NHS
Greater Glasgow and Clyde

CLINICAL GUIDELINE

Infection Management, Empirical Antibiotic Therapy in Adults

A guideline is intended to assist healthcare professionals in the choice of disease-specific treatments.

Clinical judgement should be exercised on the applicability of any guideline, influenced by individual patient characteristics. Clinicians should be mindful of the potential for harmful polypharmacy and increased susceptibility to adverse drug reactions in patients with multiple morbidities or frailty.

If, after discussion with the patient or carer, there are good reasons for not following a guideline, it is good practice to record these and communicate them to others involved in the care of the patient.

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Important Note:

The Intranet version of this document is the only version that is maintained.
Any printed copies should therefore be viewed as 'Uncontrolled' and as such, may not necessarily contain the latest updates and amendments.

Hospital Infection Management Guidelines Empirical Antibiotic Therapy in Adults

Greater Glasgow and Clyde

STOP AND THINK BEFORE ANTIBIOTIC THERAPY: 1 in 5 antimicrobial courses associated with adverse events including *C.difficile*, drug interactions/ toxicity, device related infections and *S. aureus* bacteraemia. **THINK SEPSIS if NEWS ≥ 5**. Send samples to microbiology before starting antibiotics. **RECORD antimicrobial indication and duration** on HEPMA **REVIEW** patient and results. **RECORD clinical response and prescription daily. Can you SIMPLIFY, SWITCH or STOP?** If Clinical improvement + eating/drinking + deep seated/complex infection **not** suspected then **IVOST (See** IVOST Guidelines) and **RECORD** duration of remaining oral therapy. **RECORD the STOP date for oral antimicrobial on HEPMA**
REVIEW all IV antimicrobial and prescription DAILY and **RECORD duration /**review date. **INFORM** patient of reason for antimicrobial and likely duration.
NB Doses recommended based on normal renal/liver function - see BNF or Renal handbook for dosing advice. For info on antimicrobial contra-indications, cautions and monitoring see BNF.

Definition of SEPSIS: **INFECTION** (includes Systemic Inflammatory Response Syndrome (SIRS*)) **WITH evidence of ORGAN HYPOPERFUSION (≥ 2 of: Confusion, < 15 GCS or Resp Rate ≥ 22/ min or Systolic BP ≤ 100 mm Hg**).
Ensure SEPSIS 6 within one hour: 1. Blood cultures (& any other relevant samples), 2. IV Antibiotic administration, 3. Oxygen to maintain target saturation, 4. Measure lactate, 5. IV fluids, 6. Monitor urine output hourly.
*SIRS indicated by Temp < 36°C or > 38°C, HR > 90 bpm, RR > 20/ min & WCC < 4 or > 12 x10⁹/ L. SIRS is not specific to bacterial infection (also viral & non-infective causes).

Lower Respiratory Tract Infections

Infective Exacerbation COPD
Antibiotics only if purulent sputum (send for culture along with viral gargle)
Dual antibiotic therapy not recommended & increases risk of harm
Oral ▲Doxycycline 200mg as a one-off single dose then 100mg daily
or Oral Amoxicillin 500mg 8 hrly *or* Oral ▪Clarithromycin 500mg 12 hrly
Duration 5 days

Suspected Viral Respiratory Tract Infection
Antibiotics NOT required unless secondary bacterial infections e.g. COPD exacerbation with purulent sputum (see above)
If consolidation treat as per CAP below
COVID-19 guidelines — Flu guidelines

Uncertain if LRTI/ UTI
Send MSSU, sputum and viral gargle
Oral • Co-trimoxazole 960mg 12 hrly *or* Oral ▲Doxycycline 100mg 12 hrly
Do **NOT** prescribe Co-amoxiclav
Review/ clarify diagnosis at 48 hours
Duration if diagnosis remains uncertain **MAXIMUM 5 days**

Pneumonia

Community Acquired Pneumonia (CAP)
Assess for SEPSIS
Calculate CURB 65 score:
- Confusion (new onset)
- Urea > 7 mmol/L
- RR ≥ 30 breaths/ min
- BP – diastolic ≤ 60 mmHg or systolic < 90 mmHg
- Age ≥ 65 years

If patient admitted from a care home treat as CAP.
If severe, ensure atypical screen sent.

