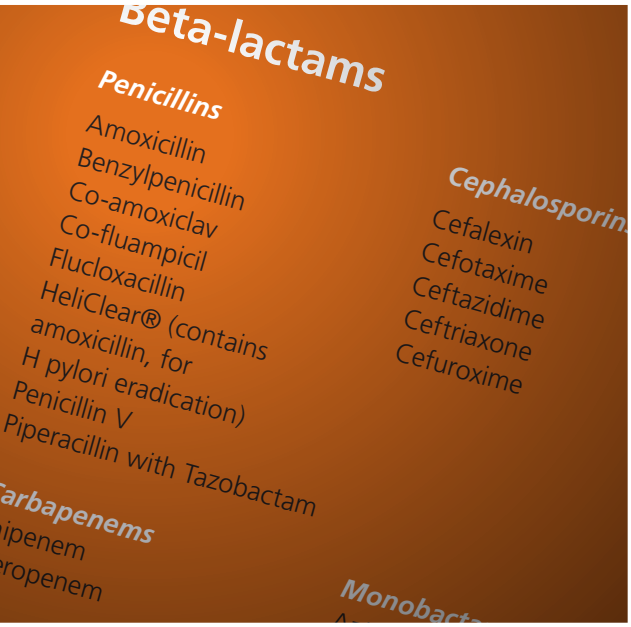
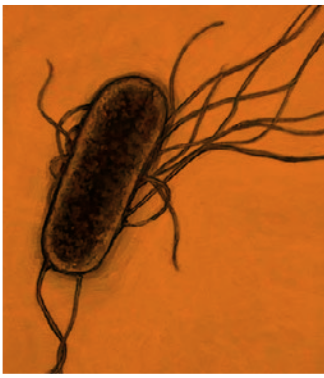
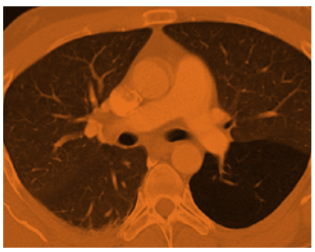
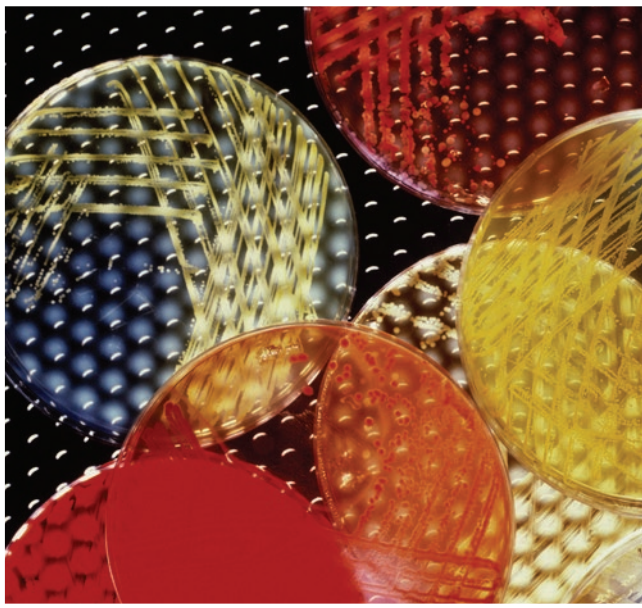
The Rotherham NHS Foundation Trust
Barnsley Hospital NHS Foundation Trust

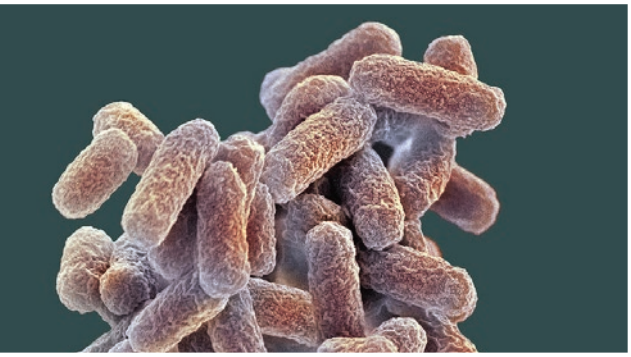
Antimicrobial Policy for Adults

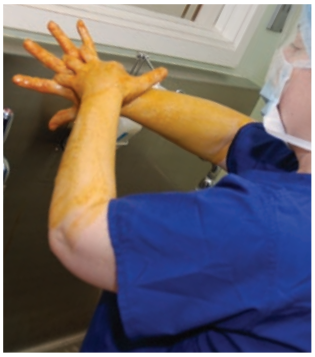












Do not use antimicrobials unless absolutely essential

2013 | 15

Your health, your life, your choice, our passion

Penicillin Allergy

Allergy Status

- Always ask for description of the reaction experienced.
- Document in notes and on medicine chart: The Name of medicine and the Reaction.
- Diarrhoea is a results of change in bowel flora and not an allergic reaction

---

PENICILLIN ALLERGY

LIFE-THREATENING
IMMEDIATE
eg anaphylaxis
angioedema
urticaria
rash – florid, blotchy

Do not use any Beta-lactams

Penicillins	*Cephalosporins*
Amoxicillin	Cefalexin
Benzylpenicillin	Cefotaxime
Co-amoxiclav	Ceftazidime
Co-fluampicil	Ceftriaxone
Flucloxacillin	Cefuroxime
HeliClear® (contains amoxicillin, for H pylori eradication)	
Temocillin	
Penicillin V	
Piperacillin with Tazobactam	

Carbapenems	*Monobactam*
Imipenem	Aztreonam
Meropenem	Microbiologist may advise

PENICILLIN ALLERGY

NOT LIFE-THREATENING
DELAYED
eg simple rash
- non confluent,
- non pruritic
- restricted to small area

Use with caution cephalosporins, carbapenems and monobactams

Cross-reactivity in 10% of patients allergic to penicillin

Cephalosporins	*Carbapenems*
Cefalexin	Imipenem
Cefotaxime	Meropenem
Ceftazidime	
Ceftriaxone	*Monobactam*
Cefuroxime	Aztreonam

PENICILLIN ALLERGY

ALL TYPES

Safe to use

Amikacin	Metronidazole
Azithromycin	Nitrofurantoin
Ciprofloxacin	Ofloxacin
Clarithromycin	Rifampicin
Clindamycin	Sodium fusidate
Colomycin	Teicoplanin
Co-trimoxazole	Tetracycline
Doxycycline	Tigecycline
Erythromycin	Tobramycin
Gentamicin	Trimethoprim
	Vancomycin

For antibiotics not listed or for further information, please contact:

	Barnsley	**Rotherham**
Ward Clinical pharmacist	Bleep	Bleep
Microbiologist	2749, 4986	4742, 7712
Medicines Information	2857	4126

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ABBREVIATIONS

BASHH	British Association of Sexual Health and HIV
bd	twice daily
BSAC	British Society for Antimicrobial Chemotherapy
BTS	British Thoracic Society
CCDC	Consultant in Communicable Disease Control
CDI	*Clostridium difficile* infection
CMV	Cytomegalovirus
CRP	C Reactive protein
CSF	Cerebrospinal fluid
CSU	Catheter specimen urine
ERCP	Endoscopic retrograde colangiopancreatography
ESBL	Extended Spectrum Beta Lactamase
FBC	Full blood count
HACEK	*Haemophilus species, Actinobacillus actinomycetemcomitans, Cardiobacterium hominis, Eikenella corrodens and Kingella species*
HDU	High dependancy unit
HIV	Human immunodeficiency virus
HPA	Health Protection Agency
HSV	*Herpes simplex virus*
i/m	Intramuscular
ITU	Intensive therapy unit
i/v	Intravenous
kg	kilogram
mg	milligram
mL	millilitre
m/r	Modified release
MRSA	Meticillin Resistant Staphylococcus Aureus
MSU	Mid stream urine
NICE	National Institute for Health and Clinical Excellence
od	once daily
P	alternative in penicillin allergy
PEG	Percutaneous endoscopic gastrostomy
PID	Pelvic inflammatory disease
PR	per rectum
p/v	per vaginum
qds	four times daily
SBP	Spontaneous bacterial peritonitis
SIGN	Scottish Intercollegiate Guidelines Network
STI	Sexually transmitted infections
tds	three times daily
U&E	Urea and electrolytes
UTI	Urinary tract infection
VZV	Varicella-zoster virus
WCC	White cell count

Antimicrobial Policy

Introduction

The aim of these guidelines is to optimise antimicrobial prescribing within both The Rotherham NHS Foundation Trust and Barnsley Hospital NHS Foundation Trust. Antimicrobials are over-prescribed in many health institutions and both these hospitals are not exempt. These guidelines would not only attempt to provide the best quality of care to manage patients with infections but also to reduce microbial resistance, healthcare associated infections and overall cost. The prudent use of antimicrobials in order to minimise the emergence of resistance has also been emphasised by the House of Lords and Department of Health (1998).[1]

The Chief Medical Officer in his report "Winning Ways" (December 2003)[2] has set out a clear direction on the actions required to reduce the level of healthcare associated infections and to curb the proliferation of antimicrobial-resistant organisms. Furthermore, antimicrobial usage has also been addressed in some of the domains of the Saving Lives Toolkit[3] and more recently the Infection Control Code of Practice (September 2006)[4] has set standards for appropriate antimicrobial prescribing.

ANTIMICROBIAL RESISTANCE- (The Path of Least Resistance)

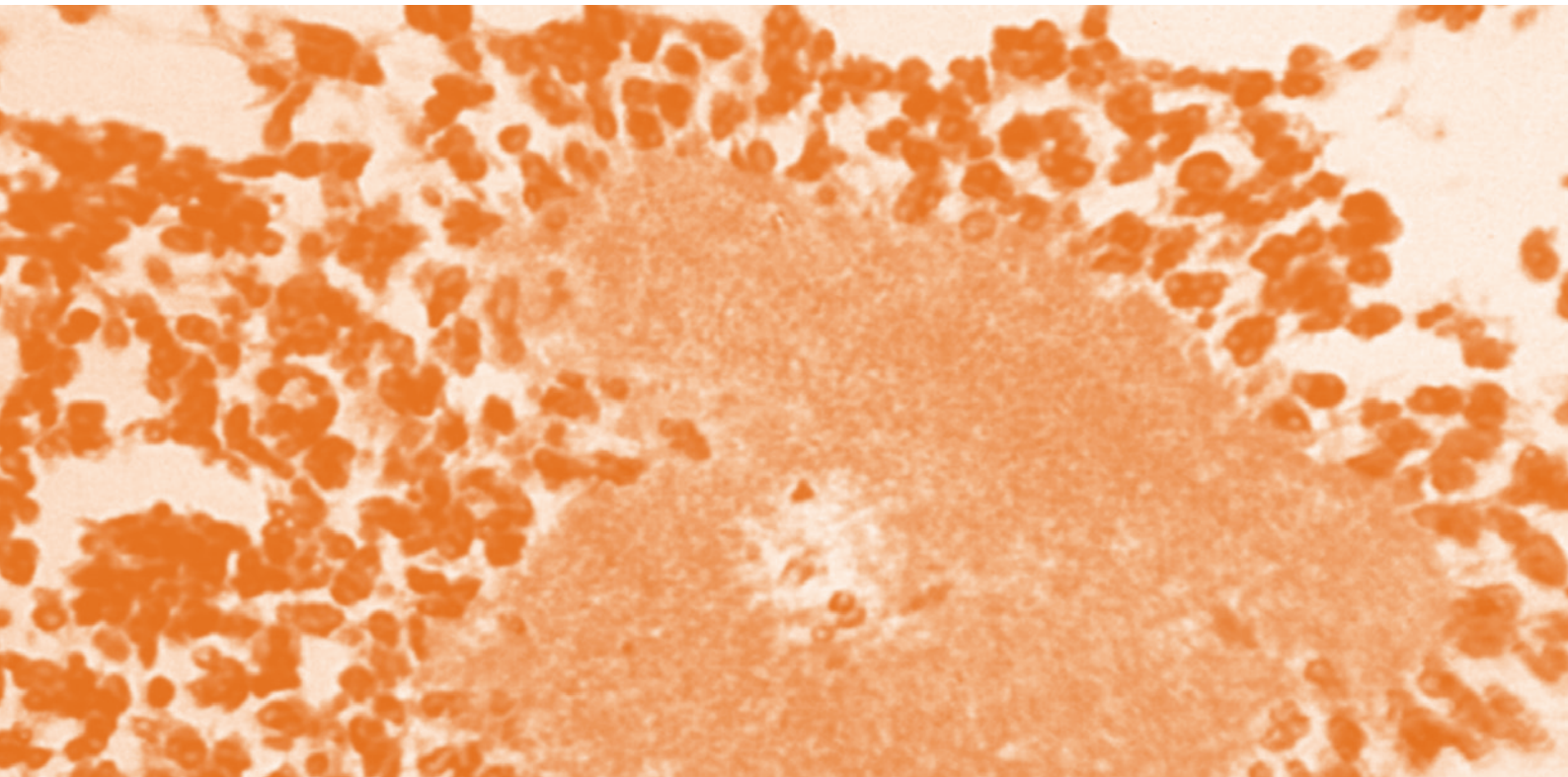
There is a growing national and international concern about the increasing resistance of micro-organisms to antimicrobial agents (House of Lords Select Committee on Science and Technology, Standing Medical Advisory Committee 1998).[5] This resistance is an inevitable consequence of antimicrobial use by Darwinian selection pressure. Resistance makes infections more difficult, and often more expensive to treat and may increase complications and length of hospital stay. The Chief Medical Officer has highlighted the importance of prudent use of antimicrobials, i.e. appropriate choice, dose and duration of antimicrobial therapy in his report "Winning Ways" (December 2003).[2]

In general, the more broad-spectrum antimicrobials are more likely to be associated with the emergence of resistance, furthermore some of the less broad-spectrum antimicrobials such as ciprofloxacin can select for emergence of MRSA.

ANTIMICROBIAL ASSOCIATED DIARRHOEA

Antimicrobial usage particularly the more broad-spectrum ones may lead to diarrhoea and *Clostridium difficile* colitis.

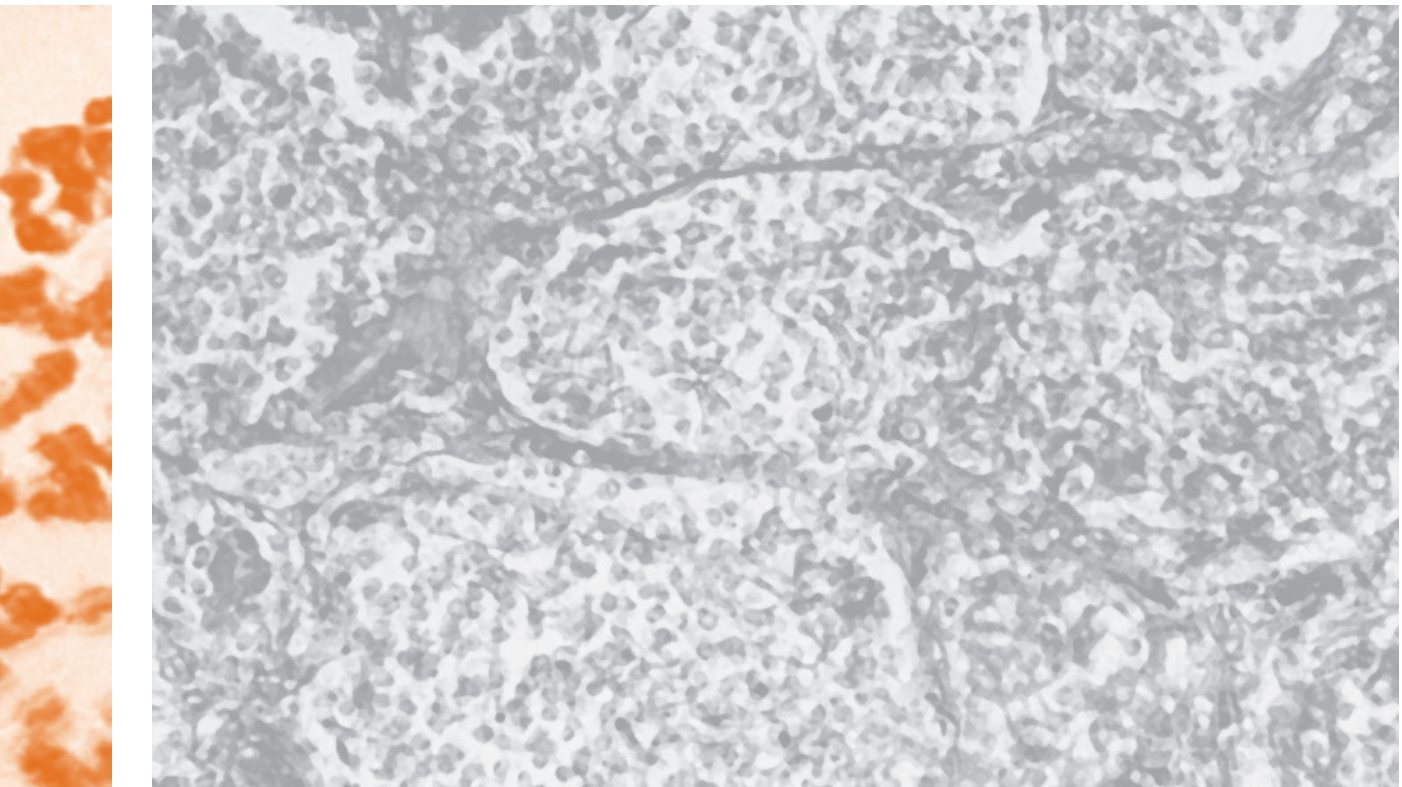
The aim of both hospitals is therefore not to use the more broad-spectrum antimicrobials such as cephalosporins – ceftriaxone/cefotaxime and carbepenems and minimise the use of cefuroxime particularly in Elderly patients.



PRINCIPLES OF ANTIMICROBIAL PRESCRIBING

Before prescribing antimicrobials, consider TEN fundamental questions:

1. **Is the patient infected with a bacterial agent?**
2. **Are empirical antimicrobials necessary?**
3. **Have you checked for antimicrobial allergies and their nature?**
4. **How can we make a microbiological diagnosis? Have the relevant specimens been obtained? (See user guide for more details).**
5. **Have you checked for any previous microbiology results?**
6. **Check for history of MRSA / ESBL /other resistant organisms and Clostridium difficile diarrhoea**
7. **What is the most appropriate antimicrobial therapy and how should it be given?**
8. **How can we monitor therapy?**
9. **What is the duration of antimicrobial therapy?**
10. **Are there any infection control/notification issues?**



ESSENTIAL FACTS

- Encourage oral antimicrobials whenever possible.
- Use IV antimicrobials only in serious infections or when patients are unable to take oral medication.
- After **24-48** hrs of IV therapy review the patient and consider switching to oral medication.
- Generally a total of **5 days** of antimicrobial therapy should suffice for uncomplicated infections.
- **Review antimicrobials** and clinical progress on a daily basis in the light of current microbiology results.
- Once the aetiological agent is identified, **switch** the broad spectrum therapy to a targeted narrow spectrum agent.

PRESCRIBING ON THE DRUG CHART

- Check for genuine allergy
- Check for MRSA status, ESBL producing and other resistant organisms and history of *Clostridium difficile* diarrhoea
- Document
  - INDICATION
  - The CODE for Restricted Antimicrobials in the section 'Additional Instructions'
- Clearly document DOSE, ROUTE and DURATION of therapy.

ADHERENCE TO THE POLICY

This will be monitored on a daily basis on the wards and as a rolling programme of audits by the directorates, microbiology and the pharmacy departments, as recommended by Infection Control Code of Practice [4], 'Saving Lives' [6] and 'start smart' [7]

ADVICE

Advice can always be obtained from the Department of Medical Microbiology. There is a 24 hour and 7 day service, both technical and clinical, available for the investigation, treatment, and prevention of infections. Pharmacists may be contacted for dosage, therapeutic drug monitoring and medicines information.

