR (Bleep 2275) or Dr Rubaiyat Haque, Consultant Allergist, via switchboard

5.4. Prescribing in Penicillin Allergy

Antibiotics within this guidance are colour coded to aide safe and appropriate choice of antibiotics in patients who are penicillin allergic.

- **Drugs in RED are contra-indicated – DO NOT USE**
- **Drugs in ORANGE may only be prescribed with documented approval of a senior member (StR and above) of the attending team**
- **Drugs in GREEN are considered safe**

DO NOT USE Contra-indicated	AVOID Unless no safe alternative	SAFE Examples include
Lists are not exhaustive – see current BNF for full details		
Amoxicillin **Benzylpenicillin** **Co-amoxiclav** **Flucloxacillin** **Penicillin G** **Penicillin V** **Phenoxymethylpenicillin** **Piperacillin+Tazobactam** **Tazocin®** **Temocillin** **Ticarcillin+Clavulanic Acid** **Timentin®** **Cefalexin** (1st Generation)	**Cefuroxime** (2nd Generation) **Cefixime** (3rd Generation) **Cefotaxime** (3rd Generation) **Ceftazidime** (3rd Generation) **Ceftriaxone** (3rd Generation) **Ceftazidime+Avibactam** (3rd Generation) **Ceftolozane+Tazobactam** **Ertapenem** **Imipenem+Cilastatin** **Meropenem**	**Amikacin** **Ciprofloxacin** **Clarithromycin** **Clindamycin** **Daptomycin** **Doxycycline** **Fosfomycin** **Gentamicin** **Levofloxacin** **Metronidazole** **Nitrofurantoin** **Teicoplanin** **Trimethoprim** **Vancomycin**

6. Intravenous to Oral Switch of Antibiotics

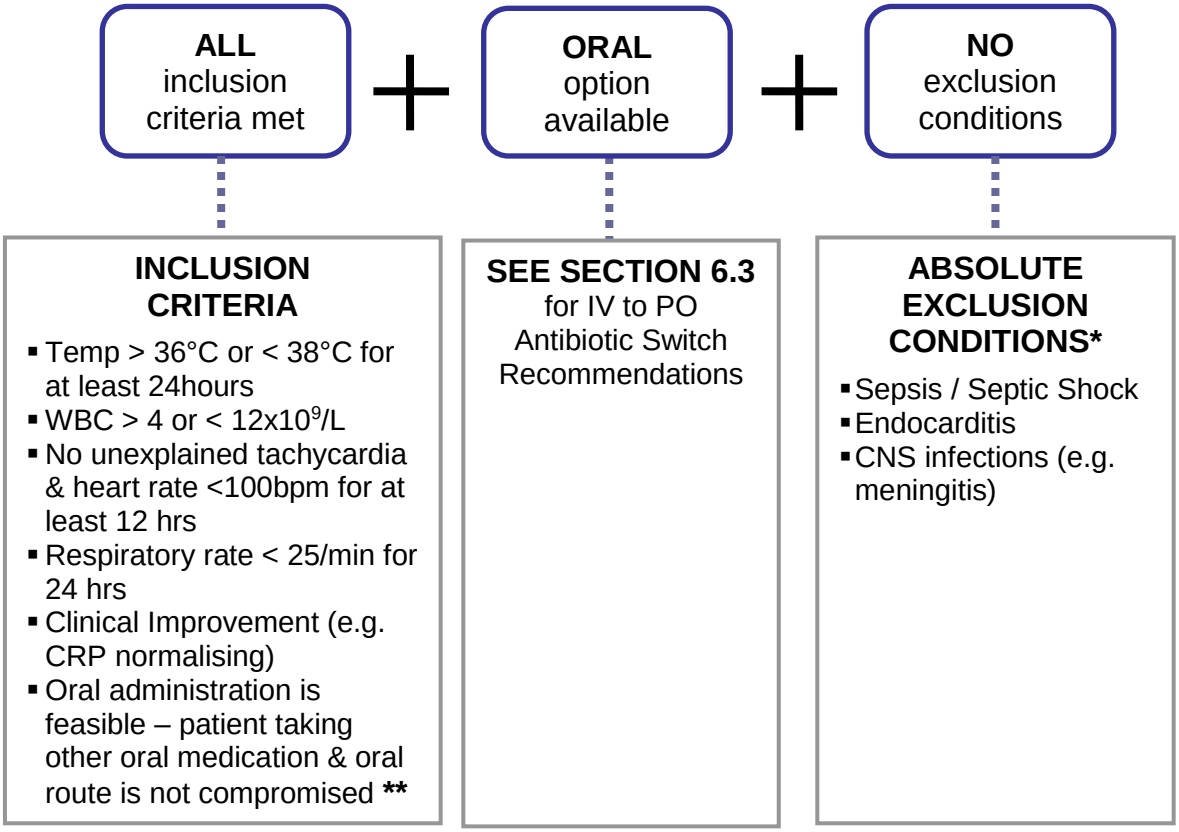
Prompt and early switching of intravenous (IV) antibiotics to effective oral (PO) therapy can provide numerous benefits without compromising clinical outcomes, safety and quality of treatment:

- Decreased risk of hospital acquired infection
- Decreased catheter related infections and other IV line associated problems
- Increased patient comfort and mobility
- Savings in both medical and nursing time
- Decreased risks of adverse effects
- Reduced potential errors made when preparing parenteral medications
- Possibility for early discharge of patient
- Cost savings (drug cost savings, IV associated drug cost saving - i.e. disposable materials, workload savings)

Patients receiving IV antibiotic therapy should be **REVIEWED DAILY** and switched to oral alternatives as appropriate. If switching to oral therapy, ensure the vascular access device is removed if no longer required.

6.1. Criteria for IV to PO Antibiotic Switch

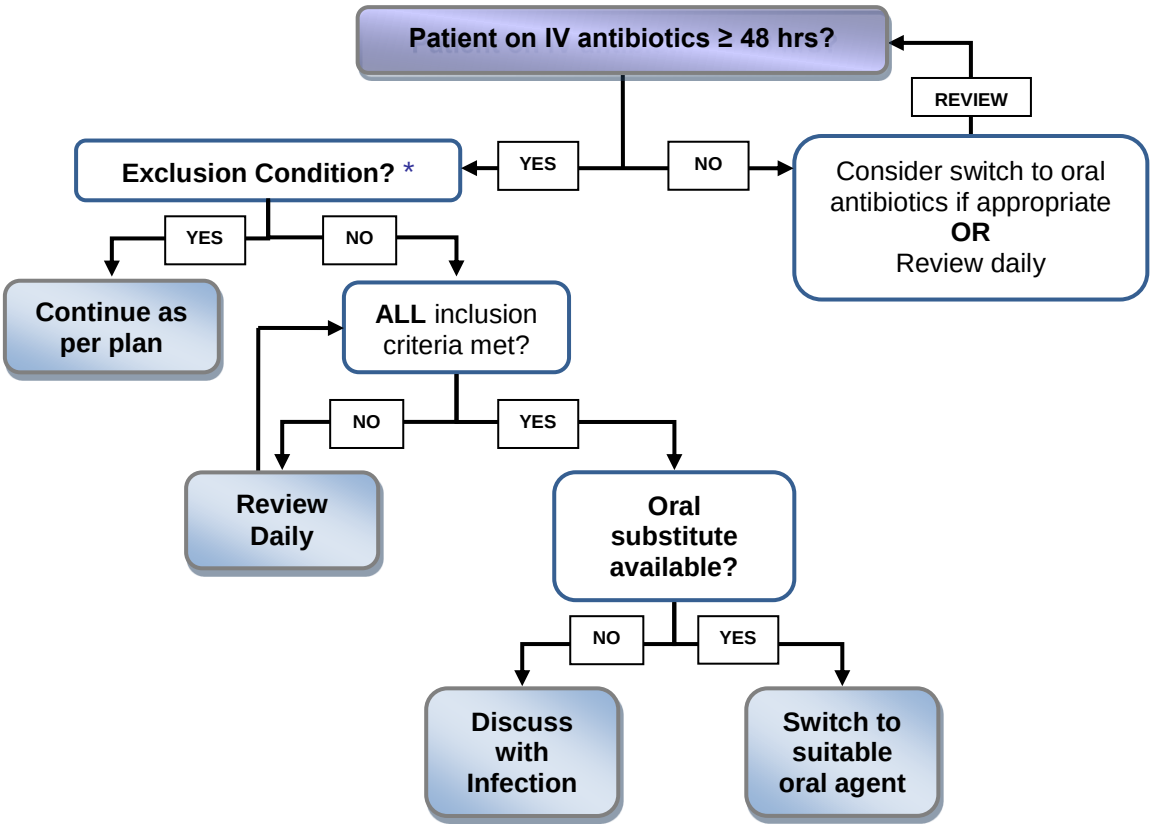
Patient meets criteria for IV to PO antibiotic switch if:



*** Relative exclusion conditions include:** bone & joint infections, deep abscess, empyema, cystic fibrosis, bronchiectasis, severe soft tissue infections – discuss with Infection.

**** For example:** NBM, vomiting, swallowing difficulties, severe diarrhoea, unconscious, impaired GI absorption.

6.2. IV to PO Antibiotic Switch Flowchart



*** If in doubt about which conditions are suitable for IV to PO switch, discuss with Infection.**

6.3. IV to Oral Switch Recommendations

IV Antibiotic	Oral Switch	Additional Comments
Amoxicillin IV	**Amoxicillin PO**	
Ciprofloxacin IV	**Ciprofloxacin PO**	Oral **Ciprofloxacin** is well absorbed. Do not take at same time of day as milk, iron/zinc or indigestion medicines, as reduces bioavailability.
Clarithromycin IV	**Clarithromycin PO**	High risk of thrombophlebitis with IV route.
Clindamycin IV	**Clindamycin PO**	Discontinue immediately if diarrhoea or colitis develops.
Co-amoxiclav IV	**Co-amoxiclav PO**	
Flucloxacillin IV	**Flucloxacillin PO**	Take oral 1hr before food or on an empty stomach.
Metronidazole IV	**Metronidazole PO**	Take with or after food.

