27. Antimicrobial Guide

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

For detailed guidelines and other conditions not listed below, refer to your hospital's guidelines for antimicrobial use

Condition	Comments/Caveats	Recommended Therapy
URTI/Sinusitis AVOID PRESCRIBING ANTIBIOTICS FOR UPPER RESPIRATORY TRACT INFECTIONS SINCE MOST ARE VIRAL.	The most common cause of URTIs is viral and thus **no antibiotics are necessary** A clinician should diagnose **Acute Bacterial Rhinosinusitis (ABRS)** when a) symptoms or signs of Acute Rhinosinusitis (ARS) (purulent nasal drainage accompanied by nasal obstruction, facial pain/pressure/fullness, or both) persist without evidence of **improvement for at least 10 days** beyond the onset of upper respiratory symptoms or b) symptoms or signs of ARS worsen within 10 days after initial improvement **(double worsening)**. **DO NOT ORDER A CT SCAN TO DIAGNOSE SINUSITIS**	**Amoxicillin/Clavulanate 1gm PO BD x 5-10 days** is the **first-line therapy** for most adults **who meet the criteria for ABRS** **In Penicillin-Allergic Patients:** Azithromycin 500mg PO OD x 3 days **Supportive therapy;** • **Decongestants (α-adrenergic) -** xylometazoline hydrochloride for **3 days**. • **Saline irrigation -** Nasal saline irrigation, alone or in conjunction with other adjunctive measures, may improve quality of life, decrease symptoms, and decrease medication use for ABRS, particularly in patients with frequent sinusitis. • **Mucolytics** • **Antihistamines** have **no role** in the symptomatic relief of ABRS in non-atopic patients.
Pharyngitis/Tonsillitis AVOID PRESCRIBING ANTIBIOTICS FOR UPPER RESPIRATORY TRACT INFECTIONS SINCE MOST ARE VIRAL.	The most predictable clinical parameter for GABHS pharyngitis is reported to be the **Centor Score** (available on **MDCalc**) a) Age < 15 years (+1) or ≥ 45 years (-1) b) History of fever > 38°C c) Absence of cough, d) Swollen and tender anterior cervical lymph nodes e) Tonsillar exudates or swelling	Adult patients with acute exudative adult pharyngitis who report **≥ 4 Centor Score ONLY** Benzathine penicillin G 1.2MU IM stat **OR** Amoxicillin/Clavulanate 1gm PO BD x 5-10 days Consider - **Single-dose Prednisone 60 mg PO** or **Dexamethasone 8 mg IM** therapy added to the standard treatment has a **more rapid improvement of pain** in adult patients with acute exudative adult pharyngitis who report **≥ 4 Centor Score** **Patients who are allergic to Penicillin** Azithromycin: 500 mg PO on day 1 followed by 250 mg PO OD for 4 days
Laryngitis	Mostly viral	**No Antibiotics necessary**
Acute Gastroenteritis AVOID PRESCRIBING ANTIBIOTICS FOR ACUTE GASTROENTERITIS **WITHOUT** SYSTEMIC DISEASE OR DYSENTERY	Any diarrhoeal illness lasting **> 1 day**, especially if accompanied by the following features should prompt evaluation of a faecal specimen; • bloody diarrhoea • moderate-severe disease (systemically ill/toxic appearing patients) • symptoms lasting >7 days • immunocompromised patients • recent use of antibiotics A **Stool Culture** is **NOT NECESSARY OR COST-EFFECTIVE** in most cases of diarrhoea without systemic disease or dysentery unless an unusual bacterial cause is suspected **Typhoid** - **Bone marrow culture** is the **most sensitive** routinely available diagnostic tool. Stool culture is positive only in up to 30-40% of cases but is often negative by the time that systemic symptoms bring patients to hospital. Blood cultures are positive in 40-80% of patients. Serologic tests e.g. the Widal test are of **limited clinical utility** because positive results may represent a previous infection.	**Food-borne toxigenic diarrhoea** usually requires only supportive treatment, **not antibiotics.** Treatment of salmonellosis with antibiotics (including quinolones) can prolong the carrier state and lead to a higher clinical relapse rate. **Treat ONLY** patients with; • bloody diarrhoea • moderate-severe disease (systemically ill/toxic appearing patients) • symptoms lasting >7 days • immunocompromised patients • recent use of antibiotics **Ciprofloxacin 500 mg PO BD x 3 days.** The duration of treatment may be extended by 2-3 days for moderate-to-severe cases. The antimotility agent **loperamide (Imodium)** may reduce the duration of diarrhoea when given with antibiotics for traveller's diarrhoea. A loperamide/simethicone combination has demonstrated faster and more complete relief. Loperamide may cause dangerous prolongation of illness in patients with some forms of bloody or inflammatory diarrhoea and, therefore**, should be restricted to patients with non-bloody stool.**

