MRSA

Patients at high risk of MRSA carriage

- Patients who are known to have previously been MRSA positive
- Frequent admissions to any healthcare facility
- Transfers from other hospitals, in the UK or abroad
- Residents in residential care facilities
- Those who have had any hospital admission within the previous 6 months

Many uncomplicated infections can be treated with oral **doxycycline** (100mg *bd*). More severe, complicated deep-seated infections or those associated with prosthetic material will require IV vancomycin. See antibacterial guidelines on intranet for more information.
Colonisation with MRSA alone (including wounds, ulcers, etc.) does not need treatment.
See Infection Control website for policies on MRSA screening, isolation and decontamination.

Clostridium difficile Infection (CDI)

See CDI guide on intranet for more information. Formerly known as *C.difficile* associated diarrhoea.

Start CDI treatment if either of the following:

- diarrhoea (4 or more loose stools/24 hours) that is hospital-acquired (over 48 hours after admission)
- or patient over 65 years with community-acquired diarrhoea

(Loose stools are those that take the shape of the container; see Bristol Stool Chart on ward.)

Initial management	**Risk assessment – severe if:**
• isolate/cohort patient • commence oral vancomycin 125mg *qds* • give IV fluids to maintain normal fluid balance • stop proton-pump inhibitors if possible. • send stool sample for *C. difficile* toxin (CDT) test • stop current antibacterials unless unsafe to do so. If continuing antibacterial therapy is essential, seek Microbiology advice.	• more than 6 bowel motions/24 hours • or WCC over 20x10⁹/L • or 2 or more of: temperature over 38°C or under 36°C pulse over 100 beats/minute respiratory rate over 20 breaths/min WCC over 10x10⁹/L or under 4x10⁹/L

Empirical treatment treat for 14 days	vancomycin 125mg po *qds*
Severe CDI + **normal colon on abdominal X-ray** treat for 14 days	vancomycin 125mg po *qds* + resuscitate patient with IV fluids and correct electrolytes + immediately involve Gastroenterology or Microbiology/ID in the patient's management
Severe CDI + **abnormal colon on abdominal X-ray** treat for 14 days	vancomycin 125mg *qds* oral/nasogastric tube + metronidazole 500mg *iv tds* + resuscitate patient with IV fluids and correct electrolytes + urgent review by Gastroenterology and/or colorectal surgeons
Relapse treat for 14 days	vancomycin 125mg po *qds* Seek expert advice when treating patients who have relapsed more than once or who are severely ill.

Good Prescribing Principles

- **Prescribe antimicrobials only when clinically justified.**
- **Always give first antimicrobial dose promptly (i.e. ideally within one hour).**
  - Prescribe first dose in the 'stat' section of the medication chart.
  - Ensure nursing staff are aware of the prescription.
- **Review empiric antimicrobial therapy promptly. Change to pathogen-directed therapy or discontinue as appropriate.**

- Document the indication and course length or review date on the medication chart and in the medical notes.
- All antimicrobial prescriptions must follow Trust guidelines where they exist.
  The rationale behind any deviations from these guidelines must be documented in the medical notes. Repeated breaches of the Trust antimicrobial policy will be reviewed by the Medical Director.
- Consider the following individual patient and drug-specific factors:
  - previous antimicrobial history
  - previous infection with multi-resistant organisms
  - allergy to antimicrobials
  - availability of antimicrobials and effective absorption by oral route
- Prescribe intravenous (IV) therapy only for those patients with severe infections and/or who are unable to take oral antimicrobials.
- Review IV antimicrobials at **48 hours** and switch to oral if appropriate.
- Antimicrobials should generally be prescribed for a maximum of **seven days.**
- Review microbiology results regularly and use them to rationalise antimicrobial therapy.
- Broad-spectrum antimicrobials should be restricted to the treatment of serious infections when the pathogen is not known or when other effective agents are unavailable. Using narrower spectrum agents reduces the likelihood of the emergence of resistant organisms and super-infections e.g. diarrhoea associated with *Clostridium difficile*.

Antimicrobial governance

Prescribing of broad-spectrum antimicrobial agents is governed by the Oxford Hospitals antimicrobial guidelines policy statement. Pharmacists are required to confirm authorisation and request a review by/discussion with Microbiology before dispensing restricted antimicrobials.