Non-severe CAP
CURB65 score: ≤ 2 (and no sepsis)
Oral Amoxicillin 500mg 8 hrly
or Oral ▲Doxycycline 200mg as a one-off single dose then 100mg daily
or Oral ▪ Clarithromycin 500mg 12 hrly
Duration 5 days

Severe CAP
CURB 65 score ≥ 3 or CAP (with any CURB 65 score) PLUS sepsis :
Oral ▪ Clarithromycin 500mg 12 hrly
PLUS *either*:
IV Amoxicillin 1g 8 hrly
or *if requiring HDU/ ICU level care*
IV Co-amoxiclav 1.2g 8 hrly
If true penicillin/beta-lactam allergy or Legionella strongly suspected
Oral ▲▪ Levofloxacin **Monotherapy** 500mg 12 hrly
(NB oral bioavailability 99 – 100 %)
Duration 5 days (IV/oral)
Legionella 10-14 days

Hospital Acquired Pneumonia (HAP)
Diagnosis of HAP is difficult and it is often over-diagnosed. Consider other causes of clinical deterioration **including hospital onset COVID-19** and review diagnosis early. Seek senior advice. Assess severity based on CURB 65 score.

If within 4 days of admission or admitted from care home
Treat as for CAP
If ≤ 7 days post hospital discharge or ≥ 5 days after admission:

Non-severe HAP
Oral therapy recommended
Oral ▲Doxycycline 100mg 12 hrly
or Oral • Co-trimoxazole 960mg 12 hrly
Duration 5 days
Trimethoprim use with caution may ⇧ K^+ and decrease renal function. Monitor

Severe HAP
IV Co-amoxiclav 1.2g 8 hourly
+ IV Gentamicin**Δ (max 4 days)
or if true penicillin/beta-lactam allergy
Oral ▲▪ Levofloxacin 500mg 12 hrly monotherapy
Duration 5 days (IV/oral)
If critically ill discuss with Infection Specialist

Aspiration pneumonia
This is a chemical injury and does not indicate antibiotic treatment.
Reserve antibiotics for those who fail to improve within 48 hrs post aspiration.
IV Amoxicillin 1g 8 hrly
or if true penicillin/beta-lactam allergy
IV ▪ Clarithromycin 500mg 12 hrly
+ IV Metronidazole 500mg 8 hrly
Duration 5 days (IV/oral)

****Gentamicin/ **Vancomycin**
Gentamicin / Vancomycin adult dosing calculators are available via 'Clinical Info' icon on staff intranet/ GGC Medicines App. See GGC Therapeutics Handbook for Prescribing advice. Use GGC Prescribing, Administration, Monitoring charts.
Vancomycin If creatinine not available give Vancomycin loading dose as per actual body weight
Gentamicin Δ Avoid Gentamicin in decompensated liver disease or myasthenia gravis, or known family history of aminoglycoside auditory toxicity or maternal relative with deafness due to mitochondrial mutation A1555G

If creatinine not available give gentamicin as follows:

Actual Body Weight	Gentamicin Dose	Actual Body Weight	Gentamicin Dose
< 40 kg	*5 mg/kg*	*60 - 69 kg*	*320 mg*
40 - 49 kg	*240 mg*	*70 - 79 kg*	*360mg*
50 - 59 kg	*280mg*	*≥ 80 kg*	*400 mg*

NB If CKD5 give 2.5 mg/kg (max 180 mg)

Skin/ Soft Tissue Infections

Mild skin/soft tissue infection
Oral Flucloxacillin 1g 6 hrly
or if true penicillin/beta-lactam allergy
Oral • Co-trimoxazole 960mg 12 hrly
or Oral ▲Doxycycline 100mg 12 hrly
Duration 5 days