Before contacting for advice:
- Assess the patient
- Know the admitting diagnosis
- Read the most recent progress notes and assessment from the prior shifts
- Have appropriate documents available eg Nursing and Medical Records, PAR (Patient at risk), Charts, Allergies, IV fluids, Resuscitation status

and communicate using the SBAR Reporting Tool.

SBAR Reporting Tool

Source: Springfield hospital, Springfield, Vermont

Situation

- State your name and unit/ward
- I am calling about patient's name and age
- The reason I am calling is…

Background

- State the admission diagnosis/working diagnosis and date of admission
- Relevant medical history including family history; underlying condition/ co morbidities
- A brief summary of treatment to date; current antimicrobial therapy and duration; recent antimicrobial use (within the last month if possible)
- History of MRSA/ ESBL/ other resistant organisms/ C.difficile diarrhoea
- Previous microbiology results
- Infective markers

Assessment

State your assessment of the patient
- Allergies
- Renal function
- Hepatic function

Recommendations/Actions

- I would like (state what you would like to see done)
- Determine timescale
- Is there anything else I should do?
- Record name and phone or bleep number of contact
- Patient concerns, expectations and wishes

Don't forget to document the call!

Antimicrobial use and restrictions

Please contact Consultant Microbiologist when considering Red and Yellow antimicrobials.

Antimicrobials		Permitted Indications
Amikacin	iv	
Amoxicillin	oral iv	
Amphotericin	iv	Prescribe by brand name AmBisome®
Azithromycin	oral	Legionella, Chlamydia
Aztreonam	iv	Hospital acquired sepsis in adults with none life threatening penicillin allergy.
Benzylpenicillin	iv	
Caspofungin	iv	
Cefalexin	oral	Obstetrics, UTI in pregnancy
Cefotaxime	iv	Meningitis in children. Brain abscess.
Ceftazidime	iv	
Ceftriaxone	iv im	Meningitis, pneumococcal and meningococcal sepsis GUM
Cefuroxime	iv	Adults younger than 75 years old with non life threatening penicillin allergy. Pyelonephritis in pregnancy.
Chloramphenicol	oral iv	
Ciprofloxacin	oral iv	Epididymo-orchitis, necrotising fasciitis, prostatitis and pyelonephritis. GUM, obstetrics and gynaecology and surgical prophylaxis as per antimicrobial policy. Prophylaxis meningococcal contacts and patients with cirrhosis
Clarithromycin	oral iv	
Clindamycin	oral iv	GUM
Co-amoxiclav	oral iv	Oral equivalent to i/v cefuroxime
Co-trimoxazole	oral iv	Pneumocystis pneumonia (treatment, prophylaxis)
Doxycycline	oral	
Ertapenem	iv	
Erythromycin	oral iv	
Ethambutol	oral	TB
Flucloxacillin	oral iv	
Fluconazole	oral iv	
Fosfomycin	oral	Only after discussion with microbiology
Fusidic acid susp. Sodium fusidate tab.	oral oral	Osteomyelitis. Must always be used with another antibiotic
Gentamicin	iv	
Isoniazid	oral	TB treatment and prophylaxis
Levofloxacin	oral	For Weston Park patients only
Linezolid	oral iv	
Meropenem	iv	
Metronidazole	oral	
Nitrofurantoin	oral	
Norfloxacin		SBP prophylaxis
Ofloxacin	oral	Pelvic Inflammatory disease
Penicillin V	oral	
Piperacillin/ tazobactam	iv	If no improvement with co-amoxiclav, hospital acquired pneumonia
Pyrazinamide	oral	TB
Rifampicin	oral	TB, prophylaxis meningococcal contacts. Always use with another antimicrobial except when used as prophylaxis for meningococcal contacts.
Rifampicin	iv	
Teicoplanin	iv	MRSA infections, surgical prophylaxis
Temocillin	iv	Only after discussion with microbiology
Tigecycline	iv	
Tobramycin	iv nebulised	
Trimethoprim	oral	
Vancomycin	oral	C difficile diarrhoea
Vancomycin	iv	Surgical prophylaxis for MRSA
Voriconazole	iv	

Red - CODE required at all times, unless for permitted indications.

Yellow – CODE required within 48 hours

Green - Prescribing permitted according to the Antimicrobial Policy

Documentation:

Health care record
Document microbiologist advice
- The CODE
- Review or stop date

Medicines Chart
Antimicrobial, route, dose, dose times plus
- The CODE
- Indication
- Review or stop date

GUIDELINE FOR THE APPROPRIATE USE OF INTRAVENOUS AND ORAL ANTIMICROBIALS FOR ADULTS

Most patients DO NOT require i/v antibiotics. The majority of those who do will only need for 24-48 hours

INDICATIONS FOR IV ANTIBIOTICS

If sepsis is suspected refer to Sepsis Six checklist on page 74

1. **Sepsis (2 or more of the following)**
   - temperature >38° C or <36° C
   - heart rate >90 beats/min
   - respiratory rate >20 breaths/min
   - WCC >12 x 10^9/L or <4 x 10^9/L
   - CURB65 score 3–5
2. **Febrile with neutropenia (WCC <1.0 x 10^9/L)**
3. **Specific indications which require high dose i/v therapy**
   e.g. endocarditis, septic arthritis, osteomyelitis, meningitis, necrotising fasciitis, disease specific scoring system
4. **Positive blood cultures in the past 24 hours**
5. **Oral route compromised**
   e.g. - unconscious
   - vomiting
   - nil by mouth
   - reduced absorption (diarrhoea or steatorrhoea)
   - mechanical swallowing disorder
6. **No oral formulation available**

Have the indications for commencing or continuing i/v antibiotics been met? (review daily)

YES

Start or Continue with i/v antimicrobial

- Continue to monitor closely
- Review need for i/v therapy again after 24 hours

Refer to Policy or discuss with microbiologist If necessary

NO

Start or Consider switch to the appropriate ORAL antimicrobial/dose

Continue to monitor patient's progress following change to oral therapy

Standard TOTAL duration i/v+oral (days)

Infective exac. of COPD	5 - 7
Pneumonia, uncomplicated	5
Pneumonia, severe	7 - 10
UTI, uncomplicated	3
Pyelonephritis	14
Cellulitis	10-14

ANTIMICROBIALS

Intravenous →	**Oral** (specify duration on Medicines Chart)
Amoxicillin	500 mg – 1g tds
Benzylpenicillin	Amoxicillin 500mg - 1g tds
Clarithromycin	500 mg bd
Co-amoxiclav	625 mg tds
Flucloxacillin	500 mg – 2 g qds
Meropenem	Discuss with microbiologist
Metronidazole	400 mg tds
Piperacillin/tazobactam	Discuss with microbiologist
Teicoplanin	Discuss with microbiologist
Vancomycin	Discuss with microbiologist

START SMART GUIDANCE [7]

Antimicrobial stewardship

Right drug, Right dose, Right time, Right duration...
Every patient

START SMART

- Take history of relevant allergies
- Initiate prompt effective antibiotic treatment within one hour of diagnosis (or as soon as possible) in patients with life threatening infections
- Comply with local prescribing guidance
- Document clinical indication and dose on drug chart and in clinical notes
- Include review/stop date or duration
- Ensure relevant microbiological specimenstaken

Then focus

Clinical review and decision# at 48 hours

Clinical review, check microbiology, make and document decision#

1. STOP

2. I/V oral switch

3. Change: to narrow spectrum agent

4. continue and review again after a further 24 hours

5. OPAT*

Document decision

Antimicrobial Prescribing Decision

*Outpatient Parenteral Therapy

RESPIRATORY TRACT INFECTIONS - Community-acquired

IMPORTANT Before prescribing antimicrobials

- **History of MRSA/ ESBL/ *Clostridium difficile*** – contact Microbiologist
- Check for previous microbiology results
- Treatment duration (i/v or oral) 5 days unless specified
- **Sepsis** – start antibiotics within an hour of diagnosis. Prescribe in STAT section of drug chart
  Refer to Sepsis Six checklist on page 74

Take appropriate samples

- Sputum in all cases if possible
- Blood culture in severe pneumonia
- Urine Legionella and pneumococcal antigen in moderate to severe infection

INFECTION	ORGANISMS	ANTIMICROBIALS	COMMENTS
Acute bronchitis or infective exacerbation of chronic obstructive pulmonary disease ↑ dyspnoea ↑ purulence ↑ sputum volume [13]	Viruses (80%) Streptococcus pneumoniae *Haemophilus influenzae* *Moraxella catarrhalis*	**Doxycycline oral** 200 mg 1st dose then 100 - 200 mg od for 5 days If failed on doxycycline therapy **Amoxicillin oral** 500 mg – 1 g tds	Tetracycline allergy or contraindicated: Amoxicillin oral 500 mg tds for 5 days To review on day 5 - longer treatment may be required in some cases until sputum becomes mucoid for at least 24 hours If unsure seek advice from Microbiologist
Pneumonia [14] Assess severity*	*Streptococcus pneumoniae* *Mycoplasma pneumoniae*		Review microbiology Send acute and convalescent sera for atypical serology
Low severity CURB65 score 0-1	*Haemophilus influenzae* *Chlamydia sp.* *Legionella sp.*	**Amoxicillin oral** 500 mg – 1 g tds for 5 days If treated with Amoxicillin prior to admission **Clarithromycin oral** 500 mg bd for 5 days	P Penicillin allergy: Doxycycline oral 200mg stat then 100- 200mg od or Clarithromycin oral or i/v 500 mg bd
Moderate severity CURB65 score 2		Start antibiotics immediately **Amoxicillin oral** 500 mg – 1 g tds plus **Clarithromycin oral** 500 mg bd Give i/v if needed	Send blood cultures and sputum P Penicillin allergy: Omit amoxicillin Total duration 5 days
High severity CURB65 score 3-5 ***CURB65 score** 1 point for each Confusion Urea >7 mmol/L Respiratory rate ≥ 30 /min Blood pressure: Systolic < 90 mmHg Diastolic ≤ 60 mmHg Age ≥ 65 years		**Start antibiotics immediately:** Strong evidence of pneumonia and no life-threatening infection, Gram-negative infection not suspected, no co-morbidities present and not living in long-term residential or nursing home **Benzylpenicillin i/v** 1.2g qds plus **Clarithromycin i/v** 500mg bd No strong evidence of pneumonia and other diagnoses possible. Life-threatening infection, Gram-negative infection suspected, co-morbidities present and living in long-term residential or nursing home **Co-amoxiclav i/v** 1.2g tds plus **Clarithromycin i/v** 500mg bd	P Penicillin allergy Non-life threatening and less than 75 years old Cefuroxime i/v 1.5 g tds plus Clarithromycin i/v 500 mg bd Life threatening and older than 75 years old Discuss with microbiologist Total duration 7-10 days **Pneumonia** continued overleaf

RESPIRATORY TRACT INFECTIONS - Community-acquired

IMPORTANT Before prescribing antimicrobials

- **History of MRSA/ ESBL/ *Clostridium difficile*** – contact Microbiologist
- Check for previous microbiology results
- Treatment duration (i/v or oral) 5 days unless specified
- **Sepsis** – start antibiotics within an hour of diagnosis. Prescribe in STAT section of drug chart
  Refer to Sepsis Six checklist on page 74

Take appropriate samples

- Sputum in all cases if possible
- Blood culture in severe pneumonia

INFECTION	ORGANISMS	ANTIMICROBIALS	COMMENTS
Pneumonia, continued	Confirmed *Streptococcus pneumoniae*	**Benzylpenicillin i/v** 1.2 g qds	P Penicillin allergy: discuss with Microbiologist
	Confirmed MRSA	**Teicoplanin i/v** 400 mg 12 hourly for 3 doses followed by 400 mg od addition of sodium fusidate or rifampicin may be advised by microbiologist	Duration: as advised by Microbiologist
Primary Atypical Pneumonia [14]	*Mycoplasma pneumoniae* *Chlamydia pneumoniae*	**Clarithromycin oral** 500 mg bd i/v If severe vomiting	Take appropriate samples, including samples for serology and urine antigen for *Legionella* In case of complications contact Microbiologist
	Chlamydia psittaci/***	**Doxycycline oral** 200 mg first dose then 100 mg bd for 14 days	*Infection control procedures should be undertaken **Locally notifiable disease
	*Coxiella burnetti***	Tetracycline is the drug of choice. Seek advice from Consultant Microbiologist	
	*Legionella pneumophila***	**Clarithromycin i/v** 500 mg bd Rifampicin or Ciprofloxacin may need to be added in severe cases Discuss with microbiologist	Change to Azithromycin oral 500 mg od when appropriate. Duration 10 days or up to 2-3 weeks in severe cases If not responding, contact Microbiologist
Post-Influenza / Staphylococcus aureus Pneumonia [10]	Confirmed *Staphylococcus aureus*	**Flucloxacillin i/v** 1 g qds plus **Sodium fusidate oral** Tablets 500 mg tds (=Suspension Fusidic acid 750 mg tds) Total duration 2-3 weeks	P Penicillin allergy: discuss with Microbiologist Sodium fusidate • NEVER USE ON ITS OWN • Seek Microbiologists advice if oral not possible • Monitor LFTs twice weekly
Bronchiectasis	*Haemophilus influenzae* *Staphylococcus aureus* *Pseudomonas spp*	Depends on organism isolated	Seek advice from Microbiologist High dose antibiotics required to achieve effective concentrations in sputum

RESPIRATORY TRACT INFECTIONS - Hospital-acquired pneumonia

IMPORTANT Before prescribing antimicrobials

- **History of MRSA/ ESBL/ *Clostridium difficile*** – contact Microbiologist
- Check for previous microbiology results
- Treatment duration (i/v or oral) 5 days unless specified
- **Sepsis** – start antibiotics within an hour of diagnosis. Prescribe in STAT section of drug chart
  Refer to Sepsis Six checklist on page 74

Take appropriate samples

- Sputum in all cases if possible
- Blood cultures

Hospital acquired Pneumonia:
Definition – Pneumonia occurring > 48 hr after admission and excluding any infection that is incubating at the time of admission.
Diagnosis of HAP is difficult. Following Criteria will help in identifying patients in whom pneumonia should be considered.

1. Purulent sputum
2. Increased oxygen requirement
3. Temperature
4. WCC >10 x 10^9/L or <4 x 10^9/L
5. New or persistent infiltrate on chest x-ray, which is otherwise unexplained

Presence of 3 or more criteria indicates high probability of pneumonia and antibiotic therapy is indicated in these patients.

INFECTION	ORGANISMS	ANTIMICROBIALS	COMMENTS
Hospital acquired Pneumonia			P Penicillin allergy: discuss with Microbiologist
Early onset (<5 days after admission) **No** previous antibiotic therapy and no risk factors	*Streptococcus pneumoniae* *Haemophilus influenzae* *Staphylococcus aureus*	**Co-amoxiclav i/v** 1.2 g tds	
Early onset (<5 days after admission) **With** previous antibiotic therapy and risk factors	In addition to above organisms *E.Coli, Klebsiella* *Acinetobacter* *Pseudomonas* MRSA	**Piperacillin/tazobactam i/v** 4.5 g tds Add if MRSA positive **Teicoplanin i/v** 400 mg 12 hourly for 3 doses then 400 mg once daily	
Late onset (>5 days after admission)	*E.Coli, Klebsiella* *Acinetobacter* *Pseudomonas* MRSA	**Piperacillin/tazobactam i/v** 4.5 g tds Add if MRSA positive **Teicoplanin i/v** 400 mg 12 hourly for 3 doses then 400 mg once daily	If previous sample positive tailor the antibiotics according to the sensitivity.

INFECTION	ORGANISMS	ANTIMICROBIALS	COMMENTS
Aspiration Pneumonia	Wide range of organisms including anaerobes	If no previous hospital admission **Amoxicillin i/v** 500 mg tds plus **Metronidazole i/v** 500 mg tds If previous hospital admission or hospital acquired **Co-amoxiclav i/v** 1.2 g tds	P Penicillin allergy: Seek advice Review in the light of cultures Change to oral at 48 hours Total duration 5 days

RESPIRATORY TRACT INFECTIONS - Mycobacterial

INFECTION	ORGANISMS	ANTIMICROBIALS	COMMENTS
Tuberculosis [15]	*Mycobacterium tuberculosis* *Mycobacterium bovis* *Mycobacterium africanum*	Doses based on patient weight First 2 months of quadruple therapy **Rifater® oral** (combination of isoniazid, rifampicin and pyrazinamide) plus **Ethambutol oral** Followed by 4 months of double therapy **Rifinah® oral** (combination of isoniazid and rifampicin)	**Please refer to TB policy** **Infection control risk – for appropriate isolation and infection control precautions** Refer to Consultant Chest Physician and Infection Control Team Notify Public Health Doctor
Atypical Mycobacterial Infection	*Mycobacterium avium intracellulare* *Mycobacterium kansasii* *Mycobacterium malmoense etc.*	Consult Microbiology for susceptibility details	Seek advice from Consultant Microbiologist and Chest Physician No need for isolation or notification

URINARY TRACT INFECTIONS [9, 10, 16]

IMPORTANT Before prescribing antimicrobials

- **History of MRSA/ ESBL/ *Clostridium difficile*** – contact Microbiologist
- Check for previous microbiology results
- **Sepsis** – start antibiotics within an hour of diagnosis. Prescribe in STAT section of drug chart Refer to Sepsis Six checklist on page 74

Take appropriate samples
- MSU for culture and sensitivities

Lower UTI

INFECTION	ORGANISMS	ANTIMICROBIALS	COMMENTS
Women (non pregnant) Simple cystitis (No fever, no loin pain)	*E coli* *Klebsiella sp.* *Proteus sp.* Enterococci MRSA	1st line ***Nitrofurantoin oral** 50 mg 6 hourly for 3 days 2nd line **Trimethoprim oral** 200 mg bd for 3 days	>90% of coliforms sensitive to nitrofurantoin. 70% sensitive to trimethoprim Send MSU for culture and sensitivities *Avoid in renal impairment (eGFR <60 mL/minute)
Men**	As above	**Antibiotics** as above Duration 7 days	****Investigate further for underlying pathology
Pregnancy	As above	**Cefalexin oral** 500 mg tds for 7 days	P Penicillin allergy: Seek advice from Microbiologist Review therapy according to culture and sensitivity

Upper UTI

Pyelonephritis Loin pain/fever	*E coli* and other Gram negative organisms predominantly	If less than 50 years of age **Ciprofloxacin oral** 500 mg bd i/v if needed 400 mg bd If older than 50 years old **Co-amoxiclav oral** 625mg tds or 1.2g i/v tds. If life threatening sepsis Consider adding single dose ****Gentamicin i/v** High Dose (Appendix A) and then review Total duration 10 – 14 days	**Pregnancy** **Cefuroxime i/v** 1.5g tds If penicillin allergy life threatening - discuss with microbiology *Gentamicin levels: (Appendix A) **Caution** **CIPROFLOXACIN ENCOURAGES THE EMERGENCE OF MRSA AND *C. difficile*** Seek advice from Microbiologist
Complicated UTI Renal calculi Urinary catheter Urological abnormality Recurrent UTI Surgery etc.	As above		
Prostatitis	As above	1st line **Ciprofloxacin oral** 500 mg bd for 4 weeks (i/v 200 – 400 mg bd if needed) 2nd line **Trimethoprim oral** 200mg bd	Seek advice from Consultant Microbiologist and Urologist Refer to Urologist for advice on specimen collection **Caution** **CIPROFLOXACIN ENCOURAGES THE EMERGENCE OF MRSA AND *C. difficile*** Seek advice from Microbiologist
Epididymo-orchitis if UTI suspected		**Ciprofloxacin oral** 500 mg bd 10 days Refer to page 35	