Condition	Comments/Caveats	Recommended Therapy
Urinary Tract Infection (UTI)	Cloudiness of the urine is most often due to protein or crystal presence, and malodorous urine may be due to diet or medication use. A urinalysis with quantitative urine **WBC counts should NOT be used alone to support a diagnosis of UTI or start antimicrobial therapy in any patient population.** A **negative Leukocyte Esterase AND a negative urine Nitrate** largely **rule out infection** in pregnant women, elderly patients, family medicine, and urology patients. The combination of a negative leukocyte esterase and negative nitrite test demonstrated a UTI **negative predictive value of 88% (95% confidence interval [CI] 84–92%).** Pyuria in a urine specimen, in the absence of symptoms (**Asymptomatic Bacteriuria**), is **NOT AN INDICATION** for antimicrobial therapy. **Urine cultures** are **NOT RECOMMENDED** in most cases of **uncomplicated UTIs** in adult women. **Urine Cultures ONLY for;** •In patients suspected of having **pyelonephritis**, a urine culture and susceptibility test should always be performed, and initial empiric therapy should be tailored appropriately based on the likely infecting uropathogen. •A urine specimen should be obtained for culture and susceptibility testing before initial antimicrobial therapy for **complicated UTIs.** **Complicated UTI** • Male gender • Structural or functional anatomic abnormalities • Renal stones • Indwelling catheters • Renal transplant • Neurogenic bladder • Recent urologic procedure **Inpatient therapy** • Sepsis • Pregnancy • Urinary tract obstruction • Persistent vomiting • Poor outpatient follow-up	**Uncomplicated Cystitis** Ciprofloxacin 500 mg PO BD x 3 days **OR** Nitrofurantoin 100mg TDS x 3 days **Uncomplicated Pyelonephritis, Outpatient Therapy** Ceftriaxone 1 g IV stat **PLUS** Ciprofloxacin 500 mg PO BD x 7 days **UTI during Pregnancy, Outpatient Therapy** Cefuroxime 500 mg PO BD for 7 days **OR** Nitrofurantoin 100mg TDS x 3 days **Complicated UTI** Ciprofloxacin 500 mg PO BD x 14 days **Uncomplicated Pyelonephritis, Inpatient Therapy** Ceftriaxone 1g IV OD 10-14 days **OR** Ciprofloxacin 400 mg IV BD x 10-14 days **UTI during Pregnancy, Inpatient Therapy** Ceftriaxone 1-2 g IV OD
Sepsis & Septic Shock	**See Sepsis & Septic Shock Algorithm**	**Give ANTIBIOTICS as an EMERGENCY (**within the **FIRST HOUR** of recognition of **Sepsis/Septic Shock**) • **Ceftriaxone 2gm IV stat** For probable **Neutropenic** patients or if patient has been **admitted in hospital** in the **last 3 months** (Hospital Acquired Infection) ▪ **Imipenem 500 mg** IV infusion over 3 hrs then QID for **General sepsis** **OR** ▪ **Meropenem 1 gm** IV infusion over 3 hrs then TDS for possible **CNS infections**

<table>
<tr><th>Condition</th><th colspan="2">Comments/Caveats</th><th>Recommended Therapy</th></tr>
<tr><td>Community-Acquired Pneumonia</td><td colspan="2">In addition to a constellation of suggestive clinical features, a demonstrable infiltrate by chest radiograph or other imaging technique, with or without supporting microbiological data, is required for the diagnosis of pneumonia.

The strongest indications for blood cultures are severe CAP and in immunocompromised patients or those with significant comorbidities, as these patients are more likely to be infected with pathogens other than S pneumoniae.