Penicillin Allergy

Penicillins are life-saving antimicrobials and patients should not be labelled 'penicillin-allergic' without careful consideration.
Life-threatening adverse reactions to penicillins due to immediate hypersensitivity (IgE mediated, Type I) are rare. A reliable history is key.
Severe allergy = all Type I reactions and some non-Type I reactions, depending on clinical severity e.g. Stevens Johnson Syndrome (SJS) or toxic epidermal necrolysis (TEN)
Non-severe allergy = most non-Type I reactions

Characteristics	**Type I immediate reactions**	**Non-Type I reactions**
Timing of onset	Usually 1 to 4 hours from exposure (up to 72 hours)	More than 72 hours from exposure
Clinical signs	Anaphylaxis Laryngeal oedema Wheezing / bronchospasm Angioedema Urticaria / pruritis Diffuse erythema	Maculopapular rash Morbilliform rash Drug fever (serum sickness) Tissue injury (immune complex) Contact dermatitis SJS / toxic epidermal necrolysis

In patients with a history of clinical signs of Type I immediate hypersensitivity (life-threatening allergy) or severe non-type I reactions e.g. SJS:

Drugs in RED are contra-indicated unless approved by Micro/ID or Immunology in a specific patient.

Drugs in ORANGE are NOT for use in patients with a severe penicillin allergy, unless at the discretion of Microbiology/ID.

Drugs in GREEN are considered safe.

In patients with a history of mild to moderate non-type I reactions as exemplified by an isolated rash but not drug fever or immune-complex type reactions, drugs in the **RED** or **ORANGE** category can be used with caution. If in doubt, discuss with Microbiology/ID.

All patients – all drugs with * must be agreed by Microbiology/ID before use, or prescribed in specialities as per specialist guidelines. This also applies to any antibacterial not listed below.

Red	**Orange**	**Green**	
amoxicillin **benzylpenicillin (penicillin G)** **co-amoxiclav (amoxicillin + clavulanic acid) (Augmentin®)** **flucloxacillin** **penicillin V (phenoxymethylpenicillin)** **procaine benzylpenicillin** **piperacillin + tazobactam (Tazocin®)** ***temocillin**	**cefalexin** ***cefotaxime** ***ceftazidime** **ceftriaxone** ***ertapenem** ***imipenem (*Primaxin®)** ***meropenem**	***amikacin** **azithromycin** ***aztreonam** ***chloramphenicol** **ciprofloxacin** **clarithromycin** **clindamycin** ***colistin (*colistimethate sodium)** **co-trimoxazole** **doxycycline** **erythromycin** **gentamicin** ***linezolid**	**metronidazole** **minocycline** ***moxifloxacin** **neomycin** **nitrofurantoin** **oxytetracycline** **rifampicin** ***sodium fusidate** **teicoplanin** **tetracycline** **trimethoprim** **tobramycin** **vancomycin**

IV-to-Oral Switch Therapy (IVOST)

Switch to oral antimicrobial agents should be considered for patients who meet all of the following inclusion criteria:

- Still on intravenous therapy after 48 hours.
- Body temperature 36-38°C for past 48 hours.
- Improving signs/symptoms of infection + patient's general condition getting better.
- Patient's clinical markers improving after treatment with IV therapy:
  - no unexplained tachycardia (pulse below 90 beats/minute in past 12 hours)
  - blood pressure stable (in past 24 hours)
  - respiratory rate less than 20 breaths/minute (in past 24 hours)
  - a high white cell count is falling or white cell count between 4-12 x10⁹/L
  - falling C-reactive protein (CRP).
- Able to tolerate oral/enteral medication and appropriate oral antimicrobial available.
- Functioning gastrointestinal tract without risk of malabsorption.
- No deep-seated or high-inflammation infection that requires high tissue antimicrobial concentrations.
  For example: infective endocarditis, *S. aureus* bacteraemia, meningitis/CNS infection, mediastinitis, osteomyelitis/septic arthritis, abscess/empyema, legionella pneumonia, cystic fibrosis exacerbation, infection of prosthetic device/foreign body, severe soft tissue infection e.g. necrotising fasciitis.