Moderate / Severe Cellulitis
Consider OPAT/ ambulatory care (consult local management pathway).
If requires inpatient management:
IV Flucloxacillin 2g 6 hrly
If MRSA suspected or if true penicillin/ beta-lactam allergy
IV Vancomycin**
If rapidly progressive
Add IV Clindamycin 600mg 6 hrly
Consider CDI risk
Duration 7-10 days (IV/oral)

Suspected Necrotising Fasciitis
Consider in SSTI with disproportionate pain or presence of acute organ dysfunction/ hypoperfusion including hypotension.
Seek urgent surgical/ orthopaedic review.
Urgent DEBRIDEMENT/ EXPLORATION may be required
IV Flucloxacillin 2g 6 hrly
+ IV Benzylpenicillin 2.4g 6 hrly
+ IV Metronidazole 500mg 8 hrly
+ IV Clindamycin 1.2g 6 hrly
+ IV Gentamicin**Δ (max 4 days)
If MRSA suspected or if true penicillin/ beta-lactam allergy
REPLACE Flucloxacillin + Benzylpenicillin with IV Vancomycin**
Rationalise therapy within 48-72 hours
Based on: response, microbiology results infection specialist review
Duration 10 days (IV/oral) or as per infection specialist

Infected human/animal bite

Non-severe bite
Oral Co-amoxiclav 625mg 8 hrly
or if true penicillin/beta-lactam allergy
Oral ▲Doxycycline 100mg 12 hrly
+ Oral Metronidazole 400mg 8 hrly
Duration- Treatment: 5 days
Prophylaxis: 3 days
See "Adult Antibiotic Wound Management for the Emergency Department" for prophylaxis indications

Severe bite
Consider surgical review.
IV Co-amoxiclav 1.2g 8 hrly
or if true penicillin/beta-lactam allergy
IV Vancomycin**
+ Oral Metronidazole 400mg 8 hrly
+ Oral ▲▪Ciprofloxacin 500mg 12 hrly
Duration 7 days (IV/oral)

Gastrointestinal Infections

Gastroenteritis
Confirm travel history/other risk factors
Antibiotics not usually required and may be deleterious in *E.coli* O157 Consider viral causes

C. difficile infection (CDI)
See CDI guidelines
Treat before lab confirmation if high clinical suspicion. Discontinue if toxin negative

Intra-abdominal sepsis
IV Amoxicillin 1g 8 hrly
+**Oral**/ IV Metronidazole **400mg /** 500mg 8 hrly
+IV Gentamicin**Δ (max 4 days))
If eGFR < 20 mL/min/1.73 m²
IV Piperacillin/Tazobactam 4.5g 12 hourly (Monotherapy)
If true penicillin/beta-lactam allergy
IV Vancomycin **
+**Oral**/ IV Metronidazole **400/** 500mg 8 hrly
+IV Gentamicin**Δ (max 4 days)
If eGFR < 20mL/min/1.73 m²
▲▪ IV/Oral Ciprofloxacin
+**Oral**/ IV Metronidazole **400/** 500mg 8 hrly
Total Duration 5 days (IV/oral)
Assuming source control
See Advice for Antibiotic therapy following 4 days IV gentamicin

Biliary tract infection
As above except metronidazole not routinely required unless severe

Pancreatitis
Does not require antibiotic therapy unless complicated by cholangitis.

Spontaneous Bacterial Peritonitis (SBP)
Ascites PLUS ascitic WCC>500/mm³ or ascitic neutrophils>250/mm³
BSG - BASL Decompensated Cirrhosis Care Bundle - First 24 Hours - The British Society of Gastroenterology
➢ ***If not receiving co-trimoxazole prophylaxis:***
Oral • Co-trimoxazole 960mg 12 hourly
If receiving co-trimoxazole prophylaxis:
IV Piperacillin/Tazobactam 4.5g 8 hourly
or if true penicillin/beta-lactam allergy
Oral ▲▪***Levofloxacin 500mg 12 hrly
Duration 7 days (IV/oral)

