HOSPITAL
SUNGAI BULOH
THE SKILL TO HEAL THE SPIRIT TO CARE
CEKAP MERAWAT PRIHATIN MENJAGA

AMS
ABX SOS
HOSPITAL SUNGAI BULOH

HOSP SG BULOH ANTIMICROBIAL GUIDELINE

2024

Only for internal circulation (HSgB). For further enquiries, kindly contact ext. 4126

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TABLE OF CONTENTS

INTRODUCTION 01

SECTION A: ADULT PATIENTS 02

SECTION B: PAEDIATRIC PATIENTS 03

SECTION C: CLINICAL PATHWAYS IN PRIMARY CARE 04

APPENDICES 05

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INTRODUCTION

Antimicrobial resistance (AMR) is a serious global health and development threat. The World Health Organization (WHO) has recognized AMR as one of the top ten public health threats to humanity. In 2019, bacterial AMR was estimated to be directly responsible for 1.27 million deaths worldwide, with an additional 4.95 million associated deaths. The primary drivers of drug-resistant pathogens are the misuse and overuse of antimicrobials in humans, animals, and agriculture.

Antimicrobial guidelines are designed to enhance prescribing practices. Evidence indicates that adherence to these guidelines not only helps standardize care but also reduces unnecessary prescriptions. Following evidence-based guidelines has been shown to decrease AMR rates and reduce mortality associated with infections. Additionally, Antimicrobial Stewardship (AMS) programs use these guidelines to monitor and evaluate antimicrobial usage effectively.

Thus together, we must work to preserve the effectiveness of our antimicrobial medicines and protect future public health. We hope that the Hospital Sungai Buloh Antimicrobial Guideline will make a meaningful contribution to this vital effort.

This hospital's Antimicrobial Guideline has been adopted and adapted from the National Antimicrobial Guideline—a consensus-based, evidence-supported resource collaboratively developed by the Ministry of Health (MOH) Infectious Disease physicians, microbiologists, and pharmacists, with additional contributions from MOH Heads of Service across various specialties. The adopt & adaptation process in Hospital Sungai Buloh involved gathering input and suggestions from experts in each relevant discipline, with final approval from the respective department heads and endorsement by the hospital director. This multi-step process allows the creation a document that is not only evidence-based but also caters to local needs and peculiarities.

We would like to express our sincere gratitude to the Editorial Team, Heads of Departments, Contributors, and the Panels Working Committee for their invaluable input, dedication, and patience throughout the extensive yet essential process of updating our Hospital Antimicrobial Guideline.

HSGB ANTIMICROBIAL GUIDELINE (HAG): WHO IS IT MEANT FOR?

This guideline primarily aims to support specialists, medical officers, nurses, pharmacists, and all healthcare providers managing patients with suspected or confirmed infections, especially when culture results are not yet available. It offers recommendations for **EMPIRICAL ANTIBIOTIC THERAPY**, which should be adjusted based on culture results once they are received.
Please note that this guideline is intended to serve as a reference and should not replace clinical judgment.

WARNING! Copyright Notice

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2. In the event an external facility wishes to use this guide as a reference for adoption and adaptation, it is mandatory for a formal written request to be submitted to Hospital Sungai Buloh through the hospital director. This request should explicitly outline the intention behind the material usage and specify the particular section from this guide that the external facility wishes to refer to or plans to adopt and adapt.
3. Additionally, proper credit and acknowledgement must be given to Hospital Sungai Buloh, indicating the adoption and adaptation of the referenced materials.

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ADDITIONAL REFERENCES & GUIDES

Make sure to check out additional essential guides on the **ABX SOS Linktree** to complement the information in this guideline.

Key resources include:

	DIAMS - IV to PO & OPAT	Guidance on SAFE criteria for switching from IV to oral therapy, oral antibiotic options, and OPAT details for patients needing extended IV treatment.
	DIAMS - Antimicrobial Dosage & Renal Adjustment	A comprehensive guide on all antimicrobials used at Hospital Sungai Buloh, with dosing recommendations and renal adjustments for common indications.
	DIAMS - Antimicrobial & Pathogen Match	A useful tool to help you select antibiotics based on gram stains and preliminary culture results.
	DIAMS - HSgB Vancomycin Protocol	A step-by-step guide covering Vancomycin dosing, dilution, administration, and therapeutic drug monitoring (TDM).
	DIAMS - Paediatric Antimicrobial Dose	A complementary guide for antibiotic dosing in paediatric patients.
	DIAMS - NICU Drug Database	A handy guide for antibiotic dosing in neonates.
	DIAMS - Prolonged/Extended Infusion Antibiotic	Instructions on the dilution and administration of beta-lactam antibiotics as prolonged infusion for optimizing efficacy.
	MoCHIs Series	Treatment algorithms and protocols for **M**anagement **o**f **C**ommon **H**ospital Sungai Buloh **I**nfection**s**, including Resistant GNR infections, *Staphylococcus aureus* bacteremia, Pneumonia & COPD, and Leptospirosis.
	HSgB Antimicrobial Policy	The golden handbook of antimicrobial rules and regulations in Hospital Sungai Buloh.

All these valuable resources and MORE are available at the link below or by scanning the QR code:

HSgB Antibiotics SOS | Linktree

SCAN ME

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SECTION A: ADULT PATIENTS

IN THIS SECTION:

A1:
BURN INJURY & PLASTIC SURGERY INFECTIONS

A2:
CARDIOVASCULAR (CVS) INFECTIONS

A3:
CATHETER RELATED BLOODSTREAM INFECTIONS (CRBSI)

A4:
CENTRAL NERVOUS SYSTEM (CNS) INFECTIONS

A5:
CHEMOPROPHYLAXIS

A6:
GASTROINTESTINAL (GI) INFECTIONS

A7:
GENERAL SURGERY-RELATED INFECTION

A8:
INFECTIONS IN IMMUNOCOMPROMISED PATIENTS (HEMATOLOGY-ONCOLOGY)

A9:
INFECTIONS IN IMMUNOCOMPROMISED PATIENTS (OPPORTUNISTIC INFECTION (OI) IN PATIENTS WITH HUMAN IMMUNODEFICIENCY VIRUS (HIV))

A10:
NEUROSURGICAL-RELATED INFECTIONS

A11:
OBSTETRICS & GYNAECOLOGICAL (O&G) INFECTIONS

A12:
OCULAR INFECTIONS

A13:
ORAL / DENTAL INFECTIONS

A14:
ORTHOPAEDIC INFECTIONS

A15:
OTORHINOLARYNGOLOGY (ORL) INFECTIONS

A16:
RESPIRATORY INFECTIONS

A17:
SEPSIS

A18:
SEXUALLY TRANSMITTED INFECTIONS (STI)

A19:
SKIN & SOFT TISSUE INFECTIONS (SSTI)

A20:
TRAUMA-RELATED INFECTIONS

A21:
TROPICAL INFECTIONS

A22:
URINARY TRACT INFECTIONS (UTI)

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HSgB Antimicrobial Guideline (HAG)

SECTION A: ADULT

A1: BURN INJURY & PLASTIC SURGERY INFECTIONS

Launched: October 2024

Updated: -

Burn-Related Infections

- Burn wound is considered sterile up to 48 hours.
- Not all burn injuries require antibiotics.
- Ideal care is in a dedicated burn unit.
- Consider plastic surgery input.
- Consider antibiotic prophylaxis for patients with severe burn and high-risk group

Severe Burn and High-Risk Group

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Severe Burn and High-risk Group	Cefazolin 1-2 g IV q8h	Amoxicillin/clavulanate 1.2 g IV q8h	Antibiotics may be necessary in certain high-risk groups: • Inhalation injury • Immunocompromised patients (E.g.: extreme age groups (elderly and children), diabetes mellitus, obesity, impaired immunity) • Delay in burn wound excision • Mechanical ventilation • Total body surface area (TBSA) burn > 20%

Other Complicated Breast Infections (e.g. Foreign Body-Related Infections):

Empirical antibiotics are not recommended. Early referral to primary/plastic surgery for input.

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Reference (Plastic Surgery Chemoprophylaxis):

1. Antibiotic Expert Groups. Therapeutic guidelines: antibiotics. Version 15. Melbourne: Therapeutic Guidelines Limited; 2014.
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References (Plastic / Burn Infections):

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2. Ramos G, Cornistein W, Cerino GT, Nacif G. Systemic antimicrobial prophylaxis in burn patients: systematic review. J Hosp Infect. 2017;97(2):105-114.

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HSgB Antimicrobial Guideline (HAG)

SECTION A: ADULT

A2:
CARDIOVASCULAR (CVS) INFECTIONS

Launched: October 2024

Updated: -

LIST OF TOPICS WITH LINKS:

1. **Infective Endocarditis**
   - Empirical Treatment (Native valve)
   - Empirical Treatment (Prosthetic Valve)
   - Viridans Streptococci & *Streptococcus bovis*
   - Nutritionally variant streptococci (NVS)
   - *Enterococcus*
   - *Staphylococcus aureus* – Methicillin Sentitive (MSSA)
   - *Staphylococcus aureus* – Methicillin Resistant (MRSA)
   - HACEK Microorganisms
   - Candida Endocarditis (Native and Prosthetic valve)
   - Culture-Negative Endocarditis
   - Footnotes for antibiotic treatment for endocarditis:
2. **Treatment of Cardiac Implantable Electronic Devices (CIED) Infections**
   - Cardiac Implantable Electronic Devices (CIED) Infections

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Infective Endocarditis (IE)

Empirical Treatment (Native valve)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Empirical Treatment (Native Valve)	Ampicillin 12 g/day IV (2 g q4h) **PLUS** Gentamicin 3 mg/kg/day IV q24h **MAY ADD** Cloxacillin 12 g/day IV (2 g q4h) *For patients with suspected Staphylococcus aureus infections (such as IVDU or patients with prosthesis) and acute presentation.*	**Antibiotic allergy:** Vancomycin 15-20 mg/kg (actual body weight) IV q8-12h; not to exceed 2 g/dose *Refer to DIAMS - HSgB Vancomycin Protocol for more dosing info* **PLUS** Gentamicin 3 mg/kg IV q24h	Adjust antibiotics based on culture and sensitivity. If culture negative, to refer Infectious Disease (ID) physician.

Empirical Treatment (Prosthetic Valve)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Empirical Treatment (prosthetic valve) Early, < 1 year	Vancomycin 15-20 mg/kg (actual body weight) IV q8-12h; not to exceed 2 g/dose *Refer to DIAMS - HSgB Vancomycin Protocol for more dosing info* **PLUS** Gentamicin 3 mg/kg IV q24h **PLUS** Cefepime 2 g IV q8h *Indicated if local epidemiology suggests for Gram-negative rod infections (such as Pseudomonas)* **PLUS** Rifampicin 300-450 mg PO/IV q12h *Only recommended for PVE and it should be started 3-5 days later than vancomycin and gentamicin.*	-	
Empirical Treatment (prosthetic valve) Late, ≥ 1 year	Ampicillin 12 g/day IV (2 g q4h) **PLUS** Gentamicin 3 mg/kg/day IV q24h **PLUS** Cloxacillin 12 g/day IV (2 g q4h)	**Antibiotic allergy:** Vancomycin 15-20 mg/kg (actual body weight) IV q8-12h; not to exceed 2 g/dose *Refer to DIAMS - HSgB Vancomycin Protocol for more dosing info* **PLUS** Gentamicin 3 mg/kg IV q24h	

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Viridans Streptococci & *Streptococcus bovis*

- Refer to organism antimicrobial quick guide
- It is recommended MIC estimation is done for these isolates to facilitate management

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Native and Prosthetic Valves **Penicillin-susceptible Viridans** **(MIC ≤ 0.12 µg/mL *Streptococci* & *Streptococcus bovis)***	Benzylpenicillin 3 MU IV q4-6h	Ampicillin 2 g IV q4h **OR** **For non-severe hypersensitivity:** Ceftriaxone 2 g IV q24h **OR** **Severe hypersensitivity to penicillin:** Vancomycin 15-20 mg/kg (actual body weight) IV q8-12h; not to exceed 2 g/dose *Refer to DIAMS - HSgB Vancomycin Protocol for more dosing info*	**Duration:** • **4 weeks (native valves)** • **6 weeks (prosthetic valves)**
Native and Prosthetic Valves **Penicillin-Relatively Resistant Viridans** **(MIC 0.25 - 2 µg/mL *Streptococci* & *Streptococcus bovis)***	Benzylpenicillin 4 MU IV q4h (total 24 MU/24h) or 24 MU IV continuously **Duration:** • **4 weeks (native valves)** • **6 weeks (prosthetic valves)** **PLUS** *Gentamicin 3 mg/kg IV q24h for **Duration: 2 weeks (native valves and prosthetic valves)**	**Antibiotic allergy:** **For non-severe hypersensitivity:** Ceftriaxone 2 g IV q24h **Duration:** • **4 weeks (native valves)** • **6 weeks (prosthetic valves)** **PLUS** *Gentamicin 3 mg/kg IV q24h for **Duration: 2 weeks (native valves and prosthetic valves)** **OR** **Severe hypersensitivity to penicillin:** Vancomycin 15-20 mg/kg (actual body weight) IV q8-12h; not to exceed 2 g/dose *Refer to DIAMS - HSgB Vancomycin Protocol for more dosing info* **Duration:** • **4 weeks (native valves)** • **6 weeks (prosthetic valves)** **PLUS** *Gentamicin 3 mg/kg IV q24h for **Duration: 2 weeks (native valves and prosthetic valves)**	***Gentamicin**: aim for pre-dose (trough) serum level of < 1 mcg/ml
Native and Prosthetic Valves **Penicillin-Resistant Viridans** **(MIC ≥ 4 µg/mL *Streptococci* & *Streptococcus bovis)***	Treat as resistant enterococcal endocarditis. Refer to **Infective Endocarditis (IE) > *Enterococcus***		

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Nutritionally variant streptococci (NVS)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Nutritionally variant streptococci; NVS	**Native valve:** Ampicillin 2 g IV q4h **OR** Benzylpenicillin 4 MU IV q4h or 24 MU/day as a continuous infusion	**Native valve:** **(For patient with non-severe hypersensitivity):** Ceftriaxone 2 g IV q24h *Ceftriaxone is preferred if clinically not responding to penicillin* **OR** **Native valve:** **(For patient with severe hypersensitivity to penicillin):** Vancomycin 15-20 mg/kg (actual body weight) IV q8-12h; not to exceed 2 g/dose *Refer to DIAMS - HSgB Vancomycin Protocol for more dosing info*	**Duration: 6 weeks**
	Prosthetic valve: Ampicillin 2 g IV q4h for **6 weeks** **PLUS** Gentamicin 1 mg/kg IV q8h for **2 weeks** **OR** Benzylpenicillin 4 MU IV q4h or 24 MU/day as a continuous infusion for **6 weeks** **PLUS** Gentamicin 1 mg/kg IV q8h for **2 weeks**	**Prosthetic valve:** **(For patient with non-severe hypersensitivity):** Ceftriaxone 2 g IV q24h for **6 weeks** *Ceftriaxone is preferred if clinically not responding to penicillin* **PLUS** Gentamicin 1 mg/kg IV q8h for **2 weeks** **OR** **Prosthetic valve:** **(For patient with severe hypersensitivity to penicillin):** Vancomycin 15-20 mg/kg (actual body weight) IV q8-12h; not to exceed 2 g/dose for **6 weeks** *Refer to DIAMS - HSgB Vancomycin Protocol for more dosing info* **PLUS** Gentamicin 1 mg/kg IV q8h for **2 weeks**	

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Enterococcus

- It is recommended that all these isolates are tested for high level resistance (HLR) to gentamicin

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Native and Prosthetic Valves Enterococcal Endocarditis **(Sensitive to Ampicillin & Gentamicin)**	Ampicillin 2 g IV q4h **PLUS** Gentamicin 1 mg/kg IV q8h *In order to maximise synergistic effect, administer gentamicin at the same time or temporally close to ampicillin.* **Duration:** Symptoms < 3 months & native valve: • **Ampicillin: 4 weeks** • **Gentamicin: 2 weeks** Symptoms > 3 months OR prosthetic valves: • **Ampicillin: 6 weeks** • **Gentamicin: 2 weeks**	**Alternative for** • **Renal impairment OR** • **Elderly patients OR** • **High-level resistance to gentamicin*** Ampicillin 2 g IV q4h **PLUS** Ceftriaxone 2 g IV q12h *Ceftriaxone should not be used alone for enterococcus infection, as they are intrinsically resistant.* *This combination is not active against Enterococcus faecium.* **Duration: 6 weeks**	* Consult ID specialist for enterococcal endocarditis with high level resistance to gentamicin.
Native and Prosthetic Valves Enterococcal Endocarditis **(Resistant to Ampicillin and susceptible to Aminoglycosides and Vancomycin)**	Vancomycin 15-20 mg/kg (actual body weight) IV q8-12h; not to exceed 2 g/dose *Refer to DIAMS - HSgB Vancomycin Protocol for more dosing info* **Duration: 6 weeks** **PLUS** Gentamicin 1 mg/kg IV q8h *Aim for pre-dose (trough) serum level of < 1 mcg/ml* **Duration: 2 weeks**		

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Staphylococcus aureus – Methicillin Sentitive (MSSA)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Native valves **Methicillin-susceptible** *Staphylococcus aureus* **(MSSA)**	**Left sided endocarditis or complicated right sided endocarditis:** Cloxacillin 2 g IV q4h **Duration: 4 to 6 weeks** ***Right sided endocarditis (tricuspid valve) in uncomplicated endocarditis:** Cloxacillin 2 g IV in q4h **Duration: 2 to 4 weeks**	**Antibiotic allergy:** **Severe hypersensitivity to penicillin:** Vancomycin 15-20 mg/kg (actual body weight) IV q8-12h; not to exceed 2 g/dose *Refer to DIAMS - HSgB Vancomycin Protocol for more dosing info* **Duration: 4 to 6 weeks** **For non-severe hypersensitivity:** Cefazolin 2 g IV q8h **Duration: 4 to 6 weeks**	* **For right sided IE:** 2 weeks regime is sufficient provided the patient fulfils all the following criteria (uncomplicated IE): • MSSA • Absence of associated prosthetic valve or left sided valve infection • Good response to treatment • Absence of metastatic sites of infection or empyema • Absence of cardiac and extracardiac complications • Vegetation < 10 mm • Absence of severe immuno-suppression (< 200 CD4 cells/ml) with or without Acquired Immune Deficiency Syndrome (AIDS)
Prosthetic Valves **Methicillin-susceptible** *Staphylococcus aureus* **(MSSA)**	Cloxacillin 2 g IV in q4h **Duration: At least 6 weeks** **PLUS** Gentamicin 1 mg/kg IM/IV q8h **Duration: 2 weeks** **PLUS** *Rifampicin 300-450 mg PO q12h **Duration: At least 6 weeks**	**Severe hypersensitivity to penicillin:** Vancomycin 15-20 mg/kg (actual body weight) IV q8-12h; not to exceed 2g/dose *Refer to DIAMS - HSgB Vancomycin Protocol for more dosing info* **Duration: At least 6 weeks** **PLUS** Gentamicin 1 mg/kg IM/IV q8h **Duration: 2 weeks** **PLUS** *Rifampicin 300-450 mg PO q12h **Duration: At least 6 weeks** **For non-severe hypersensitivity:** Cefazolin 2 g IV q8h **Duration: At least 6 weeks** **PLUS** Gentamicin 1 mg/kg IM/IV q8h **Duration: 2 weeks** **PLUS** *Rifampicin 300-450 mg PO q12h **Duration: At least 6 weeks**	***Rifampicin:** To avoid the development of resistance, it should be started after 3-5 days of effective initial cloxacillin/ vancomycin/ cefazolin therapy and/or once the bacteraemia has been cleared.

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Staphylococcus aureus – Methicillin Resistant (MRSA)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Native valves **Methicillin-resistant** *Staphylococcus aureus* **(MRSA)**	Vancomycin 15-20 mg/kg (actual body weight) IV q8-12h; not to exceed 2 g/dose *Refer to DIAMS - HSgB Vancomycin Protocol for more dosing info* **Duration: 4 to 6 weeks**	Daptomycin 10 mg/kg IV q24h • *Registered in Malaysia, however not in FUKKM.* • *Daptomycin is superior to vancomycin for MRSA bacteraemia with vancomycin MIC > 1 µg/ml* **Duration: 4 to 6 weeks**	****Daptomycin:** Daptomycin might be more effective in IE caused by MRSA with higher MIC (above 1 mg/L) to vancomycin based on case-control studies. However, risk for MIC creep against daptomycin may be present in those exposed to vancomycin.
Prosthetic Valves **Methicillin-resistant** *Staphylococcus aureus* **(MRSA)**	Vancomycin 15-20 mg/kg (actual body weight) IV q8-12h; not to exceed 2 g/dose *Refer to DIAMS - HSgB Vancomycin Protocol for more dosing info* **Duration: At least 6 weeks** **PLUS** Gentamicin 1 mg/kg IM/IV q8h **Duration: 2 weeks** **PLUS** *Rifampicin 300-450 mg PO q12h **Duration: At least 6 weeks**	-	***Rifampicin:** To avoid the development of resistance, it should be started after 3-5 days of effective initial vancomycin therapy and/or once the bacteraemia has been cleared.

HACEK Microorganisms

- H*aemophilus parainfluenzae, Aggregatibacter species, Cardiobacterium species, Eikenella corrodens,* and *Kingella* species

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Native valves & Prosthetic valves	Ceftriaxone 2 g IV q24h	Ampicillin/sulbactam 3 g IV q6h **OR** Ciprofloxacin 400 mg IV or 500 mg PO q12h	**Duration:** • **4 weeks (native valves)** • **6 weeks (prosthetic valves)** HACEK-group bacilli produce beta lactamases; definitive treatment should be adjusted based on the cultures.

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Candida Endocarditis (Native and Prosthetic valve)

- Consultation with ID specialist is needed

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Native valves & Prosthetic valves	**Initial therapy:** Amphotericin B deoxycholate 0.6-1 mg/ kg IV q24h **Duration: At least 6 weeks after surgery** **OR** Liposomal Amphotericin B 3-5 mg/kg IV q24h **Duration: At least 6 weeks after surgery** **MAY ADD** Flucytosine 25 mg/kg PO q6h *For synergistic effect. Causes dose-related marrow toxicity. Avoid using in patients with renal failure.* **Duration: At least 6 weeks after surgery**	**Initial therapy:** High dose echinocandins are recommended. Options include: • IV Caspofungin 150 mg daily **OR** • IV Micafungin 150 mg daily **OR** • IV Anidulafungin 200 mg daily	Valve replacement surgery is mandatory. **Duration:** • Continue therapy for 6 weeks after surgical replacement or longer in patient with perivalvular abscess. • If prosthetic valve cannot be replaced, lifelong suppressive therapy with Fluconazole 400 mg (6 mg/kg) daily is recommended. • The duration of therapy will depend on patient response and surgical intervention.
	Step down therapy: Fluconazole 400-800 mg (6-12 mg/kg) PO q24h *Susceptible microorganism in stable patients with negative blood cultures (clearance of Candida from blood stream)*		

Culture-Negative Endocarditis

- Consultation with ID specialist is needed

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Brucella spp.	Doxycycline 100 mg PO q12h **PLUS** Rifampicin 300-600 mg PO q24h **PLUS** Gentamicin 5 mg/kg IV q24h *For first 2-4 weeks only*	Doxycycline 100 mg PO q12h **PLUS** Rifampicin 300-600 mg PO q24h **PLUS** Streptomycin 15 mg/kg IM q24h *For first 2-4 weeks only*	**Duration: 3-6 months** depending on clinical response
***Coxiella burnetii* (Agent of Q Fever)**	Doxycycline 100 mg PO q12h **PLUS** Hydroxychoroquine 600 mg PO q24h or 200 mg PO q8h	-	**Duration: 18-24 months** depending on clinical and serological response.
Bartonella spp.	Doxycycline 100 mg PO q12h **For 6 weeks** **PLUS** Gentamicin 3 mg/kg IV q24h **For 2 weeks**	-	

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Footnotes for antibiotic treatment for endocarditis:

1. Vancomycin: aim for AUC24/MIC of 400–600 (preferred, if stable renal functions), or serum trough level of 15–20 mg/L (10–14 µmol/L) for both adults and paediatrics. Vancomycin dose should be adjusted in patients with renal impairment. Refer to DIAMS - HSgB Vancomycin Protocol for more dosing info.
2. Gentamicin for gram positive synergy dosing: use adjusted body weight for obese patients. Monitor gentamicin levels at least weekly. For conventional dosing (1 mg/kg/dose q8h), aim for gentamicin peak level (taken 30 mins after completion of a 30-minute infusion OR one hour after bolus injection) of 6–10 µmol/L (3-5 mcg/mL) and trough level (within 30 mins before the next dose) of < 2 µmol/L (<1 mcg/mL). For gentamicin 3 mg/kg q24h dosing, monitor trough levels only.
3. There should be a high tendency for stopping gentamicin in patients with deteriorating renal function or other signs of toxicity.
4. If there is high level of gentamicin resistance, ampicillin or vancomycin will need to be continued for ≥ 6 weeks. Referral to an ID physician is recommended if high level gentamicin resistance is present.
5. Rifampicin should always be used in combination with another effective anti-staphylococcal drug (ideally two active agents, i.e. cloxacillin) to minimize risk of resistance. Rifampicin increases hepatic clearance of warfarin and other drugs.
6. In selected patients of native valve endocarditis with a stable clinical course, it may be possible to switch from IV to oral antibiotics after careful assessment by both cardiologist and ID physician. If feasible, outpatient parenteral antimicrobial therapy (OPAT) can also be considered in this subset of patients. Refer DIAMS - IV to Oral & OPAT Guide.

Treatment of Cardiac Implantable Electronic Devices (CIED) Infections

Cardiac Implantable Electronic Devices (CIED) Infections

- E.g. pacemaker infections

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
CIED Infections	Refer to MOH **CPG for the Prevention, Diagnosis & Management of Infective Endocarditis 2017** – Section 7.4		

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HSgB Antimicrobial Guideline (HAG)

SECTION A: ADULT

A3: CATHETER RELATED BLOODSTREAM INFECTIONS (CRBSI)

Launched: October 2024

Updated: -

LIST OF TOPICS WITH LINKS:

1. **Non-tunnelled central venous catheters (subclavian, internal jugular, femoral)**
2. **Tunnel type indwelling venous catheters and ports (Broviac, Hickman)**

Non-tunnelled central venous catheters (subclavian, internal jugular, femoral)

- Peripherally inserted central catheter (PICC)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Non-tunnelled CVC e.g. PICC	Cloxacillin 2 g IV q4-6h **OR** Cefazolin 2 g IV q8h **MAY ADD** Ceftazidime 2 g IV q8h *For gram-negative coverage if critically ill, OR patients with femoral lines*	**If patient has risk factors for MRSA** Vancomycin 15-20 mg/kg (actual body weight) IV q8-12h; not to exceed 2 g/dose *Refer to DIAMS - HSgB Vancomycin Protocol for more dosing info* **If local epidemiology shows high ESBL prevalence AND if patient severely ill (e.g hypotension, multiorgan failure)** Meropenem IV 2 g q8h **OR** Imipenem 1 g IV q8h	BOTH peripheral blood C&S and cultures from the central line must be obtained if CRBSI is suspected. Change antibiotic to targeted therapy once cultures available. Antibiotic of choice depends on local epidemiology of CRBSI and guided by antibiogram results. Catheter removal is recommended. In uncuffed, temporary CVC, CRBSI due to Gram-negative bacilli, *S. aureus*, enterococci, fungi, and mycobacteria warrant CVC removal (KDOQI 2020) Duration of antibiotics depends on organisms, catheter removal, and presence of complications. Suggest ID consultation.

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Tunnel type indwelling venous catheters and ports (Broviac, Hickman)

- Haemodialysis catheters

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Tunnel-type catheters e.g. HD catheters	Cloxacillin 2 g IV q4-6h **PLUS** Ceftazidime 2 g IV q8h **OR** Cefazolin 2 g IV q8h **PLUS** Ceftazidime 2 g IV q8h	**If patient has risk factors for MRSA** Vancomycin 15-20 mg/kg (actual body weight) IV q8-12h; not to exceed 2 g/dose *Refer to DIAMS - HSgB Vancomycin Protocol for more dosing info* **PLUS** Ceftazidime 2 g IV q8h	Adjust dose according to renal function. Catheter removal is recommended in the following: ● Septic shock ● Septic phlebitis ● Endocarditis, or metastatic infections ● Persistent positive culture > 72 hours ● *Staph aureus, Pseudomonas aeruginosa*, fungi, *Mycobacteria* infections ● Tunnel infections ● Port abscess Duration of antibiotics depends on organisms, catheter removal, and presence of complications. In some cases, patients without any alternative site available for catheter insertion, catheter exchange over a wire or catheter salvage might be considered instead of catheter removal, regardless of microorganism isolated. Catheter salvage in difficult vascular access: ● Systemic antibiotics and an adjunctive antibiotic lock should both be used ● Gram positive microorganisms: Vancomycin 2.5mg/ml lock ● Gram negative microorganisms: Gentamicin 1mg/ml lock Suggest ID consultation.

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HSgB Antimicrobial Guideline (HAG)

SECTION A: ADULT

A4: CENTRAL NERVOUS SYSTEM (CNS) INFECTIONS

Launched: October 2024

Updated: -

LIST OF TOPICS WITH LINKS:

1. Meningitis (Acute)
- Empirical Treatment on Admission
- Causative Organism Isolated – *Haemophilus influenzae* (Gram-negative bacilli)
- Causative Organism Isolated – *Streptococcus pneumoniae* (Gram-positive cocci)
- Causative Organism Isolated – *Neisseria meningitidis* (Gram-negative diplococci)
- Prophylaxis for Household and Close Contact of Meningococcal Meningitis Cases
- Listeriosis – *Listeria monocytogenes* (Gram-positive rod)
- Brain Abscess / Subdural Empyema
- Spinal Epidural Abscess
- Viral Encephalitis

2. Meningitis (Chronic)
- Tuberculous Meningitis
- Cryptococcal Meningitis (Non-HIV, Non-transplant patient)
- Healthcare-associated Ventriculitis and Meningitis
- Neurosyphilis
- HIV related CNS infection

3. Meningoencephalitis

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Meningitis (Acute)

Empirical Treatment on Admission

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Empirical Treatment Common organisms: • *Streptococcus pneumoniae* • *Neisseria meningitidis* • *Haemophilus influenzae* Other: • *Listeria monocytogenes*	Ceftriaxone 2 g IV q12h **PLUS** Ampicillin 2 g IV q4h *(if suspecting listeriosis, please see comments)*	Cefotaxime 2 g IV q6h **PLUS** Ampicillin 2 g IV q4h *(if suspecting listeriosis, please see comments)* *If allergic to Cephalosporins, Consider Meropenem 2 g IV q8h	**Duration:** 10-14 days Antibiotics should not be delayed if lumbar puncture is delayed by radiological investigation. If no organism is isolated from CSF C&S but LP is suggestive of bacterial meningitis and the patient is responding, continue antibiotics for 10-14 days. Dexamethasone 10mg IV q6h is recommended 15 to 20 minutes before or at the time of first dose of antibiotics. Continue for 4 days if the Gram stain and/or cultures are consistent with *S. pneumoniae*. Discontinue if not *Streptococcus pneumonia* or if bacterial meningitis is subsequently thought not to be present. Incidence of **listeriosis** increases in people > 50 years of age, immunosuppressed and pregnancy. Consider empirical cover with IV ampicillin especially if the course of disease is indolent or there is epidemiological risk (refer section 1.4 - Listeriosis).

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Causative Organism Isolated – *Haemophilus influenzae* (Gram-negative bacilli)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Haemophilus influenzae	Ceftriaxone 2 g IV q12h	Cefotaxime 2 g IV q6h **If organism is susceptible and patient is allergic to cephalosporins:** Ciprofloxacin 400 mg IV q8h	**Duration:** 7-10 days

Causative Organism Isolated – *Streptococcus pneumoniae* (Gram-positive cocci)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Penicillin-sensitive strains *Penicillin MIC ≤ 0.06 mcg/ml*	Benzylpenicillin 4 MU IV q4h	-	All attempts should be made to ascertain the MIC of isolated pneumococcus. De-escalate ceftriaxone or cefotaxime to benzylpenicillin once the MIC result confirms Penicillin MIC ≤ 0.06 mcg/mL. **Duration: 10-14 days** Refer ID physician if patient not responding to the prescribed treatment
Penicillin resistant strains *Penicillin MIC ≥ 0.12 mcg/ml*	Ceftriaxone 2 g IV q12h	Cefotaxime 2 g IV q6h	
Penicillin resistant and Cephalosporin intermediate strains *Cephalosporin MIC ≥ 1 and < 2 mcg/ml* *ID Referral is recommended*	Vancomycin 25-30 mg/kg loading dose then 15-20 mg/kg IV q8-12h *Refer to DIAMS - HSgB Vancomycin Protocol for more dosing info* **PLUS** Ceftriaxone 2 g IV q12h	Vancomycin 25-30 mg/kg loading dose then 15-20 mg/kg IV q8-12h *Refer to DIAMS - HSgB Vancomycin Protocol for more dosing info* **PLUS** Cefotaxime 2 g IV q6h	
Penicillin resistant and Cephalosporin resistant strains *Cephalosporin MIC ≥ 2 mcg/ml*	Refer ID physician		

Causative Organism Isolated – *Neisseria meningitidis* (Gram-negative diplococci)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Penicillin Susceptible *Penicillin MIC ≤ 0.06 mcg/ml*	Benzylpenicillin 4 MU IV q4h	**If patient is allergic to penicillin:** Refer to Penicillin Non-susceptibe row below.	**Duration: 5-7 days**
Penicillin Non-susceptible *Penicillin MIC > 0.06 mcg/ml*	Ceftriaxone 2 g IV q12h	Cefotaxime 2 g IV q6h **If organism is susceptible and patient is allergic to cephalosporins:** Ciprofloxacin 400 mg IV q8h	

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Prophylaxis for Household and Close Contact of Meningococcal Meningitis Cases

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Meningococcal Meningitis Prophylaxis (Household & Close contacts) **Age > 15 years**	Ciprofloxacin 500 mg PO as single dose *Not recommended in pregnant or lactating women* **OR** Rifampicin 600 mg PO q12h for 2 days (4 doses) *Not recommended in pregnant women*	**In pregnancy and lactating mothers:** Ceftriaxone 250 mg IM as single dose **OR** Azithromycin 500 mg PO as single dose	Close contacts are defined as • those individuals who have had contact for > 8 hours and within 1 meter of the index case. Individuals who were in contact with oropharyngeal secretions of the index case in the last 7 days before onset of symptoms up to 24 hours after appropriate antibiotics should also receive prophylaxis. For index case who received only benzylpenicillin as therapy, chemoprophylaxis should also be given upon discharge to eliminate nasopharyngeal carriage.

Listeriosis – *Listeria monocytogenes* (Gram-positive rod)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Listeriosis	Ampicillin 2 g IV q4h **OR** Benzylpenicillin 4 MU IV q4h **MAY ADD** Gentamicin 5 mg/kg/day IV in 3 divided doses *Current evidence supporting combination therapy with gentamicin is weak but it can be considered for severe infections for synergistic effect.*	Trimethoprim/sulfamethoxazole (Bactrim) 10-20 mg/kg/day [of TMP component] IV/PO in 2-4 divided doses **DIAMS - IV to PO** **Oral Bactrim** has excellent bioavailability (~90%) with similar CNS penetration as IV *Consider oral formulation if patient can tolerate orally **OR** Meropenem 2 g IV q8h	Duration of treatment is 3 weeks depending on clinical response. May be longer in an immunocompromised host.

Brain Abscess / Subdural Empyema

Common organisms:

- *Streptococci*
- *Staphylococcus*
- Gram-negative bacilli
- Anaerobes

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Oral/ Sinus/ Hematogenous source	Ceftriaxone 2 g IV q12h **PLUS** Metronidazole 500 mg IV q8h	Cefotaxime 2 g IV q4-6h **PLUS** Metronidazole 500 mg IV q8h	Duration to be determined by clinical response (usually 4-8 weeks with IV therapy for 2 weeks minimum depending on whether surgical drainage done, clinical and radiological response). De-escalate antibiotics based on culture result and sensitivity.
Otogenic source	Ceftazidime 2 g IV q8h **PLUS** Metronidazole 500 mg IV q8h	Ceftriaxone 2 g IV q12h **PLUS** Metronidazole 500 mg IV q8h	

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Spinal Epidural Abscess

Common organisms:

- *Streptococci*
- *Staphylococcus*
- Gram-negative bacilli

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Spinal Epidural Abscess	Cloxacillin 2 g IV q6h **PLUS** Ceftriaxone 2 g IV q12h **Switch Cloxacillin to Vancomycin if suspecting MRSA infection or patient is deteriorating**	Cloxacillin 2 g IV q6h **PLUS** Cefotaxime 2 g IV q4-6h **Switch Cloxacillin to Vancomycin if suspecting MRSA infection or patient is deteriorating**	Source control is strongly recommended. It is important to attempt to obtain specimen to guide antimicrobial therapy. Continue therapy for at least 6 weeks, with a minimum of 2 weeks IV therapy. Duration to be determined by clinical response, whether surgical drainage done, clinical and radiological response.

Viral Encephalitis

Common organisms:

- *Herpes simplex*
- *Varicella zoster*

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Viral Encephalitis	Acyclovir 10 mg/kg IV q8h	-	Use Ideal Body Weight in obese class 1 and 2 patients (BMI 30-39.9kg/m^2) Use Adjusted Body Weight for class 3 obesity patients (BMI>40kg/m^2) **Duration: 14-21 days**

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Meningitis (Chronic)

Tuberculous Meningitis

- Mycobacterium tuberculosis

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Tuberculosis Meningitis	Refer to **Clinical Practice Guidelines on Management of Tuberculosis (4th Edition)**		Treatment is continued for 12 months.

Cryptococcal Meningitis (Non-HIV, Non-transplant patient)

- *Cryptococcus neoformans*
- *Cryptococcus gattii*

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Cryptococcus Meningitis	**Induction Therapy**: Amphotericin B deoxycholate 0.7 - 1 mg/kg/day IV q24h **Lipid formulations of amphotericin may be used in cases of severe nephrotoxicity.* **PLUS** Flucytosine 100 mg/kg/day PO q6h **Duration: 4-6 weeks** *Consider 6 weeks if patient has neurological complications and positive CSF culture at 2 weeks*	**Induction Therapy**: Amphotericin B deoxycholate 0.7 – 1 mg/kg/day IV q24h *Lipid formulations of amphotericin may be used in cases of severe nephrotoxicity.* **PLUS** Fluconazole 800-1200 mg PO q24h **OR** Fluconazole 1200 mg PO q24h **PLUS** Flucytosine 100 mg/kg/day PO q6h **Duration: 4-6 weeks** *Consider 6 weeks if patient has neurological complications and positive CSF culture at 2 weeks*	Repeat lumbar puncture at end of 2 weeks of induction therapy. Prompt baseline lumbar puncture is strongly encouraged. If pressures are elevated, regular LP is recommended. Consider insertion of EVD/ VP shunting if persistent high CSF pressures. Use of mannitol/ steroids and acetazolamide are not recommended in managing pressures. In non-HIV/non-transplant patients, consider intermittent LP to look for relapse of cryptococcal infection during consolidation/ maintenance phase (relapse/persistent rate) ***Lipid formulation Amphotericin B:** Consult ID for Lipid Formulation of Amphotericin B (a Red Category antibiotic with **significantly different dosing**).
	Followed by **Consolidation Therapy**: Fluconazole 400-800 mg PO q24h **Duration: 8 weeks** *Use fluconazole 800mg/day if induction phase is less than 4 weeks/ induction phase did not use flucytosine or amphotericin B.*	**Followed by** **Consolidation Therapy**: Fluconazole 800 mg PO q24h **Duration: 8 weeks**	
	Followed by **Maintenance Therapy:** Fluconazole 200 mg PO q24h **Duration: 12 months** *Longer therapy may be needed to achieve eradication*	**Followed by** **Maintenance Therapy:** Fluconazole 200 mg PO q24h **Duration: 12 months** *Longer therapy may be needed to achieve eradication*	

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Healthcare-associated Ventriculitis and Meningitis

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
HA-Ventriculitis & HA-Meningitis Empirical treatment should be decided by the primary team based on local antibiogram and CSF gram stain result.	**If C&S is not available:** Ceftazidime 2 g IV q8h **MAY ADD** Vancomycin 25-30 mg/kg loading dose then 15-20 mg/kg IV q8-12h *Refer to DIAMS - HSgB Vancomycin Protocol for more dosing info*	Meropenem 2 g IV q8h **MAY ADD** Vancomycin 25-30 mg/kg loading dose then 15-20 mg/kg IV q8-12h *Refer to DIAMS - HSgB Vancomycin Protocol for more dosing info*	De-escalate antibiotics to targeted therapy when the culture results are available.

Neurosyphilis

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Neurosyphilis	Benzylpenicillin 4 MU q4h IV for 14 days **OR** Procaine penicillin 2.4 MU IM q24h for 14 days **PLUS** *Probenecid **(UKK)** 500 mg PO q6h for 14 days	**For penicillin allergy without anaphylaxis** (in pregnant/non-pregnant patients): Ceftriaxone 2 g IV/IM q24h **Duration:** 14 days **If anaphylaxis to penicillin** (in non-pregnant patients): Doxycycline 200 mg PO q12h **Duration:** 28 days	Consider Prednisolone 40-60 mg PO q24h for 3 days starting 24 hours before the antibiotics.

HIV related CNS infection

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
HIV Related CNS infection	Refer to **A9: Infections In Immunocompromised Patients (Opportunistic Infection (OI) in Patients With Human Immunodeficiency Virus (HIV))**		

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Meningoencephalitis

Common organisms:

Bacterial:
- *Streptococcus pneumoniae*
- *Neisseria meningitidis*
- *Haemophilus influenzae*

Viral
- *Herpes simplex*
- *Varicella zoster*

Others:
- *Listeria monocytogenes*

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Meningoencephalitis	Ceftriaxone 2 g IV q12h **OR** Cefotaxime 2 g IV q6h **PLUS** Acyclovir 10 mg/kg IV q8h **MAY ADD** Ampicillin 2 g IV q4h *(if suspecting listeriosis, please see comments)*	**If allergic to Cephalosporins:** Meropenem 2 g IV q8h **PLUS** Acyclovir 10 mg/kg IV q8h **MAY ADD** Ampicillin 2 g IV q4h *(if suspecting listeriosis, please see comments)*	**Duration:** 10-14 days Antibiotics should not be delayed if lumbar puncture is delayed by radiological investigation. If no organism is isolated from CSF C&S but LP is suggestive of bacterial meningitis and the patient is responding, continue antibiotics for 10-14 days. Dexamethasone 10 mg IV q6h is recommended 15 to 20 minutes before or at the time of first dose of antibiotics. Continue for 4 days if the Gram stain and/or cultures are consistent with *S. pneumoniae*. Discontinue if not *Streptococcus pneumonia* or if bacterial meningitis is subsequently thought not to be present. Incidence of **listeriosis** increases in people > 50 years of age, immunosuppressed and pregnancy. Consider empirical cover with **IV Ampicillin** especially if the course of disease is indolent or there is epidemiological risk If listeriosis is suscpected, refer to section **Listeriosis – *Listeria monocytogenes* (Gram-positive rod)**.

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HSgB Antimicrobial Guideline (HAG)

SECTION A: ADULT

A5: CHEMOPROPHYLAXIS

Launched: October 2024

Updated: -

LIST OF TOPICS WITH LINKS:

1. **Surgical Chemoprophylaxis**
   - Introduction To Surgical Antibiotic Prophylaxis (SAP)
   - Cardiac Surgery
   - Cardiac / Vascular Surgery
   - General Surgery
   - Hepatobiliary Surgery
   - Neurosurgery
   - Obstetrics & Gynaecology Surgery
   - Ophthalmology Surgery
   - Oral / Dental Surgery
   - Orthopaedic Surgery
   - Otorhinolaryngology (ORL) surgery
   - Plastic Surgery
   - Urological Surgery
   - Thoracic Surgery
   - Vascular Surgery
2. **Non-Surgical Chemoprophylaxis**
   - Introduction
   - Prophylactic Regimens for High-Risk Dental Procedures in High-Risk Patients
   - Secondary Prevention of Rheumatic Fever

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Surgical Chemoprophylaxis

Introduction To Surgical Antibiotic Prophylaxis (SAP)

The use of antibiotics to prevent surgical site infection (SSI) is one of the keys to optimize postoperative recovery. Harms associated with antibiotic use (E.g.: allergic/adverse drug reactions) must be taken into consideration when prescribing antibiotic for surgical prophylaxis.

Healthcare providers should comply with the recommendations stipulated in Policy of Surgical Antibiotic Prophylaxis of Ministry of Health, Malaysia.

GENERAL PRINCIPLES

The principle of antibiotic prophylaxis is to prevent SSI by reducing the burden of microorganisms at the surgical site during the operative procedure. Single-dose prophylaxis is usually sufficient. If antibiotic prophylaxis is continued postoperatively, duration should be less than 24 hours (up to 48 hours for cardiac surgery), regardless of the presence of intravascular catheters or indwelling drains.

In a situation where the patient has pre-existing infections (known or suspected) and will go for a procedure, appropriate treatment regimen is required instead of prophylactic regimen. The optimal time for administration of pre-operative antibiotics is 60 minutes prior to surgical incision. Some antibiotics such as fluoroquinolones and vancomycin require administration over one to two hours; therefore, the administration of these antibiotics should begin within 120 minutes before surgical incision.

An additional dose (re-dosing) of prophylactic antibiotic during operation is indicated if:
▪ Excessive blood loss (> 1500 ml)
▪ Procedures exceed two half-lives of the drug
▪ There are other factors that may shorten the half-life of the prophylactic agent (e.g., extensive burns)

Below is the recommended redosing for common antimicrobial use for surgical antibiotic prophylaxis:

Antimicrobial	Recommended Redosing Interval in Adults with Normal Renal Function
Cefazolin	4
Cefuroxime	4
Ampicillin/Sulbactam	2
Amoxicillin/Clavulanate	3
Benzylpenicillin	2
Metronidazole	NA
Vancomycin	NA
Gentamicin	NA

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FACTORS TO CONSIDER IN ADMINISTRATION OF SURGICAL ANTIBIOTIC PROPHYLAXIS (SAP)

1. Patient Risk Factors

Individual risk factors for every patient must be considered prior to prescribing SAP. Antibiotic choice/dose may need to be modified according to patient factors such as allergies, renal function and obesity.

For patients with penicillin allergy, vancomycin or clindamycin is recommended unless stated otherwise. For obese patients, the dose that need adjustment is vancomycin (1.5g if more than 75kg) and cefazolin (2g if less than 120kg and 3g if more than 120kg).

2. Time of Administration

The optimal time for administration of most pre-operative doses is **60 minutes before surgical incision**. The antibiotic should be infused completely prior to the incision.

3. Antibiotic Choice

The need for and choice of SAP depends on the surgical wound classification (clean, clean-contaminated, contaminated, dirty-infected). Choose the appropriate SAP according to local or national guideline.

4. Pre-existing Infections

In cases of known or suspected pre-existing infections, the appropriate antibiotic treatment regimen is required instead of prophylactic regimen, while ensuring the antibiotic choice has activity against the organism(s) that is most likely to cause post-operative infection. The administration of the treatment dose must be adjusted to ensure adequate plasma and tissue concentrations are achieved at the time of surgical incision and throughout the duration of the surgical procedure. Advice from Infectious Disease physicians is recommended. Patients who are colonized with *Methicillin Resistant Staphylococcus aureus* (MRSA) should be decolonized before surgery (refer to Policies and Procedures on Infection Prevention and Control, Ministry of Health).

5. Post-operative Care

Post-operative antibiotics are indicated only if infection is suspected or confirmed. For suspected infections, antibiotic regimen may need to be modified according to clinical judgement and microbiological results.

ROLE OF HEALTHCARE PROVIDERS IN SURGICAL ANTIBIOTIC PROPHYLAXIS (SAP)

1. Prescriber

- Ensure antibiotics are ordered so that they are given at the appropriate time based on current guidelines.
- Prescribe the appropriate surgical antibiotic prophylaxis according to local or national guidelines.
- In cases when the prescriptions do not adhere to guidelines, the reason for non-adherence needs to be documented on the medication chart or case notes.
- Prescriber to inform patients and their caregivers about their antimicrobial therapy before surgery.

2. Pharmacist

- Ensure timely supply of antibiotics for surgical prophylaxis, which also includes mechanisms to control access to restricted antimicrobials according to local policy.
- Advice prescribers and nurses with regards to the choice, dose, route, duration and monitoring of antibiotic used in surgical prophylaxis.
- Monitor antibiotic use related to surgical prophylaxis.

3. Nurse

- Understand and aware of the existence of policy and guideline of surgical antibiotic prophylaxis for various surgical specialties.
- Ensure administration of prescribed antibiotic for surgical prophylaxis is safe and timely.
- Monitor antibiotic use related to surgical prophylaxis.
- Assist patients and caregivers to gain information and understand about their antimicrobial therapy prior to surgical procedure.

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Cardiac Surgery

1. **Cardiac Surgery (General)**
2. **Coronary Artery Bypass Graft (CABG)**
3. **Cardiac Device Insertion procedure**

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Cardiac Surgery (General) • Aortic dissection • Thoracic endovascular aortic repair (TEVAR) • Valve repair or replacement • Left ventricular assist device (LVAD) placement	Cefazolin 2 g IV followed by 2 g IV q8h *At onset of bypass: May consider additional 1-2g of IV cefazolin via cardiopulmonary bypass circuit.* **If MRSA colonized:** Cefazolin 2 g IV STAT **PLUS** Vancomycin 15-20 mg/kg IV STAT *Vancomycin dose of 20mg/kg pre-operatively may be preferred to achieve sufficient tissue concentrations at the time of surgery* ***Followed by*** Cefazolin 2 g IV q8h **PLUS** Vancomycin 15 mg/kg IV q12h *Refer to DIAMS - HSgB Vancomycin Protocol for more dosing info*	**Severe penicillin allergy:** Vancomycin 15-20 mg/kg IV STAT followed by 15 mg/kg IV q12h • *IV vancomycin dose of 20mg/kg pre-operatively may be preferred to achieve sufficient tissue concentrations at the time of surgery.* • *Refer to DIAMS - HSgB Vancomycin Protocol for more dosing info*	

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Coronary Artery Bypass Graft (CABG)	Cefazolin 2 g IV STAT then q8h	Cefuroxime 1.5 g IV STAT then q8h	Duration: 24-48 hours

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Cardiac Device Insertion procedure • Pacemaker implantation • Defibrillator insertion	Cefazolin 2 g IV	Cefuroxime 1.5 g IV	Single dose

Cardiac / Vascular Surgery

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Examples: **Angioplasty** **Stent insertion**	Surgical antibiotic prophylaxis not recommended	-	

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1. Chung et al., National surgical antibiotic prophylaxis guideline in Singapore. Ann Acad Med Singap. 2022 Nov; 51(11):695-711.

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General Surgery

1. **Gastroduodenal & Oesophageal**
2. **Appendectomy**
3. **Small Intestine**
4. **Colorectal surgery**
5. **To be used only in conjunction with Mechanical Bowel Preparation (MBP)**
6. **Hernial Repair with Mesh**
7. **Breast Cancer Surgery (Without Oncoplastic / Reconstruction Surgery)**
8. **Breast Reconstruction Surgery**
9. **Breast Lump Excision Biopsy**

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Gastroduodenal & Oesophageal	Cefazolin 2 g IV	Cefuroxime 1.5 g IV **Severe penicillin allergy:** Gentamicin 5 mg/kg IV **MAY ADD** Clindamycin 600-900 mg IV	Single dose

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Appendectomy	Cefazolin 2 g IV **PLUS** Metronidazole 500 mg IV	Cefuroxime 1.5 g IV **PLUS** Metronidazole 500 mg IV **OR** Amoxicillin-clavulanate 1.2g IV **Severe penicillin allergy:** Gentamicin 5 mg/kg IV **MAY ADD** Clindamycin 600-900 mg IV • *Clindamycin resistance has been increasing in Bacteroides species.* • *Metronidazole may be preferred if the procedure transverses the lower gastrointestinal tract.*	Single dose

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Small Intestine	Cefazolin 2 g IV **PLUS** Metronidazole 500 mg IV	Cefuroxime 1.5 g IV **PLUS** Metronidazole 500 mg IV **Severe penicillin allergy:** Gentamicin 5 mg/kg IV **MAY ADD** Clindamycin 600-900 mg IV	Single dose

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Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Colorectal surgery	Cefazolin 2 g IV **PLUS** Metronidazole 500 mg IV	Cefoperazone 2 g IV **PLUS** Metronidazole 500 mg IV **OR** Ceftriaxone 2 g IV **PLUS** Metronidazole 500 mg IV **Severe penicillin allergy:** Gentamicin 5 mg/kg IV **MAY ADD:** Metronidazole 500 mg IV **OR** Clindamycin 600-900 mg IV • *Clindamycin resistance has been increasing in Bacteroides species.* • *Metronidazole may be preferred if the procedure transverses the lower gastrointestinal tract.*	Single dose
To be used only in conjunction with Mechanical Bowel Preparation (MBP)	Neomycin sulfate 1 g PO **PLUS** Erythromycin base 1 g PO	Neomycin sulfate 1 g PO **PLUS** Metronidazole 1 g PO	3 doses over 10 hours the day before surgery (between 1pm-11pm). The need for MBP + PO prophylaxis to be decided by individual institution

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Hernial Repair with Mesh	Cefazolin 2 g IV	**Severe penicillin allergy:** Vancomycin 15-20 mg/kg IV	Single dose Including laparoscopic repair **Antibiotic not required for hernia repair with no mesh placement**

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Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Breast Cancer Surgery (Without Oncoplastic / Reconstruction Surgery)	Surgical antibiotic prophylaxis not recommended **For patient with risk factors*** Cefazolin 2 g IV	Surgical antibiotic prophylaxis not recommended **Severe penicillin allergy for patients with risk factors*:** Vancomycin 15-20 mg/kg IV	Single dose ***Risk factors:** • Post neo-adjuvant chemotherapy • Immunocompromised individuals

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Breast Reconstruction Surgery	Cefazolin 2 g IV STAT followed by 2 g IV q8h	Amoxicillin/clavulanate 1.2 g IV followed by 1.2 g IV q8h **Severe penicillin allergy:** Clindamycin 600-900 mg IV STAT followed by 600-900 mg IV q6-8h **OR** Vancomycin 15-20 mg/kg IV STAT followed by 15 mg/kg IV q12h	Duration: up to 24 hours Unless a drain is present, antibiotics should be discontinued within 24 hours of the completion of the procedure. If a drain is present, the role of antibiotics is less clear and should be left to physician judgement.

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Breast Lump Excision Biopsy Wire localisation excision biopsy	Surgical antibiotic prophylaxis not recommended		Refer to Breast Cancer Surgery for antibiotic choices if prophylaxis is required. Prophylactic antibiotic should not exceed single dose

REFERENCES (Surgical Chemoprophylaxis-Adult):

1. Chung et al., National surgical antibiotic prophylaxis guideline in Singapore. Ann Acad Med Singap. 2022 Nov; 51(11):695-711.
2. Splenectomy Vaccination & Antimicrobial Prophylaxis (Adult asplenic & hyposplenic patients) clinical guideline, South Australia 2019
3. Urological Infections - European Association of Urology Guidelines March 2023
4. Matthew Coates et al. Prophylactic Cefazolin Dosing in Obesity—a Systematic Review. https://doi.org/10.1007/s11695-022-06196-5

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Hepatobiliary Surgery

1. **Biliary Tract Surgery**
2. **Hepatectomy**
3. **Splenectomy or Left Sided Pancreatic Surgery**
4. **Post-splenectomy Antibiotic Prophylaxis**
5. **Pre or Post-Splenectomy Vaccinations**
6. **Whipple's Operation**
7. **Endoscopic Retrograde Cholangio-Pancreatography (ERCP)**

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Biliary Tract Surgery	Cefazolin 2 g IV	Amoxicillin/Clavulanate 1.2 g IV **OR** Ceftriaxone 2 g IV **Severe penicillin allergy:** Vancomycin 15-20 mg/kg IV **PLUS** Gentamicin 5 mg/kg IV **OR** Clindamycin 600-900 mg IV **PLUS** Gentamicin 5 mg/kg IV	Single dose It is reasonable to give single dose prophylaxis for patients undergoing laparoscopic cholecystectomy although evidence showed that antibiotic not required in low-risk patients. This is because some of these risk factors cannot be determined before surgery.

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Hepatectomy	Cefazolin 2 g IV	Amoxicillin/Clavulanate 1.2 g IV **OR** Ceftriaxone 2 g IV **Severe penicillin allergy:** Vancomycin 15-20 mg/kg IV **PLUS** Gentamicin 5 mg/kg IV **OR** Clindamycin 600-900 mg IV **PLUS** Gentamicin 5 mg/kg IV	Single dose (max up to 24 hours) Consider adding anaerobic coverage (Metronidazole - if patient on Cephalosporin) in procedures involving lower GI tract.

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Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Splenectomy or Left Sided Pancreatic Surgery	Cefazolin 2 g IV	Amoxicillin/Clavulanate 1.2 g IV **Severe penicillin allergy:** Vancomycin 15-20 mg/kg IV	Single dose There is no need to extend duration for patients who are not immunized. Administer appropriate immunizations.

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Post-splenectomy Antibiotic Prophylaxis At risk for Pneumococcus, Meningococcus & Haemophilus infection	Phenoxymethylpenicillin (Penicillin V) 250 mg PO q12h	Amoxicillin 250 mg PO q24h **Penicillin allergy:** Cephalexin 250 mg PO q12h **OR** Azithromycin 250 mg PO q24h	**Duration of chemoprophylaxis:** At least 1 year following splenectomy. Risk of sepsis remains lifelong and is highest in immunocompromised patients. Duration of chemoprophylaxis should be individualized based on patients' risk factors: ● Severely immunocompromised ● Hematological malignancy ● History of severe sepsis Post-splenectomy counselling with regards to need for repeated vaccinations and appropriate health-seeking behaviour in the event of fever ● Pamphlet ● Post splenectomy card
Pre or Post-Splenectomy Vaccinations	**Initial - Single dose only** ● Pneumococcal PCV13 0.5 ml IM/SC stat followed by PPV23 0.5 ml IM/SC STAT (8 weeks interval) ● Meningococcal A,C,Y,W 135 0.5 ml IM stat ● Haemophilus influenzae Type B conjugate 0.5 ml IM/SC stat **Revaccination - Every 5 years** ● Pneumococcal PPV23 0.5 ml IM/SC stat ● Meningococcal A,C,Y,W 135 0.5 ml IM stat		**Elective splenectomy** Administer vaccines at least 2 weeks before procedure. **Emergency splenectomy:** Give vaccines at least 7 days postoperatively or on the day of discharge, whichever comes first. It is safe to give all the initial vaccinations at the same time using different administration sites.

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Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Whipple's Operation No recent biliary intervention/ stenting	Cefazolin 2 g IV	Amoxicillin/Clavulanate 1.2 g IV **OR** Ceftriaxone 2 g IV **Severe penicillin allergy:** Vancomycin 15-20 mg/kg IV **PLUS** Gentamicin 5 mg/kg IV **OR** Clindamycin 600-900 mg IV **PLUS** Gentamicin 5 mg/kg IV	Single dose (max up to 24 hours) For patients with recent biliary interventions/stenting, there is a higher incidence of bacteria with ESBL-producers. Antibiotic should be tailored to in-house antibiogram or recent bile/blood culture from the patients.

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Endoscopic Retrograde Cholangio-Pancreatography (ERCP)	Cefazolin 2 g IV	Cefuroxime 1.5 g IV	Single dose Antibiotics are **ONLY** recommended when there is ● Incomplete biliary drainage ● Obstructive biliary tract disease

REFERENCES (Surgical Chemoprophylaxis-Adult):

1. Chung et al., National surgical antibiotic prophylaxis guideline in Singapore. Ann Acad Med Singap. 2022 Nov; 51(11):695-711.
2. Splenectomy Vaccination & Antimicrobial Prophylaxis (Adult asplenic & hyposplenic patients) clinical guideline, South Australia 2019
3. Urological Infections - European Association of Urology Guidelines March 2023
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Neurosurgery

1. **Classification of Types of Neurosurgical Procedures According to the Risk of Infection**
2. **Clean Wound Surgery**
3. **Clean Wounds with Foreign Body or Instrumentation Surgery**
4. **Clean-Contaminated Wound Surgery**

Classification of Types of Neurosurgical Procedures According to the Risk of Infection		
Category	**Definition**	**Examples**
Clean	No identifiable risk factors present; diagnoses by the exclusion of all other categories	Ideal operation conditions, closed suction below drainage not exceeding 24 hours
Clean with implants	Either temporary or permanent implants	Shunt surgery, intracranial pressure monitors, ventricular drains, acrylic cranioplasties
Clean contaminated	Risk of contamination of operative site during surgery	Entry into paranasal air sinuses, transsphenoidal or transoral procedures, prolonged surgery, breaches in surgical technique
Contaminated	Contamination is known to have occurred	Compound skull fractures, open scalp lacerations, cerebrospinal fluid fistulae, subsequent operations (early)
Dirty	Established sepsis at the time of surgery	Brain abscess, subdural or parafalcine empyema, osteitis, ventriculitis, meningitis, purulent skin infection

If pre-existing infections present, use appropriate treatment regimen instead of prophylactic regimen for procedure.
Please refer to section **A4: Central Nervous System (CNS) Infections**

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	**Alternative**	
Clean Wound Surgery • Uninfected operative wounds in which no inflammation is encountered • No viscus is entered during the procedures • E.g.: Elective craniotomy, spinal procedures, burr hole	Cefazolin 2 g IV	Cefuroxime 1.5 g IV **Severe penicillin allergy:** *Vancomycin 15-20 mg/kg IV *Rapid IV administration of vancomycin may cause vancomycin infusion reaction AND/OR hypotension* **OR** Clindamycin 600-900 mg IV	**Duration: Single dose** *Situation where the use of vancomycin is appropriate: • In patients previously colonized with MRSA • Those who are allergic to penicillins or cephalosporins • In hospitals in which MRSA or MRCoNS are frequent causes of postoperative wound infection

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Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Clean Wounds with Foreign Body or Instrumentation Surgery • CSF shunting procedures (e.g shunt insertion, EVD, Omaya, DBS surgery, intracranial pressure monitor) • Implantation of cranial or spinal implants (e.g Cranioplasty)	Cefazolin 2 g IV	Cefuroxime 1.5 g IV **Severe penicillin allergy:** *Vancomycin 15-20 mg/kg IV *Rapid IV administration of vancomycin may cause vancomycin infusion reaction AND/OR hypotension* **OR** Clindamycin 600-900 mg IV	**Duration: Single dose** *Situation where the use of vancomycin is appropriate: • In patients previously colonized with MRSA • Those who are allergic to penicillins or cephalosporins • In hospitals in which MRSA or MRCoNS are frequent causes of postoperative wound infection

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Clean-Contaminated Wound Surgery Procedures that breach air cells or nasal or oral cavity • Transphenoidal • Transoral • Trauma or surgery that causes a breach in air sinuses	Cefuroxime 1.5 g IV **PLUS** Metronidazole 500 mg IV	Amoxicillin/Clavulanate 1.2 g IV **Severe penicillin allergy:** *Vancomycin 15-20 mg/kg IV *Rapid IV administration of vancomycin may cause vancomycin infusion reaction AND/OR hypotension* **PLUS** Gentamicin 5 mg/kg IV **PLUS** Metronidazole 500 mg IV	**Duration: Single dose** Consider escalation to Ceftriaxone 2 g IV if there is dura breach or CSF leak *Situation where the use of vancomycin is appropriate: • In patients previously colonized with MRSA • Those who are allergic to penicillins or cephalosporins • In hospitals in which MRSA or MRCoNS are frequent causes of postoperative wound infection

References:

1. Salford Royal, NHS. Antibiotic Prophylaxis in Cranial Neurosurgery Antibiotic Guidelines, Unique ID: 144TD(C)25(F4) Issue number: 6, 2018
2. SIGN 104: Antibiotic prophylaxis in surgery. July 2008, updated April 2014
3. Surgical Antimicrobial Prophylaxis Clinical Guideline v2.0. Department for Health and Ageing, Government of South Australia October 2017

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Obstetrics & Gynaecology Surgery

1. **Normal Vaginal Delivery**
   - Non-operative/ Non-instrumental
   - Operative Vaginal Deliveries
2. **Perineal Tear**
   - 1st & 2nd Degree Perineal Tear
   - 3rd and 4th Degree Perineal Tear
3. **Cesarean Section -Elective (ELLSCS) / Emergency (EMLSCS)**
4. **Manual Removal of Placenta**
5. **Evacuation of Retained Product of Conception (ERPOC)**
6. **Surgical Termination of Pregnancy**
7. **Emergency Laparotomy**
8. **Elective Surgeries – Laparoscopic Surgery**
9. **Elective Surgeries – TAHBSO, Hysterectomy, LaparoscopyHysterectomy**
10. **Hysterosalpingography (HSG) / Hysteroscopy**
11. **Endometrial biopsy / Cervical tissue excision / Cervical cone procedures**
12. **Intra-uterine device (IUD) Insertion**

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Normal Vaginal Delivery			
Non-operative/ Non-instrumental	Surgical antibiotic prophylaxis not recommended	-	
Operative Vaginal Deliveries	Cefazolin 2 g IV **PLUS** Metronidazole 500 mg IV	Cefuroxime 750 mg - 1.5 g IV **PLUS** Metronidazole 500 mg IV **OR** Ampicillin/Sulbactam 3 g IV **OR** Amoxicillin/Clavulanate 1.2 g IV **Severe penicillin allergy:** Clindamycin 600-900 mg IV	**Single dose after delivery** Please refer to **A11: Obstetrics & Gynaecology Infections** section for: ● Group B Streptococcus (GBS) ● Preterm premature rupture of membranes (PPROM) prophylaxis

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Perineal Tear			
1st & 2nd Degree Perineal Tear	Surgical antibiotic prophylaxis not recommended		
3rd and 4th Degree Perineal Tear	Please refer to **A11: Obstetrics & Gynaecology Infections** section		

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Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Cesarean Section - Elective (ELLSCS) / Emergency (EMLSCS)	Cefazolin 2 g IV	Cefuroxime 750 mg - 1.5 g IV **OR** Ampicillin/Sulbactam 3 g IV **Severe penicillin allergy:** Clindamycin 600-900 mg IV	**Single dose** Continuation of antimicrobial prophylaxis (max up to 2 days) may be considered for patients with **major risk factors** for surgical infections • Obesity • Complicated caesarean • Immunocompromised

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Manual Removal of Placenta	Cefazolin 2 g IV **PLUS** Metronidazole 500 mg IV	Cefuroxime 750 mg - 1.5 g IV **PLUS** Metronidazole 500 mg IV **OR** Ampicillin 2 g IV **PLUS** Metronidazole 500 mg IV **OR** Amoxicillin/Clavulanate 1.2 g IV	**Single dose**

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Evacuation of Retained Product of Conception (ERPOC)			
First Trimester	Doxycycline 400 mg PO *Administer 1-2 hours prior to procedure*	Azithromycin 1 g PO *Administer 1-2 hours prior to procedure*	**Single dose**
Second Trimester	Cefazolin 2 g IV **PLUS** Metronidazole 500 mg IV	Cefuroxime 750 mg - 1.5 g IV **PLUS** Metronidazole 500 mg IV **OR** Ampicillin 2 g IV PLUS Metronidazole 500 mg IV **OR** Amoxicillin/Clavulanate 1.2 g IV	**Single dose**

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Surgical Termination of Pregnancy	Doxycycline 400 mg PO *Administer 1-2 hours prior to procedure*	Azithromycin 1 g PO *Administer 1-2 hours prior to procedure*	**Single dose**

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Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Emergency Laparotomy	Recommendation as per elective surgery	-	

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Elective Surgeries – Laparoscopic Surgery • Vagina and/or uterus not entered	Surgical antibiotic prophylaxis not recommended	-	

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Elective Surgeries – TAHBSO, Hysterectomy, Laparoscopy • Vaginal or abdominal hysterectomy • Vagina and/or uterus entered during laparascopy	Cefazolin 2 g IV **PLUS** Metronidazole 500 mg IV	Cefuroxime 750 mg - 1.5 g IV **PLUS** Metronidazole 500 mg IV **OR** Ampicillin/Sulbactam 3 g IV **OR** Amoxicillin/Clavulanate 1.2 g IV **Severe penicillin allergy:** Clindamycin 600-900 mg IV **PLUS** Gentamicin 5 mg/kg IV	Single dose

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Hysterosalpingography (HSG) / Hysteroscopy	Surgical antibiotic prophylaxis not recommended	-	Antibiotic prophylaxis generally not necessary unless high risk. E.g: • Dilated fallopian tubes • History of pelvic inflammatory disease (PID) • Tubal damage • Abnormal tubal architecture (associated with risk of post-operative PID/ endometritis) If evidence of endometritis/ infection found at point of procedure, treat accordingly.