SEPTICAEMIA

- It is important to establish the primary source of septicaemia in order to shed light on the most probable organisms and the underlying pathology.
- Blood culture should be taken BEFORE commencing antimicrobial therapy.
- **Sepsis – start antibiotics within an hour of diagnosis. Prescribe in STAT section of drug chart and inform nursing staff**
  Refer to Sepsis Six checklist on page 74

IMPORTANT Before prescribing antimicrobials	
• **History of MRSA/ ESBL/ *C.difficile*** – contact Microbiologist • Check for previous microbiology results • Normally treatment duration (iv or oral) 5 days unless specified	**Take appropriate samples** • Blood cultures • Urine • Sputum

Community-acquired

INFECTION	ORGANISMS	ANTIMICROBIALS	COMMENTS
Source unknown	Empirical	***Co-amoxiclav i/v** 1.2 g tds If severe add **Metronidazole i/v** 500 mg tds If life threatening sepsis Consider adding single dose ****Gentamicin i/v** High Dose (Appendix A) and then review If MRSA or line infection add **Teicoplanin i/v** 400 mg 12 hourly for 3 doses then once daily	Take appropriate samples P Penicillin allergy: Non-life threatening: **Cefuroxime i/v** 1.5 g tds Life threatening and Elderly: Contact microbiologist ***If Co-amoxiclav used in the past 4 weeks** **Piperacillin/tazobactam i/v 4.5 g tds** **Gentamicin levels: (Appendix A) UTI is the commonest cause

Hospital-acquired

INFECTION	ORGANISMS	ANTIMICROBIALS	COMMENTS
Source unknown	Wide range of hospital organisms	**Piperacillin–tazobactam i/v** 4.5 g tds If life threatening sepsis Consider adding single dose ****Gentamicin i/v** High Dose (Appendix A) and then review If MRSA or line infection add **Teicoplanin i/v** 400 mg 12 hourly for 3 doses then once daily	P Penicillin allergy: Non-life threatening: **Teicoplanin i/v** 400 mg 12 hourly for 3 doses then once daily plus **Aztreonam i/v** 1-2g tds Life threatening allergy or If previously grown resistant organism (ESBL, AmpC) contact microbiologist *Gentamicin levels: (Appendix A)

INFECTIVE ENDOCARDITIS – Empirical (Organism not known) [17]

- Discuss treatment with Consultant Cardiologist and Microbiologist

IMPORTANT
Before prescribing antimicrobials

- **History of MRSA/ ESBL/ *C.difficile*** – contact Microbiologist
- Check for previous microbiology results
- Modify as soon as culture and sensitivities are available

Take appropriate samples
THREE sets of blood cultures from different sites and at different times PRIOR to antimicrobial therapy

IMPORTANT
Therapeutic drug monitoring

Gentamicin & Vancomycin

- Renal impairment – discuss with Microbiologist
- Monitor blood levels (Appendices B & F)
- Monitor renal function 3 times a week
- Review treatment every 3 days
- Discuss duration with Microbiologist
- Inform patient of potential side effects (hearing, balance and renal impairment)

INFECTION	ORGANISMS	ANTIMICROBIALS	COMMENTS
Native valve **Acute presentation**	Empirical	**Flucloxacillin i/v** 2g 4-6 hourly (i.e. 8 to 12g daily) Use 4 hourly regimen if weight is greater than 85kg plus ***Gentamicin i/v** 80 mg 12 hourly	Treatment should be started as soon as blood cultures are collected for acute presentation P Penicillin allergy: see below Modify according to culture and sensitivities. If negative contact Consultant Cardiologist and Microbiologist *Gentamicin levels: Pre dose (trough): <1mg/L 1 hour Post dose (peak): 3 – 5 mg/L (i.e. not the usual therapeutic levels) **Vancomycin levels: (Appendix F) Pre dose (trough): 15 – 20 mg/L
Native valve **Indolent (Subacute) presentation**	Empirical	**Amoxicillin i/v** 2g 4 hourly A second agent may be required please discuss with microbiology. If not acutely septic antimicrobial therapy maybe withheld until culture results are known.	
Native valve **Acute presentation with risk factors for multiresistant Enterobacteriace** **or** **Pseudomonas**	Empirical	**Vancomycin i/v** 1g 12 hourly plus **Meropenem i/v** 2g 8 hourly	
P **Penicillin allergy** or **Intra-cardiac prosthesis** or **Suspected MRSA**	Empirical	****Vancomycin i/v** 1g 12 hourly plus **Rifampicin oral** 300-600 mg 12 hourly use lower dose if creatinine clearance is less than 30mL/min plus ***Gentamicin i/v** 80 mg 12 hourly	

ENDOCARDITIS – Targeted (Organism known) [17]

Discuss treatment with Consultant Cardiologist and Microbiologist

IMPORTANT
Before prescribing antimicrobials

- **History of MRSA/ ESBL/ *C.difficile*** – contact Microbiologist
- Treatment duration depends on the organism and patient factors. Must be discussed with Microbiologist/Cardiologist

Take appropriate samples
THREE sets of blood cultures from different sites and at different times PRIOR to antimicrobial therapy

IMPORTANT
Therapeutic drug monitoring

Gentamicin & Vancomycin

- Renal impairment – discuss with Microbiologist
- Monitor blood levels (Appendices B & F)
- Monitor renal function 3 times a week
- Review treatment every 3 days
- Inform patient of potential side effects (hearing, balance and renal impairment)
- Discuss with Microbiologist before continuing for longer than 2 weeks

INFECTION	ORGANISMS	ANTIMICROBIALS	COMMENTS
Native valve endocarditis *Streptococcal Endocarditis* *Streptococci* fully sensitive to Penicillin.	*Viridans Streptococci* *Streptococcus bovis*	Commence with **Benzylpenicillin i/v** 1.8 g 4 hourly (six times a day) plus ***Gentamicin i/v** 80 mg 12 hourly **2 weeks duration may suffice** If Gentamicin inappropriate **Benzylpenicillin i/v** 1.8 g 4 hourly for 4-6 weeks	P Penicillin allergy: Consult Microbiologist *In patients with renal impairment antibiotic dose needs to be modified *Gentamicin levels Pre dose (trough): <1mg/L 1 hr Post dose (peak): 3 – 5 mg/L i.e. not the usual therapeutic levels
Streptococci with reduced sensitivity to Penicillin		Commence with **Benzylpenicillin i/v** 2.4 g 4 hourly (six times a day) plus ***Gentamicin i/v** 80 mg 12 hourly **Duration 4-6 weeks**	**Duration may vary with the clinical course of the disease** **Discuss with Microbiologist**
Enterococcal endocarditis	Gentamicin-sensitive or low level resistant Enterococci	**Amoxicillin i/v** 2 g 4 hourly (six times a day) plus ***Gentamicin i/v** 80 mg 12 hourly **Duration 4-6 weeks**	P Penicillin allergy: Consult Microbiologist *Dose should be adjusted according to the renal function *Gentamicin levels: Pre dose (trough): <1mg/L 1 hour Post dose (peak): 3 – 5 mg/L i.e. not the usual therapeutic levels).
	Gentamicin-resistant Enterococci	**Amoxicillin i/v** 2 g 4 hourly (six times a day) Monotherapy 8-12 weeks **Streptomycin i/m** Added if strain is sensitive 7.5 mg/kg once daily Dual therapy 6 weeks	Streptomycin levels: Seek advice from Microbiology

ENDOCARDITIS – Treatment of known organisms (Continued) [17]

Discuss treatment with Consultant Cardiologist and Microbiologist

IMPORTANT
Before prescribing antimicrobials

- **History of MRSA/ ESBL/ C.difficile** – contact Microbiologist
- Check for previous microbiology results
- Treatment duration depends on the organism and patient factors. Must be discussed with Microbiologist/Cardiologist

Take appropriate samples
THREE sets of blood cultures from different sites and at different times PRIOR to antimicrobial therapy

IMPORTANT
Therapeutic drug monitoring

Gentamicin & Vancomycin

- Renal impairment – discuss with Microbiologist
- Monitor blood levels (Appendices B & F)
- Monitor renal function 3 times a week
- Review treatment every 3 days
- Inform patient of potential side effects (hearing, balance and renal impairment)
- Discuss with Microbiologist before continuing for longer than 2 weeks

INFECTION	ORGANISMS	ANTIMICROBIALS	COMMENTS
Native Valve ***Staphylococcus aureus*** **endocarditis**	*Staphylococcus aureus*	**Flucloxacillin i/v** 2 g every 4- 6 hours for 4-6 weeks use 4 hourly regime if weight is greater than 85kg	Discuss with Microbiologist for additional antimicrobials P Penicillin allergy: see below
P **Penicillin allergy** or **MRSA endocarditis**	MRSA	***Vancomycin i/v** 1 g 12 hourly plus **Rifampicin oral** 300-600 mg bd use lower dose if creatinine clearance is less than 30mL/min Duration at least 6 weeks -consult Microbiologist	*Vancomycin dose needs to be adjusted according to the renal function Discuss with Microbiologist *Vancomycin levels: Pre dose (trough) 15–20 mg/L (Appendix F)
Intracardiac prosthesis ***Staphylococcus aureus*** **endocarditis**	*Staphylococcus aureus*	**Flucloxacillin i/v** 2 g every 4- 6 hours for plus **Rifampicin oral** 300-600 mg 12 hourly plus ***Gentamicin i/v** 80 mg 12 hourly Duration 6 weeks - consult Microbiologist	Discuss with Consultant Cardiologist and Microbiologist *Gentamicin levels: Pre dose (trough): <1mg/L 1 hour Post dose (peak): 3 – 5 mg/L i.e. not the usual therapeutic levels).
Intracardiac prosthesis P **Penicillin allergy** or **MRSA endocarditis**	MRSA	****Vancomycin i/v** 1g 12 hourly plus **Rifampicin oral** 300-600 mg 12 hourly plus ***Gentamicin i/v** 80 mg 12 hourly Duration 6 weeks - consult Microbiologist	**Duration may vary with the clinical course of the disease Discuss with Microbiologist** **Flucloxacillin i/v** use 4 hourly regime if weight is greater than 85kg **Rifampicin oral** use lower dose if creatinine clearance is less than 30mL/min

ENDOCARDITIS – Treatment of known organisms (Continued) [17]

Discuss treatment with Consultant Cardiologist and Microbiologist

IMPORTANT
Before prescribing antimicrobials

- **History of MRSA/ ESBL/ C.difficile** – contact Microbiologist
- Check for previous microbiology results
- Treatment duration depends on the organism and patient factors. Must be discussed with Microbiologist/Cardiologist

Take appropriate samples
THREE sets of blood cultures from different sites and at different times PRIOR to antimicrobial therapy

IMPORTANT
Therapeutic drug monitoring

Gentamicin & Vancomycin

- Renal impairment – discuss with Microbiologist
- Monitor blood levels (Appendices B & F)
- Monitor renal function 3 times a week
- Review treatment every 3 days
- Inform patient of potential side effects (hearing, balance and renal impairment)
- Discuss with Microbiologist before continuing for longer than 2 weeks

INFECTION	ORGANISMS	ANTIMICROBIALS	COMMENTS
Endocarditis due to other organisms	*Coagulase negative staphylococci* HACEK organisms Aerobic Gram negative organisms Fungi etc.	Treatment depends upon susceptibility	Seek advice from Microbiologist
Gram negative organisms	E. coli Klebsiella Gram negative bacilli	**Cefotaxime i/v** 1g tds plus ***Gentamicin i/v** 80 mg 12 hourly	Discuss with Consultant Cardiologist and Microbiologist *Gentamicin levels: Pre dose (trough): <1mg/L 1 hour Post dose (peak): 3 – 5 mg/L i.e. not the usual therapeutic levels). **Duration may vary with the clinical course of the disease Discuss with Microbiologist**
HACEK organisms	Haemophilus species, Actinobacillus actinomycete-mcomitans, Cardiobacterium hominis, Eikenella corrodens Kingella species	**Ceftriaxone i/v** 2 g od or **Cefotaxime i/v** 1g tds plus ***Gentamicin i/v** 80 mg 12 hourly	

CENTRAL NERVOUS SYSTEM INFECTIONS [10]

IMPORTANT Before prescribing antimicrobials

- **History of MRSA/ ESBL/ *Clostridium difficile*** – contact Microbiologist
- Check for previous microbiology results

Take appropriate samples

- Blood cultures
- CSF
- Throat swabs for virolology and bacteriology
- EDTA blood for PCR
- Stool for enteroviruses

INFECTION	ORGANISMS	ANTIMICROBIALS	COMMENTS
Bacterial meningitis **Steroid use in Meningitis** Consider adjunctive treatment with dexamethasone (particularly if pneumococcal meningitis suspected in adults) preferably starting before or with first dose of antibacterial, but no later than 12 hours after starting antibacterial; avoid dexamethasone in septic shock, meningococcal septicaemia, or if immunocompromised, or in meningitis following surgery.* * British National Formulary No 63 accessed via medicines complete on 14/08/12	*Neisseria meningitidis* *Streptococcus pneumoniae* *Haemophilus influenzae type b*	Initially: **Ceftriaxone i/v** 2g bd *Immunocompromised or Elderly >65 years:* Consider *Listeria sp.*– add Amoxicillin. Duration: *Neisseria meningitidis* 7 days *Streptococcus pneumonia* 14 days *Haemophilus influenzae* 10 days	**Medical emergency** Start antibiotics immediately, then inform Microbiology and CCDC** for prophylaxis of close contacts in case of meningococcal and haemophilus infection *Please advise patients on avoiding risk in the future P Penicillin allergy: Life threatening: **chloramphenicol iv** 25mg/kg every 6 hours. Discuss with consultant microbiologist after 48 hours. Inform Hospital Infection Control Team *Gentamicin levels: (Appendix A) **CCDC – 09.00 - 17.00 Tel: 0114 2428 850 Out of hours via switchboard
	Confirmed *Listeria**	**Amoxicillin i/v** 2g 4 hourly for 3 weeks plus ***Gentamicin i/v** High dose (Appendix A) Review after 7 days – discuss with Microbiologist	
	All other organisms including *Mycobacterium tuberculosis*		Discuss with Consultant Microbiologist
Viral meningitis	Enteroviruses	Stop antimicrobials	Send stool and throat swabs for viral culture. Seek advice from Consultant Microbiologist PCR will confirm presence of enteroviruses
Encephalitis Signs of diffuse or focal neurological symptoms such as drowsiness seizures confusion	Commonest agent *Herpes simplex virus* (HSV) All bacterial agents causing meningitis, *Varicella zoster virus* (VZV), CMV, Toxoplasma and fungi	Empirically to start **Ceftriaxone i/v** 4g od plus **Aciclovir i/v** 10 mg/kg per dose every 8 hours for 14 to 21 days Add if immunocompromised or *Elderly* > 65 years **Amoxicillin i/v** 2 g 4 hourly	Discuss with Consultant Microbiologist PCR on the CSF will confirm HSV infection Do not switch to oral aciclovir
Brain abscess	Depends on source of abscess	Start with **Cefotaxime i/v** 2g qds plus **Metronidazole i/v** 500 mg tds	Discuss with Microbiologist Treatment modified according to the nature of organism and clinical manifestation

SKIN AND SOFT TISSUE INFECTIONS – Bacterial

IMPORTANT Before prescribing antimicrobials

- **History of MRSA/ ESBL/ *Clostridium difficile*** – contact Microbiologist
- Check for previous microbiology results
- Treatment duration (iv or oral) 5 days unless specified

Take appropriate samples

- Pus and aspirate when available
- Wound swabs
- Blood cultures

INFECTION	ORGANISMS	ANTIMICROBIALS	COMMENTS
Impetigo: **MILD Localised** [9]	*Staphylococcus aureus* Beta haemolytic (group A,C,G) Streptococci	Topical therapy may suffice **Hydrogen peroxide cream 1%** (Crystacide®) apply 2-3 times daily or **Polyfax® ointment** apply bd	Contact Microbiologist for further advice
Spreading		**Flucloxacillin oral** 500 mg qds	P Penicillin allergy: **Clarithromycin oral** or i/v 500 mg bd
SEVERE		**Flucloxacillin i/v** 1 g qds plus **Benzylpenicillin i/v** 1.2 g qds	P Penicillin allergy: Contact microbiologist Change to oral antibiotics (as for mild infection) after satisfactory clinical response Total duration 5 days
Erysipelas [9]	Beta haemolytic (group A,C,G) Streptococci	**Benzylpenicillin i/v** 1.2 g qds or For less severe infection **Amoxicillin oral** 500 mg tds Duration 7 days	Consider oral Amoxicillin following adequate clinical response P Penicillin allergy: **Clarithromycin oral** or i/v 500 mg bd
Cellulitis: **MILD** [9,10]	Beta haemolytic (group A,C,G) Streptococci *Staphylococcus aureus*	**Flucloxacillin oral** 500 mg qds	P Penicillin allergy: **Clarithromycin oral** 500 mg bd
MODERATE / SEVERE		**Benzylpenicillin i/v** 1.8 g qds plus **Flucloxacillin i/v** 1 g qds Review with microbiology results	**High dose i/v antimicrobials are necessary initially** P Penicillin allergy: Age less than 50 years: **Clindamycin i/v** 900mg qds Age greater than 50 years: **Teicoplanin i/v** 400mg 12 hourly for 3 doses then 600mg once daily
SEVERE **In high risk patients** eg Diabetics Immunocompromised	As above plus MRSA Infection or colonisation	**Piperacillin/ tazobactam i/v** 4.5 g tds plus **Teicoplanin i/v** 400 mg 12 hourly for 3 doses then once daily	Consider oral only after satisfactory response/ microbiology Review treatment after 5 days. Some patients may need a longer course eg 10-14 days

SKIN AND SOFT TISSUE INFECTIONS – Bacterial

IMPORTANT Before prescribing antimicrobials

- **History of MRSA/ ESBL/ *Clostridium difficile*** – contact Microbiologist
- Check for previous microbiology results
- Treatment duration (iv or oral) 5 days unless specified

Take appropriate samples

- Pus and aspirate when available
- Wound swabs
- Blood cultures

INFECTION	ORGANISMS	ANTIMICROBIALS	COMMENTS
Necrotising fasciitis or severe Group A Streptococcal cellulitis [10]	Type 1 Mixed organisms Type 2 Group A Streptococci	**Surgical Emergency** requiring frequent high dose antibiotics & debridement Commence (if renal function normal): **Benzylpenicillin i/v** 2.4 g 4 hourly plus **Clindamycin i/v** 1.2 g 6 hourly plus **Ciprofloxacin i/v** 400 mg bd Contact Microbiologist within 24 hours	Debridement: Seek urgent advice from General Surgeon P Penicillin allergy: Commence with **Clindamycin i/v** plus **Ciprofloxacin i/v** and seek microbiology advice immediately Infection control precautions and isolation should be followed
Leg ulcers	Wide range of organisms (usually polymicrobial) including Staphylococcus aureus Steptococci Anaerobes	**Co-amoxiclav i/v** 1.2g tds or oral 625mg tds may be used in the first instance. If MRSA suspected add **Teicoplanin i/v** 400 mg 12 hourly for 3 doses then once daily	Skin ulcers will usually be colonised by many organisms. Significance is established by clinical signs of infection ie spreading cellulitis, discharge or sepsis and type of organism. Contact Tissue Viability Team
Diabetic foot ulcer [19, 20]		See Pages 28-29	
Bites [9, 10] *Animal and human* Antibiotic prophylaxis advised for: puncture wound, bite involving hand, foot, face, joint, tendon, ligament; immunocompromised, diabetics, elderly and asplenic patients	Anaerobes Streptococci *Pasteurella multocida*	**Co-amoxiclav oral** 625 mg tds 7 days Penicillin allergy: **Clindamycin oral** 300 mg 6 hourly plus **Ciprofloxacin oral** 500 mg bd	Surgical toilet most important Assess tetanus and rabies risk **Caution CIPROFLOXACIN ENCOURAGES THE EMERGENCE OF MRSA**
	Human bite Mouth flora including HACEK organisms	As above	*For human bite* Assess HIV/hepatitis B & C risk Refer to Blood-Borne Policy for appropriate prophylaxis Antibiotic prophylaxis advised
Treatment of infection in inpatients		**Co-amoxiclav i/v** 1.2g tds	P Penicillin allergy: **Clindamycin i/v** 900mg qds plus **Ciprofloxacin oral** 500mg bd