Decompensated Chronic liver Disease with Sepsis Unknown Source
IV Piperacillin/Tazobactam 4.5g 8 hourly
or if true penicillin/beta-lactam allergy
Oral ▲▪***Levofloxacin 500mg 12 hrly
Duration 7 days (IV/oral)

Urinary Tract Infections

UTI in Pregnancy
See NHS GGC Obstetric guidance

Lower UTI/cystitis
Don't treat asymptomatic bacteriuria. Obtain urine culture prior to antibiotic. In women often self-limiting, consider delayed prescribing.
Antibiotics if significant symptoms
Oral Nitrofurantoin 50mg 6 hourly or Nitrofurantoin 100mg MR 12 hourly
or Oral • Trimethoprim 200mg 12 hrly
Duration: Females 3 days, Males 7 days
If eGFR < 30 mL/min/1.73 m²
Nitrofurantoin contraindicated, Trimethoprim use with caution

Upper UTI
Obtain urine for culture prior to antibiotic. Exclude pneumonia if loin/back pain

Non-severe/without sepsis
Oral▲▪Ciprofloxacin 500mg 12 hrly
Or Oral •Co-trimoxazole 960 mg 12 hrly
if trimethoprim sensitive organism.
Duration 7 days
Trimethoprim see above re ⇩ eGFR

UROSEPSIS/ Pyelonephritis with fever
IV Gentamicin**Δ (max 4 days)
If eGFR < 20 mL/min/1.73 m²
Oral ▲▪Ciprofloxacin
Duration 7 days

Catheter related UTI
Remove/ replace catheter and send urine for culture. Don't treat asymptomatic bacteriuria

Symptomatic bacteriuria without sepsis
Give single dose of IV Gentamicin**Δ immediately prior to catheter removal or if IV route not available give single dose of oral ▲▪Ciprofloxacin 500mg 30 minutes before catheter change.
If eGFR < 20 mL/min/1.73 m²
▲▪ *Ciprofloxacin 500mg single dose*
Symptomatic bacteriuria with sepsis
Treat as per pyelonephritis/ culture results.
Duration 7 days (IV/oral)

Suspected prostatitis
Consider in all men with lower UTI symptoms
Refer to Urology
Oral ▲▪Ciprofloxacin 500mg 12 hrly
or Oral • Trimethoprim 200mg 12 hrly if sensitive organism.
Duration 14 days

Bone/ Joint Infections

Septic arthritis/Osteomyelitis / Prosthetic joint infection
Urgent orthopaedic referral if underlying metal work or recent surgery. Obtain blood cultures (and if not acutely unwell/ septic, obtain synovial/ other deep samples) prior to antibiotic therapy

Native joint
IV Flucloxacillin 2g 6 hrly
If MRSA suspected or if true penicillin/beta-lactam allergy
IV Vancomycin**
If considered high risk for Gram negative infection e.g. immunocompromised, recurrent UTI or sickle cell disease:
ADD IV Gentamicin**Δ (max 4 days)
Duration and IVOST: discuss with Infection Specialist at 72 hours. Usually 4-6 weeks (IV/oral) if diagnosis confirmed.

Prosthetic joint
Antibiotic therapy should not be started in a clinically stable patient until intra-operative samples obtained
IV Vancomycin**
+ IV Gentamicin**Δ (max 4 days)
Duration and IVOST: discuss with Infection Specialist at 72 hours

Diabetic foot infection/ osteomyelitis
Assess ulcer size, probes to bone, neuropathy, peripheral vascular disease, MRSA risk. For outpatient therapy consult diabetic clinic guidelines
IV Flucloxacillin 2g 6 hrly
+Oral Metronidazole 400mg 8 hrly
If SEPSIS or SIRS ≥ 2
Add IV **Gentamicin****Δ (max 4 days)
If MRSA suspected or if true penicillin/beta-lactam allergy
IV Vancomycin**
+ Oral Metronidazole 400mg 8hrly
(Metronidazole oral bioavailability 80-100%)
If SEPSIS or SIRS ≥ 2:
Add IV **Gentamicin****Δ (max 4 days)
*If eGFR < 20 mL/min/1.73 m² **REPLACE***
Gentamicin with Oral ▲▪Ciprofloxacin
Duration/IVOST
Discuss with Infection Specialist