Recommended oral agents when converting from IV empirically

Intravenous	**Oral (check MC&S results first)**
amoxicillin 500mg-1g *tds*	**amoxicillin** 500mg-1g *tds*
benzylpenicillin 1.2-2.4g *qds*	**amoxicillin** 500mg-1g *tds*
ceftazidime 1g *tds*	Discuss with Microbiology
ceftriaxone 1-2g *od* (non-meningitis)	**co-amoxiclav** 625mg *tds* (in penicillin allergy, discuss with Microbiology if unsure)
ceftriaxone 1-2g *od* + **metronidazole** 500mg *tds*	**co-amoxiclav** 625mg *tds* (in penicillin allergy, discuss with Microbiology if unsure)
ciprofloxacin 200-400mg *bd*	**ciprofloxacin** 500mg *bd*
clindamycin 600mg *qds*	**clindamycin** 300-450mg *qds*
co-amoxiclav 1.2g *tds*	**co-amoxiclav** 625mg *tds*
clarithromycin 500mg *bd*	**clarithromycin** 500mg *bd*
flucloxacillin 1-2g *qds*	**flucloxacillin** 500mg-1g *qds*
meropenem 500mg *tds*	Discuss with Microbiology
metronidazole 500mg *tds*	**metronidazole** 400mg *tds*
piperacillin+tazobactam (Tazocin®)	Discuss with Microbiology
vancomycin	Discuss with Microbiology

Vancomycin IV Treatment Protocol

Caution – nephrotoxic drugs: Concurrent or sequential systemic use of potentially nephrotoxic drugs requires careful monitoring of serum creatinine and vancomycin concentrations. Examples of nephrotoxic drugs: amikacin, amphotericin B, ciclosporin, cisplatin, colistin, gentamicin, methotrexate, tobramycin, radio-contrast media and tacrolimus. Caution also with aciclovir, ACE-inhibitors, furosemide and bumetanide.

Contact Ward Pharmacist or Microbiology for advice or interpretation of levels

1. **Loading dose:** 1g iv for all patients (prescribe in 'once only' section of drug chart)
2. **Determine Creatinine Clearance (CrCl)** CrCl (mL/min) = $\frac{F \times (140\text{-age}) \times \text{weight (kg)}}{\text{Serum Cr } (\mu\text{mol/L})}$
   F=1 (females), F=1.25 (males)
3. **Select initial maintenance dose and dose interval from box below:**

Calculated CrCl (mL/min)	**Starting dose**	**Dose interval**	**Administration** (sodium chloride 0.9% or glucose 5%)
above 50	1 gram	12 hours (10:00+22:00)	250mL over 100 minutes
31-50	500mg	12 hours (10:00+22:00)	100-250mL over 60 minutes
20-30	750mg	**24 hours** (10:00)	250mL over 80 minutes
below 20 or patient on peritoneal dialysis	Monitor level every 24 hours. When concentration is 15mg/L or below give another 1g *iv* dose.		250mL over 100 minutes
patient on haemodialysis	Follow Renal Unit guidelines		give over 100 minutes

4. **Monitor serum vancomycin concentration** (aim pre-dose concentration 10-15mg/L)
   Take first blood sample before the morning dose, ~48 hours after starting vancomycin.
   Take blood sample immediately before the morning dose is due, then give the dose, and then check the result before the next dose. There is usually no need to monitor peak levels.

Trough concentration	**Dosage adjustment needed**
below 10mg/L	Increase dose by ~25% e.g. 500mg *bd* to 650mg *bd* (round to nearest 50mg). Monitor concentration again in ~24 hours (before morning dose).
10-15mg/L	Desirable concentration - no adjustment needed. Monitor weekly if patient has stable renal function.
15.1-20mg/L	Reduce dose by ~25% eg 500mg *bd* to 400mg *bd* (round to nearest 50mg). Monitor concentration again in ~24 hours (before morning dose).
over 20mg/L	In patients with normal renal function, check timing of sampling versus drug administration. If sample timing does not account for high level: 1. Omit further doses 2. Monitor concentrations at 24 hour intervals until 15mg/L or below 3. Restart vancomycin with ~25% dose reduction (round to nearest 50mg)

See Vancomycin IV Guideline on intranet for further information.

Gentamicin IV Treatment Protocol

Caution – nephrotoxic drugs: Concurrent or sequential systemic use of potentially nephrotoxic drugs requires careful monitoring of serum creatinine and gentamicin concentrations. Examples of nephrotoxic drugs: amikacin, amphotericin B, ciclosporin, cisplatin, colistin, methotrexate, tobramycin, radio-contrast media, tacrolimus and vancomycin. Caution also with aciclovir, ACE-inhibitors, furosemide and bumetanide.

Contact Ward Pharmacist or Microbiology for advice or interpretation of levels

The gentamicin dosing advice below does not apply to patients with ascites (>20% of body weight), burns (>20% of body surface area) or who are pregnant. See Gentamicin IV Guideline on intranet for dosing advice in these patients and consult Microbiology if needed.