Benzylpenicillin IV	**Amoxicillin PO**	**Penicillin V** should be avoided (unless treatment of tonsillitis) due to erratic absorption.
Cefuroxime IV plus Metronidazole IV	**Co-amoxiclav PO**	**Co-amoxiclav** has anaerobic activity. Consequently, **Metronidazole** should NOT be added to this agent.

No direct oral alternatives are available for the following IV agents Consult Infection for oral switch options			
Amikacin IV	**Ceftazidime IV**	**Ceftriaxone IV**	**Gentamicin IV**
Meropenem IV	**Piperacillin + Tazobactam IV**		**Teicoplanin IV**
Vancomycin IV	Oral Vancomycin is not usually systemically absorbed. The oral route is restricted for the treatment of *C. difficile.*		

7. Sepsis/Septic Shock

Sepsis is defined as “life threatening organ dysfunction caused by a dysregulated host response to infection”.

Septic shock is a subtype of sepsis with a much higher mortality characterised by a vasopressor requirement to maintain a mean arterial pressure of ≥ 65mmHg and a serum lactate level of > 2mmol/L in the absence of hypovolemia.

Patients with a NEWS2 score of 5 or greater should be screened for sepsis and managed according to the algorithm below (Figure 1). Also consider “Sepsis Red Flags – these are clinical signs suggesting a degree of organ dysfunction (Figure 2).

Figure 1: GSTFT Sepsis Algorithm

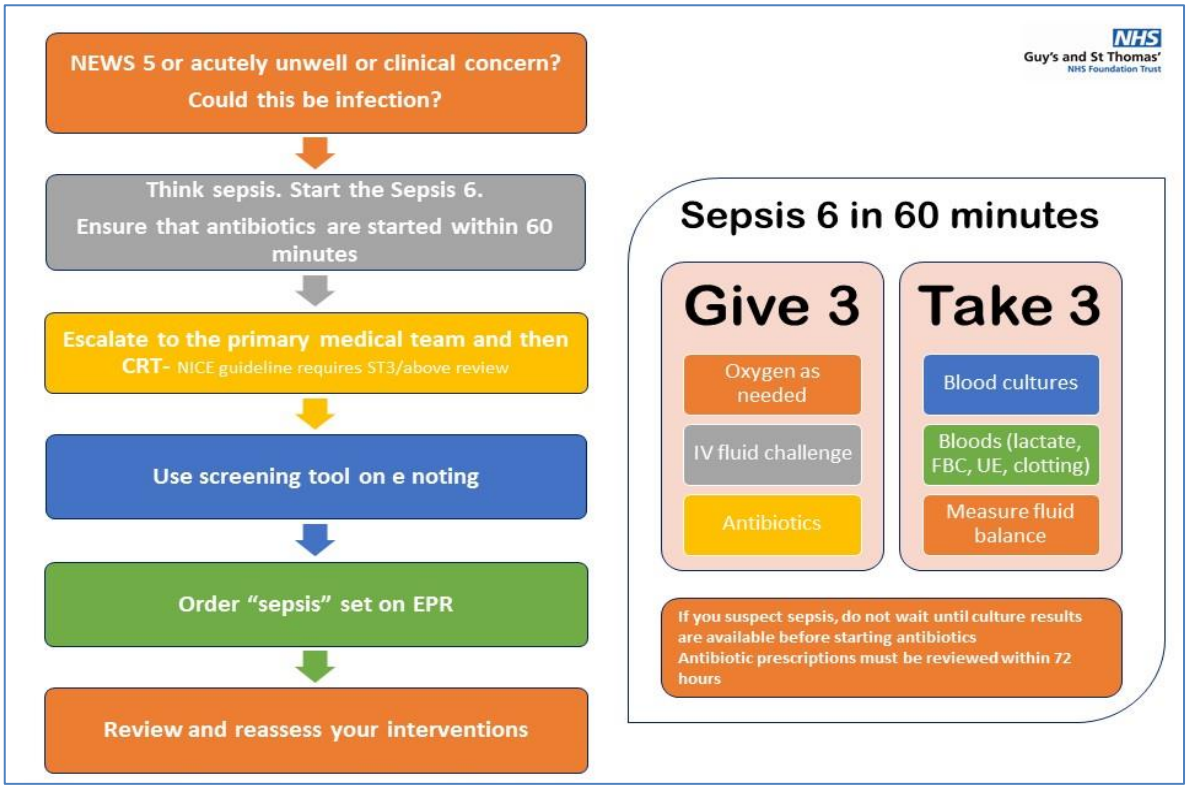
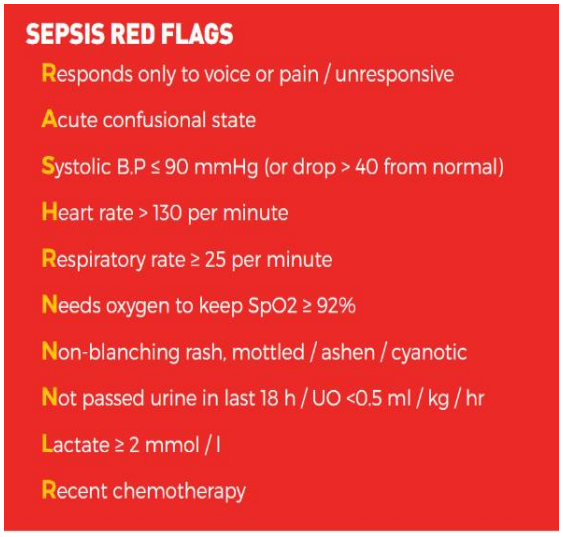