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Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Endometrial biopsy / Cervical tissue excision / Cervical cone procedures	Surgical antibiotic prophylaxis not recommended	-	

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Intra-uterine device (IUD) Insertion	Surgical antibiotic prophylaxis not recommended	-	Consider sexually transmitted infection (STI) screening in high-risk populations and advise to complete treatment prior procedure Antibiotic prophylaxis generally not necessary unless high risk (associated with risk of post-operative PID/endometritis). E.g. ● Dilated fallopian tubes, ● History of pelvic inflammatory disease (PID) ● Tubal damage ● Abnormal tubal architecture If evidence of endometritis/ infection found at point of procedure, treat accordingly.

References:

1. National Antimicrobial Guideline (NAG), Ministry of Health Malaysia 2024
2. Chung et al., National surgical antibiotic prophylaxis guideline in Singapore. Ann Acad Med Singap. 2022 Nov; 51(11):695-711
3. American Congress of Obstetrics & Gynecologist (ACOG) 2018
4. Prevention and Management of Third & Fourth Degree Tears, NHS Wales, Feb 2019
5. Heisterberg, L., Petersen, K., Sørensen, S. S., & Nielsen, D. (1986). *A comparison of metronidazole and ampicillin prophylaxis to women with a history of pelvic inflammatory disease undergoing first-trimester abortion. International Journal of Gynecology & Obstetrics, 24(5), 343–346.* doi:10.1016/0020-7292(86)90152-9

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Ophthalmology Surgery

1. **Intraocular Surgery - Preoperative**
2. **Intraocular Surgery - Intraoperative**
3. **Intraocular Surgery - Postoperative**

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Intraocular Surgery - Preoperative	Povidone iodine 10% to the periorbital skin Povidone iodine 5% into the conjunctival sac	-	
Intraocular Surgery - Intraoperative	Intracameral Injection of Cefuroxime 1 mg/0.1 ml	Intracameral Injection Moxifloxacin 0.5 mg/ 0.1 ml *Alternative in patients with penicillin allergy (OFF LABEL USE)* • *Guidelines on OFF LABEL drug applies* • *Informed consent required*	
Intraocular Surgery - Postoperative	Topical Antibiotics		

Reference:

1. Prophylaxis for intraocular surgery-CPG for Management of Post-Operative Endophthalmitis, Ministry of Health Malaysia, August 2006
2. Intraoperative Antimicrobial Prophylaxis in Elective Cataract Surgery Patients with Penicillin Allergy. The Royal College of Ophthalmologists, United Kingdom. 2022

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Oral / Dental Surgery

1. **Clean Surgery (Class 1)Clean Surgery (Class 1)**
   - **Submandibular gland surgery**
   - **Temporomandibular joint (TMJ) surgery**
   - **Excision of benign tumours/cysts**
2. **Minor Clean-Contaminated Surgery (Class 2)**
   - **Soft tissue surgery**
   - **Dentoalveolar surgery**
   - **Periodontal surgery**
   - **Insertion of dental implants and use of graft material**
   - **High degree of difficulty / long duration**
3. **Major Clean-Contaminated Surgery (Class 3)**
   - **Orthogenic Surgery**
   - **Tumour/Cyst excision**
   - **Oral Cancer Surgery**
   - **ORIF of Facial Bone Fractures**

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Clean Surgery (Class 1) • **Submandibular gland surgery** • **Temporomandibular joint (TMJ) surgery** • **Excision of benign tumours/cysts**	Not indicated for most surgeries		Antibiotic prophylaxis may be indicated if: • Duration of the surgery is expected to be very long • Open reduction and internal fixation of facial bone fractures Prophylaxis is recommended for all patients with an increased risk of surgical wound infection – i.e immunocompromised patients

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Minor Clean-Contaminated Surgery (Class 2) • **Soft tissue surgery** • **Dentoalveolar surgery** • **Periodontal surgery**	Not indicated for most surgeries		Antibiotic prophylaxis may be indicated if: • Duration of the surgery is expected to be very long • Open reduction and internal fixation of facial bone fractures Prophylaxis is recommended for all patients with an increased risk of surgical wound infection – i.e immunocompromised patients

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Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Minor Clean-Contaminated Surgery (Class 2) • **Insertion of dental implants and use of graft material** • **High degree of difficulty / long duration**	Benzylpenicillin 2 MU IV	**Oral (PO) prophylaxis options:** Amoxicillin 2 g PO **OR** Amoxicillin/Clavulanate 1.25 g PO **OR** Cephalexin 2 g PO **PLUS** Metronidazole 400 mg PO *Only in patients prescribed with cephalosporins as chemoprophylaxis* **Intravenous (IV) prophylaxis options:** Ampicillin 2 g IV **OR** Amoxicillin/Clavulanate 1.2 g IV **OR** Cefazolin 2 g IV **PLUS** Metronidazole 500 mg IV *Only in patients prescribed with cephalosporins as chemoprophylaxis* **Severe penicillin allergy:** Clindamycin 600-900 mg PO/IV	Single dose In patients with cardiac conditions with increased risk of Infective Endocarditis, chemoprophylaxis is indicated. **Please refer to Non-Surgical Chemoprophylaxis section**

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Major Clean-Contaminated Surgery (Class 3) • **Orthogenic Surgery** • **Tumour/Cyst excision** • **Oral Cancer Surgery** • **ORIF of Facial Bone Fractures**	Cefazolin 2 g IV	Amoxicillin/Clavulanate 1.2 g IV **OR** Cefuroxime 1.5 g IV **PLUS** Metronidazole 500 mg IV *Only in patients prescribed with cephalosporins as chemoprophylaxis*	Single dose For oral & maxillofacial fractures, antibiotics is recommended for the immediate post trauma period and should be discontinued once ORIF is completed In patients with cardiac conditions with increased risk of Infective Endocarditis, chemoprophylaxis is indicated. **Please refer to Non-Surgical Chemoprophylaxis section**

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Orthopaedic Surgery

1. **Clean Operation Involving Hand, Knee Or Foot and Not Involving Implantation of Foreign Materials**
2. **Fixations Of Closed Fractures / Total Joint Replacement / Spine Surgery (With or Without Instrumentation) / Arthroscopy**

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Clean Operation Involving Hand, Knee Or Foot and Not Involving Implantation of Foreign Materials	Surgical antibiotic prophylaxis is not recommended	-	

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Fixations Of Closed Fractures / Total Joint Replacement / Spine Surgery (With or Without Instrumentation) / Arthroscopy	Cefazolin 2 g IV	Cefuroxime 1.5 g IV **Severe penicillin allergy:** Clindamycin 600-900 mg IV	Single dose The benefits of routine postoperative antibiotic are uncertain. If used, postoperative prophylaxis should not exceed 24 hours.

References (Chemoprophylaxis - Adult):

1. Bratzler DW, Dellinger EP, Olsen KM et al. Clinical practice guidelines for antimicrobial prophylaxis in surgery. Am J Health-Syst Pharm.2013; 70:195-283
2. T.P Ruedi R.GBuckley,C.GMarani,AO principle of fracture management. A.H.R.W Simpson, BMJ 2015

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Otorhinolaryngology (ORL) surgery

1. **General Surgeries:**
   - **Clean Head and Neck Procedures**
   - **Clean-Contaminated Head and Neck Procedures**
   - **Clean Otologic Procedures**
   - **Clean Otologic Procedures with Placement of Prosthesis – Risk of CSF leak (eg: Cochlear implant)**
   - **Clean Otologic Procedures with Placement of Prosthesis – No Risk of CSF leak (eg: Non-cochlear implant related)**
   - **Clean Contaminated Otologic Procedures (Example: Mastoidectomy)**
2. **Specific Surgeries:**
   - **Tonsillectomy**
   - **Septorhinoplasty**
   - **Endoscopic Sinus Surgery**

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
General Surgeries:			
Clean Head and Neck Procedures • Parotidectomy • Salivary Gland Excisions	Surgical antibiotic prophylaxis is not recommended	-	
Clean-Contaminated Head and Neck Procedures • Including neck dissection procedures	Cefuroxime 1.5 g IV **PLUS** Metronidazole 500 mg IV **OR** Ampicillin/Sulbactam 3 g IV	Cefazolin 2 g IV **PLUS** Metronidazole 500 mg IV **Severe penicillin allergy:** Clindamycin 600-900 mg IV	IV antibiotic until discharge, then oralize (to complete 1-week antibiotic therapy). Prolonged course of oral antibiotics has not been shown to reduce post-operative infections and may increase risk of complications.
Clean Otologic Procedures	Surgical antibiotic prophylaxis is not recommended	-	
Clean Otologic Procedures with Placement of Prosthesis – Risk of CSF leak (eg: Cochlear implant)	Ceftriaxone 2g IV OD	**Severe penicillin allergy:** Clindamycin 600-900 mg IV q8h	IV antibiotic until discharge, then oralize to PO Cefuroxime 500 mg BD (to complete 1-week antibiotic therapy)
Clean Otologic Procedures with Placement of Prosthesis – No Risk of CSF leak (eg: Non-cochlear implant related)	Cefuroxime 1.5 g IV q8h **PLUS** Metronidazole 500 mg IV q8h **OR** Amoxicillin/Clavulanate 1.2 g IV q8h	**Severe penicillin allergy:** Clindamycin 600-900 mg IV q8h	IV antibiotic until discharge, then oralize (to complete 1-week antibiotic therapy)

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Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
General Surgeries:			
Clean Contaminated Otologic Procedures (Example: Mastoidectomy)	Cefuroxime 1.5 g IV **PLUS** Metronidazole 500 mg IV **OR** Amoxicillin/Clavulanate 1.2 g IV	Cefazolin 2 g IV **PLUS** Metronidazole 500 mg IV **Severe penicillin allergy:** Clindamycin 600-900 mg IV	Refer to **Mastoiditis section** for continuation of antibiotic treatment
	If breached intracranially: Ceftriaxone 2g IV **PLUS** Metronidazole 500 mg IV	-	

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Specific Surgeries:			
Tonsillectomy	Surgical antibiotic prophylaxis is not recommended	-	
Septorhinoplasty	**Simple septorhinoplasty:** Surgical antibiotic prophylaxis is not recommended. *Infection rates are very low, especially when nasal packing/splint use ≤ 48 hours*	-	
	Complex septorhinoplasty: Cefazolin 2 g IV **PLUS** Metronidazole 500 mg IV	**Complex septorhinoplasty:** Amoxicillin/Clavulanate 1.2 g IV **OR** Ampicillin/Sulbactam 3 g IV **Severe penicillin allergy:** Clindamycin 600-900 mg IV	IV antibiotic until discharge, then oralize (to complete 1-week antibiotic therapy)
Endoscopic Sinus Surgery	Cefazolin 2 g IV **PLUS** Metronidazole 500 mg IV	Amoxicillin/Clavulanate 1.2 g IV **OR** Ampicillin/Sulbactam 3 g IV **Severe penicillin allergy:** Clindamycin 600-900 mg IV	IV antibiotic until discharge, then oralize (to complete 1-week antibiotic therapy) Post-operative antibiotics should NOT be given if there is no mucous seen intra-operatively

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References (Chemoprophylaxis - Adult):

1. Chung et al., National surgical antibiotic prophylaxis guideline in Singapore. Ann Acad Med Singapore. 2022 Nov; 51(11):695-711.
2. Priyesh N Patel, Asitha D L Jayawardena, Rachel L Walden, Edward B Penn, David O Francis. Evidence-Based Use of Perioperative Antibiotics in Otolaryngology. Otolaryngol Head Neck Surg. 2018; 158(5):783-800.
3. https://www.mdanderson.org/content/dam/mdanderson/documents/for-physicians/algorithms/clinical-management/clin-management-surgical-antibiotic-prophylaxis-adult-web-algorithm.pdf

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Plastic Surgery

1. **General Procedures**
    - **Clean Procedures**
        i. **Breast reduction**
        ii. **Body contouring surgery**
        iii. **Face lift**
        iv. **Blepharoplasty**
    - **Clean-Contaminated Procedures**
        i. **Ear cartilage surgeries**
        ii. **Nasal cartilage surgeries**
2. **Specific Procedures**
    - **Cleft reconstruction and other cleft-related surgeries**
    - **Full Thickness Skin Graft Surgery**
    - **Flap Reconstruction**
    - **Breast Augmentation**
    - **Breast Reconstruction Surgery**

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
General Procedures			
Clean Procedures Majority of plastic surgery cases: • **Breast reduction** • **Body contouring surgery** • **Face lift** • **Blepharoplasty**	Prophylaxis not required unless patient has risk factors for postoperative infection and poor wound healing	-	Risk factors: ●Implantation of prosthetic material ●Prior skin irradiation
Clean-Contaminated Procedures • **Ear cartilage surgeries** • **Nasal cartilage surgeries**	Cefazolin 2 g IV	Amoxicillin/clavulanate 1.2 g IV	**Single dose** **Duration: Up to 24 hours**

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Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Specific Procedures			
Cleft reconstruction and other cleft-related surgeries	Amoxicillin/Clavulanate 1.2 g IV q8h	Ampicillin/Sulbactam 3 g IV q8h	**Duration 3-5 days** There is no consensus of the use of post-operative prophylaxis antibiotics. However, studies have shown that post-operative pre-emptive antibiotics may reduce complication e.g palatal fistulae
Full Thickness Skin Graft Surgery (Non-related to burn injury)	There is no consensus on the use of antibiotic prophylaxis The choice of antibiotics will depend on most recent organism isolated from previous tissue culture obtained from recipient site	-	
Flap Reconstruction	There is no consensus on the use of antibiotic prophylaxis The choice of antibiotics will depend on most recent organism isolated from previous tissue culture obtained from recipient site	-	As suggested by SICPRE guidelines, prophylaxis should be prolonged up to 72 hours for: • Microsurgical transplantation • Major skin cancer surgery • Large flap harvest
Breast Augmentation	Cefazolin 2 g IV STAT followed by 2 g IV q8h	-	**Duration: up to 24 hours** As suggested by SICPRE guidelines, prophylaxis should be prolonged up to 72 hours for: • Microsurgical transplantation • Major skin cancer surgery • Large flap harvest
Breast Reconstruction Surgery	Cefazolin 2 g IV STAT followed by 2 g IV q8h	Amoxicillin/clavulanate 1.2 g IV followed by 1.2 g IV q8h **Severe penicillin allergy** Clindamycin 600-900 mg IV STAT followed by 600-900 mg IV q6-8h **OR** Vancomycin 15-20 mg/kg IV STAT followed by 15 mg/kg IV q12h	**Duration: up to 24 hours** Unless a drain is present, antibiotics should be discontinued within 24 hours of the completion of the procedure. If a drain is present, the role of antibiotics is less clear and should be left to physician judgement.

Reference (Plastic Surgery Chemoprophylaxis):

1. Antibiotic Expert Groups. Therapeutic guidelines: antibiotics. Version 15. Melbourne: Therapeutic Guidelines Limited; 2014.
2. National Surgical Antibiotic Prophylaxis Guideline Singapore 2022
3. Piccillo EM, Farsar CJ, Holmes DM. Prophylactic Antibiotics After Cleft Lip and Palate Reconstruction: A Review From a Global Health Perspective. Cureus. 2023 Mar 19;15(3):e36371. doi: 10.7759/cureus.36371. PMID: 37090369; PMCID: PMC10113116.
4. Homsy P.,Romo I. et al. Antibiotic Prophylaxis in clean and clean-contaminated plastic surgery: A Critical Review, Volume 83, P233-245. Published April 23, 2023.DOI: http://doi.org/10.1016/j.bjps.2023.04.071
5. Borrelli MR, Sinha V, Landin ML, Chicco M, Echlin K, Agha RA, Ross AM. A systematic review and meta-analysis of antibiotic prophylaxis in skin graft surgery: A protocol. Int J Surg Protoc. 2019 Feb 28;14:14-18. doi: 10.1016/j.isjp.2019.02.001. PMID: 31851735; PMCID: PMC6913549.
6. Brambullo T, Biffoli B, Scortecci L, Messana F, Vindigni V, Bassetto F. Antibiotic Prophylaxis in Plastic Surgery: From Systematic Review to Operative Algorithm. World J Plast Surg. 2022 Jul;11(2):24-36. doi: 10.52547/wjps.11.2.24. PMID: 36117892; PMCID: PMC9446112.
7. Alderman A, Gutowski K, Ahuja A, Gray D, Post Mastectomy Expander Implant Breast Reconstruction Guideline Work Group. ASPS Clnical Practice Guideline Summary on Breast Reconstruction with expanders and implants. Plastic Reconstr Surg. 2014; 134(4):648e-655e. doi:10.1097/PRS.0000000000000541
8. Gupta, R., Sinnett, D., Carpenter, R., Preece, P. E., & Royle, G. T. (2000). *Antibiotic prophylaxis for post-operative wound infection in clean elective breast surgery. European Journal of Surgical Oncology (EJSO), 26(4), 363–366.* doi:10.1053/ejso.1999.0899

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Urological Surgery

1. **Diagnostic Procedures**
   - **Transrectal Ultrasound and Prostate Biopsy**
   - **Cystoscopy / Urodynamics Study**
   - **Retrograde Pyelogram / Ureteric Stenting**
   - **Transperineal Procedures**
2. **Endourology**
   - **Endourological Surgery**
3. **Open Surgery**
   - **Clean Procedures**
   - **Clean-Contaminated Procedures (With Opening of Urinary Tract)**
   - **Implant of Prosthetic Devices**
4. **Others**
   - **Circumcision**
   - **Shock-Wave Lithotripsy**
   - **Laparoscopic Surgery**

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Diagnostic Procedures			
Transrectal Ultrasound and Prostate Biopsy Common organisms • *Escherichia coli* • *Klebsiella spp* • *Proteus spp* • *Enterococcus spp* • *Pseudomonas aeruginosa*	Ampicillin/Sulbactam 3 g **PLUS** Gentamicin 3 mg/kg IV **OR** Amoxicillin/Clavulanate 1.2 g IV **PLUS** Gentamicin 3 mg/kg IV	Fosfomycin trometamol 3 g PO 3 hours before procedure, followed by 3 g PO 24 hours after procedure *Fosfomycin use is OFF-LABEL for this indication*	**Single dose** Rectal wash out (rectal povidone-iodine preparation) to further decrease infection risk Consider pre-operative rectal swab followed by targeted antibiotic prophylaxis
Cystoscopy / Urodynamics Study	Surgical antibiotic prophylaxis is not recommended **Prophylaxis may be recommended in *high risk cases:** Cefuroxime 500 mg PO	-	**Single dose** ***High risk cases:** • Immunocompromised patients • Debilitated patients on long term catheters • Patient with prosthesis / heart valves *[Follow recommendation for Subacute bacterial endocarditis (SBE) prophylaxis]* • Diabetics • Transplant recipients
Retrograde Pyelogram / Ureteric Stenting	Surgical antibiotic prophylaxis is not recommended		
Transperineal Procedures Clean procedures, e.g: • Prostate brachytherapy • Transperineal prostate biopsy	Surgical antibiotic prophylaxis is not recommended **Prophylaxis may be recommended in patients with risk factors*:** Ampicillin/Sulbactam 3 g IV	-	**Single dose** ***Risk factors:** • Chronic steroid use • Immunocompromised state • Recent systemic chemotherapy • Poorly controlled diabetes • Prior severe urosepsis • Post-biopsy infection

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Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Endourology			
Endourological Surgery Transurethral cases and minimally invasive surgical therapy (MIST) to the prostate (E.g: PCNL, URS, RIRS, TURP, TURBT) Common organisms: • *Escherichia coli* • *Klebsiella spp* • *Proteus spp* • *Enterococcus spp* • *Pseudomonas aeruginosa*	Amoxicillin/Clavulanate 1.2 g IV **OR** Ampicillin/Sulbactam 3 g	Cefuroxime 1.5 g IV	Single dose Antibiotic choices for urine culture negative cases. Consider tailor antibiotic prophylaxis based on pre-procedural latest urine cultures

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Open Surgery			
Clean Procedures **Example:** • Orchidectomy • Orchidopex • Varicocelectomy • Deroofing renal cysts	Surgical antibiotic prophylaxis is not recommended		
Clean-Contaminated Procedures (With Opening of Urinary Tract) **Example:** • Nephrectomy • Prostatectomy • Open Stone Surgery Common organisms: • *Escherichia coli* • *Klebsiella spp* • *Proteus spp* • *Enterococcus spp* • *Pseudomonas aeruginosa*	Amoxicillin/Clavulanate 1.2 g IV **OR** Ampicillin/Sulbactam 3 g	Cefazolin 2 g IV **PLUS** Gentamicin 3-5 mg/kg IV/IM **OR** Ceftriaxone 2 g IV **PLUS** Gentamicin 3-5 mg/kg IV/IM	Single dose Antibiotics choices for urine culture negative cases. Consider tailor antibiotic prophylaxis based on pre-procedural latest urine cultures.

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Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Open Surgery			
Clean-Contaminated Procedures (With Use of Bowel Segments) **Example:** • Cystectomy with urinary diversion • Cystoplasty Common organisms: *Escherichia coli* • *Klebsiella spp* • *Proteus spp* • *Enterococcus spp* • *Pseudomonas aeruginosa* • *Anaerobes*	Cefuroxime 1.5 g IV **PLUS** Metronidazole 500 mg IV	Amoxicillin/Clavulanate 1.2 g IV **OR** Cefoperazone 2 g IV **PLUS** Metronidazole 500 mg IV **Severe penicillin allergy:** Gentamicin 3-5 mg/kg IV **PLUS** Metronidazole 500 mg IV	**Single dose**
Implant of Prosthetic Devices **Examples:** • Insertion of penile prosthesis • Artificial urinary sphincter (AUS) • Artificial slings • Sacral neuromodulators Common organisms: *Staphylococcus aureus*	Amoxicillin/Clavulanate 1.2 g IV **OR** Ampicillin/Sulbactam 3 g	Ceftriaxone 2 g IV **MRSA Coloniser:** Vancomycin 15-20 mg/kg IV **Severe penicillin allergy:** Clindamycin 600-900 mg IV PLUS Gentamicin 3-5 mg/kg IV	**Single dose**

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Others			
Circumcision	Surgical antibiotic prophylaxis is not recommended		
Shock-Wave Lithotripsy	Surgical antibiotic prophylaxis is not recommended		
Laparoscopic Surgery	Recommendation as per open surgery, depending on the type of procedure performed *Eg: Clean or Clean-contaminated*		

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REFERENCES (Surgical Chemoprophylaxis-Adult):

1. Chung et al., National surgical antibiotic prophylaxis guideline in Singapore. Ann Acad Med Singap. 2022 Nov; 51(11):695-711.
2. Splenectomy Vaccination & Antimicrobial Prophylaxis (Adult asplenic & hyposplenic patients) clinical guideline, South Australia 2019
3. Urological Infections - European Association of Urology Guidelines March 2023
4. Matthew Coates et al. Prophylactic Cefazolin Dosing in Obesity—a Systematic Review. https://doi.org/10.1007/s11695-022-06196-5

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Thoracic Surgery

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Thoracic surgeries • Decortication • Lobectomy • Thymectomy • Video-assisted thoracoscopic surgery (VATS)	Cefazolin 2 g IV **If MRSA colonized:** Vancomycin 15-20 mg/kg IV	**Severe penicillin allergy:** Clindamycin 600-900 mg IV **OR** Vancomycin 15-20 mg/kg IV	**Single dose**

References:

1. Chung et al., National surgical antibiotic prophylaxis guideline in Singapore. Ann Acad Med Singap. 2022 Nov; 51(11):695-711.

Vascular Surgery

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Vascular surgeries (General) • Artery or vein repair • Arteriovenous fistula (AVF) / Arteriovenous graft (AVG) creation, excision, jump graft • Aortic stent graft • Bypass surgery • Open & Endovascular repair of aneurysm	Cefazolin 2 g IV followed by 2 g IV q8h **If MRSA colonized:** Cefazolin 2 g IV **PLUS** Vancomycin 15-20 mg/kg IV Followed by: Cefazolin 2 g IV q8h **PLUS** Vancomyin 15 mg/kg IV q12h *Refer to DIAMS - HSgB Vancomycin Protocol for more dosing info*	Amoxicillin/Clavulanate 1.2 g IV followed by 1.2 g IV q8h **Severe penicillin allergy:** Clindamycin 600-900 mg IV STAT followed by 600mg IV q8h **OR** Vancomycin 15-20 mg/kg IV STAT followed by 15 mg/kg IV q12h *Refer to DIAMS - HSgB Vancomycin Protocol for more dosing info*	**Duration: up to 24 hours**

REFERENCES (Surgical Chemoprophylaxis-Adult):

1. Chung et al., National surgical antibiotic prophylaxis guideline in Singapore. Ann Acad Med Singap. 2022 Nov; 51(11):695-711.
2. Splenectomy Vaccination & Antimicrobial Prophylaxis (Adult asplenic & hyposplenic patients) clinical guideline, South Australia 2019
3. Urological Infections - European Association of Urology Guidelines March 2023
4. Matthew Coates et al. Prophylactic Cefazolin Dosing in Obesity—a Systematic Review. https://doi.org/10.1007/s11695-022-06196-5

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Non-Surgical Chemoprophylaxis

Introduction

Cardiovascular Disease Patients at High Risk of IE

Antibiotic prophylaxis is recommended in patients with cardiovascular diseases undergoing oro-dental procedures at **increased risk for infective endocarditis (IE):**

1. Patients with previous IE
2. Patients with surgically implanted prosthetic valves and with any material used for surgical cardiac valve repair
3. Patients with transcatheter implanted aortic and pulmonary valvular prostheses
4. Patients with untreated cyanotic CHD, and patients treated with surgery or transcatheter procedures with post-operative palliative shunts, conduits, or other prostheses. After surgical repair, in the absence of residual defects or valve prostheses, antibiotic prophylaxis is recommended only for the first 6 months after the procedure
5. Patients with ventricular assist devices
6. Should be considered in patients with transcatheter mitral and tricuspid valve repair.
7. May be considered in recipients of heart transplant
8. Established rheumatic heart disease

Dental Procedures

For patients with increased risk of IE, antimicrobial prophylaxis is **recommended** for:

1. Dental extraction
2. Oral surgery procedures (including periodontal surgery, implant surgery and oral biopsies)
3. Dental procedures involving manipulation of gingival tissue or the periapical region of teeth (including scaling and root canal procedures)
4. Implant placement procedures and invasive dental procedures on established implants (Once dental implants are placed in high-risk patients, professional dental hygiene and follow-up should be performed at least twice yearly under antibiotic cover)

Respiratory Tract Procedures

Antimicrobial prophylaxis is recommended for patients with increased risk of IE who undergo an invasive respiratory tract procedure that involve incision or biopsy of the respiratory mucosa. Patients who undergo an invasive respiratory tract procedure to treat an established infection, e.g., biopsy drainage of an abscess, should receive an antibiotic prophylaxis which contains an anti-staphylococcal agent.

Gastrointestinal or genitourinary procedures

Routine pre-procedural antimicrobial prophylaxis is no longer recommended for patients undergoing genitourinary or gastrointestinal tract procedures. However, for high-risk cardiac patients who have an established gastrointestinal or genitourinary infection, or for those who receive antimicrobial therapy for surgical reasons, the antimicrobial regimen should include an agent active against enterococci, such as ampicillin or vancomycin.

Dermatological or musculoskeletal procedures

For patients with increased risk of IE, undergoing surgical procedures involving infected skin (including local abscesses), skin structure or musculoskeletal tissue, it is reasonable that the therapeutic regimen contains an agent active against staphylococci and beta-hemolytic streptococci. Vancomycin or clindamycin may be used in patients unable to tolerate a β-lactam antibiotic. If the infection is known or suspected to be caused by MRSA, vancomycin or another suitable agent should be administered.

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Prophylactic Regimens for High-Risk Dental Procedures in High-Risk Patients

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Prophylaxis in Dental Procedures	Amoxicillin 2 g PO *Single dose 30 to 60 minutes before procedure* **OR** Ampicillin 2 g IV *Single dose 30 to 60 minutes before procedure*	**Antibiotic allergy:** **For non-severe hypersensitivity to penicillin:** Cephalexin 2 g PO *Single dose 30 to 60 minutes before procedure* **OR** Cefazolin 1 g IV *Single dose 30 to 60 minutes before procedure* **For severe hypersensitivity to penicillin:** Doxycycline 100 mg PO *Single dose 30 to 60 minutes before procedure* **OR** Azithromycin 500 mg PO *Single dose 30 to 60 minutes before procedure*	See above for antibiotic prophylaxis in patients undergoing invasive surgical procedure to treat an established infection. **Antibiotic Allergy:** Refer to **APPENDICES > Antibiotic Allergy** for more info.

Secondary Prevention of Rheumatic Fever

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Secondary Prevention of Rheumatic Fever	Benzathine Penicillin 1.2 MU IM every 4 weeks *Consider every 3 weeks for **high-risk group**** **OR** Phenoxymethylpenicillin (Penicillin V) 250 mg PO q12h	**Antibiotic allergy:** Erythromycin ethylsuccinate (EES) 800 mg PO q12h	**Antibiotic Allergy:** Refer to **APPENDICES > Antibiotic Allergy** for more info. ***High risk group:** • Breakthrough ARF despite complete adherence to a 28-day regimen, **OR** • Severe RHD, or a history of heart valve surgery

Duration of secondary prevention:

- **Rheumatic fever with carditis and residual heart disease (persistent valvular disease)**:
  - ❖ 10 years or until 40 years of age, whichever is longer; sometimes lifelong prophylaxis
- **Rheumatic fever with carditis but no residual heart disease (no valvular disease)**:
  - ❖ 10 years or until 21 years of age, whichever is longer
- **Rheumatic fever without carditis**:
  - ❖ 5 years or until 21 years of age, whichever is longer

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HSgB Antimicrobial Guideline (HAG)

SECTION A: ADULT

A6: GASTROINTESTINAL (GI) INFECTIONS

Launched: October 2024

Updated: -

LIST OF TOPICS WITH LINKS:

1. **Oropharyngeal Candidiasis**
2. **Esophagitis**
   - Candida spp
   - Herpes Simplex Virus (HSV)
3. **Infectious Diarrhoea**
   - Empirical Therapy
   - Pathogen-Directed Therapy
   - *Aeromonas spp*
   - *Plesiomonas shigelloides*
   - *Yersinia Enterocolitica*
   - Shiga Toxin Producing *E. coli (STEC)*
   - E. coli
   - *Campylobacter jejuni*
   - Cholera
   - Giardiasis
   - Salmonella spp, non-typhi
   - *Salmonella typhi*
   - *Shigella spp*
   - *Entamoeba histolytica*
4. ***Clostridioides difficile* Infection (CDI)**
5. **Spontaneous Bacterial Peritonitis (SBP)**
6. **Liver Abscess**
   - Pyogenic Liver Abscess
   - Amoebic Liver Abscess

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Oropharyngeal Candidiasis

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Oral Candidiasis	Refer to A9: Infections in Immunocompromised Patients – Opportunistic Infections in HIV Section > **Mucocutaneous Candidiasis**		

Esophagitis

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Candida spp	Refer to Infections in Immunocompromised Patients – Opportunistic Infections in HIV Section		
Herpes Simplex Virus (HSV)	Refer to Sexually Transmitted Infections section.		

Infectious Diarrhoea

Most community-acquired watery diarrhoea are self-limiting and viral in origin (norovirus, rotavirus, and adenovirus), therefore antibiotics should be discouraged. Rehydration and electrolyte replacement are the main treatment for acute infectious diarrhoea.

Antibiotics may be considered in the following conditions after blood and stool cultures collection:

- Immunocompetent hosts with fever and bloody diarrhoea
- Suspected to have enteric fever (Refer to chapter on Typhoid)
- Ill immunocompromised hosts

Empirical Therapy

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Empirical Therapy	Azithromycin 500 mg PO q24h **single dose**	Ciprofloxacin 500 mg PO q12h *FQ-resistant Campylobacter spp has been increasingly reported.* **Duration: 3 days**	

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Pathogen-Directed Therapy

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Aeromonas spp ***Plesiomonas shigelloides*** ***Yersinia Enterocolitica***	Trimethoprim/Sulfamethoxazole (Bactrim) 160 mg/800 mg (= 2 tablets) PO q12h	Ciprofloxacin 500 mg PO q12h	**Duration: 3 days**
Shiga Toxin Producing *E. coli* (STEC)	Supportive care is the mainstay of treatment. Treatment with antibiotics should be avoided due to of risk of inducing haemolytic ureamic syndrome (HUS).		
E. coli **Enteropathogenic (EPEC) Enterotoxigenic (ETEC) Enteroaggregative (EAEC)**	Supportive care, including rehydration is the mainstay of treatment. **For severe illness or in immunocompromised host, to consider:** Azithromycin 1 g PO **single dose**	Ciprofloxacin 750 mg PO **single dose**	
Campylobacter jejuni	Azithromycin 500 mg PO q24h	Doxycycline 100 mg q12h	**Duration: 3 days** Consider longer duration of therapy in immunocompromised patients
Cholera *Vibrio cholerae*	Primary therapy is rehydration. Antibiotic is to reduce the shedding time. Refer to Tropical Infections section.		
Giardiasis *Giardia duodenalis*	Metronidazole 400 mg PO q8h **Duration: 5-7 days** *There is no RCT on the duration of metronidazole. Duration quoted from observational studies*	Albendazole 400 mg PO q24h **Duration: 5 days**	
Salmonella spp**, non-typhi**	Trimethoprim/Sulfamethoxazole (Bactrim) 160 mg/800 mg (= 2 tablets) PO q12h **In HIV patients:** Refer to Infections in Immunocompromised Patients - Opportunistic Infections in HIV section.	Azithromycin 500 mg PO q24h **OR** Ciprofloxacin 500 mg PO q12h	**Duration:** ● **Immunocompetent: 5-7 days** ● **Immunocompromised: 14 days** If bacteremia or with foci of infection, treatment has to be individualized. Antibiotic is usually not indicated, except in the following conditions: ▪ Severe illness or septic shock ▪ Presence of prostheses, valvular heart disease or severe atherosclerosis ▪ Malignancy ▪ Immunocompromised hosts
Salmonella typhi	Refer to Tropical Infections section.		

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Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Shigella spp Fever & Bloody stool	***Moderate disease:** Ciprofloxacin 750mg PO q12h **Duration: 3 days**	***Moderate disease:** Azithromycin 500 mg PO q24h **Duration: 3 days** **OR** Trimethoprim/Sulfamethoxazole (Bactrim) 160 mg/800 mg (= 2 tablets) PO q12h **Duration: 3 days**	*Moderate disease in individual such as food handler, residents of nursing home/ institutions, immunocompromised patients should be treated with antibiotic. **Duration In immunocompromised patients: 7-10 days.**
	Severe disease: Ceftriaxone 2g IV q24h **Duration: 5 days**		
Entamoeba histolytica	Metronidazole 800 mg PO q8h for **5-10 days** *There is no RCT on the duration of metronidazole. Duration quoted from observational studies* **PLUS** Paromomycin 500 mg PO q8h **for 7 days** *Requires DG's approval*	-	

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Clostridioides difficile Infection (CDI)

(previously known as *Clostridium difficile*)

- Discontinue therapy with the inciting antibiotic agent as soon as possible as this may influence risk of CDI recurrence.
- Treatment includes management of initial or recurrent disease.
- Recurrent disease is defined as resolution of CDI symptoms while on treatment followed by reappearance of symptoms within 2 months of discontinuing treatment.

Initial, Non-severe CDI

Infection/Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	
Initial, Non-severe WCC ≤ 15 x 10^9/L **AND** SCr < 1.5 mg/dL (133 µmol/L)	Vancomycin 125 mg PO q6h	Metronidazole 400 mg PO q8h *If vancomycin is not available*	**Duration: 10 days** RCTs have shown that oral vancomycin is superior to oral metronidazole.

Initial, Severe CDI

Infection/Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	
Initial, Severe WCC > 15 x 10^9/L **AND/OR** SCr ≥ 1.5 mg/dL (133 µmol/L)	Vancomycin 125 mg PO q6h	-	**Duration: 10 days**

Initial, Fulminant Colitis

Infection/Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	
Initial, Fulminant Colitis Hypotension/shock, Ileus **OR** Megacolon	Vancomycin 500 mg PO q6h **Consider rectal instillation if ileus is present (vancomycin enema)* **PLUS** Metronidazole 500 mg IV q8h	-	**Duration: 10 days (may extend to 14 days if recovery is delayed)** ***Vancomycin enema** (consider if ileus is present): Vancomycin 500 mg (in 100 mL normal saline) q6h via enema or by nasogastric tube

Recurrent CDI

Infection/Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	
Recurrent	**If Vancomycin was used for the initial episode** Vancomycin pulsed-tapered regimen: • 125 mg PO **q6h** for 10-14 days then • 125 mg PO **q12h** for 7 days then • 125 mg PO **q24h** for 7 days then • 125 mg PO **q48-72h** for 2-8 weeks	**If Metronidazole was used for the initial episode** Vancomycin 125 mg PO q6h **Duration: 10-14 days**	

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Spontaneous Bacterial Peritonitis (SBP)

Primary SBP

Common organisms:

- *Streptococcus spp.*
- Enterobacterales (E.g: *E. coli, K. pneumoniae*)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Primary SBP	Cefotaxime 2 g IV q8h **OR** Ceftriaxone 2 g IV q24h	Amoxicillin/clavulanate 1.2 g IV q6h **OR** Ciprofloxacin 400 mg IV q12h / 500 mg PO q12h ***DIAMS - IV to PO** **Oral Ciprofloxacin** has good bioavailability (>70%). *Change IV Ciprofloxacin to oral once patient can tolerate orally	**Duration: 5-7 days**

In Cirrhosis with Upper Gastrointestinal Haemorrhage

Common organisms:

- *Streptococcus spp.*
- Enterobacterales (E.g: *E. coli, K. pneumoniae*)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Cirrhosis with Upper GI Hemorrhage	Cefotaxime 2 g IV q8h **OR** Ceftriaxone 2 g IV q24h	Ciprofloxacin 400 mg IV q12h / 500 mg PO q12h	Antibiotics should be used judiciously for this indication in view of emergence of resistance. **Primary SBP prophylaxis in high-risk patients:** RCTs' demonstrate decreased in mortality and incidence of SBP with selective intestinal decontamination However, in most studies the efficacy to prevent death decreases over time due to the emergence of MDRO. Ideally, antibiotics for SBP prophylaxis should have low systemic bioavailability. For patients who may benefit from SBP prophylaxis, it is best to discuss with gastroenterologists or refer to a centre of specialisation. **Patient with recurrent SBP:** To discuss with gastroenterologisst or refer to a centre of specialisation for the role and option for secondary SBP prophylaxis.

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Liver Abscess

Pyogenic Liver Abscess

Common organisms:

- *Klebsiella spp.*
- *Escherichia coli*

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Non-Sepsis	Amoxycillin/clavulanate 1.2 g IV q6h **OR** Ampicillin/sulbactam 3 g IV q6h	Cefoperazone 1-2 g IV q12h **OR** Ceftriaxone 2 g IV q24h **OR** Cefotaxime 2 g IV q8h **OR** Cefuroxime 1.5 g IV q8h **MAY ADD** Metronidazole 500 mg IV q8h *(in patients with risk factors of anaerobic liver abscess)*	**Duration: 2-6 weeks** Shorter duration when there is adequate drainage with fever resolution, to convert IV to oral when there is clinical improvement To consider drainage if abscess size is ≥ 5cm or impending rupture. *Risk factors of anaerobic liver abscess: ●Acute/Chronic Inflammatory bowel disease with/without perforation ●Malignancy of GI tract ●Surgery of GI tract or pelvic organ Use of Carbapenem should be **RESERVED** for patients with history of biliary instrumentation **AND** suspecting multi-resistant gram-negative organism.
Sepsis or Organ Failure	Piperacillin/tazobactam 4.5 g IV q6-8h *Piperacillin/tazobactam: if given as q8h, to be given as extended infusion (over 3 – 4 hours)*	-	

Amoebic Liver Abscess

Entamoeba histolytica

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Amoebic Liver Abscess	**Amoebicidal agent** Metronidazole 750mg IV q8h *Consider oral switch to Metronidazole 800 mg PO q8h once there is satisfactory clinical improvement* **Duration: 10 days** **followed by** **Luminal agent -** To eradicate intestinal colonization after amoebicidal treatment Paromomycin **(UKK)** 25-35 mg/kg/day PO q8h **Duration: 7 days**	-	Drainage of amoebic liver abscess is not usually required but is necessary if: ▪ The patient does not respond to antibiotic therapy. ▪ The abscess is > 5 cm in diameter. ▪ The abscess is in the left lobe of the liver. ▪ The diagnosis remains in doubt

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HSgB Antimicrobial Guideline (HAG)

SECTION A: ADULT

A7:
GENERAL SURGERY-RELATED INFECTION

Launched: October 2024

Updated: -

LIST OF TOPICS WITH LINKS:

1. **Helicobacter Pylori Infection**
   - First Line Treatment – Triple Therapy
   - Second Line Treatment
2. **Spontaneous Bacterial Peritonitis (SBP)**
   - Primary SBP
   - In Cirrhosis with Upper Gastrointestinal Haemorrhage
3. **Appendicitis**
   - Uncomplicated Acute Appendicitis
   - Complicated Acute Appendicitis
4. **Liver Abscess**
   - Pyogenic Liver Abscess
5. **Cholecystitis**
6. **Cholangitis**
7. Acute Pancreatitis
8. Diverticulitis
9. **Other Surgical Infections**
   - Breast Abscess/Mastitis
   - Severe Intraabdominal Infection / Infected Wound
   - Anorectal Abscess
10. **Trauma-Related Infections**
   - Abdominal Injury
   - Chest Trauma
   - Simple Soft Tissue Injuries
   - Complex Soft Tissue Injuries

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Helicobacter Pylori Infection

First Line Treatment – Triple Therapy

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Triple Therapy First line therapy recommended in areas with < 15-20% clarithromycin resistance.	*Proton Pump Inhibitors PO q12h **PLUS** Clarithromycin 500 mg PO q12h *Consider second line treatment if clarithromycin resistance exceeds more than 15%* **PLUS** Amoxicillin 1 g PO q12h	**Antibiotic allergy:** *Proton Pump Inhibitors PO q12h **PLUS** Clarithromycin 500 mg PO q12h *Consider second line treatment if clarithromycin resistance exceeds more than 15%* **PLUS** Metronidazole 400 mg PO q12h	***Dosages of Proton Pump Inhibitors (PPI):** • Omeprazole 20 mg PO q12h • Pantoprazole 40 mg PO q12h • Lansoprazole 30 mg PO q12h • Esomeprazole 20 mg PO q12h • Rabeprazole 20 mg PO q12h **Duration of therapy: 14 days** Meta-analysis of RCTs found 14 days duration of therapy showed greater eradication rate.

Second Line Treatment

Consider second line treatment if clarithromycin resistance exceeds more than 15%.

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Bismuth Quadruple Regimen	*Proton Pump Inhibitors PO q12h **PLUS** Tetracycline hydrochloride 500 mg PO q6h **PLUS** Metronidazole 400 mg PO q8h **PLUS** Bismuth subsalicylate 300 mg PO q6h	*Proton Pump Inhibitors PO q12h **PLUS** Tetracycline hydrochloride 500 mg PO q6h **PLUS** Metronidazole 400 mg PO q8h **PLUS** Bismuth subcitrate 120-300 mg PO q6h	*Dosages of Proton Pump Inhibitors: Omeprazole 20 mg PO q12h Pantoprazole 40 mg PO q12h Lansoprazole 30 mg PO q12h Esomeprazole 20 mg PO q12h Rabeprazole 20 mg PO q12h **Duration of therapy:** 14 days Meta-analysis of RCTs found 14 days duration of therapy showed greater eradication rate.
Fluoroquinolone Triple Therapy	*Proton Pump Inhibitors PO q12h **PLUS** Amoxicillin 1 g PO q12h **PLUS** Levofloxacin 500 mg PO q24h		

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Spontaneous Bacterial Peritonitis (SBP)

Primary SBP

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Common organisms: • *Streptococcus spp.* • Enterobacterales (E.g: *E. coli, K. pneumoniae*)	Cefotaxime 2 g IV q8h **OR** Ceftriaxone 2 g IV q24h	Amoxicillin/clavulanate 1.2 g IV q6h **OR** Ciprofloxacin 400 mg IV q12h	**Duration:** 5-7 days **DIAMS - IV to PO** **Oral Ciprofloxacin** has good bioavailability (>70%). *Change to Ciprofloxacin PO 500mg q12hto oral once patient can tolerate orally

In Cirrhosis with Upper Gastrointestinal Haemorrhage

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Common organisms: • *Streptococcus spp.* • Enterobacterales (E.g: *E. coli, K. pneumoniae*)	Cefotaxime 2 g IV q8h **OR** Ceftriaxone 2 g IV q24h	Ciprofloxacin 400 mg IV q12h	**Duration:** 7 days Antibiotics should be used judiciously for this indication in view of emergence of resistance. **Primary SBP prophylaxis in high-risk patients:** RCTs' demonstrate decreased in mortality and incidence of SBP with selective intestinal decontamination However, in most studies the efficacy to prevent death decreases over time due to the emergence of MDRO. Ideally, antibiotics for SBP prophylaxis should have low systemic bioavailability. For patients who may benefit from SBP prophylaxis, it is best to discuss with gastroenterologists or refer to a centre of specialisation. **Patient with recurrent SBP:** To discuss with gastroenterologist or refer to a centre of specialisation for the role and option for secondary SBP prophylaxis.

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Appendicitis

Uncomplicated Acute Appendicitis

Common organisms:
- Enterobacterales
- *Enterococcus* spp.
- *Bacteroides spp.*

Uncomplicated acute appendicitis can be managed by two approaches:
- Non operative management (NOM) with antibiotics alone.
- Appendectomy (for patients who are not suitable for NOM approach or those who do not respond to antibiotics).

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Non-operative management (NOM)	Amoxycillin/clavulanate 1.2 g IV q6h **OR** Ampicillin/sulbactam 3 g IV q6h	Cefuroxime 1.5 g IV q8h **PLUS** Metronidazole 500 mg IV q8h	**Duration:** 7-10 days (IV and oral) **DIAMS - IV to PO** Convert IV to oral when there is clinical improvement. Consider re-evaluation for surgery if symptoms do not resolve.
Appendectomy **Antibiotic choice as per surgical chemoprophylaxis**	Cefazolin 2 g **PLUS** Metronidazole 500 mg IV	Cefuroxime 1.5 g IV **PLUS** Metronidazole 500 mg IV **OR** Amoxicillin-clavulanate 1.2 g IV **Severe penicillin allergy:** Gentamicin 5 mg/kg IV **MAY ADD** Clindamycin 600-900 mg IV • *Clindamycin resistance has been increasing in Bacteroides species.* • *Metronidazole may be preferred if the procedure transverses the lower gastrointestinal tract.*	**Single dose** Antibiotic treatment can be **stopped** once surgery is performed; **provided adequate control of the source** of infection is achieved and symptoms have resolved.

Complicated Acute Appendicitis

Abscess, perforation or peritonitis

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Non-Sepsis	Amoxycillin/clavulanate 1.2 g IV q6h **OR** Ampicillin/sulbactam 3 g IV q6h	Cefoperazone 1-2 g IV q12h **PLUS** Metronidazole 500 mg IV q8h **OR** Ceftriaxone 2 g IV q24h **PLUS** Metronidazole 500 mg IV q8h	**Duration:** 4-7 days (if adequate source control, no delay in surgical intervention and patient has rapid clinical recovery) Use of Carbapenem should be **RESERVED** for patients at high risk of developing multi-resistant gram-negative organism infection and adverse outcomes
Sepsis **Organ Failure**	Piperacillin/tazobactam 4.5 g IV q6-8h *If given as q8h, to be given as extended infusion (over 3 – 4 hours)*	-	

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Liver Abscess

Pyogenic Liver Abscess

Common organisms: *Klebsiella spp., Escherichia coli*

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Non-Sepsis	Amoxycillin/clavulanate 1.2 g IV q6h **OR** Ampicillin/sulbactam 3 g IV q6h	Cefoperazone 1-2 g IV q12h **OR** Ceftriaxone 2 g IV q24h **OR** Cefotaxime 2 g IV q8h **OR** Cefuroxime 1.5 g IV q8h **MAY ADD** *Metronidazole 500 mg IV q8h	**Duration:** 2-6 weeks Shorter duration when there is adequate drainage with fever resolution. To consider drainage if abscess size is ≥ 5cm or impending rupture. *Risk factors of anaerobic liver abscess: • Acute/Chronic Inflammatory bowel disease with/without perforation • Malignancy of GI tract • Surgery of GI tract or pelvic organ **DIAMS - IV to PO** Convert IV to oral when there is clinical improvement. Use of Carbapenem should be **RESERVED** for patients with history of biliary instrumentation **AND** suspecting multi-resistant gram-negative organism.
Sepsis or Organ Failure	Piperacillin/tazobactam 4.5 g IV q6-8h *if given as q8h, to be given as extended infusion (over 3 – 4 hours)*	-	

Cholecystitis

Common organisms: *Klebsiella spp., Escherichia coli, Enterococci spp.*

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Non-Sepsis	Amoxycillin/clavulanate 1.2 g IV q6h **OR** Ampicillin/sulbactam 3 g IV q6h	Cefoperazone 1-2 g IV q12h **OR** Ceftriaxone 2 g IV q24h **OR** Cefotaxime 2 g IV q8h	For **mild to moderate** acute cholecystitis, ***antibiotics may be ceased within 24H post-cholecystectomy***, in the absence of gallbladder necrosis, pericholecystic abscess or biliary peritonitis. **Duration:** 4-7 days Use of Carbapenem should be **RESERVED** for patients with history of biliary instrumentation **AND** suspecting multi-resistant gram-negative organism.
Sepsis Organ Failure Complicated case E.g.: Abscess or perforation	Piperacillin/tazobactam 4.5 g IV q6-8h *if given as q8h, to be given as extended infusion (over 3 – 4 hours)*	-	

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Cholangitis

Community acquired - Common organisms: *Klebsiella spp., Escherichia coli, Enterococci spp.*

Appropriate source control to drain infected foci and restoration of anatomic and physiological function is recommended for all patients, as antibiotics will not penetrate the biliary system in the presence of obstruction.

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Non-Sepsis	Amoxycillin/clavulanate 1.2 g IV q6h **OR** Ampicillin/sulbactam 3 g IV q6h	Cefoperazone 1-2 g IV q12h **OR** Ceftriaxone 2 g IV q24h **OR** Cefotaxime 2 g IV q8h **MAY ADD** Metronidazole 500 mg IV q8h *Metronidazole is required if biliary enteric anastomosis is present.*	**Duration:** 4-7 days Treatment may be reduced to ***3 days post-biliary drainage with fever resolution***. Use of Carbapenem should be **RESERVED** for patients with history of biliary instrumentation **AND** suspecting multi-resistant gram-negative organism.
Sepsis **Organ Failure** **Complicated case** E.g.: Abscess or perforation	Piperacillin/tazobactam 4.5 g IV q6-8h *if given as q8h, to be given as extended infusion (over 3 – 4 hours)*	-	

Acute Pancreatitis

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Mild to moderate Pancreatitis	Self-limiting, often do not require antibiotics. Prophylactic antibiotics have not been shown to reduce mortality, rates of pancreatic or peripancreatic infection or need for surgery. If infective biliary calculi in origin, refer to severe pancreatitis.		Duration depends on adequate source control. Short course of antibiotics until surgically obtained cultures are available. Modify antibiotics according to culture and sensitivity. Use of Carbapenem should be **RESERVED** for patients at high risk of developing multi-resistant gram-negative organism infection.
Severe Pancreatitis High risk • Extrapancreatic infection • Infected Pancreatic necrosis	Piperacillin/tazobactam 4.5 g IV q6-8h *If given as q8h, to be given as extended infusion (over 3 – 4 hours)*	Cefoperazone 1-2 g IV q12h **OR** Ceftriaxone 2 g IV q24h **OR** Cefotaxime 2 g IV q8h **PLUS** Metronidazole 500 mg IV q8h	

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Diverticulitis

Common organisms:
- Enterobacterales (E.g: *E. coli, K. pneumoniae*)
- *Enterococcus spp.*
- *Bacteroids spp.*

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Uncomplicated acute diverticulitis in non-septic, Immunocompetent host	Antibiotics is usually not required		Uncomplicated diverticulitis is defined as acute diverticulitis without perforation or abscess.
Uncomplicated acute diverticulitis with risk factors Risk factors: • Systemic signs of infection • Elderly • Presence of significant comorbidities (DM, IHD, HF, ESRF, Chronic liver disease) • Immunocompromised state	Amoxycillin/clavulanate 1.2 g IV q6h **OR** Ampicillin/sulbactam 3 g IV q6h	Cefuroxime 1.5 g IV q8h **PLUS** Metronidazole 500 mg IV q8h	**Duration: 7-10 days (IV and oral)** **DIAMS - IV to PO** Convert IV to oral when there is clinical improvement. Require close clinical monitoring and re-evaluation for antibiotics if symptoms progress.
Complicated Diverticulitis Abscess, perforation or peritonitis	**Non-sepsis:** Amoxicillin/clavulanate 1.2 g IV q6h **OR** Ampicillin/sulbactam 1.5 g-3 g IV 8h **Sepsis or organ failure:** Piperacillin/tazobactam 4.5 g IV q6-8h *If given as q8h, to be given as extended infusion (over 3 – 4 hours)*	**Non-sepsis:** Cefoperazone 1-2 g IV q12h **PLUS** Metronidazole 500mg IV q8h **OR** Ceftriaxone 2 g IV q24h **PLUS** Metronidazole 500 mg IV q8h	Use of Carbapenem should be **RESERVED** for patients at high risk of developing multi-resistant gram-negative organism infection.

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Other Surgical Infections

Breast Abscess/Mastitis

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Breast Abcess/Mastitis Common organism: *Staphylococcus aureus*	Cloxacillin 1-2 g IV q6h **OR** Cefazolin 1-2 g IV q8h	Amoxicillin/clavulanate 625 mg PO q8h **OR** Ampicillin/sulbactam 750 mg PO q12h **Antibiotic allergy:** Clindamycin 600 mg IV/PO q8h	Surgical drainage is the mainstay of management. **Duration**: 10 to 14 days but **shorter** antibiotic duration **(5 to 7 days) can be considered** if adequate source control and local wound management has shown clinical improvement. **Antibiotic Allergy:** Refer to **APPENDICES > Antibiotic Allergy** for more info.

Severe Intraabdominal Infection / Infected Wound

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Common organism: • Enterobacterales • Enterococcus • Anaerobes	Piperacillin/tazobactam 4.5 g IV q6-8h *If given as q8h, to be given as extended infusion (over 3 – 4 hours)*	Ciprofloxacin 400 mg IV q12h **PLUS** Clindamycin 600 mg IV q8-6h or 900 mg q8h	

Anorectal Abscess

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Mild	Amoxycillin/clavulanate 1.2 g IV q6h or 625 mg PO q8h **OR** Ampicillin/sulbactam 3 g IV q6h	-	**Drainage procedure is mandatory.** **Duration:** 4-7 days Antibiotics can be discontinued once adequate source control, no delay in surgical intervention and patient has rapid clinical recovery.
Moderate to severe E.g.: Deep seated, sepsis/organ failure, immunocompromised	Cefoperazone 1-2 g IV q12h **PLUS** Metronidazole 500 mg IV q8h **OR** Ceftriaxone 2 g IV q24h **PLUS** Metronidazole 500 mg IV q8h	-	

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Trauma-Related Infections

Abdominal Injury

Patients who do not require surgery:
No antibiotics required

Patients who require surgery:
Antibiotic choice will be based on organs involved.
Duration:

- If hollow viscus injury is repaired early (**within 12 hours**): Antibiotics should be continued for no more than 24 hours.
- If hollow viscus injury is repaired **late (> 12hours):** Antibiotics should be limited to 7 days.
- If hollow viscus injury is **incompletely repaired or clinical signs persist** in patients with traumatic abdominal injury: Antibiotics can be used for more than 7 days.

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Gram-negative enteric aerobes & anaerobes	Amoxycillin/clavulanate 1.2 g IV q8h	Cefuroxime 750 mg - 1.5 g IV q8h **PLUS** Metronidazole 500 mg IV q8h **OR** Cefoperazone 1-2 g IV q12h **PLUS** Metronidazole 500 mg IV q8h	**Duration**: 4 to 7 days if adequate source control, no delay in surgical intervention and patient has rapid clinical recovery.

Chest Trauma

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Penetrating Chest Trauma Requiring Chest Tube Insertion	Cefazolin 2 g IV q8h **Duration:** 1 day (prophylaxis)	-	Prophylactic antibiotic use is not indicated in patients with blunt chest trauma (non-penetrating trauma)

Simple Soft Tissue Injuries

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Minor Wounds with Simple Repair Gunshot wound and superficial stab wound of extremiti	Antibiotics not required. Good wound care is required: • Debridement of devitalized tissue • Irrigation and remove all foreign material • Hemostasis • Closure of the wound when safe and appropriate		

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Complex Soft Tissue Injuries

Muscular, skeletal and soft tissue trauma, gunshot or crush & degloving injuries or stab wounds

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Penetrating and puncture-type wounds / Complex soft tissue wounds without open fractures Common organisms: • *Staphylococcus aureus* • Beta-haemolytic *Streptococci* • Polymicrobial infection	Cloxacillin 2 g IV q6h **MAY ADD** Metronidazole 500 mg IV q8h *If there is soil/rust contamination or heavy machinery.* **MAY ADD** Gentamicin 5 mg/kg IV q24h *If there's extensive skin and soft tissue involvement (for gram negative coverage)*	Cefazolin 2 g IV q8h **PLUS** Metronidazole 500 mg IV q8h *If there is soil/rust contamination or heavy machinery.* **OR** Cefuroxime 1.5 g q8h **PLUS** Metronidazole 500 mg IV q8h *If there is soil/rust contamination or heavy machinery.* **OR** Amoxicillin/Clavulanate 1.2 g IV q8h	Duration: depends on the extent of infection. ▪ For combat-related isolated soft tissue injury, antibiotic duration of 1 - 3 days may be adequate. ▪ For severe penetrating injuries, especially those involving joints and/or tendons, antibiotics must be given for at least **5 days.** Tetanus immunization should be given in addition to appropriate antibiotics. Antibiotic therapy should be tailored to the susceptibility of deep wound cultures isolates once available.

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HSgB Antimicrobial Guideline (HAG)

SECTION A: ADULT

A8:
INFECTIONS IN IMMUNOCOMPROMISED PATIENTS (HEMATOLOGY-ONCOLOGY)

Launched: October 2024

Updated: -

LIST OF TOPICS WITH LINKS:

1. **Introduction**
2. **Suggested Empirical Antibiotic Therapy in Adult Febrile Neutropenic Patients**
   - Low Risk (Outpatient)
   - High Risk (Inpatient)
3. **De-Escalation Strategies**
4. **Infection Prevention Strategies**
5. **Antifungal Therapy**

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Introduction

1. Any infection in the immunocompromised host is life-threatening and needs immediate attention.
   Febrile neutropenia is defined as single temperature: ⩾ 38.3°C orally or ⩾ 38.0°C over 1 hour; and neutropenia: < 500 neutrophils/mcL or < 1000 neutrophils/mcL and a predicted decline to ⩽ 500 neutrophils/mcL over the next 48 hours.

2. Cultures may be positive in less than 40% of cases. Patients have impaired inflammatory responses and hence may have no localizing signs. The usual sign is fever > 38°C or hypothermia. The common portals of infection include the oral cavity, gastrointestinal tract, perianal region, lungs and IV lines.