1. **Determine Creatinine Clearance (CrCl)**
   CrCl (mL/min) = $\frac{F \times (140\text{-age}) \times \text{weight (kg)}}{\text{Serum Cr } (\mu\text{mol/L})}$ F=1 (females) F=1.25 (males)
2. **Estimate ideal body weight (IBW)**
   IBW (kg) = (males 50kg, females 45kg) + 2.3kg per inch over 5ft
   If overweight by more than 20% above IBW, use an adjusted weight for the gentamicin dose.
   adjusted weight (kg) = IBW + 0.4 x (actual weight – IBW)
3. **Calculate gentamicin dose** (use table below and round dose to nearest 40mg)

Usual treatment dose	5-7mg/kg *single dose*
Treatment dose for febrile neutropenia (normal renal function)	7mg/kg for two doses, 24 hours apart
Treatment dose: **patient with renal impairment** (CrCl under 60 mL/min) **or at higher risk of renal impairment** (e.g. frail elderly patients).	3 mg/kg *single dose*
Treatment of bacterial endocarditis (normal renal function)	1mg/kg *iv tds* ongoing therapy
Prophylaxis – for surgery or for change of chronic indwelling urethral catheter in males (give just before catheter change)	1.5mg/kg *single dose*

4. **Gentamicin administration:** iv infusion over 60 minutes.
   Doses under 120mg can be given as an iv bolus over at least 3 minutes.
5. **Prescribe gentamicin iv dose** in the 'once only' section of the medication chart.
   (Exception: bacterial endocarditis treatment. Prescribe this in the 'regular dosing' section.)

Most patients only require one dose of gentamicin.

- Only give two or more doses of gentamicin after consultation with Microbiology.
  (The exception is febrile neutropenia where two doses are given.)
- Also discuss all cases of bacterial endocarditis with Microbiology.
  If more than one gentamicin dose is required, consult Gentamicin IV Guideline on Trust intranet for further information for dosing advice and discuss with Microbiology if needed.

Patients with renal impairment (CrCl under 60mL/min) or unstable/deteriorating renal function: do not give any further gentamicin until serum concentration is below 2mg/L.

Bacterial endocarditis – monitoring gentamicin levels are mandatory.
Aim for: trough (pre-dose) below 1mg/L, peak (1 hour post-dose) 3-5 mg/L.

See Gentamicin IV Guideline on intranet for further information.

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Oxford Radcliffe Hospitals NHS Trust
Nuffield Orthopaedic Centre NHS Trust

Oxford Hospitals Adult Inpatient Pocket Antimicrobial Guide

For full guides and latest updates see the 'Antimicrobial Guidelines' web-page, under 'Clinical Resources' on the ORH intranet home-page.

For further advice contact:
Microbiology & Infectious Diseases 20880/20893 or bleep (JR)4077
(or via switchboard after hours)
Medicines Information 21505 (or via switchboard after hours)

Important notes for all sections of Pocket Antimicrobial Guide

All drug doses are based on normal renal function. For dosing in renal impairment, contact the ward pharmacist.

Typical durations are for **uncomplicated** infections.

Write the indication and course length or review date on all antimicrobial prescriptions.

Gentamicin – modify dose regimen in renal impairment. See gentamicin iv protocol.

Co-amoxiclav – do NOT use if patient is allergic to penicillin. Avoid in biliary disease and in cirrhosis/alcoholic hepatitis. In pregnancy of 20-36 weeks gestation, if woman is at risk of preterm labour, consider using a cephalosporin instead of co-amoxiclav (risk of NEC in baby).

Nitrofurantoin – use with caution in renal impairment (creatinine clearance less than 60ml/minute). Avoid in G6PD deficiency, upper UTI / pyelonephritis and near term in pregnancy.