Figure 2: Sepsis Red Flags



If sepsis or septic shock suspected, contact Critical Response Team:
STH - Bleep 0161 / 0166 or StR 0610
Guys - Bleep 1162 or StR 0762

For further information see Sepsis page on GT*i*

8. Empirical Antibiotic Guidelines

8.1 Community Associated Infections

Applies to patients presenting to the Emergency Department and infections evident within 3 days of hospital admission.

CONDITION	1st LINE	PENICILLIN ALLERGY	COMMENTS
Lower Respiratory Tract Infections			
During the influenza season, always consider influenza and other seasonal respiratory viral infections – See Seasonal influenza page on GT*i*			
Community Acquired Pneumonia (CAP)[8,9]	**CRB-65 Score (score 1 point for each feature present):** ▪ **C** = new onset confusion ▪ **R** = respiratory rate > 30/mins ▪ **B** = systolic blood pressure < 90 or diastolic blood pressure ≤ 60mmHg ▪ ***65*** = age > 65 years Demand management for Pathology services has meant that routine measurement of urea levels is no longer carried out at GSTT. In order to provide a prognostic tool for CAP that doesn't use urea, CRB-65 has been chosen - which is also endorsed by the British Thoracic Society. All patients aged > 65 yrs or at risk of invasive pneumococcal disease who are admitted with CAP and who have not previously received pneumococcal vaccine should receive 23-valent pneumococcal polysaccharide vaccine (23-PPV) at convalescence in line with the Department of Health guidelines.		
CAP Non-Severe (CRB-65< 2)	**Amoxicillin** 500mg tds PO/IV **plus** **Doxycycline** 200mg od PO for 5 days	**Doxycycline** 200mg od PO for 5 days	All patients admitted to hospital with suspected CAP should have CXR performed as soon as possible to support the diagnosis [8,9].
	If parenteral therapy required, prescribe **Clarithromycin** 250mg bd IV instead of **Doxycycline**		
CAP Severe (CRB-65≥ 2)	**Co-amoxiclav** 1.2g tds IV **plus** **Doxycycline** 200mg od PO for 5 days If parenteral therapy required, prescribe **Clarithromycin** 500mg bd IV instead of **Doxycycline**	**Levofloxacin** 500mg bd IV / PO for 5 days	
Infective Exacerbation of COPD	**Doxycycline** 200mg od PO for 7 days If parenteral therapy required, prescribe **Clarithromycin** 500mg bd IV instead of **Doxycycline**	As for first line	

Infective Exacerbation of Bronchiectasis[10] Sputum MUST be sent for culture prior to antibiotics.	**Co-amoxiclav** 625mg tds PO **or** 1.2g tds IV for 7-10 days If *Pseudomonas aeruginosa* infection suspected, **add** **Gentamicin** 5mg/kg od IV for two doses (see dosing guidance)	**Doxycycline** 200mg od for 7-10 days If parenteral therapy required, prescribe **Clarithromycin** 500mg bd IV instead of **Doxycycline** If *Pseudomonas aeruginosa* infection suspected, **add** **Gentamicin** 5mg/kg od IV for two doses (see dosing guidance)	If *Pseudomonas aeruginosa* cultured, consider switch to **Piperacillin + Tazobactam** 4.5g tds IV for 7-14 days in consultation with Infection doctors.

8.1 Community Associated Infections

Applies to patients presenting to the Emergency Department and infections evident within 3 days of hospital admission.