SKIN AND SOFT TISSUE INFECTIONS – Wounds

IMPORTANT Before prescribing antimicrobials

- **History of MRSA/ ESBL/ *Clostridium difficile*** – contact Microbiologist
- Check for previous microbiology results
- Treatment duration (iv or oral) 5 days unless specified

Take appropriate samples

- Pus and aspirate when available
- Wound swabs
- Blood cultures

INFECTION	ORGANISMS	ANTIMICROBIALS	COMMENTS
Following clean surgery [9]	*Staphylococcus aureus* Streptococci	**Flucloxacillin i/v** 1- 2 g qds or **oral** 500mg to 1g In severe cases seek advice from Consultant Microbiologist Duration 5 days	Mild erythema does not require antimicrobials P Penicillin allergy: **Clarithromycin i/v** or oral 500 mg bd
	MRSA Less serious	**Doxycycline oral** 200 mg first dose then 100 mg bd for 5 days	Check for tetracycline sensitivity
	More serious or unable to take oral	**Teicoplanin i/v** 400 mg 12 hourly for 3 doses then 400 mg daily	Duration: discuss with Microbiologist
Following contaminated surgery [9]	*Staphylococcus aureus* MRSA Coliforms Anaerobes	Seek advice from Microbiologist	The mainstay of treatment is surgical intervention

SKIN AND SOFT TISSUE INFECTIONS – Dermatophyte [8]

IMPORTANT Before prescribing antimicrobials	
	Take appropriate samples • Skin scrapings • Nail clippings • Hair

INFECTION	ORGANISMS	ANTIMICROBIALS	COMMENTS
Skin infections in general	*Trichophyton sp.* *Epidermophyton sp.* *Microsporum sp*	For limited infections **Clotrimazole cream 1%** Apply 2 - 3 times a day or **Miconazole cream 2%** Apply twice daily	Skin scrapings should be sent to Microbiology
Scalp ringworm and extensive tinea infections	As above	**Terbinafine oral** 250 mg od for at least 4 weeks or, if failed **Itraconazole oral** (pulsed) 200mg od for a 7 day course repeat after 21 days for 3 courses	Check LFT's initially prior to starting treatment thereafter every 2 weeks
Pityriasis versicolor	*Malassezia furfur*	**Topical** **Selenium sulphide shampoo** (Selsun®) Use as a lotion (diluted with water) and leave for 30 minutes or overnight. Repeat 2-7 times over 2 weeks	In recurrent cases seek advice from Dermatologist.
Nail infections	*Trichophyton sp.* *Epidermophyton sp*	**Terbinafine oral** 250 mg od 6 weeks - 3 months	Nail clippings should be sent to Microbiology

SKIN AND SOFT TISSUE INFECTIONS – Candida

INFECTION	ORGANISMS	ANTIMICROBIALS	COMMENTS
Dermal candidiasis	*Candida albicans* *Candida glabrata* *Candida tropicalis* *etc*	**Topical** **Clotrimazole cream 1%** Apply bd - tds or **Miconazole cream 2%** Apply bd **Systemic** **Fluconazole oral** 50 mg od for 2-4 weeks (for up to 6 weeks in tinea pedis)	Duration of therapy will depend on the clinical condition

SKIN AND SOFT TISSUE INFECTIONS – Viral [8]

INFECTION	ORGANISMS	ANTIMICROBIALS	COMMENTS
Herpes simplex	*Herpes simplex virus*	**Aciclovir cream 5%** Apply to lesions at first sign of attack 5 times a day for 5 days For more serious infection **Aciclovir oral** 200 mg 5 times a day for 5 days	
Chickenpox **Inpatients & Complicated Chickenpox (such as pneumonia and pregnancy)**	*Varicella-zoster virus*	**Aciclovir oral** 800 mg 5 times a day for 7 days In severe infections **Aciclovir i/v** 5 –10 mg/kg 8 hourly followed by oral – total 7 days	
Herpes zoster	*Varicella-zoster virus*	**Aciclovir oral** 800 mg 5 times a day for 7 days or **Famciclovir oral** 250 mg tds for 7 days	

SKIN AND SOFT TISSUE INFECTIONS – Arthropod infestations

INFECTION	ORGANISMS	ANTIMICROBIALS	COMMENTS
Scabies	*Sarcoptes scabiei*	Ist choice **Permethrin 5% cream** Apply over the whole body, neck down and wash off after 8 -12 hours. Repeat after 7 days 2nd choice **Malathion 0.5% aqueous liquid** Apply over the whole body and wash off after 24 hours Repeat after 7 days (Unlicensed Use)	Consult with Dermatologist to confirm diagnosis Inform Infection Control Team Infection Control procedures should be followed If evidence of cross infection (i.e. 2 cases or more) then all patients & staff should be treated
	Norwegian scabies - A more serious scabies usually affecting the Immuno-compromised	**Ivermectin oral** (Named Patient) 200 micrograms/kg single dose	All members of the affected household should be treated, paying particular attention to the web of the fingers and toes and brushing under the ends of nails
Head Lice	*Pediculus capitis*	**Malathion 0.5% aqueous liquid** Apply to dry hair and scalp, leave on for 12 hours, rinse and dry Repeat after 7 days (unlicenced use)	Two applications 7 days apart to prevent lice emerging from eggs that survive the first application

Guidelines for the management of diabetic patients with an infected foot ulcer and / or infected foot

Before prescribing antimicrobials - check history of MRSA or Pseudomonas

Infection	Signs and symptoms, Wound bed	Investigations	Treatment	Antimicrobials Check Allergy Status
Minor infections Localised erythema, Warmth & swelling around ulcer (< 3cm) [19, 20]	• Superficial • Bed: yellow/ grey • Delayed healing / non healing • Friable and marked granulation • New areas of breakdown or necrosis • Bridging of soft tissue and epithelium • Odour	Foot examination, to include vascular and neurological assessment Wound assessment Wound swab Blood glucose Temperature Pulse and BP	• Inspection of wound on admission or out of hours on the ward • Wound / callus debridement by experienced practitioner • Pressure relief • Wound management – antimicrobials • Moisture balance • Ongoing evaluation based on clinical findings • Patient education **Referrals** All patients with infected diabetic foot ulcers to the Multi-disciplinary Diabetic Foot Care Team	1st line **Flucloxacillin oral** 500mg to 1g **+ Amoxicillin oral** 500mg tds P Penicillin allergy **Clarithromycin oral** 500mg bd **Add Metronidazole oral** 400 mg tds, if wound malodorous 2nd line **Co-amoxiclav oral** 625 mg tds Wound swab results should be obtained as soon as possible. Prescribed antimicrobials should be checked against sensitivity results, and changed accordingly.
Moderate infections Intense widespread erythema, swelling and heat (> 3cm), +/- bony involvement, +/- ischaemia, +/- lymphangitis, regional lymphadenitis malaise, flu-like symptoms--pyrexia, tachycardia, rigors and erratic glucose levels **BUT HAEMODYNAMICALLY STABLE**	• Deep tissue ulceration + /- undermined edges +/- penetrates to bone • Wound breakdown or satellite areas • Extreme purulent discharge • Malodour • Increased pain • Swelling, induration • Crepitus • Sausage shaped toe(s) (indicating osteomyelitis) • Blue discolouration of skin due to ischaemia or tissue destruction	As for minor infection plus Bloods: FBC, U&Es, WCC CRP Blood cultures X-ray Urgent arterial Doppler - if absent or weak foot pulses	• Same as minor infections, except antimicrobials • Hospitalisation • Non-weight bearing • May also require surgical debridement **Urgent referrals** 1. Diabetologist / Multidisciplinary Diabetic Foot Care team 2. Vascular Surgeons If peripheral vascular disease confirmed or cannot be excluded	**Co-amoxiclav i/v** 1.2 g tds **Add Metronidazole oral** 400 mg tds, if wound malodorous P Penicillin allergy Contact Microbiologist Modify antimicrobial therapy according to culture and sensitivities. **If colonised with MRSA or pseudomonas or has had recent antibiotic use then seek advice from microbiologist**

	Signs and symptoms, Wound bed	Investigations	Treatment	Antimicrobials Check Allergy Status
Severe Infections - Presenting as clinical emergency - Patient haemodynamically unstable **Limb ischaemia** and / or **Septicaemia** and / or **Triggering early warning score**	• Present as above plus marked necrosis (dry) or gangrene (wet) • Large areas of infected sloughy tissue • Localised fluctuance and expression of pus • Crepitus with gas in the soft tissues on X-ray • Purplish discolouration of the skin indicating subcutaneous necrosis • Pyrexia • Acute ischaemia may present as a red foot / leg or have a white appearance with purplish mottling with absent foot and possibly foot and possibly popliteal pulses	As for moderate infection **ALWAYS:** Blood cultures and wound swab Consider also arterial blood gasses Consider: Urgent dopplers, Arteriogram MRA	• As for moderate infection • Intravenous antimicrobials • Insulin sliding scale and i/v fluids • Monitor blood glucose hourly **Immediate referral to:** 1. Vascular surgeons for possible radical debridement/ reconstruction / amputation 2. Diabetologist • If hypotensive - aggressive i/v fluid therapy • PAR scoring • Most patients will require transfer to HDU / ITU	**Seek immediate advice from Microbiologist**

References:

Edmonds ME and Foster VM, Managing the Diabetic Foot.

ABC of Diabetes BMJ 2003; 326: 977-979.

BONE AND JOINT INFECTIONS [8, 9, 10]

IMPORTANT Before prescribing antimicrobials

- **History of MRSA/ ESBL/ *Clostridium difficile*** – contact Microbiologist
- Check for previous microbiology results
- Treatment duration may be several weeks, according to the microbiology

Take appropriate samples

- Blood cultures
- Other orthopaedic samples when possible
- Wound swabs
- Cultures from septic foci

INFECTION	ORGANISMS	ANTIMICROBIALS	COMMENTS
ACUTE OSTEOMYELITIS Non-high risk patients	*Staphylococcus aureus* Others *Anaerobes*	**Flucloxacillin i/v** 2 g qds plus **Addition of sodium fusidate may be advised by Microbiologist**	Blood culture and other relevant orthopaedic samples should be taken before initiation of therapy i/v Flucloxacillin therapy for at least 1-2 weeks in the first instance, followed by oral therapy for a total of 6-8 weeks.
High risk patients	As above plus Gram-Negative organisms	Seek advice from consultant Microbiologist	Modify according to culture and sensitivities P Penicillin allergy: Contact Microbiologist
	Known MRSA	High dose **Teicoplanin i/v** 400 mg 12 hourly for 3 doses then 600 mg od plus **Sodium fusidate oral** Tablets 500 mg tds (= Suspension Fusidic acid 750 mg tds)	Discuss with Microbiologist Monitor response with CRP Sodium fusidate • NEVER USE ON ITS OWN • Seek Microbiologists advice if oral not possible • Monitor LFTs twice weekly Sodium fusidate should not be administered with statin drugs due to interaction. Seek advice from pharmacist
CHRONIC OSTEOMYELITIS	As above	Discuss with Microbiologist Normally duration of treatment is longer.	Surgical debridement is the mainstay of the treatment
SEPTIC ARTHRITIS **NATIVE JOINT**	*Staphylococcus aureus* Beta haemolytic Streptococci	**Flucloxacillin i/v** 2 g qds plus **Benzylpenicillin i/v** 1.8 g qds	i/v therapy for at least 2 weeks followed by oral therapy for total of 4-6 weeks P Penicillin allergy: seek advice from Microbiologist
	Known MRSA	Discuss with Microbiologist **Teicoplanin i/v** 400 mg 12 hourly for 3 doses then 600 mg od plus **Sodium fusidate oral** Tablets 500 mg tds (= Suspension Fusidic acid 750 mg tds)	Sodium fusidate • NEVER USE ON ITS OWN • Seek Microbiologists advice if oral not possible • Monitor LFTs twice weekly Sodium fusidate should not be administered with statin drugs due to interaction. Seek advice from pharmacist
SEPTIC ARTHRITIS **PROSTHETIC JOINT**	Wide range of organisms	Contact Microbiologist Appropriate sampling and identification of infecting agent is crucial	Collaborative management between Orthopaedic Surgeon and Microbiologist

ENT INFECTIONS [9, 10]

IMPORTANT
Before prescribing antimicrobials

- **History of MRSA/ ESBL/ C.difficile** – contact Microbiologist
- Check for previous microbiology results
- Treatment duration (iv or oral) 5 days unless specified

Take appropriate samples

- Pus and aspirate when possible
- Wound swabs
- Blood cultures

INFECTION	ORGANISMS	ANTIMICROBIALS	COMMENTS
Tonsillitis / Pharyngitis	Majority viral Group A beta haemolytic Streptococci	If severe **Benzylpenicillin i/v** 1.2 g qds for 48 hours followed by **Amoxicillin oral** 500 mg tds Total duration: 10 days	P Penicillin allergy: **Clarithromicin oral** 500 mg bd
Peritonsillar Abscess (Quinsy)	As above + / - Anaerobes	**Benzylpenicillin i/v** 1.2 g qds for 48 hours plus **Metronidazole oral** 400 mg tds Change to **Co-amoxiclav oral** 625 mg tds Total duration: 10 days	P Penicillin allergy: seek advice from Microbiologist
Otitis Externa	Many are viral *Staphylococcus aureus* Group A, C or G Streptococci Anaerobes	May not be infective. Often respond to careful cleansing and topical steroids	According to culture and sensitivity If malignant otitis or spreading cellulitis contact Microbiologist
Acute Otitis Media (1st episode)	Viral *Streptococcus pneumoniae* *Haemophilus influenzae*	**Amoxicillin oral** 500 mg tds for 5-7 days	**Mainly viral. 80% resolve without antimicrobials** P Penicillin allergy: **Doxycycline oral** 200 mg first dose then 100 mg od
Chronic or Discharging Otitis Media	*Streptococcus pneumoniae* *Haemophilus influenzae* *Staphylococcus aureus*	Consult Microbiologist and treat according to culture results	Swab should be taken for culture
Acute Sinusitis (Rhinogenic origin)	Viral *Streptococcus pneumoniae* *Haemophilus influenzae*	**Amoxicillin i/v** 500 mg tds for 5 days or **Amoxicillin oral** 500mg tds for 5 days	**Mainly viral. Symptomatic benefit of antimicrobials is small** P Penicillin allergy: **Doxycycline oral** 200 mg first dose then 100 mg od
Acute Sinusitis (Dental origin)	*As above +* *Wide range of organisms including:* Streptococci, *viridans Streptococci* Anaerobes	**Co-amoxiclav oral** 625 mg tds for 7 days If severe **Co-amoxiclav i/v** 1.2 g tds	P Penicillin allergy: **Doxycycline oral** 200 mg first dose then 100 mg od

ORAL AND MAXILLOFACIAL SURGERY INFECTIONS

INFECTION	ORGANISMS	ANTIMICROBIALS	COMMENTS
Acute infections including tissue space abscesses secondary to dental sepsis etc.	Oral and upper respiratory flora	**Co-amoxiclav i/v** 1.2 g tds	Discuss with Microbiologist

EYE INFECTIONS [8, 9]

INFECTION	ORGANISMS	ANTIMICROBIALS	COMMENTS
Conjunctivitis	*Staphylococcus aureus* *Haemophilus influenzae* *Streptococcus pneumoniae* Group A C G Streptococci	**Chloramphenicol** 0.5% eye drops 2 hourly during the day and 1% ointment at night for 5 days	Restricted to staphylococci infections (MSSA/MRSA): **Fusidic acid m/r eye drops** 1% Apply bd
	Chlamydia, viruses, fungi, protozoa, helminths		Seek advice from Consultant Ophthalmologist
Periorbital cellulitis		**Benzylpenicillin i/v** 1.2 g qds plus **Flucloxacillin i/v** 1 g qds	Take conjunctival swabs P Penicillin allergy: seek advice from Microbiologist Consider oral following clinical improvement
Deep seated eye infection	Wide range of organisms	Depends on organism isolated and antibiotic susceptibility	Seek advice from Consultant Ophthalmologist
Post-operative eye infection			
Post-injury eye infection			
Endophthalmitis			Collaboration between Consultant Ophthalmologist and Microbiologist is essential

OBSTETRIC AND GYNAECOLOGICAL INFECTIONS

IMPORTANT Before prescribing antimicrobials

- **History of MRSA/ ESBL/ *Clostridium difficile*** – contact Microbiologist
- Check for previous microbiology results
- Treatment duration (i/v or oral) 5 days unless specified
- **Sepsis** – start antibiotics within an hour of diagnosis. Prescribe in STAT section of drug chart Refer to Sepsis Six checklist on page 74

Take appropriate samples

- Blood cultures
- Wound swab
- HVS or endocervical swab

INFECTION	ORGANISMS	ANTIMICROBIALS	COMMENTS
Post-operative sepsis	Coliforms Group B Streptococci Anaerobes	**Co-amoxiclav i/v** 1.2 g tds or **Co-amoxiclav oral** 625 mg tds	Send specimens to Microbiology - blood culture, urine, and wound swabs P Penicillin allergy: Clindamycin plus Ciprofloxacin i/v initially if necessary followed by oral
Post-partum sepsis	As above	As above	
Pelvic inflammatory disease (PID) **Acute Admissions** [21]	*Neisseria gonorrhoea* *Chlamydia trachomatis* *Mycoplasma hominis* *Ureaplasma urealyticum* *Coliforms* Group B Streptococci Anaerobes (Wide range of mixtures of organisms)	***Ceftriaxone i/v** 2 g od plus **Doxycycline oral** 100 mg bd for 14 days plus **Metronidazole oral** 400 mg bd for 14 days	*Discontinue Ceftriaxone 24 hours after clinical improvement P Penicillin allergy: Contact Microbiologist
Outpatient Regime	As above	**Ofloxacin oral** 400 mg bd for 14 days plus **Metronidazole oral** 400 mg bd for 14 days	

SEXUALLY TRANSMITTED INFECTIONS

PATIENTS DIAGNOSED STI	
• Encourage patients to attend GU Medicine for additional screening. • Sexual partners may also require treatment	**Take appropriate samples**

INFECTION	ORGANISMS	ANTIMICROBIALS	COMMENTS
Uncomplicated gonorrhoea [23]	*Neisseria gonorrhoea*	**Ceftriaxone i/m** 500mg single dose plus **Azithromycin oral** 1gm single dose P Penicillin allergy if life threatening: **NON-PREGNANT** **Azithromycin oral** 2 g single dose (unlicensed) or **Ciprofloxacin oral** 500mg single dose when infection is known or anticipated to be quinolone sensitive **PREGNANT** **Spectinomycin i/m** (Named Patient) 2 g single dose plus **Azithromycin oral** 1gm single dose	Screen for co-incident sexually transmitted disease
Uncomplicated chlamydia infection [9, 24]	*Chlamydia trachomatis types (D-K)*	**NON-PREGNANT** **Azithromycin oral** 1 g single dose or **Doxycycline oral** 100 mg bd for 7 days	Screen for co-incident sexually transmitted disease **PREGNANT** refer to GU medicine
Bacterial vaginosis [25]	*Gardnerella vaginalis* *Prevotella sp* *Mycoplasma hominis* *Mobilincus sp*	**NON-PREGNANT** **Metronidazole oral** 2 g single dose or 400 mg bd for 7 days or **Balance Activ** gel 1 application at night for 7 nights	**PREGNANT** **Metronidazole oral** 400 mg bd for 7 days (High dose 2 g contraindicated) or **Balance Activ** gel 1 application at night for 7 nights Metronidazole allergy or contraindicated: **Clindamycin 2% cream intravaginal** 5 g at night for 7 nights or oral 300 mg twice daily for 7 days or **Balance Activ** gel 1 application at night for 7 nights

SEXUALLY TRANSMITTED INFECTIONS (Continued)

PATIENTS DIAGNOSED STI	
• Encourage patients to attend GU Medicine for additional screening • Sexual partners may also require treatment	**Take appropriate samples**

INFECTION	ORGANISMS	ANTIMICROBIALS	COMMENTS
Trichomoniasis [26]	*Trichomonas vaginalis*	**NON-PREGNANT** **Metronidazole oral** 2 g single dose or **Metronidazole oral** 400 mg bd for 7 days	Refer to GU Medicine **PREGNANCY** **Metronidazole oral** 400 mg bd for 7 days (High dose 2 g contraindicated)
Primary genital herpes	*Herpes simplex virus*	**Aciclovir oral** 400mg tds for 5 days	Refer to GU medicine
Genital warts	*Human papilloma virus*	Topical therapies available in Wart Treatment Clinic	Please refer to GU Medicine
Candida vaginitis (Thrush)	*Candida albicans* *Other Candida species*	**Clotrimazole p/v** 500 mg pessary single dose Alternative treatment Fluconazole oral 150 mg single dose	For frequent recurrent episodes, please refer to GU Medicine
Epididymo-orchitis Most probably STI related [27] If UTI suspected	*Neisseria gonorrhoea* *Chlamydia* Most probably due to bowel organisms	**Ceftriaxone i/m** 500mg single dose plus **Doxycycline** 100mg bd 10-14/7 If chlamydia and gonorrhea infection considered unlikely **Doxycycline** 100mg bd 10-14/7 or **Ofloxacin** 200mg bd 14/7 **Ciprofloxacin oral** 500 mg bd 10 days Refer to page 16	Please refer to GU Medicine for contact tracing and counselling
HIV			Seek specialist advice from GU Medicine

HAEMATOLOGICAL INFECTIONS for Rotherham Hospital

These patients suffer from various haematological immuno-compromising conditions such as acute and chronic leukaemias, myelomas etc. Neutropaenic patients whether disease or chemotherapy induced are at highest risk of acquiring infection. Refer to Sepsis Six checklist on page 74.