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Central Nervous System

Indication and typical duration*	First-line	Second-line/alternative
Meningitis community-acquired bacterial†: Non-pregnant female and male patients aged 18-50 years See Community-acquired Meningitis guide on intranet	ceftriaxone 2g iv *bd*	**Severe penicillin allergy:** chloramphenicol 25mg/kg iv *qds* (reduce to 12.5mg/kg *qds* after 48 hours)
	Consider corticosteroids – see meningitis guide on intranet	
Meningitis community-acquired bacterial with risk of Listeria†: (Pregnant females, immunocompromised patients and patients aged over 50 years) See Community-acquired Meningitis guide on intranet	ceftriaxone 2g iv *bd* + amoxicillin 2g iv *4-hourly* (review amoxicillin after 48 hours)	**Non-severe penicillin allergy:** ceftriaxone 2g iv *bd* **plus** discuss Listeria risk with Microbiology **Severe penicillin allergy:** chloramphenicol 25mg/kg iv *qds* (reduce to 12.5mg/kg *qds* after 48 hours) **plus** discuss Listeria risk with Microbiology
	Consider corticosteroids – see meningitis guide on intranet	
Post operative meningitis / EVD-associated ventriculitis: See Neurosurgical Meningitis guideline on intranet	ceftriaxone 2g iv *bd* + If high risk of MRSA carriage add vancomycin iv protocol	If recent antibacterial therapy, within 1 month (excluding surgical prophylaxis) or patient on Neurosciences ICU: ceftazidime 2g iv *tds* + vancomycin iv protocol
	If associated with intracranial shunt add vancomycin 10mg intrathecal *od*: see intracranial shunt infection guide on intranet	
Viral encephalitis 14-21 days	**aciclovir** 10mg/kg iv *tds* (use ideal body weight for obese patients) Send CSF sample for viral PCR	

* Discuss duration with Microbiology

† Inform the Health Protection Agency of all cases of meningitis (including viral) and meningococcal septicaemia (tel in hours: 0845 279 9879, tel out of hours: 0870 238 5155). Treatment regimen identical for meningococcal septicaemia.

Respiratory

Indication and typical duration	First-line	Second-line/alternative
See Pneumonia guide on intranet. Avoid **simvastatin** in patients on clarithromycin.		
Community and healthcare-acquired pneumonia, mild CURB-65 score = 0-1 + previously untreated 3-5 days	amoxicillin 500mg po *tds*	doxycycline 100mg po *bd* **or** clarithromycin 500mg po *bd*
Community-acquired pneumonia, mild-to-moderate CURB-65 score = 2 **or** CURB-65 score = 0-1 + treated within past month 3-5 days (both antibacterials)	amoxicillin 500mg-1g po/iv *tds* + clarithromycin 500mg po *bd*	ceftriaxone 2g iv *od* + clarithromycin 500mg po *bd* **Severe penicillin allergy (3rd-line):** moxifloxacin 400mg po *od*
	If high risk of MRSA carriage: add vancomycin iv protocol	
Community-acquired pneumonia, severe CURB-65 score ≥ 3 5-7 days (review iv daily)	co-amoxiclav 1.2g iv *tds* + clarithromycin 500mg iv/po *bd* **or (2nd-line):** ceftriaxone 2g iv *od* + clarithromycin 500mg iv/po *bd*	**Severe penicillin allergy (3rd-line):** moxifloxacin 400mg po *od* (give via iv route if nil-by-mouth or not absorbing)
	If high risk of MRSA carriage: add vancomycin iv protocol	
Healthcare-acquired pneumonia, moderate-to-severe 5 days (review iv daily)	co-amoxiclav 1.2g iv *tds* **or (2nd-line):** ceftriaxone 2g iv *od*	**Severe penicillin allergy (3rd-line):** moxifloxacin 400mg po *od* (give via iv route if nil-by-mouth or not absorbing)
	If high risk of MRSA carriage: add vancomycin iv protocol	
COPD infective exacerbation 5-7 days If consolidation on chest X-ray, treat as for pneumonia (above). Antibacterials are only indicated if patient is febrile or has purulent sputum.	co-amoxiclav 625mg po *tds*	doxycycline 100mg po *bd*
	If severe sepsis:	
	co-amoxiclav 1.2g iv *tds* **or (2nd-line):** ceftriaxone 2g iv *od*	**Severe penicillin allergy (3rd-line):** moxifloxacin 400mg po *od* (give via iv route if nil-by-mouth or not absorbing)
Aspiration pneumonia community-acquired 5 days Not an indication for antibacterials unless an established infection.	co-amoxiclav 625mg po *tds*	doxycycline 100mg po *bd* + metronidazole 400mg po *tds*
	If strictly nil-by-mouth:	
	co-amoxiclav 1.2g iv *tds* **or (2nd-line):** ceftriaxone 2g iv *od* + metronidazole 500mg iv *tds*	**Severe penicillin allergy (3rd-line):** moxifloxacin 400mg iv *od*