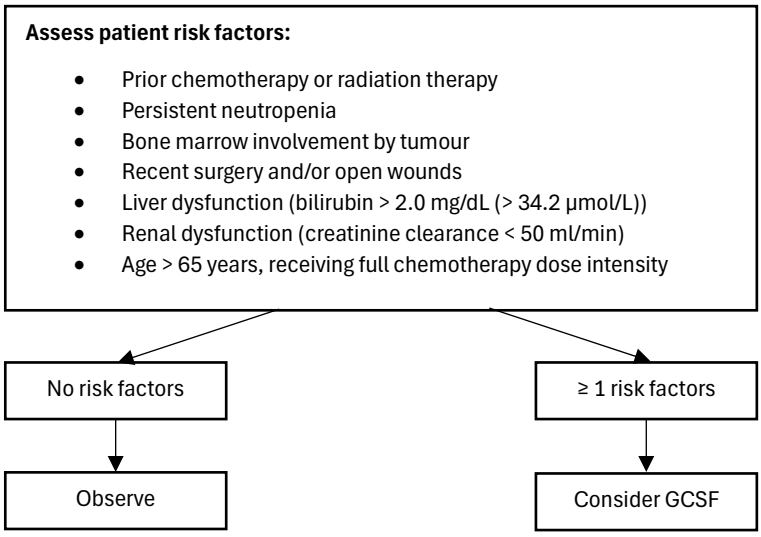
3. Patients may not always mount a temperature response due to the severity of their illness. If a patient is unwell on assessment with a history of receiving systemic anticancer therapies, neutropenic sepsis should be suspected.

4. Other signs/symptoms that may suggest infection in neutropenic patients (any one of the following):

Signs:	Symptoms:
• Hypothermia < 35.0 ˚C (two readings 1 hour apart) • Unexplained hypotension / tachycardia / abdominal pain • Any unexplained clinical deterioration, even in the absence of fever	• Chills / rigors / sweating • Sore throat / cough / urinary symptoms, unexplained skin lesions • Pain at intravenous catheter sites (tunneled or untunnelled) • Unexplained diarrhoea

Note: Focal signs/symptoms of infection may or may not be present

5. Potential pathogens are dependent on the underlying defect. For example;
   - Neutropenia: Gram-negative organisms, Gram-positive organisms, Fungi
   - Hypogammaglobulinaemia, post splenectomy/hyposplenic patients: Encapsulated organisms
   - Defective cellular immunity: Pneumocystis jirovecii, Toxoplasma, Fungi, Viruses, Mycobacteria



* Flowchart modified from NCCN (Clinical Guideline: Neutropenic sepsis: prevention and management of neutropenic sepsis in cancer patients

6. The oncology or haematology team responsible for the patient should be made aware as soon as possible that the patient has been admitted for suspected neutropenic sepsis.

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Suggested Empirical Antibiotic Therapy in Adult Febrile Neutropenic Patients

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Low Risk (Outpatient) Suitable low risk patients include: • no evidence of dehydration or hypotension • no evidence of pneumonia • no COAD • able to access prompt medical attention if deteriorates Outpatient oral antibiotics may be considered after careful risk assessment and consultation with a hemato-oncologist.	Amoxicillin/clavulanate 625 mg PO q8h **MAY ADD:** Ciprofloxacin 500 mg PO q12h *Add ciprofloxacin if patient is previously colonized by Pseudomonas aeruginosa.*	-	Treat until patient recovers. Can consider stopping the antibiotic after reassessing the patient following 2 days afebrile at the discretion of the treating hemato-oncologists – if the patient has stable vital signs, no evidence of ongoing infection, are educated about their condition and stay near to hospital facilities.
High Risk (Inpatient) Risk assessment for complication of severe infection should be done during triage. Patient is deemed high risk if there is: • prolonged and profound neutropenia with ANC < $0.1x10^9$/L • hypotension • pneumonia • new onset abdominal pain or neurological signs The administration of the first dose of empirical antibiotic with anti-pseudomonal coverage should be done as soon as possible following triage (within the first hour) after taking blood C&S.	**First line therapy:** Piperacillin/tazobactam 4.5 g IV q6h *If given as q8h, to be given as extended infusion (over 3-4 hours)* **MAY ADD:** *Amikacin 15 mg/kg IV q24h	**First line therapy:** Cefepime 2 g IV q8h **MAY ADD:** *Amikacin 15 mg/kg IV q24h **MAY ADD:** Metronidazole 500 mg IV q8h *Metronidazole may be added in the presence of:* • *severe mucositis* • *intra-abdominal infections* • *peri-anal abscesses* • *colitis*	*DIAMS - IV to PO / OPAT Consider IV to PO antibiotic switch in a clinically stable patient who has no GI absorption issue. ***Amikacin** may be added in patient with severe sepsis for broader gram-negative coverage. It can be discontinued if microbiological C&S isolated organisms sensitive to piperacillin/tazobactam or cefepime and patient is clinically stable.
	Severe sepsis or Second line therapy for persistent fever of 4 - 7 days and signs of deterioration: Meropenem 1 g IV q8h **MAY ADD:** *Vancomycin 15-20 mg/kg IV q8-12h; not to exceed 2 g/dose *Refer to DIAMS – HSgB Vancomycin Protocol for more dosing info.*	**Severe sepsis or Second line therapy for persistent fever of 4 - 7 days and signs of deterioration:** Imipenem 500 mg q6h or 1 g IV q8h (in severe sepsis) **MAY ADD:** *Vancomycin 15-20 mg/kg IV q8-12h; not to exceed 2 g/dose *Refer to DIAMS – HSgB Vancomycin Protocol for more dosing info.*	*__Vancomycin__ is not a routine in the initial antibiotic regime. Consider add vancomycin for these patients: • colonized with MRSA • suspected to have catheter-related infection, skin and soft-tissue infection • in septic shock Stop vancomycin after 48 hours if no evidence of gram-positive cocci. **Linezolid** is an alternative in those patients with no clinical response to vancomycin and in those with suspected or confirmed VRE, VISA or VRSA.

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De-Escalation Strategies

- Modification of antibiotic regime if deterioration of clinical status or if there is no clinical improvement over 72-96 hours in a stable patient.
- The antibiotics are generally kept for a minimal duration of 5 to 7 days or stopped if afebrile for 2 days in patients who is asymptomatic with negative cultures and improving neutrophil *count. (*refer to comment on low risk out-patient).
- In instances where cultures are positive and the patient is improving with targeted therapy, consider discontinuing non-relevant combination therapy. For example: patient with MRSA positive cultures on combination therapy meropenem and vancomycin, to stop meropenem.

Infection Prevention Strategies

- Strict isolation measures.
- Patient's personal hygiene and diet.
- Regular surveillance culture.
- Hand washing and strict aseptic technique.
- Prevention of HCAI (E.g.: BSI, HAP, VAP)

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Antifungal Therapy

- It should be initiated earlier in the presence of:
  - severe mucositis
  - oral thrush
  - dysphagia
  - suspicious skin infiltrates or pulmonary infiltrates
  - fundal exudates
  - prolonged steroid use more than 2 weeks
- IV amphotericin B remains the empirical therapy of choice for invasive fungal infections. For patients who are intolerant, refractory or those with toxicity to conventional amphotericin B, the lipid formulations of amphotericin B, voriconazole and echinocandins are alternatives for empirical therapy based on local availability and costs.
- Voriconazole is an alternative to amphotericin B for pre-emptive and directed therapy for invasive aspergillosis.
- In candidiasis, echinocandins, azoles and amphotericin B are antifungals of choice.

Daily Dose of Antifungal Agent

- Amphotericin B lipid complex (ABLC): 5 mg/kg q24h
- Amphotericin B deoxycholate (conventional): 0.7-1.0 mg/kg q24h
- Liposomal amphotericin B: 3-5 mg/kg q24h
- Anidulafungin: 200 mg loading dose, followed by 100 mg q24h
- Caspofungin: 70 mg loading dose, followed by 50 mg q24h
- Micafungin: 100 mg q24h
- Fluconazole: 12 mg/kg/day for 1 day, then 6 mg/kg q24h
- Itraconazole: 200 mg q8h for 3 days, followed by 200 mg q12h
- Posaconazole: (Tablet) 300 mg q12h for 1 day, followed by 300 mg q24h
- Voriconazole: 6 mg/kg q12h for 2 doses, followed by 3-4 mg/kg q12h

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
A. For patients on fluconazole or no antifungal prophylaxis **If:** • New clinical signs or symptoms suggestive of invasive fungal infections (IFI)* • Fever persists ⩾ 7 days with no identified fever source	Micafungin 100 mg IV q24H	Anidulafungin 200 mg IV single dose, then 100 mg IV q24h **OR** Caspofungin 70 mg IV single dose, then 50 mg IV q24h	*If sinus and/or chest CT scan findings not suggestive of fungal infection, it is less likely to be aspergillus or mold infections.
B. If signs and symptoms suggestive of invasive fungal infections (IFI)* AND sinus ± chest CT suggestive of fungal infection.	Voriconazole 6 mg/kg IV q12h for 2 doses, then 4 mg/kg IV q12h	**For patients on voriconazole or posaconazole as prophylaxis:** *Amphotericin B deoxycholate 0.7 – 1 mg/kg IV q24h **OR** *Liposomal Amphotericin B 3-5 mg/kg IV q24h	

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HSgB Antimicrobial Guideline (HAG)

SECTION A: ADULT

A9:

INFECTIONS IN IMMUNOCOMPROMISED PATIENTS (OPPORTUNISTIC INFECTION (OI) IN PATIENTS WITH HUMAN IMMUNODEFICIENCY VIRUS (HIV))

Launched: October 2024

Updated: -

LIST OF TOPICS WITH LINKS:

1. Introduction to Opportunistic Infections (OI) in Patients with Human Immunodeficiency Virus (HIV)
2. Pneumocystis jiroveci (Carinii) Interstitial Pneumonia (PJP/PCP)
3. Toxoplasma gondii Encephalitis
4. Mucocutaneous Candidiasis
5. Herpes Zoster (HZ) Diseases - Shingles
6. Varicella-Zoster Virus (VZV) Diseases
7. Herpes Simplex Virus (HSV) Infections
8. Cryptococcal Meningitis or Meningoencephalitis (*Cryptococcus neoformans*)
9. Cryptococcosis (Localized Non-Meningeal Disease)
10. Penicilliosis (*Penicillium/Talaromyces marneffei*)
11. Histoplasmosis (*Histoplasma capsulatum*)
12. *Mycobacterium tuberculosis* (TB) Infection and Diseases
13. *Mycobacterium avium* Complex (MAC) Disease
14. Cytomegalovirus (CMV) Disease
15. Rhodococcus Infections (*Rhodococcus hoagii*, formerly *Rhodococcus equi/Corynebacterium equi*)
16. Syphilis (*Treponema pallidum* Infection)
17. Bacterial Enteric Infections – Empirical Treatment or Treatment of Salmonellosis (Salmonella Non-Typhi)
18. Enteric Disease – *Cystoisospora/Isospora belli*
19. Enteric Disease – Cryptosporidiosis & Microsporidiosis
20. Bartonellosis
21. Progressive Multifocal Leukoencephalopathy (PML)

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Introduction to Opportunistic Infections (OI) in Patients with Human Immunodeficiency Virus (HIV)

Important cut-offs for CD4 T cells, above which particular AIDS illnesses are improbable.
These **CD4 counts** are only reference values; exceptions are always possible.

- **No cut-off:** Kaposi's sarcoma, pulmonary tuberculosis, HZV, bacterial pneumonia, lymphoma, HSV
- **< 250/µl:** PCP, oesophageal candidiasis, PML, HIV encephalopathy
- **< 100/µl:** Cerebral toxoplasmosis, cryptococcosis, miliary tuberculosis
- **< 50/µl:** CMV end organ disease, cryptosporidiosis, atypical mycobacteriosis

The treatment regimens are based on drugs available in the Hospital Sungai Buloh & Ministry of Health National Formulary and hence in some instances may vary from internationally accepted treatments. Some regimes are chosen as preferred regimes due to cost considerations.

Pneumocystis jiroveci (Carinii) Interstitial Pneumonia (PJP/PCP)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
PCP Treatment	Trimethoprim/sulfamethoxazole (Bactrim) 15-20 mg/kg/day (of TMP component) IV/PO in 3-4 divided doses	**For mild to moderate cases: (PO_2 70-80 mmHg)** Clindamycin 600 mg IV/PO q8h **PLUS** Primaquine 30 mg (base) PO q24h **OR** Dapsone 100 mg PO q24h* **PLUS** Trimethoprim 15 mg/kg/day PO in 3-4 divided doses **For severe cases: (PO_2 <70 mmHg)** Pentamidine **(UKK)** 4 mg/kg/day IV (in 1 pint D5% or NS run over 1-2 hours) **OR** Clindamycin 600 mg IV q6h or 900 mg IV q8h **PLUS** Primaquine 30mg (base) PO q24h *(Patient should be tested for G6PD deficiency)*	**Duration: 21 days** Patients with severe disease should receive adjunctive corticosteroids as soon as possible (within 72 hours of starting PCP treatment): **Prednisolone dose:** • 40 mg PO q12h for 5 days, then • 40 mg PO q24h for 5 days, then • 20 mg PO q24h for 11 days (Total duration is 21 days) *DIAMS - IV to PO **Tab. Bactrim & Cap. Clindamycin** have excellent bioavailability (~90%). *Change to oral formulation after clinical improvement and patient can tolerate orally
PCP Prophylaxis (primary & secondary) Indications: • CD4 count < 200 cells/µL • CD4 count 200-250 cells/µL if ART cannot be initiated	Trimethoprim/sulfamethoxazole (Bactrim) 80-160 mg/400-800 mg (=1–2 tablets) PO q24h	Dapsone 100 mg PO q24h *(Patient should be tested for G6PD deficiency)* **OR** Aerosolized Pentamidine (UKK) 300 mg monthly via ultrasonic nebulizer	**Discontinuation:** Can consider when CD4 100-200 cells/µL if HIV RNA is suppressed for 3-6 months with ART. **Restarting prophylaxis:** • CD4 count falls to < 200 cells/µL or • PCP occurs at a CD4 > 200 cells/µL (lifelong prophylaxis should be considered). Patients receiving Sulfadiazine/ Pyrimethamine or Sulfadoxine/ Pyrimethamine for treatment or suppression of toxoplasmosis do not require additional prophylaxis for PCP.

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Toxoplasma gondii Encephalitis

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Acute Infection	Trimethoprim/sulfamethoxazole (Bactrim) 10 mg/kg/day (of TMP component) IV/PO* in 2 divided doses *DIAMS - IV to PO **Tab. Bactrim & Cap. Clindamycin** have excellent bioavailability (~90%). *Change to oral formulation once patient can tolerate orally	**If Bactrim unavailable/intolerable:** Pyrimethamine (UKK) 200 mg PO loading dose followed by Pyrimethamine: • 50 mg PO q24h (if BW ≤ 60kg) • 75 mg PO q24h (if BW > 60kg) **PLUS** Folinic acid 10-25 mg IV q24h or 15 mg PO q24h **PLUS** Clindamycin 600 mg IV/PO* q6h *(additional therapy must be added for primary prophylaxis for PCP)*	**Duration: At least 6 weeks** Longer duration if clinical and radiologic disease is extensive or response is incomplete in 6 weeks. **Adjunctive corticosteroids** (E.g.: dexamethasone) should be administered when clinically indicated to treat mass effect associated with focal lesions or associated oedema but should be discontinued as soon as clinically feasible. In the case of sulfa allergy and pyrimethamine is not available, sulfa desensitization should be attempted in those without a history of severe reaction (E.g.: SJS).
Suppressive/ Maintenance Therapy/ Secondary Prophylaxis	Trimethoprim/Sulfamethoxazole (Bactrim) 160 mg/800 mg (= 2 tablets) PO **q12h** CAUTION **Common mistake:** For **Toxoplasmosis maintenance therapy,** the correct dose is **T. Bactrim 2 tabs BD**. This differs from PCP maintenance therapy, which uses T. Bactrim 2 tabs OD.	Dapsone 100 mg PO q24h **PLUS** Pyrimethamine (UKK) 50 mg PO twice weekly* **MAY ADD** Folinic acid 15 mg PO twice weekly* **OR** Clindamycin 600 mg PO q8h **PLUS** Pyrimethamine (UKK) 50 mg PO twice weekly* **MAY ADD** Folinic acid 15 mg PO twice weekly*	**Discontinuation:** Consider when CD4 >200 cells/µL if HIV RNA is suppressed for 6 months with ART. *Recommendation is based on the consensus of HSgB ID consultants based on expert opinion.
Primary Prophylaxis *(Prevention of toxoplasmosis in someone at risk but without a prior history of infection)* Indications: Toxoplasma IgG +ve with CD4 <100 cells/µL	Trimethoprim/Sulfamethoxazole (Bactrim) 160 mg/800 mg (= 2 tablets) PO **q24h**	Dapsone 50 mg PO q24h **PLUS** Pyrimethamine (UKK) 50 mg PO once weekly **MAY ADD** Folinic acid 30 mg PO once weekly **OR** Dapsone 200 mg PO once weekly **PLUS** Pyrimethamine (UKK) 75 mg PO once weekly **MAY ADD** Folinic Acid 25 mg PO once weekly	**Discontinuation:** • CD4 > 200 cells/µL for > 3 months, or • CD4 > 100 cells/µL if HIV viral load suppressed for 3 to 6 months

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Mucocutaneous Candidiasis

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Oropharyngeal candidiasis (oral thrush)	Fluconazole 100 mg PO q24h **OR** Nystatin suspension 500,000 units PO 4-times daily	Itraconazole 200 mg PO q24h *Absorption depends on gut acidity. Take the Itraconazole capsule with food and acidic beverages (e.g., Cola drinks). Avoid Proton Pump Inhibitors (PPIs).* **CAUTION** **Drug-drug Interaction (Azole):** Check for drug-drug interactions for every patient on azole antifungals	**Duration: 7-14 days** Chronic suppressive therapy is usually not recommended.
Oesophageal candidiasis	Fluconazole 200-400 mg PO/IV* q24h ***DIAMS - IV to PO** **Oral Fluconazole** has excellent bioavailability (>90%). *Change to Cap. Fluconazole once patient can tolerate orally	Itraconazole 200 mg PO q24h *Absorption depends on gut acidity. Take the Itraconazole capsule with food and acidic beverages (e.g., Cola drinks). Avoid Proton Pump Inhibitors (PPIs).* **CAUTION** **Drug-drug Interaction (Azole):** Check for drug-drug interactions for every patient on azole antifungals	**Duration: 14-21 days** Infection with other pathogens (E.g.: CMV, HSV that causes esophagitis) can result in symptoms that mimic oesophageal candidiasis, a diagnostic and therapeutic trial of antifungal therapy is usually warranted before endoscopy. Endoscopy is required with unusual presentations or lack of response to azole within several days.

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Herpes Zoster (HZ) Diseases - Shingles

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Shingles (Herpes Zoster)	**Immunocompetent** Acyclovir 800 mg PO 5 times/day*		Advisable to start treatment early within 48 hours. **Duration: 7 days** ***Oral Acyclovir 5 times/day administration:** • Please ensure there is at least a 4-hour interval between doses. • Example of administration times: 7 AM, 11 AM, 3 PM, 7 PM & 11 PM.
	Immunocompromised Acyclovir 10 mg/kg IV q8h** *(change to oral therapy once there is an improvement)* **Oral Therapy:** Acyclovir 800 mg PO 5 times/day*		

Varicella-Zoster Virus (VZV) Diseases

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Chicken Pox (*Varicella zoster*)	**Immunocompetent** Acyclovir 800 mg PO 5 times/day*		Advisable to start treatment early within 48 hours. **Duration: 7 days** ***Oral Acyclovir 5 times/day administration:** • Please ensure there is at least a 4-hour interval between doses. • Example of administration times: 7 AM, 11 AM, 3 PM, 7 PM & 11 PM.
	Immunocompromised Acyclovir 10 mg/kg IV q8h** *(change to oral therapy once there is an improvement)* **Oral Therapy:** Acyclovir 800 mg PO 5 times/day*		
Viral Pneumonia (*Varicella zoster*)	Acyclovir 10 mg/kg IV q8h** **Duration: 7 days**		****IV Acyclovir Dose in Obese Patients:** • Obesity class 1 & 2 (BMI 30-39.9 kg/m^2): Use Ideal Body Weight (IBW) • Obesity class 3 (BMI ≥ 40 kg/m^2): Use Adjusted Body Weight (AdjBW)
Viral Encephalitis (*Varicella zoster*)	*Acyclovir 10 mg/kg IV q8h** **Duration: 14-21 days**		

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Herpes Simplex Virus (HSV) Infections

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Non-genitalia Eg: Orolabial	Acyclovir 400 mg PO q8h		**Duration: 7 days**
Genital Herpes Physical supportive measures (saline bathing, analgesia, local anaesthetics) are recommended. Topical antivirals are less effective than oral agents and not recommended, due to the association with acyclovir resistant strain. Addition of topical antivirals to oral treatment is of no benefit.	**First Episode (in non-pregnant petients):** Acyclovir 400 mg PO q8h *Oral antiviral drugs indicated within 5 days of the start of the episode and while new lesions are still forming.* **Duration: 7-10 days**	**First episode (in pregnancy):** Acyclovir 400 mg PO q8h **Duration: 7-10 days.** **For 3rd trimester acquisition:** Continue treatment till delivery	
	Recurrent Episode (in non-pregnant petients): **Short course:** Acyclovir 800 mg PO q8h for **2 days** **5-day course:** Acyclovir 800 mg PO q12h for **5 days**	**Recurrent episode (in pregnancy):** Acyclovir 400 mg PO q8h *Treatment recommended starting at 36 weeks' gestation.*	
	Suppressive therapy (if ⩾ 6 recurrences/year, severe, prolonged or with psychosocial problems): Acyclovir 400 mg PO q12h **Duration:** Up to 1 year, then reassess **If break-through recurrences occur:** Increase to: Acyclovir 400 mg PO q8h **Duration:** 7-10 days	-	
	Severe disease: (requiring hospitalization) Acyclovir 5-10 mg/kg/dose IV q8h	-	**Duration: 10-14 days**
Viral Encephalitis (*Herpes symplex*)	*Acyclovir 10 mg/kg IV q8h		**Duration: 14-21 days** ***Dose in Obese Patients:** • Obesity class 1 & 2 (BMI 30-39.9 kg/m^2): Use Ideal Body Weight (IBW) • Obesity class 3 (BMI ≥ 40 kg/m^2): Use Adjusted Body Weight (AdjBW)

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Cryptococcal Meningitis or Meningoencephalitis (*Cryptococcus neoformans*)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Induction Therapy	*Amphotericin B deoxycholate 1 mg/kg IV q24h **PLUS** Flucytosine 25 mg/kg PO q6h **(Duration: 1 week)** **Followed by:** Fluconazole 1200 mg IV/PO q24h *(may be given in divided dosing)* **(Duration: 1 week)** **OR** Liposomal Amphotericin B **(UKK)** 10 mg/kg **(Single high dose)** **Followed by:** Fluconazole 1200 mg IV/PO q24h *(may be given in divided dosing)* **PLUS** Flucytosine 25 mg/kg PO q6h **(Duration: 2 weeks)** **Followed by Consolidation Therapy**	*Amphotericin B deoxycholate 0.7 - 1 mg/kg IV q24h **PLUS** • Flucytosine 25 mg/kg PO q6h **OR** • Fluconazole 800 - 1200 mg IV/PO q24h *(may be given in divided dosing)* **(Duration: 2 weeks)** **OR** Fluconazole 1200 mg IV/PO q24h **PLUS** Flucytosine 25 mg/kg PO q6h **(Duration: 2 weeks)** **Followed by Consolidation Therapy**	*Lipid formulation of Amphotericin B may be used to replace Amphotericin B deoxycholate if renal impairment occurs while patient is on Amphotericin B deoxycholate: • **Amphotericin B Lipid Complex (ABLC) (UKK)** 5 mg/kg IV q24h, **OR** • **Liposomal Amphotericin B (UKK)** 3 mg/kg IV q24h For severe/recurrent infection, please refer to ID physician. ***DIAMS - IV to PO** **Oral Fluconazole** has excellent bioavailability (>90%). *Change to Cap Fluconazole once patient can tolerate orally
Consolidation Therapy Continued after successful induction therapy; defined as substantial clinical improvement and negative CSF culture after repeat LP.	*Fluconazole 400 - 800 mg PO/IV q24h **Consider weight-based dosing for Obesity Class 1, 2, or 3 (BMI ≥30 kg/m2)* *Use actual body weight (ABW) for weight-based dose calculations: 6 mg/kg once daily (maximum dose: 800-1600 mg [not well established])* **Followed by Maintenance Therapy**	**For patients intolerant or failed fluconazole:** (however less effective and higher relapse rate) Itraconazole 200 mg PO q12h *Absorption depends on gut acidity. Take the Itraconazole capsule with food and acidic beverages (e.g., Cola drinks). Avoid Proton Pump Inhibitors (PPIs).* **CAUTION** **Drug-drug Interaction (Azole):** Check for drug-drug interactions for every patient on azole antifungals **Followed by Maintenance Therapy**	**Duration: 8 weeks** ***Fluconazole dose:** The dose can then be reduced to 400 mg/day to complete the 8-week consolidation phase if all of the following criteria are met: (i) The patient received induction therapy with amphotericin B plus flucytosine for 2 weeks. (ii) CSF cultures obtained after 2 weeks of induction therapy are negative. (iii) ART has been started.
Maintenance Therapy Continued after consolidation therapy.	Fluconazole 200 mg PO q24h	**For patients intolerant or failed fluconazole:** (however less effective and higher relapse rate) Itraconazole 200 mg PO q24h *Absorption depends on gut acidity. Take the Itraconazole capsule with food and acidic beverages (e.g., Cola drinks). Avoid Proton Pump Inhibitors (PPIs).*	**Discontinuation:** • Completed initial (induction, consolidation) therapy **AND** • At least 1 year on maintenance therapy **AND** • Remains asymptomatic from cryptococcal infection **AND** • CD4 count ≥ 100 cells/μL and suppressed HIV RNA in response to effective ART for ≥ 6 months
Secondary prophylaxis	Fluconazole 200 mg PO q24h	-	**Restarting secondary prophylaxis:** CD4 count < 100 cells/μL

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Cryptococcosis (Localized Non-Meningeal Disease)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Mild-moderate pulmonary infection or extra-pulmonary non-CNS disease **or** **Asymptomatic with positive lung/blood culture or positive antigen test (no CNS disease)**	*Fluconazole 400 - 800 mg PO q24h **Duration: 10 weeks.** **Consider weight-based dosing for Class 1, 2, or 3 obesity (BMI ⩾30 kg/m²) patients.* *Use actual body weight (ABW) for weight-based dose calculations: 6 mg/kg once daily (maximum dose not well established: 800-1600 mg)* **Followed by maintenance therapy (secondary prophylaxis)**	**Itraconazole 200 mg PO given q8h **Duration: 3 days** Then, consolidation: Itraconazole 200 mg PO given q12h **Duration: 8 weeks** *Absorption depends on gut acidity. Take the Itraconazole capsule with food and acidic beverages (e.g., Cola drinks). Avoid Proton Pump Inhibitors (PPIs).* **Followed by maintenance therapy (secondary prophylaxis)**	⚠ CAUTION **Drug-drug Interaction (Azole):** Check for drug-drug interactions for every patient on azole antifungals
Maintenance (secondary prophylaxis)	Fluconazole 200 mg PO q24h	Itraconazole 200 mg PO q24h *Absorption depends on gut acidity. Take the Itraconazole capsule with food and acidic beverages (e.g., Cola drinks). Avoid Proton Pump Inhibitors (PPIs).*	**Discontinuation of maintenance:** At least 1 year of treatment **AND** CD4 count ≥ 100 cells/μL and suppressed HIV RNA in response to effective ART for ≥ 6 months In the case of treatment failure, all patients initially treated with fluconazole should have their therapy changed to amphotericin B until clinical response is achieved.
Severe pulmonary or extra-pulmonary non-CNS disease	Treat as per **Cryptococcal Meningitis or Meningoencephalitis (Cryptococcus neoformans)**		

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Penicilliosis (*Penicillium/Talaromyces marneffei*)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	**Alternative**	
Acute Infection (Mild disease) (Only skin involvement; no fungaemia)	Loading dose *Itraconazole 200 mg PO q8h for 3 days, then reduce to: Itraconazole 200 mg PO q12h *Absorption depends on gut acidity. Take the Itraconazole capsule with food and acidic beverages (e.g., Cola drinks). Avoid Proton Pump Inhibitors (PPIs).* **Followed by Maintenance Therapy.**		**Duration: at least 8-12 weeks** **CAUTION** **Drug-drug Interaction (Azole):** Check for drug-drug interactions for every patient on azole antifungals
Acute Infection (Moderate to severe disease)	**Induction Therapy:** *Amphotericin B deoxycholate 0.7-1.0 mg/kg/day IV **Followed by Consolidation Therapy.**	**If unable to tolerate Amphotericin B deoxycholate:** Voriconazole 6 mg/kg IV q12h on Day 1, then 4 mg/kg IV q12h for at least 3 days, then 400 mg PO q12h **OR** **If IV Voriconazole not available:** Voriconazole 600 mg PO q12h on Day 1, then 400 mg PO q12h **OR** **If Voriconazole Contraindicated:** Amphotericin B Lipid Complex (ABLC) **(UKK)** 5 mg/kg IV q24h, **OR** Liposomal Amphotericin B **(UKK)** 3 mg/kg IV q24h **Followed by Consolidation Therapy.**	**Duration: 2 weeks** ***DIAMS - IV to PO** **Oral Voriconazole** has excellent bioavailability (96%). *Change to Tab Voriconazole once patient can tolerate orally **CAUTION** **Drug-drug Interaction (Azole):** Check for drug-drug interactions for every patient on azole antifungals
	Consolidation Therapy: Itraconazole 200 mg PO q12h *Absorption depends on gut acidity. Take the Itraconazole capsule with food and acidic beverages (e.g., Cola drinks). Avoid Proton Pump Inhibitors (PPIs).* **Followed by Maintenance Therapy.**	**If unable to tolerate Itraconazole:** Voriconazole 200 mg PO q12h **OR** **If on concurrent Rifampicin or Rifabutin:** Fluconazole 400 mg PO q12h **Followed by Maintenance Therapy.**	**Duration: 10 weeks** **CAUTION** **Drug-drug Interaction (Azole):** Check for drug-drug interactions for every patient on azole antifungals
Maintenance Therapy or Secondary Prophylaxis	Itraconazole 200 mg PO q24h *Absorption depends on gut acidity. Take the Itraconazole capsule with food and acidic beverages (e.g., Cola drinks). Avoid Proton Pump Inhibitors (PPIs).*	**If on concurrent Rifampicin or Rifabutin:** Fluconazole 400 mg PO q24h	**Discontinuation:** CD4 count > 100 cells/μL for ≥ 6 months on ART

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Histoplasmosis (*Histoplasma capsulatum*)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	**Alternative**	
Mild disseminated disease (Blood culture positive but patient is asymptomatic)	**Induction & maintenance therapy:** Itraconazole 200 mg PO q8h for 3 days, then 200 mg PO q12h *Absorption depends on gut acidity. Take the Itraconazole capsule with food and acidic beverages (e.g., Cola drinks). Avoid Proton Pump Inhibitors (PPIs).*	**Induction & maintenance therapy** (For patients intolerant to Itraconazole): Fluconazole 800 mg/day PO in 1-2 divided doses	**Duration: At least 12 months** ⚠ CAUTION **Drug-drug Interaction (Azole):** Check for drug-drug interactions for every patient on azole antifungals
Moderate to severe disseminated disease	**Induction therapy:** Amphotericin B deoxycholate 0.7-1.0 mg/kg IV q24h **Duration: At least 2 weeks** **Followed by Maintenance therapy**	**Induction therapy** (if unable to tolerate Amphotericin B Deoxycholate)*: Amphotericin B Lipid Complex (ABLC) **(UKK)** 5 mg/kg IV q24h **OR** Liposomal Amphotericin B **(UKK)** 3 mg/kg IV q24h **Duration: for 2 weeks or until clinically improved** **Followed by Maintenance therapy**	*Lipid formulation of Amphotericin B may be used to replace Amphotericin B deoxycholate if renal impairment occurs while patient is on conventional Amphotericin B until improvement in renal function is seen. All triazole antifungals have the potential to interact with certain ARV agents and other anti-infective agents. ⚠ CAUTION **Drug-drug Interaction (Azole):** Check for drug-drug interactions for every patient on azole antifungals
	Maintenance therapy: Itraconazole 200 mg PO q8h for 3 days, then 200 mg q12h *Absorption depends on gut acidity. Take the Itraconazole capsule with food and acidic beverages (e.g., Cola drinks). Avoid Proton Pump Inhibitors (PPIs).* **Duration: At least 12 months** **Followed by Chronic Suppressive Therapy (Secondary prophylaxis)** for patients with severe disseminated disease or CNS Infection	**Maintenance therapy** (For patients intolerant to Itraconazole or on concurrent Rifampicin or Rifabutin): Fluconazole 800 mg/day PO in 1-2 divided doses **Duration: At least 12 months** **Followed by Chronic Suppressive Therapy (Secondary prophylaxis)** for patients with severe disseminated disease or CNS Infection	
Chronic Suppressive therapy (Secondary prophylaxis) Indication: • Severe disseminated or CNS infection after completion of at least 12 months of treatment. • Relapsed despite appropriate initial therapy.	Itraconazole 200 mg PO q24h *Absorption depends on gut acidity. Take the Itraconazole capsule with food and acidic beverages (e.g., Cola drinks). Avoid Proton Pump Inhibitors (PPIs).* ⚠ CAUTION **Drug-drug Interaction (Azole):** Check for drug-drug interactions for every patient on azole antifungals	Fluconazole 400 mg PO q24h	**Discontinuation:** • Received azole for > 1 year **AND** • Negative fungal blood cultures **AND** • CD4 count > 150 cells/μL for ≥ 6 months on ART **Restarting secondary prophylaxis:** CD4 count < 150 cells/μL

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Mycobacterium tuberculosis (TB) Infection and Diseases

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	**Alternative**	
Treatment of tuberculosis **(Intensive Therapy)**	**Fixed-Dose Combination (FDC):** **Tab. Akurit-4/Forecox:** *(Each tablet contains: Rifampicin 150 mg, Isoniazid* 75 mg, Pyrazinamide 400 mg & Ethambutol 275 mg)* • 30 - 37 kg: 2 tablets PO q24h • 38 - 54 kg: 3 tablets PO q24h • 55 - 70 kg: 4 tablets PO q24h • > 70 kg: 5 tablets PO q24h ⚠ CAUTION **Drug-drug Interaction (Rifampicin):** Check for drug-drug interactions before starting Rifampicin based regimen. **Followed by Maintenance Therapy**	**Loose Pills:** **Ethambutol** (**E**) 15 mg/kg PO q24h *(Range: 15 – 20 mg/kg)* *(Round the dose to the nearest 200 mg)* *(Max dose: 1600 mg)* **PLUS** **Isoniazid*** (**H**) 5 mg/kg PO q24h *(Range: 4 – 6 mg/kg)* *(Round the dose to the nearest 50 mg)* *(Max dose: 300 mg)* **PLUS** **Rifampicin** (**R**) 10 mg/kg PO q24h *(Range: 8 - 12 mg/kg)* *(Round the dose to the nearest 150 mg)* *(Max dose: 600 mg)* **PLUS** **Pyrazinamide** (**Z**) 25 mg/kg PO q24h *(Range: 20 - 30 mg/kg)* *(Round the dose to the nearest 250 mg)* *(Max dose: 2000 mg)* **Followed by Maintenance Therapy**	**Duration: 2 months (56 doses)** *Duration can be prolonged to 3 months in cases such as:* • *Pneumonia with cavitation* • *Persistently +ve sputum AFB* * All patients on Isoniazid (**H**) should be given Tab. Pyridoxine (B6) 20 mg OD for prevention of neuropathy Refer to **Ministry of Health CPG on Management of Tuberculosis 4th Edition (2021)** for more info.
Treatment of tuberculosis **(Maintenance Therapy)**	**Fixed-Dose Combination (FDC):** **Tab. Akurit-2:** *(Each tablet contains: Rifampicin 150 mg & Isoniazid* 75 mg)* • 30 - 37 kg: 2 tablets PO q24h • 38 - 54 kg: 3 tablets PO q24h • 55 - 70 kg: 4 tablets PO q24h • > 70 kg: 5 tablets PO q24h	**Loose Pills:** **Isoniazid*** (**H**) 5 mg/kg PO q24h *(Range: 4 – 6 mg/kg)* *(Round the dose to the nearest 50 mg)* *(Max dose: 300 mg)* ** All patients on Isoniazid (H) should be given Tab. Pyridoxine (B6) 20 mg OD for prevention of neuropathy* **PLUS** **Rifampicin** (**R**) 10 mg/kg PO q24h *(Range: 8 - 12 mg/kg)* *(Round the dose to the nearest 150 mg)* *(Max dose: 600 mg)*	**Duration: Based on indication** • **4 months (126 doses)** *For pulmonary TB* • **7 months (217 doses)** *For bone & joint TB* *or* *For pulmonary/ extrapulmonary TB with:* ○ *Slow / suboptimal response* ○ *Sputum culture still positive after 2 months of intensive phase provided sensitive to 1st line regime* ○ *No PZA in intensive phase* • **10 months (309 doses)** *For TB meningitis*
Latent tuberculosis	**6H Regimen:** **Isoniazid*** (**H**) 5 mg/kg PO q24h *(Range 4–6 mg/kg)* *(Round the dose to the nearest 50 mg)* *(Max dose: 300 mg)* **Duration: 6 months (180 doses)**	**3HR Regimen** **Isoniazid*** (**H**) 5 mg/kg PO q24h *(Range: 4 – 6 mg/kg)* *(Round the dose to the nearest 50 mg)* *(Max dose: 300 mg)* **PLUS** **Rifampicin** (**R**) 10 mg/kg PO q24h *(Range: 8- 12 mg/kg)* *(Round the dose to the nearest 150 mg)* *(Max dose: 600 mg)* **Duration: 3 months (90 doses)** **OR** **4R Regimen** **Rifampicin** (**R**) 10 mg/kg PO q24h *(Range: 8- 12 mg/kg)* *(Round the dose to the nearest 150 mg)* *(Max dose: 600 mg)* **Duration: 4 months (120 doses)**	* All patients on **Isoniazid** (**H**) should be given Tab. Pyridoxine (B6) 20 mg OD for prevention of neuropathy ⚠ CAUTION **Drug-drug Interaction (Rifampicin):** Check for drug-drug interactions before starting Rifampicin based regimen.

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Mycobacterium avium Complex (MAC) Disease

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	**Alternative**	
Treatment	**Three-drug therapy:** **Macrolide:** • Azithromycin 500 mg PO q24h **OR** • Clarithromycin 500 mg PO q12h **PLUS** **Ethambutol** 15 mg/kg PO q24h **PLUS** **Rifamycin:** • Rifabutin 5 mg/kg PO q24h **OR** • Rifampicin 10 mg/kg PO q24h *Concomitant tuberculosis needs to be ruled out if monotherapy rifampicin is used.* ⚠ **CAUTION** **Drug-drug Interaction (Rifampicin/Rifabutin):** Check for drug-drug interactions before starting Rifampicin or Rifabutin based regimen	**MAY ADD**:** *Addition of 4th drug should be considered for patients with disseminated disease, require IV/IM.* **Fluoroquinolones:** • Levofloxacin 500 mg PO q24h **OR** • Ciprofloxacin 500-750 mg PO q12h **OR** • Moxifloxacin 400 mg PO q24h **AND/OR** **Part of combination therapy if oral therapy has been ineffective or is not feasible:** Amikacin 10-15 mg/kg IV q24h	**Duration: At least 12 months** Treatment of choice shall be tailored according to culture and susceptibility testing results. **Discontinuation:** Consider if patient is on ART **AND** CD4 >100 cells/μL **AND** undetectable HIV viral load **AND** clinical improvement with culture conversion **AND** completed ≥ 12 months of MAC treatment
Maintenance/ Secondary Prophylaxis	Same as the treatment regimen (choose among the Oral options)		**Restarting secondary prophylaxis:** CD4 < 100 cells/μL again
Primary Prophylaxis Indications: • CD4 < 50 cells/μL • Ruled out active MAC and TB	Azithromycin 1250 mg PO once weekly	Clarithromycin 500 mg PO q12h	**Discontinuation:** • Consider if patient is on ART **AND** • Viral load is suppressed, CD4 > 100 cells/μL > 3 months

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Cytomegalovirus (CMV) Disease

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
CMV Retinitis For treatment of: • Immediate Sight-Threatening Lesions - Adjacent to the Optic nerve or Fovea • Small Peripheral Lesions	**Systemic therapy:** Ganciclovir 5 mg/kg IV q12h **Duration: 2-3 weeks** **Followed by Maintenance Therapy/ Secondary Prophylaxis**	**Systemic therapy** (If patient well, tolerating orally & planned for discharge): *Valganciclovir 900 mg PO q12h **Duration: 2-3 weeks** **Followed by Maintenance Therapy/ Secondary Prophylaxis**	Systemic therapy is indicated in all cases.
	Intravitreal therapy: (Indicated in zone 1 and 2 lesions Intravitreal Ganciclovir 2 mg/0.1ml biweekly	**Intravitreal therapy: (Indicated in zone 1 and 2 lesions** Intravitreal Foscarnet **(UKK)** 2.4 mg/0.1ml (1-2 weekly)	Intravitreal therapy to be tapered according to clinical response. Ganciclovir implant 4.5 g is an option for prolonged usage of intravitreal ganciclovir.
Extraocular CMV diseases Eg: Oesophagitis, colitis, interstitial pneumonitis, neurological disease	Ganciclovir 5 mg/kg IV q12h, Once patient tolerate orally, may consider switch to: Valganciclovir 900 mg PO q12h *(in CMV oesophagitis and colitis only)* **Followed by Maintenance Therapy/ Secondary Prophylaxis**		**Duration: 3 – 6 weeks** or until signs and symptoms have been resolved. Immune recovery is essential for successful treatment. Start ART within 2 weeks if possible.
Maintenance Therapy/ Secondary prophylaxis <u>Indications:</u> • CD4 <100 cells/µL	Ganciclovir 5 mg/kg IV q24h 5–7 times weekly	Valganciclovir 900 mg PO q24h	**Discontinuation:** Consider if patient is on ART and viral load well suppressed, CD4 > 100 cells/µL > 3 months and after 3-6 months of CMV treatment. **Maintenance therapy is generally not necessary; ART offers best hope for prevention of relapses.**

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Rhodococcus Infections (*Rhodococcus hoagii*, formerly *Rhodococcus equi/Corynebacterium equi*)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Induction Treatment	Azithromycin 500 mg IV/PO STAT, then 250 mg IV/PO q24h **OR** Levofloxacin 500-750 mg IV/PO q24h **PLUS** *Rifampicin 600 mg PO q24h *Concomitant tuberculosis needs to be ruled out with use of rifampicin monotherapy.* **CAUTION** **Drug-drug Interaction (Rifampicin):** Check for drug-drug interactions before starting Rifampicin based regimen **Followed by Maintenance Therapy/ Secondary Prophylaxis**	Azithromycin 500 mg IV/PO STAT, then 250 mg IV/PO q24h **OR** Levofloxacin 500-750 mg IV/PO q24h **OR** *Rifampicin 600mg OD *Concomitant tuberculosis needs to be ruled out with use of rifampicin monotherapy.* **PLUS** Injectables: • Vancomycin 15-20 mg/kg IV q8-12H *Refer to DIAMS – HSgB Vancomycin Protocol for more dosing info* **OR** • Imipenem/Cilastatin 500 mg IV q6h **Followed by Maintenance Therapy/ Secondary Prophylaxis**	**Duration: Immunocompromised – at least 2 months** (Duration will depend on the extent of the diseases). Adjust antibiotics according to susceptibility data. Use at least two or more susceptible agents. For CNS involvement, to consider antibiotics with good CNS penetration. **CAUTION** **Fluoroquinolone Administration:** Allow a 2-6 hours **gap between taking Ciprofloxacin/Levofloxacin and consuming dairy products, multivitamins, antacids or NG tube feeding** to avoid concurrent exposure to multivalent cation (e.g Ca, Fe, Al, Mg, Zn) – cations can bind to the drug & prevent absorption.
Maintenance Therapy/ Secondary prophylaxis	Azithromycin 250 mg PO q24h **PLUS** Levofloxacin 500-750 mg PO q24h **CAUTION** **Fluoroquinolone Administration:** Allow a 2-hour **gap between taking Ciprofloxacin/Levofloxacin and consuming dairy products, multivitamins, antacids or NG tube feeding** to avoid concurrent exposure to multivalent cation (e.g Ca, Fe, Al, Mg, Zn) – cations can bind to the drug & prevent absorption.	*Rifampicin 600 mg PO q24h **PLUS** Azithromycin 250 mg PO q24h **OR** Levofloxacin 500-750 mg PO q24h	**Duration: Until CD4 > 200 cells/µL** Choice to be based on susceptibility test. *Concomitant tuberculosis needs to be ruled out with use of rifampicin monotherapy. **CAUTION** **Drug-drug Interaction (Rifampicin):** Check for drug-drug interactions before starting Rifampicin based regimen

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Syphilis (*Treponema pallidum* Infection)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Primary syphilis or **Secondary syphilis** or **Early latent syphilis** (history of syphilis infection within the last 2 years)	Benzathine Penicillin 2.4 MU IM STAT **OR** Procaine Penicillin 600,000 units IM q24h for 10 days	**For penicillin allergy** (in non-pregnant patients): Doxycycline 100 mg PO q12h **Duration: 14 days** **For penicillin allergy** (in pregnant patients): Desensitize and treat with penicillin as there are no proven alternatives. *(The benefit of treatment outweighs the risk of allergic reaction in skin test and desensitization. Refer to the penicillin desensitization protocol in Appendix.)* **If failed desensitization:** Ceftriaxone 500 mg IM q24h **Duration: 10 days** **OR** *Azithromycin 2 g PO **STAT** **OR** *Erythromycin ethylsuccinate (EES) 800 mg PO q6h **Duration: 14 days**	**Treatment of sexual partner:** • Sexual partner(s) should be examined, investigated and treated epidemiologically. • Abstain from sex for 1 week after the patient and partner(s) have completed treatment. **Treatment interruption:** If drug administration is interrupted for ⩾ 1 day at any point during the treatment course, the entire course may need to be restarted. Patients should be warned of possible reactions to treatment: - Jarisch-Herxheimer reaction - Anaphylaxis/allergy ***Macrolide use in Pregnancy:** If macrolide is used, for neonate assessment and treatment at birth
Late latent syphilis or **Gumma (benign tertiary) syphilis** or **Cardiovascular syphilis**	Benzathine Penicillin 2.4 MU IM weekly for 3 weeks (Day 1, 8, and 15) **OR** Procaine penicillin 600,000 units IM q24h for 14 days	**For penicillin allergy** (in non-pregnant patients): Doxycycline 100 mg PO q12h **Duration: 28 days** **For penicillin allergy** **(in pregnant patients):** Erythromycin ethylsuccinate (EES) 800 mg PO q6h ***Macrolide use in Pregnancy:*** *If macrolide is used, for neonate assessment and treatment at birth* **Duration: 28 days**	**Treatment of sexual partner:** • Sexual partner(s) should be examined, investigated and treated epidemiologically. • Abstain from sex for 1 week after the patient and partner(s) have completed treatment. **Cardiovascular syphilis:** Consider prednisolone 40-60 mg PO q24h for 3 days starting 24 hours before the antibiotics. **Treatment interruption:** If benzathine penicillin is interrupted by ⩾ 2 weeks in between the weekly doses, the entire course needs to be restarted
Neurosyphilis or **Ocular Syphilis (syphilitic uveitis)**	Benzylpenicillin 4 MU q4h IV for 14 days **FOLLOWED BY:** Benzathine penicillin G 2.4 million units IM x 1 after completion of Benzylpenicillin	**For penicillin allergy without anaphylaxis** (in pregnant/non-pregnant patients): Ceftriaxone 2 g IV/IM q24h **Duration: 14 days** **If anaphylaxis to penicillin** (in non-pregnant patients): Doxycycline 200 mg PO q12h **Duration: 28 days**	Consider Prednisolone 40-60 mg PO q24h for 3 days starting 24 hours before the antibiotics.

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Bacterial Enteric Infections – Empirical Treatment or Treatment of Salmonellosis (Salmonella Non-Typhi)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Empirical Treatment (Pending Diagnostic Studies and Culture & Sensitivity)	Ceftriaxone 2 g IV q24h		Antibiotic is indicated for patients with advanced HIV disease with fever or infective diarrhoea **Duration:** • Therapy and its duration should be adjusted depending on stool microbiology results and antibiotic sensitivity testing . If no pathogen is identified and the patient recovers quickly, **5 days** of therapy is reasonable.
Salmonellosis (Non-Typhoidal Salmonella spp.)	Ciprofloxacin 500-750 mg PO or 400 mg IV q12h **OR** Ceftriaxone 2 g IV q24h ***DIAMS - IV to PO** **Oral Ciprofloxacin** has good bioavailability (>70%). *Change IV Ciprofloxacin to oral once diarrhoea resolves patient can tolerate orally	Ampicillin 2 g IV q4-6h **OR** Trimethoprim/Sulfamethoxazole (Bactrim) 160 mg/800 mg (= 2 tablets PO or 2 ampoules IV) q12h **DIAMS - IV to PO** **Oral Bactrim** has excellent bioavailability (~90%). *Change to Tab. Bactrim once diarrhoea resolves and patient can tolerate orally	Susceptibility profile may help guide final choice. **Duration:** • **If CD4 ≥ 200: 7-14 days.** • **If CD4 ≥ 200 and with bacteraemia: 14 days** is appropriate provided documented clearance of bacteraemia. • **If CD4< 200 and with bacteraemia: 6 weeks.** Longer course with debridement and drainage needed for persistent bacteraemia or metastatic disease.

Enteric Disease – *Cystoisospora/Isospora belli*

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Initial Therapy	Trimethoprim/Sulfamethoxazole (Bactrim) 160 mg/800 mg (= 2 tablets PO or 2 ampoules IV) q6h **DIAMS - IV to PO** **Oral Bactrim** has excellent bioavailability (~90%). *Change to Tab. Bactrim once patient can tolerate orally	**If sulfa-intolerant** Pyrimethamine **(UKK)** 50-75 mg PO q24h **PLUS** Folinic acid 10-25 mg PO q24h **OR** Ciprofloxacin 500 mg PO q12h	**Duration: 10 days** For patients whose symptoms persist after 10 days, the treatment duration can be extended to 3-4 weeks. **Discontinuation:** CD4 count > 200 cells/μL for ≥ 6 months on ART
Secondary prophylaxis	Trimethoprim/Sulfamethoxazole (Bactrim) 160 mg/800 mg (= 2 tablets) PO q24h	**If sulfa-intolerant** Pyrimethamine **(UKK)** 25 mg PO q24h **PLUS** Folinic acid 5-10 mg PO q24h **OR** Ciprofloxacin 500 mg PO three times a week	

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Enteric Disease – Cryptosporidiosis & Microsporidiosis

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Cryptosporidiosis *(Cryptosporidium sp.)*	Symptomatic treatment of diarrhoea		Effective ART (to increase CD4 > 100 cells/μL) can result in complete, sustained clinical, microbiological and histologic resolution.
Microsporidiosis *(Microsporidium sp.)*	Albendazole 400 mg PO q12h **PLUS** Symptomatic treatment of diarrhoea (the best treatment option is ART and fluid support)	-	**Duration: for 2-4 weeks** Effective ART (to increase CD4 > 100 cells/μL) can result in complete, sustained clinical, microbiological and histologic resolution.

Bartonellosis

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Bacillary Angiomatosis, Peliosis Hepatis, Bacteraemia, and Osteomyelitis	Doxycycline 100 mg PO q12h **OR** Erythromycin 500 mg PO/IV q6h	Azithromycin 500 mg PO q24h **OR** Clarithromycin 500 mg PO q12h	**Duration: At least 3 months** If relapse occurs after initial (> 3 month) course of therapy, long-term suppression with doxycycline or a macrolide is recommended as long as CD4 <200 cells/μL.
Other Severe Infections (or CNS involvement)	Doxycycline 100 mg PO/IV* q12h **OR** Erythromycin 500 mg PO/IV q6h **MAY ADD** Rifampicin 300 mg PO/IV q12h	-	**Duration: At least 3 months** If relapse occurs after initial (> 3 month) course of therapy, long-term suppression with doxycycline or a macrolide is recommended as long as CD4 <200 cells/μL. *IV Doxycycline and IV Rifampicin requires DG's approval (UKK).
Confirmed *Bartonella* endocarditis	Refer to **A2: Cardiovascular infections > Culture-Negative Endocarditis > *Bartonella spp.*** section.		

Progressive Multifocal Leukoencephalopathy (PML)

- Caused by Polyoma virus JC virus (JCV)
- No effective therapy exists.
- With ART, some patients improve and others stabilize. Few may deteriorate due to immune reconstitution.

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HSgB Antimicrobial Guideline (HAG)

SECTION A: ADULT

A10: NEUROSURGICAL-RELATED INFECTIONS

Launched: October 2024

Updated: -

Antibiotic prophylaxis **NOT RECOMMENDED** for:

- Basal skull fractures
- Traumatic CSF fistula
- Post-surgical CSF leak

Cranial Trauma

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Open Fracture/ Penetrating Injuries without Dura Breach	Cefazolin 2 g IV q8h **OR** Cefuroxime 1.5 g q8h **MAY ADD** Metronidazole 500 mg IV q8h	Amoxicillin/Clavulanate 1.2 g IV q8h	**Duration: Until 24 hours after wound closure or 72 hours total (whichever occurs first).** The use of antibiotic here is pre-emptive antibiotics and should not be continued beyond a short course.
Penetrating Injuries with Dura Breach	Ceftriaxone 2g IV q12h **PLUS** Metronidazole 500mg IV q8h	-	**Duration: 2 weeks**

Healthcare-associated Ventriculitis and Meningitis

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
HA-Ventriculitis & HA-Meningitis Empirical treatment should be decided by the primary team based on local antibiogram and CSF gram stain result.	**If C&S is not available:** Ceftazidime 2 g IV q8h **MAY ADD** Vancomycin 25-30 mg/kg loading dose then 15-20 mg/kg IV q8-12h *Refer to DIAMS - HSgB Vancomycin Protocol for more dosing info*	Meropenem 2 g IV q8h **MAY ADD** Vancomycin 25-30 mg/kg loading dose then 15-20 mg/kg IV q8-12h *Refer to DIAMS - HSgB Vancomycin Protocol for more dosing info*	De-escalate antibiotics to targeted therapy when the culture results are available.

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HSgB Antimicrobial Guideline (HAG)

SECTION A: ADULT

A11: OBSTETRICS & GYNAECOLOGICAL (O&G) INFECTIONS

Launched: October 2024

Updated: -

LIST OF TOPICS WITH LINKS:

1. Pelvic Inflammatory Disease (PID)
2. Endometriosis
3. Septic Abortion
4. Chorioamnionitis
5. Intrapartum Antibiotic Prophylaxis (IAP) For Group B Streptococcus (GBS) Positive Mothers
6. Preterm Premature Rupture of Membranes (PPROM)
7. Postpartum Mastitis
8. Post Lower Segment Caesarean Section (LSCS) Infection
9. Perineal Tear

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Pelvic Inflammatory Disease (PID)

Common organisms:

- *Neisseria gonorrhoeae*
- *Chlamydia trachomatis*
- *Bacteroides sp.*
- Enterobacterales
- *Haemophilus influenzae*
- *Streptococcus sp.* especially *Streptococcus agalactiae* (GBS)
- *Gardnerella vaginalis*
- *Ureaplasma urealyticum*
- *Mycoplasma hominis*

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Outpatient (Mild)	Ceftriaxone 500 mg IM as a SINGLE DOSE (if BW > 150 kg, 1 g IM STAT) **PLUS** Metronidazole 400 mg PO q8h **PLUS** Doxycycline 100 mg PO q12h	**If cephalosporin allergy and low risk for gonorrhoea:** Levofloxacin 500 mg PO q24h **PLUS** Metronidazole 400 mg PO q8h	**Duration: 14 days** Sexual partner(s) within 60 days should be examined, investigated and treated epidemiologically for chlamydia and gonorrhoea, regardless of PID aetiology or pathogen isolated. Abstain from sex until the patient and partner(s) have completed treatment and symptoms are resolved
In-Patient (Moderate-Severe)	Ceftriaxone 2 g IV q24h **PLUS** Doxycycline 100 mg PO q12h **PLUS** Metronidazole 400 mg PO q8h or 500 mg IV q8h	Ampicillin/sulbactam 3 g IV q6h **PLUS** Doxycycline 100 mg PO q12h **OR** Clindamycin 900 mg IV q8h **PLUS** Gentamicin 3-5 mg/kg IV q24h	**Duration: 14 days** Tubo-ovarian abscess: Surgical intervention for source control may be required. May need to consider tuberculosis if not responding to standard treatment.
	Oral Step-Down Therapy: Clindamycin 450 mg PO q6h or 600 mg PO q8h **OR** Doxycycline 100 mg PO q12h **PLUS** Metronidazole 400 mg PO q12h		Patients with clinical improvement after 24-48 hours can be transitioned to oral therapy to complete the 14 days of treatment.

Endometriosis

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
In Non-pregnant Women	Refer to treatment guideline for **severe Pelvic Inflammatory Disease (PID)**		
Postpartum Endometritis	Amoxicillin/clavulanate 1.2 g IV q8h **OR** Ampicillin/sulbactam 3 g IV q6h	Cefotaxime 1 g IV q8h **PLUS** Metronidazole 500 mg IV q8h **PLUS** Gentamicin 5 mg/kg IV x 1 dose **OR** Clindamycin 900 mg IV q8h **PLUS** *Gentamicin 5 mg/kg q24h	**Duration:** • IV treatment is typically continued until the patient is **clinically improved (no fundal tenderness) and afebrile for 24 - 48 hours.** • If an oral antibiotic regimen is administered, **duration: 14 days**. *TDM for gentamicin is required

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Septic Abortion

Common organisms:

- *Bacteroides sp*. especially *Prevotella bivia*
- *Streptococcus sp*. (Grp A, Grp B),
- Enterobacterales
- *Chlamydia trachomatis*
- *Ureaplasma urealyticum*

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
	Ampicillin/sulbactam 3 g IV q6h **PLUS** Doxycycline 100 mg PO q12h	Ampicillin 2 g IV q4-6h **PLUS** Metronidazole 500 mg IV q8h **PLUS** Gentamicin 5 mg/kg IV q24h **OR** Clindamycin 900 mg IV q8h **PLUS** *Gentamicin 5 mg/kg IV q24h	**Duration: 10-14 days** Intravenous antibiotics are administered until the patient has improved and afebrile for 48 hours, then are typically followed by oral antibiotics. *TDM for gentamicin is required

Chorioamnionitis

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
	Ampicillin/sulbactam 3 g IV q6h	Ampicillin 2 g IV q6h **PLUS** *Gentamicin 5 mg/kg IV q24h **If the patient is undergoing a cesarean delivery:** Ampicillin 2 g IV q4-6h **PLUS** *Gentamicin 5 mg/kg IV q24h **PLUS** Metronidazole 500 mg IV q8h **Mild antibiotic allergy:** Cefazolin 2 g IV q8h **PLUS** *Gentamicin 5 mg/kg IV q24h **Severe antibiotic allergy:** Clindamycin 900 mg IV q8h	**Duration:** • Antibiotic regimen is continued postpartum until the patient is **afebrile and asymptomatic for at least 48 hours.** • There is no evidence that continuation with oral antibiotic are beneficial after discontinuation of parenteral therapy.

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Intrapartum Antibiotic Prophylaxis (IAP) For Group B Streptococcus (GBS) Positive Mothers

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Indications of IAP: • Previous infant with invasive GBS disease, • Preterm labour, • GBS carriage in previous pregnancy, • PPROM with known GBS carrier, • GBS carriage in current pregnancy.	Benzylpenicillin 5 MU IV initial dose, then 2.5–3 MU IV q4h until delivery	Ampicillin 2g IV initial dose, then 1g IV q4h until delivery **Mild antibiotic allergy:** Cefazolin 2g IV initial dose, then 1g q8h until delivery **OR** Cefuroxime 1.5g IV STAT and 750mg IV q8h until delivery **Severe antibiotic allergy:** Vancomycin 15-20 mg/kg IV q8-12h until delivery *Refer to DIAMS – HSgB Vancomycin Protocol for more dosing info.* **OR** Clindamycin 900 mg IV q8h until delivery	Prophylaxis begins at hospital admission for labour or rupture of membrane and continued every four hours until the infant is delivered. Treatment is **not indicated** if Caesarean section performed before onset of labour with intact membrane (to use standard surgical prophylaxis). Antenatal treatment is **not recommended** for GBS cultured from a vaginal or rectal swab.

Preterm Premature Rupture of Membranes (PPROM)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Non-GBS Carrier	Erythromycin ethylsuccinate (EES) 400 mg PO q6h or 800 mg PO q12h	-	**Duration: 7-10 days**
GBS Carrier	Ampicillin 2 g IV q6h for 48 hours **PLUS** *Azithromycin 1 g PO STAT upon admission **Followed by:** Amoxicillin 500 mg PO q8h for an additional 5-7 days or until delivery whichever comes first	-	*Azithromycin: To cover for Ureaplasmas – important cause of chorioamnionitis & Chlamydia

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Postpartum Mastitis

Common organisms:

- *Staphylococcus aureus (MSSA)*
- *Streptococcus pyogenes (Group A)*
- *Escherichia coli*
- *Bacteroides sp.*
- *Corynebacterium sp.,*
- CoNS

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Outpatient	Cephalexin 500 mg PO q6h	-	**Duration: 5-7 days**. If poor response, may consider extending to **10-14 days.**
Inpatient	Cloxacillin 2 g IV q4h - q6h	Cefazolin 1-2 g IV q8h	**Duration: 5-7 days.** If poor response, may consider extending to **10-14 days.** **Cultures:** • **Milk culture** for less severe infection. • **Blood culture** for severe infection (hemodynamic instability).