CONDITION	1st LINE	PENICILLIN ALLERGY	COMMENTS
Upper Respiratory Tract Infections			
During the influenza season, always consider influenza and other seasonal respiratory viral infections – See Seasonal influenza page on GT*i*			
Bacterial Tonsillitis	**Phenoxymethylpenicillin** 500mg qds PO for 10 days If unable to swallow, prescribe **Benzylpenicillin** 1.2g qds IV instead of **Phenoxymethylpenicillin**	**Clarithromycin** 250mg bd PO for 10 days If unable to swallow, use IV route.	
Parapharyngeal Abscess, Quinsy	**Benzylpenicillin** 1.2g qds IV **plus** **Metronidazole** 500mg tds IV for 10 days	**Clarithromycin** 500mg bd IV **plus** **Metronidazole** 500mg tds IV for 10 days	Refer to ENT Surgeons
Acute Suppurative Parotitis	**Co-amoxiclav** 1.2g tds IV for 7-10 days	**Clarithromycin** 500mg bd IV **plus** **Metronidazole** 500mg tds IV for 7-10 days	Refer to ENT Surgeons as surgical decompression frequently required
Otitis Media, Sinusitis Most uncomplicated cases resolve without antibiotics.	**Amoxicillin** 500mg tds PO for 7 days	**Clarithromycin** 250mg bd PO for 7 days	Consider antibiotics for severe or persistent symptoms**.**

8.1 Community Associated Infections

Applies to patients presenting to the Emergency Department and infections evident within 3 days of hospital admission.

CONDITION	1st LINE	PENICILLIN ALLERGY	COMMENTS
Genito-Urinary Infections			
Uncomplicated UTI	**DO NOT** start antibiotics for a positive urine dipstick **UNLESS** symptoms of infection are also present.		Review culture results when available and consider appropriate antibiotic treatment choice.
	If eGFR >45ml/min: **Nitrofurantoin** 100mg MR bd PO **If eGFR <45ml/min:** **Cefalexin** 500mg tds PO Treat for 3 days in women and for 7 days in men	**If eGFR >45ml/min:** **Nitrofurantoin** 100mg MR bd PO **If eGFR <45ml/min:** **Ciprofloxacin** 250mg bd PO Treat for 3 days in women and for 7 days in men	
Pyelonephritis Urine MUST be sent for culture prior to first dose of antibiotic.	**Ciprofloxacin** 400mg bd IV **or** 500mg bd PO for 7 days In severe cases, add **Gentamicin** 5mg/kg od IV for 24-48hrs (see dosing guidance)	As for first line	Review culture results when available and consider appropriate antibiotic treatment choice.
Epididymo-orchitis			
Age < 35yrs (evaluate for other STIs)	**Ceftriaxone** 500mg IM as a single dose **plus** **Doxycycline** 100mg bd PO for 14 days If IM injection refused or inappropriate, use **Cefixime** 400mg as a single immediate dose PO instead of **Ceftriaxone**	**Ofloxacin** 200mg bd PO for 14 days	Refer all patients to GUM Dept. **Note:** 35-40% of gonococci at GSTFT are fluoroquinolone resistant.
Age ≥ 35yrs or UTI-related	**Ofloxacin** 200mg bd PO for 14 days	As for first line	Evaluate for STIs and refer to GUM Dept if clinically indicated. Sexually transmitted aetiology common in MSM in this age group.
Acute Prostatitis	**Ofloxacin** 200mg bd PO for 28 days	As for first line	Patients with recurrent infection or who have been treated previously with fluoroquinolones (e.g. **Ciprofloxacin** or **Ofloxacin**), consult Infection.

8.1 Community Associated Infections

Applies to patients presenting to the Emergency Department and infections evident within 3 days of hospital admission.

CONDITION	1st LINE	PENICILLIN ALLERGY	COMMENTS
Skin and Soft Tissue Infections			
Cellulitis	**Flucloxacillin** 500mg qds PO **or** 1g qds IV for 7 days	**Clarithromycin** 500mg bd PO/IV for 7 days **If severe cellulitis, consult Infection for more appropriate alternative therapy**	There is evidence that routine addition of **Benzylpenicillin** to **Flucloxacillin** does not improve outcome[11]
Human and Animal Bites			
Simple = Injury <24 hrs before presentation, superficial injury (puncture, scratch, abrasion)	**Co-amoxiclav** 625mg tds PO for 5 days	**Metronidazole** 400mg tds PO for 5 days **plus** **Doxycycline** 200mg od PO for 5 days	For all bites consider risk of HIV, Hepatitis B&C (human bite) and rabies (animal bite) and tetanus. Consider *C difficile* history before prescribing **Clindamycin** – discuss with Infection
Complicated = Injury associated with laceration, skin loss, underlying fracture, distal vascular deficit, cellulitis, pus/discharge, ascending lymphangitis	**Co-amoxiclav** 1.2g tds IV for 5 days and review **Refer to surgeons**	**Clindamycin** 600mg qds IV **plus** **Ciprofloxacin** 400mg bd IV for 5 days and review **Refer to surgeons**	
Diabetic Foot Infections	Refer **ALL** patients to Foot Health via EPR – Inpatient / Outpatient referral to correct hospital site (STH/Guys)		
Superficial	**Co-amoxiclav** 625mg tds PO for 7 days and review in Diabetic Foot Clinic	**Clindamycin** 450mg tds PO for 7days and review in Diabetic Foot Clinic	Consider *C difficile* history before prescribing **Clindamycin** – discuss with Infection
Necrosis or suspected osteomyelitis	Discuss **ALL** cases with Infection Between 9am-5pm Mon-Fri also refer cases to the Foot Health Team (Bleep 1952 / 2105)		
Necrotising fasciitis **GIVE ALL DOSES IMMEDIATELY**	**Cefuroxime** 1.5g IV **plus** **Metronidazole** 500mg IV **plus** **Gentamicin** 5mg/kg IV (see dosing guidance)	**Vancomycin** IV (see dosing guidance) **plus** **Metronidazole** 500mg IV **plus** **Gentamicin** 5mg/kg IV (see dosing guidance)	**URGENTLY DISCUSS ALL CASES WITH INFECTION AND PLASTIC SURGEONS**