Comorbidities:
• Chronic heart, lung or renal disease
• Diabetes mellitus
• Alcoholism
• Malignancy
• Asplenia
• Immunosuppressant condition or drugs

Inpatient Therapy
• CURB65 ≥ 2 (available in MDCalc)
• Patient factors requiring hospitalization

HCAP risk factors?
• Hospitalization for 2 or more days of the past 90 days
• Resides in nursing home or long-term care facility
• Received chemotherapy, IV antibiotics, or wound care within the prior 30 days
• Attended a hospital or haemodialysis clinic in the last 30 days</td><td>Outpatient Treatment
Amoxicillin/Clavulanate 1gm PO BD x 7 - 10 days

In Penicillin-Allergic Patients:
Azithromycin: 500 mg PO on day 1 followed by 250 mg PO OD for 4 days

Inpatient Treatment
Amoxicillin/Clavulanate 1.2gm IV T x 7 - 10 days
PLUS
Azithromycin 500mg IV OD x 7 - 10 days

Healthcare Associated Pneumonia (HCAP)
Antipseudomonal beta-lactam
Imipenem 500mg IV infusion over 3 hours QID</td></tr>
<tr><td>Malaria</td><td colspan="2"><table><tr><th>Defining Criteria for Severe Malaria</th><th>Finding</th></tr><tr><td>Impaired consciousness (cerebral malaria)</td><td>A Glasgow coma score < 11 in adults or a Blantyre coma score < 3 in children</td></tr><tr><td>Prostration</td><td>Generalized weakness so that the person is unable to sit, stand or walk without assistance</td></tr><tr><td>Multiple convulsions</td><td>> 2 episodes within 24 h</td></tr><tr><td>Acidosis</td><td>A base deficit of > 8 mEq/L or, if not available, a plasma bicarbonate level of < 15 mmol/L or venous plasma lactate ≥ 5 mmol/L. Severe acidosis manifests clinically as respiratory distress (rapid, deep, laboured breathing).</td></tr><tr><td>Hypoglycaemia</td><td>Blood or plasma glucose < 2.2 mmol/L (< 40 mg/dL)</td></tr><tr><td>Severe malarial anaemia</td><td>Haemoglobin concentration ≤ 5 g/dL or a haematocrit of ≤ 15% in children < 12 years of age (< 7 g/dL and < 20%, respectively, in adults) with a parasite count > 10 000/µL</td></tr><tr><td>Renal impairment</td><td>Plasma or serum creatinine > 265 µmol/L (3 mg/dL) or blood urea > 20 mmol/L</td></tr><tr><td>Jaundice</td><td>Plasma or serum bilirubin > 50 µmol/L (3 mg/dL) with a parasite count > 100 000/ µL</td></tr></table></td><td>Uncomplicated Malaria
Artemether + Lumefantrine - Coartem® 80/480 1 tablet at 0, 8, 24, 36, 48 and 60 hours (six doses).
<table><tr><th>Body weight (kg)</th><th>Dose (mg) of artemether + lumefantrine given twice daily for 3 days</th></tr><tr><td>5 to < 15</td><td>20 + 120</td></tr><tr><td>15 to < 25</td><td>40 + 240</td></tr><tr><td>25 to < 35</td><td>60 + 360</td></tr><tr><td>≥ 35</td><td>80 + 480</td></tr></table>Severe Malaria
IV Artesunate 2.4mg/kg at 0, 12 and 24 hours and daily until patient can take oral. Children weighing < 20 kg should receive a higher dose of artesunate (3 mg/kg bw per dose) to ensure equivalent exposure to the drug.</td></tr>
</table>