Post Lower Segment Caesarean Section (LSCS) Infection

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Mild	Antibiotic is generally not indicated. Appropriate dressing is the primary treatment.		-
Moderate - Severe	Cloxacillin 2 g IV q6h **OR** Cefazolin 1-2 g IV q8h	**Risk of gram negative or anaerobic infection (e.g. diabetes):** Ampicillin/sulbactam 3 g IV q6-8h	-

Perineal Tear

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
1st & 2nd Degree Perineal Tear	Please refer to **Surgical Chemoprophylaxis > Obstetrics & Gynaecology Surgery > 1st & 2nd Degree Perineal Tear**		
3rd and 4th Degree Perineal Tear	Cefazolin 2 g IV q8h **PLUS** Metronidazole 500 mg IV q8h	Cefuroxime 1.5 g IV q8h **PLUS** Metronidazole 500 mg IV q8h **OR** Ampicillin/Sulbactam 3 g IV q6-8h **OR** Amoxicillin/Clavulanate 1.2 g IV q8h **Severe penicillin allergy:** Clindamycin 600 mg IV q6h or 900 mg IV q8h	**Duration: 5-7 days**

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HSgB Antimicrobial Guideline (HAG)

SECTION A: ADULT

A12: OCULAR INFECTIONS

Launched: October 2024

Updated: -

LIST OF TOPICS WITH LINKS:

1. **Eyelid**
   - Anterior Blepharitis
   - Meibomian Gland Dysfunction/ Posterior Blepharitis
   - Internal Hordeolum with Secondary Infection
   - External Hordeolum (Stye)
2. **Conjunctiva**
   - Bacterial Conjunctivitis
   - Chlamydial Conjunctivitis (*Chlamydia trachomatis*)
   - Chlamydial Conjunctivitis (Trachoma)
   - Gonococcal Conjunctivitis
3. **Cornea**
   - Bacterial Keratitis
   - Contact Lens Related Bacterial Keratitis
   - Acanthamoeba Keratitis
   - Fungal Keratitis
   - Herpes Simplex Keratitis
   - Herpes Zoster Ophthalmicus
4. **Retina**
   - Acute Retinal Necrosis
   - CMV Retinitis (Cytomegalovirus)
5. **Endophthalmitis**
   - Bacterial Endophthalmitis (Post-operative/ Post trauma)
   - Fungal Endophthalmitis (Post-operative/ Endogenous)
   - Endogenous Endophthalmitis
6. **Ocular**
   - Ocular Toxoplasmosis
   - **Ocular Tuberculosis**
   - Ocular Melioidosis
   - Ocular Leptospirosis
7. **Dacryocystitis**
8. **Cellulitis**
   - Preseptal Cellulitis
   - Orbital Cellulitis/Abscess

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Eyelid

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Anterior Blepharitis Common organisms: ● *Staphylococcus aureus* ● *Staphylooccus epidermidis*	Eyelid hygiene/scrubs is the mainstay of therapy. Topical antibiotics are not indicated as an initial therapy.	Chloramphenicol ointment 1% applied q12h to the lid margin for 1-2 weeks **OR** Oxytetracycline with Polymyxin B eye ointment applied q12h to the lid margin **OR** Fusidic Acid 1% eye ointment applied q12h to the lid margin	-
Meibomian Gland Dysfunction/ Posterior Blepharitis	Warm compresses and massage. Systemic therapy is not indicated as an initial therapy.	*Doxycycline 100 mg PO daily or q12h for 4-6 weeks **OR** **Azithromycin 500 mg PO q24h for 3 days weekly intervals, with a minimum of 3 cycles	*Tetracyclines are contraindicated in children < 8 years. **Off-label use
Internal Hordeolum with Secondary Infection Common organism: ● *Staphylococcus aureus*	Warm compresses. Systemic antibiotics are indicated in the presence of superficial cellulitis or abscess.		-
	Mild Infections: Cloxacillin 500 mg IV/PO q6h	Amoxicillin/clavulanate 625 mg PO q8h	
	Severe Infections: Cloxacillin 1-2 g IV/PO q6h		
External Hordeolum (Stye) Common organism: ● *Staphylococcus aureus*	Epilation of affected eye lash and warm compresses. Systemic antibiotics are indicated in the presence of superficial cellulitis or abscess		-
	Mild Infections: Cloxacillin 500 mg IV/PO q6h	**Mild Infections:** Amoxicillin/clavulanate 625 mg PO q8h	
	Severe Infections: Cloxacillin 1-2 g IV/PO q6h	**Severe Infections:** Cefazolin 2 g IV q8h **OR** Cephalexin 500 mg PO q6h **MRSA or penicillin allergy:** Trimethoprim/Sulfamethoxazole (Bactrim) 5-10 mg/kg/day of TMP component q12h	

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Conjunctiva

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Bacterial Conjunctivitis Common organisms: • *Staphylococcus aureus* • *Streptococcus pneumonia* • *Haemophilus influenzae*	Chloramphenicol 0.5% eye drop q6h **MAY ADD** Chloramphenicol eye ointment at night	Moxifloxacin 0.5% eye drop q6h **OR** Ciprofloxacin 0.3% eye drop q6h **OR** Levofloxacin 0.5% eye drop q6h	-
Chlamydial Conjunctivitis (*Chlamydia trachomatis*)	Azithromycin PO 1 g STAT **MAY ADD** Topical tetracycline eye ointment 1% q12h for 6 weeks	*Doxycycline PO 100 mg q12h for 7 days	*Doxycycline not recommended for pregnancy
Chlamydial Conjunctivitis (Trachoma)	Azithromycin PO 1 g STAT	*Doxycycline PO 100 mg q12h for minimum of 21 days	
Gonococcal Conjunctivitis	Ceftriaxone IM/IV 1 g STAT	-	Frequent eye toileting of the infected eye with topical saline eye drops until discharge reduces. Topical antibiotics may be considered as ancillary therapy

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Cornea

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Bacterial Keratitis (Empirical)	**Monotherapy:** (For Mild Bacterial Keratitis) Ciprofloxacin 0.3% eye drop q1-2h **OR** Moxifloxacin 0.5% eye drop q1-2h **OR** Levofloxacin 0.5% eye drop q1-2h	**Combination therapy of two:** (For Severe Bacterial Keratitis) *Gentamicin 0.9% eye drop q1-2h **PLUS** Moxifloxacin 0.5% q1-2h **OR** Ciprofloxacin 0.3% eye drop q1-2h **OR** Levofloxacin 0.5% eye drop q1-2h	*Prepared extemporaneously using injectable forms
	MRSA: *Vancomycin 5% eye drop q1-2h		
Bacterial Keratitis (Gram-Positive Cocci (GPC))	Moxifloxacin 0.5% eye drop q1-2h	*Cefuroxime 5% eye drop q1-2h	*Prepared extemporaneously using injectable forms
	MRSA: *Vancomycin 5% eye drop q1-2h		
Bacterial Keratitis (Gram-Negative Rods (GNR))	**Monotherapy:** (For Mild Bacterial Keratitis) Ciprofloxacin 0.3% eye drop q1-2h **OR** Levofloxacin 0.5% eye drop q1-2h	**Combination therapy of two:** (For Severe Bacterial Keratitis) *Gentamicin 0.9% eye drop q1-2h **PLUS** *Ceftazidime 5% eye drop q1-2h **OR** Ciprofloxacin 0.3% eye drop q1-2h **OR** Levofloxacin 0.5% eye drop q1-2h	*Prepared extemporaneously using injectable forms
Contact Lens Related Bacterial Keratitis	**Monotherapy:** Ciprofloxacin 0.3% eye drop q1-2h **OR** Levofloxacin 0.5% eye drop q1-2h	**Combination therapy of two:** *Gentamicin 0.9% eye drop q1-2h **PLUS** *Ceftazidime 5% eye drop q1-2h **OR** Ciprofloxacin 0.3% eye drop q1-2h **OR** Levofloxacin 0.5% eye drop q1-2h	*Prepared extemporaneously using injectable forms
Acanthamoeba Keratitis *(Acanthamoeba sp.)*	*Chlorhexidine 0.02% eye drop q1-2h **PLUS** **Propamidine isethionate 0.1% eye drop **(UKK)** q1-2h	-	*Prepared extemporaneously using injectable forms

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Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Fungal Keratitis Common organisms: • *Aspergillus sp.* • *Fusarium sp.* • *Candida sp.*	**Polyenes:** **(choice of therapy for yeast)** **Natamycin 5% eye drop q1-2h **OR** *Amphotericin B 0.05-0.15% eye drop q1-2h **Azoles** **(choice of therapy for Fusarium sp.)** *Voriconazole 1% eye drop **(UKK)** q1-2h **OR** *Fluconazole 0.2% eye drop q1-2h	**Oral Therapy:** **(May be considered in the absence of contraindications)** Fluconazole 200 mg PO q24h **OR** Itraconazole 200 mg PO q24h	**Duration: minimum 3 weeks** Dual combination therapy of polyene and azole antifungal may be used. *Prepared extemporaneously using injectable forms
Herpes Simplex Keratitis (*Herpes simplex* Type 1 & 2)	Acyclovir 3% eye ointment 5 times/day for 10 – 14 days or for at least 3 days after healing, whichever shorter.		*Prepared extemporaneously using injectable forms
	In the presence of stromal or endothelial disease: Acyclovir 400 mg PO 5 times/day* ***Oral Acyclovir 5 times/day administration:*** • *Please ensure there is at least a 4-hour interval between doses.* • *Example of administration times: 7 AM, 11 AM, 3 PM, 7 PM & 11 PM.*		**Duration: 7-10 days**
	Prophylaxis for recurrent cases: Acyclovir 400 mg PO q12h		**Duration: 12 months**
Herpes Zoster Ophthalmicus *Requires systemic therapy.*	**Immunocompetent:** Acyclovir 800 mg PO 5 times/day* for 7 days ***Oral Acyclovir 5 times/day administration:*** • *Please ensure there is at least a 4-hour interval between doses.* • *Example of administration times: 7 AM, 11 AM, 3 PM, 7 PM & 11 PM.*		Advisable to start treatment early within 48-72 hours. Topical antiviral treatment is not recommended for herpes zoster. **Systemic antiviral treatment** is recommended for all immunocompromised patients or for immunocompetent patients with following criteria: 1. >50 years of age 2. Moderate or severe pain 3. Moderate or severe rash 4. Non-truncal involvement
	Immunocompromised: Acyclovir 10 mg/kg IV q8h for 7 days (change to oral once there is an improvement as below) **Oral Therapy:** Acyclovir 800 mg PO 5 times/day* for 7 days ***Oral Acyclovir 5 times/day administration:*** • *Please ensure there is at least a 4-hour interval between doses.* • *Example of administration times: 7 AM, 11 AM, 3 PM, 7 PM & 11 PM.*		

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Retina

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Acute Retinal Necrosis Common organisms: • *Varicella Zoster virus* • *Herpes Simplex* • *Cytomegalovirus (rarely)*	Acyclovir 10-12 mg/kg/dose IV q8h (not more than 800 mg/dose) **Duration: 7-10 days until disease stabilize, then oral therapy for a minimum 6 weeks as below:** **Oral Therapy:** Acyclovir 800 mg PO 5 times/day* **PLUS** Intravitreal therapy (if retinitis is threatening the macular/ optic disc) • Intravitreal foscarnet **(UKK)** 1.2-2.4 mg/0.1 ml **OR** • Intravitreal ganciclovir 0.2-2mg/0.1ml biweekly	*Valacyclovir **(UKK)** 1 g PO q8H **Duration: 6 weeks**	Recommended to switch to definitive treatment once microbiology results available. ***Oral Acyclovir 5 times/day administration:** • Please ensure there is at least a 4-hour interval between doses. • Example of administration times: 7 AM, 11 AM, 3 PM, 7 PM & 11 PM.
CMV Retinitis (Cytomegalovirus)	**Systemic Therapy:** Ganciclovir 5 mg/kg IV q12h for 2-3 weeks	**Systemic Therapy:** *Valganciclovir 900 mg PO q12h for 2-3 weeks (induction), followed by 900 mg PO q24h (maintenance) **OR** *Foscarnet IV **(UKK)** 60 mg/kg q8H or 90 mg/kg q12h for patients with treatment limiting toxicities to ganciclovir or with ganciclovir resistance	Systemic therapy is indicated in all cases. Maintenance therapy may need to be continued until CD4 count is > 100 cells/mm^3 for 3 consecutive months.
	Intravitreal Therapy: (Indicated in zone 1 and 2 lesions) Intravitreal Ganciclovir 2 mg/0.1 ml biweekly	**Intravitreal Therapy: (Indicated in zone 1 and 2 lesions)** Intravitreal foscarnet **(UKK)** 2.4 mg/0.1 ml (1-2 weekly)	Intravitreal therapy to be tapered according to clinical response. Ganciclovir implant 4.5g is an option for prolonged usage of intravitreal ganciclovir.

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Endophthalmitis

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Bacterial Endophthalmitis (Post-operative/ Post trauma) Common organisms: **Early, Acute:** • *Staphylococcus epidermidis,* • *Staphylococcus aureus,* • *Streptococcus sp.,* • *Pseudomonas aeruginosa,* • *Enterococcus sp.,* • *Candida Albicans* **Low grade/Chronic:** • *Cutibacterium acnes,* • *Staphylococcus epidermidis*	**Intravitreal Antibiotic Injections:** *Vancomycin 1-2 mg/0.1 ml **PLUS** *Ceftazidime 2 mg/0.1 ml	**Intravitreal Antibiotic Injections:** *Vancomycin 1-2 mg/0.1 ml **PLUS** *Amikacin 0.4 mg/0.1 ml	Repeat intravitreal antibiotics after 48 to 72 hours if indicated. *Prepare extemporaneously using injectable forms.
	Systemic therapy: Vancomycin 15 – 20 mg/kg IV q8-12h; not to exceed 2g/dose *Refer to DIAMS – HSgB Vancomycin Protocol for more dosing info* **PLUS** Ceftazidime 1-2 g IV q8h **Deescalate to:** Ciprofloxacin 750 mg PO q12h after 72 hours / evidence of clinical improvement **For culture negative:** **ADD** Clarithromycin 500 mg PO q12h for 2 weeks	**Systemic therapy:** Ciprofloxacin 750 mg PO q12h for 10 days **OR** Moxifloxacin 400 mg PO q24h for 10 days	Systemic treatment only indicated in cases of delay of transfer to ophthalmology centre. If suspicious of fungal endophthalmitis, refer section fungal endophthalmitis.
	Topical therapy: Moxifloxacin 5% eye drop	**Topical therapy:** Ceftazidime 5% eye drop	
Fungal Endophthalmitis (Post-operative/ Endogenous)	**Intravitreal Therapy:** Amphotericin B 0.005 mg/0.1 ml **PLUS** **Systemic Therapy:** Fluconazole 800 mg (12 mg/kg) IV loading dose then 400-800 mg IV (6-12 mg/kg) daily **For severe condition:** Amphotericin B 0.5-1 mg/kg IV q24h; **MAY ADD** Flucytosine 25 mg/kg q6h *(recommended for less susceptible azole isolates)* **Step down therapy:** Fluconazole 200 mg PO q24h for total 4-6 weeks (minimum)	**Intravitreal Therapy:** *Voriconazole 50-100 ug/0.1 ml **PLUS** **Systemic Therapy:** *Voriconazole 400 mg (6 mg/kg) IV/PO q12h for 2 doses, followed by 200 mg (4 mg/kg) PO q12h	Intravitreal and systemic therapy are indicated in all cases. Refer to microbiological sensitivity. **Duration:** Systemic therapy is typically continued for at least 4-6 weeks depending on observed ophthalmologic improvement. *Requires DG's approval

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Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Endogenous Endophthalmitis Common organisms: • *Streptococcus pneumoniae or other streptococcus* • *Neisseria meningitidis* • *Staphylococcus aureus* • *Klebsiella pneumoniae or other gram-negative organism* • *Candida sp*	**Systemic therapy:** Vancomycin 15 – 20 mg/kg IV q8-12h; not to exceed 2g/dose *Refer to DIAMS – HSgB Vancomycin Protocol for more dosing info* **PLUS** Ceftazidime 1-2 g IV q8h **Deescalate to:** Ciprofloxacin 750 mg PO q12h after 72 hours / evidence of clinical improvement **For culture negative:** **ADD** Clarithromycin 500 mg PO q12h for 2 weeks **AND** Intravitreal antibiotic injection as below:	**Systemic therapy:** Ciprofloxacin 750 mg PO q12h for 10 days **OR** Moxifloxacin 400 mg PO q24h for 10 days	Treatment is based on primary infection (bacterial/fungal) and culture and sensitivity results. All cases require systemic therapy. Intravitreal injection is indicated in cases with vitreous involvement and sight threatening choroidal lesions. Topical therapy may supplement therapy. Not to use systemic steroids in these cases. Review antibiotic regimen after microbiology results. Repeat intravitreal antibiotics after 48 to 72 hours if indicated.
	Intravitreal Antibiotic Injections: *Vancomycin 1-2 mg/0.1 ml **PLUS** *Ceftazidime 2 mg/0.1 ml	**Intravitreal Antibiotic Injections:** *Vancomycin 1-2 mg/0.1 ml **PLUS** *Amikacin 0.4 mg/0.1 ml	
	Topical therapy: Moxifloxacin 5% eye drop	**Topical therapy:** Ceftazidime 5% eye drop	

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Ocular

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Ocular Toxoplasmosis *(Toxoplasma gondii)*	Trimethoprim/ulfamethoxazole (Bactrim) 160/800 mg (= 2 tablets) PO q12h **Duration: at least 6 weeks**	Pyrimethamine **(UKK)** 100 mg PO on Day 1, then 25-50 mg PO q24h **PLUS** Folinic acid 10-25 mg PO q24h **PLUS** Sulfadiazine **(UKK)** 1 g PO q6h **Duration: for at least 6 weeks** **OR** Azithromycin 500 mg PO q24h **Duration: 3 weeks** **OR** Clindamycin 300 mg PO q6h **Duration: 3 weeks**	Pregnancy: May consider intravitreal clindamycin 1.0mg/0.1ml. Systemic steroids are usually indicated in immunocompromised patients.
	Prophylaxis for recurrent lesions: Trimethoprim/sulfamethoxazole (Bactrim) 80 mg/400 mg (=1 tablet) PO q12h, 3 times a week		
Ocular Syphilis *(Treponema pallidum)*	Ocular syphilis (syphilitic uveitis) should be treated as neurosyphilis. Refer to **Sexually Transmitted Infections (STI) section > Syphilis (*Treponema pallidum*) > Neurosyphilis.**		
Ocular Tuberculosis *(Mycobacterium tuberculosis)*	**Requires systemic therapy.** Refer to **Section A: Adult Patients > A9: Infections in Immunocompromised Patients (Opportunistic Infection (OI) in Patients with Human Immunodeficiency Virus (HIV)) > *Mycobacterium tuberculosis* (TB) Infection and Diseases** or Ministry of Health's CPG on Management of Tuberculosis (Extra pulmonary TB). Ethambutol may cause optic neuropathy and should be avoided depending on the case. Ocular TB presents as a unilateral/ bilateral infective uveitis characterized by multifocal choroiditis/ granuloma and there may be supportive FFA findings of occlusive vasculitis. The diagnosis may be clinical as vitreous sampling for AFB or TB PCR may not be very sensitive due to small sample size and sensitivity of the tests. Clinical response to anti-TB is often diagnostic. Uveitis secondary to TB Hypersensitivity is an immune response to acid fast bacilli in the eye and manifests predominantly as an inflammatory uveitis. Treatment includes anti-TB in combination with an immunosuppressive dose of systemic steroids for at least 6-9 months. Systemic steroids may be indicated but is only for: • Non-active systemic TB • Immunocompetent patients • Severe ocular inflammation developing after starting anti-TB treatment • Vision threatening condition		

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Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Ocular Melioidosis	For ocular manifestations of melioidosis, refer to: **Section A: Adult Patients > A21: Tropical Infections > Melioidosis (*Burkholderia pseudomallei*)**		
Ocular Bartonellosis	Doxycycline 100 mg PO q12h **OR** Azithromycin 500 mg PO on Day 1, then 250 mg PO q24h	-	**Duration: 2 – 6 weeks**
Ocular Leptospirosis	For ocular leptospirosis, refer to: **Section A: Adult Patients > A21: Tropical Infections > Leptospirosis**		

Dacryocystitis

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Dacryocystitis Common organisms: • *Streptococcus pneumoniae* • *Staphylococcus aureus* • *Gram-negative anaerobes*	Amoxicillin/clavulanate 625 mg PO q8h	Ampicillin/sulbactam PO 375 mg q12h	Consider intravenous antibiotics in severe infections. **Duration: 7 days**

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Cellulitis

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Preseptal Cellulitis Common organisms: • *Streptococcus pneumoniae* • *Staphylococcus aureus* • *Streptococcus sp.*	Cloxacillin 500-1000 mg PO q6h **Duration: 5-7 days** **OR** Cephalexin 500 mg PO q6H **Duration: 7 days** **OR** Cefuroxime 500 mg PO q12h **Duration: 7 days**	**Oral therapy:** **For patients with penicillin allergy:** Clindamycin PO 300-600 mg q8h **Duration: 7 days** **OR** **For patients with concurrent sinusitis:** Amoxicillin/clavulanate 625 mg PO q8h **Duration: 7 days**	
		IV therapy: **(For severe infections)** Cloxacillin 2 g IV q6h for 7 days **OR** **For patients with penicillin allergy:** Clindamycin 600 mg IV q6-8h OR 900 mg q8h for 7 days (if penicillin allergy) **OR** **For patients with concurrent sinusitis:** Ceftriaxone 2 g IV q24h	**Duration: 7 days**
Orbital Cellulitis/Abscess Common organisms: • *Streptococcus pneumoniae* • *Staphylococcus aureus* • *Streptococcus sp.* • *Gram-negative anaerobes (odontogenic source)* • *Haemophilus influenza*	Cefotaxime 2 g IV q8h **OR** Ceftriaxone 2 g IV q24h **OR** Amoxicillin/clavulanate 1.2 g IV q8h for 7-10 days **If anaerobes suspected:** **ADD** Metronidazole 500 mg IV q8h *Only If patient started on cephalosporins – Augmentin has adequate anaerobic cover*	**Penicillin/cephalosporin allergy:** Vancomycin 15 – 20 mg/kg IV q8-12h *Refer to DIAMS – HSgB Vancomycin Protocol for more dosing info* **PLUS** Ciprofloxacin 400 mg IV / 500 mg PO q12h **If anaerobes suspected:** **ADD** Metronidazole 500 mg IV q8h *Only If patient started on cephalosporins – Augmentin has adequate anaerobic cover*	**Duration: 7-14 days** depending on clinical response

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HSgB Antimicrobial Guideline (HAG)

SECTION A: ADULT

A13:
ORAL / DENTAL INFECTIONS

Launched: October 2024

Updated: -

LIST OF TOPICS WITH LINKS:

1. Antimicrobial Use for Bacterial Infections

- Infections of the Teeth and Supporting Structures
  - i. Reversible/ Irreversible Pulpitis
  - ii. Localised Dentoalveolar Abscess / Apical / Periapical / Periodontal abscess
  - iii. Dry Socket
  - iv. Localised Pericoronitis
  - v. Chronic Gingivitis
  - vi. Chronic Periodontitis
  - vii. Aggressive Periodontitis
- Infections of the Jaws
  - i. Osteomyelitis of the Jaws of Dental Origin
- Spreading Infections and Infections of Fascial Spaces (With/Without Systemic Signs)
  - i. Cellulitis ± Abscess of Dental Origin
  - ii. Surgical site infection (SSI)
  - iii. Traumatic Wound Infection
- Post Implant Infections (Peri Implantitis)

2. Antimicrobial Use for Fungal Infections

3. Antimicrobial Use for Viral Infections

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Antimicrobial Use for Bacterial Infections

Infections of the Teeth and Supporting Structures

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Reversible/ Irreversible Pulpitis	Symptomatic treatment. Antibiotic use is not recommended.		
Localised Dentoalveolar Abscess / Apical / Periapical / Periodontal abscess	**Superficial:** Systemic antibiotic use not recommended (immunocompetent).		The definitive treatment involves aggressive surgical intervention for source control, which includes drainage of the abscess with or without tooth extraction. If the procedure is successful, a minimum duration of 3 days of antibiotic therapy should be administered. **Duration: 3 – 7 days** **Antibiotic Allergy:** Refer to APPENDICES > Antibiotic Allergy for more info.
	Deep Infection / Immunocompromised patient: Amoxicillin 500 mg PO q8h **MAY ADD** Metronidazole 400 mg PO q8h	**Deep Infection / Immunocompromised patient:** Amoxicillin/clavulanate 625 mg PO q8h **Antibiotic allergy:** Clindamycin 300 mg PO q6h for 7 days	
Dry Socket	Systemic antibiotic use is not recommended. Local treatment with saline irrigation and antiseptic/ analgesic dressings and symptomatic relief of pain		
Localised Pericoronitis	Systemic antibiotic use is not recommended in the absence of regional or systemic signs and symptoms. **Once systemic spread of infection is suspected:** Amoxicillin 500 mg PO q8h **MAY ADD:** Metronidazole 400 mg PO q8h		Local treatment with antiseptic irrigation and mouthwash and symptomatic relief of pain. **Duration: 5 days**
Chronic Gingivitis	Systemic antibiotic use is not recommended. **First line treatment:** Mechanical and chemical plaque control. 0.2% Aqueous Chlorhexidine Gluconate is not used alone but as an adjunct to mechanical debridement. **Second line treatment:** Antimicrobial mouth rinse		

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Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Chronic Periodontitis	Systemic antibiotic use is generally not recommended **First-line treatment:** Mechanical plaque control **Antibiotic use can be considered in cases of:** 1. Unresponsive to conventional mechanical therapy. 2. Acute infection associated with systemic manifestation. 3. Immunocompromised. 4. Generalized periodontitis stage III in young adults.		
	Amoxicillin 500 mg PO q8h **PLUS** Metronidazole 400 mg PO q8h **OR** Amoxicillin/clavulanate 625 mg PO q8h	**Antibiotic allergy:** Clindamycin 300 mg PO q6h	**Duration: 3-7 days** **Antibiotic Allergy:** Refer to APPENDICES > Antibiotic Allergy for more info.
Aggressive Periodontitis Common organisms: • *Aggregatibacter actinomycetemcomitans* • *Porphyromonas gingivalis* • *Tannerella forsythia* • *Prevotella intermedia* • *Treponema denticola*	Amoxicillin 500 mg PO q8h **PLUS** Metronidazole 400 mg PO q8h	**Antibiotic allergy:** Clindamycin 300 mg PO q6h **OR** Azithromycin 500 mg PO q24h for 3 days	**Duration: 7 days** Antibiotics are used as an adjunct to scaling and root debridement. **Antibiotic Allergy:** Refer to APPENDICES > Antibiotic Allergy for more info.

Infections of the Jaws

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Osteomyelitis of the Jaws of Dental Origin Different organisms may be involved	For **acute cases**, start with: Amoxicillin 500 mg PO q8h **PLUS** Metronidazole 400 mg PO q8h **OR** Amoxicillin/clavulanate 625 mg PO q8h	**Antibiotic allergy:** Clindamycin 300-450 mg PO q6h or 600-900 mg IV q8h	Culture and sensitivity are necessary to guide the antibiotic. For chronic cases, start with surgical treatment first. Start antibiotics only when causative organisms are identified. **Duration of antibiotic therapy:** 4-6 weeks depending on patient response / microbiological clearance of the pathogen. **Antibiotic Allergy:** Refer to APPENDICES > Antibiotic Allergy for more info.

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Spreading Infections and Infections of Fascial Spaces (With/Without Systemic Signs)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Cellulitis ± Abscess of Dental Origin Common organisms (polymicrobial including): • Prevotella • Peptostreptococcus • *Fusobacterium nucleatum* • Viridans Streptococci • *Streptococcus anginosus* group • Clostridium sp	Benzylpenicillin 2-4 MU IV q4-6h **PLUS** Metronidazole 500 mg IV q8h **OR** Amoxicillin/Clavulanate 1.2 g IV q8h **OR** Cefuroxime 1.5 g IV q8h **PLUS** Metronidazole 500 mg IV q8h	**Antibiotic allergy:** Clindamycin 300-450 mg PO q6h or 600-900 mg IV q8h	Incision and drainage are advised and change antibiotics in accordance with the result of culture and sensitivity. Continue IV therapy for 1 to 2 days following successful abscess drainage, then switch to oral therapy. **Antibiotic Allergy:** Refer to **APPENDICES > Antibiotic Allergy** for more info.
Surgical site infection (SSI) Infection is usually by endogenous organisms rather than exogenous Common organisms: • Viridans Streptococci • Staphylococci • *Prevotella intermedia* • Peptostreptococcus • Eubacterium • *Fusobacterium nucleatum*	Benzylpenicillin 2-4 MU IV q4-6h **PLUS** Metronidazole 500 mg IV q8h **OR** Amoxicillin/Clavulanate 1.2 g IV q8h **OR** Cefuroxime 1.5 g IV q8h **PLUS** Metronidazole 500 mg IV q8h	**Antibiotic allergy:** Clindamycin 300-450 mg PO q6h or 600-900 mg IV q8h	Incision and drainage are advised and change antibiotics in accordance with the result of culture and sensitivity. Continue IV therapy for 1 to 2 days following successful abscess drainage, then switch to oral therapy. **Antibiotic Allergy:** Refer to **APPENDICES > Antibiotic Allergy** for more info.
Traumatic Wound Infection Usually caused by endogenous organisms rather than exogenous. Common organisms: • *Viridans Streptococci* • *Staphylococci* • *Prevotella intermedia* • *Peptostreptococcus* • *Eubacterium* • *Fusobacterium nucleatum*	Benzylpenicillin 2-4 MU IV q4-6h **PLUS** Metronidazole 500 mg IV q8h **OR** Amoxicillin/Clavulanate 1.2 g IV q8h **OR** Cefuroxime 1.5 g IV q8h **PLUS** Metronidazole 500 mg IV q8h	**If not responding to first-line antibiotics:** Ceftriaxone 2 g IV q24h **PLUS** Metronidazole 500 mg IV q8h **Antibiotic allergy:** Clindamycin 300-450 mg PO q6h or 600 mg IV q6h / 900 mg IV q8h	Empirical antibiotics are started. Incision and drainage are advised and the antibiotic is changed in accordance with the result of culture and sensitivity. Continue intravenous therapy for 1 to 2 days following successful abscess drainage, then switch to oral therapy.

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Post Implant Infections (Peri Implantitis)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Heterogeneous mixed infection. Common organisms: • Actinomyces sp. • Eubacterium sp. • Propionibacterium sp. • Lactobacillus sp. • Veillonella sp. • *Porphyromonas gingivalis* • *Prevotella intermedia* • *Fusobacterium nucleatum*	Systemic antibiotics are generally not recommended unless in severe cases.		
	Severe cases (e.g. deep pockets ⩾7 mm, extensive suppuration): Amoxicillin/clavulanate 625 mg PO q8h **OR** Amoxicillin 500 mg PO q8h **PLUS** Metronidazole 400 mg PO q8h	**Antibiotic allergy:** Doxycycline 100 mg PO q12h **OR** Clindamycin 300 mg PO q6h	**Antibiotic Allergy:** Refer to APPENDICES > Antibiotic Allergy for more info.

Antimicrobial Use for Fungal Infections

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Oral Candidiasis	Refer to Section A: Adult Patients > A5: Infections in Immunocompromised Patients > Opportunistic Infections (OI) in Patients with HIV > Mucocutaneous Candidiasis		

Antimicrobial Use for Viral Infections

Common oral viral infections:

- Herpes simplex virus type 1 (HSV-1)
- Primary herpetic gingivostomatitis
- Herpes labialis
- Herpes simplex virus type 2 (HSV-2)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
	Symptomatic treatment in most cases. Refer to Section A: Adult Patients > A18: Sexually Transmitted Infections > Anogenital Ulcer Disease > Genital Herpes (*Herpes simplex* virus (HSV) Type 1 and 2)		

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SECTION A: ADULT

A14: ORTHOPAEDIC INFECTIONS

Launched: October 2024

Updated: -

LIST OF TOPICS WITH LINKS:

1. **Bone & Joint Infections**
   - Osteomyelitis
     - Acute Osteomyelitis
     - Chronic Osteomyelitis
     - Vertebral Osteomyelitis / Epidural Abscess
     - Implant-associated vertebral osteomyelitis
   - Septic Arthritis
   - Prosthetic Joint Infection
   - Implant Related Infection After Fracture Fixation
2. **Complicated Skin and Soft Tissue Infection**
   - Diabetic Foot Infections (DFU Infection)
   - Necrotising Fasciitis (NF)
   - Myonecrosis / Gas Gangrene
3. **Trauma-Related Infections:**
   - Simple Soft Tissue Injuries
   - Complex Soft Tissue Injuries
   - Compound Fractures / Open Fractures

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Bone & Joint Infections

Osteomyelitis

1. **Acute Osteomyelitis**
2. **Chronic Osteomyelitis**
3. **Vertebral Osteomyelitis / Epidural Abscess**
4. **Implant-associated vertebral osteomyelitis**

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Acute Osteomyelitis Common organisms: *Staphylococcus aureus* (80%) Group A *Streptococcus pyogenes* Rarely gram-negative bacilli	**Empirical coverage:** Cloxacillin 2 g IV q6h	**Empirical for patient with antibiotic allergy:** Cefazolin 2 g IV q6-8h	Antibiotic therapy tailored to tissue/bone C&S result. **Duration:** Minimum duration: 6 weeks. Initial ***IV therapy for 2-4 weeks followed by oral therapy***. Modify according to clinical response. ***4 weeks of IV antibiotics*** is required for ***Staphylococcus aureus*** osteomyelitis associated ***with bacteraemia.*** A ***shorter duration*** of antibiotics can be considered if the osteomyelitis is ***fully resected*** (E.g.: amputation with a clear margin): • No surrounding soft tissue infection: 5 days. • Evidence of soft tissue infection: 10-14 days. ***DIAMS - IV to PO / OPAT** Conversion from IV to PO therapy with good bioavailability can be done *after minimum 2 weeks of IV antibiotics* provided: • Patient has no significant comorbidity • Infection with good source control • Clinical response seen • Patient able to tolerate orally • Suitable oral antibiotics with good oral bioavailability & proven sensitivity to causative organism

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Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Chronic Osteomyelitis Commonest organism: *Staphylococcus aureus* **Definition:** • Relapsing infection despite adequate duration of appropriate antibiotic ▪ Chronic pain / swelling / bone tenderness associated with tissue necrosis, increased drainage or persistent sinus tracts ▪ Presence of bone destruction and presence of sequestra on imaging	Empirical treatment before taking adequate cultures is not recommended. Choice of antibiotic treatment will depend on C&S results **from tissue / bone samples only** (superficial swab samples are not reliable). Thorough surgical debridement required (removal of dead bone / orthopaedic hardware).		Treat until inflammatory parameters are normal. **Duration:** **Minimum 6 weeks but usually > 3 months.** A ***shorter duration*** of antibiotics can be considered if the osteomyelitis is ***fully resected*** (E.g.: amputation with a clear margin): • No surrounding soft tissue infection: 5 days. • Evidence of soft tissue infection: 10-14 days. *DIAMS - IV to PO / OPAT Conversion from IV to PO therapy with good bioavailability can be done *after minimum 2 weeks of IV antibiotics* provided: • Patient has no significant comorbidity • Infection with good source control • Clinical response seen • Patient able to tolerate orally • Suitable oral antibiotics with good oral bioavailability & proven sensitivity to causative organism

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Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Vertebral Osteomyelitis / Epidural Abscess Common organism: *Staphylococcus aureus* (main) Brucella Salmonella Gram-negative Bacilli	Empirical therapy should be withheld unless the patient is septic or in patients with neurologic compromise. CT-guided needle biopsy & aspiration should be done & specimen send for C&S.		Empiric gram-negative (3rd or 4th generation cephalosporin) should be covered if patient had: ▪ Recent spinal hardware inserted or surgery ▪ Intra-abdominal infections ▪ Co-existing or synchronous genitourinary infection ▪ Immunocompromised Antibiotic therapy tailored to tissue/bone C&S result. **Duration:** ▪ Minimum 6 weeks. ▪ Minimum ***8 weeks if undrained*** paravertebral abscess(es) and/or infection due to ***drug-resistant organisms.*** ▪ Up to ***12 weeks*** if ***extensive*** bone destruction or infection due to ***Brucella sp***. Refer to **Brucellosis under Tropical Infections section for infection due to *Brucella sp*.** *DIAMS - IV to PO / OPAT Conversion from IV to oral therapy with good bioavailability can be done ***after minimum 2 weeks*** of IV antibiotics.
	Cloxacillin 2 g IV q4h	Cefazolin 2 g IV q6-8h	

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Implant-associated vertebral osteomyelitis **Early onset** (*within 30 days* of implant insertion): *Staphylococcus aureus* Beta-hemolytic streptococci Gram-negative bacilli **Late onset** (*>30 days* of implant insertion): *Staphylococcus aureus* CoNS *Corynebacterium spp.* *P. acnes*	Empirical treatment before taking adequate cultures is not recommended. Antibiotic selection is based on bone C&S.		**Duration:** Minimum 12 week. Final treatment duration depends on hardware retention/removal. *DIAMS - IV to PO / OPAT Conversion from IV to PO therapy with good bioavailability can be done *after minimum 2 weeks of IV antibiotics* provided: • Patient has no significant comorbidity • Infection with good source control • Clinical response seen • Patient able to tolerate orally • Suitable oral antibiotics with good oral bioavailability & proven sensitivity to causative organism

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Septic Arthritis

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Common organisms: *Staphylococcus / Streptococcus*	Cloxacillin 2 g IV q4-6h	**Antibiotic allergy:** Cefazolin 2 g IV q6-8h **OR** Clindamycin 600 mg IV q6h, followed by oral therapy (same dose) **If suspected/confirmed MRSA:** Vancomycin 15-20 mg/kg (actual body weight) IV q8-12h; not to exceed 2 g/dose *Consider loading dose 25-30mg/kg for critically ill or septic patients to achieve faster steady state.*	Drainage, debridement and washout of infected joints is important to limit further damage. Empirical therapy wherever possible should be directed by the result of the gram stain of the joint aspirate. **Duration:** IV therapy 2-4 weeks, then oral therapy to complete total duration of 4-6 weeks. A shorter duration of therapy is possible in immunocompetent patients who have had adequate surgical drainage. To consider gonococcal arthritis in a sexually active patient. Refer to the **Sexually Transmitted Infections > Gonorrhoea infection** section. ***DIAMS - IV to PO / OPAT** Conversion from IV to PO therapy with good bioavailability can be done *after minimum 2 weeks of IV antibiotics* provided: • Patient has no significant comorbidity • Infection with good source control • Clinical response seen • Patient able to tolerate orally • Suitable oral antibiotics with good oral bioavailability & proven sensitivity to causative organism **Antibiotic Allergy:** Refer to **APPENDICES > Antibiotic Allergy** for more info.

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Prosthetic Joint Infection

1. Prosthetic Joint Infections (Empirical)
2. Prosthetic Joint Infection (Definitive): Methicillin-sensitive *Staphylococcus aureus* (MSSA)
3. Prosthetic Joint Infection (Definitive): Methicillin-resistant *Staphylococcus aureus* (MRSA)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Prosthetic Joint Infections (Empirical) **Early onset** (<3months after surgery): *Staphylococcus aureus* Gram-negative bacilli **Delayed onset** (from 3 to 12 months after surgery): Less virulent organism; CoNS / *Enterococcus* / anaerobes **Late onset** (>12 months after surgery): *Staphylococcus aureus,* Enterobacterales, β-hemolytic Streptococci, Anaerobes	Empirical therapy is not recommended.		**Treatment concepts:** • Treatment is based on culture and sensitivity. • In staphylococcal infection, rifampicin should be added in combination with at least one other anti-staphylococcal agent, several days after surgical debridement when implant is retained/exchanged following surgery. • Treatment strategy and duration of treatment depends on surgical strategy.
Prosthetic Joint Infection (Definitive): Methicillin-sensitive *Staphylococcus aureus* (MSSA)	**Initial treatment:** Cloxacillin 2 g IV q4-6h **OR** Cefazolin 2 g IV q6-8h **PLUS** Rifampicin 300-450 mg PO q12h	-	**Duration:** 2-6 weeks for IV therapy (according to treatment strategy). Followed by an oral combination therapy according to susceptibility. Rifampicin should be included if the implant is in situ. *DIAMS - IV to PO / OPAT Conversion from IV to PO therapy with good bioavailability provided: • Patient has no significant comorbidity • Infection with good source control • Clinical response seen • Patient able to tolerate orally • Suitable oral antibiotics with good oral bioavailability & proven sensitivity to causative organism
Prosthetic Joint Infection (Definitive): Methicillin-resistant *Staphylococcus aureus* (MRSA)	**Initial treatment:** Vancomycin 15-20 mg/kg (actual body weight) IV q8-12h; not to exceed 2 g/dose **PLUS** Rifampicin 300-450 mg PO q12h	-	

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Implant Related Infection After Fracture Fixation

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Fracture Fixation Device Infection **Early onset** (< 2 weeks): Highly virulent organisms *(Staphylococcus aureus* or *gram-negative bacilli)* **Delayed onset** (2–10 weeks): Less virulent organisms (*Staphylococcus epidermidis* or *Cutibacterium acnes*) **Late onset** (> 10 weeks): Low virulence organisms *(Staphylococcus epidermidis)*	Intraoperative tissue culture should be taken to guide antibiotic regimen. Empirical therapy is not recommended unless patient is septic.		**Treatment concepts:** • Treatment is based on culture and sensitivity. • In staphylococcal infection, rifampicin should be added in combination with at least one other anti-staphylococcal agent, several days after surgical debridement when implant is retained/exchanged following surgery. • Treatment strategy and duration of treatment depends on surgical strategy. *DIAMS - IV to PO / OPAT Conversion from IV to PO therapy with good bioavailability provided: • Patient has no significant comorbidity • Infection with good source control • Clinical response seen • Patient able to tolerate orally • Suitable oral antibiotics with good oral bioavailability & proven sensitivity to causative organism
	Ampicillin/sulbactam 3 g IV q6H	-	

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Complicated Skin and Soft Tissue Infection

1. Diabetic Foot Infections (DFU Infection)
2. Necrotising Fasciitis (NF)
3. Myonecrosis / Gas Gangrene

Diabetic Foot Infections (DFU Infection)

Antibiotics should not be used unless there are local or systemic symptoms of infection. Local treatment including surgical debridement is important. Antibiotic selection should be based on the most recent culture and sensitivity report.

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Mild infection **At least 2** of these items are present: • Local swelling / induration • Erythema > 0.5 cm but < 2cm around the wound • Local tenderness / pain • Local increased warmth • Purulent discharge **And no other cause** of an inflammatory response of the skin (E.g.: trauma, gout, thrombosis).	Cloxacillin 500 mg PO q6h **OR** Cephalexin 500 mg PO q6h	Amoxicillin/clavulanate 625 mg PO q8h **OR** Ampicillin/sulbactam 375-750 mg PO q12h	**Duration:** 1-2 weeks* **10 days following surgical debridement* *DIAMS - IV to PO / OPAT Conversion from IV to PO therapy with good bioavailability provided: • Patient has no significant comorbidity • Infection with good source control • Clinical response seen • Patient able to tolerate orally • Suitable oral antibiotics with good oral bioavailability & proven sensitivity to causative organism
Moderate infections Infection with **NO** systemic manifestations and involving: • Erythema extending ≥ 2cm from the wound margin, **and/or** • Tissue deeper than skin and subcutaneous tissues (e.g.: tendon, muscle, joint, and bone) **Severe infections** Infection associated systemic manifestations (≥ 2 SIRS)	Amoxicillin/clavulanate 1.2 g IV q8h **OR** Ampicillin/sulbactam 3 g IV q6-8h **If pseudomonas is suspected:** Piperacillin/tazobactam 4.5 g IV q6-8h *If given as q8h, to be given as extended infusion (over 3-4 hours)* **If MRSA is suspected:** Vancomycin 15-20 mg/kg q8-12h; not to exceed 2 g/dose *Refer to HSgB Vancomycin Protocol for vancomycin loading dose*	Cefuroxime 1.5 g IV q8h **PLUS** Metronidazole 500 mg IV q8h *In ischemia limb / necrosis / gas forming.*	Surgical debridement is **URGENT** for severe infections. Antibiotics should be streamlined based on intraoperative C&S. **Duration for skin & soft tissues involvement:** Total duration 2-4 weeks **Duration for bone/joint involvement:** • ***Resected:*** total duration 2-5 days • ***Debridement of infected soft tissue:*** total duration 1-2 weeks • ***Positive culture or histology of bone margins after bone resection:*** total duration 3 weeks • ***No surgery or dead bone:*** total duration 6 weeks *DIAMS - IV to PO / OPAT Conversion from IV to PO therapy with good bioavailability provided adequate source control

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Necrotising Fasciitis (NF)

- Necrotizing fasciitis is a rapidly progressing, life-threatening soft tissue infection with extensive fascial necrosis & relative sparing of underlying muscle caused by a toxin-producing bacterium. Presentation is acute (over hours); rarely, subacute (over days), and is followed by rapid progression to extensive destruction, which can lead to systemic toxicity, limb loss, and/or death.
- The rapidness of erythema progression (~1-2 hours) helps differentiate necrotizing fasciitis from cellulitis and indicates the need for urgent surgical intervention.
- **Immediate aggressive surgical debridement is the primary treatment modality**. Repeated surgical debridement for source control is normally necessary.
- Aetiology may be polymicrobial (mixed aerobic-anaerobic microbes) or monomicrobial (most commonly Group A streptococcus).
- Empirical therapy should be broad and streamlined based on intraoperative C&S.
- Necrotizing fasciitis commonly involves the extremities. *Refer to the respective organ/system sections for other presentations i.e. necrotizing fasciitis of the perineum (Fournier gangrene), head and neck region, and neonatal infection.*

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Type 1: Polymicrobial infection **Risk factor:** older age group, immunocompromised or chronic diseases (e.g.: diabetes) **Organisms:** • Anaerobes (e.g.: *Bacteroides*, *Clostridium* or *Peptostreptococcus*) • Facultative anaerobic streptococci (other than Group A *Streptococcus* [GAS]) • Enterobacterales (e.g.: *E. coli*, *Enterobacter*, *Klebsiella*, *Proteus*) • Obligate aerobes (e.g.: *Pseudomonas aeruginosa*)	Piperacillin/tazobactam 4.5 g IV q6-8h *If given as q8h, to be given as extended infusion (over 3-4 hours)* **MAY ADD** Clindamycin 600 mg IV q6H or 900 mg IV q8h for 3-5 days (to stop if no evidence of Group A *Streptococcus*) *Should be started empirically if there is risk of Group A Streptococcus or presence of gas crepitus.*	Meropenem 1g IV q8h **OR** Imipenem 1g IV q6-8h **MAY ADD** Clindamycin 600 mg IV q6H or 900 mg IV q8h for 3-5 days (to stop if no evidence of Group A *Streptococcus*) *Should be started empirically if there is risk of Group A Streptococcus or presence of gas crepitus.*	**Duration:** There is a lack of any convincing evidence regarding the ideal duration of antibiotic therapy, which varies ***between 7 and 14 days***. In general, antibiotics should be continued until no further debridement is needed and the patient's hemodynamic status has normalized.
Type 2: Monomicrobial infection Group A *Streptococcus* (most common)	Benzylpenicillin 2-4 MU IV q4h **PLUS** Clindamycin 600 mg IV q6H or 900 mg IV q8h *If confirmed Group A Streptococcus: Clindamycin & penicillin combination therapy is given until patients are clinically and hemodynamically stable for at least 48 to 72 hours; followed by penicillin monotherapy thereafter.*	-	
Water-related Wound infection **Common organisms:** • *Vibrio vulnificus (fresh water)* • *Aeromonas hydrophila (ocean / brackish water)*	Ceftriaxone 2 g IV q24h **PLUS** Doxycycline 100 mg PO q12h	Ciprofloxacin 400 mg IV q8h	

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Myonecrosis / Gas Gangrene

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Common organisms: *Clostridium* sp (80-95%)	**Mild:** Benzylpenicillin 4 MU IV q4h **PLUS** Clindamycin 600 mg IV q6H or 900 mg IV q8h **Moderate to severe:** Piperacillin/tazobactam 4.5 g IV q6-8h *If given as q8h, to be given as extended infusion (over 3-4 hours)* **PLUS** Clindamycin 600 mg IV q6H or 900 mg IV q8h	-	Aggressive surgical debridement is necessary to remove all necrotic tissue. **Duration: 10-28 days** Refer to **A22: Urinary Tract Infections (UTI) > Fournier's Gangrene** sections for other gas forming infections (e.g. emphysematous pyelonephritis)

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Trauma-Related Infections:

1. Simple Soft Tissue Injuries
2. Complex Soft Tissue Injuries
3. Compound Fractures / Open Fractures

Simple Soft Tissue Injuries

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Minor Wounds with Simple Repair Gunshot wound and superficial stab wound of extremities.	Antibiotics not required. Good wound care is required: • Debridement of devitalized tissue • Irrigation and remove all foreign material • Hemostasis • Closure of the wound when safe and appropriate		

Complex Soft Tissue Injuries

Muscular, skeletal and soft tissue trauma, gunshot or crush & degloving injuries or stab wounds

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Penetrating and puncture-type wounds / Complex soft tissue wounds without open fractures Common organisms: • *Staphylococcus aureus* • Beta-haemolytic *Streptococci* • Polymicrobial infection	Cloxacillin 2 g IV q6h **MAY ADD** Metronidazole 500 mg IV q8h *Add metronidazole if there is soil/rust contamination or heavy machinery.* **MAY ADD** Gentamicin 5 mg/kg IV q24h *Add gentamicin if there's extensive skin and soft tissue involvement (for gram negative coverage)*	Cefazolin 2 g IV q8h **MAY ADD** Metronidazole 500 mg IV q8h *Add metronidazole if there is soil/rust contamination or heavy machinery.* **OR** Cefuroxime 1.5 g q8h **MAY ADD** Metronidazole 500 mg IV q8h *Add metronidazole if there is soil/rust contamination or heavy machinery.* **OR** Amoxicillin/Clavulanate 1.2 g IV q8h	**Duration: depends on the extent of infection.** ▪ For combat-related isolated soft tissue injury, antibiotic duration of **1 - 3 days** may be adequate. ▪ For severe penetrating injuries, especially those involving joints and/or tendons, antibiotics must be given for at least **5 days.** Tetanus immunization should be given in addition to appropriate antibiotics. Antibiotic therapy should be tailored to the susceptibility of deep wound cultures isolates once available.
Plantar Wounds E.g.: penetrating injury through the plantar foot Common organisms: • *Pseudomonas aeruginosa* • *Staphylococcus aureus*	Piperacillin/tazobactam 4.5 g IV q6-8h *If given as q8h, to be given as extended infusion (over 3 -4 hours)* **OR** Cefepime 2 g IV q8h	Ciprofloxacin 750 mg PO q12h	**Duration: total 7-14 days** following adequate surgical debridement if no evidence of established osteomyelitis upon presentation. Tetanus immunization should be given in addition to appropriate antibiotics. Antibiotic therapy should be tailored to the susceptibility of deep wound cultures isolates once available. If there is osteomyelitis, refer to the **Bone and Joint Infections: Osteomyelitis.**

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Compound Fractures / Open Fractures

Compound fractures: Antibiotics are administered as prophylaxis within 3 hours of injury

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Gustilo Type I & II Fractures Common organisms: Gram positive organism	Cefazolin 2 g IV q8h **MAY ADD** Metronidazole 500 mg IV q8h *Add metronidazole if there is soil/rust contamination or heavy machinery.*	Cefuroxime 1.5 g IV q8h **MAY ADD** Metronidazole 500 mg IV q8h *Add metronidazole if there is soil/rust contamination or heavy machinery.*	**Duration:** • Gustilo Type I: stop after 24 hours of surgery • Gustilo Type II: discontinue after 24 hours to 48 hours surgery Pre-debridement and post-debridement cultures are not representative of actual infection.
Gustilo Type III Fractures Common organisms: • Gram positive organisms • Gram negative organisms	Cefazolin 2 g IV q8h **PLUS** Gentamicin 5 mg/kg IV q24h *Add gentamicin if there's extensive skin and soft tissue involvement (for gram negative coverage)* **OR** Cefuroxime 1.5 g q8h **PLUS** Gentamicin 5 mg/kg IV q24h *Add gentamicin if there's extensive skin and soft tissue involvement (for gram negative coverage)* **MAY ADD** Metronidazole 500 mg IV q8h *Add metronidazole if there is soil/rust contamination or heavy machinery.*	Ceftriaxone 2g IV q24h **MAY ADD** Metronidazole 500mg IV q8h *Add metronidazole if there is soil/rust contamination or heavy machinery.* **Presence of water contamination:** **Fresh water contamination:** Piperacillin/tazobactam 4.5 g IV q6-8h *If given as q8h, to be given as extended infusion (over 3 -4 hours)* **Sea water contamination:** Piperacillin/tazobactam 4.5 g IV q6-8h *If given as q8h, to be given as extended infusion (over 3 -4 hours)* **PLUS** Doxycycline 100mg PO q12h	**Duration:** Gustilo Type III: 24 hours after wound closure or up to a maximum of 72 hours (whichever is earlier) Pre-debridement and post-debridement cultures are not representative of actual infection.

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HSgB Antimicrobial Guideline (HAG)

SECTION A: ADULT

A15: OTORHINOLARYNGOLOGY (ORL) INFECTIONS

Launched: October 2024

Updated: -

LIST OF TOPICS WITH LINKS:

1. **Throat & Upper Respiratory Tract (URTI)**
   - Tonsilitis / Pharyngitis
   - Acute Peritonsillar Abscess (Quinsy)
   - Diphtheria
   - Acute Epiglottitis (Supraglottitis)
   - Deep Neck Space Abscess / Parapharyngeal Abscess / Retropharyngeal Abscess / Ludwig Angina
2. **Nose**
   - Acute Rhinosinusitis
   - Acute Bacterial Rhinosinustis
3. **Ear**
   - Otitis Media
   - Otitis Externa
   - Mastoiditis
   - Perichondritis
   - Pinna (External Ear/Auricle) Infections
   - Otomycosis

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Throat & Upper Respiratory Tract (URTI)

Tonsilitis / Pharyngitis

<table>
<tr><th>Infection/Condition & Likely Organism</th><th colspan="2">Suggested Treatment for Adult Patients</th><th>Comments</th></tr>
<tr><th></th><th>Preferred</th><th>Alternative</th><th></th></tr>
<tr><td>Common organism:
Respiratory virus (>80% of cases)
Group A Streptococcus</td><td colspan="2">Use Modified Centor Score to determine infection origin (bacterial or viral) and whether antibiotics are necessary.

<table>
<tr><th>CRITERIA</th><th>SCORE</th></tr>
<tr><td>Absence of cough</td><td>1</td></tr>
<tr><td>Swollen and tender anterior cervical lymph nodes</td><td>1</td></tr>
<tr><td>Temperature (> 38°C)</td><td>1</td></tr>
<tr><td>Tonsillar exudates or severe swelling</td><td>1</td></tr>
<tr><td>Age:
• 3 to 14 years
• 15 to 44 years
• ≥ 45 years</td><td>
1
0
-1</td></tr>
<tr><td>TOTAL SCORE</td><td>0-2: No antibiotic required
3-5: Treat with antibiotic</td></tr>
</table>

Treatment for Modified Centor Score < 3:

Modified Centor Score < 3 does not require antibiotic treatment, as sore throats are commonly viral in origin. Give symptomatic treatment only (e.g: analgesics, antipyretics)

Treatment for Modified Centor Score 3-5:

Modified Centor Score ≥ 3 requires antibiotic therapy due to a higher risk of Group A Streptococcus (GAS) infection</td><td></td></tr>
<tr><td></td><td>Phenoxymethylpenicillin (Pen V) 500 mg PO q6h or 1 g PO q12h

OR

Benzathine Penicillin 1.2 MU IM, one single dose</td><td>Amoxicillin 500 mg PO q8h

Antibiotic allergy:

Erythromycin ethylsuccinate (EES) 800 mg q12h</td><td>Duration: 5-10 days

Consider 10 days in settings with a high prevalence of rheumatic fever or in patients with a history of rheumatic fever or rheumatic heart disease and who are aged between 3 and 21 years.

Antibiotic Allergy: Refer to APPENDICES > Antibiotic Allergy for more info.</td></tr>
</table>

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Acute Peritonsillar Abscess (Quinsy)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Common organism: Group A Streptococcus *Fusobacterium necrophorum* *Streptococcus anginosus* group	Drainage or aspiration of the abscess is the mainstay of treatment for peritonsillar abscess.		
	Benzylpenicillin 2 MU IV q6h **PLUS** Metronidazole 500 mg IV q6-8h **OR** Ampicillin/sulbactam 3 g IV q6h **OR** Amoxicillin/clavulanate 1.2 g IV q8h	**Antibiotic allergy:** Clindamycin 600 mg IV q6h - 900 mg IV q8h	**Duration: 10-14 days of therapy (Intravenous + Oral)** ***DIAMS - IV to PO** **Oral Ampicillin / Sulbactam & Amoxicillin / Clavulanate** has excellent bioavailability (80%). **IV Benzylpenicillin** can switch to **Oral Phenoxymethylpenicillin or Amoxicillin.** *Change to oral antibiotic once patient can tolerate orally **Antibiotic Allergy:** Refer to **APPENDICES > Antibiotic Allergy** for more info.

Diphtheria

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Organism: *Corynebacterium diphtheriae*	Erythromycin lactobionate 500 mg IV q6h, followed by *Erythromycin ethylsuccinate (EES) 800 mg PO q6h **OR** Benzylpenicillin 25,000 units/kg q6h to a maximum of 1 MU IV/IM q6h, followed by Phenoxymethylpenicillin (Pen V) 500 mg PO q6h **PLUS** Diphtheria Antitoxin	**Azithromycin 500 mg OD IV/PO **PLUS** Diphtheria Antitoxin	**Duration: 14 days (intravenous + oral therapy)** Antibiotics are not a substitute for treatment with diphtheria antitoxin. The role of adjunctive antibiotic treatment is to eradicate *C. diphtheriae*, which prevents further toxin production. **DIAMS - IV to PO** Parenteral treatment is preferred for patients who are unable to swallow. Once the patient improves and can swallow comfortably, switch to oral therapy.
Diphtheria Antitoxin Dose depends on severity	**Stage of illness** / **Dose**: Pharyngeal/ laryngeal disease of 2 days duration — 20,000 - 40,000 units Nasopharyngeal disease — 40,000 – 60,000 units Systemic disease of ≥3 days or any patient with diffuse neck swelling — 80,000 – 120,000 units ***Administer over 60 mins to inactivate toxins rapidly***		***CLOSE CONTACT MANAGEMENT** IM Benzathine Penicillin 1.2 MU single dose **OR** *Erythromycin ethylsuccinate (EES) 800 mg q6h for 7-10 days **OR** **Azithromycin 500 mg q24h for 7-10 days *Erythromycin base 250 mg = Erythromycin ethylsuccinate 400 mg **There is no CLSI / EUCAST breakpoint for azithromycin. Thus, azithromycin is advice to be given only for patients who cannot tolerate penicillin or erythromycin

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Acute Epiglottitis (Supraglottitis)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Common organisms: *Streptococcus pneumoniae* *Group A Streptococcus* *Haemophilus influenzae* Type B Virus	Ceftriaxone 2 g IV q24h **OR** Ampicillin/sulbactam 3 g IV q6h **OR** Amoxycillin/clavulanate 1.2 g IV q8h	**Antibiotic allergy:** Clindamycin 600 mg IV q6h - 900 mg IV q8h **PLUS** Ciprofloxacin 400 mg IV q12h	**Duration: 7 to 10 days (intravenous + oral therapy)** Longer in cases of bacteraemia, concomitant meningitis or immunocompromised. Requires urgent hospitalisation. May present with life-threatening upper airway obstruction, especially in paediatrics. Consider adding vancomycin for patients with moderate to severe sepsis, concomitant meningitis or previously colonized with MRSA. ***DIAMS - IV to PO / OPAT** **Oral Ampicillin / Sulbactam & Amoxicillin / Clavulanate** has excellent bioavailability (80%). **IV Ceftriaxone** can switch to **Oral Amoxicillin / Clavulanate or Cefuroxime** (¬50%). *Change to oral antibiotic once patient can tolerate orally. **If cannot tolerate orally, may consider OPAT.** **Antibiotic Allergy:** Refer to **APPENDICES > Antibiotic Allergy** for more info.

Deep Neck Space Abscess / Parapharyngeal Abscess / Retropharyngeal Abscess / Ludwig Angina

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Common organisms (usually polymicrobial): *Anaerobes (eg Fusobacteria sp, Prevotella sp)* *Streptococcus spp.* *Staphylococcus aureus*	Ampicillin/sulbactam 3 g IV q6h **OR** Amoxycillin/clavulanate 1.2 g IV q8h **OR** Cefuroxime 1.5 g IV q8h **PLUS** Metronidazole 500 mg IV q6h	**Immediate / Delayed Non-Severe Penicillin Allergy:** Cefazolin 2 g IV q8h **OR** Ceftriaxone 2 g IV q24h **PLUS** Metronidazole 500 mg IV q6h **Immediate / Delayed Severe Penicillin Allergy:** Clindamycin 600 mg IV q6h or 900 mg IV q8h	**Duration: 10 to 14 days (intravenous + oral therapy)** For significant abscess, surgical drainage and debridement are required. If there is evidence of necrotising fasciitis (clinical / radiological evidence), may add IV clindamycin. ***DIAMS - IV to PO / OPAT** Once the patient improves, switch to oral therapy after a minimum of 3 to 5 days of intravenous therapy.

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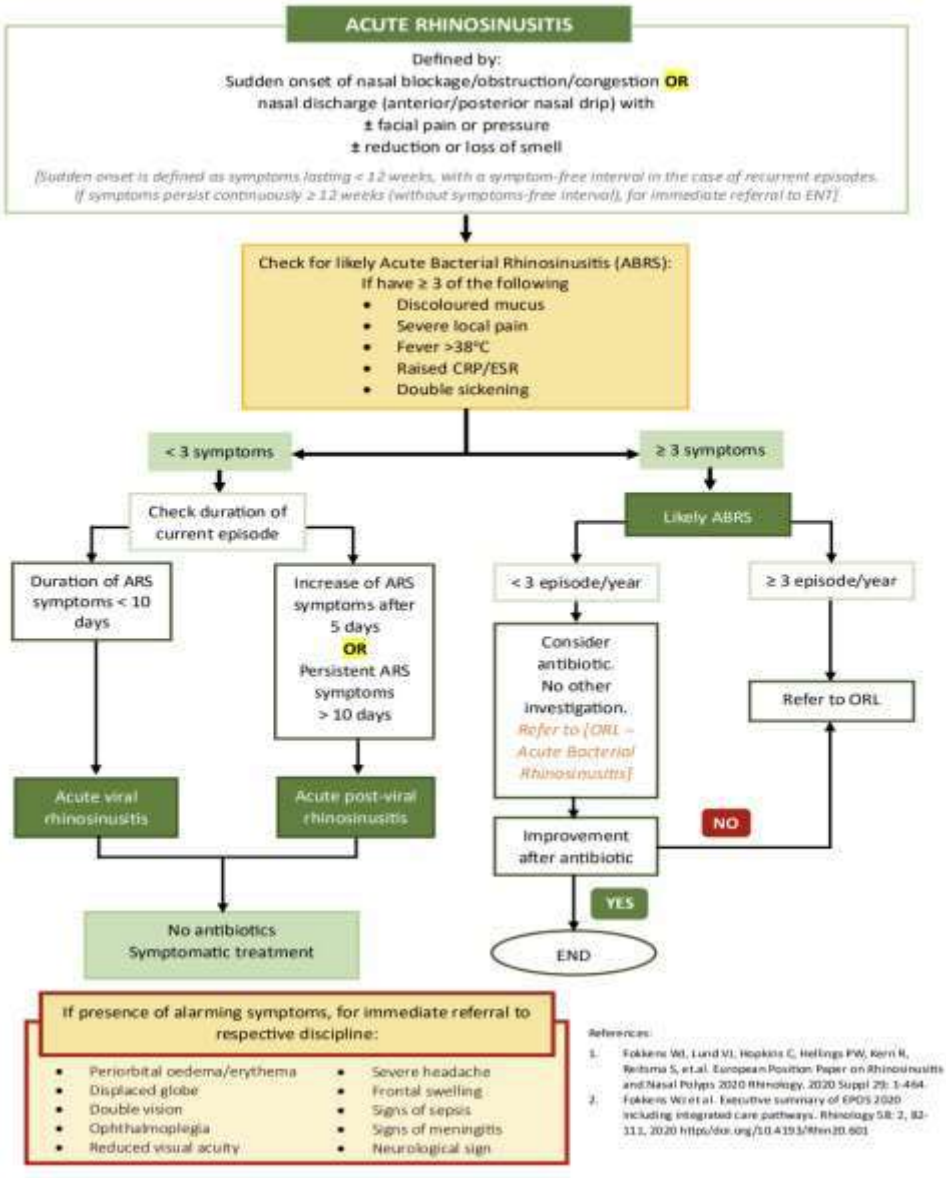
Nose

Rhinosinusitis

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Acute Rhinosinusitis	• Antibiotics are not needed in the majority of cases. Most cases of sinusitis occur as a complication of a viral upper respiratory tract infection and are self-limited. • Use the **algorithm** below to determine the infection origin (bacterial or viral) and whether antibiotics are necessary. **Algorithm for Acute Rhinosinusitis in Adults**  References: 1. Fokkens WJ, Lund VJ, Hopkins C, Hellings PW, Kern R, Reitsma S, et al. European Position Paper on Rhinosinusitis and Nasal Polyps 2020 Rhinology. 2020 Suppl 29: 1-464. 2. Fokkens WJ et al. Executive summary of EPOS 2020 including integrated care pathways. Rhinology 58: 2, 82-111, 2020 https/doi.org/10.4193/Rhin20.601		
Acute Bacterial Rhinosinustis Common organisms: *Streptococcus pneumoniae* *Haemophilus influenzae* *Moraxella catarrhalis*	**If antibiotic naïve for this current infection:** Amoxicillin 500 – 1000 mg PO q8h **For partially treated:** Amoxicillin/clavulanate 625 mg PO q8h **OR** Ampicillin/sulbactam 375mg PO q12h	**Penicillin Allergy:** Doxycycline 100 mg q12h **Pregnant patients with antibiotic allergy would need to be treated with:** Azithromycin 500 mg PO q24hr for 3 days	**Duration: 5 days** *If no improvement after 3 days of oral antibiotic, refer to Otorhinolaryngology department (Refer to ARS in Adults Algorithm [to link with above algorithm]).* **Antibiotic Allergy:** Refer to **APPENDICES > Antibiotic Allergy** for more info.