Gastrointestinal

Indication and typical duration	First-line	Second-line/alternative
***Helicobacter pylori* infection** 7 days *See H. pylori* guideline on intranet	omeprazole 20mg po *bd* + amoxicillin 1g po *bd* + clarithromycin 500mg po *bd*	omeprazole 20mg po *bd* + clarithromycin 500mg po *bd* + metronidazole 400mg po *bd*
Cholecystitis and ascending cholangitis 7-14 days (review iv daily)	ceftriaxone 2g iv *od* + metronidazole# 400mg po *tds*	ciprofloxacin# 500mg po *bd* + metronidazole# 400mg po *tds*
Acute severe pancreatitis with no clear evidence of infection	No antibacterials	
Spontaneous bacterial peritonitis Ascitic fluid WBC >0.3 x 10⁹/L 5 days	ceftriaxone 2g iv *od*	ciprofloxacin 500mg po *bd*
Primary intra-abdominal sepsis, low-risk* eg diverticulitis 7 days (review iv daily)	co-amoxiclav 1.2g iv *tds* + metronidazole# 400mg po *tds*	ceftriaxone 2g iv *od* + metronidazole# 400mg po *tds* **Severe penicillin allergy:** ciprofloxacin# 500mg po *bd* + metronidazole# 400mg po *tds*
Systemic infection before results are available: severe sepsis or septic shock	gentamicin 5mg/kg iv *single dose* AND antibacterials as above as per 'systemic infection before results are available: sepsis'	
Primary / secondary intra-abdominal sepsis, high-risk† eg post-op 7 days (review iv daily) For oral follow-on therapy consult Microbiology.	piperacillin/tazobactam (Tazocin®) 4.5g iv *tds* + metronidazole# 400mg po *tds*	ceftazidime 1g iv *tds* + metronidazole# 400mg po *tds* **Severe penicillin allergy:** ciprofloxacin# 500mg po *bd* + metronidazole# 400mg po *tds*

* **Low-risk patient:** community-acquired + no prior similar antibacterials.

† **High-risk patient:** prolonged hospital stay, recent cephalosporin or co-amoxiclav.

R only give via iv route if nil-by-mouth or not absorbing: metronidazole (500mg iv *tds*), ciprofloxacin (400mg iv *bd*)

Systemic sepsis of UNKNOWN source

In all situations a senior review is needed within 24hrs with a review of diagnosis, microbiological investigations and discussion of antimicrobial regimen with Microbiology.

Definitions: severity of systemic infections

Sepsis:	Clinical evidence of infection ***plus*** 2 or more SIRS (systemic inflammatory response syndrome) criteria: • temperature >38 or <36°C • respiratory rate >20/min • heart rate >90 bpm • WCC >12 or <4 x 10⁹/L
Severe sepsis:	Sepsis **plus** organ dysfunction: hypotension (systolic BP <90mmHg) or hypoperfusion (lactic acidosis, oliguria or acute alteration in mental status).
Septic shock:	Sepsis with hypotension despite adequate fluid resuscitation. **Septic shock is a medical emergency and requires urgent treatment with effective antimicrobials to prevent mortality. Contact Microbiology immediately.**

Infection of UNCONFIRMED Chest and/or Urinary Origin

Indication and typical duration	First-line	Second-line/alternative
Possible infection: less than 2 SIRS criteria present	Take appropriate cultures (blood, urine, etc). Close observation without antibacterials may be appropriate.	
Systemic infection before results are available: sepsis	co-amoxiclav 1.2g iv *tds*	ceftriaxone 2g iv *od* **Severe penicillin allergy:** ciprofloxacin 500mg po *bd* (400mg iv *bd* if nil-by-mouth or not absorbing) + vancomycin iv protocol
	If likely GI source add metronidazole 400mg po *tds* (500mg iv *tds* if nil-by-mouth or not absorbing)	
	If high risk of MRSA carriage: add vancomycin iv protocol	
Systemic infection before results are available: severe sepsis or septic shock	gentamicin 5mg/kg iv *single dose* AND antibacterials as above as per 'systemic infection before results are available: sepsis'	

Surgical wound infections

Before starting antibacterial treatment, take appropriate samples for culture (e.g. pus, blood culture). Adjust empirical treatment according to culture results/clinical progress. Consult Microbiology if required.

Indication	First-line	Second-line/alternative
Wound infection: clean procedures	flucloxacillin 1g iv *qds* (or 500mg po qds)	ceftriaxone 2g iv *od* **or** cefalexin 500mg po *tds*
	If high risk of MRSA carriage: substitute vancomycin iv protocol	
Wound infection: clean-contaminated procedures	co-amoxiclav 1.2g iv *tds* (or 625mg po *tds*)	ceftriaxone 2g iv *od* **or** cefalexin 500mg po *tds*
	If high risk of MRSA carriage: add vancomycin iv protocol	
Wound infection: contaminated procedures and dirty procedures	metronidazole# 400mg po *tds* + co-amoxiclav 1.2g iv *tds* (or 625mg po *tds*)	metronidazole# 400mg po *tds* + ceftriaxone 2g iv *od* **or** cefalexin 500mg po *tds*
	If high risk of MRSA carriage: add vancomycin iv protocol	

R Only give metronidazole (500mg iv *tds*) via iv route if nil-by-mouth or not absorbing.