<table>
<tr><th>Condition</th><th colspan="2">Comments/Caveats</th><th>Recommended Therapy</th></tr>
<tr><td>Malaria cont…</td><td>Defining Criteria for Severe Malaria</td><td>Finding</td><td rowspan="4">Uncomplicated Malaria
Artemether + Lumefantrine - Coartem® 80/480 1 tablet at 0, 8, 24, 36, 48 and 60 hours (six doses).
<table><tr><th>Body weight (kg)</th><th>Dose (mg) of artemether + lumefantrine given twice daily for 3 days</th></tr><tr><td>5 to < 15</td><td>20 + 120</td></tr><tr><td>15 to < 25</td><td>40 + 240</td></tr><tr><td>25 to < 35</td><td>60 + 360</td></tr><tr><td>≥ 35</td><td>80 + 480</td></tr></table>Severe Malaria
IV Artesunate 2.4mg/kg at 0, 12 and 24 hours and daily until the patient can take orally. Children weighing < 20 kg should receive a higher dose of artesunate (3 mg/kg bw per dose) to ensure equivalent exposure to the drug.</td></tr>
<tr><td></td><td>Pulmonary oedema</td><td>Radiologically confirmed or oxygen saturation < 92% on room air with a respiratory rate > 30/min, often with chest in-drawing and crepitations on auscultation</td></tr>
<tr><td></td><td>Significant bleeding</td><td>Including recurrent or prolonged bleeding from the nose, gums or venepuncture sites; haematemesis or melena</td></tr>
<tr><td></td><td>Shock</td><td>Compensated shock is defined as capillary refill ≥ 3 s or temperature gradient on the leg (mid to proximal limb), but no hypotension. Decompensated shock is defined as systolic blood pressure < 70 mm Hg in children or < 80 mm Hg in adults, with evidence of impaired perfusion (cool peripheries or prolonged capillary refill).</td></tr>
<tr><td></td><td>Hyperparasitemia</td><td>P. falciparum parasitaemia > 10%</td></tr>
<tr><td>Community-Acquired Severe Intra-Abdominal Infection, Biliary, and Extra-Biliary Infections</td><td colspan="2">Empiric coverage of Enterococcus is recommended</td><td>Piperacillin-Tazobactam 4.5gm IV QID</td></tr>
<tr><td>Cellulitis/ Abscesses/ Folliculitis/ Carbuncle/ Furuncle</td><td colspan="2">Most abscesses are Staph aureus. Most cellulitis is Group A beta-haemolytic streptococcus (although some are Staph aureus)

Empiric therapy for Streptococcus pyogenes (beta-haemolytic streptococcus) is recommended

Clindamycin is bacteriostatic, potential for cross-resistance and emergence of resistance in erythromycin-resistant strains; inducible resistance in MRSA

Effective treatment of abscesses entails incision, thorough evacuation of the pus, and probing the cavity to break up ovulations. Gram stain, culture, and systemic antibiotics are rarely indicated unless there is extensive surrounding cellulitis, fever, multiple lesions, severely impaired host defences, or cutaneous gangrene.</td><td>Oral Therapy

Beta-haemolytic Streptococcus coverage:
Amoxicillin/Clavulanate 1gm PO BD x 7 days

OR

Clindamycin 450 mg PO QID x 7-10 days

Parenteral Therapy (Inpatient)

Beta-haemolytic Streptococcus and MSSA Coverage

Cefazolin 1gm IV q8 hours for 7-10 days

OR

Clindamycin 600 mg IV q8 hours for 7-10 days</td></tr>
<tr><td>Necrotizing skin & soft tissue infections</td><td colspan="2">Surgical intervention is the major therapeutic modality in cases of necrotizing fasciitis.

Necrotizing fasciitis falls into two groups;
• The spontaneous extremity cellulitis is usually Group A Streptococcus and sometime Staph aureus.
• The second group includes head and neck, abdominal/groin and is frequently polymicrobial.</td><td>Consult a Surgeon</td></tr>
</table>

Condition	Comments/Caveats	Recommended Therapy
STI – Urethritis, Epididymitis, Orchitis, Proctitis, Cervicitis	**Minimum criteria** for clinical diagnosis of PID (**all 3 should be present**): a) Bilateral lower abdominal (uterine) tenderness (sometimes radiating to the legs) b) Cervical motion tenderness - Positive cervical motion tenderness is defined as increased discomfort from a normal pelvic examination, as stated by the patient. Of note, **cervical motion tenderness** is **neither sensitive nor specific for gynaecologic pathology**, is a **sign of nonspecific peritoneal inflammation**, c) Bilateral adnexal tenderness (with or without a palpable mass) One or more of the following additional criteria can be used to enhance the specificity of the minimum criteria and support a diagnosis of PID: • oral temperature >38.3° C; • abnormal cervical or vaginal mucopurulent discharge; • presence of abundant numbers of WBC on saline microscopy of vaginal fluid; and • laboratory documentation of cervical infection with N. gonorrhoea or C. trachomatis.	**STI – Urethritis, Epididymitis, Orchitis, Proctitis, Cervicitis** Ceftriaxone 250mg IM stat **PLUS** Azithromycin 1gm PO stat **PID** **Mild-Moderate disease** Ceftriaxone 250mg IM stat **PLUS** Doxycycline 100mg PO BD x 14 days **WITH or WITHOUT** Metronidazole 500mg PO BD x 14 days **Severe disease/In-patient therapy -** Suggested criteria: • surgical emergencies (e.g., appendicitis) cannot be excluded; • the patient is pregnant; • the patient does not respond clinically to oral antimicrobial therapy; • the patient is unable to follow or tolerate an outpatient oral regimen; • the patient has severe illness, nausea and vomiting, or high fever; or • the patient has a tubo-ovarian abscess. Amoxicillin/Clavulanate 1.2g IV BD **PLUS** Doxycycline 100mg IV/PO BD x 14days