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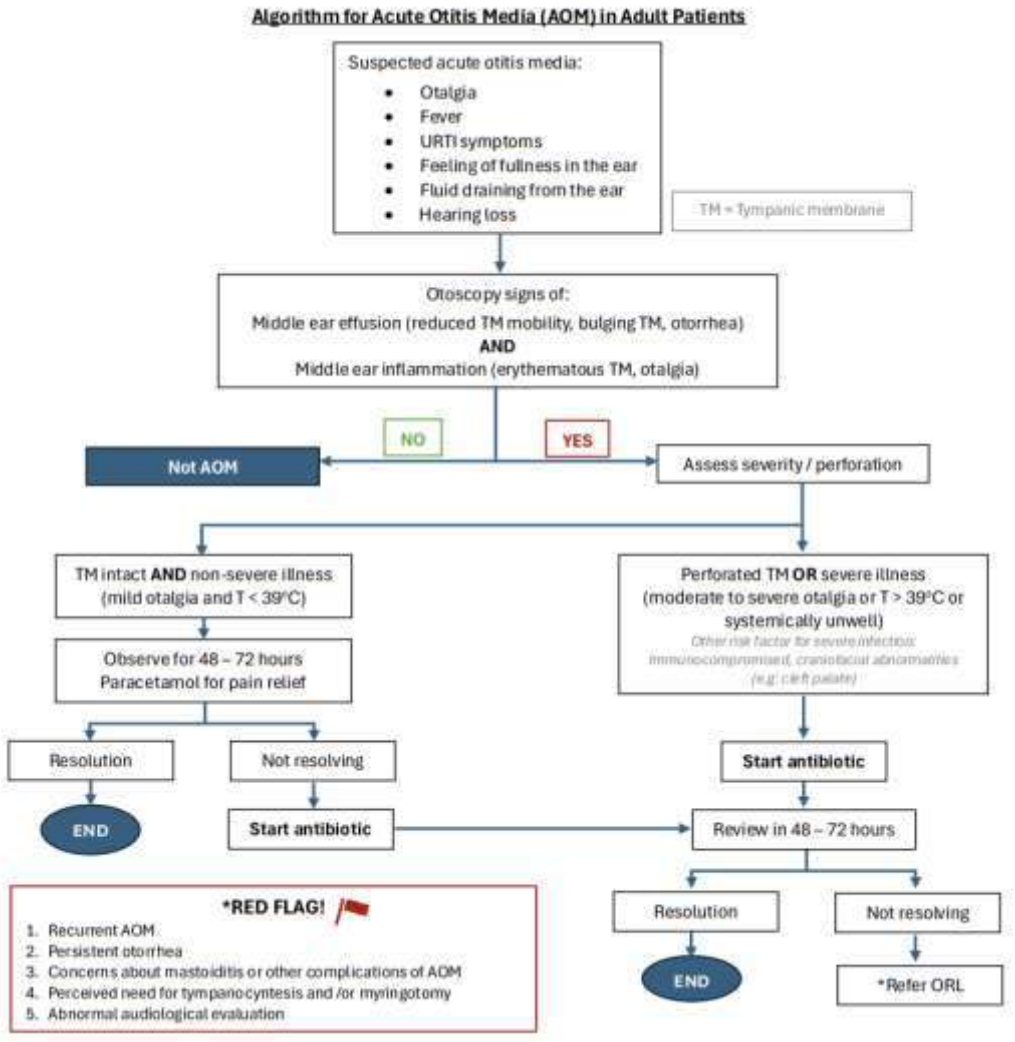
Ear

Otitis Media

<table>
<tr><th rowspan="2">Infection/Condition & Likely Organism</th><th colspan="2">Suggested Treatment for Adult Patients</th><th rowspan="2">Comments</th></tr>
<tr><th>Preferred</th><th>Alternative</th></tr>
<tr><td>Acute Otitis Media (AOM)</td><td colspan="3"> 

Adapted from Clinical Pathway in Primary Care, NAG 2024</td></tr>
<tr><td></td><td>If antibiotic naïve for this current infection:
Amoxicillin 500 – 1000 mg PO q8h

For partially treated:
Amoxicillin/clavulanate 625 mg PO q8h
OR
Ampicillin/sulbactam 375mg PO q12h</td><td>Erythromycin Ethylsuccinate (EES) 400 mg PO q6h or 800 mg PO q12h</td><td>Duration: 5 - 7 days</td></tr>
<tr><td>Chronic Suppurative Otitis Media
Common organisms (often polymicrobial):
Anaerobes
Staphylococcus aureus
Enterobacterales
P. aeruginosa
Mycobacterium tuberculosis</td><td>Ofloxacin 0.3% otic solution.
Instill 10 drops into affected ear(s) q12h.

Referral to ORL is recommended for further examination to exclude cholesteatoma or chronic osteitis.</td><td>-</td><td>Duration: 7 - 14 days

Aural toileting is required in discharging ears</td></tr>
</table>

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Otitis Externa

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Acute Localised Otitis Externa Common organisms: *Staphylococcus aureus* *Streptococcus pyogenes*	Cloxacillin 500 mg PO q6h **OR** Cephalexin 500 mg PO q6h	**Penicillin allergy:** Clindamycin 600 mg PO q8h	**Duration: 5-7 days**
Acute Diffuse Otitis Externa (Swimmer's Ear) Common organisms: *Pseudomonas aeruginosa* *Staphylococcus aureus*	Ofloxacin 0.3% otic solution. Instill 10 drops into affected ear(s) q24h. **PLUS** Amoxicillin/clavulanate 625mg PO q8h **OR** Ampicillin/sulbactam 375mg PO q12h **MAY ADD** Steroid ear drops (when fungal infection is NOT suspected	-	**Duration: 7-14 days** Aural toileting is required in discharging ears
Malignant / Necrotizing Otitis Externa Common organisms: *Pseudomonas aeruginosa (95%)* *Staphylococcus aureus*	Ciprofloxacin 400 mg IV q8h or 750mg PO q12h	Ceftazidime 2 g IV q8h **OR** Piperacillin/tazobactam 4.5 g IV q6–8h *If given as q8h, to be given as extended infusion (over 3 – 4 hours).* Ciprofloxacin 400 mg IV q8h (option for beta-lactam allergic patients)	**Duration: 6 weeks (intravenous + oral)** ***DIAMS - IV to PO / OPAT** Once patient showing a clinical response, switch to oral therapy, change to PO Ciprofloxacin 750 mg q12H to complete the treatment **Oral Ciprofloxacin** has excellent bioavailability (~70%). **CAUTION** Allow a 2-hour **gap between taking Ciprofloxacin and consuming dairy products, multivitamins, antacids or NG tube feeding** to avoid concurrent exposure to multivalent cation (e.g Ca, Fe, Al, Mg, Zn) – cations can bind to the drug & prevent absorption. Hold the tube feeding 1H before or 2H after Ciprofloxacin given.

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Mastoiditis

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
	Cefuroxime 1.5 g IV q8h **PLUS** Metronidazole 500 mg IV q8h **OR** Amoxicillin/Clavulanate 1.2 g IV q8h	Cefazolin 2 g IV q8h **PLUS** Metronidazole 500 mg IV q8h **Severe penicillin allergy:** Clindamycin 600-900 mg IV q8h	**Duration:** 10 -14 days (IV + oral)
	If breached intracranially, Ceftriaxone 2g IV q24h **MAY ADD** Metronidazole 500 mg IV q8h	-	**Duration:** 10 -14 days (IV + Oral)

Perichondritis

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Infection of the ear cartilage	Ciprofloxacin 750 mg PO q12h	-	**Duration:** 7 days

Pinna (External Ear/Auricle) Infections

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Skin infection of the external ear/auricle	Amoxicillin/clavulanate 1.2 g IV q8h	Ampicillin/sulbactam 3 g IV q8h	**Duration:** 7 days

Otomycosis

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Common organism: *Candida* sp. *Aspergillus* sp.	Clotrimazole 1% ear solution, apply q6-8h		**Duration:** 10 - 14 days Aural toileting is required in discharging ears

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HSgB Antimicrobial Guideline (HAG)

SECTION A: ADULT

A16:
RESPIRATORY INFECTIONS

Launched: October 2024

Updated: -

LIST OF TOPICS WITH LINKS:

1. **Upper Respiratory Tract Infections (URTI)**
2. **Lower Respiratory Tract Infections (LRTI)**
   - Community Acquired Pneumonia (CAP)
   - Viral Pneumonia
   - COVID-19
   - Influenza
   - Varicella Zoster
   - Lung Abscess and Empyema
   - Infective Exacerbation of Chronic Obstructive Pulmonary Disease (COPD)
   - Hospital Acquired Pneumonia (HAP/VAP)
   - Aspiration Pneumonia

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Upper Respiratory Tract Infections (URTI)

C1: ACUTE BRONCHITIS AND PNEUMONIA

ADULT PATIENTS

Suspected pneumonia/acute bronchitis:
Acute cough ± sputum

Consider differential diagnosis
Eg. URTI, asthma, COPD, CCF, post-nasal drip, ACE-I induced cough

Vital Sign Abnormalities – if any of the following:
- Tachycardia (HR > 100 beats/min)
- Tachypnoea (RR > 24 breaths/min)
- Fever (Temperature > 38°C)
- Hypoxemia (SPO2 < 95%)

YES → Physical Examination: Abnormalities suggestive of consolidation or pleural effusion?

YES → Treat as **Pneumonia**. Do CXR as baseline (if facility available)

NO → Do CXR (if facility available. If not available, to refer). Does it suggest pneumonia?

YES → Treat as **Pneumonia**. Do CXR as baseline (if facility available)

NO → **Acute Bronchitis** likely:
- Antibiotics are not needed
- Great majority of cases are self-limiting and of viral origin
- Symptomatic treatment
- Consider bronchodilator in case of wheezing

NO → Physical Examination: Abnormalities suggestive of consolidation or pleural effusion?

NO → **Acute Bronchitis** likely:
- Antibiotics are not needed
- Great majority of cases are self-limiting and of viral origin
- Symptomatic treatment
- Consider bronchodilator in case of wheezing

Recommended dosage (**adult outpatient**):

Antibiotics	Dosing	Duration	Remarks
Amoxycillin	500 – 1000 mg PO q8h	5-7 days	Preferred
Amoxycillin/clavulanate	625 mg PO q8h	5-7 days	Alternative
Doxycycline	100 mg PO q12h	5-7 days	Alternative

CRB – 65 (***consider hospitalization if ≥ 2***)
- Confusion (new onset)
- RR ≥ 30 breaths/min
- SBP < 90 or DBP ≤ 60mmHg

Other consideration for hospitalization: SpO2 < 95%, comorbidities and inability to maintain oral intake

Consider **Pertussis** during outbreak:
- Cough ≥ 2 weeks
- Paroxysms of cough
- Post-tussive vomiting
- Inspiratory whoop

Erythromycin Ethylsuccinate 800 mg PO q12h for 14 days

Consider **COVID-19**

Consider **Influenza** during outbreak:
- Acute fever and myalgia
- Oseltamivir 75mg PO q12h for 5 days indicated for high risk* patients (regardless of onset of symptom duration)
- For non-high-risk patients, clinical benefit is greatest if initiated within 48 hours

**Patients at higher risk for influenza*:
- Age <2 years or ≥ 65 years old
- Pregnant women or immunosuppressed individuals
- Patients with chronic medical conditions e.g. CCF, IHD, chronic lung disease, asthma, CKD, DM, malignancy, chronic liver disease, etc.
- Morbid obesity (BMI ≥ 40 kg/m^2)

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Lower Respiratory Tract Infections (LRTI)

Community Acquired Pneumonia (CAP)

- The diagnosis of CAP generally requires the demonstration of an infiltrate on chest radiograph in a patient with a clinically compatible syndrome (E.g.: fever, dyspnoea, cough and sputum production).
- Previous relevant encounters at any health care facilities and antibiotic exposure must be obtained.
- Pulmonary tuberculosis (PTB) must be considered and further investigated in an appropriate clinical situation such as prolonged symptoms, presence of risk factors for PTB and radiological changes compatible with PTB.
- Choice of antibiotic treatment must also be based on likely etiology and local antibiogram whenever possible.
- Assessment of severity and decision for admission can be guided by using CURB-65 or SMART-COP scoring. Physician should use the scoring tools to support, not to replace clinical judgment.

Subtopics Links:

1. **Assessment of severity and decision for admission tools**
2. **Outpatient**
3. **Outpatient (with comorbidities)**
4. **Inpatient – Moderate CAP**
5. **Inpatient – Severe CAP**

Assessment of severity and decision for admission tools

CURB-65

CURB-65 criteria
(1 point for each criterion)

- Confusion (new onset)
- Urea > 7 mmol/l
- Respiratory rate of ≥ 30/min
- Blood pressure ≤ 90/60 mmHg
- Age ≥ 65 65

CURB-65 score

- **Score 0-1:** Mild. Can manage outpatient.
- **Score 2:** Moderate. Consider admission.
- **Score 3-5:** Severe. Inpatient admission. Consider ICU referral.

Alternatively, CRB-65 can also be used. It does not require laboratory values for its calculation, and the score value interpretation is the same as for CURB-65.

SMART-COP

SMART-COP criteria

Criteria	Point
Systolic BP < 90mmHg	2
Multilobar CXR involvement	1
Albumin <3.5 g/dL	1
Respiratory rate ≥ 30/min (≥ 25/min if ≤50 yrs old)	1
Tachycardia ≥ 125/min	1
Confusion (new onset)	1
Oxygen saturation *If age >50:* *SpO2 ⩽90% OR PaO2<60 or PF ratio <250* *If age ⩽50:* *SpO2 ⩽93% OR PaO2<70 or PF ratio <333*	2
Arterial pH <7.35	2

SMART-COP score

- **Score 0-2:** Mild. Can manage outpatient.
- **Score 3-4:** Moderate. Inpatient admission.
- **Score ≥5:** Severe. Consider ICU referral.

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Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Outpatient	Amoxicillin 500 mg-1 g PO q8h for 5-7 days	Doxycycline 100 mg PO q12h for 5-7 days	
Outpatient (with comorbidities) **Comorbidities:** Chronic heart, lung, liver, or renal disease, diabetes mellitus, alcoholism, malignancy, or asplenia.	Amoxicillin/clavulanate 625 mg PO q8h for 5-7 days **MAY ADD** *Azithromycin 500 mg PO q24h for 3 days	**Antibiotic allergy:** **Levofloxacin 750 mg PO q24h for 5 days	***Azithromycin:** May add if atypical pathogen is suspected. **Levofloxacin should be strictly reserved for antibiotic allergy due to higher risk of adverse events. **Antibiotic Allergy:** Refer to **APPENDICES > Antibiotic Allergy** for more info.
Inpatient – Moderate CAP CURB-65 score 2 or SMART-COP score 3-4	Amoxicillin/clavulanate 1.2 g IV q8h for 5-7 days **PLUS** *Azithromycin 500 mg IV/PO q24h for 3 days	Ceftriaxone 2 g IV q24h for 5-7 days **PLUS** *Azithromycin 500 mg IV/PO q24h for 3 days **Antibiotic allergy:** **Levofloxacin 750 mg IV/PO q24h for 5-7 day	***Azithromycin:** May need a longer duration of therapy among immunocompromised patients or those with confirmed Legionella pneumonia. ****Levofloxacin** should be strictly reserved for antibiotic allergy due to higher risk of adverse events. ***DIAMS - IV to PO** **IV Ceftriaxone** can switch to PO Amoxicillin/clavulanate, when clinical condition improves, and patient is able to tolerate orally. If suspected melioidosis infection, refer to **Tropical Infection > Melioidosis** section.
Inpatient – Severe CAP CURB-65 score ≥ 3 or SMART-COP score ≥ 5	Amoxicillin/clavulanate 1.2 g IV q8h for 5-7 days **OR** Ceftriaxone 2 g IV q24h for 5-7 days **PLUS** *Azithromycin 500 mg IV/PO q24h for 3 days	**If at risk of pseudomonal infection*:** **Piperacillin/tazobactam 4.5g IV q6-8h for 7 days *If given as q8h, to be given as extended infusion (over 3-4 hours)* **OR** Cefepime 2g IV q8h for 7 days **PLUS** *Azithromycin 500mg IV/PO q24h for 3 days	***Strong risk factors for pseudomonal infection:** ▪ Prior respiratory infection or isolation of *P. aeruginosa* ▪ Hospitalization with receipt of IV antibiotics in past 3 months ▪ Detection of gram-negative rods on a good-quality sputum gram stain **Other risk factors for pseudomonal infection:** ▪ Recent hospitalization or stay in a long-term care facility ▪ Recent antibiotic use ▪ Frequent COPD exacerbations requiring glucocorticoid/antibiotic ▪ Structural lung diseases ▪ Immunosuppressed ***Azithromycin:** May need a longer duration of therapy among immunocompromised patients or those with confirmed Legionella pneumonia.

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Viral Pneumonia

COVID-19

Refer to COVID-19 Management Guidelines in Malaysia.

Influenza

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
	Oseltamivir 75 mg PO q12h for 5 days		Clinical benefit is greatest if initiated within 48 hours. In hospitalized / immunocompromised patients, treatment is started regardless of symptom duration, and may need longer duration of treatment.

Varicella Zoster

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
	Acyclovir 10 mg/kg IV q8h for 7 days		

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Lung Abscess and Empyema

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Empirical treatment	**No recent thoracic surgery/ procedure or HAP/VAP:** Amoxicillin/clavulanate 1.2 g IV q6-8h **OR** Ampicillin-sulbactam 3 g IV q6h **Post-procedure (e.g. pleural interventions, thoracic or oesophageal surgery) or presence of HAP/VAP:** Piperacillin-tazobactam 4.5 g IV q6-8h *If given as q8h, to be given as extended infusion (over 3-4 hours)* **MAY ADD** *Vancomycin 15-20 mg/kg (actual body weight) IV q8-12h	**No recent thoracic surgery/ procedure or HAP/VAP:** Ceftriaxone 2 g IV q24h **PLUS** **Metronidazole 500 mg IV q8h **Antibiotic allergy:** Clindamycin 600 mg IV/PO q8h **Post-procedure (E.g. pleural interventions, thoracic or oesophageal surgery) or presence of HAP/VAP:** Meropenem 1 g IV q8h **MAY ADD** *Vancomycin 15-20 mg/kg IV q8-12h	**Lung empyema:** Attempts should be made to drain the collection to improve clinical outcome. **Duration:** ▪ **Adequate source control:** 2-4 weeks of antibiotics from the time of drainage/surgery and defervescence. ▪ **Inadequate source control:** 4-6 weeks of antibiotics. Avoid aminoglycosides in the management of empyema. If melioidosis is suspected, refer to **Tropical Infection > Melioidosis** section. * **Vancomycin:** May add if hospital MRSA prevalence is high. Refer DIAMS Vancomycin Protocol **Metronidazole**: in cases of lung abscess when aspiration is suspected. **Antibiotic Allergy:** Refer to **APPENDICES > Antibiotic Allergy** for more info. *DIAMS - IV to PO Change to oral regime once clinical improvement is seen.
Methicillin-susceptible *Staphylococcus aureus* (MSSA)	Cloxacillin 2 g IV q4h	Cefazolin 2 g IV q8h	**Duration: 4-6 weeks**, depending on clinical response. In rare cases (slow response to antibiotics) may need prolonged therapy. *DIAMS - IV to PO Change to **Amoxicillin/clavulanate 625 mg PO q8h** to complete the duration improvement is seen.

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Infective Exacerbation of Chronic Obstructive Pulmonary Disease (COPD)

Antibiotics only considered if there is:

- Increased purulence in sputum **AND** one of the following:
  - Increased sputum volume
  - Increased dyspnoea

OR

- Patient intubated

Infection/Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	
Outpatient	Amoxicillin/clavulanate 625 mg PO q8h for 5 days	Cefuroxime 500 mg PO q12h for 5 days **OR** Doxycycline 100 mg PO q12h for 5 days	
Inpatient	Amoxicillin/clavulanate 1.2 g IV q8h for 5-7days **MAY ADD** Azithromycin 500 mg IV/PO for 3 days	Ceftriaxone 2 g IV q24h for 5-7 days **MAY ADD** Azithromycin 500 mg IV/PO for 3 days	*DIAMS - IV to PO Change to oral regime once clinical improvement is seen
Inpatient with Risk Factor of Pseudomonal Infection	Piperacillin-tazobactam 4.5 g IV q6-8h for 7 days *If given as q8h, to be given as extended infusion (over 3-4 hours)* **MAY ADD** Azithromycin 500 mg IV/PO for 3 days	Cefepime 2 g IV q8h for 7 days **MAY ADD** Azithromycin 500 mg IV/PO for 3 days	Risk factors for pseudomonal infection: ▪ Chronic colonization of previous isolation of *Pseudomonas aeruginosa* from sputum ▪ Very severe COPD (FEV1<30% predicted) ▪ Bronchiectasis ▪ Broad spectrum antibiotic use within the past 3 months ▪ Chronic systemic glucocorticoid use

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Hospital Acquired Pneumonia (HAP/VAP)

HAP: Pneumonia that occurs ≥ 48 hours after admission and did not appear to be incubating at the time of admission
VAP: Pneumonia that occurs ≥ 48 hours after endotracheal intubation

Risk factors for multidrug-resistance (MDR) organisms HAP/VAP:
- Prior intravenous antibiotic use within 90 days
- Previous colonization or infection with MDR pathogens

Additional risk factors for MDR organisms VAP:
- Septic shock at time of VAP
- Acute respiratory distress syndrome (ARDS) or acute renal replacement therapy (RRT) preceding VAP
- ≥ 5 days of hospitalization prior to onset of VAP

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Early Onset HAP/VAP 2 - 4 days of admission/intubation	Amoxicillin/clavulanate 1.2 g IV q8h for 5-7days	Ceftriaxone 2 g IV q24h for 5-7 days	Need to adjust to local antibiogram/ prevalent organisms. **Consider broader spectrum antibiotic if deteriorated while on adequate antibiotic therapy.**
Late Onset HAP/VAP (5 days or more of admission/intubation) **OR** **Severe Pneumonia** ▪ Septic shock ▪ Respiratory failure, need for ventilation support ▪ Rapid progression of infiltrates on chest X-ray **OR** **At risk of Pseudomonal Infection**** (refer to comments column)	Piperacillin-tazobactam 4.5g IV q6-8h for 7 days *If given as q8h, to be given as extended infusion (over 3-4 hours)* **OR** Cefepime 2g IV q8h for 7 days	**High risk of MDR organisms:** Meropenem 1g IV q8h for 7 days **OR** Imipenem/cilastatin 500mg IV q6h for 7 days	** **Strong risk factors for pseudomonal infection:** ▪ Prior respiratory infection or isolation of *P. aeruginosa* ▪ Hospitalization with receipt of IV antibiotics in past 3 months ▪ Detection of gram-negative rods on a good-quality sputum gram stain ** **Other risk factors for pseudomonal infection:** ▪ Recent hospitalization or stay in a long-term care facility ▪ Recent antibiotic use ▪ Frequent COPD exacerbations requiring glucocorticoid/antibiotic ▪ Structural lung diseases ▪ Immunosuppressed Ideal empirical antibiotic coverage depends on local prevalence of organisms. To de-escalate antibiotics according to culture and sensitivity results. Longer duration may be indicated depending upon clinical, radiological and laboratory parameters.

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Aspiration Pneumonia

It is important to distinguish aspiration pneumonia from aspiration events/ aspiration pneumonitis:

- **Aspiration pneumonia**: a bacterial infection caused by aspiration of organisms from oropharynx.
- **Aspiration (chemical) pneumonitis**: acute chemical injury to the lung parenchyma after aspiration of acidic stomach contents. Antibiotic is not indicated.

Indications of antibiotic therapy:

- Delayed symptoms (suggestive of aspiration pneumonia, as compared to rapid onset within hours in pneumonitis)
- Patients taking gastric acid suppression therapy or with bowel obstruction

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
	Amoxicillin/clavulanate 1.2 g IV q8h	Ceftriaxone 2 g IV q24h **MAY ADD** Metronidazole 500 mg IV q8h **Antibiotic allergy:** Clindamycin 600 mg IV/PO q8h	**Duration: 7 days** Anaerobic coverage is not routinely required for suspected aspiration pneumonia unless lung abscess or empyema is suspected. ***DIAMS - IV to PO** Change to oral regime once clinical improvement is seen

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HSgB Antimicrobial Guideline (HAG)

SECTION A: ADULT

A17: SEPSIS

Launched: October 2024

Updated: -

Guide for Choice of Empirical Therapy in Sepsis or Septic Shock

General Approach:

1. Initiate empirical broad spectrum antibiotic regimens targeting the most likely pathogens for the suspected infections.
2. Evaluate appropriateness of antimicrobial therapy daily, with consideration given to the patient's clinical assessment and improvement.
3. Modify antibiotic therapy in 48 to 72 hours once additional information is available (E.g.: source of infection, imaging, results of Gram stain, culture and susceptibility testing).
4. Review the appropriateness of antibiotic regimen chosen for opportunities to de-escalate or potentially discontinue therapy if infection is unlikely according to the principles of **Antimicrobial Stewardship.**

Source of infection is not apparent

The choice of empirical regimen should be guided by:

- **age** (e.g.: neonates, paediatric or adult)
- **where** the infection was acquired (i.e. in the community or in hospital), or is associated with healthcare-contact or overseas travel
- **recent culture** and susceptibility testing if available
- **risk factors** for the likelihood of drug-resistant infection including history of prior infection, known colonisation, and ecologic data from the hospital and the community of origin
- whether **local microbiology** and antimicrobial susceptibility is known
- whether the patient is **neutropenic or immunocompromised**
- exposure risk or risk factor for acquiring infections which is **locally endemic** (E.g.: melioidosis, typhoid, leptospirosis)

Source of infection is identified

When the source of sepsis or septic shock is apparent (e.g.: sepsis or septic shock that develops in a patient with pneumonia or urinary tract infection), the antibiotic selection should be **based on the common pathogens** typically associated with the **source and their usual susceptibilities.**

For more details on the appropriate antibiotic choice, please refer to the relevant section of the source of infection.

Reference: Strich JR, Heil EL, Masur H. Considerations for Empiric Antimicrobial Therapy in Sepsis and Septic Shock in an Era of Antimicrobial Resistance. J Infect Dis. 2020 Jul 21;222(Suppl 2):S119-S131. doi: 10.1093/infdis/jiaa221. PMID: 32691833; PMCID: PMC7372215.

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HSgB Antimicrobial Guideline (HAG)

SECTION A: ADULT

A18: SEXUALLY TRANSMITTED INFECTIONS (STI)

Launched: October 2024

Updated: -

LIST OF TOPICS WITH LINKS:

1. **STI Introduction**
2. **Anogenital Ulcer Disease**
   - Syphilis (*Treponema pallidum*)
   - Syphilis in Pregnancy
   - Genital Herpes (*Herpes simplex* virus (HSV) Type 1 and 2)
   - Chancroid
   - Lymphogranuloma Venereum (LGV)
   - Granuloma Inguinale (Donovanosis)
   - MPOX (Monkeypox Virus)
3. **Urethral Discharge**
   - Gonorrhoea (*Neisseria gonorrhoeae*)
   - Chlamydia (*Chlamydia trachomatis*)
   - Non-Gonococcal Urethritis (NGU)
   - Epididymo-Orchitis / Epididymitis
4. **Vaginal Discharge**
   - Trichomoniasis
   - Cervicitis
   - Bacterial Vaginosis
   - Vulvovaginal Candidiasis (*Candida* spp.)

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STI Introduction

Sexually transmitted infections (STIs) which have similar signs and symptoms are grouped into syndromes:

- Anogenital ulcer disease (syphilis, herpes simplex, chancroid, lymphogranuloma venereum (LGV), donovanosis, Mpox)
- Urethral discharge (gonorrhoea, chlamydia, non-gonococcal urethritis, epididymo-orchitis)
- Vaginal discharge (trichomoniasis, bacterial vaginosis, candidiasis, cervicitis)
- Anorectal discharge (gonorrhoea, chlamydia, LGV)

Syndromic approach is essential to ensure appropriate, prompt and effective treatment.

Anogenital Ulcer Disease

Syphilis (*Treponema pallidum*)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Primary syphilis, Secondary syphilis, Early latent syphilis (history of syphilis infection within the last 2 years)	Benzathine Penicillin 2.4 MU IM STAT **OR** Procaine Penicillin 600,000 units IM q24h for 10 days	**For penicillin allergy:** Doxycycline 100 mg PO q12h for 14 days	Sexual partner(s) should be examined, investigated and treated epidemiologically. Abstain from sex for 1 week after the patient and partner(s) have completed treatment. If drug administration is interrupted for ≥ 1 day at any point during the treatment course, the entire course may need to be restarted. Patients should be warned of possible reactions to treatment: ▪ Jarisch-Herxheimer reaction ▪ Anaphylaxis/allergy
Late latent syphilis, Gumma (benign tertiary) syphilis, Cardiovascular syphilis	Benzathine Penicillin 2.4 MU IM weekly for 3 weeks (Day 1, 8, and 15) **OR** Procaine penicillin 600,000 units IM q24h for 14 days	**For penicillin allergy:** Doxycycline 100 mg PO q12h for 28 days	Sexual partner(s) should be examined, investigated and treated epidemiologically. Abstain from sex for 1 week after the patient and partner(s) have completed treatment. Cardiovascular syphilis: Consider prednisolone 40-60mg PO q24h for 3 days starting 24 hours before the antibiotics. If benzathine penicillin is interrupted by ≥ 2 weeks in between the weekly doses, the entire course needs to be restarted.

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Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Neurosyphilis	Benzylpenicillin 4 MU q4h IV for 14 days **OR** Procaine penicillin 2.4 MU IM q24h for 14 days **PLUS** *Probenecid 500 mg PO q6h for 14 days	**For penicillin allergy without anaphylaxis:** Ceftriaxone 2 g IM or IV q24h for 14 days **OR** **If anaphylaxis to penicillin:** Doxycycline 200 mg PO q12h for 28 days	Consider Prednisolone 40-60mg PO q24h for 3 days starting 24 hours before the antibiotics. *Indication not listed in MOH Drug Formulary.
Syphilis in HIV (Primary, secondary, early and late latent and neurosyphilis)	Treatment as appropriate for stage of infection.		
Incubating syphilis / epidemiological treatment	Benzathine penicillin 2.4 MU IM STAT	**For penicillin allergy:** Doxycycline 100 mg PO q12h for 14 days	

Syphilis in Pregnancy

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Primary syphilis, Secondary syphilis, Early latent syphilis (history of syphilis infection within the last 2 years)	Benzathine Penicillin 2.4 MU IM STAT **OR** Procaine Penicillin 600,000 units IM q24h for 10 days	**For penicillin allergy:** *Desensitize and treat with penicillin as there are no proven alternatives. **If failed desensitization:** Ceftriaxone 500 mg IM q24h for 10 days **OR** Azithromycin 2 g PO STAT **OR** Erythromycin ethylsuccinate (EES) 800 mg PO q6h for 14 days	Sexual partner(s) should be examined, investigated and treated epidemiologically. If macrolide is used, for neonate assessment and treatment at birth. *The benefit of treatment outweighs the risk of allergic reaction in skin test and desensitization. Refer to **APPENDICES > Penicillin Desensitization Protocol** for more info.
Late latent syphilis, Gumma (benign tertiary) syphilis, Cardiovascular syphilis	Benzathine Penicillin 2.4 MU IM weekly for 3 weeks (Day 1, 8, and 15) **OR** Procaine penicillin 600,000 units IM q24h for 14 days	**For penicillin allergy:** Erythromycin ethylsuccinate (EES) 800 mg PO q6h for 28 days	Sexual partner(s) should be examined, investigated and treated epidemiologically. If macrolide is used, for neonate assessment and treatment at birth. Cardiovascular syphilis: Consider prednisolone 40-60mg PO q24h for 3 days starting 24 hours before the antibiotics.
Neurosyphilis	Benzylpenicillin 4 MU q4h IV for 14 days **OR** Procaine penicillin 2.4 MU IM q24h for 14 days **PLUS** *Probenecid 500 mg PO q6h for 14 days	**For penicillin allergy without anaphylaxis:** Ceftriaxone 2 g IM or IV q24h for 14 days	Consider Prednisolone 40-60mg PO q24h for 3 days starting 24 hours before the antibiotics. *Indication not listed in MOH Drug Formulary.

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Genital Herpes (*Herpes simplex* virus (HSV) Type 1 and 2)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
First episode	Acyclovir 400 mg PO q8h for 7-10 days	*Valacyclovir 1 g PO q12h for 7-10 days	Physical supportive measures (saline bathing, analgesia, local anaesthetics) are recommended. Oral antiviral drugs indicated within 5 days of the start of the episode and while new lesions are still forming. Topical antivirals are less effective than oral agents and not recommended, due to the association with acyclovir resistant strain. Addition of topical antivirals to oral treatment is of no benefit. *Not listed in MOH Drug Formulary.
Recurrent episode	**Short course:** Acyclovir 800 mg PO q8h for 2 days **5-day course:** Acyclovir 800 mg PO q12h for 5 days	**Short course:** *Valacyclovir 500 mg PO q12h for 3 days **5-day course:** *Valacyclovir 1 g PO q24h for 5 days	*Not listed in MOH Drug Formulary.
Suppressive therapy If ≥ 6 recurrences/year, severe, prolonged or with psychosocial problems.	Acyclovir 400 mg PO q12h for up to 1 year, then reassess. **If break-through recurrences occur:** Increase to Acyclovir 400 mg PO q8h for 7-10 days	*Valacyclovir 500 mg PO q24h for up to 1 year, then reassess **If ≥ 10 recurrences/year:** *Valacyclovir 1 g PO q24h for up to 1 year, then reassess	*Not listed in MOH Drug Formulary.
Severe disease Requiring hospitalisation.	Acyclovir 5-10 mg/kg/dose IV q8h for 10-14 days		
First episode (in pregnancy)	Acyclovir 400 mg PO q8h for 7-10 days **For 3rd trimester acquisition:** Continue treatment till delivery	*Valacyclovir 500 mg PO q12h for 7-10 days	*Not listed in MOH Drug Formulary.
Recurrent episode (in pregnancy)	Acyclovir 400 mg PO q8h Treatment recommended starting at 36 weeks' gestation.	*Valacyclovir 500 mg PO q12h Treatment recommended starting at 36 weeks' gestation.	*Not listed in MOH Drug Formulary.

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Chancroid

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Haemophilus ducreyi	Azithromycin 1 g PO STAT	Ceftriaxone 250 mg IM STAT **OR** Ciprofloxacin 500 mg PO q12h for 3 days **OR** Erythromycin ethylsuccinate (EES) 800 mg PO q8h for 7 days	Sexual partner(s) within 10 days before onset of the patient's symptoms should be examined and treated even in the absence of symptoms. Patients should be re-examined 3-7 days after initiation of therapy. Successful treatment: Ulcers improve symptomatically within 3 days and substantial re-epithelization occurs within 7 days after onset of therapy. In pregnancy/breastfeeding, to use azithromycin, ceftriaxone or erythromycin

Lymphogranuloma Venereum (LGV)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Chlamydia trachomatis serovars L1,2,3	*Doxycycline 100 mg PO q12h for 21 days	Azithromycin 1 g PO weekly for 3 weeks **OR** Erythromycin ethylsuccinate (EES) 800 mg PO q6h for 21 days	Sexual partner(s) within 60 days should be evaluated and treated if symptomatic. If asymptomatic, they should be empirically treated for exposure with doxycycline 100 mg PO q12h for 7 days. Proctitis and anorectal discharge are common especially in the MSM population. Fluctuant buboes: Should be aspirated through healthy adjacent skin. Surgical incision contraindicated. If an alternative treatment regimen is given or pregnant, consider test-of-cure 4 weeks after completion of treatment. *Doxycycline is contraindicated in pregnancy.

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Granuloma Inguinale (Donovanosis)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Klebsiella granulomatis	Azithromycin 1 g PO weekly or 500mg q24h	*Doxycycline 100 mg PO q12h **OR** Trimethoprim/Sulfamethoxazole (Bactrim) 160 mg/800 mg (= 2 tablets) PO q12h **OR** Erythromycin ethylsuccinate (EES) 800 mg PO q6h	Sexual partner(s) within 60 days before onset of the patient's symptoms must be screened and treated. Duration of treatment: at least 3 weeks or until all lesions have completely healed. *Doxycycline is contraindicated in pregnancy.

MPOX (Monkeypox Virus)

Refer to Guidelines on Mpox Management in Malaysia.

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Urethral Discharge

Gonorrhoea (*Neisseria gonorrhoeae*)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Uncomplicated (cervix, urethra, rectum, pharynx)	**Cervix, urethra, rectum:** Ceftriaxone 500 mg IM STAT (if BW>150kg, 1g IM STAT) **PLUS** *Doxycycline 100 mg PO q12h for 7 days *(if Chlamydia has not been excluded)*	**Cervix, urethra, rectum (Cephalosporin allergy):** Gentamicin 240 mg IM STAT **PLUS** Azithromycin 2 g PO STAT	Sexual partner(s) within 60 days should be examined, investigated and treated epidemiologically irrespective of the test results. Abstain from sex for 1 week after the patient and partner(s) have completed treatment and symptoms are resolved. *Doxycycline is contraindicated in pregnancy.
	Pharynx: Ceftriaxone 500 mg IM STAT (if BW>150kg, 1g IM STAT) **PLUS** *Doxycycline 100 mg PO q12h for 7 days *(if Chlamydia has not been excluded)*	**Pharynx (Anaphylaxis or severe reaction to cephalosporin):** Consult for expert opinion	
In Pregnancy	Ceftriaxone 500 mg IM STAT (if BW>150kg, 1g IM STAT) **PLUS** Azithromycin 1 g PO STAT *(if Chlamydia has not been excluded)*	**Anaphylaxis or severe reaction to cephalosporin:** Consult for expert opinion	
Disseminated gonococcal infection (DGI)	**With arthritis-dermatitis syndrome:** Ceftriaxone 1 g IV or IM q24h for 7 days **With purulent arthritis:** Ceftriaxone 1 g IV or IM q24h for 7-14 days **With meningitis:** Ceftriaxone 1-2 g IV q12h-24h for 10-14 days **With endocarditis:** Ceftriaxone 1-2 g IV q12h-24h for 4-6 weeks	**With arthritis-dermatitis syndrome:** Cefotaxime 1 g IV q8h for 7 days	
Conjunctivitis	Refer Ocular Infections section		

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Chlamydia (*Chlamydia trachomatis*)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Uncomplicated (cervix, urethra, rectum, pharynx)	Doxycycline 100 mg PO q12h for 7 days	Azithromycin 1 g PO STAT **OR** *Levofloxacin 500 mg PO q24h for 7 days	Sexual partner(s) within 60 days should be examined, investigated and treated epidemiologically, irrespective of the test results. Abstain from sex for 1 week after the patient and partner(s) have completed treatment and symptoms are resolved. * Indication not listed in MOH Drug Formulary.
In pregnancy	Azithromycin 1 g PO STAT	Amoxicillin 500 mg PO q8h for 7 days	

Non-Gonococcal Urethritis (NGU)

Common organisms:

- *Chlamydia trachomatis*
- *Mycoplasma genitalium*
- *Ureaplasma spp.*
- *Trichomonas vaginalis*
- *Adenoviruses*
- *Herpes simplex virus (HSV)*

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
First episode	Doxycycline 100 mg PO q12h for 7 days	Azithromycin 500 mg PO STAT, then 250mg q24h for 4 days	Sexual partner(s) within 60 days should be examined, investigated and treated epidemiologically, irrespective of the test results. Abstain from sex for 1 week after the patient and partner(s) have completed treatment and symptoms are resolved Consider empiric treatment for chlamydia for sexual partner(s). *Indication not listed in MOH Drug Formulary
Recurrent and persistent	**If treated with doxycycline as first line**: Azithromycin 500 mg PO STAT, then 250 mg PO q24h for the next 4 days **PLUS** Metronidazole 400 mg PO q12h for 5 days **If treated with azithromycin as first line**: *Moxifloxacin 400 mg PO q24h for 10-14 days **PLUS** Metronidazole 400 mg PO q24h for 5 days	-	

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Epididymo-Orchitis / Epididymitis

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
STI - related	Ceftriaxone 500 mg IM STAT **PLUS** Doxycycline 100 mg PO q12h for 10 days	-	Abstain from sex until the patient and partner(s) have completed treatment and symptoms are resolved. To review the diagnosis if no clinical improvement after 3 days. Review at 2 weeks to assess treatment compliance, partner(s) notification and resolution of symptoms. Look out for complications i.e., hydrocoele, abscess, infarction, infertility.
STI-related but Unlikely Gonorrhoea	Doxycycline 100 mg PO q12h for 10 days	-	
Non-STI Related (Enteric / Urinary Organisms)	*Levofloxacin 500mg PO q24h for 10 days	*Ofloxacin 200mg PO q12h for 14 days	*Indication not listed in MOH Drug Formulary.

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Vaginal Discharge

Trichomoniasis

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Trichomonas vaginalis	Metronidazole 400 mg PO q12h for 7 days **OR** Metronidazole 2 g PO STAT*	-	Sexual partner(s) should be treated simultaneously. Abstain from sex for 1 week after the patient and partner(s) have completed treatment and symptoms are resolved. *Single high dose metronidazole is associated with gastrointestinal side effects and higher failure rate, especially if partner(s) are not treated concurrently

Cervicitis

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
	*Doxycycline 100 mg PO q12h for 7 days	Azithromycin 1g PO STAT	Presumptive treatment of chlamydia. *Doxycycline is contraindicated in pregnancy

Bacterial Vaginosis

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Common organisms: Anaerobic bacteria (E.g.: *Prevotella sp., Mobiluncus sp., Gardnerella vaginalis, Mycoplasma hominis)*	Metronidazole 400 mg PO q12h for 7 days **OR** Metronidazole 2 g PO STAT*	Clindamycin 300 mg PO q12h for 7 days	Not an STI but frequently detected during STI screening. *Single high dose metronidazole is associated with gastrointestinal side effects.

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Vulvovaginal Candidiasis (*Candida* spp.)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Uncomplicated Infection	Clotrimazole 500 mg as a single vaginal pessary STAT	Fluconazole 150-200 mg PO STAT	
Complicated Infection (Severe Vaginitis Symptoms)	Fluconazole 150-200 mg PO q72h for 2 doses (Day 1 and 4)	Clotrimazole 500 mg vaginal pessary q72h for 2 doses (Day 1 and 4)	
Recurrent Infection (≥ 3 Episodes of Symptomatic Vulvovaginal Candidiasis in <1 year)	Fluconazole 150-200 mg PO q72h for 3 doses (Day 1,4 and 7), then weekly for 6 months	Clotrimazole 500 mg vaginal pessary weekly for 6 months	Treat each episode with a longer course of topical azole.
In Pregnancy	Clotrimazole pessary 500mg as a single vaginal pessary STAT	Topical azole at least for 1 week	Oral azole is contraindicated in pregnancy.

References:

1. Workowski K.A et al. CDC Sexually Transmitted Infections Treatment Guidelines, 2021. MMWR Recomm Rep.
2. Malaysian Guidelines in the Treatment of Sexually Transmitted Infections. 5th edition. 2023
3. Guidelines for the Management of Symptomatic Sexually Transmitted Infections. Geneva: World Health Organization.2021.
4. British Association for Sexual Health and HIV (BASHH) National Guidelines on specific infections.
5. Gilbert, David N., et al. The Sanford Guide to Antimicrobial Therapy Mobile. VA, USA: Antimicrobial Therapy, Inc. 2019.

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HSgB Antimicrobial Guideline (HAG)

SECTION A: ADULT

A19:
SKIN & SOFT TISSUE INFECTIONS (SSTI)

Launched: October 2024

Updated: -

LIST OF TOPICS WITH LINKS:

1. **Purulent Skin & Soft Tissue Infections**
   - Folliculitis
   - Furuncles (“Boils”)
   - Carbuncles
   - Skin Abscess
2. **Non-Purulent Skin & Soft Tissue Infections**
   - Localised Impetigo
   - Generalised Impetigo/Ecthyma
   - Erysipelas
   - Ecthyma Gangrenosum
3. **Other Bacterial Skin & Soft Tissue Infections**
   - Cellulitis
   - Bite – Related Infections
   - Cat Scratch Disease
   - SSTI with Water Exposure
   - SSTI In Neutropenic Patients
   - SSTI caused by Methicillin Resistance *Staphylococcus aureus* (MRSA)
   - If Community Acquired MRSA Suspected
   - Peripheral Phlebitis/Thrombophlebitis
   - Bed Sore / Pressure Sore / Decubitus Ulcer
4. **Mycobacterial Infections**
   - Hansen’s Disease (Leprosy)
   - Non-Tuberculous Mycobacterial (NTM) Skin And Soft Tissue Infections
5. **Fungal Infections**
6. **Viral Infections**
7. **Parasitic Infestation**
   - Scabies
   - Head Lice
   - Body Lice/Pubic Lice

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Purulent Skin & Soft Tissue Infections

Folliculitis

Common organisms:

- *Staphylococcal aureus*
- *Pseudomonas aeruginosa*
- *Malassezia furfur*
- *Herpes simplex virus*
- *Demodex spp.*

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Mild	Usually self-limiting and no treatment is required. Consider good skin hygiene. Warm compresses for comfort.		
Known or Suspected Staphylococcal	Topical 2% fusidic acid q8-12h **OR** Topical 2% mupirocin q8h (Outpatient use only)		General measures include warm compress, antiseptic washes, good skin hygiene and clean sharp razors when shaving. Obtain a pus or swab for culture and sensitivity if accessible. Topical antibiotic therapy is preferred for folliculitis that persists with general measures and involves a limited area of the skin.
Deep or Extensive Lesions	Cloxacillin 500 mg PO q6h **OR** Cephalexin 1000 mg PO q12h		Systemic antimicrobial therapy with *S. aureus* coverage is suggested for patients with deep or extensive folliculitis that fails to resolve or recurs after topical therapy. Consider the etiology of the folliculitis and the severity and the distribution of the lesions. Referral to a dermatologist if other etiologies are considered, especially when initial systemic treatment fails: 1.Gram-negative folliculitis (e.g. *Enterobacter*, *Klebsiella*, *Escherichia*, *Serratia*, *Morganella*, and *Proteus* species): primarily in patients on long-term antibiotic therapy, most often during treatment for acne. 2. Pseudomonal folliculitis: appears 8-48 hours after exposure to contaminated water (e.g. hot tub/spa) or wet suits. 3. Folliculitis caused by *Malassezia furfur*, Demodex mites or herpes simplex virus: seen in immunocompromised patients.

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Furuncles ("Boils")

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Furuncles ("Boils")	Cloxacillin 500 mg PO q6h	Amoxicillin/clavulanate 625 mg PO q8h	**Duration: 5 days** If lesions spontaneously rupture and drain, systemic antimicrobials are usually unnecessary unless fever or evidence of systemic infection is present

Carbuncles

Common organism:

- *Staphylococcus aureus*

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Carbuncles	Cloxacillin 1-2 g IV q6h **OR** Cefazolin 1 g IV q8h	Amoxicillin/clavulanate 1.2 g IV q8h **OR** Ampicillin/sulbactam 3 g q6-8h	Surgical drainage is the mainstay of treatment. Consider IV to PO switch if adequate surgical treatment and rapid clinical response. **Duration: 7-10 days**

Skin Abscess

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Skin Abscess* Common organism: *Staphylococcus aureus*	Cloxacillin 1-2 g IV q6h **OR** Cefazolin 1-2 g IV q8h	Amoxicillin/clavulanate 1.2 g IV q8h **OR** Ampicillin/sulbactam 3 g q6-8h	Surgical drainage is the mainstay of treatment. Consider IV to PO switch if adequate surgical treatment and rapid clinical response. **Duration: 7-10 days** *Skin abscesses usually occur on the extremities, back, or trunk. For treatment of abscesses in other organs/anatomical site, please refer to the relevant sections.

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Non-Purulent Skin & Soft Tissue Infections

Localised Impetigo

Common organism:

- *Staphylococcus aureus*
- *Streptococcus pyogenes*

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Localised Impetigo	Topical 2% fusidic acid q8-12h **OR** Topical 2% mupirocin q8h (Outpatient use only)	Cloxacillin 500 mg PO q6h **OR** Cephalexin 500 mg PO q12h	Duration: 5 days

Generalised Impetigo/Ecthyma

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Generalised Impetigo/Ecthyma	Cloxacillin 500 mg PO q6h **OR** Cephalexin 1000 mg PO q12h **Antibiotic allergy:** Erythromycin ethylsuccinate (EES) 800 mg PO q12h	Amoxicillin/clavulanate 625 mg PO q8h **Other alternative/in case of CA-MRSA:** Clindamycin 300 mg PO q6h **OR** Trimethoprim/Sulfamethoxazole (Bactrim) 160 mg/800 mg (= 2 tablets) PO q12h	Duration: 5-7 days (based on clinical response) **Antibiotic Allergy:** Refer to **APPENDICES > Antibiotic Allergy** for more info.

Erysipelas

Common organism:

- *Streptococcus pyogenes*

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Erysipelas	Phenoxymethylpenicillin 500 mg PO q6h **OR** Amoxicillin 500 mg PO q8h **If severe:** Benzylpenicillin 2-4 MU IV q4-6h ***CA-MRSA:** Clindamycin 300 mg PO q6h **OR**	Cephalexin 1000 mg PO q12h **If severe:** Cefazolin 1 g IV q8h **OR** Cefuroxime 750 mg IV q8h **CA-MRSA:** **Vancomycin 15-20 mg/kg q8-12h; not to exceed 2 g/dose *Refer to DIAMS – HSgB Vancomycin Protocol for more dosing info.*	Duration: 5 days *CA-MRSA: IV Vancomycin is used if oral therapy is not feasible **Vancomycin Info Refer to: **DIAMS – HSgB Vancomycin Protocol** for further info on Vancomycin Dosing, Administration & TDM Sampling

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Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
	Trimethoprim/Sulfamethoxazole (Bactrim) 160 mg/800 mg (= 2 tablets) PO q12h		

Ecthyma Gangrenosum

Most common causative organism is *Pseudomonas sp*., however antibiotics need to be tailored according to susceptibility result.

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Ecthyma gangrenosum	Ciprofloxacin 500 mg PO q12h **OR** *Piperacillin/tazobactam 4.5 g IV q6 – 8h **Piperacillin/tazobactam: if given as q8h, to be given as extended infusion (over 3 – 4 hours).*	Ceftazidime 2 g IV q8h **OR** Cefepime 2 g IV q8h	**Duration: 7 days** (based on clinical response) *Refer to: **DIAMS – Prolonged/Extended Infusion Abx**

Other Bacterial Skin & Soft Tissue Infections

Cellulitis

- **Mild cellulitis:** without systemic signs of infection. Common organisms: *Streptococcus pyogenes* & *Staphylococcus aureus*
- **Moderate cellulitis:** with *SIRS but no hypotension. Common organisms: *Streptococcus pyogenes* & *Staphylococcus aureus*
- **Severe cellulitis:** with *SIRS and hypotension. Common organisms: *Streptococcus pyogenes* & *Staphylococcus aureus*

***Systemic inflammatory response syndrome (SIRS):**
1. fever,
2. tachypnea,
3. tachycardia
4. abnormal white cell count

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Mild Cellulitis	Cloxacillin 500 mg PO q6h **OR** Cephalexin 1000 mg PO q12h **OR** Amoxicillin 500 mg PO q8h	Amoxicillin/clavulanate 625 mg PO q8h **OR** Ampicillin/sulbactam 375 mg PO q12h	Duration: 5-10 days (longer duration may be required in case of no clinical improvement or if an underlying medication condition is present). ***DIAMS – IV to Oral & OPAT** Consider IV to PO switch once patient's condition improves. Refer to DIAMS IV to Oral & OPAT **Antibiotic Allergy:** Refer to **APPENDICES > Antibiotic Allergy** for more info **Antibiotic prophylaxis may be considered in patients with 3 to 4
Moderate Cellulitis	Cloxacillin 1-2 g IV q6h	Ampicillin/sulbactam 3 g IV q6-8h **OR** Amoxicillin/clavulanate 1.2 g IV q8h **OR** Cefazolin 1-2 g IV q8h	

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Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Severe Cellulitis	*Piperacillin/tazobactam 4.5 g IV q6h-8h **Piperacillin/tazobactam: if given as q8h, to be given as extended infusion (over 3 – 4 hours).* ***Refer to DIAMS – Prolonged/Extended Infusion Abx** (Deescalate once cultures are available/ Necrotizing fasciitis ruled out)	Ampicillin/sulbactam 3 g IV q6-8h **OR** Amoxicillin/clavulanate 1.2 g IV q8h **OR** **Antibiotic allergy:** Clindamycin 600 mg IV q6h (Deescalate once cultures are available/ Necrotizing fasciitis ruled out)	episodes of recurrent cellulitis per year despite attempts to treat or control predisposing factors such as lymphoedema, obesity, eczema and venous insufficiency. Antibiotic prophylaxis should be continued for one year and to reassess the need for further prophylaxis if indicated thereafter.
****Antibiotic Prophylaxis: Cellulitis**	Phenoxymethyl penicillin (Penicillin V) 250 mg PO q12h (500mg PO q12h if BMI ≥ 33)	**Antibiotic allergy:** Clarithromycin 250 mg PO q24h **OR** Erythromycin ethylsuccinate (EES) 400 mg PO q12h	

Bite – Related Infections

** consider alternative organisms in the following circumstances

- For all **bite-related wounds**, thorough wound irrigation and/or debridement must be of utmost priority. Consider Plastic Surgery consultation.
- The risk of **tetanus** needs to be evaluated to provide adequate post-exposure prophylaxis by vaccination.
- For management of **rabies**, please refer to MOH Guideline on Rabies Management in Human and Animals.

Common organisms:

- **Dog/cat bite:** *Pasteurella multocida, Capnocytophaga canimorsus*
- **Human bite**: *Eikenella corrodens*, anaerobes, *Staphylococcus aureus*
- **Monkey bite:** *Streptococcus spp., Staphylococcus aureus*, anaerobes,*Cercopithecine Herpesvirus 1 (exposed to macaques)
- **Rodent bite:** *Francisella tularensis*, *Leptospira spp*, *Pasteurella multocida*, *Spirillum minor*
- **Reptile (E.g.: crocodiles, lizards, snakes, turtles) bite:** Anaerobes, Enterobacterales

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Dog/cat/human/ rodent/reptile bite	Amoxicillin/clavulanate 625 mg PO q8h		**Duration: 5 days** *Add acyclovir only when exposed to a macaque via bites and scratches, exposure to tissue culture material, exposure to tissue obtained during autopsies of monkeys, needlestick injuries, cage scratches, mucosal splash.
Monkey bite	Amoxicillin/clavulanate 625 mg PO q8h **PLUS** *Acyclovir 800 mg PO 5 times/day for 14 days ***Oral Acyclovir 5 times/day administration:*** • *Please ensure there is at least a 4-hour interval between doses.* • *Example of administration times: 7 AM, 11 AM, 3 PM, 7 PM & 11 PM.*		

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Cat Scratch Disease

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Cat Scratch Disease Common organism: *Bartonella henselae*	Azithromycin 500 mg PO on **Day 1**, then 250 mg PO q24h for **4 days**		

SSTI with Water Exposure

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Sea Water Exposure Common organisms: *Vibrio sp.*	Doxycycline 200 mg STAT, then 100 mg PO q12h **MAY ADD** *Ceftriaxone 2 g IV q24h		*Consider adding third generation cephalosporins in severe infections.
Fresh or Brackish Water Exposure Common organisms: • *Aeromonas sp.* • *Staphylococcus aureus* • *Plesiomonas* • *Streptococcus pyogenes*	Trimethoprim/ sulfamethoxazole (Bactrim) 320 mg/1600 mg (=4 tablets) PO q12h	Ciprofloxacin 400 mg IV q12h **OR** Ciprofloxacin 750 mg PO q12h **PLUS** Cloxacillin 500 mg PO q6h **MAY ADD** *Metronidazole 400 mg PO q8h	Oral therapy is encouraged if wounds are not associated with systemic features or involving deeper tissues. Add metronidazole if wounds immersed in soil- or sewage-contaminated water.

SSTI In Neutropenic Patients

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Neutropenic Patients Common organisms: • *Pseudomonas aeruginosa* • Other Gram-negatives	*Piperacillin/tazobactam 4.5 g IV q6-8h **Piperacillin/tazobactam: if given as q8h, to be given as extended infusion (over 3 – 4 hours).* **OR** Cefepime 2 g IV q8h		***DIAMS – Prolonged/Extended**

SSTI caused by Methicillin Resistance *Staphylococcus aureus* (MRSA)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Methicillin Resistance Staphylococcus aureus (MRSA)	Vancomycin 15-20 mg/kg IV q8-12h **In severe infections:** To load with vancomycin 25-30 mg/kg IV, followed by 15-20 mg/kg (actual body weight) IV q8-12h; not exceeding 2 g/dose	Linezolid 600 mg IV/PO q12h ***DIAMS – IV to Oral & OPAT** Tab. Linezolid has excellent bioavailability (~100%). *Change to oral formulation after clinical improvement and patient can tolerate orally	****Vancomycin Info** Refer to DIAMS – HSgB Vancomycin Protocol for further info on Vancomycin Dosing, Administration & TDM Sampling

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Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
	Refer to DIAMS – HSgB Vancomycin Protocol for more dosing info.		

If Community Acquired MRSA Suspected

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
If CA-MRSA Suspected	Clindamycin 300-600 mg IV/PO q6-8h **OR** Doxycyline 100 mg PO q12h **OR** Trimethoprim/Sulfamethoxazole (Bactrim) 160 mg/800 mg (= 2 tablets) PO q12h		Consider CA-MRSA if: • Outbreaks of known CA-MRSA • Non-resolving cellulitis

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Peripheral Phlebitis/Thrombophlebitis

Common organisms:

- *Staphylococcus aureus*
- Coagulase negative *Staphylococcus*
- Gram-negative organisms

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Grade 1	Observe cannula		Duration: 5 days (depending on clinical response) Peripheral intravenous catheters with associated pain, induration, erythema, or exudate should be removed. **VISUAL INFUSION PHLEBITIS SCORE** **Score 0:** Insertion site healthy, no signs of phlebitis **Score 1:** Presence of one of the following signs: Slight pain or slight redness at IV insertion site. **Score 2:** Presence of 2 of the following signs: Pain at IV site, redness or swelling. **Score 3:** Presence of all of the following signs: Pain along the path of the cannula, redness around the insertion site and swelling. **Score 4:** Presence of all of the following signs: Pain along the path of the cannula, redness around the insertion site, swelling, palpable venous cord. **Score 5:** Presence of all of the following signs: Pain along the path of the cannula, redness around the insertion site, swelling, palpable venous cord, febrile.
Grade 2	Resite/Remove the intravenous cannula		
Grade 3 - 4	• Remove the intravenous cannula and take blood culture • Consider treatment*		
Grade 5	• Take blood culture • Resite/remove cannula • Initiate treatment*		
***Empirical Antibiotic Treatment for Grade 3-5**	Cloxacillin 1 g IV q6h If blood culture negative and clinical improvement, to switch to oral: Cloxacillin 500 mg PO q6h **OR** Cephalexin 1000 mg PO q12h	Cefazolin 2 g IV q8h	

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Bed Sore / Pressure Sore / Decubitus Ulcer

Common organisms: Polymicrobial organism

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Bed Sore/ Pressure Sore/ Decubitus Ulcer	**Local treatment** (debridement and dressing) is preferred. **If there is surrounding cellulitis/ signs of bacteraemia/ fasciitis/ surrounding intramuscular abscess/ OM changes** Ampicillin/sulbactam 3 g IV q6-8h **OR** Amoxicillin/clavulanate 1.2 g IV q8h	-	

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Mycobacterial Infections

Hansen's Disease (Leprosy)

Mycobacterium leprae

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Hansen's Disease (Leprosy)	Rifampicin 600 mg PO once a month (supervised) **PLUS** Dapsone 100 mg PO q24h **PLUS** Clofazimine 300 mg PO once a month and 50 mg PO q24h	***Bacterial resistance or hypersensitivity to first line**: Can be substituted with one of the following: Ofloxacin 400 mg PO q24h **OR** Minocycline 100 mg PO q24h **OR** Clarithromycin 500 mg PO q24h	*Second line or drug-resistant regimen can only be initiated by a dermatologist. **Duration:** **Paucibacillary: 6 months** **Multibacillary: 1 year**
Prophylaxis of leprosy For contacts of leprosy patients after excluding leprosy and TB disease, and in the absence of other contraindication	**10-14 years old:** Rifampicin 450 mg PO stat **≥15 years old:** Rifampicin 600 mg PO stat		

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Non-Tuberculous Mycobacterial (NTM) Skin And Soft Tissue Infections

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Mycobacterium marinum	Clarithromycin 500 mg PO q12h **PLUS** Rifampicin 600 mg PO q24h **OR** Ethambutol 25 mg/kg PO q24h		Often resistant to isoniazid. To change the treatment regime based on susceptibility results once available. Duration: continue for another 1 to 2 months of treatment after clinical symptom resolution.
	For Deep Tissue Involvement Consider 3 drug combination therapy: Clarithromycin 500 mg PO q12h **PLUS** Rifampicin 600 mg PO q24h **PLUS** Ethambutol 25 mg/kg PO q24h		
Mycobacterium kansasii	Rifampicin 600 mg PO q24h **PLUS** Ethambutol 15 mg/kg PO q24h **PLUS** Isoniazid 300 mg PO q24h **OR** Clarithromycin 500 mg PO q12h **OR** Azithromycin 250 mg PO q24h		Duration: minimum of 12 months duration
***Mycobacterium ulcerans* (Buruli ulcer)**	Rifampicin 10 mg/kg PO q24h **PLUS** Clarithromycin 7.5 mg/kg PO q12h	Rifampicin 10 mg/kg PO q24h **PLUS** Streptomycin 15 mg/kg IM q24h for 4 weeks **Followed by:** Rifampicin 10 mg/kg PO q24h **PLUS** Clarithromycin 7.5 mg/kg PO q12h	Wide surgical excision and debridement are important. **<u>Duration:</u>** **WHO category 1:** Pre-ulcerative lesions and skin lesions smaller than 5 cm, duration of antibiotic 4 weeks with simple excision or 8 weeks of antibiotic therapy only **WHO category 2**: Antibiotic at least 8 weeks with supportive care (E.g.: surgery) **WHO category 3:** Lesions > 15cm, antibiotic plus surgical debridement and reconstruction. Duration of treatment depends on clinical response as complications are common (joint and bone involvement)

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Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
***Mycobacterium fortuitum / chelonae / abscessus* complex**	**Mild disease:** (Surgical debridement plus **2 active agents** depending on the severity of lesions) Clarithromycin 500 mg PO q12h **OR** Azithromycin 250-500 mg PO q24h **OR** Trimethoprim/Sulfamethoxazole (Bactrim) 160 mg/800 mg (= 2 tablets) PO q12h **OR** Minocycline 100 mg PO q12h **OR** Ciprofloxacin 750 mg PO q12h **MAY ADD** *Amikacin 15 mg/kg IV q24h		**Duration: 4-6 months depending on clinical response.** *Amikacin: Started for severe infection until clinical improvement (together with 2 oral agents), then continue with just 2 oral agents. Serious skin and soft tissue infection, bone and disseminated disease, immunocompromised host: use 2 drug combination therapy (consider 3 drugs for severe infection) for first 2-8 weeks. To change the treatment regime based on susceptibility results once available. To consider oral switch once there is clinical improvement, to complete the remaining duration.
	Severe disease (Surgical debridement plus **2 active agents** depending on the severity of lesions) Initial induction with: Amikacin 15 mg/kg IV q24h **OR** Imipenem 1 g IV q12h **PLUS** Clofazimine 100-200 mg PO q24h		

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Fungal Infections

Tinea Capitis

Common organism:

- *Trichophyton*
- *Microsporum*

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Tinea capitis	Griseofulvin 500 mg PO q12h for 6 to 12 weeks or longer until fungal cultures are negative *HSgB Griseofulvin preparation is 125mg microsize (subject to availability)* **OR** Terbinafine 250 mg PO q24h **PLUS** 2.5% selenium sulphide shampoo **OR** 2% ketoconazole shampoo, 2 – 3 times per week for 2 weeks	*Itraconazole 5 mg/kg PO q24h **OR** Fluconazole 6 mg/kg PO q24h Duration is based on mycological result/ type of treatment agent and clinical response. E.g.: *Trichophyton sp* : 2-4 weeks *Microsporum sp* : 8-12 weeks	Other recommendations: • For kerion, griseofulvin should be considered as first line unless *Tricophyton* has been cultured as the pathogen. Duration of treatment may be longer. • Contacts of patient may be treated with 2% ketoconazole shampoo 2 – 3 times per week for 2 weeks. • Surgical excision is to be avoided. • Topical therapy alone is not recommended for the management of tinea capitis. • Consider adding oral prednisolone in selected cases. *Itraconazole: Absorption depends on gut acidity. Take capsule with food and acidic beverage (E.g.: cola or oranges drinks). Avoid PPIs and H2 blockers.