Urinary Tract Infection

Indication and typical duration	First-line	Second-line/alternative
Asymptomatic bacteriuria is common and does NOT need treatment in non-pregnant adults unless clinical signs or sepsis. **Older patients** with no urinary symptoms + no signs of systemic sepsis + positive urinalysis: withold empirical antibacterial treatment until confirmation of urinary infection from cultures. **See guidelines** for UTIs in older people or UTIs in pregnancy on intranet for more information.		
Non-severe lower UTI female (non-pregnant) + male 3 days – uncatheterised women 7 days – all other patients	**Modify according to sensitivities** nitrofurantoin 50mg po *qds* **or** co-amoxiclav 625mg po *tds*	**3rd-line (use when penicillin allergy + renal impairment):** trimethoprim 200mg po *bd*
MRSA UTI 7 days (14 days if systemic sepsis)	**Lower UTI with no systemic sepsis:** nitrofurantoin 50mg po *qds*	**UTI with systemic sepsis or pyelonephritis:** vancomycin iv protocol
Pyelonephritis/upper UTI (including pregnancy) 14 days (review iv daily) For oral follow-on therapy see IV-to-oral switch recommendations	co-amoxiclav 1.2g iv *tds* In pregnancy of 20-36 weeks gestation, if woman is at risk of preterm labour, consider using a cephalosporin instead of co-amoxiclav (risk of NEC in baby).	ceftriaxone 2g iv *od* **Severe penicillin allergy:** ciprofloxacin 500mg po *bd* (400mg iv *bd* if nil-by-mouth or not absorbing). **Consult microbiology if pregnant.**
	Consider adding gentamicin 5mg/kg iv *single dose*. If high risk of MRSA carriage: add vancomycin iv protocol.	
Asymptomatic bacteriuria in pregnancy 7 days	Await sensitivities then treat – options include: amoxicillin 500mg po *tds* (avoid in penicillin allergy) nitrofurantoin 50mg po *qds* (avoid near term) cefalexin 500mg po *tds* (avoid in severe penicillin allergy) trimethoprim 200mg po *bd* (avoid in first trimester) co-amoxiclav 625mg po *tds* (avoid in penicillin allergy)	
Lower UTI in pregnancy (non-severe) 7 days	Treat according to recent sensitivity data if available. If not available treat empirically as follows: cefalexin 500mg po *tds* **or** nitrofurantoin 50mg po *qds* (avoid near term) If high risk of MRSA carriage: add vancomycin iv protocol	
Urinary catheters:		
Asymptomatic bacterial colonisation	Treatment not required	
Indications for treatment	Urinary symptoms, fever, high peripheral WCC, signs of systemic sepsis (eg functional decline, immobility, delerium).	