IMPORTANT Before prescribing antimicrobials

- **History of MRSA/ ESBL** – contact Microbiologist
- Check for previous microbiology results
- Treatment duration – as advised by Consultant Microbiologist

Take appropriate samples

- Blood cultures – central line & peripheral site

INFECTION	ORGANISMS	ANTIMICROBIALS	COMMENTS
Non-neutropaenic patients with clinical signs of infection	Wide range of organisms depending on site of infection	**See relevant section in the policy**	
Neutropaenic patients (neutrophils < 0.5 x 10^9 /L) with a temperature greater than 38^{O}C or other signs or symptoms consistent with clinically significant sepsis.	*Wide range of organisms:* Coliforms *Pseudomonas sp.* *Staphylococcus aureus* Streptococci	**Piperacillin/Tazobactam i/v** 4.5g tds plus if life threatening infection add high dose ***Gentamicin i/v** as per local guidance. (see Appendix A) If oral ulceration present consider fungal and herpes viral infection. send swabs and discuss with Microbiologist. When oral can be given switch to **Ciprofloxacin oral** 500mg bd plus **Amoxycillin oral** 500mg tds If NO response within 24 – 48 hours then change to: **Teicoplanin i/v** 400 mg 12 hourly for the first three doses, then 400 mg od plus **Meropenem i/v** 1g tds If NO response following second regimen after 48 hours then rule out systemic fungal infection. Contact Consultant Microbiologist	Blood cultures should be obtained from • central line • peripheral site Patient should be in protective isolation P Penicillin allergy: **Teicoplanin i/v** 400 mg 12 hourly for the first three doses, then 400 mg od plus ***Gentamicin i/v** High Dose (see Appendix A) Seek advice from Haematologist and Microbiologist May require Amikacin or Tobramycin depending on the organism isolated. Please see protocol for serum level monitoring (Appendix C and D) *Gentamicin level (Appendix A)
Intravascular-catheter associated infection whether neutropaenic or not	Coagulase-negative Stapylococci *Staphylococcus aureus* Diphtheroids Coliforms	**Teicoplanin i/v** 400 mg 12 hourly for the first three doses then 400 mg od plus ***Gentamicin i/v** High Dose (see Appendix A)	As above plus take swab from catheter exit site

HAEMATOLOGICAL INFECTIONS for Barnsley Hospital

These patients suffer from various haematological immuno-compromising conditions such as acute and chronic leukaemias, myeloma etc. Neutropaenic patients whether disease or chemotherapy induced are at highest risk of acquiring infections. Refer to Sepsis Six checklist on page 74.

IMPORTANT Before prescribing antimicrobials

- **History of MRSA/ ESBL** – contact Microbiologist
- Check for previous microbiology results
- Treatment duration – as advised by Consultant Microbiologist

Take appropriate samples

- Blood cultures – central line & peripheral site

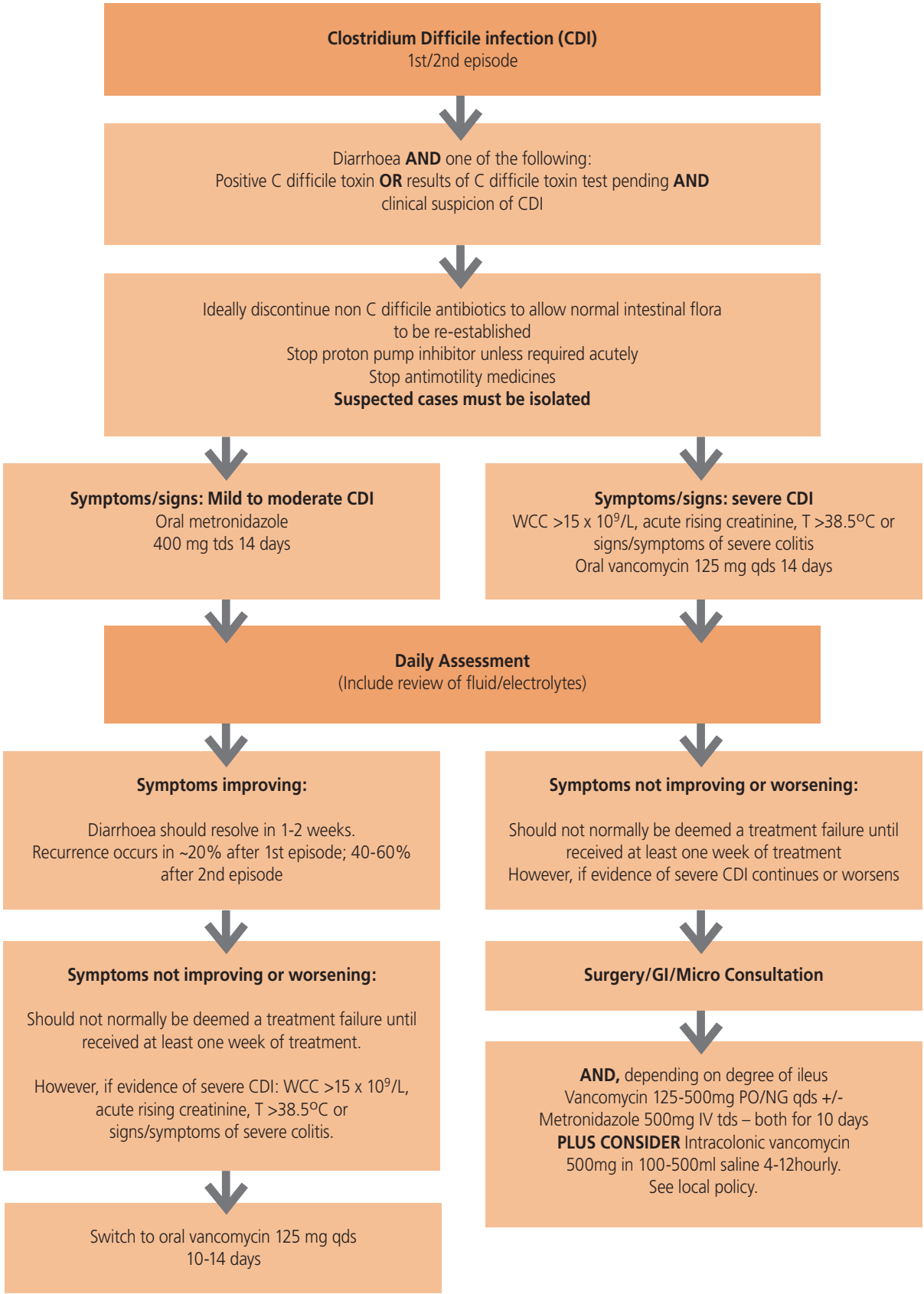
INFECTION	ORGANISMS	ANTIMICROBIALS	COMMENTS
Non-neutropaenic patients with clinical signs of infection	Wide range of organisms depending on site of infection	**See relevant section in the policy**	
Neutropaenic patients (neutrophils < 0.5 x 10^9 /L) with a temperature greater than 38^{O}C or other signs or symptoms consistent with clinically significant sepsis.	*Wide range of organisms:* Coliforms *Pseudomonas sp.* *Staphylococcus aureus* Streptococci	**Piperacillin/Tazobactam i/v** 4.5g tds plus if life threatening infection add high dose ***Gentamicin i/v** as per local guidance. (see Appendix A) If oral ulceration present consider fungal and herpes viral infection. send swabs and discuss with Microbiologist. When oral can be given switch to **Ciprofloxacin oral** 500mg bd plus **Amoxycillin oral** 500mg tds If NO response within 24 – 48 hours then change to: **Teicoplanin i/v** 400 mg 12 hourly for the first three doses, then 400 mg od plus **Meropenem i/v** 1g tds If NO response following second regimen after 48 hours then rule out systemic fungal infection. Contact Consultant Microbiologist	Blood cultures should be obtained from • central line • peripheral site Patient should be in protective isolation P Penicillin allergy: **Teicoplanin i/v** 400 mg 12 hourly for the first three doses, then 400 mg od plus ***Gentamicin i/v** High Dose (see Appendix A) Seek advice from Haematologist and Microbiologist May require Amikacin or Tobramycin depending on the organism isolated. Please see protocol for serum level monitoring (Appendix C and D) *Gentamicin level (Appendix A)
Intravascular-catheter associated infection in non-neutropaenic patients	*Staphyloccus. aureus* *Coagulase-negative Staphylococcus* Diphtheroids Coliforms	**Teicoplanin i/v** 400 mg 12 hourly for the first three doses then 400 mg od plus ***Gentamicin i/v** High Dose (see Appendix A)	As above plus Take swab from catheter exit site

GASTRO-INTESTINAL INFECTIONS

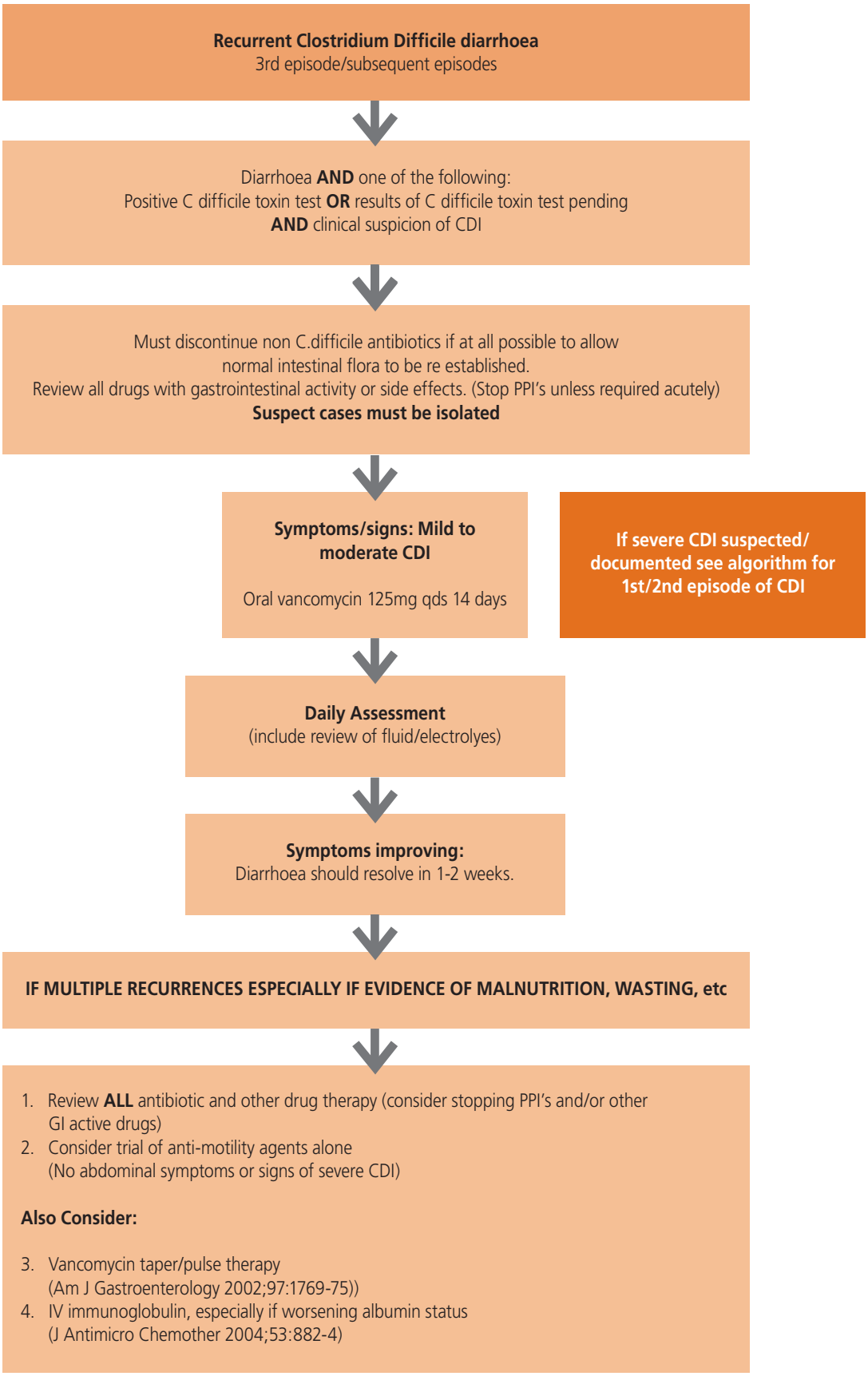
IMPORTANT Before prescribing antimicrobials	
• **History of MRSA/ ESBL/ *Clostridium difficile*** – contact Microbiologist • Check for previous microbiology results • Treatment duration – as advised by Consultant Microbiologist	**Take appropriate samples**

INFECTION	ORGANISMS	ANTIMICROBIALS	COMMENTS
Acute gastro-enteritis	*Salmonella sp.* *Shigella sp.* *Campylobacter sp.* Viruses	Usually NOT required May be necessary in invasive salmonellosis	Cases should be barrier nursed. Food poisoning is a notifiable disease
Antibiotic associated diarrhoea [28]	*Clostridium difficile*	Ist and 2nd episode see chart on page 37 3rd or subsequent episode see chart on page 38	STOP other antimicrobials if possible If no response after treatment seek advice from Microbiologist
Enteric fever	*Salmonella typhi* *Salmonella paratyphi*	**Ciprofloxacin oral** 500 mg bd for 14 days	If cannot take oral consider i/v initially 400 mg bd
Biliary infections **Cholangitis** **Cholecystitis**	Coliforms Gram negative organisms	**Co-amoxiclav i/v** 1.2 g tds or oral 625 mg tds	P penicillin allergy - seek advice from microbiologist
Eradication of *Helicobacter pylori* [29]	*Helicobacter pylori*	1st line **Triple therapy,** all Twice daily for 7 days **Clarithromycin oral** 500 mg bd plus **Amoxicillin* oral** 1 g bd plus **Lansoprazole oral** (Rotherham) 30 mg bd **Omeprazole oral** (Barnsley) 20 mg bd 2nd line In consultation with Gastroenterologist	P *Penicillin allergy: Replace Amoxicillin with Metronidazole oral 400 mg bd and Reduce clarithromycin dose 250 mg bd Do not use clarithromycin or metronidazole if used in the past year for any infection
Liver Abscess	Coliforms Streptococci Anaerobes		Seek advice from Microbiologist
Pancreatitis			Seek advice from Microbiologist
Prophylaxis in cirrhosis patients required only for: [33] **1. Patients admitted with GI variceal bleed** **2. Patients recovering from spontaneous bacterial peritonitis (SBP)** **Spontaneous Bacterial Peritonitis (SBP)**	 Treatment	 1. **Ciprofloxacin oral** 500 mg bd for 7 days 2. **Norfloxacin oral** 400 mg od Prophylaxis for life or until disappearance of ascites or transplant. See local guidelines	

C.difficile diarrhoea 1st or 2nd episode [28]



Recurrent C.difficile diarrhoea 3rd or subsequent episodes [28]



MRSA Decolonisation and follow up of patients

All MRSA positive patients should be prescribed the following decolonisation regime in an attempt to eradicate MRSA.

For first decolonisation treat all sites regardless of where positive and for any subsequent decolonisation treat the positive site only.

PROCEDURE	PRODUCT	DIRECTIONS	DURATION
Nasal Clearance	Mupirocin nasal ointment 2% (Bactroban Nasal®)	Apply to both nostrils 3 times daily	**5 Days**
Shower/bath	Octenisan® solution 2%	Thoroughly apply daily directly on to wet skin covering all areas. Allow contact time of 3 minutes before rinsing.	**5 Days**
Hair wash	Octenisan® solution 2%	Shampoo hair with this product twice during the 5 day period Allow contact time of 3 minutes before rinsing.	**5 Days**
If throat positive refer to microbiology	Chlorhexidine mouthwash	10 mL Twice daily	**5 Days**
If wound swab positive	Povidone iodine (in non pregnant) Octenilin wound cleanser	 If infected systemic antibiotics may be needed	Based on wound assessment including advice from tissue viability

Forty eight hours after the completion of above treatment swab from nose, groin, wound and any other previously positive site must be sent.

If 3 consecutive swabs are negative for MRSA no further action is required if he/she is discharged into the community.

Inpatients
Whilst the patient is still in the hospital the following must be sent weekly to check for MRSA (including the original positive site):

- nasal, groin, and any wound swabs,
- CSU if catheterised,
- sputum samples if productive,

If found positive again repeat the decolonisation regime. If still positive after second decolonisation contact Infection Control Team for further advice.

Only take repeat swabs 48 hours after decolonisation therapy has been completed

Please refer to Infection Control Policy

ANTIMICROBIAL PROPHYLAXIS [28]

Principles of Surgical Prophylaxis

Choice of antimicrobial	The selected antimicrobial for prophylaxis must cover the expected pathogen for that operative site.
MRSA carriage	MRSA carriage should be eradicated with intranasal mupirocin and/or octenisan prior to surgery.
History of MRSA	A glycopeptide must be given, for example Teicoplanin.
Timing of administration	Antimicrobial should be administered before tourniquet is applied and 30–60 minutes before skin incision.
Dose of antimicrobial	A single therapeutic dose of antimicrobial with a long enough activity through the operation is recommended. A longer course of 24 hours may be necessary in high risk surgery
Additional doses	Should be considered if intraoperative blood loss more than 1500 mL.
Routes of administration	Prophylactic antimicrobials should be administered intravenously. Ciprofloxacin given orally has comparable serum and tissue levels to intravenous administration. In addition to intravenous antimicrobials, impregnated cement is recommended for cemented joint replacements.
Writing prescription	In the "once only" section of the Medicine Chart.