8.1 Community Associated Infections

Applies to patients presenting to the Emergency Department and infections evident within 3 days of hospital admission.

CONDITION	1st LINE	PENICILLIN ALLERGY	COMMENTS
Abdomino-Pelvic Infections			
Cholecystitis, Acute peritonitis, Acute appendicitis, Intra-abdominal abscess, Cholangitis	**Cefuroxime** 750mg – 1.5g tds IV **plus** **Metronidazole** 500mg tds IV for 5-7 days	**Vancomycin** IV (see dosing guidance) **plus** **Gentamicin** 5mg/kg od IV (see dosing guidance) **plus** **Metronidazole** 500mg tds IV for 5-7 days	
Spontaneous Bacterial Peritonitis	**Piperacillin + Tazobactam** 4.5g tds IV Review at 48-72hrs	**Ciprofloxacin** 400mg bd IV Review at 48-72hrs Consult Infection if recent use of fluoroquinolones	Send ascitic fluid in Universal and blood culture bottles. Neutrophil count > $250x10^6$/L is diagnostic of SBP[12]. See "Management of Ascites in Cirrhosis" guideline on GT*i*.
Pelvic Inflammatory Disease[13] (in-patients)	**Ceftriaxone** 2g od IV for 5 days **plus** **Metronidazole** 500mg bd IV (or 400mg bd PO) **plus** **Doxycycline** 100mg bd PO for 14 days	**Ofloxacin** 400mg bd (IV or PO) **plus** **Metronidazole** 500mg tds IV (or 400mg tds PO) for 14 days **Note:** suboptimal gonococcal cover – contact Infection if strong suspicion of gonococcal infection	Investigate for sexually transmitted infections. See GUM: Pelvic Inflammatory Disease Outpatient Treatment guideline on GT*i*.
***Helicobacter pylori* Infection**	**Amoxicillin** 1g bd PO **plus** **Clarithromycin** 500mg bd PO **plus** Omeprazole 20mg bd PO for 7 days	**Clarithromycin** 500mg bd PO **plus** **Metronidazole** 400mg bd PO **plus** Omeprazole 20mg bd PO for 7 days	Refer to Gastroenterology for consideration of gastric biopsy for culture and sensitivity in recalcitrant cases
Acute Gastroenteritis	Mild to moderate symptoms – antibiotics are not indicated		Always consider the possibility of *C difficile* and norovirus infection. **Note:** there is an ongoing outbreak of *Shigella* infections in MSM with high rates of Azithromycin resistance[14]. If suspected shigellosis in MSM, consider using **Ciprofloxacin** 500mg bd PO for 5 days
	Severe symptoms (dehydration, bloody stools, fever or immunocompromised) consider: **Azithromycin** 500mg od PO for 5 days	As for first line	

8.1 Community Associated Infections

Applies to patients presenting to the Emergency Department and infections evident within 3 days of hospital admission.