Vascular graft infection
IV Flucloxacillin 2g 6hrly
+ IV Gentamicin**Δ (max 4 days)
If MRSA suspected or if true penicillin/ beta-lactam allergy
IV Vancomycin**
+ IV Gentamicin**Δ (max 4 days)
Discuss duration/IVOST/ further management with Infection specialist

CNS Infections

LP safe without CT scan UNLESS: seizures, GCS ≤ 12, CNS signs, papilloedema or immunosuppression. If CT: Blood cultures and antibiotics BEFORE CT scan.
Use Meningitis/ Encephalitis order set on Trakcare, Blood and CSF Glucose.
LP contraindicated if: Brain shift, rapid GCS reduction, Resp/ cardiac compromise, severe sepsis, rapidly evolving rash, infection at LP site, coagulopathy, thrombocytopenia, anticoagulant drugs

Possible bacterial meningitis
IV Ceftriaxone 2g 12 hrly
or if previous penicillin anaphylaxis
IV Chloramphenicol 25mg/kg (max 2g) 6 hrly
If bacterial meningitis strongly suspected:
ADD IV Dexamethasone 10mg 6 hrly (for 4 days)
Prior to, or at the same time as antibiotics and refer to ID
If age ≥ 60 years, immunosuppressed, pregnant, alcohol excess, liver disease or if listeria meningitis suspected:
ADD IV Amoxicillin 2g 4 hrly to Ceftriaxone
or if true penicillin/beta-lactam allergy
ADD IV • Co-trimoxazole 30mg/kg 6 hrly to Chloramphenicol
Duration of antibiotics: Discuss with Infection Specialist

Possible viral meningitis
Usually diagnosed after empirical management and exclusion of bacterial meningitis.
Viral meningitis does NOT require antiviral prescription unless immunocompromised.
Discuss with Infection Specialist.
Confusion or reduced consciousness = Encephalitis NOT meningitis

Possible viral encephalitis
Consider if confusion or reduced level consciousness in suspected CNS infection. Ensure CSF viral PCR is requested. May not be possible to differentiate from bacterial meningo-encephalitis.
IV Aciclovir 10mg/kg 8 hrly
See BNF for dosing in renal impairment.
Discuss **all** patients with infection specialist. May require repeat LP or neuro-imaging to establish diagnosis.
Duration: Confirm with infection specialist

Severe Systemic Infection Source Unknown

Sepsis where source unknown
Review all anatomical systems, perform CXR and consider other imaging/ laboratory investigations
Review previous microbiology results and discuss with an infection specialist if previous gentamicin resistance
Review diagnosis DAILY
Add cover for *S.aureus* infection if; healthcare associated, recent hospitalisation, post-op wound/ line related, PWID
Add cover for MRSA infection if; recent MRSA carrier or previous infection
Add cover for Streptococcal infection if; pharyngitis/erythroderma/hypotension

Source unknown
IV Amoxicillin 1g 8 hrly
+ IV Gentamicin**Δ (max 4 days)
If S.aureus suspected
ADD IV Flucloxacillin 2g 6 hrly
If MRSA suspected or if true penicillin/ beta-lactam allergy
IV Vancomycin**
+ IV Gentamicin**Δ (max 4 days)
If severe Streptococcal infection suspected
ADD IV Clindamycin 600mg 6 hrly
*If eGFR < 20mL/min/1.73 m², **REPLACE***
Gentamicin with Oral/IV ▲▪Ciprofloxacin
Duration: Review with response/ micro results at 72 hours