Classification of surgery

Class	Type
Clean	- no inflammation encountered - no entry into respiratory, alimentary or urinary tract
Clean-contaminated	- entry into respiratory, alimentary or urinary tract but without significant spillage
Contaminated	- acute infection (without pus) - visible contamination of the wound - compound/ open injuries less than 4 hours old
Dirty	-in the presence of pus -previously perforated hollow viscus -compound/ open injuries more than 4 hours old

SURGICAL PROPHYLAXIS [8, 28]

	Timing: administer i/v antimicrobials 30-60 minutes before incision		
	1st line	**Patients with Penicillin allergy**	**Patients with History of MRSA**
Head and neck - Intracranial			
Penetrating Head injury Requires prophylaxis only in • Failed suicide attempts with the wound originating in the oropharynx • Orbital fractures • Fragments of wood, clothing or soil in the wound	**Co-amoxiclav i/v** 1.2 g 8 hourly for 5 days	Not life threatening allergy **Cefuroxime i/v** 1.5 g 8 hourly for 5 days Life threatening allergy **Clindamycin i/v** 600 mg 12 hourly for 5 days	**Add Teicoplanin i/v** 400 mg 12 hours for 3 doses then 400 mg once daily for 5 days
CSF leak	No prophylaxis	No prophylaxis	
Spinal surgery	**Flucloxacillin i/v** 2 g single dose plus **Gentamicin i/v** 120 mg single dose	**Teicoplanin i/v** 600 mg single dose plus **Gentamicin i/v** 120 mg single dose	**Teicoplanin i/v** 600 mg single dose plus **Gentamicin i/v** 120 mg single dose
Head and neck			
Head and neck surgery Clean, benign	No prophylaxis	No prophylaxis	
Head and neck surgery Clean, malignant; Neck dissection	**Co-amoxiclav i/v** 1.2 g single dose	Non life threatening allergy **Cefuroxime i/v** 1.5 g single dose plus **Metronidazole i/v** 500 mg single dose Life threatening allergy **Clindamycin i/v** 600 mg single dose plus **Gentamicin i/v** 120 mg single dose	**Teicoplanin i/v** 600 mg single dose plus **Metronidazole i/v** 500 mg single dose plus **Gentamicin i/v** 120 mg single dose
Head and neck surgery Contaminated/ clean contaminated	**Co-amoxiclav i/v** 1.2 g 8 hourly for 3 doses	Non life threatening allergy **Cefuroxime i/v** 1.5 g 8 hourly for 3 doses plus **Metronidazole i/v** 500 mg 8 hourly for 3 doses Life threatening allergy **Clindamycin i/v** 600 mg 12 hourly 2 doses plus **Gentamicin i/v** 120 mg 12 hourly for 2 doses	**Teicoplanin i/v** 600 mg followed by 400 mg 12 hours later plus **Metronidazole i/v** 500 mg 8 hourly for 3 doses plus **Gentamicin i/v** 120 mg 12 hourly for 2 doses

SURGICAL PROPHYLAXIS, continued [8, 28]

	Timing: administer i/v antimicrobials 30-60 minutes before incision		
	1st line	**Patients with Penicillin allergy**	**Patients with History of MRSA**
Facial			
Open reduction and internal fixation of mandibular fractures	**Co-amoxiclav i/v** 1.2 g 8 hourly for 3 doses	Not life threatening allergy **Cefuroxime i/v** 1.5 g 8 hourly for 3 doses plus **Metronidazole i/v** 500 mg 8 hourly for 3 doses Life threatening allergy **Clindamycin i/v** 600 mg 12 hourly for 2 doses plus **Gentamicin i/v** 120 mg 12 hourly for 2 doses	**Teicoplanin i/v** 600 mg followed by 400 mg 12 hours later plus **Metronidazole i/v** 500 mg 8 hourly four 3 doses plus **Gentamicin i/v** 120 mg 12 hourly for 2 doses
Intraoral bone grafting procedures	**Co-amoxiclav i/v** 1.2 g single dose	Not life threatening allergy **Cefuroxime i/v** 1.5 g single dose plus **Metronidazole i/v** 500 mg single dose Life threatening allergy **Clindamycin i/v** 600 mg single dose plus **Gentamicin i/v** 120 mg single dose	**Teicoplanin i/v** 600 mg single dose plus **Metronidazole i/v** 500 mg single dose plus **Gentamicin i/v** 120 mg single dose
Orthognathic surgery	**Co-amoxiclav i/v** 1.2 g 8 hourly for 3 doses	**Clindamycin i/v** 600 mg bd for 2 doses plus **Gentamicin i/v** 120 mg 12 hourly for 2 doses	**Teicoplanin i/v** 600 mg followed by 400 mg 12 hours later plus **Metronidazole i/v** 500 mg 8 hourly for 3 doses plus **Gentamicin i/v** 120 mg 12 hourly for 2 doses
Facial surgery (clean)	No prophylaxis	No prophylaxis	
Facial plastic surgery (implant)	**Co-amoxiclav i/v** 1.2 g single dose	Non life threatening allergy **Cefuroxime i/v** 1.5 g single dose plus **Metronidazole i/v** 500 mg single dose Life threatening allergy **Clindamycin i/v** 600 mg single dose plus **Gentamicin i/v** 120 mg single dose	**Teicoplanin i/v** 600 mg single dose plus **Metronidazole i/v** 500 mg single dose plus **Gentamicin i/v** 120 mg single dose

SURGICAL PROPHYLAXIS, continued [8, 28]

	Timing: administer i/v antimicrobials 30-60 minutes before incision		
	1st line	**Patients with Penicillin allergy**	**Patients with History of MRSA**
Ear, nose and throat			
Ear surgery clean/ clean contaminated	No prophylaxis	No prophylaxis	
Routine nose, sinus and endoscopic sinus surgery	No prophylaxis	No prophylaxis	
Complex septorhinoplasty Including grafts	**Co-amoxiclav i/v** 1.2 g 8 hourly for 3 doses	Non life threatening allergy **Cefuroxime i/v** 1.5 g 8 hourly for 3 doses plus **Metronidazole i/v** 500 mg 8 hourly for 3 doses Life threatening allergy **Clindamycin i/v** 600 mg 12 hourly for 2 doses plus **Gentamicin i/v** 120 mg 12 hourly 2 doses	**Teicoplanin i/v** 600 mg followed by 400 mg 12 hours later plus **Gentamicin i/v** 120 mg 12 hourly 2 doses plus **Metronidazole i/v** 500 mg 8 hourly for 3 doses
Tonsillectomy	No prophylaxis	No prophylaxis	Discuss with microbiologist
Adenoidectomy	No prophylaxis	No prophylaxis	Discuss with microbiologist
Grommet insertion	Single dose of topical antibiotic		
Ophthalmology			
Cataract surgery	**Cefuroxime intracameral** 1mg in 0.2mL or **Cefuroxime Subconjunctival** 125 mg in 0.5mL	**Cefuroxime intracameral** 1mg in 0.2mL or **Cefuroxime Subconjunctival** 125 mg in 0.5mL	**Cefuroxime intracameral** 1mg in 0.2mL or **Cefuroxime Subconjunctival** 125 mg in 0.5mL
Glaucoma or corneal grafts	**Chloramphenicol** eye drops 0.5% qds for two weeks	**Chloramphenicol** eye drops 0.5% qds for two weeks	**Chloramphenicol** eye drops 0.5% qds for two weeks
Lacrimal surgery	**Chloramphenicol ointment** 1% bd for 1 week	**Chloramphenicol ointment** 1% bd for 1 week	**Chloramphenicol ointment** 1% bd for 1 week
Penetrating eye injury	**Cefuroxime** Subconjunctival 125mg in 0.5mL then systemic as advised by microbiologist	**Cefuroxime** Subconjunctival 125mg in 0.5mL then systemic as advised by microbiologist	**Cefuroxime** Subconjunctival 125mg in 0.5mL then systemic as advised by microbiologist
Lid surgery	**Chloramphenicol** ointment 1% bd for 1 week	**Chloramphenicol** ointment 1% bd for 1 week	**Chloramphenicol** ointment 1% bd for 1 week
Squint surgery	**Maxitrol ointment** bd for 1 week	**Maxitrol ointment** bd for 1 week	**Maxitrol ointment** bd for 1 week

SURGICAL PROPHYLAXIS, continued [8, 28]

	Timing: administer i/v antimicrobials 30-60 minutes before incision		
	1st line	**Patients with Penicillin allergy**	**Patients with History of MRSA**
Thorax			
Breast reshaping procedures **Breast surgery with implants** (reconstructive or aesthetic) **Breast surgery for cancer**	**Benzylpenicillin i/v** 1.8 g single dose plus **Gentamicin i/v** 120 mg single dose	**Teicoplanin i/v** 600mg single dose plus **Gentamicin i/v** 120 mg single dose	**Teicoplanin i/v** 600mg single dose plus **Gentamicin i/v** 120 mg single dose
Cardiac pacemaker insertion	**Teicoplanin i/v** 600 mg single dose plus **Gentamicin i/v** 120 mg single dose	**Teicoplanin i/v** 600 mg single dose plus **Gentamicin i/v** 120 mg single dose	**Teicoplanin i/v** 600 mg single dose plus **Gentamicin i/v** 120 mg single dose
Hepatobiliary			
Bile duct surgery	**Gentamicin i/v** 120 mg single dose plus **Metronidazole i/v** 500 mg single dose	**Gentamicin i/v** 120 mg single dose plus **Metronidazole i/v** 500 mg single dose	**Gentamicin i/v** 120 mg single dose plus **Metronidazole i/v** 500 mg single dose plus **Teicoplanin i/v** 600 mg single dose
Gall bladder surgery (open)	**Gentamicin i/v** 120 mg single dose plus **Metronidazole i/v** 500 mg single dose If infection suspected, continue for 3 days then review	**Gentamicin i/v** 120 mg single dose plus **Metronidazole i/v** 500 mg single dose If infection suspected, continue for 3 days then review	**Gentamicin i/v** 120 mg single dose plus **Metronidazole i/v** 500 mg single dose plus **Teicoplanin i/v** 600 mg single dose If infection suspected, continue for 3 days then review
Gall bladder surgery (laparoscopic) **High risk patients :** intraoperative cholangiogram, bile spillage, conversion to laparotomy, acute cholecystitis/pancreatitis, jaundice, pregnancy, immuno-suppression, insertion of prosthetic devices	No prophylaxis unless high risk patients, then as above for open surgery single dose	No prophylaxis unless high risk patients, then as above for open surgery single dose	Contact microbiologist

SURGICAL PROPHYLAXIS, continued [8, 29]

	Timing: administer i/v antimicrobials 30-60 minutes before incision		
	1st line	**Patients with Penicillin allergy**	**Patients with History of MRSA**
Lower gastrointestinal			
Appendicectomy	**Co-amoxiclav i/v** 1.2 g single dose	**Gentamicin i/v** 120 mg single dose plus **Metronidazole i/v** 500 mg single dose	**Teicoplanin i/v** 600 mg single dose plus **Gentamicin i/v** 120 mg single dose plus **Metronidazole i/v** 500 mg single dose
Colorectal surgery	**Gentamicin i/v** 120 mg single dose plus **Metronidazole i/v** 500 mg single dose	**Gentamicin i/v** 120 mg single dose plus **Metronidazole i/v** 500 mg single dose	**Gentamicin i/v** 120 mg single dose plus **Metronidazole i/v** 500 mg single dose plus **Teicoplanin i/v** 600 mg single dose
Spleen			
Splenectomy	Elective: Immunisation Emergency: **Benzylpenicillin i/v** 1.8g single dose plus **Gentamicin i/v** 120mg single dose plus Immunisation 2 weeks later	**Teicoplanin i/v** 600mg single dose plus **Gentamicin i/v** 120mg single dose plus Immunisation 2 weeks later	**Teicoplanin i/v** 600mg single dose plus **Gentamicin i/v** 120mg single dose plus Immunisation 2 weeks later
Abdomen			
Hernia **With or without mesh:** **- laparoscopic** **- incisional**	No prophylaxis At the discretion of the surgeon in case of bowel adhesion, trauma		
Open laparoscopic surgery with mesh (eg gastric band or rectoplexy)	At the discretion of surgeon in high risk patients		

SURGICAL PROPHYLAXIS, continued [18, 31]

Caution CIPROFLOXACIN ENCOURAGES THE EMERGENCE OF MRSA

Timing: administer i/v antimicrobials 30-60 minutes before incision

	1st line	Patients with Penicillin allergy	Patients with History of MRSA
GI Endoscopy			
Any procedure* Prophylaxis for endocarditis	No prophylaxis	No prophylaxis	No prophylaxis
Any procedure In patients with Cirrhosis with acute GI bleed	From admission **Co-amoxiclav i/v** 1.2 g tds for 5 days	From admission Non-life threatening allergy **Cefuroxime i/v** 1.5 g tds for 5 days Life threatening allergy **Ciprofloxacin i/v** 400 mg bd for 5 days plus **Teicoplanin i/v** 400 mg 12 hourly for 3 doses than once daily for 4 days	From admission **Ciprofloxacin i/v** 400 mg bd for 5 days Plus **Teicoplanin i/v** 400 mg 12 hourly for 3 doses than once daily for 4 days
PEG All patients MRSA screen all patients prior to PEG	<1 hour before procedure **Benzylpenicillin i/v** 1.8g single dose plus **Gentamicin i/v** 120mg single dose	<1 hour before procedure **Teicoplanin i/v** 600 mg single dose plus **Gentamicin i/v** 120 mg single dose	<1 hour before procedure **Teicoplanin i/v** 600 mg single dose plus **Gentamicin i/v** 120 mg single dose
GI dilatation/ Sclerotherapy/ ERCP in obstructed system In patients with neutrophils <0.5 x10^9 or advanced haematology malignancy	Discuss with Haematologist & Microbiologist	Discuss with Haematologist & Microbiologist	Discuss with Haematologist & Microbiologist
ERCP In patients with CBD stone / obstruction / stent change **If decompression not achieved at ERCP:**	**Co-amoxiclav i/v** 1.2 g tds for 5 days or Oral 625 mg tds for 5 days	If Penicillin allergy or Co-amoxiclav in the last 4weeks **Ciprofloxacin oral** 500 mg bd plus **Doxycycline oral** 200 mg stat followed by 100 mg od for 5 days	Discuss with microbiologist
	If C. difficile or any other concerns, discuss with Microbiologist		

*Explain why antimicrobials no longer needed: High risk-benefit ratio (simple measures like good oral hygiene reduce risk of endocarditis).

Educate about endocarditis symptoms: fever, chills, rigors, sweats, weight loss, arthralgia, fatigue and to seek urgent medical attention.

For those used to prophylaxis: explain international consensus.
Respect their preference and give prophylaxis, if still prefer it.

SURGICAL PROPHYLAXIS, continued [18, 31]

Caution CIPROFLOXACIN ENCOURAGES THE EMERGENCE OF MRSA

	Timing: administer i/v antimicrobials 30-60 minutes before incision		
	1st line	**Patients with Penicillin allergy**	**Patients with History of MRSA**
GI Endoscopy continued			
ERCP In patients with ongoing cholangitis or sepsis elsewhere	From admission **Co-amoxiclav i/v** 1.2 g tds for 5 - 7 days If Co-amoxiclav in the last 4 weeks: **Piperacillin/tazobactam i/v** 4.5 g tds for 5-7 days	8am – 10pm Discuss with Microbiologist 10pm – 8pm **Teicoplanin i/v** 600 mg single dose plus **Gentamicin i/v** High dose (Appendix A) and discuss with Microbiologists next morning	8am – 10pm Discuss with Microbiologist 10pm – 8pm **Teicoplanin i/v** 600 mg single dose plus **Gentamicin i/v** High dose (Appendix A) and discuss with Microbiologists next morning
ERCP In patients with PSC, hilar cholangiocarcinoma, pancreatic pseudocyst, neutophils <0.5 x10^9/L ± advanced haematology malignancy	**Gentamicin i/v** 120 mg (on table) or **Ciprofloxacin oral** 750 mg (60 -90 minutes before)	**Gentamicin i/v** 120 mg (on table) or **Ciprofloxacin oral** 750 mg (60 -90 minutes before)	Consult Microbiologist
ERCP In patients post liver transplant	1 hour pre-procedure **Amoxicillin i/v** 1g single dose plus **Gentamicin i/v** 120 mg single dose	1 hour pre-procedure **Teicoplanin i/v** 600 mg single dose plus **Gentamicin i/v** 120 mg single dose	1 hour pre-procedure **Teicoplanin i/v** 600 mg single dose plus **Gentamicin i/v** 120 mg single dose

*****Explain why antimicrobials no longer needed: High risk-benefit ratio (simple measures like good oral hygiene reduce risk of endocarditis).

Educate about endocarditis symptoms: fever, chills, rigors, sweats, weight loss, arthralgia, fatigue and to seek urgent medical attention.

For those used to prophylaxis: explain international consensus.
Respect their preference and give prophylaxis, if still prefer it.