CONDITION	1st LINE	PENICILLIN ALLERGY	COMMENTS
Other Infections			
Sepsis/Septic Shock (no focus) See Sepsis page on GT*i* **Administer 1st dose of antibiotic within 1hr of diagnosis.**	**Cefuroxime** 1.5g tds IV **plus** **Metronidazole** 500mg tds IV **plus** **Gentamicin** 5mg/kg IV (see dosing guidance)	**Use this regimen if MRSA suspected** **Vancomycin** IV (see dosing guidance) **plus** **Gentamicin** 5mg/kg od IV (see dosing guidance) **plus** **Metronidazole** 500mg tds IV	**Contact Clinical Response Team:** **STH - Bleep 0161/0166 or StR 0610** **Guys - Bleep 1162 or StR 0762** Prescribe first dose as "STAT" on MedChart. Inform nurse of need for urgent administration.
	Consider substituting **Amikacin** 15mg/kg IV (see dosing guidance) for **Gentamicin** if known to be colonised with Gentamicin-resistant organisms or extensive recent hospital contact.		
Bacterial Meningitis Discuss with Infection addition of Dexamethasone 10mg qds IV (give with or before 1st dose of antibiotic) for 4 days[15]	**Ceftriaxone** 4g IV as a single immediate dose on Day 1, then 2g od IV Give for 5-10 days. If non-severe penicillin allergy (NO anaphylaxis), this option may be considered following review and documented approval of a senior member of the attending team (StR and above).	If severe penicillin allergy (ANAPHYLAXIS), consult Infection	If immunocompromised or > 60yrs, consider adding **Amoxicillin** 2g 4hrly IV (to cover *Listeria* infection). **ONLY** add **Aciclovir** 10mg/kg tds IV (use ideal body weight) if encephalitis suspected. If using Aciclovir ensure patient is well hydrated to minimise risk of renal toxicity.
Infective Endocarditis	Take 3 sets of blood cultures (ideally at least 2-4 hours apart) Discuss with Infection **PRIOR** to starting antibiotics		See "Gentamicin – Multiple Daily Dosing Regimen for the Treatment of Endocarditis" guideline on GT*i*
Septic Arthritis (native joint) Aspirate joint prior to starting antibiotics.	**Flucloxacillin** 2g qds IV	**Clindamycin** 600mg qds IV	Discuss **ALL** suspected cases with Infection for advice on appropriate investigations, antibiotic choice and duration. Consider *C difficile* history before prescribing **Clindamycin** – discuss with Infection
Osteomyelitis	Take 2-3 sets of blood cultures Discuss with Infection		This is a very heterogeneous infection, urgent liaison with

Prosthetic joint or Metalwork-associated Bone or Joint Infection		Orthopaedics and Infection advised before starting antibiotics.

8.2 Healthcare Associated Infections

Applies to infections not clinically apparent at admission that develop after 3 days in hospital (with the exception of early-onset hospital-acquired pneumonia), or to patients discharged from hospital in the last 4 weeks. Antibiotic choices may be modified if microbiological data are available. Making a correct diagnosis of healthcare associated infection is very difficult, so sending samples and waiting for results is often more appropriate than starting empirical antibiotics.

CONDITION	1st LINE	PENICILLIN ALLERGY	COMMENTS
Respiratory Tract Infections			
Healthcare Acquired Pneumonia (HAP)	Requires demonstration of radiological pulmonary infiltrate for diagnosis. HAP is frequently over-diagnosed: consider alternative explanations (e.g. Vascular Access Device-related or urinary catheter-related).		
HAP Early-onset (< 3/7 after admission)	**Co-amoxiclav** 625mg tds PO **or** 1.2g tds IV for 5 days	**Doxycycline** 200mg od PO for 5 days If parenteral therapy required, use **Clarithromycin** 500mg bd IV	
HAP Late-onset (> 3/7 after admission)	**Co-amoxiclav** 625mg tds PO **or** 1.2g tds IV for 5 days **plus** **Gentamicin** 5mg/kg od IV for 2 doses then review (see dosing guidance)	**Vancomycin** IV (see dosing guidance) for 5 days **plus** **Gentamicin** 5mg/kg od IV for 2 doses then review (see dosing guidance)	Contact Critical Care Response Team STH – Bleep 0161/0166 or StR 0610 Guys – Bleep 1162 or StR 0762
Aspiration pneumonia	Treat as for healthcare associated pneumonia. Limit duration to 3 days		
Urinary Tract Infections			
Urinary Tract Infection	**DO NOT** start antibiotics for a positive urine dipstick **UNLESS** symptoms of infection are also present. As resistance rates to all oral agents are ≥25%, imperative to send urine for culture. Empirical antibiotics should only be given to patients with severe symptoms. **If eGFR >45ml/min:** **Nitrofurantoin** 100mg MR bd PO for 5 days **If eGFR <45ml/min:** **Ciprofloxacin** 250mg bd PO for 5 days If evidence of sepsis/septic shock, use regimens recommended under Sepsis/Septic Shock		**DO NOT** treat catheter-related bacteriuria without clinical evidence of UTI. Review culture results when available and consider appropriate antibiotic treatment choice.