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Tinea Barbae

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Tinea barbae	Same as treatment of **tinea capitis**		

Tinea Corporis / Tinea Cruris / Tinea Faciei

Common organism:

- *Trichophyton*
- *Microsporum*
- *Epidermophyton*

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Mild infections	Topical imidazoles or allylamines cream/lotion. E.g.: Clotrimazole 1% **OR** Miconazole 2% **OR** Ketoconazole **OR** Terbinafine **Duration: Until clinical clearance with additional 2 weeks**		Other recommendations: • In patients with renal or hepatic impairment, caution should be exercised while prescribing systemic antifungals. • Terbinafine clearance is significantly reduced in patient with renal impairment. Other systemic antifungals are preferred in these patients. • Topical nystatin should not be used in dermatophytosis as they are not effective against dermatophytes. *Itraconazole: Absorption depends on gut acidity. Take capsule with food and acidic beverage (E.g.: cola or orange drinks). Avoid PPIs and H2 blockers.
Extensive infections	Terbinafine 250 mg PO q24h for 2 weeks OR *Itraconazole 200 mg PO q24h for 2 weeks OR Griseofulvin 500 mg PO q12h or q24h for 4-6 weeks *HSgB Griseofulvin preparation is 125mg microsize (subject to availability)*	Fluconazole 150-300 mg per week PO for 3-4 weeks	

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Tinea Manuum/ Tinea Pedis

Common organism:

- *Trichophyton*
- *Microsporum*
- *Epidermophyton*

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
First line	Topical antifungals as mentioned in tinea corporis for 4-8 weeks		Other recommendations: • Topical keratolytic agents can be used in conjunction with antifungals for hyperkeratotic type of tinea pedis/manuum. • Potassium permanganate in 1:10,000 dilution wet dressings, applied for 20 min 2–3 times/day, may be helpful if vesiculation or maceration is present. • Systemic antifungals can be prescribed as first line treatment in severe moccasin-type tinea pedis or severe recurrent tinea with blisters.
Resistant cases	Terbinafine 250 mg PO q24h for 2-4 weeks **OR** *Itraconazole 200 mg PO q24h for 2-4 weeks *Absorption depends on gut acidity. Take capsule with food and acidic beverage (E.g.: cola or orange drinks). Avoid PPIs and H2 blockers.* **OR** Griseofulvin 500 mg PO q12h for 6-12 weeks *HSgB Griseofulvin preparation is 125mg microsize (subject to availability)*	Fluconazole 150 mg/week PO for 4 weeks	

Tinea Unguium (Onychomycosis)

Common organism:

- *Trichophyton*
- *Microsporum*
- *Epidermophyton*

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Tinea unguium (onychomycosis)	*Amorolfine 5% Nail Lacquer once weekly application **Duration:** **Fingernails**: 6 months **Toenails**: 12 months **OR** **Pulse itraconazole 200 mg PO q12h for 1 week per month **Duration:** **Fingernails**: 2 months **Toenails**: 3 months **OR** Terbinafine 250 mg PO q24h **Duration:** **Fingernails:** 6 weeks **Toenails:** 12 weeks	Griseofulvin 500 mg PO q12h *HSgB Griseofulvin preparation is 125mg microsize (subject to availability)* Duration: **Fingernails**: 6 months **Toenails**: 12 months **OR** Fluconazole 150 mg PO once weekly **Duration:** **Fingernails**: ≥ 3 months **Toenails**: 6-12 months	*Amorolfine 5% Nail Lacquer is not indicated for children less than 12 years old. Patients with contraindications to systemic agents may consider topical antifungal agents. Diagnosis of onychomycosis should be confirmed with a KOH preparation test, culture, or PAS Stain. Empirical treatment is not recommended. **Itraconazole: Absorption depends on gut acidity. Take capsule with food and acidic beverage (E.g.: cola or orange drinks). Avoid PPIs and H2 blockers.

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Tinea Versicolor

Common organism:

- *Malassezia furfur*
- *Pityrosporum orbiculare*

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
First line	First line: Topical treatment only Selenium sulphide 2% shampoo; Apply to affected areas 10 minutes before bathing, or Dilute to 1:1 with water, apply and leave overnight (treat for 1-2 weeks) **OR** Ketoconazole 2% shampoo, apply to affected areas 10 minutes before bathing **<u>For face:</u>** Topical imidazole for 4-6 weeks. E.g.: Miconazole 2% cream, clotrimazole 1% cream	**Alternative for selenium sulphide and ketoconazole shampoo:** Sulfur preparation **OR** Salicylic solution	**Recommendations:** Ketoconazole shampoo or selenium sulphide shampoo can be used once every two to four weeks for approximately six months in order to try and prevent recurrence.
For recurrent or resistant cases	*Itraconazole 200 mg PO q24h for 1 week or 400 mg single dose *Absorption depends on gut acidity. Take capsule with food and acidic beverage (e.g.: Cola or orange drinks). Avoid PPIs and H2 blockers.* **OR** Fluconazole 300 mg PO weekly dose for 2 weeks		

Candidiasis

Common organism:

- *Candida albicans*

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Mild cutaneous candidiasis	Topical imidazole q12h until clear. E.g.: Miconazole 2% cream	Clotrimazole 1% Cream	Treatment of sexual partner is advisable in case of recurrent infection.
Extensive cutaneous candidiasis	*Itraconazole 200 mg PO q24h for 1 week *Absorption depends on gut acidity. Take capsule with food and acidic beverage (E.g.: cola or orange drinks). Avoid PPIs and H2 blockers*.	Fluconazole 100mg PO q24h for 1 week (in severe and immunocompromised patients)	

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Subcutaneous Fungal Infections (Lymphocutaneous and Cutaneous Sporotrichosis)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Lymphocutaneous and Cutaneous Sporotrichosis	*Itraconazole 200 mg PO q12h until all lesions have resolved (usually for a total of 3–6 months)	**For patients not able to tolerate itraconazole:** Terbinafine 500 mg PO q12h OR Fluconazole 400 mg q24h	In some immunocompromised condition such as AIDS, longer treatment may be necessary. Refer to **Infections in Immunocompromised Patients - Opportunistic Infections in HIV Patients section.** *Itraconazole: Absorption depends on gut acidity. Take capsule with food and acidic beverage (E.g.: cola or orange drinks). Avoid PPIs and H2 blockers. **Avoid azole in pregnancy

Systemic Sporotrichosis

(pulmonary, osteoarticular, meningeal, or disseminated sporotrichosis)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Systemic sporotrichosis	Amphotericin B deoxycholate 0.7-1 mg/kg IV q24h for 2 weeks Followed by; *Itraconazole 200 mg PO q12-24h for at least of 12 months duration		In some immunocompromised condition such as AIDS, longer treatment may be necessary. Refer to **Infections in Immunocompromised Patients - Opportunistic Infections in HIV Patients section.** *Itraconazole: Absorption depends on gut acidity. Take capsule with food and acidic beverage (E.g.: cola or orange drinks). Avoid PPIs and H2 blockers. **Avoid azole in pregnancy.
****In pregnancy and breastfeeding**	Terbinafine 500 mg PO q12h	Amphotericin B deoxycholate 0.7-1 mg/kg IV q24h	

Cutaneous Fungal Infection in Immunocompromised Patients

Refer to treatment of disseminated fungal infection in **Infections in Immunocompromised Patients - Opportunistic Infections in HIV Patients section.**section.

Skin biopsy for histopathological examination (HPE) and culture are advised before commencing treatment.

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Aspergillus Sp, Scedosporium Apiospermum, Lomentospora Prolificans and Fusarium Sp Infection

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Aspergillus sp, Scedosporium apiospermum, Lomentospora prolificans and Fusarium sp infection	Voriconazole 6 mg/kg IV q12h for 2 doses, followed by 4 mg/kg IV q12h	Amphotericin B (deoxycholate) 0.7–1 mg/kg q24h **OR** Amphotericin B (lipid formulation) 3–5 mg/kg q24h	For *Lomentospora prolificans*, consider surgical debridement and reduction of immunosuppression. Consider IV to PO switch once clinically improving and can tolerate orally.

Cryptococcal Skin Infections

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Cryptococcal skin infections	Fluconazole 400 mg PO q24 h		

Peniciliosis, Disseminated Histoplasmosis and Disseminated Cryptococcosis

Refer to treatment of disseminated fungal infection in **Infections in Immunocompromised Patients - Opportunistic Infections in HIV Patients section.**

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Viral Infections

Herpes Simplex Skin Infections

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Non-genitalia	Acyclovir 400 mg PO q8h		Duration: 7 days
Genitalia	Refer to **Sexually Transmitted Infections > Herpes Simplex** section.		

Varicella Zoster (Chickenpox)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Immunocompetent	Acyclovir 800 mg PO 5 times daily for 7 days ***Oral Acyclovir 5 times/day administration:*** • *Please ensure there is at least a 4-hour interval between doses.* • *Example of administration times: 7 AM, 11 AM, 3 PM, 7 PM & 11 PM.*		Advisable to start treatment early within 48 hours.
Immuno-compromised	Acyclovir 10 mg/kg IV q8h for 7 days (change to oral once there is an improvement)		

Herpes Zoster

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Herpes zoster	**Immunocompetent** Acyclovir 800 mg PO 5 times/day for 7 days ***Oral Acyclovir 5 times/day administration:*** • *Please ensure there is at least a 4-hour interval between doses.* • *Example of administration times: 7 AM, 11 AM, 3 PM, 7 PM & 11 PM.*		Topical antiviral treatment **is not recommended** for herpes zoster. Systemic antiviral treatment is recommended for all immunocompromised patients or for immunocompetent patients with following criteria: 1. >50 years of age 2. Moderate or severe pain 3. Moderate or severe rash 4. Non-truncal involvement Advisable to start treatment early within 48 - 72 hours.
	Immunocompromised Acyclovir 10 mg/kg IV q8h for 7 days (change to oral once there is an improvement)		

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Parasitic Infestation

Scabies

Common organism: *Sarcoptes scabiei*

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Scabies	Apply benzyl benzoate emulsion 25% (EBB) from neck down and leave for 24 hours for 2-3 days **OR** Apply permethrin 5% lotion/cream and leave for 8 hours Repeat application after 1 week.		Clothing and bedding of persons with scabies should be washed in hot water and dried.
In pregnancy/ Immuno-compromised	Apply permethrin 5% lotion/cream and leave for 8 hours. Repeat application after 1 week.		

Head Lice

Common organism: *Pediculus humanus capitis*

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Head lice	Apply permethrin 1% lotion to scalp for 10 minutes and wash off **OR** Apply malathion 1% shampoo and leave for 15 minutes and wash off Repeat application after 1 week.		Use special fine-toothed nit comb to reduce risk of re-infestation.

Body Lice/Pubic Lice

Common organism: *Pediculus humanus*

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Body lice/Pubic lice	Apply malathion lotion 0.5% for 8-12 hours and wash off **OR** Apply permethrin 1% cream to affected area for 10 minutes and wash off		

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HSgB Antimicrobial Guideline (HAG)

SECTION A: ADULT

A20: TRAUMA-RELATED INFECTIONS

Launched: October 2024

Updated: -

LIST OF TOPICS WITH LINKS:

1. **Abdominal Injury**
2. **Chest Trauma**
   - Penetrating chest trauma requiring chest tube insertion
3. **Compound Fractures / Open Fractures**
   - Gustilo Type I & II Fractures
   - Gustilo Type III Fractures
4. **Cranial Trauma**
   - Open Fracture/ Penetrating Injuries without Dura Breach
   - Penetrating Injuries with Dura Breach
5. **Maxillofacial Injury / Facial Trauma**
   - Spreading Infections and Infections of Fascial Spaces (With/Without Systemic Signs)
6. **Simple Soft Tissue Injuries**
   - Minor Wounds with Simple Repair
7. **Complex Soft Tissue Injuries**
   - Penetrating and puncture-type wounds / Complex soft tissue wounds without open fractures
   - Plantar Wounds
   - Burn & Electrocution

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Abdominal Injury

Patients who do not require surgery:
No antibiotics required

Patients who require surgery:
Antibiotic choice will be based on organs involved.

Duration:
- If hollow viscus injury is repaired early (**within 12 hours**): Antibiotics should be continued for no more than 24 hours.
- If hollow viscus injury is repaired **late (> 12hours):** Antibiotics should be limited to 7 days.
- If hollow viscus injury is **incompletely repaired or clinical signs persist** in patients with traumatic abdominal injury: Antibiotics can be used for more than 7 days.

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Common organism: Gram-negative enteric aerobes & anaerobes	Amoxycillin/clavulanate 1.2 g IV q8h	Cefuroxime 750 mg - 1.5 g IV q8h **PLUS** Metronidazole 500 mg IV q8h **OR** Cefoperazone 1-2 g IV q12h **PLUS** Metronidazole 500 mg IV q8h	**Duration: 4 to 7 days** if adequate source control, no delay in surgical intervention and patient has rapid clinical recovery.

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Chest Trauma

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Penetrating chest trauma requiring **chest tube insertion**	Cefazolin 2 g IV q8h **Duration:** 1 day (prophylaxis)	-	Prophylactic antibiotic use is not indicated in patients with blunt chest trauma (non-penetrating trauma)

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Compound Fractures / Open Fractures

Compound fractures: Antibiotics are administered as prophylaxis **within 3 hours of injury**

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Gustilo Type I & II Fractures Common organisms: Gram positive organism	Cefazolin 2 g IV q8h **MAY ADD** Metronidazole 500 mg IV q8h *Add metronidazole if there is soil/rust contamination or heavy machinery.*	Cefuroxime 1.5 g IV q8h **MAY ADD** Metronidazole 500 mg IV q8h *Add metronidazole if there is soil/rust contamination or heavy machinery.*	**Duration:** • Gustilo Type I: stop after 24 hours of surgery • Gustilo Type II: discontinue after 24 hours to 48 hours surgery Pre-debridement and post-debridement cultures are not representative of actual infection.
Gustilo Type III Fractures Common organisms: • Gram positive organisms • Gram negative organisms	Cefazolin 2 g IV q8h **PLUS** Gentamicin 5 mg/kg IV q24h *Add gentamicin if there's extensive skin and soft tissue involvement (for gram negative coverage)* **OR** Cefuroxime 1.5 g q8h **PLUS** Gentamicin 5 mg/kg IV q24h *Add gentamicin if there's extensive skin and soft tissue involvement (for gram negative coverage)* **MAY ADD** Metronidazole 500 mg IV q8h *Add metronidazole if there is soil/rust contamination or heavy machinery.*	Ceftriaxone 2g IV q24h **MAY ADD** Metronidazole 500mg IV q8h *Add metronidazole if there is soil/rust contamination or heavy machinery.* **Presence of water contamination:** **Fresh water contamination:** Piperacillin/tazobactam 4.5 g IV q6-8h *If given as q8h, to be given as extended infusion (over 3 -4 hours)* **Sea water contamination:** Piperacillin/tazobactam 4.5 g IV q6-8h *If given as q8h, to be given as extended infusion (over 3 -4 hours)* **PLUS** Doxycycline 100mg PO q12h	**Duration:** Gustilo Type III: 24 hours after wound closure or up to a maximum of 72 hours (whichever is earlier) Pre-debridement and post-debridement cultures are not representative of actual infection.

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Cranial Trauma

Antibiotic prophylaxis **NOT RECOMMENDED** for:

- Basal skull fractures
- Traumatic CSF fistula
- Post-surgical CSF leak

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Open Fracture/ Penetrating Injuries without Dura Breach	Cefazolin 2 g IV q8h **OR** Cefuroxime 1.5 g q8h **MAY ADD** Metronidazole 500 mg IV q8h	Amoxicillin/Clavulanate 1.2 g IV q8h	**Duration: Until 24 hours after wound closure** or **72 hours total** (whichever occurs first). The use of antibiotic here is pre-emptive antibiotics and should not be continued beyond a short course.
Penetrating Injuries with Dura Breach	Ceftriaxone 2 g IV q12h **PLUS** Metronidazole 500 mg IV q8h	-	**Duration: 2 weeks**

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Maxillofacial Injury / Facial Trauma

Spreading Infections and Infections of Fascial Spaces (With/Without Systemic Signs)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Traumatic wound infection is usually caused by endogenous organisms rather than exogenous. Common organisms: • *Viridans Streptococci* • *Staphylococci* • *Prevotella intermedia* • *Peptostreptococcus* • *Eubacterium* • *Fusobacterium nucleatum*	Benzylpenicillin 2-4 MU IV q4-6h **PLUS** Metronidazole 500 mg IV q8h **OR** Amoxicillin/Clavulanate 1.2 g IV q8h **OR** Cefuroxime 1.5 g IV q8h **PLUS** Metronidazole 500 mg IV q8h	**If not responding to first-line antibiotics:** Ceftriaxone 2 g IV q24h **PLUS** Metronidazole 500 mg IV q8h **Antibiotic allergy:** Clindamycin 300-450 mg PO q6h or 600 mg IV q6h / 900 mg IV q8h	Empirical antibiotics are started. Incision and drainage are advised and the antibiotic is changed in accordance with the result of culture and sensitivity. Continue intravenous therapy for 1 to 2 days following successful abscess drainage, then switch to oral therapy.

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Simple Soft Tissue Injuries

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Minor Wounds with Simple Repair Gunshot wound and superficial stab wound of extremities	Antibiotics not required. Good wound care is required: • Debridement of devitalized tissue • Irrigation and remove all foreign material • Hemostasis • Closure of the wound when safe and appropriate		

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Complex Soft Tissue Injuries

Muscular, skeletal and soft tissue trauma, gunshot or crush & degloving injuries or stab wounds

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Penetrating and puncture-type wounds / Complex soft tissue wounds without open fractures Common organisms: • *Staphylococcus aureus* • *Beta-haemolytic Streptococci* • *Polymicrobial infection*	Cloxacillin 2 g IV q6h **MAY ADD** Metronidazole 500 mg IV q8h *Add metronidazole if there is soil/rust contamination or heavy machinery.* **MAY ADD** Gentamicin 5 mg/kg IV q24h *Add gentamicin if there's extensive skin and soft tissue involvement (for gram negative coverage)*	Cefazolin 2 g IV q8h **MAY ADD** Metronidazole 500 mg IV q8h *Add metronidazole if there is soil/rust contamination or heavy machinery.* **OR** Cefuroxime 1.5 g q8h **MAY ADD** Metronidazole 500 mg IV q8h *Add metronidazole if there is soil/rust contamination or heavy machinery.* **OR** Amoxicillin/Clavulanate 1.2 g IV q8h	**Duration: depends on the extent of infection.** ▪ **For combat-related isolated soft tissue injury,** antibiotic duration of **1 - 3 days** may be adequate. ▪ **For severe penetrating injuries**, especially those involving joints and/or tendons, antibiotics must be given for at least **5 days.** Tetanus immunization should be given in addition to appropriate antibiotics. Antibiotic therapy should be tailored to the susceptibility of deep wound cultures isolates once available.
Plantar Wounds E.g.: penetrating injury through the plantar foot Common organisms: • *Pseudomonas aeruginosa* • *Staphylococcus aureus*	Piperacillin/tazobactam 4.5 g IV q6-8h *If given as q8h, to be given as extended infusion (over 3 -4 hours)* **OR** Cefepime 2 g IV q8h	Ciprofloxacin 750 mg PO q12h	**Duration: total 7-14 days** following adequate surgical debridement if no evidence of established osteomyelitis upon presentation. Tetanus immunization should be given in addition to appropriate antibiotics. Antibiotic therapy should be tailored to the susceptibility of deep wound cultures isolates once available. If there is osteomyelitis, refer to the **Orthopaedic Infection section – Bone and Joint Infections: Osteomyelitis.**
Burn & Electrocution	Antibiotics not required		

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SECTION A: ADULT

A21: TROPICAL INFECTIONS

Launched: October 2024

Updated: -

LIST OF TOPICS WITH LINKS:

1. **Typhoid Fever**
2. **Cholera**
3. **Rickettsial Diseases (Scrub Typhus)**
4. **Brucellosis**
5. **Leptospirosis**
6. **Tetanus**
7. **Melioidosis (*Burkholderia pseudomallei*)**
   - Intensive Therapy - Mild (Non-Neurological)
   - Intensive Therapy - Moderate - Severe (Neuromeliodosis, persistent bacteremia or severe sepsis)
   - Eradication Therapy
8. **Malaria**
   - *Plasmodium falciparum* - Non Complicated
   - *Plasmodium falciparum* - Severe
   - *Plasmodium vivax / ovale*
   - *Plasmodium malariae / knowlesi***

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Typhoid Fever

Salmonella enterica serovar Typhi

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Mild	Ceftriaxone 50-75 mg/kg/24h (2-4 g/day) IV q12-24h **OR** Cefotaxime 40-80 mg/kg/24h (2-6 g/day) IV q8-12h	Ciprofloxacin 500-750 mg PO q12h **OR** Azithromycin 20 mg/kg PO q24h (maximum 1 g q24h) **(Refer susceptibility testing result before considering alternative treatment regime)**	*Notifiable disease* IV to PO switch is recommended once symptoms improve based on susceptibility testing result. Refer to: *DIAMS – IV to Oral & OPAT **Duration: minimum 7-14 days** Notes: longer duration of fever defervescence may be observed in patients treated with cephalosporin.
Moderate to Severe (Severe sepsis or shock, gastrointestinal bleeding, intestinal perforation, encephalopathy, metastatic infection or other complications)	Ceftriaxone 50-75 mg/kg/24h (2-4 g/day) IV q12-24h **OR** Cefotaxime 40-80 mg/kg/24h (2-6 g/day) IV q8-12h-	Ciprofloxacin 400 mg IV q8-12h **OR** Azithromycin 20 mg/kg IV q24h (maximum 1 g q24h)	Consult ID Physician for complicated/severe typhoid or drug-resistant typhoid. **Duration: 10-14 days.** Once symptoms improve, may consider IV to oral antibiotic switch based on susceptibility testing results. Refer to: DIAMS – IV to Oral & OPAT In case of persistent fever after 5-7 days of effective antimicrobial therapy, re-evaluate and repeat culture. Longer duration of antimicrobial therapy may be necessary in the presence of metastatic or deep seated infection. **Adjunctive corticosteroid** may be considered after consultation with an ID physician in severe typhoid with delirium, obtundation, coma or shock. In such cases, administer: **IV dexamethasone 3 mg/kg followed by 8 doses of 1 mg/kg every q6h for 48 hours**. Monitor patients closely as corticosteroid use is associated with increased risk of gastrointestinal bleeding and perforation.
Extensively Drug Resistant (Resistant to ceftriaxone, ciprofloxacin, amoxicillin, chloramphenicol and co-trimoxazole)	Meropenem IV 1g q8h		Consult ID Physician
Chronic Carrier (Individual excreting *Salmonella typhi* in stool/urine for > 1 year after onset of acute illness)	**Ciprofloxacin susceptible:** Ciprofloxacin 750 mg PO q12h for 4 weeks	**Ciprofloxacin resistant:** Trimethoprim/Sulfamethoxazole (Bactrim) 160 mg/800 mg (= 2 tablets) PO q12h for 6 weeks	Consult ID Physician

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Cholera

Vibrio cholerae

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Cholera	Doxycycline 300 mg PO single dose	Ciprofloxacin 1 g PO single dose **OR** *Azithromycin 1 g PO single dose **OR** *Erythromycin Ethylsuccinate (EES) 800 mg PO q12h for 3 days	***Notifiable disease*** Indication for antibiotics: • Oral or intravenous hydration is the mainstay of cholera treatment. • Antibiotics are recommended for patients with moderate to severe illness who are hospitalized. *Azithromycin / Erythromycin is recommended in pregnancy.

Rickettsial Diseases (Scrub Typhus)

Rickettsia species, Orientia tsutsugamushi (rickettsia tsutsugamushi)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Mild	Doxycycline 100 mg PO q12h for 5 days	*Azithromycin 500 mg PO q24h for 3 days	*Azithromycin is recommended in pregnancy ***Please consult ID Physician***
Moderate to Severe ARDS, septic shock, myocarditis, meningoencephalitis, hepatitis, renal failure	Azithromycin 500 mg IV q12h on Day 1 then 500 mg q24h for 6 days **PLUS** Doxycycline 200 mg PO q12h Day 1 then 100 mg q12h for 6 days		IV to PO switch is recommended once symptoms improve. Refer to DIAMS IV to Oral & OPAT for more information. *DIAMS – IV to Oral & OPAT

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Brucellosis

Brucella melitensis, Brucella abortus, Brucella suis and *Brucella canis* ***(CONSULT ID PHYSICIAN)***

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Systemic Disease In the absence of focal disease due to spondylitis, neurobrucellosis or endocarditis.	Doxycycline 100 mg PO q12h for 6 weeks **PLUS** Streptomycin 1 g (5 mg/kg) IM q24h for 2-3 weeks **OR** Doxycycline 100 mg PO q12h for 6 weeks **PLUS** Rifampicin 600-900 mg (15 mg/kg) PO q24h for 6 weeks	Doxycycline 100 mg PO q12h for 6 weeks **PLUS** Gentamicin 5 mg/kg/24h IM/IV for the first 7 days	***Notifiable disease.*** ***Consult ID Physician***
Pregnancy	**< 36 weeks gestation:** Rifampicin 600-900 mg (15 mg/kg) PO q24h for 6 weeks **PLUS** Trimethoprim/Sulfamethoxazole (Bactrim) 160 mg/800 mg (= 2 tablets) PO q12h for 6 weeks **> 36 weeks gestation:** *Rifampicin 600-900 mg (15 mg/kg) PO q24h monotherapy until delivery.		*After delivery, to continue combination therapy as in non-pregnant regime.
Spondylitis	Doxycycline 100 mg PO q12h for at least 12 weeks **PLUS** Rifampicin 600-900 mg (15 mg/kg) PO q24h for at least 12 weeks **PLUS** Gentamicin 5 mg/kg/24h IM/IV for the first 7 days		
Neurobrucellosis	Ceftriaxone 2 g IV q12h for 4-6 weeks **PLUS** Doxycycline 100 mg PO q12h for 6 weeks **PLUS** Rifampicin 600-900 mg (15mg/kg) PO q24h for at least 12 weeks	Doxycycline 100 mg PO q12h for 12 weeks **PLUS** Rifampicin 600-900 mg(15mg/kg) PO q24h for at least 12 weeks **PLUS** Trimethoprim/Sulfamethoxazole (Bactrim) 160 mg/800 mg (= 2 tablets) PO q12h for 12 weeks	
Endocarditis	Refer to **Cardiovascular Infection section for Infective Endocarditis.**		
Chemoprophylaxis For high-risk laboratory exposures to *Brucella* isolates	Doxycycline 100 mg PO q12h for 3 weeks **PLUS** Rifampicin 600 mg for 3 weeks	*Doxycycline 100 mg PO q12h for 3 weeks **PLUS** Trimethoprim/Sulfamethoxazole (Bactrim) 160 mg/800 mg (= 2 tablets) PO q12h for 3 weeks *In case of exposure to Brucella abortus RB51 strain (which is resistant to rifampicin)	PEP should be offered as soon as high-risk laboratory exposure to *Brucella* isolates has been identified and be administered for up to six months following exposure. PEP may be considered for low-risk exposure in pregnant women or immunosuppressed individuals (consult ID physician).

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Leptospirosis

Leptospira interrogans

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Mild	Doxycycline 100 mg PO q12h for 5-7 days **OR** *Amoxicillin 25-50 mg/kg/day PO in 3 divided doses or 500 mg PO q8h for 7 days **Amoxicillin or azithromycin is recommended for pregnant women*	*Azithromycin 500 mg PO q24h for 3 days **Amoxicillin or azithromycin is recommended for pregnant women*	***Notifiable disease*** Early antibiotic therapy is recommended if leptospirosis is clinically suspected following recent high-risk exposure (E.g.: flood, recreational activities).
Moderate to Severe Leptospiral pulmonary syndrome, multiorgan involvement, sepsis.	*Benzylpenicillin 1.5 MU IV q6h	*Ceftriaxone 2 g IV q24h	*IV to PO switch is recommended once symptoms improve. Refer to DIAMS IV to Oral & OPAT for more information. **Duration: 7 days** There is insufficient evidence to support routine use of corticosteroid therapy. However, use of steroids as an adjunct to antibiotic therapy may be considered in severe leptospirosis with pulmonary haemorrhage (consult ID physician).
Chemoprophylaxis Consider on a case-by-case basis in short periods of high risk exposure (E.g.: soldiers, outbreak response personnel involved in occupational/ recreational activities (see comments))	Doxycycline 200 mg PO weekly starting 1-2 days before exposure and continue during exposure **Doxycycline is contraindicated in pregnancy and breastfeeding. Gastrointestinal side effects are common.*		The mainstay prevention of leptospirosis is avoidance of direct contact with contaminated water or environment. Evidence on effectiveness of prophylactic antibiotics in prevention of leptospirosis is limited. Routine use of prophylactic antibiotics is not recommended. In situations of major outbreaks, the use of mass chemoprophylaxis is not recommended.

Tetanus

Clostridium tetani

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Tetanus ***Notifiable disease. Consult ID Physician.***	Metronidazole 500 mg IV q6-8h for 7-10 days **PLUS** Human Tetanus Immunoglobulin single dose 500 IU IM **PLUS** Anti-tetanus toxoid vaccine IM (initiate age-appropriate active immunization at a different site)	Benzylpenicillin 100,000-200,000 unit/kg/24h IV q6h for 7-10 days **PLUS** Human Tetanus Immunoglobulin single dose 500 IU IM **PLUS** Anti-tetanus toxoid vaccine IM (initiate age-appropriate active immunization at a different site)	All patients with tetanus should undergo wound debridement to eradicate spores and necrotic tissue. *IV to oral switch is recommended once symptoms improve. Refer to DIAMS IV to Oral & OPAT for more information.

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Melioidosis (*Burkholderia pseudomallei*)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	**Alternative**	
Intensive Therapy - Mild (Non-Neurological)	Ceftazidime 100-120 mg/kg/24h IV q6-8h (usual dose: 2 g IV q6h) **MAY ADD:** *Bactrim (Trimethoprim 80 mg/ Sulphamethoxazole 400 mg) • **< 40 kg:** 160/800 mg (= 2 tablets) PO q12h • **40-60 kg:** 240/1200 mg (= 3 tablets) PO q12h • **> 60 kg:** 320/1600 mg (= 4 tablets) PO q12h **PLUS** Folic Acid 5 mg PO q24h **Followed by Eradication Therapy.**	***Bactrim graded introduction:** • Due to the high incidence of adverse effects associated with Bactrim, gradual introduction of Bactrim may be considered. • The gradual introduction may be applied for all melioidosis patients, including those requiring ICU therapy, EXCEPT for neurological melioidosis, where full-dose Bactrim is started immediately. • If Bactrim has not been incorporated into the initial intensive therapy (eg: melioidosis pneumonia / bacteremia without a focus), graded Bactrim introduction may be started during intensive phase to ensure full Bactrim dose is achieved before the cessation of the IV therapy. • Graded dose will require approx. 1-2 weeks, but a more rapid introduction may be considered for unwell patients or deep-seated infections. **Graded introduction Bactrim for patients over 60 kg with normal renal function over 8 days:** 1. 40/200 mg **(½ tablet) BD** for **2 days**, then 2. 80/400 mg **(1 tablet) BD** for **2 days**, then 3. 160/800 mg **(2 tablets) BD** for **2 days**, then 4. 240/1200mg **(3 tablets) BD** for **2 days**, then 5. Full dose 320/1600 mg **(4 tablets) BD** subsequently For those < 60 kg or those with impaired renal function, refer to ID Physician to determine the graded dosing schedule. Ref: The 2024 revised Darwin Melioidosis Treatment Guideline.	***Bactrim (Trimethoprim/ Sulphamethoxazole):** add on in eye, neurologic, genitourinary infection testicular and prostatic abscesses, pericardium, bone and joint, cutaneous and soft tissue infections. Drainage of abscesses should be attempted wherever appropriate such as prostatic, empyema and pericardium. **Duration of intensive therapy:** • **Skin and soft tissue infection, mild pneumonia:** 2 weeks • **Bacteraemia with no foci:** 2-4 weeks • **Complicated pneumonia, prostatic, deep-seated foci, septic arthritis**: 4 - 6 weeks • **Osteomyelitis:** 6 weeks • **Neurologic/CNS:** 8 weeks • **Arterial infection**; e.g. mycotic aneurysm: 8 weeks Use clinical judgement to guide prolongation of intensive phase in patients with slow clinical improvement or persistent bacteraemia. Carbapenems are potentially neurotoxic especially at higher doses. Use with caution in patients with renal impairment or CNS disorders. Consider OPAT for IV Ceftazidime. Refer to DIAMS – IV to PO & OPAT.
Intensive Therapy - Moderate - Severe (Neuromeliodosis, persistent bacteremia or severe sepsis)	Meropenem 75 mg/kg/24h IV q8h (usual dose: 1 g IV q8h; 2 g IV q8h for CNS disease) **OR** Imipenem 50 mg/kg/24h IV q6h or maximum 4 g/day (usual dose : 500 mg IV q6h; 1 g q6-8h for severe infection) *(Consider de-escalate to ceftazidime once symptoms improve/stable)* **MAY ADD:** *Bactrim (Trimethoprim 80 mg / Sulphamethoxazole 400 mg) • **< 40 kg:** 160/800 mg (= 2 tablets) PO q12h • **40-60 kg:** 240/1200 mg (= 3 tablets) PO q12h • **> 60 kg:** 320/1600 mg (= 4 tablets) PO q12h **PLUS** Folic Acid 5 mg PO q24h **Followed by Eradication Therapy.**		
Eradication Therapy	*Bactrim (Trimethoprim 80 mg / Sulphamethoxazole 400 mg) • **< 40 kg:** 160/800 mg (= 2 tablets) PO q12h • **40-60 kg:** 240/1200 mg (= 3 tablets) PO q12h • **> 60 kg:** 320/1600 mg (= 4 tablets) PO q12h **PLUS** Folic Acid 5 mg PO q24h	Amoxicillin/clavulanate • **< 60 kg:** 1250 mg (= 2 tablets) PO q8h • **> 60 kg:** 1875 mg (= 3 tablets) PO q8h	**Duration of eradication therapy:** • **Osteomyelitis, neurologic/CNS: 24 weeks** • **Others: minimum 12 weeks** *** Bactrim:** Refer to Bactrim graded introduction dose above.

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Malaria

Extracted from Ministry of Health's Guideline on Management of Malaria 2013.
For further info, please refer to the Ministry of Health's latest Guideline on Management of Malaria.

Plasmodium falciparum - Non Complicated

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
New Infection	Riamet* *(1 tablet: 20 mg artemether/ 120 mg lumefantrine)* A **3-day treatment schedule** with a total of **6 doses** is recommended: • **1st dose:** STAT (0 hour) • **2nd dose:** 8th hours *(from stat dose)* • Then subsequently **1 dose BD for 2 days** as follows: – ***3rd dose:*** *24th hour (from stat dose)* – ***4th dose:*** *36th hour (from stat dose)* – ***5th dose:*** *48th hour (from stat dose)* – ***6th dose:*** *60th hour (from stat dose)* Each dose is based on body weight: • **5 - <15 kg :** 1 tablet per dose • **15 - <25 kg :** 2 tablets per dose • **25 - <35 kg :** 3 tablets per dose • **≥ 35 kg :** 4 tablets per dose **PLUS** Primaquine single dose (refer to comments section)	Artesunate /Mefloquine (AS+MQ FDC Tablet)** 2 FDC strengths available: 1. 25 mg AS /55 mg MQ, and 2. 100 mg AS / 220 mg MQ A **3-day treatment schedule**, once daily regime • **5-8 kg :** 1 tablet of 25 mg AS/ 55 mg MQ • **9-17 kg :** 2 tablets 25 mg AS / 55 mg MQ • **18-29 kg :** 1 tablet of 100mg AS/ 220 mg MQ • **≥30 kg :** 2 tablets of 100 mg AS/ 220 mg MQ **PLUS** Primaquine single dose (refer to comments section) **OR** Quinine (10 mg/kg) PO q8h **PLUS** Doxycycline 100 mg PO BD for 7 days **PLUS** Primaquine single dose (refer to comments section)	***Riamet:** • Should be taken with a fatty meal e.g milk to increase bioavailability. • If the patient cannot tolerate Riamet or take a high fat diet, AS+MQ will be the preferred option. • In pregnancy: Limited data on safety of artemisinin exposure during 1st trimester, thus quinine is recommended. Exposure of artemisinin derivatives during 2nd and 3rd trimester have shown no adverse effects on the mother or fetus. **Primaquine single dose:** • A **single dose** of 0.75 mg/kg (max 45 mg) Primaquine to be given on Day 1 of treatment in addition to artemisin regime and quinine, except for pregnant women and infant < 1 year of age. • If G6PD status unknown before use, to use 0.25 mg/kg. **Lactating woman:** • Do not use primaquine and tetracycline ****AS+MQ:** • Do not use in pregnancy • May cause seizure in children with epilepsy • Interact with Quinine, Choloroquine and Halofantrine and may cause arrhythmia • Do not repeat AS-MQ regime within 60 days. (Re-use of mefloquine within 60 days of first treatment is associated with increased risk of neuropsychiatric reactions.)
Treatment Failure or Relapse	Use an alternative ACT regimen (eg: if Riamet is used as the first line regimen, so the choice will be AS+MQ and vice versa) Refer to new Infection table above for dosing **PLUS** Primaquine single dose (refer to comments section)	Quinine 10 mg/kg PO q8h **PLUS** Doxycycline 100 mg PO BD for 7 days **PLUS** Primaquine single dose (refer to comments section)	**Primaquine single dose:** • A **single dose** of 0.75 mg/kg (max 45 mg) Primaquine to be given on Day 1 of treatment in addition to artemisin regime and quinine, except for pregnant women and infant < 1 year of age. • If possible, check G6PD status before use. If G6PD status unknown before use, to use 0.25 mg/kg.

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Plasmodium falciparum - Severe

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Severe *P. falciparum* infection	*IV Artesunate 2.4 mg/kg at • 0 hour, then • 12 hour, then • 24 hour, then • Daily subsequently till day 7 **PLUS** Doxycycline 100 mg PO q12h for 7 days **PLUS** Primaquine single dose (refer to comments section) ***IV to PO** *Parenteral artesunate should be given for a **minimum of 24 hours (3 doses)** or until patient can tolerate orally. Then, it can be switched to a **full 3-day course of oral ACT** (either Riamet or AS+MQ). Refer to *Plasmodium falciparum - Non Complicated* table above for dosing *For all stages of pregnancy: IV Artesunate as for normal adults	IV Quinine loading dose: • 20 mg salt/kg over 4 hours in D5% **OR** • IV Quinine 7 mg salt/kg over 1 hour followed by 10 mg salt/kg over 4 hours **PLUS** Primaquine single dose (refer to comments section) **Followed by:** IV Quinine 10 mg/kg q8h (may be converted to oral if tolerated) for 7 days **PLUS** Doxycycline 100 mg PO BD for 7 days	IM artesunate or quinine can be given if no venous access available. The drug must be given before transporting patient to a tertiary centre. The patient should be managed in an intensive care facility **Quinine:** • Monitor patient's blood glucose and ECG while on IV quinine. • In renal failure or hepatic dysfunction, quinine dose should be reduced by one third after 48 hours. No dosage adjustments are necessary if patients are receiving haemodialysis **Primaquine single dose:** • A **single dose** of 0.75 mg/kg (max 45 mg) Primaquine to be given on Day 1 of treatment in addition to artemisin regime and quinine, except for pregnant women and infant < 1 year of age. • If possible, check G6PD status before use.

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Plasmodium vivax / ovale

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
New Infection	Chloroquine 10 mg base/kg (max 600 mg) PO STAT, then 5 mg base/kg (max 300 mg) at 6 hours later, Day 2 and Day 3 **PLUS** **Primaquine 0.5 mg/kg (max 30 mg) PO q24h for 14 days	**In pregnancy:** The full course of Chloroquine will be given, then followed by 300 mg weekly until delivery The full course of Primaquine** will only be given post-delivery	****Primaquine:** • In patients with mild variants of G6PD deficiency, primaquine should be given in a dose of 0.75 mg base/kg body weight once a week for 8 weeks. • If significant haemolysis occurs on treatment, then primaquine should be stopped. • For adults >70 kg, continue 30 mg daily beyond 14 days until a total cumulative dose of 6 mg/kg is reached
Treatment failure or Suspected chloroquine resistant	**Repeat course:** *ACT (Riamet) for 3 days *(1 tablet: 20 mg artemether/ 120 mg lumefantrine)* A **3-day treatment schedule** with a total of **6 doses** is recommended: • **1st dose:** STAT (0 hour) • **2nd dose:** 8th hours *(from stat dose)* • Then subsequently **1 dose BD for 2 days** as follows: – ***3rd dose:*** *24th hour (from stat dose)* – ***4th dose:*** *36th hour (from stat dose)* – ***5th dose:*** *48th hour (from stat dose)* – ***6th dose:*** *60th hour (from stat dose)* Each dose is based on body weight: • **5 - <15 kg :** 1 tablet per dose • **15 - <25 kg :** 2 tablets per dose • **25 - <35 kg :** 3 tablets per dose • **≥ 35 kg :** 4 tablets per dose **PLUS** **Primaquine 0.5 mg/kg (max 30 mg) PO q24h for 14 days		
Severe *P. vivax*	Treatment is as per *Plasmodium falciparum* - Severe		

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*Plasmodium malariae / knowlesi***

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
New Infection	Riamet *(1 tablet: 20 mg artemether/ 120 mg lumefantrine)* A **3-day treatment schedule** with a total of **6 doses** is recommended: • **1st dose:** STAT (0 hour) • **2nd dose:** 8th hours *(from stat dose)* • Then subsequently **1 dose BD for 2 days** as follows: – ***3rd dose:*** *24th hour (from stat dose)* – ***4th dose:*** *36th hour (from stat dose)* – ***5th dose:*** *48th hour (from stat dose)* – ***6th dose:*** *60th hour (from stat dose)* Each dose is based on body weight: • **5 - <15 kg :** 1 tablet per dose • **15 - <25 kg :** 2 tablets per dose • **25 - <35 kg :** 3 tablets per dose • **≥ 35 kg :** 4 tablets per dose	Artesunate /Mefloquine (AS+MQ FDC Tablet) 2 FDC strengths available: 3. 25 mg AS /55 mg MQ, and 4. 100 mg AS / 220 mg MQ A 3-day treatment schedule, once daily regime • **5-8 kg :** 1 tablet of 25 mg AS/ 55 mg MQ • **9-17 kg :** 2 tablets 25 mg AS / 55 mg MQ • **18-29 kg :** 1 tablet of 100mg AS/ 220 mg MQ • **≥30 kg :** 2 tablets of 100 mg AS/ 220 mg MQ **OR** Chloroquine 10 mg base/kg (max 600 mg) PO STAT, then 5 mg base/kg (max 300 mg) at 6 hours later, Day 2 and Day 3	** *P. knowlesi* and *P. malariae* cannot be distinguished by microscopy. In Sabah and Sarawak, *P. malariae* is rare; nearly all reports of *P. malariae* are in fact *P. knowlesi* when tested by PCR. Patient diagnosed by microscopy as *P. malariae* should be presumed to have *P. knowlesi* infection. It does not require radical cure with primaquine, as no hypnozoites are formed in infection with this species.
Severe *P. malariae/knowlesi*	*IV Artesunate 2.4 mg/kg at • 0 hour, then • 12 hour, then • 24 hour, then • Daily subsequently till day 7 **PLUS** Doxycycline 100 mg PO q12h for 7 days ***IV to PO** *Parenteral artesunate should be given for a **minimum of 24 hours (3 doses)** or until patient can tolerate orally. Then, it can be switched to a **full 3-day course of oral ACT** (either Riamet or AS+MQ). Refer to new Infection table above for dosing *For all stages of pregnancy: IV Artesunate as for normal adults		

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HSgB Antimicrobial Guideline (HAG)

SECTION A: ADULT

A22:
URINARY TRACT INFECTIONS (UTI)

Launched: October 2024

Updated: -

LIST OF TOPICS WITH LINKS:

1. **Classification of Urinary Tract Infections (UTI)**
2. **Asymptomatic Bacteriuria**
3. **Uncomplicated UTI**
    - Uncomplicated Cystitis
    - Uncomplicated Pyelonephritis
4. **Complicated UTI - Complicated Pyelonephritis, Cystitis, Catheter-Associated UTI (CA-UTI)**
5. **Urosepsis**
6. **Recurrent UTI - Prophylaxis for Recurrent Urinary Tract Infections (rUTIs)**
7. **Balanitis**
    - Bacterial Balanitis
    - Candida Balanitis
8. **Surgical Infections**
    - Renal Abscess (Pyonephrosis/ Perinephric Abscess/ Renal Abscess)
    - Bacterial Prostatitis
        i. Acute Bacterial Prostatitis (ABP)
        ii. Chronic Bacterial Prostatitis (CBP)
    - Testicular/Scrotal Infection
    - Epididymo-orchitis (non-STD related)
    - Testicular/ Scrotal Abscess
    - Fournier's Gangrene

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Classification of Urinary Tract Infections (UTI)

Asymptomatic Bacteriuria (ABU)

- Urine bacterial growth ≥105cfu/mL in 2 serial samples in women or a single sample in men without urinary tract infection (UTI) symptoms.

Uncomplicated UTI

- Acute, sporadic or recurrent lower (uncomplicated cystitis) and/or upper (uncomplicated pyelonephritis) UTI, limited to non-pregnant women with no known relevant anatomical and functional abnormalities within the urinary tract or comorbidities.

Complicated UTI

- UTIs in patients with increased risk of a complicated course:
  - all men
  - pregnant women
  - anatomical or functional abnormalities of the urinary tract
  - indwelling urinary catheters
  - renal diseases
  - concomitant immunocompromising diseases (for example, uncontrolled diabetes)

Catheter-associated UTI (CA-UTI)

- CA-UTI occurs in a person whose urinary tract is currently catheterized or has had a catheter in place within the past 48 hours.

Urosepsis

- Life threatening organ dysfunction caused by a dysregulated host response to infection originating from the urinary tract.

Recurrent UTI

- Recurrences of uncomplicated and/or complicated UTIs, with a frequency of at least three UTIs/year or two UTIs in the last six months.

Asymptomatic Bacteriuria

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Asymptomatic Bacteriuria	Treatment is NOT indicated unless: • In pregnant women • Prior to transurethral resection of prostate (TURP) or urological procedures breaching the mucosa (refer to **Chemoprophylaxis section**)		**Duration of treatment for pregnant women: 5 days.** **Please refer to "Uncomplicated Cystitis" for choice of antibiotics.** **Do not screen or treat asymptomatic** bacteriuria in the following conditions: ▪ Women without risk factors ▪ Post-menopausal women ▪ Patients with indwelling or suprapubic catheters and nephrostomy tubes ▪ Elderly institutionalized patients ▪ Patients with dysfunctional and/or reconstructed lower urinary tracts ▪ Patients with renal transplants ▪ Patients prior to arthroplasty surgeries ▪ Patients with history of recurrent urinary tract infections

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Uncomplicated UTI

Uncomplicated Cystitis

Common organisms: *Escherichia coli, Klebsiella pneumoniae, Streptococcus agalactiae*

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Uncomplicated cystitis	*Nitrofurantoin 50-100 mg PO q6h (macrocrystals) **Avoid Nitrofurantoin if GFR < 30ml/min.* **OR** *Nitrofurantoin 100 mg PO q12h (monohydrate/macrocrystals, dual release) **Avoid Nitrofurantoin if GFR < 30ml/min.* **OR** Cephalexin 500mg PO q12h **Duration: 5 days**	Amoxicillin/clavulanate 625 mg PO q8h **OR** Ampicillin/sulbactam 375-750 mg PO q12h **OR** Cefuroxime 500 mg PO q12h **Duration: 3-5 days** **OR** Oral Fosfomycin • **For patients suspected to have MDR Gram negative infection:** Fosfomycin 3 g PO x **1 dose** **OR** • **If confirmed MDR pathogens sensitive to fosfomycin:** Fosfomycin 3 g PO q48h for total **3 doses.**	**Ciprofloxacin and other fluoroquinolones**: Highly efficacious in 3-day regimens but have a propensity for collateral damage and should be reserved for definitive therapy or severe infections. Fluoroquinolones can be considered alternative antimicrobials for patients who cannot tolerate the recommended antibiotics due to adverse effects such as drug allergy. **Bactrim (Trimethoprim-sulfamethoxazole)**: Not recommended to be used as empirical therapy for UTI as the local resistance rates of E. coli and Klebsiella pneumoniae has been consistently > 30%. If susceptible, trimethoprim-sulfamethoxazole 160/800 mg PO q12h for 3 days can be used for definitive therapy. **Amoxicillin or ampicillin:** Should not be used for empirical treatment given the relatively poor efficacy and the very high prevalence of antimicrobial resistance.

Uncomplicated Pyelonephritis

Common organisms: *Escherichia coli, Klebsiella pneumoniae, Streptococcus agalactiae*

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Outpatient treatment	Amoxicillin/clavulanate 625 mg PO q8h **OR** Ampicillin/sulbactam 375-750 mg PO q12h **Duration: 7-10 days**	*Ciprofloxacin 500 mg PO q12h **Ciprofloxacin has a propensity for collateral damage and potential adverse effects.* **Duration: 7 days**	Perform ultrasound of the upper urinary tract to exclude obstructive pyelonephritis. If there is evidence of obstruction, please refer to "**Complicated UTI**" section. Consider stepping down to oral antibiotics based on culture and sensitivity result once patient is afebrile for >48 hours, clinically improving and able to take oral medications.
Inpatient treatment	Amoxicillin/clavulanate 1.2 g IV q6h **OR** Ampicillin/sulbactam 1.5-3 g IV q8h **Duration: 7 days**	Cefuroxime 750 mg IV q8h **OR** Ceftriaxone 1 g IV q24h **Duration: 7 days**	

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Complicated UTI

Complicated Pyelonephritis, Cystitis, Catheter-Associated UTI (CA-UTI)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Complicated Pyelonephritis, Cystitis, Catheter-associated UTI (CA-UTI) Common organisms: • *Escherichia coli* • *Klebsiella pneumoniae* • *Enterococcus faecalis* • *Streptococcus agalactiae* • *Pseudomonas aeruginosa*	*Amoxicillin/clavulanate 1.2 g IV q6h **Amoxicillin/clavulanate is generally safe in pregnancy (category B) but may have an increased risk of necrotizing enterocolitis associated with its use in pre-term and premature rupture of membrane.* **OR** Ampicillin/sulbactam 1.5-3 g IV q8h **MAY ADD** **Aminoglycoside ***Consider adding aminoglycoside (E.g.: amikacin) in patients with severe pyelonephritis, or risk factors for pseudomonas aeruginosa or MDR organisms.*	Cefuroxime 750-1500 mg IV q8h **OR** Ceftriaxone 1-2 g IV q24h **MAY ADD** **Aminoglycoside ***Consider adding aminoglycoside (E.g.: amikacin) in patients with severe pyelonephritis, or risk factors for pseudomonas aeruginosa or MDR organisms.*	**Duration: 10-14 days** For mild or moderate CAUTIs, especially in stable patients with no signs of systemic infection, **oral antibiotics may be sufficient**, provided that the chosen antibiotic is effective against the identified pathogen. The choice between oral and IV antibiotics should be guided by clinical judgment, the patient's overall condition, and the results of urine culture and sensitivity testing. Consider stepping down to oral antibiotics based on culture and sensitivity result once patient is afebrile for > 48 hours, clinically improving and able to take oral medications. Refer to DIAMS IV to Oral & OPAT for more information. Pyuria alone in the absence of other symptoms is not diagnostic of CA-UTI. Remove unnecessary catheters. Whenever indicated, change catheter prior to starting treatment.

Urosepsis

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Urosepsis	*Piperacillin-tazobactam 4.5 g IV q6-8h **Piperacillin/tazobactam: if given as q8h, to be given as extended infusion (over 3 – 4 hours).* **OR** Cefepime 2 g IV q8h	**Meropenem 1g IV q8h **OR** **Imipenem 500 mg IV q8h ***Carbapenem should be reserved for urosepsis with risk factors for MDR or ESBL-producing organism.*	

Recurrent UTI

Prophylaxis for Recurrent Urinary Tract Infections (rUTIs)

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Prophylaxis for Recurrent Urinary Tract Infections (rUTIs)	Nitrofurantoin 50-100 mg PO ON (macrocrystals) **OR**	Trimethoprim/sulfamethoxazole (Bactrim) 80 mg/400 mg (=1 tablet) PO ON **OR** Trimethoprim 100 mg PO ON	Antimicrobial prophylaxis is indicated if non-antimicrobial measures (behavioral and personal hygiene) fail. Continuous prophylaxis for 3-12 months or intermittent post-coital

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Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
	Nitrofurantoin 100 mg PO ON (monohydrate/macrocrystals, dual release) *Long-term use of nitrofurantoin has been associated with an increased risk of rare adverse effects, including pulmonary toxicity, hepatotoxicity and peripheral polyneuropathy.* **OR** Cephalexin 250 mg PO ON		prophylaxis (a single dose of antibiotics taken within the 2-hour period after sexual intercourse).

Balanitis

Bacterial Balanitis

Common organisms for Aerobic infection:

- *Staphylococcus sp.*
- *Streptococcus sp.*

Antibiotics are only indicated if there is **clinical suspicion or evidence** of bacterial balanitis.
Please refer to the **Sexually Transmitted Infection** section for antibiotic choice if there is evidence of STI.

Infection/Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	
Aerobic Infection	Mupirocin ointment 2% LA q8-12h for 7-10 days **MAY ADD** Amoxicillin/clavulanate 625 mg PO q8h for 7 days (for severe cases)		
Anaerobic Infection	Amoxicillin/clavulanate 625 mg PO q8h for 7 days		

Candida Balanitis

Common organism: *Candida sp.*

Infection/Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	
Candida Balanitis	Clotrimazole cream 1% q12h for 7-14 days **OR** Miconazole cream 2% q12h 7-14 days **For severe cases,** **MAY ADD** Fluconazole 200 mg PO q24h **MAY ADD** Hydrocortisone cream 1% q12h (if marked inflammation is present)		

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Infection/Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	

Surgical Infections

Renal Abscess (Pyonephrosis/ Perinephric Abscess/ Renal Abscess)

Common organisms:

- *Escherichia coli*
- *Klebsiella pneumoniae*
- *Staphylococcus aureus*
- *Enterococcus faecalis*
- *Streptococcus agalactiae*
- *Pseudomonas aeruginosa*

Less common organism:

- *Mycobacterium tuberculosis*

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Pyonephrosis/ Perinephric Abscess/ Renal Abscess	Amoxicillin/clavulanate 1.2 g IV q6h **OR** Ampicillin/sulbactam 3 g IV q6-8h **MAY ADD** Gentamicin 5 mg/kg IV q24h	Cefuroxime 750-1500 mg IV q8h **OR** Ceftriaxone 2 g IV q24h **MAY ADD** Gentamicin 5 mg/kg IV q24h	Source control by surgical or pigtail drainage is the mainstay of treatment. **Duration of antibiotics: 2-3 weeks (of both IV and oral).** The duration of antibiotics should be determined by the extent of infection, source control, clinical response, resolution on follow-up imaging, and normalization of inflammatory markers. Consider stepping down to oral antibiotics based on culture and sensitivity results once the patient is afebrile for >48 hours, clinically improving and able to take oral medications. . Refer to DIAMS IV to Oral & OPAT for more information. *DIAMS – IV to Oral & OPAT

Bacterial Prostatitis

Acute Bacterial Prostatitis (ABP)

Common organisms:

- *Escherichia coli*
- *Klebsiella pneumoniae*
- *Enterococcus faecalis*
- *Pseudomonas aeruginosa*

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Outpatient treatment	Trimethoprim/Sulfamethoxazole (Bactrim) 160 mg/800 mg (= 2 tablets) PO q12h **OR** Ciprofloxacin 500 mg PO q12h		Obtain urine culture before starting treatment. **Duration of antibiotics: Minimum 10-14 days or up to 6 weeks** depending on the severity and clinical response.

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			Consider stepping down to oral antibiotics based on culture and sensitivity results once the patient is afebrile for >48 hours, clinically improving and able to take oral medications. Refer to DIAMS IV to Oral & OPAT for more information. *DIAMS – IV to Oral & OPAT If patient has risk factors for sexually transmitted disease, please refer to **Sexually Transmitted Infection** for choice of antibiotics.
Inpatient treatment	Amoxicillin/clavulanate 1.2 g IV q6h **OR** Ampicillin/sulbactam 3 g IV q6-8h **MAY ADD** Gentamicin 5 mg/kg IV q24h	Cefuroxime 750 – 1500 mg IV q8h **OR** Ceftriaxone 1-2 g IV q24h **MAY ADD** Gentamicin 5 mg/kg IV q24h	

Chronic Bacterial Prostatitis (CBP)

Chronic or recurrent urogenital symptoms that persist for at least 3 months.

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Chronic Bacterial Prostatitis	Ciprofloxacin 500 mg PO q12h for 4-6 weeks *Ciprofloxacin, despite the high resistance rates of uropathogens, is recommended as first line agent in the empirical treatment of chronic bacterial prostatitis due to the favourable pharmacokinetic properties.*	Trimethoprim/Sulfamethoxazole (Bactrim) 160 mg/800 mg (= 2 tablets) PO q12h for 4-12 weeks	Referral to urologist is recommended to differentiate from **chronic non-bacterial prostatitis** before starting antibiotics.

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Testicular/Scrotal Infection

Epididymo-orchitis (non-STD related)

Common organisms:

- *Escherichia coli*
- *Klebsiella pneumoniae*
- *Enterococcus faecalis*
- *Pseudomonas aeruginosa*

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Epididymo-orchitis (non-STD related)	Levofloxacin 500 mg PO q24h for 10 days	Ciprofloxacin 500 mg PO q12h for 10-14 days **OR** Trimethoprim/Sulfamethoxazole (Bactrim) 160 mg/800 mg (= 2 tablets) PO q12h for 10 days	If patient has risk factors for sexually transmitted disease, please refer to **Sexually Transmitted Infection** section for choice of antibiotics.

Testicular/ Scrotal Abscess

Common organisms:

- *Escherichia coli*
- *Klebsiella pneumoniae*
- *Enterococcus faecalis*
- *Pseudomonas aeruginosa*

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Testicular/ Scrotal Abscess	Amoxicillin/clavulanate 1.2 g IV q6h **OR** Ampicillin/sulbactam 3 g IV q6-8h **MAY ADD** Gentamicin 5 mg/kg IV q24h	Cefuroxime 750-1500 mg IV q8h **OR** Ceftriaxone 2 g IV q24h **MAY ADD** Gentamicin 5 mg/kg IV q24h	Surgical drainage is the mainstay of treatment.

Fournier's Gangrene

Common organisms:

- *Escherichia coli*
- *Klebsiella pneumoniae*
- *Enterococcus faecalis*
- *Pseudomonas aeruginosa*
- Anaerobes

Infection/Condition & Likely Organism	Suggested Treatment for Adult Patients		Comments
	Preferred	Alternative	
Fournier's Gangrene	*Piperacillin-tazobactam 4.5 g IV q6-8h **Piperacillin/tazobactam: if given as q8h, to be given as extended infusion (over 3 – 4 hours)*	Ceftriaxone 2 g IV q24h **PLUS** Metronidazole 500 mg IV q8h	Aggressive surgical debridement is the mainstay of treatment. Antibiotics are given until source control is achieved.

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SECTION B:
PAEDIATRIC PATIENTS

IN THIS SECTION:

B1:
CARDIOVASCULAR (CNS) INFECTIONS

B2:
CENTRAL NERVOUS SYSTEM (CNS) INFECTION

B3:
CHEMOPROPHYLAXIS

B4:
GASTROINTESTINAL (GI) INFECTIONS

B5:
INFECTIONS IN IMMUNOCOMPROMISED PATIENTS

B6:
NEONATAL INFECTIONS

B7:
OCULAR INFECTIONS

B8:
ORTHOPAEDIC INFECTIONS

B9:
OTORHINOLARYNGOLOGY (ORL) INFECTIONS

B10:
RESPIRATORY INFECTIONS

B11:
SKIN & SOFT TISSUE INFECTIONS (SSTI)

B12:
TROPICAL INFECTIONS

B13:
URINARY TRACT INFECTIONS (UTI)

B14:
VASCULAR INFECTIONS

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HSgB Antimicrobial Guideline (HAG)

SECTION B: PAEDIATRIC PATIENTS

B1: CARDIOVASCULAR (CNS) INFECTIONS

Launched: October 2024

Updated: -

LIST OF TOPICS WITH LINKS:

1. **Acute Myocarditis**
2. **Acute Pericarditis**
   - Viral
   - Bacterial
3. **Infective Endocarditis (IE)**
   - Empirical Therapy For Infective Endocarditis
     - Community-Acquired Organisms
     - Healthcare-Associated Organisms
   - Specific Organisms For Infective Endocarditis
     - *Streptococcus viridans*
     - *Enterococcus sp.*
     - *Staphylococcus aureus*
     - HACEK organisms
4. **Culture-Negative Endocarditis**

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Acute Myocarditis

Viral

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Commonest cause: • Enteroviruses • Adenovirus • Influenza • Coronaviruses • HIV etc	Treatment mainly supportive.	-	Among the viruses implicated are enteroviruses including Coxsackie & EV71. For severe HFMD with cardiopulmonary failure stage, use of IVIG may be considered if not used during CNS involvement or autonomic nervous system dysregulation stage. Immunomodulation may be considered in SARS-CoV-2 infection

Acute Pericarditis

Viral

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
(Viral - commonest cause)	Treatment mainly supportive.	-	

Bacterial

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Common organisms: • *Staphylococcus aureus* • *Haemophilus influenzae* • *Salmonella spp.* • *M. tuberculosis* Non-infectious causes (especially post cardiac surgery) are becoming more common.	***Empiric for purulent pericarditis:** Cloxacillin 200 mg/kg/day IV in 4-6 divided doses (max. 12 g/day) **PLUS** Cefotaxime 200-300 mg/kg/day IV in 4 divided doses (max. 12 g/day) **Cover with IV Vancomycin in settings with high prevalence of MRSA*	**Antibiotic Allergy:** Cefazolin 100 mg/kg/day IV in 3 divided doses (max. 6 g/day)	Need pericardial fluid to differentiate between different etiologic agent & C&S to adjust antibiotic. Consider surgical drainage for tamponade, pre-tamponade & ineffective conservative management. **Duration of therapy: 4 weeks** **Antibiotic Allergy:** Refer to APPENDICES > Antibiotic Allergy for more info.

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Infective Endocarditis (IE)

Empirical Therapy For Infective Endocarditis

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Community-Acquired Organisms Common organisms: • *Streptococcus* • *Enterococcus* • HACEK Gram-negative organisms	Ampicillin 200-300 mg/kg/day IV/PO in 4-6 divided doses (max. 12 g/day) **PLUS** Gentamicin 1 mg/kg/dose IV q8h **MAY ADD** *Cloxacillin 200 mg/kg/day IV in 4-6 divided doses (max. 12 g/day)	-	*For acute presentation, need to cover for MSSA since *Streptococcus, Enterococcus* & HACEK presentations are usually sub-acute.
Healthcare-Associated Organisms Common organisms: • MRSA • Non-HACEK Gram-negative organisms • *Enterococcus sp*.	Vancomycin 60 mg/kg/day IV in 2- 3 divided doses (max. 2 g/day unless unable to achieve therapeutic level) **PLUS** Gentamicin 1 mg/kg/dose IV q8h **MAY ADD** *Rifampicin 20 mg/kg/day IV/PO in 3 divided doses (max. 900 mg/day)	-	***Rifampicin** IS ONLY for prosthetic valve AND added after 3-5 days later than vancomycin & gentamicin. If non-HACEK Gram-negative organism like pseudomonas is suspected epidemiologically, add Cefepime 50 mg/kg/dose IV q8h until cultures are known. Once cultures are available, adjust accordingly.

