Infection Management Guidelines Empirical Antibiotic Therapy in Adults

Greater Glasgow and Clyde

STOP AND THINK BEFORE ANTIBIOTIC THERAPY: 1 in 5 antibiotic 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 antibiotic indication** on kardex. **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** and **RECORD** duration of remaining oral therapy. **RECORD the STOP date for oral antibiotic** - score kardex at appropriate date. **REVIEW all IV antibiotics DAILY** and **RECORD** review date. **INFORM** patient of reason for antibiotic and likely duration.

NB Doses recommended based on normal renal/liver function - see BNF or Renal handbook for dosing advice. For info on antibiotic 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 COVID-19 pneumonia

Antibiotics NOT usually required

Antibiotics only if COPD with purulent sputum (treat as above) or suspected bacterial pneumonia with Chest X-Ray changes (treat as Pneumonia below)
Consider stopping antibiotics following review and positive SARS-CoV-2 result

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

Non-severe CAP

CURB 65 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 syndrome:

IV/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/IV ▲▲Levofloxacin 500mg 12 hrly monotherapy
(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
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

Severe HAP

IV Co-trimoxazole 960mg 12 hrly
(or if allergy IV Co-amoxiclav 1.2g 8 hrly)
+ IV Gentamicin**Δ (max 4 days)

See BNF for dosing of co-trimoxazole in renal impairment if eGFR < 20 mL/min/ 1.73 m² contact infection specialist

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)

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

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 5 days (treatment) 3 days (prophylaxis)

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 including COVID-19

C. difficile infection (CDI)

See NHS GGC CDI guidance

Treat before lab confirmation if suspected. Discontinue if toxin negative

No severity markers
Oral Metronidazole 400mg 8 hrly
(Do not use suspension)

Any severity marker or first recurrence of CDI
Oral Vancomycin 125mg 6 hrly
Duration 10 days

If enteral feeding tube use Vancomycin (see full NHS GGC CDI guidance)

Intra-abdominal sepsis

IV Amoxicillin 1g 8 hrly
+ IV/**Oral** Metronidazole 500/**400**mg 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 **
+ IV/**Oral** Metronidazole 500/**400**mg 8 hrly
+ IV Gentamicin**Δ (max 4 days)

If eGFR < 20mL/min/1.73 m²
▲▲ IV/Oral Ciprofloxacin
+ IV/**Oral** Metronidazole 500/**400**mg 8 hrly

Total Duration 5 days (IV/oral)
Assuming source control

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

Ascites PLUS peritoneal white cell count
> 500/mm³ or > 250 neutrophils/mm³

If not receiving co-trimoxazole prophylaxis:
IV/Oral Co-trimoxazole 960mg 12 hourly

If receiving co-trimoxazole prophylaxis:
IV Co-amoxiclav 1.2g 8 hrly

or if true penicillin/beta-lactam allergy

Oral /IV▲▲Ciprofloxacin **500**/400mg 12 hrly
+ IV Vancomycin**

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 /IV▲▲Ciprofloxacin **500**/400mg 12 hrly
+ IV Vancomycin**

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 hrly
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 may ⇧ K⁺ and decrease renal function. Monitor

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 Trimethoprim 200mg 12 hrly if 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 10-30 mL/min/1.73 m²
▲▲Ciprofloxacin 500mg single dose

Symptomatic bacteriuria with sepsis
As above and 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

Obtain blood cultures prior to antibiotic therapy. If not acutely unwell/septic, also obtain synovial fluid/deep tissue 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 microbiology at 72 hours. Usually 4 - 6 weeks (IV/oral) if diagnosis confirmed.

Prosthetic joint
IV Vancomycin**
+ IV Gentamicin**Δ (max 4 days)

Duration and IVOST: discuss with microbiologist 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
+ IV/**Oral** Metronidazole 500/**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**
+ IV/**Oral** Metronidazole 500/**400mg** 8 hrly
If SEPSIS or SIRS ≥2 Add
IV **Gentamicin****Δ (max 4 days)
(Metronidazole oral bioavailability 80- 100%)

*If eGFR < 20 mL/min/1.73 m² **REPLACE***
Gentamicin with Oral/IV ▲▲Ciprofloxacin

Duration/IVOST
Discuss with Micro/ID

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 true penicillin/beta-lactam allergy
IV Chloramphenicol 25mg/kg (max 2g) 6 hrly

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

IF BACTERIAL MENINGITIS STRONGLY SUSPECTED **ADD** IV Dexamethasone 10mg 6 hrly (for 4 days) and refer to ID

Duration of antibiotics:
Discuss with Micro/ID

Possible viral meningitis

Usually diagnosed after empirical management and exclusion of bacterial meningitis. **Viral meningitis does NOT require antiviral prescription unless immunocompromised.**
Discuss with ID.
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 further management with ID/ virology. May require repeat LP or neuro-imaging to establish diagnosis.

Duration: Discuss with ID

Severe Systemic Infection Source Unknown

Urgent Blood Cultures then IV Antimicrobial Therapy within ONE hour

Community or Healthcare associated sepsis where source unknown

Review all anatomical systems, perform CXR and consider other imaging/ laboratory investigations

Consider and test for COVID-19

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 < 20 mL/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

Immunocompromised Patient

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

****Gentamicin/ **Vancomycin**

Gentamicin / Vancomycin adult dosing calculators are available via 'Clinical Info' icon on staff intranet / GGC Medicines App. 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

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)

!! 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.

▲▲**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.

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

NHS GGC Antimicrobial Utilisation Committee; Nov 2020 Expires Nov 2023, Updates: www.ggcformulary.scot.nhs.uk/Guidelines

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