SURGICAL PROPHYLAXIS, continued [8, 28]

	Timing: administer i/v antimicrobials 30-60 minutes before incision		
	1st line	**Patients with Penicillin allergy**	**Patients with History of MRSA**
Gynaecological			
Hysterectomy - Abdominal - Vaginal	**Co-amoxiclav i/v** 1.2 g single dose	**Gentamicin i/v** 120 mg single dose plus **Clindamycin i/v** 600 mg single dose	**Teicoplanin i/v** 600 mg single dose plus **Gentamicin i/v** 120 mg single dose plus **Metronidazole i/v** 500 mg single dose
Salpingooophorectomy	No prophylaxis	No prophylaxis	
Caesarian section **Assisted delivery** **Manual removal of placenta**	**Cefuroxime i/v** 1.5 g single dose plus **Metronidazole i/v** 500 mg single dose	Non-life threatening allergy **Cefuroxime i/v** 1.5 g single dose plus **Metronidazole i/v** 500 mg single dose Life threatening allergy **Gentamicin i/v** 120 mg single dose plus **Clindamicin i/v** 600 mg single dose	**Teicoplanin i/v** 600 mg single dose plus **Gentamicin i/v** 2 mg/kg single dose plus **Metronidazole i/v** 500 mg single dose
Perineal tear **For third/fourth degree perineal tear involving the anal sphincter/rectal mucosa**	**Cefuroxime i/v** 1.5 g single dose plus **Metronidazole i/v** 500 mg single dose	Non-life threatening allergy **Cefuroxime i/v** 1.5 g single dose plus **Metronidazole i/v** 500 mg single dose Life threatening allergy **Gentamicin i/v** 120 mg single dose plus **Clindamicin i/v** 600 mg single dose	**Teicoplanin i/v** 600 mg single dose plus **Gentamicin i/v** 120 mg single dose plus **Metronidazole i/v** 500 mg single dose
Induced abortion	**Metronidazole i/v** 500 mg single dose if genital Chlamydia can not be ruled out **Doxycycline oral** 100 mg bd for 7 days	**Metronidazole i/v** 500 mg single dose if genital Chlamydia can not be ruled out **Doxycycline oral** 100 mg bd for 7 days	**Metronidazole i/v** 500 mg single dose if genital Chlamydia can not be ruled out **Doxycycline oral** 100 mg bd for 7 days
Evacuation of incomplete miscarriage	No proplylaxis	No proplylaxis	No proplylaxis
Intrauterine contraceptive device (IUCD) insertion	No prophylaxis	No prophylaxis	No prophylaxis

SURGICAL PROPHYLAXIS, continued [8, 28]

Caution CIPROFLOXACIN ENCOURAGES THE EMERGENCE OF MRSA

	Timing: administer i/v antimicrobials 30-60 minutes before incision		
	1st line	**Patients with Penicillin allergy**	**Patients with History of MRSA**
Urology			
Transrectal prostate biopsy	**Ciprofloxacin oral** 500 mg bd for 3 days, first dose 1-2 hours before biopsy	**Ciprofloxacin oral** 500 mg bd for 3 days, first dose 1-2 hours before biopsy	Discuss with Microbiologist
Shock wave lithotripsy	No prophylaxis	No prophylaxis	Discuss with Microbiologist
Percutaneous nephrolithotomy	**Cefuroxime i/v** 750 mg 8 hourly for 3 doses plus **Metronidazole i/v** 500 mg 8 hourly for 3 doses	Non life threatening allergy **Cefuroxime i/v** 750 mg 8 hourly for 3 doses plus **Metronidazole i/v** 500 mg 8 hourly for 3 doses Life threatening allergy discuss with microbiologist	Discuss with Microbiologist
Endoscopic ureteric stone fragmentation/removal For patients with stones ≥20mm or with pelvicalyceal dilation	**Gentamicin i/v** 120 mg single dose	**Gentamicin i/v** 120 mg single dose	Discuss with Microbiologist
Transurethral resection of prostate **Transurethral resection of bladder tumours**	**Gentamicin i/v** 120 mg single dose	**Gentamicin i/v** 120 mg single dose	Discuss with Microbiologist
Penile prosthesis	At induction **Gentamicin i/v** 160 mg plus **Metronidazole i/v** 500 mg plus **Co-amoxiclav i/v** 1.2 g then from next day **Gentamicin i/v** 80 mg 8 hourly for 3 doses plus **Ciprofloxacin oral** 500 mg bd for 5 days	At induction **Gentamicin i/v** 160 mg plus **Metronidazole i/v** 500 mg then from next day **Gentamicin i/v** 80 mg 8 hourly for 3 doses plus **Ciprofloxacin oral** 500 mg bd for 5 days	Discuss with Microbiologist
Nesbitt's / Lue Procedure	**Gentamicin i/v** 120 mg single dose	**Gentamicin i/v** 120 mg single dose	Discuss with Microbiologist
Intravesical botox therapy via flexible cystoscopy	**Ciprofloxacin oral** 500mg bd for 3 days First dose 1-2 hours before procedure	**Ciprofloxacin oral** 500mg bd for 3 days First dose 1-2 hours before procedure	Discuss with microbiologist

SURGICAL PROPHYLAXIS, continued [8, 28]

	Timing: administer i/v antimicrobials 30-60 minutes before incision		
	1st line	**Patients with Penicillin allergy**	**Patients with History of MRSA**
Limb			
Arthroplasty (Joint replacement)	**Flucloxacillin i/v** 2 g followed by 1 g 6 hourly for 3 doses plus **Gentamicin i/v** 160 mg single dose	**Teicoplanin i/v** 600 mg single dose plus **Gentamicin i/v** 160 mg single dose	**Teicoplanin i/v** 600 mg single dose plus **Gentamicin i/v** 160 mg single dose
Open fracture	**Co-amoxiclav i/v** 1.2 g 8hourly for 3 doses	**Teicoplanin i/v** 600 mg single dose plus **Gentamicin i/v** 120 mg 12 hourly 2 doses	**Teicoplanin i/v** 600 mg single dose plus **Gentamicin i/v** 120 mg 12 hourly 2 doses
Open surgery for closed fractures	**Co-amoxiclav i/v** 1.2 g 8 hourly for 3 doses	**Teicoplanin i/v** 600 mg single dose plus **Gentamicin i/v** 120 mg 12 hourly 2 doses	**Teicoplanin i/v** 600 mg single dose plus **Gentamicin i/v** 120 mg 12 hourly 2 doses
Hip fracture	**Co-amoxiclav i/v** 1.2 g 8 hourly for 3 doses	**Teicoplanin i/v** 600 mg single dose plus **Gentamicin i/v** 120 mg 12 hourly 2 doses	**Teicoplanin i/v** 600 mg single dose plus **Gentamicin i/v** 120 mg 12 hourly 2 doses
Orthopaedic surgery (without implant)	No prophylaxis		
Lower limb amputation	**Gentamicin i/v** 120 mg single dose plus **Benzyl penicillin i/v** 1.8 g single dose then 600 mg 6 hourly for 5 days	**Gentamicin i/v** 120 mg single dose plus **Teicoplanin i/v** 400 mg 12 hourly for 3 doses then once daily for 5 days	**Gentamicin i/v** 120 mg single dose plus **Teicoplanin i/v** 400 mg 12 hourly for 3 doses then once daily for 5 days
Soft tissue surgery of the hand Antibiotic prophylaxis for clean surgery is not normally recommended but if complicated, then it should be considered. Antibiotic prophylaxis is recommended for surgery involving insertion of a prosthetic device or implant.	**Co-amoxiclav i/v** 1.2 g single dose	Non-life threatening allergy **Cefuroxime i/v** 1.5 g single dose plus **Gentamicin i/v** 120 mg single dose Life threatening allergy **Teicoplanin i/v** 600 mg single dose plus **Gentamicin i/v** 120 mg single dose	**Teicoplanin i/v** 600 mg single dose plus **Gentamicin i/v** 120 mg single dose

MEDICAL PROPHYLAXIS

PROCEDURE	ANTIMICROBIALS
Meningococcal disease/ Meningitis contacts [8]	**Ciprofloxacin oral** 500 mg single dose (Unlicensed Indication) or **Rifampicin oral** 600 mg bd for 2 days **PREGNANCY** Ceftriaxone i/m 250 mg single dose
Haemophilus influenzae type b contacts [8]	**Rifampicin oral** 600 mg od for 4 days
Whooping cough contacts [8]	**Erythromycin oral** 500 mg qds for 7 days
Post splenectomy / asplenic patients (or sickle cell disease patients) [8]	**Penicillin V oral** 250 mg bd for life Penicillin allergy: Erythromycin oral 500 mg bd for life Vaccinations Please refer to Splenectomy Guidelines (Appendix G)
Tuberculosis prophylaxis (susceptible close contacts or those who have become tuberculin positive) [8] Discuss with consultant chest physician	**Isoniazid oral** 300 mg od for 3 months plus **Rifampicin oral** 600 mg od (450 mg if less than 50kg) for 3 months (or for selected patients) **Isoniazid oral** 300 mg od for 6 months

PROPHYLAXIS AGAINST INFECTIVE ENDOCARDITIS [19]

Introduction

Antibiotics have been offered routinely as a preventative measure to people at risk of infective endocarditis undergoing interventional procedures. However, there is little evidence to support this practice. Antibiotic prophylaxis has not been proven to be effective and there is no clear association between episodes of infective endocarditis and interventional procedures. Any benefits of prophylaxis need to be weighed against the risks of adverse effects for the patient and of antibiotic resistance developing. As a result, this guideline recommends that antibiotic prophylaxis is no longer offered routinely for defined interventional procedures.

Summary of recommendations

Adults and children with structural cardiac conditions.
Regard people with the following cardiac conditions as being at risk of developing infective endocarditis.

- Acquired valvular heart disease with stenosis or regurgitation
- Valve replacement
- Structural congenital heart disease, including surgically corrected or palliated structural conditions, but excluding isolated atrial septal defect, fully repaired ventricular septal defect or fully repaired patent ductus arteriosus and closure devices that are judged to be endothelial
- Hypertrophic cardiomyopathy
- Previous infective endocarditis

Advice

Offer people at risk of infective endocarditis clear and consistent information about prevention, including:

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

When to offer prophylaxis

Do not offer antibiotic prophylaxis against infective endocarditis-

- To people undergoing dental procedures
- To people undergoing non-dental procedures at the following sites:
    1. upper and lower gastrointestinal tract
    2. genitourinary tract: this includes urological, gynaecological and obstetric procedures and childbirth
    3. upper and lower respiratory tract, this includes ear, nose and throat procedures and bronchoscopy.
- Do not offer chlorhexidine mouthwash as prophylaxis against infective endocarditis to people at risk undergoing dental procedures.
- Discuss with microbiology if the patients' clinical status is of a complex nature.

Managing infection

- Investigate and treat promptly any episodes of infection in people at risk of infective endocarditis to reduce the risk of endocarditis developing.
- Discuss with microbiology if a person at risk of infective endocarditis is receiving antimicrobial therapy because they are undergoing a gastrointestinal or genitourinary procedure at a site where there is a suspected infection.

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THERAPEUTIC DRUG MONITORING

Aminoglycosides (Gentamicin, Amikacin, Tobramycin)

Gentamcin is widely used for surgical prophylaxis and for the treatment endocarditis and other serious infections. Amikacin and tobramycin are used in case of resistance to gentamicin.

Aminoglycosides are excreted via the kidneys and therefore accumulation occurs in renal impairment. The side effects associated with toxic levels are hearing and balance disorders and further renal impairment. These drugs should be used with caution in the Elderly patients, during pregnancy and in patients with renal impairment. If possible an alternative should be considered.

Patients must be informed of potential side effects.

Dose calculation and monitoring serum concentration

- The dose and dose interval must be based on patient's ideal body weight and renal function.
- Serum concentrations must be monitored to avoid both excessive and subtherapeutic levels.
- The doses must be given at the times prescribed.
- Serum concentrations must be monitored according to the regimens.
- Time of dose and time of sample must be documented at all times, otherwise the results cannot be acted upon.
- The treatment with aminoglycosides must be reviewed daily.

Glycopeptides (Vancomycin and Teicoplanin)

Glycopeptides are used for surgical prophylaxis and for the treatment of infections.

Intravenous Vancomycin dose calculation and monitoring serum concentration

- Vancomycin dose and dose interval must be based on patient's ideal body weight and renal function when treating infection.
- Serum concentrations must be monitored to avoid both excessive and subtherapeutic levels.
- The doses must be given at the times prescribed.
- Serum concentrations must be monitored according to the regimens.
- Time of dose and time of sample must be documented at all times, otherwise the results cannot be acted upon.
- The treatment with vancomycin must be reviewed daily.

Teicoplanin serum levels require monitoring in deep seated infections to ensure adequate levels have been achieved.

APPENDIX A High Dose Gentamicin Regimen [33]

Inform patient of potential side effects (hearing, balance and renal impairment)

HIGH DOSE GENTAMICIN REGIMEN

Need for treatment must be reviewed daily

Protocol
To calculate dose and interpret levels

This regime gives a constant dose of gentamicin of 7 mg/kg calculated from ideal body weight. A serum level is measured 6 – 14 hours after the first dose to determine the dosage interval. High dose gentamicin must be prescribed on the high dose gentamicin (7mg/kg) prescription, administration and monitoring chart.

1. FIND OUT PATIENT DETAILS

- Indication
- Allergy status
- Male/ Female
- Age
- Height (feet / inches)
- Weight (kg)
- Serum creatinine (micromol/L)
- U&Es

Calculate creatinine clearance*

2. CONTRAINDICATIONS FOR HIGH DOSE GENTAMICIN REGIME

Do not use this regimen for:
- Pregnant women
- Children < 16 years
- Urology surgery prophylaxis
- Any patient who has
  - Ascites
  - Limb amputation
  - Cystic fibrosis
  - Endocarditis
  - Major burns
  - Renal transplant
  - Renal impairment (creatinine clearance <30 mL/minute)*

Consider interactions

3. SELECT THE DOSE AND PRESCRIBE ON THE CHART

- Read off patients Ideal Body Weight (IBW).
- Compare Ideal Body Weight with Actual Body Weight (ABW)
- Select gentamicin dose based on whichever weight is less, Ideal Body Weight or Actual Body Weight.

ADULT MALES (>16 years)			
Height	Calculated IBW kg	Gentamicin dose mg	ABW (use if less than IBW) kg
5′ 1.52m	50	360	49 to 54
5′1″ 1.55m	52.3		
5′2″ 1.57m	54.6	400	55 to 59
5′3″ 1.6m	56.9		
5′4″ 1.62m	59.2		
5′5″ 1.65m	61.5	440	60 to 65
5′6″ 1.67m	63.8		
5′7″ 1.7m	66.1	480	66 to 71
5′8″ 1.72m	68.4		
5′9″ 1.75m	70.7		
5′10″ 1.78m	73.0	520	72 to 77
5′11″ 1.8m	75.3		
6′ 1.82m	77.6		
6′1″ 1.85m	79.9	560	78 to 82
6′2″ 1.88m	82.2		
6′3″ 1.9m	84.5		

ADULT FEMALES (>16 years)			
Height	Calculated IBW kg	Gentamicin dose mg	ABW (use if less than IBW) kg
5′ 1.52m	45.5	320	43 to 48
5′1″ 1.55m	47.8		
5′2″ 1.57m	50.1	360	49 to 54
5′3″ 1.6m	52.4		
5′4″ 1.62m	54.7	400	55 to 59
5′5″ 1.65m	57.0		
5′6″ 1.67m	59.3		
5′7″ 1.7m	61.6	440	60 to 65
5′8″ 1.72m	63.9		
5′9″ 1.75m	66.2		
5′10″ 1.78m	68.5	480	66 to 71
5′11″ 1.8m	70.8		
6′ 1.82m	73.1	520	72 to 77
6′1″ 1.85m	75.4		
6′2″ 1.88m	77.7		
6′3″ 1.9m	80.0	560	78 to 82

For heights outside this range contact pharmacy

Height in feet/inches = $\frac{\text{Height in centimetres}}{2.54}$

IBW calculations:
Male = 50 kg + (2.3 kg x number of inches over 5 feet)
Female = 45.5 kg + (2.3 kg x number of inches over 5 feet)

*Creatinine clearance (mL/minute) = $\frac{\textbf{F} \times (140 - \text{age}) \times \text{Body Weight}}{\text{serum creatinine}}$

F: Males 1.23 Females 1.04
Body weight: Actual or Ideal, whichever is less

HIGH DOSE GENTAMICIN REGIMEN

Need for treatment must be reviewed daily

Protocol
To calculate dose and interpret levels

4. Administration

Dilute the required dose of gentamicin in 100 mL sodium chloride 0.9%.

- Give by intravenous infusion over 1 hour.
- Record on the medicine chart the EXACT start time of the infusion.

5. Monitoring Gentamicin therapy

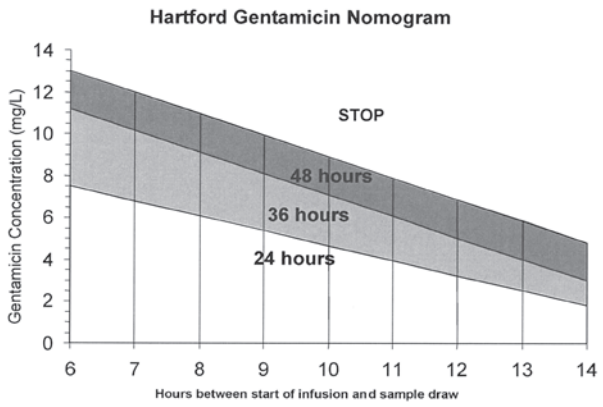
Requires monitoring of gentamicin levels and renal function

i. Documentation required on: *Medicine chart & Microbiology form*	• EXACT time & date of starting gentamicin infusion. • EXACT time & date of taking blood sample.
ii. Blood samples	Must only be taken by venepuncture from a site other than that used for administration.
iii. Monitoring serum levels	• 6 to 14 hours after (ideally 7 hours) **start of the FIRST infusion** (if possible during 0900 - 1800 hours). • Further monitoring as below:

Dose interval	Monitoring levels
24 hours	6-14 hours after every third dose
36 hours	6-14 hours after every dose
48 hours	6-14 hours after every dose

6. Interpretation of levels

- Plot the level on the nomogram.
- Adjust the dose interval according to where the level falls (ie 24 hourly, 36 hourly or 48 hourly).
- Adjust to the longer dose interval if the level falls on a one line.
- Stop gentamicin if the level is above the 48 hour line. Continue taking levels daily until the levels fall below 2 mg/L. Discuss with Microbiologist/ Pharmacist.
- If the serum creatinine is rising significantly, measure the gentamicin level as soon as possible, within the 6-14 hour window, and reassess the dosage interval.



Reference

Antimicrobial Agents and Chemotherapy 1995; 39: 650-655

Protocol produced by Yorkshire Antibiotic Pharmacist Group (May 2007)

Adapted by Rotherham / Barnsley Antibiotic Policy Development Group (2007 and 2010)

CONTACT NUMBERS

Rotherham		**Barnsley**	
Consultant Microbiologist	4742 7712	Consultant Microbiologist	2749
Microbiology Laboratory	4242	Microbiology laboratory	2687
Ward Clinical Pharmacist	Bleep	Ward Clinical Pharmacist	Bleep
Medicines Information	4126	Medicines Information	2857

Out of hours – via the switch board

APPENDIX B Therapeutic drug monitoring – Gentamicin Conventional Dose Regimen [8]

When High Dose Gentamicin Regimen contraindicated

Inform patient of potential side effects (hearing, balance and renal impairment)

<table>
<tr><td>Patient details
Required to advise /revise Gentamicin dose</td><td colspan="2">• Clinical diagnosis
• Height, weight, age
• Serum creatinine
• Gentamicin - dose, times of doses
- time samples taken and serum levels</td></tr>
<tr><td rowspan="3">Prescribing Gentamicin

Dose
(symmetric dosing)</td><td>Endocarditis
Streptococci and Enterococci</td><td rowspan="2">Other infections, when High Dose Gentamicin regimen contraindicated

Loading dose 2 mg/kg

Followed by 2 doses
1.5 mg/kg 12 hourly</td></tr>
<tr><td>80 mg 12 hourly
for 3 doses</td></tr>
<tr><td colspan="2">Revise dose after blood levels on 3rd dose</td></tr>
<tr><td colspan="3">Therapeutic levels</td></tr>
<tr><td>Pre dose
immediately before dose</td><td>< 1 mg/L</td><td>< 2 mg/L</td></tr>
<tr><td>Post dose
1 hour post dose</td><td>3 – 5 mg/L</td><td>5 – 10 mg/L</td></tr>
<tr><td colspan="3">Administration</td></tr>
<tr><td></td><td colspan="2">Intravenous bolus over 3 –5 minutes.