Possible Infective Endocarditis
Always seek senior specialist advice and refer to cardiology.
Native heart valve
IV Amoxicillin 2g 4 hrly
+ IV Flucloxacillin 2g 6 hrly if < 85kg (4 hrly if ≥ 85kg)
+ IV Gentamicin Δ (°synergistic dosing)
If MRSA/ resistant organisms suspected or if true penicillin/beta-lactam allergy
IV Vancomycin**
+ IV Gentamicin Δ (°synergistic dosing)
Prosthetic heart valve
IV Vancomycin**
+ IV Gentamicin Δ (°synergistic dosing)
Discuss with Infection Specialist within 72 hours
°See Synergistic Gentamicin for Endocarditis in Adults guideline on StaffNet for dosing

Immunocompromised Patient

Urgent Blood Cultures then IV Antimicrobial Therapy within ONE hour

Immunocompromised Patient
Recent Chemotherapy (< 3 weeks), high dose steroids (e.g. prednisolone > 15mg/day for > 2 weeks), other immunosuppressants (e.g. anti-TNF, cyclophosphamide), Stem cell/solid organ transplant or primary immunodeficiency

Neutropenic Sepsis
Neutrophils ≤ 0.5 x 10⁹/ L + fever (temperature > 38°C or 37.5°C on 2 occasions 30 min apart) / hypothermia < 36°C **OR** chills, shivers, sweats or other symptoms suggestive of infection.
All patients who have received recent chemotherapy and who exhibit any of the symptoms above are presumed to be neutropenic and septic.

Immunocompromised with fever BUT normal neutrophils AND source of infection identified
Manage as per infection management guidelines based on anatomical source.

Neutropenic sepsis or Immunocompromised with fever and source of infection unknown;
(See guideline Initial Management of Neutropenic Sepsis or Sepsis of Unknown Source in Immunocompromised Adults)

NEWS ≤ 6 Standard Risk
IV Piperacillin/Tazobactam 4.5g 6 hourly
If MRSA colonised/ line infection or sign of skin and soft tissue infection
ADD IV Vancomycin**
Or if true penicillin/ beta-lactam allergy
IV Gentamicin**Δ (max 4 days)
+ IV Vancomycin**

NEWS ≥ 7 High Risk
IV Piperacillin/Tazobactam 4.5g 6 hourly
+ IV Gentamicin**Δ (max 4 days)
If MRSA colonised/ line infection or sign of skin and soft tissue infection
ADD IV Vancomycin**
Or if true penicillin/ beta-lactam allergy
IV Gentamicin**Δ (max 4 days)
+ IV Vancomycin**
+ IV ▲▪Ciprofloxacin 400mg 8 hourly

Patients with Stem Cell Transplant or receiving chemotherapy for Acute Leukaemia
NEWS ≤ 6 See High Risk treatment above.
NEWS ≥ 7 Critical Risk
See Neutropenic Sepsis guidelines

!! Important Antibiotic Drug Interactions & Safety Information !!

▲**Doxycycline/ Quinolone:** reduced absorption with iron, calcium, magnesium & some nutritional supplements. See BNF (Appendix1) or see pharmacy for advice.
▪**Clarithromycin/ Quinolone:** risk of serious drug interactions see BNF (appendix 1) or seek pharmacy advice. May also prolong the QTc interval, avoid (where possible) if other QTc risk factors. If oral route compromised give IV (see BNF for dose).
▲▪**Quinolones e.g.** Ciprofloxacin, Levofloxacin Stop treatment at first signs of a serious adverse reaction (e.g. tendonitis), prescribe with caution for people over 60 years and avoid co administration with a corticosteroid. See BNF for dosing advice in reduced renal function.
Trimethoprim • / Co-trimoxazole• Use with caution, may increase K+ and decrease renal function. Monitor U+Es. If oral route compromised, co-trimoxazole can be given IV (see BNF for dose).

INFECTION SPECIALISTS: Duty Microbiologist, Infectious Disease (ID) Unit at QEUH. **FOR FURTHER ADVICE:** Clinical/Antimicrobial Pharmacist , local Respiratory Unit (for RTI) or from GGC Therapeutic Handbook.
Infection Control advice may be given by Duty Microbiologist

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