Skin and Soft Tissue and Septic Arthritis Infections

Indication and typical duration	First-line	Second-line/alternative
Mild cellulitis 7 days See Cellulitis guide on intranet	flucloxacillin 500mg po *qds*	**Penicillin allergy:** clindamycin 300-450mg po *qds*
	If high risk of MRSA carriage: substitute doxycycline 100mg po *bd*	
Moderate / severe cellulitis 7-14 days (2-5 days iv then oral treatment as for mild cellulitis) See Cellulitis guide on intranet	flucloxacillin 1g iv *qds*	ceftriaxone 2g iv *od* **Severe penicillin allergy:** clindamycin 600mg iv *qds*
	If high risk of MRSA carriage: substitute vancomycin iv protocol	
Animal and human bites 7-10 days Also see AE tetanus protocol. If moderate-severe infection, give 2-5 days iv therapy, then switch to oral.	co-amoxiclav 625mg po *tds*	ceftriaxone 2g iv *od* + metronidazole 400mg po *tds* **or** **Animal bite:** doxycycline 100mg po *bd* **Human bite:** clindamycin 450mg po *qds* (600mg iv *qds*)
Open fracture prophylaxis: on presentation in Emergency Department 3 days - until 2nd look (change of dressing/surgical toilet only) Also see AE tetanus protocol	co-amoxiclav 1.2g iv *tds*	ceftriaxone 2g iv *od* +/- metronidazole 400mg po *tds* **Severe penicillin allergy:** vancomycin iv protocol + gentamicin 1.5mg/kg iv *single dose* +/- metronidazole 400mg po *tds*
	If high risk of MRSA carriage: add vancomycin iv protocol	
Necrotising fasciitis Surgical debridement is life-saving Review iv at 48 hours	co-amoxiclav 1.2g iv *tds* + clindamycin 900mg iv *qds*	ceftriaxone 2g iv *od* + clindamycin 900mg iv *qds* **Severe penicillin allergy:** ciprofloxacin 400mg iv *bd* + clindamycin 900mg iv *qds*
	If high risk of MRSA carriage: add vancomycin iv protocol	
Native joint septic arthritis or acute osteomyelitis Discuss duration with Microbiology/Bone Infection Unit	co-amoxiclav 1.2g iv *tds*	ceftriaxone 2g iv *od* **Severe penicillin allergy:** ciprofloxacin 500mg po *bd* + clindamycin 600mg iv *qds*
	If high risk of MRSA carriage: add vancomycin iv protocol	
Diabetic foot infection mild-to-moderate If severe infection consult Bone Infection Unit or Microbiology. Reduce dose of ciprofloxacin in renal impairment.	metronidazole 400mg po *tds* + co-amoxiclav 625mg po *tds* (or co-amoxiclav 1.2g iv *tds*)	ciprofloxacin 500mg po *bd* + clindamycin 450mg po *qds* **IV therapy:** ceftriaxone 2g iv *od* + metronidazole 400mg po *tds*
	If high risk of MRSA carriage: add vancomycin iv protocol	

Neutropenic Fever

See neutropenic fever guide on intranet for more information. Neutropenic fever is a medical emergency, which can occur in any patient who has had chemotherapy within the preceding 4 weeks and occasionally in those with other causes of neutropenia. **Clinicians who are not experienced in the management of this condition must contact a senior clinician or Microbiology to discuss further.** There should always be a specialist review at 48 hours.

Indications for Antibacterial Therapy in Neutropenic Fever:

• Neutrophil count less than **1.0x10⁹/L** + temperature above **38°C** on at least one occasion.

• Any bone marrow transplant patient with a temperature above **37.5°C** on a single reading.

Also consider prompt antibacterials in neutropenic patients who may be unwell in other ways (e.g. tachycardia, hypotension) but who remain afebrile or do not meet the above criteria.

First-line	Second-line/alternative
piperacillin/tazobactam (Tazocin®) 4.5g iv *tds* + gentamicin *7mg/kg iv *od* for 2 days *use 3mg/kg gentamicin if renal impairment (see gentamicin IV guide on intranet)	meropenem 500mg iv *qds* + gentamicin *7mg/kg iv *od* for 2 days *use 3mg/kg gentamicin if renal impairment (see gentamicin IV guide on intranet) Patients on protocols with 'high dose methotrexate' (above 3g per m²) – omit the gentamicin and give meropenem alone. **Severe penicillin allergy:** ciprofloxacin 500mg po *bd* (or 400mg iv *bd*) + vancomycin iv protocol

Give vancomycin iv protocol instead of gentamicin if the patient:

• is known to be MRSA positive

• has an obvious or high probability of vascular catheter related infection (e.g. rigors on flushing line, or red and tender exit site)

Consider adding metronidazole 400mg po *tds* (500mg iv *tds* if nil-by-mouth or not absorbing) if the clinical presentation includes diarrhoea / perianal sepsis / abdominal pain / dental or sinus infection. NB both piperacillin/tazobactam (Tazocin®) and meropenem provide good anaerobic cover.

Vascular Access Device infection/Line infection

In suspected peripheral VAD/line infection, **remove the infected cannula** (send tip for MC&S) and take blood cultures.

In suspected central VAD/line infection; take central and peripheral blood cultures. **Remove CVC** and send tip for MC&S.

	First Line	Second Line
Infection of peripheral vascular access device/line: non-severe (no systemic sepsis) 7 days Discuss with Microbiology if positive blood culture	doxycycline 100mg po *bd*	co-trimoxazole 960mg po *bd*
Infection of peripheral vascular access device/line: severe + **Infection of central vascular access device / line** 7 days (review iv daily) Discuss with Microbiology if positive blood culture	vancomycin iv protocol If severe sepsis or septic shock, *add:* gentamicin 5mg/kg iv *single dose* Review with results at 24 hours and discuss with Microbiology. If methicillin-sensitive *S. aureus* isolated, switch vancomycin to flucloxacillin 2g iv *qds*	