Important
• Doses must be given at prescribed times otherwise interpretation is difficult.
• Document on Drug Kardex the EXACT time the dose is given.</td></tr>
<tr><td colspan="3">Monitoring Gentamicin levels</td></tr>
<tr><td></td><td colspan="2">• First Pre dose & Post dose levels on the 3rd dose.
• Monitor blood levels on 3rd dose after changing the dose.
• Monitor twice a week if levels stable and the renal function stable

Important
• Blood samples must be taken via a venepuncture, not from any existing venous access.
• Document the EXACT times the bloods are taken on Drug Kardex and Laboratory Request Forms.</td></tr>
<tr><td>Monitoring renal function</td><td colspan="2">Three times a week</td></tr>
</table>

APPENDIX C Therapeutic Drug Monitoring – Amikacin [8]

Inform patient of potential side effects (hearing, balance and renal impairment)

Patient details Required to advise /revise Amikacin dose	• Clinical diagnosis • Height, weight, age • Serum creatinine • Amikacin - dose, times of doses - time samples taken and serum levels
Prescribing Amikacin Dose (symmetric dosing)	First 3 dose doses 7.5 mg /kg 12 hourly for 3 doses then review after blood levels on 3rd dose
Therapeutic serum levels Pre dose (Trough) One hour Post dose (Peak)	 Less than 10 mg/L 20 to 30 mg/L
Administration	Intravenous bolus over 3 –5 minutes. Important • Doses must be given at prescribed times otherwise interpretation is difficult. • Document on Drug Kardex the EXACT time the dose is given.
Monitoring Amikacin levels	• First Pre dose & Post dose levels on the 3rd dose. • Monitor blood levels on 3rd dose after changing the dose. • Monitor twice a week if levels stable and the renal function stable **Important** • Blood samples must be taken via a venepuncture, not from any existing venous access. • Document the times the bloods are taken on Drug Kardex and Laboratory Request Forms.
Sampling times	Pre dose (trough) levels - immediately before dose. Post dose (peak) levels - one hour after i/v bolus dose.
Monitoring renal function	Three times a week

APPENDIX D Therapeutic Drug Monitoring – Tobramycin [8]

Inform patient of potential side effects (hearing, balance and renal impairment)

Patient details Required to advise /revise Tobramycin dose	• Clinical diagnosis • Height, weight, age • Serum creatinine • Tobramycin - dose, times of doses - time samples taken and serum levels
Prescribing Tobramycin Dose (symmetric dosing)	*In normal renal function* *Loading dose* *3mg/kg* *followed by 2 doses* 1.5 mg/kg for 12 hourly Revise dose based on serum levels on 3rd dose Impaired renal function - contact Microbiologist
Therapeutic serum levels Pre dose (Trough) One hour Post dose (Peak)	 Less than 2 mg/L 6 to 10 mg/L
Administration	Intravenous bolus over 3 –5 minutes. **Important** • Doses must be given at prescribed times otherwise interpretation is difficult. • Document on Drug Kardex the EXACT time the dose is given.
Monitoring Tobramycin levels	Monitor blood levels on 3rd dose after starting tobramycin or when changing dose. **Important** • Blood samples must be taken via a venepuncture, not from any existing venous access. • Document the EXACT times the bloods are taken on Drug Kardex and Laboratory Request Forms.
Sampling times	Pre dose (trough) levels - immediately before dose. Post dose (peak) levels - one hour after i/v bolus dose.
Monitoring renal function	Three times a week

APPENDIX E Therapeutic Drug Monitoring – Teicoplanin

Patient details Required to advise /revise Teicoplanin dose	• Clinical diagnosis • Height, weight, age • Serum creatinine • Teicoplanin - dose, times of doses - time sample taken and serum level
Prescribing Teicoplanin	400 mg 12 hourly for 3 doses, followed by 400 mg od or 800 mg od in osteomyelitis
Therapeutic serum levels Pre dose (Trough)	Routine monitoring not necessary. Monitor in renal impairment and serious infections, e.g. endocarditis, osteomyelitis More than 10 mg/L 20-60 mg/L for osteomyelitis, HIV patients, i/v drug users
Administration	Intravenous bolus over 3 – 5 minutes
Monitoring	Blood levels before 5 th or 6th dose after starting teicoplanin or 2-3 days after changing the dose. **Important** • Blood samples must be taken via a venepuncture, not from any existing venous access.
Sampling times	Pre dose (trough) levels - immediately before dose.

APPENDIX F Therapeutic Drug Monitoring – Vancomycin

Inform patient of potential side effects (hearing, balance and renal impairment)

Patient details Required to advise /revise Vancomycin dose	• Clinical diagnosis • Height, weight, age • Serum creatinine • Vancomycin - dose, times of doses - time samples taken and serum levels
Prescribing Vancomycin Dose (symmetric dosing)	*In normal renal function* Commence with 1g 12 hourly for 3 doses then review after the blood levels on the 3rd dose Impaired renal function - contact Microbiologist
Therapeutic serum levels Pre dose (Trough)	 10 - 15 mg/L (15 - 20mg/L in endocarditis)
Administration	Reconstitute I g vial with 20 mL water for injection Dilute 1 g with 250 mL Infusion fluid Infusion fluid: sodium chloride 0.9% or glucose 5% Intravenous infusion rate 10 mg /minute **Important** • Doses must be given at prescribed times otherwise interpretation is difficult. • Document on Drug Kardex the EXACT time the dose is given.
Monitoring blood levels	• Immediately before giving the 3rd dose. • Repeat level twice a week if levels and the renal function stable. **Important** • Blood samples must be taken via a venepuncture, not from any existing venous access.
Sampling times	Pre dose (trough) levels - immediately before dose.
Monitoring renal function	Three times a week

APPENDIX G Post-Splenectomy prevention of infection – Advice for Clinicians All clinical areas incuding Inpatients and Outpatients

INTRODUCTION

Patients that have had splenectomies, or who have conditions causing hyposplenism, are at risk of infections. The organisms are usually encapsulated bacteria, of which *Streptoccus pneumoniae* is the most common but includes *Haemophilus influenzae* and *Neisseria meningitidis*. Other pathogens include *Escherichia coli, Pseudomonas aeruginosa,* and *Capnocytophagia canimorsus* from dog and animal bites. They are also at risk from other infections including protozoa (malaria and babesiosis).

The incidence of overwhelming post splenectomy infection is at 0.18 – 0.42% per year. The mortality may be as high as 69%. There is a lifelong risk of infection, but it is thought to be increased in the first two years post-splenectomy. The risk of infection is increased in children with Thalassaemia major and sickle cell disease. Patients with Hodgkin's disease, or immunosuppression are also at greater risk.

PATIENT EDUCATION

1. Information leaflet regarding infection risks and alert card
2. Medic alert bracelet
3. Regular antibiotics
4. Vaccinations
5. Attend hospital if feel unwell
6. Seek advice before travelling abroad

SPLENECTOMY ALERT

1. Complete the patient data alert inside the front cover of the patient's notes.
2. Inform the patient's General Practitioner that the patient has had a splenectomy and communicate any vaccinations given in the hospital. Primary care records need to be marked concerning the patient's increased risk of infection and vaccination status.
3. Ensure the patient has been given a splenectomy leaflet and alert card (available from the Haematology Department on request).
4. Encourage the patient to obtain a medic alert disc, or carry an alert card.
5. There is a small risk of splenectomised individuals being exposed to infective biological materials in certain occupations. This needs to be considered and discussed with the employer.
6. Patients having had a splenectomy, or who are hyposplenic, who become unwell and may have developed an infection, need to be admitted to hospital for systemic antibiotics.

IMMUNISATIONS

Planned Splenectomy
Immunisations should ideally be given four to six weeks (at least two weeks) prior to a planned splenectomy as long as there is no history of allergy.

Emergency Splenectomy
Immediately after an emergency splenectomy, patient's ability to mount antibody response is low and therefore immunisation should be given when the patient is recovering, prior to discharge from hospital.

a) Pneumococcal polysaccharide vaccine (Pneumovax II). Revaccination is recommended every 5 years in individuals in whom antibody levels may decline more rapidly e.g. with sickle cell disease, and lymphoproliferative diseases.
b) *Haemophilus influenzae* type b vaccine conjugate and meningococcal C vaccine (combined Hib/MenC). One dose irrespective of previous immunisation status.
c) Quadrivalent meningococcal ACWY conjugate vaccine. Single dose 1 month after pneumococcal polysaccharide and combined Hib/Menc vaccines irrespective of previous immunisation status.

Other vaccination considerations

a) Influenza vaccine should be offered annually.
b) Quadrivalent meningococcal ACWY conjugate vaccine should be offered if going to an endemic area on holiday.
c) Ensure vaccination and re-vaccination status is documented in notes
d) Patients that have had a splenectomy in the past should be offered vaccinations but consideration of lifelong antibiotic prophylaxis should be discussed with the patient.

ANTIBIOTICS

N.B. CONSULT PAEDIATRIC DOSES FOR CHILDREN

1. Patients should be advised to continue antibiotics lifelong. This is normally Penicillin V 250mg twice daily (adult dose). If the patient is allergic to Penicillin V, Erythromycin 500mg twice daily should be given.

2. If the patient is unlikely to comply with lifelong medication, it may be appropriate for them to have a course of antibiotics at home (eg Amoxicillin 3g) for "at risk" situations. This could also be given to all patients to be taken if they begin to feel unwell. Patients taking Erythromycin should be advised to increase this to therapeutic doses if they begin to feel unwell.

3. There is an increased risk of unusual infections following dog bites and in these cases the Penicillin V / Erythromycin should be increased to therapeutic doses.

4. Patients developing infection despite the above measures may need to be admitted as an emergency for intravenous antibiotics.

TRAVEL

1. Patients who have had a splenectomy, or have conditions causing hyposplenism, are at potential risk with overseas travel. Specialist advice may be obtained from infectious disease or tropical disease units.

2. Consider giving the patient a course of antibiotics to take with them on holiday. Patients visiting areas with meningitis should be offered the meningococcal ACWY polyvalent vaccine.

3. The main protozoal infections that cause problems associated with splenectomy are malaria and babeisosis. Patients travelling to regions with malaria should be advised to assiduously follow standard recommendations regarding basic preventative measures, prophylaxis and diagnosis and treatment of suspected malaria. Asplenic patients with malaria may have delayed clearance of parasites from the blood stream despite appropriate treatment. If they feel unwell on returning from holiday they should be advised to inform a health professional that they have been to a malarial area.

4. Babesiosis is a tic borne protozoal disease with similar clinical manifestations to malaria; the disease is rare and confined to a few regions around the world. Treatment for this includes a combination of Clindamycin and quinine.

References

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British Journal of Haematology 2011 155 308-17
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APPENDIX H Antimicrobial doses in renal impairment

Adapted from The Renal Drug Handbook (3rd edition) [34]

Key: CrCl Creatinine Clearance (based on Cockroft and Gault equation)
RF Renal function
CVVH Continuous venovenous haemofiltration

Antimicrobials	Route	Doses			
		Normal renal function	**CrCl 20-50 mL/ minute**	**CrCL 10-20 mL/ minute**	**CrCl <10 mL/ minute**
Aciclovir	oral	*Herpes simplex* 200-400 mg 4 hourly (five times daily)	As normal RF	200 mg 6 - 8 hourly	200 mg 12 hourly
	oral	*Herpes zoster* 800 mg 4 hourly (five times daily)	As normal RF	800 mg 8 -12 hourly	400 mg 12 hourly
Aciclovir	i/v	5-10 mg/kg 8 hourly	5-10 mg/kg 12 hourly	5-10 mg/kg 24 hourly	2.5-5 mg/kg 24 hourly
Amikacin Monitor serum levels	i/v	7.5 mg/kg ideal body weight Max. 1.5 g /day	Seek advice	Seek advice	Seek advice
Amoxicillin	oral i/v	500 mg 8 hourly Max 6 g /day 12 g in endocarditis	As normal RF	As normal RF	As normal RF Max. 6 g /day in endocarditis
Amphotericin (Ambisome)	i/v	1 – 3 mg/kg/day Max 5 mg/kg Unlicensed dose	As normal RF	As normal RF	As normal RF
Azithromycin	Oral	Genital Chlamydia 1 g single dose Other infections 500 mg daily	As normal RF	As normal RF	As normal RF
Aztreonam	i/v	1 g 8 hourly	As normal RF	1 g first dose then 0.5 g 8 hourly	1 g first dose then 0.5 g 12 hourly
Benzylpenicillin	i/v	1.2 – 2.4 g 6 hourly Max. 14.4 g /day	As normal RF	1.2 g 6 hourly	1.2 g 6 hourly
Caspofungin	i/v	1st dose 70 mg then <80 kg – 50 mg od >80 kg – 70 mg od	As normal RF	As normal RF	As normal RF
Cefotaxime	i/v	1 – 2 g 8 hourly Max 12g in 3 – 4 divided doses	As normal RF	As normal RF	1 g 8-12 hourly
Ceftazidime	i/v	1 g 8 hourly	1 g 12 hourly	1 g 24 hourly	CrCl 6-15 500 mg 24 hourly CrCl <5 500 mg –1g 48 hourly
Ceftriaxone	i/v	1 g once daily Max 2 – 4 g daily	As normal RF	As normal RF	As normal RF Max 2 g daily

Antimicrobial doses in renal impairment, continued

Key: CrCl Creatinine Clearance (based on Cockroft Goult equation)
RF Renal function
CVVH Continuous venovenous haemofiltration

Antimicrobials	Route	Doses			
		Normal renal function	**CrCl 20-50 mL/ minute**	**CrCL 10-20 mL/ minute**	**CrCl <10 mL/ minute**
Cefuroxime	i/v	1.5 g 8 hourly	As normal RF	750 mg 8 hourly	750 mg – 1.5 g once daily
Ciprofloxacin	i/v	400 mg 12 hourly	As normal RF	200 mg 12 hourly	200 mg 12 hourly
	Oral	500 mg 12 hourly	As normal RF	250 mg 12 hourly	250 mg 12 hourly
Clarithromycin	i/v oral	500 mg 12 hourly	As normal RF	250 - 500 mg 12 hourly	250 - 500 mg 12 hourly
Clindamycin	i/v Oral	600 mg – 1.2 g 6 hourly 150 – 450 mg 6 hourly	As normal RF	As normal RF	May require dose reduction
Co-amoxiclav	i/v	1.2 g 8 hourly	As normal RF	1.2 g 12 hourly	1.2 g stat then 1.2 g 12 hourly
	Oral	625 mg 8 hourly	As normal RF	As normal RF	As normal RF
Co-trimoxazole	i/v	PCP: 120 mg/kg (in 2-4 divided doses)	As inormal RF	60 mg /kg 12 hourly for 3 days 30 mg/kg 12 hourly	30 mg/kg 12 hourly
Doxycycline	Oral	100-200 mg once daily	As normal RF	As normal RF	As normal RF
Gentamicin Monitor levels	i/v	7 mg/kg Ideal body weight Appendix A	Seek advice	Seek advice	Seek advice
Erythromycin	i/v	1 g 6 hourly	As normal RF	As normal RF	500 mg 8 hourly
Flucloxacillin	i/v	1 g – 2 g 6 hourly	As normal RF	As normal RF	As normal RF Max 4 g daily
Fluconazole	i/v	400 mg od	As normal RF	As normal RF	200 mg od
Fusidic acid	Oral	500mg-1g every 8 hours	As normal RF	As normal RF	As normal RF

Antimicrobial doses in renal impairment, continued

Key: CrCl Creatinine Clearance (based on Cockroft Goult equation)
RF Renal function
CVVH Continuous venovenous haemofiltration

Antimicrobials	Route	Doses			
		Normal renal function	CrCl 20-50 mL/ minute	CrCL 10-20 mL/ minute	CrCl <10 mL/ minute
Meropenem	i/v	1 g – 2 g 8 hourly	1 g 12 hourly	500 mg 8 hourly	500 mg 12 hourly
Metronidazole	i/v	500 mg 8 hourly	As normal RF	As normal RF	As normal RF
Nitrofurantoin	oral	50-100 mg 6 hourly	Avoid	Contraindicated	
Ofloxacin	oral	200-400 mg daily increasing to 400 mg 12 hourly	200 – 400 mg once daily	200 – 400 mg once daily	200 mg once daily
Penicillin V	oral	500 mg 6 hourly	As normal RF	As normal RF	As normal RF
Piperacillin / tazobactam	i/v	4.5 g 8 houry	As normal RF	4.5 g 8 – 12 hourly	4.5 g 12 hourly
Rifampicin	i/v oral	450 mg -1.2 g daily in 2 -4 divided doses	Seek advice	Seek advice	Seek advice
Teicoplanin	i/v	Loading dose 400 mg 12 hourly for 3 doses then 200 – 400 mg once daily	As normal RF	Loading dose 400 mg 12 hourly for 3 doses then 200- 400 mg 24 – 48 hourly	Loading dose 400 mg 12 hourly for 3 doses then 200 – 400 mg 48 – 72 hours
Tigecycline	i/v	1st dose 100 mg then 50 mg 12 hourly	As normal RF	As normal RF	As normal RF
Tobramycin Monitor serum levels	i/v	1st dose 2 mg/kg then 1.5 mg/kg 12 hourly	Seek advice	Seek advice	Seek advice
Vancomycin Monitor serum levels	i/v	1 g 12 hourly	Seek advice	Seek advice	Seek advice

APPENDIX I Types of Antimicrobials [8]

ANTIBACTERIALS

Betalactams			
Penicillins Amoxicillin Benzylpenicillin Co-amoxiclav Flucloxacillin Penicillin V Piperacillin/tazobactam Temocillin	**Cephalosporins** Cefalexin Cefotaxime Ceftazadime Ceftriaxone Cefuroxime	**Carbapenems** Ertapenem Imipenem Meropenem	**Monobactam** Aztreonam
Macrolides	**Tetracyclines**	**Quinolones**	**Sulphonamides**
Azithromycin Clarithromycin Erythromycin	Doxycycline Minocycline Tigecycline	Ciprofloxacin Ofloxacin	Co-trimoxazole
Aminoglycosides	**Glycopeptides**	**Others**	
Amikacin Gentamicin Tobramycin	Teicoplanin Vancomycin	Chloramphenicol Colomycin Linezolid Metronidazole Nitrofurantoin	Rifampicin Sodium fusidate (Fusidic acid) Trimethoprim

ANTIFUNGALS

Amphotericin (Ambisome®) Caspofungin Fluconazole Voriconazole	Itraconazole Miconazole Nystatin Terbinafine		

ANTIVIRALS

Aciclovir Famciclovir Valaciclovir			

See BNF for further details and drugs not listed

CONTACT NUMBERS

ROTHERHAM NHS FOUNDATION TRUST Telephone number 01709 820000		**BARNSLEY HOSPITAL NHS FOUNDATION TRUST** Telephone number 01226 730000	
Consultant Medical Microbiologist	7712	Consultant Medical Microbiologist	2749
Associate Specialist	4742	Consultant Medical Microbiologist	4986
Microbiologist on Duty	Bleep 280	Microbiologist on Duty	Bleep 207
Clinical Scientist	4741	Chief Biomedical Scientist	3044
Microbiology Laboratory	4242	Microbiology Laboratory	2687
Ward Clinical Pharmacist	Bleep	Ward Clinical Pharmacist	Bleep
Medicines Information Pharmacist	4126	Medicines Information Pharmacist	2857
Pharmacist Antimicrobial Lead	8132	Pharmacist Antimicrobial Lead	Bleep 688
Out of hours – contact appropriate on-call staff via Switchboard			

Consultant in Communicable Disease Centre (CCDC)	0900 - 1700 1700 - 0900	Tel: 01142 428850 via switchboard

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In consultation with all consultants and senior prescribers of both hospitals

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CONTACTING MICROBIOLOGIST

Before contacting for advice:

- Assess the patient
- Know the admitting diagnosis
- Read the most recent progress notes and assessment from the prior shifts
- Have appropriate documents available eg Nursing and Medical Records, PAR (Patient at risk), Charts, Allergies, IV fluids, Resuscitation status

and communicate using the SBAR Reporting Tool.

SBAR Reporting Tool

Situation

- State your name and unit/ward
- I am calling about patient's name and age
- The reason I am calling is…

Background

- State the admission diagnosis/working diagnosis and date of admission
- Relevant medical history including family history; underlying condition/ co morbidities
- A brief summary of treatment to date; current antimicrobial therapy and duration; recent antimicrobial use (within the last month if possible)
- History of MRSA/ ESBL/ other resistant organisms/ C.difficile diarrhoea
- Previous microbiology results
- Infective markers

Assessment

State your assessment of the patient

- Allergies
- Renal function
- Hepatic function

Recommendations/Actions

- I would like (state what you would like to see done)
- Determine timescale
- Is there anything else I should do?
- Record name and phone or bleep number of contact
- Patient concerns, expectations and wishes

Don't forget to document the call!

Dawn Adsetts
Rotherham Critical Care Outreach

SEPSIS SIX

Six simple tasks that save lives!

Within one hour:

1.Give high flow oxygen
Via non rebreathe mask

2.Take blood cultures

3.Give IV antibiotics

4.Start IV resuscitation
Hartmanns or equivalent

5.Check FBC and lactate

6.Monitor hourly Urine Output
May require catheter

Adapted from Survive Sepsis. Sepsis 6 2010. www.survivesepsis.org.uk

Survive Sepsis (2010) has shown that the chances of an individual dying from sepsis can be halved by following the Sepsis Six.

NOTES

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