<table>
<tr><th>Condition</th><th>Comments/Caveats</th><th>Recommended Therapy</th></tr>
<tr><td>HIV Post Exposure Prophylaxis (PEP)</td><td>

Exposed individual must be HIV negative at baseline
Exposure must have occurred within the past 72 hours
Exposure must be high-risk. Faeces, nasal secretions, saliva, sputum, sweat, tears, urine, and vomitus are not considered to be infectious unless they are visibly bloody.

Estimated per-unprotected act risk for acquisition of HIV by exposure route
<table>
<tr><th>Exposure route</th><th>% Risk</th></tr>
<tr><td>Blood transfusion</td><td>90%</td></tr>
<tr><td>Needle-sharing injection-drug use</td><td>0.67%</td></tr>
<tr><td>Receptive anal intercourse</td><td>0.5%</td></tr>
<tr><td>Percutaneous needle stick</td><td>0.3%</td></tr>
<tr><td>Receptive penile-vaginal intercourse</td><td>0.1%</td></tr>
<tr><td>Insertive anal intercourse</td><td>0.06%</td></tr>
<tr><td>Insertive penile-vaginal intercourse</td><td>0.1%</td></tr>
<tr><td>Receptive oral intercourse</td><td>0.01%</td></tr>
<tr><td>Insertive oral intercourse</td><td>0.005%</td></tr>
</table>
The overall rate of HIV transmission through percutaneous inoculation is reported to be 0.3% (95% confidence interval [CI] 0.2–0.5); the risk of acquiring an HIV infection is greater for percutaneous injuries that involve;

hollow-bore needles that have been in contact with an artery or vein,
when blood is visible on the device,
a deep needle stick, and
when the source patient has advanced HIV disease.

Splashes or infectious material to mucous membranes or broken skin may also transmit HIV infection (estimated risk per exposure, 0.09%; 95% CI 0.006–0.5). Exposure of intact skin to contaminated blood has not been identified as a risk for HIV transmission.

Counsel on risks and benefits of PEP and obtain verbal consent for testing (HIV, FHG, UEC, LFTs, HBV and HCV)
Voluntary HIV testing for source individuals
Offer PEP as soon as high-risk exposure is established and exposed individual tests HIV negative at baseline (if HIV testing not available, can provide 1-2 days of PEP to cover until HIV test performed)
Pregnancy testing
Cr (if TDF-containing regimen) and Hb (if AZT-containing regimen), however PEP should be offered even when lab tests are not available. Do not delay administration of PEP while waiting for lab results
Hepatitis B vaccination (if not previously immunized & not known HBV positive)

</td><td>
PEP should be initiated as soon as possible after exposure, but no later than after 72 hours.

Consult local guidelines for the recommended regimens
<table>
<tr><th>Regimen</th><th>Dose</th><th>Comments</th></tr>
<tr><td colspan="3">ADULTS</td></tr>
<tr><td>Tenofovir/Lamivudine
TDF/3TC
(300/300mg)

PLUS

Atazanavir/Ritonavir (ATV/r)
(300/100mg)</td><td>1 tablet OD

PLUS

1 tablet OD with food</td><td>Zidovudine
AZT
(300mg)
can be used as an alternative when TDF cannot be used</td></tr>
<tr><td colspan="3">CHILDREN</td></tr>
<tr><td>Abacavir/Lamivudine
ABC/3TC

PLUS

Lopinavir/Ritonavir
LPV/r</td><td>Consult local guidelines for the weight-based dosages</td><td>Zidovudine
AZT
can be used as an alternative when ABC cannot be used</td></tr>
</table>
PEP should be continued for 28 days (dispense all 28 days of treatment at the first visit)

Follow up client at 7 days, 14 days, and 28 days after starting PEP
Follow up HIV antibody testing at 3 months, if negative, test again at 6 months after which annual testing applies
Assess for and manage side effects due to PEP
Follow up with gastroenterologist if positive HBV, HCV and/or abnormal LFTs

</td></tr>
</table>