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Specific Organisms For Infective Endocarditis

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Streptococcus viridans	**Strains fully susceptible to penicillin (MIC < 0.125 mg/l):** Benzylpenicillin 200,000-300,00 units/kg/day IV in 4-6 divided doses (up to 12-18 million units/day)	**Strains fully susceptible to penicillin (MIC < 0.125 mg/l):** Ampicillin 300 mg/kg/day IV in 4-6 divided doses (max. 12 g/day) **OR** Ceftriaxone 100 mg/kg/day IV in 1-2 divided doses (max. 4 g/day) **OR** **For Antibiotic allergy:** *Vancomycin 40 mg/kg/day IV in 2-3 divided doses (max. 2 g/ day)	**Duration:** • **4 weeks for native valve** • **6 weeks for prosthetic valve** ***Vancomycin:** • Recommended only for patients with immediate type penicillin hypersensitivity. • Dose adjusted for trough concentration of 10-15 mg/L. **Antibiotic Allergy:** Refer to **APPENDICES > Antibiotic Allergy** for more info.
	Strains with MIC > 0.125 to 2 µg/ml: Benzylpenicillin 200,000-300,00 units/kg/day IV in 4-6 divided doses (up to 12-18 million units/day) **PLUS** Gentamicin 1 mg/kg/dose IV q8h for 2 weeks **OR** Ceftriaxone 100 mg/kg/day IV in 1-2 divided doses (max. 4 g/day) **PLUS** Gentamicin 1 mg/kg/dose IV q8h for 2 weeks	**Strains with MIC > 0.125 to 2 µg/ml** (with Beta-lactam allergy): *Vancomycin 40 mg/kg/day IV in 2-3 divided doses (max. 2 g/ day) **PLUS** Gentamicin 1 mg/kg/dose IV q8h	**Do not use ampicillin.** **Duration:** • **4 weeks for native valve** • **6 weeks for prosthetic valve** ***Vancomycin:** • Recommended only for patients with immediate type penicillin hypersensitivity. • Dose adjusted for trough concentration of 10-15 mg/L. **Antibiotic Allergy:** Refer to **APPENDICES > Antibiotic Allergy** for more info.

Only for internal circulation (HSgB). For further enquiries, kindly contact ext. 4126

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Specific Organisms For Infective Endocarditis

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Enterococcus sp.	**Penicillin-Sensitive (MIC ≤ 8 mg/l):** Ampicillin 200-300 mg/kg/day IV in 4-6 divided doses (max. 12 g/day) for *4-6 weeks **PLUS** Gentamicin 1 mg/kg/dose IV q8h for *2-6 weeks	**Penicillin-Sensitive (MIC ≤ 8 mg/l)** (For Individuals with renal impairment (CrCl ≤ 50ml/min ONLY): Ampicillin 200-300 mg/kg/day IV in 4-6 equally divided doses (max. 12 g/day) **PLUS** Ceftriaxone 100 mg/kg/day IV in 1-2 divided doses (max. 4 g/day)	***Duration:** • **If symptoms less than 3 months & native valve**: ampicillin for 4 weeks & gentamicin for 2 weeks. • **If symptoms more than 3 months:** ampicillin & gentamicin for 6 weeks. Do not use ceftriaxone alone since enterococcus is intrinsically resistant to this drug. This combination is NOT ACTIVE against E. faecium
	Sensitive to Penicillin & Vancomycin but High-level Resistance to Gentamicin (MIC >500 mg/l): Ampicillin 300 mg/kg/day IV in 4-6 divided doses (max. 12 g/day) **PLUS** Ceftriaxone 100 mg/kg/day IV in 1-2 divided doses (max. 4 g/day)	-	**Duration: 6 weeks** Do not use ceftriaxone alone since enterococcus is intrinsically resistant to this drug. This combination is NOT ACTIVE against E. faecium
	Resistant to Penicillin but Susceptible to Vancomycin & Gentamicin: **Vancomycin 40 mg/kg/day IV in 3 divided doses (max. 2 g/ day) **PLUS** Gentamicin 1 mg/kg/dose IV q8h	-	**Duration: 6 weeks** **Maximum dose of vancomycin: 2 g/day unless not able to achieve therapeutic range. Aim for serum trough of 10-20 mg/L.

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Specific Organisms For Infective Endocarditis

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Staphylococcus aureus	**Methicillin-sensitive (MSSA) (left-sided):** Cloxacillin 200-300 mg/kg/day IV in 4-6 divided doses (max. 12 g/day) **Duration: 4-6 weeks**	Methicillin-sensitive (MSSA) (left-sided or right sided) **For patients with Antibiotic Allergy:** Cefazolin 100 mg/kg/day IV in 3 divided doses (max. 6 g/day) for 4-6 weeks **OR** Vancomycin 60 mg/kg/day IV in 2-3 divided doses (max. 2 g/day) for 4-6 weeks. **Duration: 4-6 weeks**	**Antibiotic Allergy:** Refer to **APPENDICES > Antibiotic Allergy** for more info.
	Methicillin-sensitive (MSSA) (right-sided): Cloxacillin 200-300 mg/kg/day IV in 4-6 divided doses (max. 12 g/day) **Duration: 4 weeks**		**Methicillin-sensitive (right sided):** **May shorten duration to 2 weeks** if good response, no metastatic sites, no cardiac or extracardiac complications with size of vegetation less than 20mm.
	Methicillin-sensitive (MSSA) (left & right): Vancomycin 60 mg/kg/day IV in 2-3 divided doses (max. 2 g/day) **Duration: 4-6 weeks**		
	Methicillin-sensitive (MSSA) (prosthetic valve): Cloxacillin 200-300 mg/kg/day in 4-6 divided doses (max. 12g/day) **Duration: ≥ 6 weeks** **PLUS** Gentamicin 1 mg/kg/dose IV q8h **Duration: 2 weeks** **PLUS** *Rifampicin 20 mg/kg/day PO in 3 divided doses (max. 900 mg/day) **Duration: ≥ 6 weeks**	-	***Rifampicin:** • Has better penetration but to protect against development of resistance. • Use Rifampicin ONLY after 3-5 days of cloxacillin AND/OR bacteremia has been cleared.
	Methicillin-resistant (MRSA) (prosthetic valve): Vancomycin 60 mg/kg/day in 2-3 divided doses (max. 2 g/day) **Duration: ≥ 6 weeks** **PLUS** Gentamicin 1 mg/kg/dose IV q8h **Duration: 2 weeks** **PLUS** *Rifampicin 20 mg/kg/day PO in 3 divided doses (max. 900 mg/day) **Duration: ≥ 6 weeks**	**Methicillin-resistant (MRSA) (left & right):** *Daptomycin 10 mg/kg IV daily **Duration: 4-6 weeks**	***Rifampicin:** • Has better penetration but to protect against development of resistance. • Use Rifampicin ONLY after 3-5 days of cloxacillin AND/OR bacteremia has been cleared. ***Daptomycin:** • Registered in Malaysia however not in FUKKM. • Daptomycin is superior to vancomycin for MRSA bacteremia with MIC >1 mg/L.

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Specific Organisms For Infective Endocarditis

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
HACEK organisms Slow growth or no growth in blood culture Organisms: • *Haemophilus species* • *Aggregatibacter actinomycetemcomitans* • *Cardiobacterium hominis* • *Eikenella corrodens* • *Kingella kingae*	Ceftriaxone 100 mg/kg/day in 2 divided doses (max. 4 g/day)		**Duration: 4 weeks**

Culture-Negative Endocarditis

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
	Ampicillin/sulbactam 300 mg/kg/day IV in 4-6 divided doses (max. 8 g/day ampicillin component) **PLUS** Gentamicin 1 mg/kg/dose IV q8h **Duration: 4-6 weeks**	-	Culture-negative endocarditis (CNE) is diagnosed when a child has clinical & echocardiogram evidence of IE but persistent negative cultures. This is in individuals with no prior antimicrobial use. If fungi or fastidious organisms is suspected, kindly ask microbiologist to prolong incubation. Patients with culture-negative endocarditis should be treated in consultation with an ID specialist.

References:

1. American Academy of Paediatrics. Committee on Infectious Diseases. Red Book: Report of the Committee on Infectious Diseases (2021)
2. Malaysian Clinical Practice Guideline for the Prevention, Diagnosis and Management of Infective Endocarditis 2017

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HSgB Antimicrobial Guideline (HAG)

SECTION B: PAEDIATRIC PATIENTS

B2: CENTRAL NERVOUS SYSTEM (CNS) INFECTION

Launched: October 2024

Updated: -

LIST OF TOPICS WITH LINKS:

1. **Meningitis**
   - Meningitis Empirical Treatment
   - Meningitis - Specific Organisms Treatment
     - Group B Streptococcus (GBS)
     - *Haemophilus influenzae* (HI)
     - *Neisseria meningitidis*
     - *Streptococcus pneumoniae (SP)*
     - Cryptococcal Meningitis
2. **Encephalitis**
   - Herpes Simplex Encephalitis
     - Pediatric herpes CNS disease
     - Neonatal herpes CNS disease
3. **Brain Abscess**

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Meningitis

Meningitis Empirical Treatment

Common Organisms based on Age groups:		
< 1 month: • *Group B streptococcus (GBS)* • *E. coli*	**1-3 months:** • *Group B streptococcus (GBS)* • *E. coli* • *S. pneumoniae* • *N. meningitidis*	**> 3 months:** • *S. pneumoniae,* • *Hib* • *E. coli* • Salmonellosis • *N. meningitidis*

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
	Cefotaxime 200-300 mg/kg/day IV in 4 divided doses (max. 2 g/dose) **OR** Ceftriaxone 100 mg/kg/day IV in 2 divided doses (max. 2 g/dose; 4 g/day)		**For children below 3 months of age:** • Cefotaxime is the preferred third generation cephalosporin since less drug-drug interactions (in terms of interaction with calcium-containing infusion & bilirubin displacement). • Given the commonality of GBS in this age group, adding IV C Penicillin (Benzylpenicillin) to Cefotaxime while awaiting culture results can be considered. • Once organism is known, please refer below to adjust antibiotics.

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Meningitis - Specific Organisms Treatment

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Group B Streptococcus (GBS)	Benzylpenicillin 300,000-400,000 units/kg/day IV in 4-6 divided doses (max. 24 million units/day)	-	**Duration: 14 days**
***Haemophilus influenzae* (HI)**	Cefotaxime 200-300 mg/kg/day IV in 4 divided doses (max. 2 g/dose) **OR** Ceftriaxone 100 mg/kg/day IV in 1 or 2 divided doses (max. 2 g/dose; 4 g/day)	**If Ampicillin MIC <1 mcg/mL:** Ampicillin 300 mg/kg/day q6h (max. 12 g/day)	**Duration: 10 days**
Neisseria meningitidis	Benzylpenicillin 300,000-400,000 units/kg/day IV in 4-6 divided doses (max. 12 million units/day) **OR** Ceftriaxone 100 mg/kg/day IV in 2 divided doses (max. 2 g/dose; 4 g/day)		**Duration: 7 days** Prophylaxis for all household contacts & health care workers involved in unprotected contact during intubation & suctioning of airway or mouth-to-mouth resuscitation.
Streptococcus pneumoniae (SP)	**Penicillin-susceptible** (MIC ≤ 0.06 mcg/mL): Benzylpenicillin 300,00-400,000 units/kg/day in 4-6 divided doses (max. 24 million units/day)		**Duration: 14 days** *Treat in consultation with ID specialist.
	Penicillin-resistant (MIC ≥ 0.12 mcg/ml) **& Cefotaxime/Ceftriaxone-Sensitive** (MIC ≤ 0.5 mcg/mL): Cefotaxime 200-300 mg/kg/day IV in 4 divided doses (max. 2 g/dose) **OR** Ceftriaxone 100 mg/kg/day IV in 2 divided doses (max. 2g /dose; 4g/day)		
	***Penicillin & Cefotaxime/Ceftriaxone-nonsusceptible** (MIC ≥ 1.0 mcg/ml) **(Drug-Resistant *Streptococcus pneumoniae*, DRSP):** High dose Cefotaxime 300 mg/kg/day IV in 4 divided doses (max. 12 g/day) **OR** High dose Ceftriaxone 100 mg/kg/day IV in 1 or 2 divided doses (max. 2 g/dose; 4 g/day) **PLUS** Vancomycin 60 mg/kg/day in 3 divided doses (max. 2g/day unless unable to achieve therapeutic level). Target AUC24 of 400-600 mg*hour/L.		

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BACK

Meningitis - Specific Organisms Treatment

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Cryptococcal Meningitis *Cryptococcus neoformans*	**Induction Therapy:** Amphotericin B 1.0 mg/kg/day IV q24h **MAY ADD** 5-flucytosine 25 mg/kg/dose (max. 2 g/dose) PO q6h		**Duration: 2-4 weeks** Duration of induction with 5-flucytosine (5-FU) is at least 2 weeks & until CSF repeat culture is NEGATIVE.
	Consolidation Therapy: Fluconazole 6-12 mg/kg/dose (max. 400 mg/dose) IV/PO q24h for 8 weeks		**Duration: 8 weeks**

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Encephalitis

Herpes Simplex Encephalitis

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Pediatric herpes CNS disease	**> 4 month to 12 years old:** Acyclovir 30-45 mg/kg/day IV in 3 divided doses	-	**Duration: 21 days minimum.** Dosing exceeding 500 mg/m2 can be associated with acute kidney injury.
	> 12 years old: Acyclovir 30 mg/kg/day IV in 3 divided doses	-	
Neonatal herpes CNS disease	Acyclovir 60 mg/kg/day IV in 3 divided doses	-	

Brain Abscess

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
	Cefotaxime 200-300 mg/kg/day IV in 4 divided doses (max. 2 g/dose) **OR** Ceftriaxone 100 mg/kg/day IV in 2 divided doses (max. 2 g/dose; 4 g/day) **PLUS** Metronidazole 15 mg/kg IV stat then 7.5 mg/kg IV q8h (max. 4 g/day)	**If secondary to trauma:** **PLUS** Cloxacillin 200-300 mg/kg/day in 4-6 divided doses (max. 12 g/day) (Add to third-generation Cephalosporin)	Surgical drainage may be indicated if appropriate. **Duration: 6-8 weeks,** depending on response based on neuroimaging & clinical presentations.

References:

1. American Academy of Paediatrics. Committee on Infectious Diseases. Red Book: Report of the Committee on Infectious Diseases (2021)
2. Sanford Guide to Antimicrobial Therapy 2022

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HSgB Antimicrobial Guideline (HAG)

SECTION B: PAEDIATRIC PATIENTS

B3: CHEMOPROPHYLAXIS

Launched: October 2024

Updated: -

LIST OF TOPICS WITH LINKS:

1. **Surgical**
   - Cardiac Surgery
   - Thoracic Surgery
   - Abdominal Surgery
   - Hepatobiliary Surgery
   - Neurosurgery
   - Orthopaedic Surgery
   - Otorhinolaryngology (ORL) Surgery (Head & Neck)
   - Plastic Surgery
   - Urology Surgery
   - Interventional Radiology (IR)
2. **Non-Surgical Prophylaxis**
   - Cardiovascular
     - Rheumatic Fever
     - Infective Endocarditis (IE)
   - Infection Prophylaxis In Immunocompromised - Post-splenectomy
   - Tropical Infection - Malaria Prophylaxis
   - Other Infections
     - *Haemophilus influenza* B Exposure
     - Meningococcal Exposure
     - Neonatal Group B Streptococcus Infection
     - Pertussis Post-exposure prophylaxis (PEP)
     - Varicella (Chicken pox) Post-exposure prophylaxis (PEP)

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Surgical Prophylaxis

Guidelines for prevention of surgical site infections (SSIs) have been published. General principles:

1. Agent used for antimicrobial prophylaxis should prevent SSIs and related morbidity and mortality
2. Reduce duration and cost of care
3. Produce no adverse effect
4. Minimise adverse consequences to the microbial flora

Timing:

Effective chemoprophylaxis occurs only when the appropriate antimicrobial drug is present in tissues at sufficient local concentration at the time of intra-operative bacterial contamination:

- **Administration of antimicrobial agent** is recommended **within 60 minutes before surgical incision** to ensure adequate tissue concentration at the start of the procedure.
- **Agents that require longer administration time** such as vancomycin should begin **within 120 minutes before surgery begins**.
- Adequate antimicrobial concentration should be maintained throughout the surgical procedure and in most instances, single dose of antimicrobial agent is sufficient and the **duration of prophylaxis after any procedure should not exceed 24 hours**.
- **Intra-operative dosing** is required if:
    - The **duration of the procedure is greater than two times the half-life** of the antimicrobial agent, or
    - There is **excessive blood loss**.

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Cardiac Surgery

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Common organisms: • *S. epidermidis,* • *S. aureus,* • *Corynebacterium sp.*, • Enteric Gram-negative bacilli	Cefazolin 30 mg/kg IV (max. 2 g) *Recommended re-dosing interval from initiation of pre -operative dose:* ***every 4 hours***	**If known to have MRSA/MRSE colonisation:** Vancomycin 15 mg/kg IV (max. 2 g)	**Antibiotic allergy:** Clindamycin 10 mg/kg IV (max. 900 mg) *Recommended re-dosing interval from initiation of pre-operative dose:* ***every 6 hours*** **Antibiotic Allergy:** Refer to **APPENDICES > Antibiotic Allergy** for more info.

References:

1. Clinical Practical Guideline for Antimicrobial Prophylaxis for Surgery 2013. American Society of Hospital Pharmacists (ASHP) guideline, IDSA, Surgical Infection Society (SIS) and Society of Healthcare Epidemiology of America (SHEA). Bratzler DW, Dellinger EP, Olsen KM, Perl TM, Auwaerter PG, Bolon MK, Fish DN, Napolitano LM, Sawyer RG, Slain D, Steinberg JP, Weinstein RA. American Journal of Health-system Pharmacy 2013. 70(3):195-283
2. Antibiotic Prophylaxis for Paediatric Surgery. Royal Hospital for Children Glasgow. 2018

Thoracic Surgery

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Non-cardiac including lobectomy, pneumonectomy, segmentectomy, lung biopsy & thoracotomy	Cefazolin 30 mg/kg IV (max. 2 g/dose, 12 g/day) *Recommended re-dosing interval from initiation of pre -operative dose:* ***every 4 hours***	Ampicillin/sulbactam 50 mg/kg (of Ampicillin component) IV (max. 2 g/dose) *Recommended re-dosing interval from initiation of pre-operative dose:* ***every 2 hours***	**Antibiotic allergy:** Clindamycin 10 mg/kg IV (max. 900 mg/dose, 3.6 g/day) *Recommended re-dosing interval from initiation of pre-operative dose:* ***every 6 hours*** **Antibiotic Allergy:** Refer to **APPENDICES > Antibiotic Allergy** for more info.

References:

1. Clinical Practical Guideline for Antimicrobial Prophylaxis for Surgery 2013. American Society of Hospital Pharmacists (ASHP) guideline, IDSA, Surgical Infection Society (SIS) and Society of Healthcare Epidemiology of America (SHEA). Bratzler DW, Dellinger EP, Olsen KM, Perl TM, Auwaerter PG, Bolon MK, Fish DN, Napolitano LM, Sawyer RG, Slain D, Steinberg JP, Weinstein RA. American Journal of Health-system Pharmacy 2013. 70(3):195-283
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Abdominal Surgery

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Clean contaminated Surgery Examples: • Gastroduodenal procedures, • Early appendicitis, • Closure of stoma	Cefazolin 30 mg/kg IV (max. 2 g) *Recommended re-dosing interval from initiation of pre-operative dose:* ***every 4 hours***	Ampicillin/sulbactam 50 mg/kg (of ampicillin component) IV *Recommended re-dosing interval from initiation of pre -operative dose:* ***every 2 hours***	**Antibiotic allergy:** Clindamycin 10 mg/kg IV (max. 900 mg) *Recommended re-dosing interval from initiation of pre-operative dose:* ***every 6 hours*** **PLUS** Gentamicin 2.5 mg/kg IV **Antibiotic Allergy:** Refer to **APPENDICES > Antibiotic Allergy** for more info.

References:

1. Clinical Practical Guideline for Antimicrobial Prophylaxis for Surgery 2013. American Society of Hospital Pharmacists (ASHP) guideline, IDSA, Surgical Infection Society (SIS) and Society of Healthcare Epidemiology of America (SHEA). Bratzler DW, Dellinger EP, Olsen KM, Perl TM, Auwaerter PG, Bolon MK, Fish DN, Napolitano LM, Sawyer RG, Slain D, Steinberg JP, Weinstein RA. American Journal of Health-system Pharmacy 2013. 70(3):195-283.
2. Antibiotic Prophylaxis for Paediatric Surgery. Royal Hospital for Children Glasgow. 2018

Hepatobiliary Surgery

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Biliary tract Examples: • Cholecystectomy, • Choledochal cysts excision, • On Table Cholangiogram	Cefazolin 30 mg/kg IV (max. 2 g) *Recommended re-dosing interval from initiation of pre-operative dose:* ***every 4 hours*** **OR** Ampicillin/sulbactam 50 mg/kg (of ampicillin component) IV *Recommended re-dosing interval from initiation of pre -operative dose:* ***every 2 hours***	Ceftriaxone 50-75mg/kg IV; max. 2g **OR** Cefotaxime 50mg/kg; max. 1g *Recommended re-dosing interval from initiation of pre -operative dose:* ***every 3 hours*** **PLUS** Metronidazole 15 mg/kg IV (For neonates less than 1200 g, to give 7.5 mg/kg) *Recommended re-dosing interval from initiation of pre -operative dose:* ***every 8 hours***	**Antibiotic allergy:** Clindamycin 10 mg/kg IV (max. 900 mg) *Recommended re-dosing interval from initiation of pre-operative dose:* ***every 6 hours*** **PLUS** Gentamicin 2.5 mg/kg IV **Antibiotic Allergy:** Refer to **APPENDICES > Antibiotic Allergy** for more info..

References:

1. Clinical Practical Guideline for Antimicrobial Prophylaxis for Surgery 2013. American Society of Hospital Pharmacists (ASHP) guideline, IDSA, Surgical Infection Society (SIS) and Society of Healthcare Epidemiology of America (SHEA). Bratzler DW, Dellinger EP, Olsen KM, Perl TM, Auwaerter PG, Bolon MK, Fish DN, Napolitano LM, Sawyer RG, Slain D, Steinberg JP, Weinstein RA. American Journal of Health-system Pharmacy 2013. 70(3):195-283.
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Neurosurgery

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Elective craniotomy & Cerebrospinal fluid-shunting procedures	Cefazolin 30 mg/kg IV (max. 2 g) *Recommended re-dosing interval from initiation of pre-operative dose:* ***every 4 hours***	Cefuroxime 50mg/kg IV (max. 1.5 g) *Recommended re-dosing interval from initiation of pre -operative dose:* ***every 4 hours*** **If known to have MRSA/MRSE colonisation:** Vancomycin 15 mg/kg IV (max. 2 g)	**Antibiotic allergy:** Clindamycin 10 mg/kg IV (max. 900 mg) *Recommended re-dosing interval from initiation of pre-operative dose:* ***every 6 hours*** **Antibiotic Allergy:** Refer to **APPENDICES > Antibiotic Allergy** for more info.

References:

1. Clinical Practical Guideline for Antimicrobial Prophylaxis for Surgery 2013. American Society of Hospital Pharmacists (ASHP) guideline, IDSA, Surgical Infection Society (SIS) and Society of Healthcare Epidemiology of America (SHEA). Bratzler DW, Dellinger EP, Olsen KM, Perl TM, Auwaerter PG, Bolon MK, Fish DN, Napolitano LM, Sawyer RG, Slain D, Steinberg JP, Weinstein RA. American Journal of Health-system Pharmacy 2013. 70(3):195-283.
2. Antibiotic Prophylaxis for Paediatric Surgery. Royal Hospital for Children Glasgow. 2018

Orthopaedic Surgery

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Clean Operations Involving Hand, Knee, or Foot & Not Involving Implantation of Foreign Materials	Surgical antibiotic prophylaxis not recommended.		
Spinal Procedure with or without Instrumentation/ Hip Surgery/ Implantation of Internal Fixation Devices (e.g.: nails, screws, plates, wires)	Cefazolin 30 mg/kg IV (max. 2 g) *Recommended re-dosing interval from initiation of pre-operative dose:* ***every 4 hours***	-	**Antibiotic allergy:** Clindamycin 10 mg/kg IV (max. 900 mg) *Recommended re-dosing interval from initiation of pre-operative dose:* ***every 6 hours*** **Antibiotic Allergy:** Refer to **APPENDICES > Antibiotic Allergy** for more info.

References:

1. Clinical Practical Guideline for Antimicrobial Prophylaxis for Surgery 2013. American Society of Hospital Pharmacists (ASHP) guideline, IDSA, Surgical Infection Society (SIS) and Society of Healthcare Epidemiology of America (SHEA). Bratzler DW, Dellinger EP, Olsen KM, Perl TM, Auwaerter PG, Bolon MK, Fish DN, Napolitano LM, Sawyer RG, Slain D, Steinberg JP, Weinstein RA. American Journal of Health-system Pharmacy 2013. 70(3):195-283.
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Otorhinolaryngology (ORL) Surgery (Head & Neck)

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Clean	Example: Tonsillectomy, Adenoidectomy, Tracheostomy, Thyroglossal cyst excision, Preauricular sinus, Dermoid cyst, Brachial anomaly, Parotidectomy, Lymph node biopsy, etc. Surgical antibiotic prophylaxis not recommended.		
Clean with Placement of Prosthesis (Excludes tympanostomy tubes)	**Cochlear implant** Ceftriaxone 2g IV OD	**Cochlear implant with Antibiotic allergy:** Clindamycin 10 mg/kg IV (max. 900 mg) *Recommended re-dosing interval from initiation of pre-operative dose: **every 6 hours***	**Antibiotic Allergy:** Refer to **APPENDICES > Antibiotic Allergy** for more info.
	Non-cochlear implant related (No risk of CSF leak) Ampicillin/sulbactam 50 mg/kg (of Ampicillin component) IV (max. 2 g/dose) *Recommended re-dosing interval from initiation of pre-operative dose: **every 2 hours*** **OR** Cefuroxime 50 mg/kg IV (max. 1.5 g/dose) *Recommended re-dosing interval from initiation of pre-operative dose: **every 4 hours***	-	
Clean-contaminated Procedures with the exception of Tonsillectomy & Functional Endoscopic Sinus Procedure	Ampicillin/sulbactam 50 mg/kg (of Ampicillin component) IV (max. 2 g/dose) *Recommended re-dosing interval from initiation of pre-operative dose: **every 2 hours*** **OR** Cefuroxime 50 mg/kg IV (max. 1.5 g/dose, 6 g/day) *Recommended re-dosing interval from initiation of pre-operative dose: **every 4 hours*** **PLUS** Metronidazole 15 mg/kg IV (max. 1.5 g/day) *Recommended re-dosing interval from initiation of pre -operative dose: **every 8 hours***	Cefazolin 30 mg/kg IV (max. 2 g/dose, 12 g/day) *Recommended re-dosing interval from initiation of pre-operative dose: **every 4 hours*** **PLUS** Metronidazole 15 mg/kg IV (max. 500 mg/dose, 1.5 g/day) *Recommended re-dosing interval from initiation of pre -operative dose: **every 8 hours***	**Antibiotic allergy:** Clindamycin 10 mg/kg IV (max. 900 mg/dose, 3.6 g/day)) *Recommended re-dosing interval from initiation of pre-operative dose: **every 6 hours*** **Antibiotic Allergy:** Refer to **APPENDICES > Antibiotic Allergy** for more info.

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Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Clean-contaminated Cancer Surgery	Ampicillin/sulbactam 50 mg/kg (of Ampicillin component) IV (max. 2 g/dose, 8 g/dose) *Recommended re-dosing interval from initiation of pre-operative dose:* ***every 2 hours*** **OR** Cefuroxime 50 mg/kg IV (max. 1.5 g/dose, 6 g/dose) *Recommended re-dosing interval from initiation of pre-operative dose:* ***every 4 hours*** **PLUS** Metronidazole 15 mg/kg IV (max. 500 mg/dose, 1.5 g/day) *Recommended re-dosing interval from initiation of pre -operative dose:* ***every 8 hour***	Cefazolin 30 mg/kg IV (max. 2 g/dose, 12 g/day) *Recommended re-dosing interval from initiation of pre-operative dose:* ***every 4 hours*** **PLUS** Metronidazole 15 mg/kg IV (max. 500 mg/dose, 1.5 g/day) *Recommended re-dosing interval from initiation of pre -operative dose:* ***every 8 hours***	**Antibiotic allergy:** Clindamycin 10 mg/kg IV (max. 900 mg/dose, 3.6 g/day)) *Recommended re-dosing interval from initiation of pre-operative dose:* *every 6 hours* **Antibiotic Allergy:** Refer to **APPENDICES > Antibiotic Allergy** for more info.

References:

1. Clinical Practical Guideline for Antimicrobial Prophylaxis for Surgery 2013. American Society of Hospital Pharmacists (ASHP) guideline, IDSA, Surgical Infection Society (SIS) and Society of Healthcare Epidemiology of America (SHEA). Bratzler DW, Dellinger EP, Olsen KM, Perl TM, Auwaerter PG, Bolon MK, Fish DN, Napolitano LM, Sawyer RG, Slain D, Steinberg JP, Weinstein RA. American Journal of Health-system Pharmacy 2013. 70(3):195-283
2. Antibiotic Prophylaxis for Paediatric Surgery. Royal Hospital for Children Glasgow.2019
3. Children's Health Queensland Paediatric Antibiocard: Empirical Antibiotic Guidelines 2022
4. American Academy of Paediatrics. Commitee on Infectious Diseases. Red Book: Report of the committee on Infectious Diseases (2018)
5. British National Formulary for Children 2022-2023
6. Micromedex Pediatric Reference version 5.5.0(485)

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Plastic Surgery

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Elective Soft Tissue Surgery	No prophylaxis unless complex prolonged procedure If complex, Cloxacillin 25 mg/kg IV (max. 1 g/dose) *Recommended re-dosing interval from initiation of pre-operative dose: **every 4 hours***		
Elective Hand or Foot Surgery Involving Bone	Cloxacillin 25 mg/kg IV (max. 1 g/dose) *Recommended re-dosing interval from initiation of pre-operative dose: **every 4 hours***	-	**Antibiotic allergy:** Clindamycin 10 mg/kg IV (max. 900 mg) *Recommended re-dosing interval from initiation of pre-operative dose: **every 6 hours*** **Antibiotic Allergy:** Refer to **APPENDICES > Antibiotic Allergy** for more info.
Cleft lip & palate surgery	Amoxicillin/clavulanate 30 mg/kg IV (max. 1.2 g/dose) *Recommended re-dosing interval from initiation of pre-operative dose: **every 4 hours***	-	**Antibiotic allergy:** Clindamycin 10 mg/kg IV (max. 900 mg) *Recommended re-dosing interval from initiation of pre-operative dose: **every 6 hours*** **Antibiotic Allergy:** Refer to **APPENDICES > Antibiotic Allergy** for more info.
Excision & Grafting Surgery	Amoxicillin/clavulanate 30 mg/kg IV (max. 1.2 g/dose) *Recommended re-dosing interval from initiation of pre-operative dose: **every 4 hours***	-	**Antibiotic allergy:** Clindamycin 10 mg/kg IV (max. 900 mg) *Recommended re-dosing interval from initiation of pre-operative dose: **every 6 hours*** **Antibiotic Allergy:** Refer to **APPENDICES > Antibiotic Allergy** for more info.

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1. Clinical Practical Guideline for Antimicrobial Prophylaxis for Surgery 2013. American Society of Hospital Pharmacists (ASHP) guideline, IDSA, Surgical Infection Society (SIS) and Society of Healthcare Epidemiology of America (SHEA). Bratzler DW, Dellinger EP, Olsen KM, Perl TM, Auwaerter PG, Bolon MK, Fish DN, Napolitano LM, Sawyer RG, Slain D, Steinberg JP, Weinstein RA. American Journal of Health-system Pharmacy 2013. 70(3):195-283.
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Urology Surgery

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Low Tract Instrumentation with Risk Factors for Infections	Trimethoprim 2 mg/kg PO (max. 100 mg)	Cefazolin 30 mg/kg IV (max. 2 g/dose) *Recommended re-dosing interval from initiation of pre-operative dose:* ***every 4 hours***	**Antibiotic allergy:** Gentamicin 2.5 mg/kg IV **Antibiotic Allergy:** Refer to **APPENDICES > Antibiotic Allergy** for more info.
Clean without entry into urinary tract/ clean with entry into urinary tract (e.g.: hypospadias surgery)	Cefazolin 30 mg/kg IV (max. 2 g/dose) *Recommended re-dosing interval from initiation of pre-operative dose:* ***every 4 hours***	Amoxicillin/clavulanate 30 mg/kg IV (max. 1.2 g/dose) *Recommended re-dosing interval from initiation of pre-operative dose:* ***every 4 hours***	UTI should be treated before procedure when possible. Medical literature does not support continuing antimicrobial prophylaxis until urinary catheter have been removed.
Clean-contaminated (Entering gastrointestinal tract)	Cefazolin 30 mg/kg IV (max. 2 g/dose) *Recommended re-dosing interval from initiation of pre-operative dose:* ***every 4 hours*** **PLUS** Metronidazole 15 mg/kg IV (max. 500 mg/dose) *Recommended re-dosing interval from initiation of pre -operative dose:* ***every 8 hours***	Amoxicillin/clavulanate 30 mg/kg IV (max. 1.2 g/dose) *Recommended re-dosing interval from initiation of pre-operative dose:* ***every 4 hours***	**Antibiotic allergy:** Gentamicin 2.5 mg/kg IV **Antibiotic Allergy:** Refer to **APPENDICES > Antibiotic Allergy** for more info.

References:

1. Clinical Practical Guideline for Antimicrobial Prophylaxis for Surgery 2013. American Society of Hospital Pharmacists (ASHP) guideline, IDSA, Surgical Infection Society (SIS) and Society of Healthcare Epidemiology of America (SHEA). Bratzler DW, Dellinger EP, Olsen KM, Perl TM, Auwaerter PG, Bolon MK, Fish DN, Napolitano LM, Sawyer RG, Slain D, Steinberg JP, Weinstein RA. American Journal of Health-system Pharmacy 2013. 70(3):195-283.
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Interventional Radiology (IR)

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Percutaneous Endoscopic Gastrostomy (PEG) or Jejunostomy (PEJ) or Nephrostomy Tube Placement	Cefazolin 30 mg/kg IV (max. 2 g/dose) *Recommended re-dosing interval from initiation of pre-operative dose:* ***every 4 hours***	Amoxicillin/clavulanate 30 mg/kg IV (max. 1.2 g/dose) *Recommended re-dosing interval from initiation of pre-operative dose:* ***every 4 hours***	-
Micturating Cystourethrogram (MCUG)	Trimethoprim 2 mg/kg PO (max. 100 mg) (If patient is already on existing antibiotic UTI prophylaxis, increase antibiotic to therapeutic dose for a single dose prior procedure)	-	-
Tenckhoff Peritoneal Dialysis Catheter Insertion	Cefazolin 30 mg/kg IV (max. 2 g/dose) *Recommended re-dosing interval from initiation of pre-operative dose:* ***every 4 hours***	Amoxicillin/clavulanate 30 mg/kg IV (max. 1.2 g/dose) *Recommended re-dosing interval from initiation of pre-operative dose:* ***every 4 hours***	-
Burns	Surgical antibiotic prophylaxis not recommended.		-

References:

1. Clinical Practical Guideline for Antimicrobial Prophylaxis for Surgery 2013. American Society of Hospital Pharmacists (ASHP) guideline, IDSA, Surgical Infection Society (SIS) and Society of Healthcare Epidemiology of America (SHEA). Bratzler DW, Dellinger EP, Olsen KM, Perl TM, Auwaerter PG, Bolon MK, Fish DN, Napolitano LM, Sawyer RG, Slain D, Steinberg JP, Weinstein RA. American Journal of Health-system Pharmacy 2013. 70(3):195-283.
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Non-Surgical Prophylaxis

Cardiovascular

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	**Alternative**	
Rheumatic Fever (Secondary prevention)	IM Benzathine penicillin: • ≤ 27 kg: 0.6 MU • > 27 kg: 1.2 MU every 3-4 weeks	Phenoxymethylpenicillin (Penicillin V) 250 mg PO q12h **Antibiotic allergy:** Erythromycin ethylsuccinate (EES) 15-20 mg/kg/dose PO q12h (max. 4 g/day)	**Duration:** 1. **With carditis & residual heart disease (persistent valvular disease):** 10 years since the last episode of ARF or 40 years of age whichever is longer. Consider lifelong prophylaxis. 2. **With carditis but no residual heart disease (no valvular disease):** 10 years since the last episode of ARF or 21 years of age whichever is longer. 3. **Without carditis:** 5 years since last ARF or until 21 years of age whichever is longer. **Antibiotic Allergy:** Refer to **APPENDICES > Antibiotic Allergy** for more info.
Infective Endocarditis (IE)	IE prophylaxis is recommended for patients with the highest risk cardiac conditions undergoing procedures likely to result in bacteremia with a microorganism that has the potential ability to cause bacterial endocarditis. Prophylaxis is always required for: 1. Dental procedures that involve: • Extraction • Periodontal procedure including surgery • Subgingival scaling • Root planning • Re-planting avulsed teeth • Other surgical procedure e.g.: implant placement & apicectomy 2. Incision & drainage of local abscess in the brain, skin, subcutaneous tissue (boils & carbuncle, eye (dacryocystitis), epidural, lung, orbital area, per rectal area, liver (pyogenic liver), tooth & surgical procedure through infected skin. 3. Percutaneous endoscopic gastrotomy.		
	Amoxicillin 50mg/kg PO (max. 2 g) 30-60 minutes before procedure **OR** Ampicillin 50 mg/kg IV (max. 2 g) 30-60 minutes before procedure	**Antibiotic allergy:** Clindamycin 20 mg/kg IV/PO (max. 900 mg) 30-60 minutes before procedure **Another alternative:** Cefazolin 50 mg/kg IV (max. 2 g) (cephalosporin should not be used in children with anaphylaxis, angioedema or urticaria)	Prophylaxis is required in some circumstances. Please refer to Ministry of Health CPG for Prevention, Diagnosis & Management of Infective Endocarditis (2017) for further info. Maintenance of optimal oral hygiene may reduce the incidence of bacteremia from daily activities and is more important than prophylactic antibiotics for a dental procedure to reduce the risk of IE. **Antibiotic Allergy:** Refer to **APPENDICES > Antibiotic Allergy** for more info.

References:

1. Clinical Practice Guidelines for the Prevention, Diagnosis and Management of Infective Endocarditis. 2017.
2. American Academy of Paediatrics. Committee on Infectious Diseases. Red Book: Report of the Committee on Infectious Diseases. 2021.

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Infection Prophylaxis In Immunocompromised

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Post-splenectomy At risk for infection caused by: • Pneumococcus, • Meningococcus, • Haemophilus sp.	Phenoxymethylpenicillin (Penicillin V): • 125 mg PO q12h for ≤ 5 years old • 250 mg PO q12h for > 5 years old **Duration of chemoprophylaxis:** • Minimum 1 – 3 years post splenectomy • Life-long prophylaxis for those with other cause of asplenia, previous episode of sepsis and remain immunocompromised	Amoxicillin 20 mg/kg/day (250 – 500 mg PO q12h; 500 mg daily if poor compliance i.e., adult dose) **Antibiotic allergy:** Erythromycin ethylsuccinate (EES) 15-20 mg/kg/dose PO q12h (max. 4 g/day)	Risk of sepsis is lifelong but especially high in the first 2 years after splenectomy. Important adjunct: • Immunisation against Pneumococcus, Haemophilus, Meningococcus at least 14 days prior to splenectomy (if not possible then as soon as possible, 14 days or more after surgery). • Pneumococcal conjugate vaccine is preferred for better immunogenicity • Yearly influenza vaccine is also recommended. Not all pneumococcal isolates are sensitive to these antibiotics. Limitation stressed to parents so that all febrile illness in this group of children are taken seriously since initial signs & symptoms of fulminant septicaemia can be subtle. **Antibiotic Allergy:** Refer to APPENDICES > Antibiotic Allergy for more info.

References:

1. Grace M. Lee; Preventing infections in children and adults with asplenia. Hematology Am Soc Hematol Educ Program 2020; 2020 (1): 328–335.

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Tropical Infection

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Malaria Prophylaxis	**For chloroquine-sensitive area:** Chloroquine dose: 5 mg/kg base (8.3 mg/kg salt) orally, once weekly, up to maximum adult dose of 300 mg base (begin 1-2 weeks before travelling and take weekly through-out and 4 weeks after leaving area)	Atovaquone-proguanil (Malarone®)** Paediatric dose: • 5-8 kg : ½ paediatric tablet daily • 9-10 kg : ¾ paediatric tablet daily • 11-20 kg : 1 paediatric tablet daily • 21-30 kg : 2 paediatric tablets daily • 31-40 kg : 3 paediatric tablets daily • 40 kg : 1 adult tablet daily Start prophylactic treatment with Malarone® 1 or 2 days before entering a malaria-endemic area and continue daily during the stay and for 7 days after return.	***Mefloquine:** • Not recommended if there are cardiac conduction abnormalities, seizures or psychiatric disorders. E.g.: depression, psychosis. • Black box warning: Neuropsychiatric reactions may persist even after discontinuation. • If using Mefloquine: Start 2-3 weeks before, continue weekly during exposure and 4 weeks thereafter. **** Atovaquone/proguanil (Malarone®):** is another drug used in malaria prophylaxis in children (for chloroquine-resistance) BUT not yet registered in Blue Book (available commercially in Malaysia). To carefully assess risk and benefit of starting antimalarial prophylaxis to any children to prevent development of drug resistance.
	For chloroquine-resistant area: Mefloquine*: weekly dose by weight in kg (tablet with 250 mg base, 274 mg salt) • ≤ 9 kg : 5mg/kg weekly • >9-19 kg : 1/4 adult tablet weekly • >19-30 kg : ½ adult tablet weekly • >30-45 kg : ¾ adult tablet weekly • >45 kg : 1 adult tablet weekly Start 2-3 weeks before, continue weekly during exposure and for 4 weeks thereafter. **Age >8 years old:** Doxycycline 2.2 mg/kg once daily, up to 100 mg/day. Take 1-2 days before, during and 4 weeks after travelling.		

References:

1. The Management Guidelines of Malaria in Malaysia 2013.
2. American Academy of Paediatrics. Committee on Infectious Diseases. Red Book: Report of the Committee on Infectious Diseases (2021).
3. The Sanford guide to antimicrobial therapy 2023.

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Other Infections

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Haemophilus influenza B Exposure	Rifampicin • **≤ 1 month of age:** 10 mg/kg/dose PO q24h for 4 days • **>1 month of age:** 20 mg/kg/dose PO q24h for 4 days (max. 600 mg/dose)	-	Chemoprophylaxis is indicated for: **1. ALL household contacts** in the following circumstances (household contact is defined as a person who resides with the index patient or who spent ⩾ 4 hours with the index patient for at least five of the seven days before the day of hospital admission of the index case): • Household with at least one contact <4 years old who is unimmunised or incompletely immunised. • Household with a contact who is an immunocompromised child, regardless of that child's Hib immunisation status. • Household with a child younger than 12 months who has not completed the primary Hib series. **2. Nursery Contact** • For ALL attendees in childcare & preschool (regardless of age or vaccination status) when unimmunised or incomplete immunised children attend the facility and two or more cases of Hib invasive disease have occurred within 60 days. **3. Index case** • Prior to discharge if did not receive at least ONE dose of cefotaxime/ ceftriaxone and infants younger than 2 years. For contacts < 2 years old who are not immunised: complete immunisation.

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Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Meningococcal Exposure	Ciprofloxacin PO • < 1 year : 30 mg per kg PO (max. 125 mg) stat • 1-4 years : 125 mg PO stat • 5-11 years: 250 mg PO stat • ≥ 12 years: 500 mg PO stat	Ceftriaxone IM • **< 15 years old:** 125 mg stat • **≥ 15 years old:** 250 mg stat **OR** Rifampicin PO • **≤ 1 month of age:** 5 mg/kg/dose PO q24h for 2 days • **>1 month of age:** 15-20 mg/kg/dose PO q24h for 2 days (max. 600 mg/dose)	**Close contact:** Chemoprophylaxis is provided to close contact at **HIGH RISK** which include: • All household especially children younger than 2 years old. • Childcare or preschool contact at any time during 7 days before onset of illness. • Direct exposure to index patient's secretion through kissing or through sharing toothbrushes or eating utensils at any time during 7 days before onset of illness. • Frequently slept in same place as index patient during 7 days before onset of illness. **Healthcare staff:** Routine prophylaxis is not recommended unless there is intimate exposure to respiratory secretion during mouth-to-mouth resuscitation, unprotected contact during intubation/suctioning at any time 7 days before onset of illness or within 24 hours of initiation of effective antimicrobial therapy. **Index Case:** Give chemoprophylaxis to index case prior to discharge if treated with regimens other than cefotaxime or ceftriaxone. Chemoprophylaxis is ideally initiated within 24 hours after index patient is identified; prophylaxis is not indicated more than 2 weeks after exposure.
Neonatal Group B Streptococcus Infection Prophylaxis *(To be given to the mother during labour)*	**Intrapartum maternal prophylaxis:** Benzylpenicillin 5 million units IV loading, then 2.5-3.0 million units IV q6h till delivery	**Intrapartum maternal prophylaxis:** Ampicillin 2g IV loading, then 1g IV q6h till delivery **Antibiotic allergy:** **Low risk anaphylaxis:** Cefazolin 2 g IV loading then 1g IV q8h till delivery **High risk anaphylaxis:** Clindamycin 900 mg IV q8h till delivery **OR** **If Clindamycin resistant:** Vancomycin 1 g IV loading, then q12h till delivery	Treat during labour if previously delivered infant with invasive GBS, GBS bacteriuria or antenatal screening swabs positive **OR** if GBS status is not known **AND** any of the following: • Preterm <37 weeks • PROM >18 hours • Intrapartum temperature >38°C **Antibiotic Allergy:** Refer to **APPENDICES > Antibiotic Allergy** for more info.

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Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Pertussis **Post-exposure prophylaxis (PEP)**	*Azithromycin • **<1 month old till 5 months old:** 10 mg/kg/day PO in a single dose q24h for 5 days • **6 months & older:** 10 mg/kg/day PO in a single dose on Day 1, (max. 500 mg) then 5 mg/kg/dose (max. 250 mg) on Day 2-Day 5. **Duration: 5 days** **OR** Clarithromycin • **< 1 month**: Not recommended • **≥ 1 month till 12 years:** 15 mg/kg/day PO q12h (max. 1 g/day) • **≥ 12 years till adult:** 500 mg PO q12h (max. 1 g/day) **Duration: 7 days**	*Erythromycin ethylsuccinate (EES): • **<1 months**: Not preferred. Use only if azithromycin is not available. • **≥ 1 month till adult:** 40-50 mg/kg/day PO in 2 divided doses (max. 2 g/day) **Duration: 14 days** **OR** Trimethoprim/sulfamethoxazole (Bactrim): • **2 months & older:** 8 mg (TMP)/kg/day PO in 2 divided doses (max. 320 mg TMP/day) **Duration: 14 days**	*__Macrolide__ (Azithromycin & Erythromycin): • Drug of choice for PEP and treatment is a macrolide. Azithromycin is the preferred macrolide. • Association between orally administered azithromycin and erythromycin with infantile hypertrophic pyloric stenosis (especially in infant <6 weeks) has been reported but Azithromycin remains the drug of choice in very young infants because the risk of developing severe disease outweighs the potential risk. **Antimicrobial prophylaxis is recommended for:** 1. ALL household contacts of the index cases & other close contacts, including children in childcare, regardless of immunisation status. 2. When considering borderline degree of exposure for a non-household contact, PEP should be administered if contact personally is at high risk∞ or lives in a household with person at high risk of severe disease (E.g.: young infant, pregnant women, person who has contact with infants). 3. Close contacts who are unimmunised or under immunised should have pertussis immunisation initiated or continued using age-appropriate products according to the recommended schedule as soon as possible (this include off-label Tdap in children 7-9 years old who did not complete DTaP series.) **High risk:** Infant, women at third trimester of pregnancy and people with pre-existing health conditions that may be exacerbated by pertussis infection (not limited to immunocompromised individuals & those with moderate to severe asthma).

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Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Varicella (Chicken pox) Post-exposure prophylaxis (PEP)	Potential interventions for people without evidence of immunity exposed to varicella (chicken pox) following significant exposure*: **1. Varicella vaccine:** Within 3-5 days of exposure for susceptible healthy adult/child 12 months old or older (followed by a second dose at age-appropriate interval) **2. When indicated & available, Varicella zoster immune globulin (VZIG)**:** VZIG dose as per product information; weight-based as soon as possible after exposure up to 10 days after **AND** Acyclovir 20 mg/kg/dose PO q6h (max. 3200 mg/day) beginning 7-10 days after exposure & continue for 7 days to prevent breakthrough VZV after VZIG or IVIG if no contraindications. **3. When VZIG not available:** ****IVIG (400 mg/kg) IV once **AND** Acyclovir 20 mg/kg/dose PO q6h (max. 3200 mg/day) beginning 7-10 days after exposure & continue for 7 days to prevent breakthrough VZV after VZIG or IVIG if no contraindications.	-	***Exposure is significant if:** 1. Household: Residing in the same household 2. Playmate: Face-to-face indoor play ⩾1 hour 3. Hospital: In same 2 to 4-bed room or adjacent beds in a large ward, face-to-face contact with an infectious staff member or patient, or visit by a person deemed contagious 4. Newborn infant ****VZIG -** For patients who are at high risk for severe infection & complications (susceptible hosts***) & significant exposure* (and have contraindications to vaccine). *****Susceptible hosts include:** 1. Immunocompromised children 2. Pregnant women, newborns of mothers with Varicella shortly before or after delivery (i.e.: 5 days before or within 2 days after delivery) 3. Premature infants born at ⩾28 weeks of gestation who are exposed during their hospitalization & whose mothers do not have evidence of immunity 4. Premature infants born at <28 weeks of gestation or birth weight ⩽1000 g regardless of their mothers' immunity. ******IVIG** - Patients receiving monthly high dose IVIG (≥ 400 mg/kg) are likely to be protected & probably do not require VZIG if the most recent dose of IVIG was administered ≤ 3 weeks before exposure.

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HSgB Antimicrobial Guideline (HAG)

SECTION B: PAEDIATRIC PATIENTS

B4: GASTROINTESTINAL (GI) INFECTIONS

Launched: October 2024

Updated: -

LIST OF TOPICS WITH LINKS:

1. **Gastroenteritis - Acute gastroenteritis (AGE)**
2. **Dysentery - Bacterial Infection**
3. **Parasitic Infection**
   - Amoebiasis
   - Giardiasis
4. **Typhoid Fever**
5. **Cholera**
6. **Peritonitis**
7. **Liver Abscess**
   - Liver abscess (amoebic)
   - Liver abscess (pyogenic)
8. **Cholangitis**
9. **Enterocolitis**

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Gastroenteritis

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Acute gastroenteritis (AGE) Most common causes are viruses. E.g.: rotavirus	Antibiotics not recommended. Antibiotic therapy may prolong carriage state of salmonellosis. Oral rehydration is the cornerstone of treatment.	-	

Dysentery

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Bacterial Infection Common organisms: • Shigella • E. coli • Campylobacter	Most are mild infections which resolve spontaneously without antibiotics.		Resistance patterns towards amoxicillin, trimethoprim sulfamethoxazole, ciprofloxacin & azithromycin are on the rise. Adjust antibiotic once culture & sensitivity (C&S) results are available. **Reserve fluoroquinolone only for isolate where there is no other antibiotic option available due to its many side effects.
	Mild or uncomplicated: Adequate fluid replacement. No antibiotics required.	**Mild or uncomplicated:** (Hospitalized children) Ampicillin 100 mg/kg/day PO in 4 divided doses (max. 2 g/day) **Duration: 5-7 days**	
	Severe illness: (hospitalisation, invasive/other complications or immunocompromised patients*) Ceftriaxone 75-100 mg/kg/day IV q24h (max. 2 g/day) (origin of infections: Asia) **Duration: 5 days** (7-10 days for immunocompromised host)	**Severe illness:** **Ciprofloxacin 20-30 mg/kg/day IV in 2 divided doses (max. 1.5 g/day) s **OR** Azithromycin 10 mg/kg/dose IV q24h (max. 500 mg/dose). **Duration: 3 days**	

Parasitic Infection

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Amoebiasis	Metronidazole 30-50 mg/kg/day PO in 3 divided doses (max. 750 mg/dose)	-	Similar dosage for extraintestinal disease. **Duration: 7-10 days**
Giardiasis	Metronidazole 15 mg/kg/day PO in 3 divided doses (max. 250 mg/dose)	-	Similar dosage for extraintestinal disease. **Duration: 5-7 days**

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Typhoid Fever

Common organisms: *Salmonella typhi* & S. paratyphi A & B

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Empirical treatment	Ceftriaxone 75-100 mg/kg/day IV q24h (max. 2 g/day) **Duration: 7-14 days**	-	Adjust antibiotic once C&S results are known. Choice of antibiotics & duration depends on disease, C&S results & whether oral route is preferred. **Duration of antibiotics:** • 7 days (uncomplicated) • 10 days (for severe disease) • 14 days (if using ampicillin) if patient is clinically improving and without a fever for 48 hours. *Fluoroquinolones need to be used with caution in children due to possible arthropathy & rapid development of resistance. There is now increasing data of other side effects e.g: hypoglycaemia & neuropsychiatric d/o. Ampicillin & Bactrim (trimethoprim/ sulfamethaxazole) may be considered for susceptible strain. More strains now becoming sensitive to these agents except for certain countries
Mild or uncomplicated	*Ciprofloxacin 30-40 mg/kg/day PO in 2 divided doses (max. 1.5 g/day) **Duration: 5-7 days**	Azithromycin 20 mg/kg/dose PO q24h (max. 1 g/dose) **OR** Ampicillin 100 mg/kg/day PO in 4 divided doses (max. 2 g/day)	
Severe infection or suspected resistant organism	Ceftriaxone 80-100 mg/kg/day IV q24h (max. 2 g/day) **Duration: 7-14 days**	*Ciprofloxacin 30-40 mg/kg/day IV in 2 divided doses (max. 0.8-1.2 g/day) **Duration: 7-10 days**	
Chronic carrier state (> 1 year)	Ampicillin 100 mg/kg/day PO in 4 divided doses (max. 2 g/day) **OR** Amoxicillin 100 mg/kg/day PO in 2 divided doses (max. 4 g/day) **OR** Trimethoprim/Sulfamethoxazole (Bactrim) 8 mg (TMP)/kg/day PO in 2 divided doses (max. 320 mg TMP/day) **Duration: 6 weeks**	*Ciprofloxacin 20-30 mg/kg/day PO in 2 divided doses (max. 1.5 g/day) for 4 weeks **Duration: 4 weeks** **OR** **If oral therapy not tolerated & strain is susceptible:** Ampicillin 200-300 mg/kg/day IV in 4-6 divided doses (max. 12 g/day).	

Cholera

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
	Azithromycin 20 mg/kg/day PO in a single dose (max. 1 g) **OR** Erythromycin ethylsuccinate (EES) 12.5 mg/kg/dose PO q6h (max. 250 mg/dose) for 3 days	**For children > 8 years old:** *Doxycycline 4.4 mg/kg/day PO in a single dose (max. 200 mg) **Avoid using doxycycline for young children as they can cause staining of the teeth. Use of doxycycline should be considered in an epidemic caused by susceptible isolate.*	Oral or IV rehydration is the cornerstone of treatment. Prompt initiation of antibiotic therapy reduces the volume and duration of diarrhoea. Antibiotics should be considered for people who are moderately to severely ill. Antibiotic choice depends on age and pattern of resistance. Monitor antibiotic sensitivity pattern at the beginning of and during the outbreak as it can change. Fluoroquinolones are not approved for children younger than 18 years old for this indication.

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Peritonitis

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Common organisms: • Gram-positive • Gram-negative organisms • Anaerobes	**Primary/spontaneous bacterial peritonitis** Cefotaxime 200-300 mg/kg IV in 4 divided doses (max. 2 g/dose)	Ampicillin 100 mg/kg/day PO in 4 divided doses (max. 2 g/day) **PLUS** Gentamicin 5 mg/kg/day IV OD **PLUS** Metronidazole 7.5 mg/kg/dose IV q8h (max. 4 g/day) **Duration: 7-14 days** **OR** Amoxicillin-clavulanate • **Age 3 months and above:** 75 mg/kg/day (amoxicillin dose) IV in 3 divided doses • **Age < 3 months or < 4 kg:** 50 mg/kg/day (amoxicillin dose) IV in 2 divided doses	May omit metronidazole in primary peritonitis. In immunocompetent patient with mild to moderate peritonitis and source control, suggest 5 days of therapy.
	Secondary peritonitis (secondary to perforated viscus): Cefotaxime 200-300 mg/kg IV in 4 divided doses (max. 2 g/dose) **PLUS** Metronidazole 15 mg/kg/dose loading dose followed by 7.5 mg/kg/dose IV q8h (max. 4 g/day)		
	Secondary (nosocomial) peritonitis: Piperacillin/tazobactam IV 300 mg/kg/day in 3-4 divided doses (max. 16 g/day)		
	If culture proven ESBL: Imipenem/cilastatin 60-100 mg/kg/day IV in 4 divided doses (max. 4 g/day) **OR** Meropenem 60-100 mg/kg/day IV in 3 divided doses (max. 6 g/day)	**Once patient is stable, de-escalate treatment to:** *Ertapenem 30 mg/kg/day IV in 2 divided doses (max. 1 g/day). **Ertapenem is not licensed to be used in infants less than 3 months old.*	

Liver Abscess

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Liver abscess (amoebic) *Entamoeba histolytica*	Metronidazole 35-50 mg/kg/day PO in 3 divided doses **Duration: 7-10 days**	-	Amoebic abscess tends to be solitary lesion. Consider surgical drainage if needed.
Liver abscess (pyogenic) Common organisms: • *Klebsiella spp.* • *E. coli* • *Streptococcus milleri* • Other Gram-negative organisms • Anaerobes • *S. aureus*	Cefotaxime 200 mg-300 mg/kg/day IV in 4 divided doses (max. 2 g/dose) **OR** Ceftriaxone 100 mg/kg/day IV in 1-2 divided doses (max. 2 g/dose; 4 g/day) **PLUS** Metronidazole 22.5-40 mg/kg/day IV in 3 divided doses (max. 4 g/day)	Piperacillin/tazobactam 300-400 mg/kg/day (of piperacillin component) IV in 3-4 divided doses (max. 16 g/day) **For ESBL-Klebsiella:** (above 3 months of age) Ertapenem 30 mg/kg/day IV in 2 divided doses (max. 1 g/day)	Surgical drainage is needed in most cases. **Duration: 4-6 weeks.**

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Cholangitis

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Acute Cholangitis Common organisms: • Gram-positive • Gram-negative organisms • Anaerobes	Cefotaxime 200 mg-300 mg/kg/day IV in 4 divided doses (max. 2 g/dose) **OR** Ceftriaxone 100 mg/kg/day IV in 1-2 divided doses (max. 2 g/dose; 4 g/day) **PLUS** Metronidazole 22.5-40 mg/kg/day IV in 3 divided doses (max. 4 g/day)	Piperacillin/tazobactam 300-400 mg/kg/day (of piperacillin component) IV in 3-4 divided doses (max. 16 g/day) **OR** Ampicillin/sulbactam 200-300 mg/kg/day (of ampicillin component) IV in 4-6 equally divided doses	**Duration: ∽ 7 days.** Outcome is similar with less than 7 days to those with longer duration > 7 days in patients treated with percutaneous cholecystectomy. Source control is needed in cases of treatment failure.

Enterocolitis

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Common organisms: • Enterobacteriaceae • Enterococci • Bacteroides	Ampicillin 200mg/kg/day IV in 4-6 divided doses (max. 12 g/day) **PLUS** Metronidazole 15 mg/kg loading dose, followed by 7.5 mg/kg/dose IV q8h (max. 4 g/day)	Cefotaxime 200 mg/kg/day IV in 4 divided doses (max. 2 g/dose) **PLUS** Metronidazole 15 mg/kg loading dose, followed by 7.5 mg/kg/dose IV q8h (max. 4 g/day)	Antibiotics should be adjusted with results of C&S. **Duration: 5-7 days for uncomplicated enterocolitis.**

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HSgB Antimicrobial Guideline (HAG)

SECTION B: PAEDIATRIC PATIENTS

B5: INFECTIONS IN IMMUNOCOMPROMISED PATIENTS

Launched: October 2024

Updated: -

LIST OF TOPICS WITH LINKS:

1. **Febrile Neutropenia**
   - First Line
   - Second Line
   - Third Line

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Febrile Neutropenia

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
First Line **Fever >38°C, Neutrophil <500 mm^3** Common organisms: • Enterobacteriaceae (*Klebsiella sp., E. coli* etc.) • Pseudomonas • Aerobic Gram-positive (Staphylococci, Streptococci)	Cefepime 50 mg/kg/dose IV in q8h (max. 6 g/day)	Piperacillin/tazobactam 300 - 400 mg/kg/day IV in 4 divided doses (max. 16 g/day of piperacillin component)	Use monotherapy with an anti-pseudomonal β–lactam agents. Meta-analysis has shown that there is no clinical advantage with β-lactam and aminoglycoside combination therapy. Also need to look at local epidemiological data.
Second Line **Persistent fever > 72 hours*** (*DO NOT MODIFY INITIAL COVERAGE BASED SOLELY ON PERSISTENCE OF FEVER). Common organisms: • Enterobacteriaceae (Klebsiella sp, E. coli etc.) • Pseudomonas • Aerobic Gram-positive (Staphylococci, Streptococci) • Enterococci • Other resistant organisms	Meropenem 60-120 mg/kg/day IV in 3 divided doses (max. 6 g/day) **MAY ADD** Vancomycin 60 mg/kg/day in 3-4 divided doses (max. 2 g/day) *Consider adding Vancomycin in suspected catheter-related infections, positive blood culture for gram positive cocci, hypotensive patients and patients who are known to be colonised with MRSA.*	-	Escalate to second line if patient is unstable, to cover resistant gram negative, gram positive and anaerobes. In patients responding to initial empiric antibiotic therapy, discontinue double coverage (empirical vancomycin, if initiated) or double gram negative after 24-72 hours if there is no specific microbiologic indication to continue combination therapy.
Third Line **Fever > 4-7 days with no identified source of fever** Common organisms: • **Bacterial:** Candida sp. Aspergillus sp., Fusarium sp. • **Viral:** Respiratory viruses are the most common, HSV, VZV	Imipenem/cilastatin 60-100 mg/kg/day IV in 4 divided doses (max. 4 g/day) **PLUS** Amphotericin B 0.5 mg/kg/dose IV q24h & gradually escalate by (0.25- 1 mg/kg/dose) q24h (max. 1.5 mg/kg/day) **OR** Lipid formulation of amphotericin B 3-5 mg/kg/day	Imipenem/cilastatin 60-100 mg/kg/day IV in 4 divided doses (max. 4 g/day) **PLUS** Caspofungin 70 mg/m^2/dose IV q24h at Day 1, then 50 mg/m^2/dose IV q24h (max. 70 mg/dose for loading and maintenance dose)	1/3 of febrile neutropenic patients with persistent fever >1 week have systemic fungal infections. Initiate antifungal in patients at high risk of invasive fungal disease with prolonged ($\geqslant$ 96 hours) febrile neutropenia unresponsive to broad spectrum antibacterial agents. Amphotericin based antifungal is considered broader spectrum than echinocandin (E.g.: caspofungin).