Surgical Site Infections (SSIs) - *Inform SSI surveillance team (bleep 0504 or email :SSIS)*			
GI, ENT, Vascular, Urology, Obstetrics, Gynaecology	**Co-amoxiclav** 625mg tds PO for 5 days	Consult Infection	Take appropriate samples (e.g. pus) & consider imaging. Ensure Surgical Consultant Review.
Cardiothoracic, Breast, Orthopaedics, Plastics	**Flucloxacillin** 500mg qds PO for 5 days	**Clarithromycin** 500mg bd PO for 5 days	

8.2 Healthcare Associated Infections

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CONDITION	1st LINE	PENICILLIN ALLERGY	COMMENTS
Other Infections			
***Clostridium difficile* infection**[16] See *Clostridium difficile* infection policy on GT*i*	**Severe *Clostridium difficile* Infection (one or more of the following): Consider surgical review if features of severe CDI** • WBC > $15x10^9$/L • Temp > 38.5°C • Clinical evidence of sepsis/septic shock • Acute increase in Creatinine (> 50% above baseline) • Radiographic or endoscopic evidence of colitis or pseudomembranous colitis • Colonic dilatation > 6cm		
	Discuss ALL cases with Infection **Based on clinical review by Infection, treatment may be initiated with either:** **Fidaxomicin** 200mg bd PO for 10 days **or** **Vancomycin** 125mg qds PO for 10 to 14 days **Note:** use the parenteral formulation of vancomycin orally – refer to C diff policy for further details		Stop all other antibiotics if feasible. Consider faecal microbiota transplantation (FMT) in patients with recurrent *C difficile* infection

Sepsis / Septic shock (no focus) See Sepsis page on GT*i* **Administer antibiotics within 1hr of diagnosis**	**Co-amoxiclav** 1.2g tds IV **plus** **Gentamicin** 5mg/kg od IV for 2 doses then review (see dosing guidance)	**Use this regimen if MRSA colonised** **Vancomycin** IV (see dosing guidance) **plus** **Gentamicin** 5mg/kg od IV for 2 doses then review (see dosing guidance) If abdominal source suspected **ADD**: **Metronidazole** 500mg tds IV	**Contact Clinical Response Team:** **STH - Bleep 0161/0166 or StR 0610** **Guys - Bleep 1162 or StR 0762** Prescribe first dose as "STAT" on MedChart. Inform nurse of need for urgent administration.
	Consider substituting **Amikacin** 15mg/kg IV (see dosing guidance) for **Gentamicin** if known to be colonised with **Gentamicin**-resistant organisms or extensive recent hospital contact.		

7.2 Healthcare Associated Infections

Applies to infections not clinically apparent at admission that develop after 3 days in hospital (with the exception of early-onset hospital-acquired pneumonia), or to patients discharged from hospital in the last 4 weeks. Antibiotic choices may be modified if microbiological data are available. Making a correct diagnosis of healthcare associated infection is very difficult, so sending samples and waiting for results is often more appropriate than starting empirical antibiotics.

CONDITION	1st LINE	PENICILLIN ALLERGY	COMMENTS
Other Infections			
Suspected Vascular Catheter-related Blood Stream Infection Ensure peripheral (and central if tunnelled line) blood cultures are drawn before starting antibiotics	**Vancomycin** IV (see dosing guidance) **plus** **Gentamicin** 5mg/kg od IV for 2 doses then review (see dosing guidance)	As for first line	Advice regarding ongoing management will be provided by the Infection doctors (based upon blood culture results)
Neutropenic Sepsis	View guidance on GT*i*		

9. GSTFT Resistance Data

9.1. Community acquired urinary isolates

Resistance rates for urinary isolates from Emergency Department & Evan Jones at GSTFT in 2017 (1121 isolates):

Piperacillin + Tazobactam	12%
Amikacin	7%
Co-amoxiclav	27%
Gentamicin	13%
Ciprofloxacin	13%
Ceftazidime	17%
Nitrofurantoin	17%
Trimethoprim	39%
Amoxicillin	57%
Cefalexin	21%
Meropenem	6%
Co-amoxiclav + Gentamicin	6%

9.2. Hospital acquired urinary isolates

Resistance rates for urinary isolates from medical and surgical wards at GSTFT in 2017 (1573 isolates):

Piperacillin + Tazobactam	30%
Amikacin	18%
Co-amoxiclav	47%
Gentamicin	30%
Ciprofloxacin	26%
Ceftazidime	36%
Nitrofurantoin	45%
Trimethoprim	60%
Amoxicillin	81%
Cefalexin	47%
Meropenem	18%
Co-amoxiclav + Gentamicin	19%

9.3. Hospital acquired respiratory tract isolates

Resistance rates for respiratory tract isolates from medical and surgical wards at GSTFT in 2017 (581 isolates):

Piperacillin + Tazobactam	24%
Amikacin	29%
Co-amoxiclav	52%
Gentamicin	29%
Ciprofloxacin	15%
Ceftazidime	23%
Meropenem	11%
Co-amoxiclav + Gentamicin	8%

9.4. Hospital acquired bacteraemias

Resistance rates for blood culture isolates from medical and surgical wards at GSTFT in 2017 (206 isolates):

Piperacillin + Tazobactam	29%
Amikacin	31%
Co-amoxiclav	47%
Gentamicin	32%
Ciprofloxacin	50%
Ceftazidime	43%
Meropenem	18%
Co-amoxiclav + Gentamicin	16%
Co-amoxiclav + Amikacin	15%

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