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HSgB Antimicrobial Guideline (HAG)

SECTION B: PAEDIATRIC PATIENTS

B6: NEONATAL INFECTIONS

Launched: October 2024

Updated: -

LIST OF TOPICS WITH LINKS:

1. **Congenital & Perinatal Infections**
   - Meningitis
   - Necrotising Enterocolitis (NEC)
   - Early Onset Sepsis (< 48 hours)
   - Late Onset Sepsis (> 48 hours)
   - Congenital syphilis
   - Congenital Toxoplasmosis
   - Herpes simplex Neonatal
   - Tetanus Neonatorum
   - Congenital Gonococcal Ophthalmitis/ Conjunctivitis
   - *Chlamydia trachomatis* Conjunctivitis
2. **Group B Streptococcus (GBS)** - *Streptococcus agalactiae*
3. **E. Coli Infection**

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Congenital & Perinatal Infections

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Meningitis Common organisms: • GBS • E. coli • Listeria • Other Gram-negative bacilli/rod (GNR)	**Empirical therapy** Benzylpenicillin (Penicillin G) 150,000 units/kg/dose IV • **GA ≤ 34 weeks:** PNA ≤ 7 days: q12h; PNA > 7 days: q8h • **GA > 34 weeks:** PNA ≤ 7 days: q8h; PNA > 7 days: q6h **OR** Ampicillin • **≤ 1 week of age:** 200-300 mg/kg/day IV in 3 divided doses • **> 1 week of age:** 300 mg/kg/day IV in 4 divided doses **PLUS** Cefotaxime 50 mg/kg/dose IV • **≤ 1 week of age:** q12h • **> 1 week of age:** q8h	Cefepime 50 mg/kg/dose IV q12h **SEVERE CNS infections (if hospital-acquired):** Meropenem 40 mg/kg/dose IV • **< 32 weeks, <14 days**: q12h • **< 32 weeks, ≥14 days:** q8h • **≥ 32 weeks:** q8h	DIAMS – HSgB NICU Antimicrobial Database Kindly refer to Hosp Sg Buloh NICU Antimicrobial Database DIAMS for dosing. Adjust antibiotics accordingly once cultures are known.
Necrotising Enterocolitis (NEC) Common organisms: • Klebsiella • E. coli • Clostridia • Coagulase-negative Staphylococci • Enterococci • Bacteroides	**Stage 1** Ampicillin 100 mg/kg/dose IV • **≤ 1 week of age:** q12h • **> 1 week of age:** q8h **PLUS** Gentamicin 5 mg/kg/dose IV • **< 30 weeks of CGA:** q48h • **30-34 weeks of CGA:** q36h • **≥ 35 weeks CGA:** q24h **PLUS** Metronidazole **Loading dose**: 15 mg/kg/dose IV **Maintenance dose:** • **≤ 34 weeks of age:** 7.5 mg/kg/dose IV q12h • **35-40 weeks of age:** 7.5 mg/kg/dose IV q8h • **> 40 weeks of age:** 10 mg/kg/dose IV q8h **Stage 2 / Stage 3** Cefotaxime 50 mg/kg/dose IV • **≤ 1 week of age:** q12h • **> 1 week of age:** q8h **PLUS** Metronidazole **Loading dose**: 15 mg/kg/dose IV **Maintenance dose:** • **≤ 34 weeks of age:** 7.5 mg/kg/dose IV q12h • **35-40 weeks of age:** 7.5 mg/kg/dose IV q8h • **> 40 weeks of age:** 10 mg/kg/dose IV q8h		DIAMS – HSgB NICU Antimicrobial Database Kindly refer to Hosp Sg Buloh NICU Antimicrobial Database DIAMS for dosing. **Duration: 10-14 days** There is insufficient evidence regarding the duration of antibiotic treatment for NEC. This suggested regimen for NEC is empirical. Once culture is known, decisions regarding choice of antibiotics are best guided by culture results. Use vancomycin if CoNS/MRSA is suspected (substitute Ampicillin with Vancomycin).

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Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Early Onset Sepsis (< 48 hours) Common organisms: • Group B Streptococcus (GBS) • Listeria • *Streptococcus sp.* • *E. coli* • *Haemophilus influenzae* • *Klebsiella sp.* • etc.	Benzylpenicillin (Penicillin G) 100,000 units/kg/dose IV • **GA ≤ 34 weeks:** PNA ≤ 7 days: q12h PNA > 7 days: q8h • **GA > 34 weeks:** PNA ≤ 7 days: q8h PNA > 7 days: q6h **OR** Ampicillin 200-300 mg/kg/day IV • **≤ 1 week of age:** in 3 divided doses • **> 1 week of age:** in 4 divided doses **PLUS** Gentamicin 5 mg/kg/dose IV • **< 30 weeks of CGA:** q48h • **30-34 weeks of CGA:** q36h • **≥ 35 weeks CGA:** q24h	-	**DIAMS – HSgB NICU Antimicrobial Database** Kindly refer to Hosp Sg Buloh NICU Antimicrobial Database for dosing. Consider stopping antibiotics at 36-48 hours if negative blood culture, initial clinical suspicion not strong and reassuring baby's condition with low CRP. If positive blood culture or strong clinical suspicion of sepsis but negative culture, may give 7 days of antibiotics. Consider antibiotics for more than 7 days if baby not fully recovered and based on pathogen identified on blood culture. In this empiric therapy - meningitis is not a consideration. Once cultures are known, adjust antibiotics accordingly.
Late Onset Sepsis (> 48 hours) Common organisms: • Methicillin-sensitive/ resistant S. aureus (MSSA/MRSA) • Coagulase- negative Staphylococci (CoNS) • Gram-negative rods (Depending on local epidemiological data) *For late onset sepsis, the most common organisms are predominantly Gram-positive cocci, namely Staphylococci, especially CONS, in premature neonates and also neonates with central catheters.*	**First Line** Cloxacillin 50 mg/kg/dose IV • **≤ 1 week of age:** q12h • **> 1 week of age:** q8h **PLUS** Gentamicin 5 mg/kg/dose IV • **< 30 weeks of CGA:** q48h • **30-34 weeks of CGA:** q36h • **≥ 35 weeks CGA:** q24h	**First Line** Amikacin 15 mg/kg/dose IV • **< 30 weeks of CGA:** q48h • **30-34 weeks of CGA:** q36h • **≥ 35 weeks CGA:** q24h	**DIAMS – HSgB NICU Antimicrobial Database** Kindly refer to Hosp Sg Buloh NICU Antimicrobial Database for dosing. Piperacillin/tazobactam is a good second line option in pneumonia and intra-abdominal sepsis (non–CONS sepsis with good coverage against Gram-positive, Gram-negative & anaerobes). There is possibility of Gram-negative rods with inducible β-lactamases and ESBL producing organism such as Klebsiella, Serratia and E. coli in some NICU in Malaysia hence need to look at local epidemiology before deciding on suitable second line. Cefepime is the preferred agent when there are Gram-negative bacteria with extended spectrum cephalosporin resistance due to AmpC-β-lactamases. **Duration:** • If positive blood culture or strong clinical suspicion of sepsis but negative culture, may give 7 days of antibiotics. • Consider antibiotics for more than 7 days if baby not fully recovered, based on site of infection & pathogen identified on blood culture.
	Second Line Piperacillin/tazobactam IV • **PMA ≤ 30 weeks:** 100 mg/kg/dose q8h • **PMA > 30 weeks:** 80 mg/kg/dose q6h **< 30 weeks** 0-28 days: 100 mg/kg q12h > 28 days: 100 mg/kg q8h **30-36 weeks** 0-14 days: 100 mg/kg q12h > 14 days: 100 mg/kg q8h **37-44 weeks** 0-7 days: 100 mg/kg q12h > 7 days: 100 mg/kg q8h **≥ 45 weeks:** 100 mg/kg q8h	**Second Line** Cefepime IV **Term and Prem younger than 28 days of life:** 30 mg/kg/dose q12h **Term and Prem greater than 28 days of life:** 50 mg/kg/dose q12h	

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Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Congenital syphilis Organism: *T. pallidum*	Benzylpenicillin (Penicillin G) 50,000 units/kg/dose IV • **For first 7 days of life:** q12h • **Thereafter**: q8h **Duration: 10 days*** (*14 days if CSF abnormal)	Procaine penicillin 50,000 units/kg/dose IM in a single daily dose **Duration: 10 days*** (*14 days if CSF abnormal)	Only severe cases are clinically apparent at birth. Refer to algorithm for diagnosing & evaluation. Re-evaluate & possibly re-treat. Please refer Red Book 2021 & Malaysian Paediatric Protocol 4th edition.
	If diagnosed with congenital syphilis after one month of age: Benzylpenicillin (Penicillin G) 200,000 – 300,000 units/kg/dose IV in 4-6 divided doses **Duration: 10-14 days**		
	In infants considered less likely to have syphilis and normal CSF examination including normal physical examination & long bone radiograph Benzathine penicillin 50,000 units/kg/dose IM in a single dose can be given		
Congenital Toxoplasmosis Organism: *T. gondii*	Pyrimethamine/sulfadoxine (Fansidar®) **(UKK)** Pyrimethamine **(UKK)** 1.25 mg/kg/dose PO every 10 days **PLUS** Sulfadoxine 25 mg/kg/dose PO every 10 days **PLUS** Folinic acid 50 mg PO every 7 days for 12 months*	Pyrimethamine **(UKK)** 1 mg/kg/day PO for 2 months, followed by 0.5 mg/kg/day PO for 10 months • **< 60 kg:** up to 50 mg/day • **≥ 60 kg:** up to 75 mg/day **PLUS** Sulfadiazine **(UKK)** 100 mg/kg/day PO in 2 divided doses for 12 months* **PLUS** Folinic Acid 50 mg PO every 7 days for 12 months	Drug regimen is not definitively established. Clinical trials are ongoing. Prednisolone 0.5 mg/kg (max. 20 mg/dose) q12h can be added if CSF protein ≥ 1 g/dL or active severe chorioretinitis. Steroids given till CSF protein < 1 g/dL or resolution of severe chorioretinitis. Fansidar is currently an "orphan" drug that needs special procurement measures to buy. Refer to paediatric ID consultant for treatment and availability of drug. * **Total duration** may be extended up to 2 years depending on severity and response to treatment. **UKK** = Ubat Kelulusam Khas (Requires DG's Approval)

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Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Herpes simplex Neonatal • Localised skin, eye & mouth (SEM) • Central nervous system (CNS) with or without SEM • Disseminated disease involving multiple organs	Acyclovir 20 mg/kg/dose IV • **< 30 weeks:** q12h • **≥ 30 weeks:** q8h All infants surviving neonatal HSV infection of any classification should receive oral acyclovir suppression at 300 mg/m^2/dose administered 3 times daily for 6 months after completion of parenteral therapy (adjust dose monthly to account for growth).	-	**Duration:** • **Skin, eyes, mouth: 14 days** • **CNS/disseminated: minimum of 21 days** Screen for other STDs. **For CNS disease:** Repeat lumbar puncture at end of therapy for HSV PCR. If PCR remains positive, continue IV acyclovir for another one week. Recurrence of HSV can occur and may be a lifelong problem.
Tetanus Neonatorum	Metronidazole • **PMA < 34 weeks:** 7.5 mg/kg/dose IV q12h • **PMA 35-40 weeks:** 7.5 mg/kg/dose IV q8h • **PMA > 40 weeks:** 10 mg/kg/dose IV q8h	Benzylpenicillin (Penicillin G) 100,000 units/kg/dose IV • **GA ≤ 34 weeks:** PNA ≤ 7 days: q12h PNA > 7 days: q8h • **GA > 34 weeks:** PNA ≤ 7 days: q8h PNA > 7 days: q6h	**DIAMS – HSgB NICU Antimicrobial Database** Kindly refer to Hosp Sg Buloh NICU Antimicrobial Database DIAMS for dosing. **Duration: 7 to 10 days** IM Human Tetanus Immunoglobulin 250-500 IU for neutralizing of unbound toxin. Antibiotics may fail to eradicate *C. tetani* unless adequate wound debridement is performed.
Congenital Gonococcal Ophthalmitis/ Conjunctivitis	Immediate & frequent saline eye irrigation. **Non-disseminated disease:** Cefotaxime 100 mg/kg/dose IV in a single dose. **Duration:** May need to continue for 48-72h until systemic infection has been ruled out. **Disseminated disease:** Cefotaxime 50 mg/kg/dose IV • **≤ 1 week of age:** q12h • **1 week of age:** q8h **Duration: 7 days.** (10–14 days if meningitis is documented).	-	Evaluate for signs of disseminated infection (E.g.: sepsis, arthritis & meningitis). Screen mother & baby for chlamydial infection. Screen for other STDs. Investigate and treat parents.

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Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Chlamydia trachomatis **Conjunctivitis**	Erythromycin ethylsuccinate (EES) 12.5 mg/kg/dose q6h PO **Duration: 14 days*** (* Second course of treatment might be required) Local eye toilet until discharge stops.	Azithromycin 20 mg/kg/day PO, once daily for 3 days. (Limited data on efficacy)	Initial treatment for chlamydial conjunctivitis should be based upon a positive diagnostic test. Re-swab after treatment; 20-30% will need a second course to clear infection.

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Group B Streptococcus (GBS)

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Streptococcus agalactiae	**Sepsis:** Benzylpenicillin (Penicillin G) 100,000 units/kg/dose IV • **GA ≤ 34 weeks:** PNA ≤ 7 days: q12h; PNA > 7 days: q8h • **GA > 34 weeks:** PNA ≤ 7 days: q8h; PNA > 7 days: q6h **OR** Ampicillin • **≤ 1 week of age:** 200-300 mg/kg/day IV in 3 divided doses • **>1 week of age:** 300 mg/kg/day IV in 4 divided doses **PLUS** *Gentamicin 5 mg/kg/dose IV • **< 30 weeks of CGA:** q48h • **30-34 weeks of CGA:** q36h • **≥ 35 weeks CGA:** q24h	-	DIAMS – HSgB NICU Antimicrobial Database Kindly refer to Hosp Sg Buloh NICU Antimicrobial Database DIAMS for dosing. **Duration of treatment for GBS:** • **Uncomplicated (bacteremia without a defined focus): 14 days** • **Meningitis: 21 days** *Gentamicin can be discontinued once the infection is under control.
	Meningitis Benzylpenicillin (Penicillin G) 150,000 units/kg/dose IV • **GA ≤ 34 weeks:** PNA ≤ 7 days: q12h; PNA > 7 days: q8h • **GA > 34 weeks:** PNA ≤ 7 days: q8h; PNA > 7 days: q6h **OR** Ampicillin • **≤ 1 week of age:** 200-300 mg/kg/day IV in 3 divided doses • **>1 week of age:** 300 mg/kg/day IV in 4 divided doses **PLUS** *Gentamicin 5 mg/kg/dose IV • **< 30 weeks of CGA:** q48h • **30-34 weeks of CGA:** q36h • **≥ 35 weeks CGA:** q24h	-	DIAMS – HSgB NICU Antimicrobial Database Kindly refer to Hosp Sg Buloh NICU Antimicrobial Database DIAMS for dosing. **Duration for treatment: 21 days** For uncomplicated meningitis, may consider repeat lumbar puncture 48-72 hours. If CSF culture negative, gentamicin can be stopped and continue penicillin/ampicillin for 2 weeks Doses of penicillin for meningitis is higher as recommended by experts (as high as 500,000 unit/kg/day (> 7 days of age).

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BACK

E. Coli Infection

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
E. coli	**Sepsis/Meningitis:** Cefotaxime 50 mg/kg/dose IV • **GA < 32 weeks:** PNA ≤ 7 days: q12h PNA > 7 days: q8h • **GA ≥ 32 weeks:** PNA ≤ 7 days: q12h PNA > 7 days: q8h **PLUS** Gentamicin 5 mg/kg/dose IV • **< 30 weeks of CGA:** q48h • **30-34 weeks of CGA:** q36h • **≥ 35 weeks CGA:** q24h	-	**DIAMS – HSgB NICU Antimicrobial Database** Kindly refer to Hosp Sg Buloh NICU Antimicrobial Database DIAMS for dosing. **Duration:** • **Bacteremia: 14 days.** • **Meningitis: 21 days.** All cases of bacteremia need lumbar puncture to exclude meningitis. Treatment duration of 14 days can be decided on a case-by-case basis if meningitis is excluded and good clinical response.

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HSgB Antimicrobial Guideline (HAG)

SECTION B: PAEDIATRIC PATIENTS

B7: OCULAR INFECTIONS

Launched: October 2024

Updated: -

LIST OF TOPICS WITH LINKS:

1. **Preseptal Cellulitis**
2. **Orbital Cellulitis**

Preseptal Cellulitis

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Common organism: • *Streptococcus pneumoniae* • *Staphylococcus aureus* • *Streptococcus pyogenes* • *Haemophilus influenzae*	**Mild Preseptal Cellulitis** Amoxicillin/clavulanate (Augmentin) 20-25 mg/kg/dose PO q12h *(dose based on Augmentin component, applicable for Syrup 7:1 and Tablet 4:1 formulation)*	**Mild Preseptal Cellulitis** Cephalexin 25-50 mg/kg/day PO in 2 divided doses (max. 2 g/day) for 10 days	Failure to respond within 24-48 hours may indicate orbital cellulitis or underlying sinus disease. When improving and no organism identified, change to amoxicillin/clavulanate and complete for 7 days of therapy
	Systemically Unwell Cloxacillin 200 mg/kg/day IV in 4 divided doses (max. 12 g/day) **PLUS** Cefotaxime 150-200 mg/kg/day IV in 3 divided doses (max. 6 g/day)	**Systemically Unwell** Cloxacillin 200 mg/kg/day IV in 4 divided doses (max. 12 g/day) **PLUS** Ceftriaxone 50 mg/kg/dose IV q12h (max. 4 g/day)	

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Orbital Cellulitis / Abscess

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Common organism: • *Streptococcus pneumoniae* • *Staphylococcus aureus* • *Streptococcus pyogenes* • *Haemophilus influenzae* • Anaerobes	Cloxacillin 200 mg/kg/day IV in 4 divided doses (max. 12 g/day) **PLUS** Ceftriaxone 50 mg/kg/dose IV q12h (max. 4 g/day) **MAY ADD** Metronidazole 30 mg/kg/day IV q8h (max 1500 mg/day) *If associated with chronic sinusitis/complicated with intracranial abscess* **Duration: 7-14 days** **Inpatient**: Consider transition to oral antibiotic after 48-72 hours of to complete 14 days following good response and no positive culture **Choice of oral agent:** Amoxicillin/clavulanate (Augmentin) 20-25 mg/kg/dose PO q12h *(dose based on Augmentin component, applicable for Syrup 7:1 and Tablet 4:1 formulation)*	**Antibiotic allergy:** Clindamycin 30-40 mg/kg/day PO in 3 or 4 divided doses (max. 450 mg/dose) **CA-MRSA:** Adjust accordingly with sensitivity E.g.: Vancomycin 60 mg/kg/day IV in 3-4 divided doses	This condition is considered a surgical emergency and requires immediate consultation with ENT surgeon and ophthalmologist. Urgent CT scan needed to exclude associated abscess and intracranial extension. Urgent surgical drainage of the ethmoid sinuses or of an orbital, subperiosteal or intracranial abscess may be needed. **Antibiotic Allergy:** Refer to **APPENDICES > Antibiotic Allergy** for more info.

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HSgB Antimicrobial Guideline (HAG)

SECTION B: PAEDIATRIC PATIENTS

B8: ORTHOPAEDIC INFECTIONS

Launched: October 2024

Updated: -

LIST OF TOPICS WITH LINKS:

1. Septic Arthritis (SA) & Osteomyelitis (OM)
- 0 – 3 months old
- >3 months to 5 years old
- >5 years old

Septic Arthritis (SA) & Osteomyelitis (OM)

Common organisms according to age groups:

≤ 3 months
S. aureus
Streptococcus agalactiae
Gram-negative enteric organism

>3 months to 5 years old
Staphylococcus aureus
Streptococcus pyogenes
Streptococcus pneumoniae
Non-typeable *Haemophilus* spp.
Kingella kingae

Older than 5 years
Staphylococcus aureus
Streptococcus pyogenes

Polymicrobial infection: More likely with penetrating trauma or contagious spread

***UNCOMPLICATED OM**
Uncomplicated OM is defined as single bone involvement, rapid resolution of bacteraemia, rapid clinical response to medical and surgical treatment, rapid fall of CRP with no identified acute or late sequalae of infection.

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Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
0 – 3 months old	Cloxacillin 200 mg/kg/day IV in 4-6 divided doses (max 2 g/dose) **PLUS** Cefotaxime 200 mg/kg/day IV in 4 divided doses (max 2 g/dose)	Cefazolin is alternative anti-staphylococcal agent for infants aged 1-3 months if no CNS involvement	Empiric antibiotics should be started based on clinical diagnosis of SA or OM. CBC, blood cultures and CRP +/- ESR should be taken prior to antibiotic therapy. Optimise antimicrobial treatment based on C&S. Surgical debridement often not required in OM. Urgent wash out & drainage is needed in SA in hip and other joints to reduce pressure on growth plate. Synovial fluid and bone culture/analysis is part of diagnostic work up if child is subjected to drainage or debridement. ***Duration of antibiotics:** • **SA**: total of 3-4 weeks (4-6 weeks if hip is involved) • **OM**: 4-6 weeks • **Neonatal OM**: Similar duration for other age group but at least 4 weeks of IV antibiotics. • Shorter duration of 3-4 weeks for uncomplicated MSSA or culture negative OM responded to initial therapy for children > 3 months old. ***Duration – Consider IV to PO** • Transition to oral antibiotic is based on clinical and laboratory improvement if compliance and follow up is assured. • Choice of oral regimen is based on culture and susceptibility results. If cultures are negative, oral therapy is directed toward the most likely pathogen with similar spectrum of activity as parenteral therapy. • Higher doses are generally given to ensure adequate bone penetration. • For complex OM (multifocal, significant bone destruction, immunocompromised host & resistant/unusual
>3 months to 5 years old	Cloxacillin 200 mg/kg/day IV in 4-6 divided doses (max 2 g/dose) **MAY ADD** Cefuroxime 100-200 mg/kg/day IV in 3 divided doses (max 1.5 g/dose) (or as monotherapy) **OR** Cefotaxime 200 mg/kg/day IV in 4 divided doses (max 2 g/dose)	Cefazolin 100-150 mg/kg/day IV in 3 divided doses (max 1 g/dose) (Can be use in children with suspected *S. aureus* or *S. pyogenes*. Less hypersensitivity reaction compared to cloxacillin & more convenient dosing) *Kingella kingae*: uncommon organism causing infection in <5 years old; indolent onset; preceding oral ulcers; may affect nontubular bones; sensitive to β-lactam antibiotics e.g., cefuroxime or amoxicillin/clavulanate	
>5 years old	Cloxacillin 200 mg/kg/day IV in 4-6 divided doses (max 2 g/dose)	-	

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HSgB Antimicrobial Guideline (HAG)

SECTION B: PAEDIATRIC PATIENTS

B9: OTORHINOLARYNGOLOGY (ORL) INFECTIONS

Launched: October 2024

Updated: -

LIST OF TOPICS WITH LINKS:

1. **Tonsilitis / Pharyngitis**
2. **Rhinosinusitis**
3. **Acute Otitis Media (AOM)**
4. **Acute Otits Externa**
5. **Acute Epiglotitis**
6. **Diphtheria**

Tonsilitis / Pharyngitis

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Group A *Streptococcus*	Phenoxymethylpenicillin (Penicillin V) 25-50 mg/kg/day (max 2 g/day) PO in 4 divided doses **OR** Amoxicillin 50 mg/kg/day (max 1 g/day) PO in 1 or 2 divided doses	**Antibiotic allergy (non-life threatening):** Cephalexin 25-50 mg/kg/day (max 2 g/day) PO in 2 divided doses **OR** Erythromycin ethylsuccinate (EES) 40-50 mg/kg/day (max 4 g/day) PO in 2 divided doses	**Duration:** 10 days Once-daily dose amoxicillin (50 mg/kg, max 1 g/day) for 10 days, is as effective as penicillin V or multiple dose amoxicillin for 10 days endorsed by the American Heart Association and the Infectious Disease Society of America in its guidelines for the treatment of GAS pharyngitis and the prevention of ARF. Adherence is important for once-daily dosing regimens.

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Rhinosinusitis

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Common organisms: • Viral (most common) • *Streptococcus pneumoniae* • *Haemophilus influenzae* • *Moraxella catarrhalis* • Group A Streptococcus	Amoxicillin 80-90 mg/kg/day (max 2 g/day) PO in 2 divided doses	**Non-life-threatening allergy:** Cefuroxime 30 mg /kg/day (max 1 g/day) PO in 2 divided doses **Severe antibiotic allergy:** Erythromycin ethylsuccinate (EES) 40-50 mg/kg/day (max 4 g/day) PO in 2 divided doses	**Duration: 5 days** The most common causes are viral infections. Acute bacterial sinusitis is suspected when child with URTI presents with: 1. Persistent illness (nasal discharge or daytime cough or both for ≥ 10 days without improvement) 2. Worsening course 3. Severe onset (concurrent fever & purulent discharge for 3 days) For rhinosinusitis, most experts recommend using high dose amoxicillin (90mg/kg/day).

Acute Otitis Media (AOM)

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Common organisms: *Streptococcus pneumonia* *Haemophilus influenzae* *Moraxella catarrhalis*	Amoxicillin 80-90 mg/kg/day (max 3 g/day) PO in 2 divided doses **For clinical failure & history of using amoxicillin in the last 30 days and has concurrent purulent conjunctivitis:** Amoxicillin/clavulanate (Augmentin) 20-25 mg/kg/dose PO q12h *(dose based on Augmentin component, applicable for Syrup 7:1 and Tablet 4:1 formulation)*	**Antibiotic allergy (non-life-threatening):** Cefuroxime 30 mg/kg/day (max 1 g/day) PO in 2 divided doses **Severe antibiotic allergy:** Erythromycin ethylsuccinate (EES) 30-50 mg/kg/day (max 4 g/day) PO in 2 divided doses **OR** Azithromycin 10 mg/kg/dose (max 500 mg/day) PO on Day 1, followed by 5 mg/kg/dose (max 250 mg/day) PO q24h on Day 2-Day 5	Most uncomplicated otitis media do not require antibiotics with certain exception: ▪ children <2 years ▪ immunosuppression ▪ severe disease **Duration**: < 2yrs: 7- 10 days ≥ 2yrs: 5 - 7 days Amoxicillin/Clavulanate (40-50 mg/kg/day) may not be adequate to treat AOM due to penicillin nonsusceptible *S. pneumoniae*

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Acute Otits Externa

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Common organisms: *Pseudomonas aeruginosa* *Staphylococcus aureus*	**Mild to moderate:** Topical antibiotic with/without topical steroids. E.g.: ▪ Gentamicin 0.3% ear drops: 3-4 drops 3 times/day for 7 days ▪ Polymyxin B sulphate 10,000 U, neomycin sulphate 5 mg & hydrocortisone10 g ear drops: 4 drops 3 or 4 times/day for 7 days ▪ Ofloxacin 0.3% otic solution: Instill 5 drops into affected ear(s) once daily for 7days (Indication: for 1-12 years old)	-	Consult ORL surgeon. Ototoxic agents like gentamicin or neomycin should not be used in the presence of tympanostomy tubes or perforated tympanic membrane. Clinical response should be seen within 48 to 72 hours, but full response may take up 6 days. Non-response should prompt an evaluation for obstruction, presence of foreign body, non-adherence or an alternative diagnosis.

Acute Epiglotitis

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
	Ceftriaxone 50-75 mg/kg/dose (max 2 g/dose) IV q24h **OR** Cefotaxime 150-200 mg/kg/day (max 4 g/day) IV in 4 divided doses	Clindamycin 30 – 40 mg/kg/day (max 1.8 g/day) IV in 3 divided doses	**Duration:** 7 – 10 days ***DIAMS - IV to PO** Switch to oral therapy (e.g.: amoxicillin/clavulanate) when improving and able to tolerate orally.

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Diphtheria

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Corynebacterium diphtheriae	Erythromycin 40-50 mg/kg/day (max 500 mg/dose) IV/PO in 4 divided doses for 14 days **OR** Benzylpenicillin 100,000 – 150,000 units/kg/day (max.1 MU/dose) IV in 4 divided doses, followed by Phenoxymethylpenicillin (Pen V) 125-250mg PO q6h for total of 14 days of therapy (intravenous + oral) **PLUS** Diphtheria Antitoxin	Azithromycin 10 mg/kg/day (max 500mg/dose) IV/PO q24h for 14 days **PLUS** Diphtheria Antitoxin	**Duration:** 14 days (intravenous + oral therapy) Antibiotics are not a substitute for treatment with diphtheria antitoxin. The role of adjunctive antibiotic treatment is to eradicate *C. diphtheriae*, which prevents further toxin production. ***DIAMS - IV to PO** Parenteral treatment is preferred for patients who are unable to swallow. Once the patient improves and can swallow comfortably, switch to oral therapy. ***CLOSE CONTACT MANAGEMENT** IM Benzathine Penicillin BW < 30kg 600,000 U single dose BW ≥ 30kg 1.2 MU single dose **OR** Erythromycin ethylsuccinate (EES) 40-50mg/kg/day PO in 4 divided doses for 7-10 days **OR** Azithromycin 10mg/kg/day PO q24h for 7-10 days
Diphtheria Antitoxin	Dose depends on severity and time since symptom onset **Stage of illness** / **Dose** Pharyngeal/ laryngeal disease of 2 days duration: 20,000 - 40,000 units Nasopharyngeal disease: 40,000 – 60,000 units Systemic disease of ≥3 days or any patient with diffuse neck swelling: 80,000 – 120,000 units ***Administer over 60 mins to inactivate toxins rapidly***		

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HSgB Antimicrobial Guideline (HAG)

SECTION B: PAEDIATRIC PATIENTS

B10: RESPIRATORY INFECTIONS

Launched: October 2024

Updated: -

LIST OF TOPICS WITH LINKS:

1. Community-Acquired Pneumonia (CAP)
2. Severe Community-Acquired Pneumonia
3. Empyema Thoracis

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Community-Acquired Pneumonia (CAP)

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Outpatient Infant (≥3 months) & children **Viral** infection is more common (Influenza, RSV, human metapneumovirus (hMPV), Parainfluenza, Adenovirus) **Bacteria** (*S. pneumoniae,* Group A *Streptococcus, S. aureus, H. influenzae*)	*High dose amoxicillin 80-90 mg/kg/day (max 4000 mg/day) PO in 2 divided doses for 5-7 days **Oral weight bands**: 3-5 kg**:** 250 mg q12h 6-9 kg: 375 mg q12h 10-14 kg: 500 mg q12h 15-19 kg: 750 mg q12h ≥ 20 kg: 500 mg q8h or 1 g q12h For influenza: If suspected, treatment to be initiated as early as possible. **Oseltamivir** **<9 months old**: 3 mg/kg/dose PO q12h for 5 days **9-11 months old**: 3.5 mg/kg/dose PO q12h for 5 days **1-12 years old**: ≤15 kg: 30 mg PO q12h >15-23kg: 45 mg PO q12h >23-40kg: 60 mg PO q12h >40 kg: 75 mg PO q12h Treatment for 5 days	Erythromycin ethylsuccinate (EES) 30-50 mg/kg/day (max 2 g/day) PO in 2 divided doses	Antibiotics are not routinely recommended since viral infection is more common. For infant & children admitted to hospital, treat as presumed bacterial unless viral origin is known. Macrolide antibiotics should be used if mycoplasma or chlamydia pneumonia is suspected. May be started in school-going children where disease predominates. **Duration:** minimum 5 days and until afebrile for 2-3 days in empiric therapy with absence of an identified specific etiology and specific therapy with pneumonia due to pneumococcus, *H. influenzae* & *Moraxella catarrhalis*. *At least 40 mg/kg/dose, children who do not respond to oral Amoxicillin should be referred to the center with appropriate second line treatment. Experts recommend using high dose amoxicillin to overcome resistance conferred by cell wall changes of the bacteria (pneumococcus). Standard dose: Amoxicillin 45-50mg/kg/day PO in 3 divided doses for 5-7 days, to be considered only for children who cannot tolerate high doses.
Inpatient Fully immunised	Benzylpenicillin 150,000-200,000 units/kg/day (max 24 million unit/day) IV in 3-4 divided doses for 5- 7 days	**Second line/partially treated** Cefuroxime 100-150 mg/kg/day (max 6 g/day) IV in 3 divided doses **OR** Amoxicillin/clavulanate 30 mg/kg/dose (Augmentin component) IV q8h	Macrolide antibiotics should be used if either Mycoplasma or *Chlamydia pneumonia* is suspected.

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Severe Community-Acquired Pneumonia

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Child not fully immunised/life-threatening	Cefotaxime 150-200 mg/kg/day (max 8 g/day) in 3 to 4 divided doses **OR** Ceftriaxone 75-100 mg/kg/day (max 4 g/day) in 2 divided doses **MAY ADD** *Azithromycin 10 mg/kg/dose (max 500 mg) IV q24h on Day 1; then 5 mg/kg/dose (ma. 250mg) on Day 2-5 if considering atypical organisms	Cefuroxime 100-150 mg/kg/day (max 6 g/day) IV in 3 divided doses **MAY ADD** *Azithromycin 10 mg/kg/dose (max 500 mg) IV q24h on Day 1; then 5 mg/kg/dose (ma. 250mg) on Day 2-5 if considering atypical organisms	**Duration:** 5-7 days. Consider longer treatment and assess for complications e.g empyema, if patient not fully recovered. For the management of empyema, refer to **Empyema thoracis** section below. *The role of antimicrobial in treating both *M. pneumoniae* and *C. pneumoniae* is unknown because most children resolve infection without macrolides, treatment may be appropriate to hasten recovery in children who are more seriously ill or have a persistent cough. Macrolide resistance *Mycoplasma pneumoniae* currently is very common in Asia and routine use should be avoided.

Empyema Thoracis

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Empirical treatment needs to cover organisms below: • *Staphylococcus aureus* • *Streptococcus pneumoniae* Other bacteria implicated: *Streptococcus pyogenes, Haemophilus influenzae* & other Gram-negative organisms in immunocompromised individuals If patient is not responding to treatment, need to rule out TB	Cefuroxime 100-200 mg/kg/day (max 4.5 g/day) IV in 3 divided doses **OR** Cefotaxime 200-300mg/kg/day (max 8 g/day) IV in 4 divided doses **PLUS** Cloxacillin 200-300 mg/kg/day (max 12g/day) IV in 4-6 divided doses **Duration: 4-6 weeks**	***Staphylococcus aureus* (methicillin-sensitive):** Cloxacillin 200-300 mg/kg/day (max 12g/day) IV in 4-6 divided doses for 4-6 weeks ***Streptococcus pneumoniae* (penicillin-sensitive):** Benzylpenicillin 200,000-300,000 units/kg/day (max 24 MU/day) IV in 4-6 divided doses ***Streptococcus pneumoniae* (penicillin- resistant, based on result of C&S):** Cefotaxime 200-300 mg/kg/day (max 8 g/day) IV in 4 divided doses **OR** Ceftriaxone 100 mg/kg/day (max 4 g/day) IV in 1-2 divided doses	Based on C&S of pleural fluid/tissue or blood culture. All children with empyema need to receive high dose antibiotic therapy via intravenous route to ensure pleural penetration. Pneumatocele on chest x-ray indicate *S. aureus* BUT they can also be seen in pneumococcal disease. There is NO CONSENSUS on how long antibiotic needs to be given. Most recommend 3-6 weeks of total antibiotics depending on severity. For moderate to severe or Stage 1-2 parapneumonic effusion, to consider pleural drainage and intrapleural fibrinolytic agent on top of antimicrobial therapy. Stage 2 failed medical therapy and stage 3 empyema thoracis need surgical intervention. (Refer Empyema Thoracic in Children: Consensus Guideline from Malaysia Pediatric Empyema Thoracic Working Group 2020 Edition)

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SECTION B: PAEDIATRIC PATIENTS

B11:
SKIN & SOFT TISSUE INFECTIONS (SSTI)

Launched: October 2024

Updated: -

LIST OF TOPICS WITH LINKS:

1. Abscess
2. Cellulitis
3. Hansen's Disease (Leprosy)
4. Impetigo
5. Necrotising Fasciitis (NF)
6. Scalded Skin Syndrome (SSSS)
7. Animal Bites
8. Scabies
9. Tinea Capitis

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Abscess

Common organism: *Staphylococcus aureus*

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Mild	*Cloxacillin 50-100 mg/kg/day PO in 4 divided doses (max. 1 g/day) **Doses recommended are for children weighing less than 25 kg. For children weighing more than 25 kg, use adult dosage (500 mg PO q6h).*	Cephalexin 25-50 mg/kg/day PO in 2 divided doses (max. 2 g/day)	**Duration: 5-7 days** Incision & drainage (I&D) is the MAINSTAY of therapy. If needle aspiration is inadequate, can send pus obtained during I&D for C&S. Use parenteral route for severe infections. Consider CA-MRSA if poorly resolving, based on local epidemiology (still generally uncommon).
Severe	Cloxacillin 200 mg/kg/day IV in 4 divided doses (max. 12 g/day)	-	
CA-MRSA	Clindamycin 30-40 mg/kg/day PO in 3-4 divided doses (max. 1.8 g/day) **OR** Trimethoprim/sulfamethoxazole (Bactrim) 8-12 mg/kg/day (TMP dose) PO in 2 divided doses (max. 320 mg/day)	-	

Cellulitis

Common organism: *Staphylococcus aureus*

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Mild	*Cloxacillin 50-100 mg/kg/day PO in 4 divided doses (max. 1 g/day) **Doses recommended are for children weighing less than 25 kg. For children weighing more than 25 kg, use adult dosage (500 mg PO q6h).*	Cephalexin 25-50 mg/kg/day PO in 2 divided doses (max. 2 g/day)	**Duration: 5-7 days** Total treatment until 3 days after acute inflammation disappears. Administer using parenteral route for extensive lesions.
Severe	Cloxacillin 200 mg/kg/day IV in 4 divided doses (max. 12 g/day)	-	

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Hansen's Disease (Leprosy)

Organism: *Mycobacterium leprae*

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
< 10 years old or < 40kg	Rifampicin 10 mg/kg PO (max. 600 mg/day) once a month **PLUS** Dapsone 2 mg/kg PO q24h (max. 100 mg/day) **PLUS** Clofazimine 100 mg PO once a month, 50 mg twice weekly	-	**Duration:** • Paucibacillary: 6 months • Surveillance 5 years • Multibacillary: 12 months • Surveillance 15 years
10-14 years old	Rifampicin 450mg PO (max. 600 mg/day) once a month **PLUS** Dapsone 50 mg PO q24h (max. 100 mg/day) **PLUS** Clofazimine 150 mg PO once a month & 50 mg alternate day	-	

Impetigo

Common organism: *Staphylococcus aureus & Streptococcus pyogenes*

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Localised	Topical 2% Fusidic acid 2-3 times daily	Topical 2% Mupirocin cream 2-3 times daily	**Duration: 7 days**
Generalised	Cloxacillin 50-100 mg/kg/day PO in 4 divided doses (max. 1 g/day)	Cephalexin 25-50 mg/kg/day PO in 2 divided doses (max. 2 g/day)	**Duration: 5-7 days**

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Necrotising Fasciitis (NF)

Streptococcus spp.:
Group A Streptococcus (GABHS),
Other Streptococcus

Staphylococcal:
Staphylococcus aureus & *Streptococcus pyogenes*

Other pathogens to consider:
Clostridia sp.
Polymicrobial

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Streptococcal Necrotising Fasciitis	Benzylpenicillin 200,000-300,000 units/kg/day IV in 4-6 divided doses (max. 24 million units/day) **PLUS** Clindamycin 10 mg/kg IV q6h (max: 4.8 g/day) *Combination therapy is needed with clindamycin to block toxin production whether or not patient manifests toxic shock syndrome.*	-	50% of patients have associated streptococcal toxic shock syndrome (STSS). Prompt and aggressive surgical debridement of the deep-seated infection is the mainstay of therapy. Tissues should be sent for Gram stain and culture to determine etiology. IVIG can be used as an adjunct in Group A streptococcal infection, typically at 1 gm/kg on Day 1, followed by 0.5 mg/kg on 1-2 subsequent days. **Duration: at least 2 weeks if no foci is found** (no deep-seated involvement plus no involvement of heart, bone, joint etc.)
Staphylococcal Necrotising Fasciitis	Cloxacillin 200 mg/kg/day IV in 4-6 divided doses (max. 1 g/day) **PLUS** Clindamycin 10 mg/kg IV q6h (max: 4.8 g/day) *Combination therapy is needed with clindamycin to block toxin production whether or not patient manifests toxic shock syndrome.*	**If CA-MRSA is suspected** Vancomycin 60 mg/kg/day IV in 3-4 divided doses (max. 2 g/day)	**Duration: at least 2 weeks if no foci is found** (no deep-seated involvement plus no involvement of heart, bone, joint etc.) Prompt and aggressive surgical debridement of the deep-seated infection is the mainstay of therapy. Tissues should be sent for Gram stain and culture to determine etiology. Vancomycin is NOT RECOMMENDED for the treatment of serious MSSA infections because outcomes are INFERIOR compared with cases in which anti-staphylococcus β-lactam (cloxacillin) is used AND to minimise the emergence of vancomycin resistance.

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Scalded Skin Syndrome (SSSS)

Common organism: *Staphylococcus aureus*

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
	Cloxacillin 200 mg/kg/day IV in 4-6 divided doses (max. 12 g/day) **Step down:** Cloxacillin 25-50 mg/kg/day PO in 4 divided doses (max. 1 g/day)	-	Switch to oral therapy when the patient shows clinical improvement and negative blood culture results. Doses recommended are for children weighing less than 25 kg. For children weighing more than 25 kg, use adult dosage.

Animal Bites

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Cat Bites Common organism: • *Pasteurella multocida* • *Staphylococcus spp.* • *Streptococcus spp.* • *Neisseria* • *Moraxella*	Amoxicillin/clavulanate (Augmentin) 20-25 mg/kg/dose PO q12h *(dose based on Augmentin component, applicable for Syrup 7:1 and Tablet 4:1 formulation)*	Amoxicillin/clavulanate 30mg/kg/dose IV q8h (max. amoxicillin 3 g/day)	**Duration: 5-7 days** Consider rabies prophylaxis according to local epidemiology. Other animal bites: to discuss with ID Physician.
Dog Bites Common organism: • *Pasteurella canis* • *Staphylococcus spp.* • *Streptococcus spp.* • *Fusobacterium*	Amoxicillin/clavulanate (Augmentin) 20-25 mg/kg/dose PO q12h *(dose based on Augmentin component, applicable for Syrup 7:1 and Tablet 4:1 formulation)*	Amoxicillin/clavulanate 30mg/kg/dose IV q8h (max. amoxicillin 3 g/day) **OR** Clindamycin 20-40 mg/kg/day IV in 3 divided doses (max. 4.8g/day) **PLUS** Co-trimoxazole 8-10 mg (TMP)/kg/day IV in 2 divided doses (max. 320 mg TMP/day)	**Duration: 5-7 days** Consider rabies prophylaxis according to local epidemiology. Other animal bites, to discuss with ID Physician.

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Scabies

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Scabies	**Infant < 2 months** Sulphur 6% in petroleum in ointment base for 3 days		Treat whole body including the face (avoid eyes and mouth). Treat all family members/close contacts simultaneously. Refer to **Ministry of Health Guideline for Management of Scabies in Adults and Children (2015)** for cautions and topical application method.
	Children < 2 years Two applications of Permethrin 5% for 8-12 hours at one week apart	**Children < 2 years** Sulphur 6% in petroleum in ointment base for 3 days	
	Children < 12 years Two applications of permethrin 5% for 8-12 hours at one week apart	**Children < 12 years** Benzyl Benzoate 12.5% Whole body neck and below for 3 consecutive days	
Nodular Scabies	**Children < 2 years** Crotamiton cream TDS for 5-7 days		
	Children < 12 years Crotamiton cream TDS for 7-14 days		

Tinea Capitis

Common organisms: *Trichophyton spp., Microsporum spp.*

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
	Griseofulvin (microsize) 1 month – 2 years: 15 – 25mg/kg/DAY in 1-2 divided doses (max 1000mg/DAY) >2 years: 20-25mg/kg/DAY in 1-2 divided doses (max 1000mg/DAY) **Duration: for at least 6 weeks until clinically clear**	Terbinafine 4-6 mg/kg/day PO daily (max. 250 mg/day) • 10-20 kg: 62.5 mg daily • 20-40 kg: 125 mg daily • 40 kg: 250 mg daily **Duration: for 4 weeks or longer depend on pathogen** **OR** Itraconazole 3-5mg/kg/day PO daily (max. 200mg/day) **Duration: for 2-6 weeks** **OR** Fluconazole 5-6mg/kg/day PO (max. 300mg/day) **Duration: for 3-6 weeks**	**Griseofulvin:** • First line treatment for Microsporum sp • Take with fatty food. Monitor liver function if treatment duration > 8 weeks Adjunctive selenium or ketoconazole shampoo can reduce transmissibility.

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HSgB Antimicrobial Guideline (HAG)

SECTION B: PAEDIATRIC PATIENTS

B12: TROPICAL INFECTIONS

Launched: October 2024

Updated: -

LIST OF TOPICS WITH LINKS:

1. **Scrub Typhus**
2. **Brucellosis**
3. **Leptospirosis**
4. **Melioidosis**
   - Intensive/Induction Therapy
   - Maintenance Therapy
5. **Tetanus**
6. **Malaria**
   - *Plasmodium falciparum*
   - *Plasmodium vivax, Plasmodium malariae, Plasmodium knowlesi*
   - Mixed Infection

For **Typhoid Fever** and **Cholera**, refer to **Gastrointestinal Infections Section**.

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Scrub Typhus

Common organism: *Rickettsia Tsutsugamushi*

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Mild	Doxycycline 2-4 mg/kg/day IV/PO in 1-2 divided dose (max. 200 mg/day) **Duration: 5-7 days**	Azithromycin 10 mg/kg/dose PO q24h (max. 500 mg/dose) **Duration: 3 days**	Doxycycline can be used in young children (even below 8 years old) since safety data approved its use for rickettsial diseases.
Severe Disease	IV Doxycycline and Azithromycin combination	-	

Brucellosis

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Common organisms: • *B. melitensis,* • *B. abortus,* • *B. suis,* • *B. canis*	Rifampicin 15-20 mg/kg/day PO in 1-2 divided doses (max. 600-900 mg/day) **PLUS** • **For children <8 years old:** Trimethoprim/sulfamethoxazole (Bactrim) 10mg/kg/day (TMP dose) (max. 480mg TMP/day) PO in 2 divided doses • **For children >8 years old:** Doxycycline 4.4mg/kg/day PO in 2 divided doses (max. 200mg/day) **Duration: 6 weeks**	-	For non-localised disease: Can use two-drug combination. Drug of choice for Brucellosis for children >8 years old: Doxycycline (plus rifampicin)
	Serious illness Rifampicin 15-20 mg/kg/day PO in 1-2 divided doses (max. 600-900 mg/day) for 6 weeks **PLUS** • **For children <8 years old:** Trimethoprim/sulfamethoxazole (Bactrim) 10 mg/kg/day (TMP dose) (max. 480 mg TMP/day) PO in 2 divided doses for 6 weeks • **For children >8 years old:** Doxycycline 4.4 mg/kg/day PO in 2 divided doses (max. 200 mg/day) for 6 weeks **PLUS** Gentamicin 5 mg/kg/dose IV q24h for 7-14 days	-	

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Leptospirosis

Common organisms: *L. icterohaemorrhagiae & L. canicola*

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Mild Disease	Amoxicillin 40-45 mg/kg/day PO in 3 divided doses (max. 500 mg/dose)	**For children >8 years old:** Doxycycline 2 mg/kg/dose PO q12h (max. 200 mg/day)	**Duration: 7 days**
Moderate to Severe disease	Benzylpenicillin 200,000 units/kg/day IV in 4 divided doses (max. 12-18 million units/day)	Ceftriaxone 100mg/kg/day IV q24h (max. 2 g/day) **OR** Cefotaxime 150-200 mg/kg/day IV in 3-4 divided doses (max. 12 g/day)	**Duration: 7 days**

Melioidosis

Organisms: *Burkholderia pseudomallei*

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Intensive/Induction Therapy	Ceftazidime 200 mg/kg/day IV in 3-4 divided doses (max. 6 g/day)	Imipenem/cilastatin 75-100 mg/kg/day IV in 4 divided doses (max. 1g/ dose) **OR** Meropenem 75mg/kg/day IV in 3 divided doses (Neurological melioidosis: 120-150mg/kg/day IV in 3 divided dose) (max. 2g/dose)	**Duration: 2-8 weeks** • Uncomplicated: 2 weeks • Complicated pneumonia, deep-seated infection, neurological melioidosis, osteomyelitis & septic arthritis: 4-8 weeks
Maintenance Therapy	Trimethoprim/ sulfamethoxazole (Bactrim) 4-6 mg/kg/dose (of TMP component) PO q12h up to 240 mg then to follow adult dose **PLUS** Folic acid 5 mg PO q24h* **MAY ADD (if high risk relapse & for children above 8 years old only)*:** Doxycycline 4 mg/kg/day PO in 2 divided doses (max. 200 mg/day)	**Children below 8 years old:** Amoxicillin/clavulanate 20 mg/kg/dose (of amoxicillin component) PO q8h (higher relapse rate) Ratio dose depends on product available (7:1 or 4:1)	**Duration:12- 20 weeks** *Folic acid 5 mg PO q24h to be given for patients on Bactrim (Trimethoprim/sulfamethoxazole).

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Tetanus

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Organism: *Clostridium tetani*	Metronidazole 30 mg/kg/day IV in 3-4 divided doses (max. 500 mg/dose) **Neutralisation of toxin:** Human tetanus globulin (TIG) 500IU IM as a single dose.	Benzylpenicillin 200,000 units/kg/day IV in 4 divided doses (max. 12-18 million units/day) **Neutralisation of toxin:** If TIG not available: IVIG 200-400 mg/kg as a single dose	**Duration: 7-10 days** Primary tetanus infection: Clinical diagnosis to be made as negative culture is often negative. **Steps in care:** 1. Early airway protection & treatment of reflex spasm with benzodiazepine (midazolam). 2. Neutralisation of toxin: TIG single dose, administered IM 250-500 IU. 3. Surgical debridement of infected tissues. 4. Refer Table for tetanus wound prophylaxis

Tetanus Prophylaxis for Wound Table:

History of tetanus toxoid vaccine (No. of doses):	Type of wounds			
	Clean, minor wounds		All other wounds**	
	DTaP***, Tdap, or Td vaccine required?	*TIG required?	DTaP***, Tdap, or Td vaccine required?	*TIG required?
Fewer than 3 doses or unknown	**Yes**	**No**	**Yes**	**Yes**
3 or more doses	**No** (if < 10 years since the last dose of tetanus-containing vaccine)	**No**	**No** (if < 5 years since the last dose of tetanus-containing vaccine)	**No**
	Yes (if ≥ 10 years since the last dose of tetanus-containing vaccine)	**No**	**Yes** (if ≥ 5 years since the last dose of tetanus-containing vaccine)	**No**

***TIG**: Tetanus immune globulin (for neutralization of toxin)
****Other wounds**: Such as, but not limited to, wounds contaminated with dirt, feces, soil, and saliva; puncture wounds; avulsions, and wounds resulting from missiles, crushing, burns and frostbite
*****DTAP: Used for children <7 years of age.** Tdap is preferred to Td for underimmunized children 7 years of age or older who have not received Tdap previously

Ref: Adapted from Red Book: 2021-2024 report of the Committee on Infectious Disease

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Malaria

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	**Alternative**	
Plasmodium falciparum	**Uncomplicated** Artemether/lumefantrine (Riamet®) (20 mg artemether/ 120 mg lumefantrine per tablet) The patient should receive an initial STAT dose, followed by second dose 8 hours later, then 1 dose q12h for the following two days: • 5-14 kg: 1 tablet per dose • 15-24 kg: 2 tablet per dose • 25-35 kg: 3 tablet per dose • ≥ 35 kg: 4 tablet per dose	**Uncomplicated** Artesunate/mefloquine FDC (ASMQ) (ASMQ is available as FDC tablet 25/55 mg & 100/220 mg) • 5-8 kg: 25/55 mg PO q24h • 9-17 kg: 50/110 mg PO q24h • 18-29 kg: 100/220 mg PO q24h • >30 kg: 200/440 mg PO q24h Duration: 3 days	Artesunate/mefloquine may cause seizure in children with epilepsy. Riamet® should be served with high-fat diet e.g. milk to enhance absorption. **Primaquine 0.25 mg base/kg to be given on Day 1 as a single dose** in addition to artemisinin-based combination therapy (ACT) (G6PD testing is not required prior to administration of this dose).
	Treatment failure An alternative artemisinin-based combination therapy (ACT) regimen to be used. (If Riamet® is used as the first line regimen, use ASMQ & vice versa)	**Treatment failure** Artesunate 4 mg/kg/dose PO q24h **PLUS** Clindamycin 10 mg/kg/dose PO q12h for 7 days **OR** Quinine 10 mg salt/kg/dose PO q8h **PLUS** Clindamycin 10 mg/kg/dose PO q12h for 7 days	Artesunate/mefloquine may cause seizure in children with epilepsy. Riamet® should be served with high-fat diet e.g. milk to enhance absorption. **Primaquine 0.25 mg base/kg to be given on Day 1 as a single dose** in addition to artemisinin-based combination therapy (ACT) (G6PD testing is not required prior to administration of this dose).
	Severe/Complicated (Almost always due to P. falciparum. Suspect mixed infections if P. vivax/ P. knowlesi malaria appears more severe than usual) **Children > 20 kg** • **Day 1:** IV artesunate* 2.4 mg/kg on admission, then repeat again at 12 & 24 hours • **Day 2-7:** IV artesunate* 2.4 mg/kg OD or switch to oral ACT **Children < 20 kg** • **Day 1:** IV artesunate* 3.0 mg/kg on admission, then repeat again at 12 & 24 hours • **Day 2-7:** IV artesunate* 3.0 mg/kg OD or switch to oral ACT **Duration: 7 days**	**Severe/Complicated** (Almost always due to P. falciparum. Suspect mixed infections if P. vivax/ P. knowlesi malaria appears more severe than usual) Day 1: *Quinine loading dose 20 mg/kg IV (dilute in 250 ml D5%) run over 4 hours; followed by maintenance dose 8 hours later; Quinine 10 mg/kg IV q8h till Day 7 (max. 600 mg base) **Change to quinine PO if able to tolerate orally (max. quinine per dose = 600 mg).* *Reduce quinine IV dose by one third of total dose if unable to change to quinine PO after 48 hours (10 mg/kg q8h to 10 mg/kg q12h) or in renal failure or liver impairment.* **PLUS** • Doxycycline 2.2 mg/kg/dose (max. 100 mg/dose) PO q12h **OR** • Clindamycin 10 mg/kg/dose PO q12h **Duration: 7 days**	Avoid using ASMQ (artesunate/ mefloquine) if patient presents initially with impaired consciousness as increased incidence of neuropsychiatric complications associated with mefloquine following cerebral malaria have been reported. Children with severe malaria should be started on broad-spectrum antibiotic treatment immediately at the same time as antimalarial treatment. **Parenteral Artesunate:** • IM artesunate (same dose as IV) can be used in patients with difficult intravenous access. • IV artesunate should be given for a minimum of 24 hours (3 doses) or until patient tolerating orally and thereafter to complete treatment with a complete course of oral ACT (3 days of ASMQ or Riamet®. • *Do not use IV artesunate as monotherapy for 7 days. If IV artesunate needs to be continued indefinitely, clindamycin must be added to the regimen to complete 7 days of treatment.*

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Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Plasmodium vivax, Plasmodium malariae, Plasmodium knowlesi	**Uncomplicated** ACT (Riamet® or ASMQ) • **Artemether/lumefantrine (Riamet®)** (20 mg artemether/ 120 mg lumefantrine per tablet) The patient should receive an initial STAT dose, followed by second dose 8 hours later, then 1 dose q12h for the following two days: ○ 5-14 kg: 1 tablet per dose ○ 15-24 kg: 2 tablet per dose ○ 25-35 kg: 3 tablet per dose ○ ≥ 35 kg: 4 tablet per dose **OR** • **Artesunate/mefloquine FDC (ASMQ)** (ASMQ is available as FDC tablet 25/55 mg & 100/220 mg) ○ 5-8 kg: 25/55 mg PO q24h ○ 9-17 kg: 50/110 mg PO q24h ○ 18-29 kg: 100/220 mg PO q24h ○ >30 kg: 200/440 mg PO q24h **For *P. vivax*, as above PLUS:** Primaquine 0.5 mg/kg PO q24h for 14 days (max. 30 mg base/dose)	**Uncomplicated** Quinine 10 mg salt/kg PO q8h for 7 days **For *P. vivax*, as above PLUS:** Primaquine 0.5 mg/kg PO q24h for 14 days (max. 30mg base/dose) Mefloquine 15 mg/kg single dose combined with primaquine have been found to be effective (except for *P. knowlesi*)	**Primaquine:** • Primaquine is ONLY needed for P. vivax for a total of 14 days. • Primaquine (0.5 mg/kg) may cause haemolysis in individuals with G6PD deficiency, hence G6PD testing is required before administration of primaquine above 0.25 mg/kg. • For those found to have mild to moderate G6PD deficiency, an intermittent primaquine regimen of 0.75 mg base/kg weekly for 8 weeks can be given under medical supervision. • In severe G6PD deficiency, primaquine is contraindicated and should not be used. **P. knowlesi** (monkey malaria) can cause severe malaria and should be treated as severe malaria secondary to P. falciparum.
	Severe & complicated *P. vivax, P. knowlesi or P. malariae* Treat as per severe *P. falciparum* malaria		
Mixed Infection	Treat as per *P. falciparum*		

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SECTION B: PAEDIATRIC PATIENTS

B13:
URINARY TRACT INFECTIONS (UTI)

Launched: October 2024

Updated: -

LIST OF TOPICS WITH LINKS:

1. Scrub Typhus
2. Lower Urinary Tract Infection
3. Prophylaxis for UTI

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Acute Pyelonephritis

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Common organism: • *Escherichia coli* • *Proteus spp.* • *Klebsiella spp.* • *Enterobacter spp.*	**0-2 months old** Ampicillin 50 mg/kg/dose IV ≤ 1 week of age: q12h > 1 week of age: q8h **PLUS** Gentamicin 5 mg/kg/dose IV ≤ 30 weeks of CGA: q48h > 30-34 weeks of CGA: q36h > 35 weeks of CGA: q24h *Use IBW in obese patients and monitor serum concentrations closely*	**0-2 months old** Cefotaxime 150-200mg/kg/day IV in 3 divided doses (max. 6 g/day) **MAY ADD** Amikacin 15 mg/kg/dose IV daily *Use IBW in obese patients and monitor serum concentrations closely*	Duration: 7 – 10 days Adjust therapy based on culture result. Switch to oral therapy when improving and able to tolerate oral therapy.
	≥ 3 months old Cephalexin 25-50 mg/kg/day PO in 2 divided doses (max. 2 g/day) **OR** Amoxicillin/clavulanate (Augmentin) 20-25 mg/kg/dose PO q12h *(dose based on Augmentin component, applicable for Syrup 7:1 and Tablet 4:1 formulation)*	**≥ 3 months old** Cefotaxime 50 mg /kg /dose IV q8h (max. 6 g/day) **OR** Ceftriaxone 50 mg / kg/dose IV q12h (max. 2 g/day) **MAY ADD** Amikacin 15 mg/kg/dose IV daily *Use IBW in obese patients and monitor serum concentrations closely*	

Lower Urinary Tract Infection

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Lower UTI .	Amoxicillin/clavulanate (Augmentin) 20-25 mg/kg/dose PO q12h *(dose based on Augmentin component, applicable for Syrup 7:1 and Tablet 4:1 formulation)* **OR** Cefuroxime 30 mg/kg/day PO in 2 divided doses (max 500 mg/day) **OR** Trimethoprim/sulfamethoxazole (Bactrim) 8-10 mg/kg/day (of TMP component) PO in 2 divided doses	Nitrofurantoin 2 mg/kg/dose PO q12h (Sustained release tablets) **OR** Nitrofurantoin 1 mg/kg/dose q6h (immediate release tablets) (max. 100 mg/dose)	Duration: 3-5 days

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Prophylaxis for UTI

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Prophylaxis for infants & children with Recurrent UTI .	Trimethoprim 1-2 mg/kg PO at night (max. 100 mg ON) **OR** Trimethoprim/sulfamethoxazole (Bactrim) 2 mg/kg (of TMP component) PO at night **OR** Nitrofurantoin 1-2 mg/kg PO at night (max. 100 mg ON)	Cephalexin 12.5 mg/kg PO at night (max.125 mg/dose)	Antibiotic prophylaxis should not be routinely recommended in children with first-time UTI. Prophylactic antibiotics should be given for **3 days with MCUG** (micturating cystourethogram) taking place on the second day. Children with Grade I-IV vesicoureteral reflux (VUR) may experience a decrease in recurrent UTI by 50% following first or second febrile or symptomatic UTI with increased detection of resistant organisms following antibiotic prophylaxis.

REFERENCES

1. Malaysian National Antimicrobial Guideline 2024
2. NICE Guidelines: Urinary tract infection: diagnosis, treatment and long-term management of urinary tract infection in children 2018. Last update 2022
3. Alexandra Hospital Clinical Practice Guideline – UTI December 2021 Version 3
4. WHO Antibiotic guideline 2022

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HSgB Antimicrobial Guideline (HAG)

SECTION B: PAEDIATRIC PATIENTS

B14: VASCULAR INFECTIONS

Launched: October 2024

Updated: -

LIST OF TOPICS WITH LINKS:

1. **Catheter Related Blood Stream Infections (CRBSI)**
   - **Gram-Positive Organisms (GPC)**
   - **Coagulase-negative *Staphylococcus* (CONS)**
   - ***Staphylococcus aureus***
   - **Gram-Negative Bacilli (GNB/GNR)**
   - **ESBL Negative Enterobacterales**
   - **ESBL Positive Enterobacterales**
   - ***Pseudomonas aeruginosa***
   - ***Candida albicans or* Other Candida Species**
2. **Suppurative Thrombophlebitis**
   - **MSSA**
   - **MRSA**

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Catheter Related Blood Stream Infections (CRBSI)

Diagnosis needs:

1. **Paired blood** cultures drawn from both **catheters** and **peripheral vein.**
2. If blood cultures cannot be drawn from peripheral vein, it is recommended that **two or more blood cultures** should be drawn through different catheter lumen.

Long term catheters should be removed in patients with CRBSI with:

Severe sepsis, suppurative thrombophlebitis, endocarditis, blood stream infections that continue despite 72 hours of antimicrobial therapy or longer to which the infecting organism is susceptible or infections due to *Staphylococcus aureus, Pseudomonas aeruginosa*, fungi & mycobacterium.

Attempts at catheter salvage are only recommended in uncomplicated CRBSI or CLABSI caused by bacteria that are neither too virulent nor too difficult to eradicate.

Exact optimal duration of therapy has not been established in children with or without catheter removal. 10-14 days after first negative blood culture is usually recommended.

Gram-Positive Organisms (GPC)

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Coagulase-negative *Staphylococcus* (CONS)	**Methicillin-sensitive CONS (MSCONS)** Cloxacillin 200 mg/kg/day IV in 4-6 divided doses (max. 2 g/dose)	**Methicillin-sensitive CONS (MSCONS)** Cefazolin 100 mg/kg/day IV in 3 divided doses (max. 6 g/day if no endocarditis)	Clinical correlation is important to decide whether isolates from blood culture is coloniser or true pathogen.
	Methicillin-resistant CONS (MRCONS) Vancomycin 60 mg/kg/day IV in 3-4 divided doses (max. 3600 mg/day) *Target AUC24 of 400-600 mg.hr/L*	-	
Staphylococcus aureus	**Methicillin-sensitive (MSSA)** Cloxacillin 200 mg/kg/day IV in 4-6 divided doses (max. 2 g/dose)	**Methicillin-sensitive (MSSA)** Cefazolin 100 mg/kg/day IV in 3 divided doses (max. 6 g/day if no endocarditis)	
	Methicillin-resistant (MRSA) Vancomycin 60mg/kg/day IV in 3-4 divided doses (max. 3600mg/day) *Target AUC24 of 400-600 mg.hr/L*	-	

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Gram-Negative Bacilli (GNB/GNR)

Examples: *Escherichia coli, Proteus spp, Klebsiella spp, Enterobacter spp.*

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
ESBL Negative Enterobacterales	Piperacillin/tazobactam: 300 mg of piperacillin/kg/day in 3-4 divided doses (max. 16 g/day)	-	Empiric treatment with piperacillin/ tazobactam covers most of the Gram-negative organisms (Enterobacterales), Gram-positive organisms and pseudomonas. Tailor therapy with results from culture and sensitivities.
ESBL Positive Enterobacterales	Imipenem 60-100 mg/kg/day IV in 4 divided doses (max. 4 g/day) **OR** Meropenem 60-120 mg/kg/day IV in 3 divided doses (max. 6 g/day)	Ertapenem 30 mg/kg/day IV in 2 divided doses (max. 1 g/day)	
Pseudomonas aeruginosa	Ceftazidime 150-200 mg/kg/day in 3 divided doses (max. 6 g/day) **OR** Piperacillin/tazobactam: 300 mg of piperacillin/kg/day in 3-4 divided doses (max. 16 g/day)	Cefepime 50 mg/kg/dose IV q8h (max. 2 g/dose)	Not all pseudomonas is drug resistant. If ceftazidime remains susceptible, please use ceftazidime with/without an anti-pseudomonas aminoglycoside to treat. De-escalation is important to preserve antibiotic for future use.

Candida albicans or Other Candida Species

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
Candida albicans or Other *Candida* species	Fluconazole 12 mg/kg IV q24h (max. 800 mg/dose)	*Micafungin 2 mg/kg q24h (max. 100mg) **OR** Amphotericin B lipid complex 3-5 mg/kg/dose IV q24hr (Max: 5 mg/kg/dose)	Fungaemia: treatment without catheter removal is associated with low success rate and higher mortality. Other echinocandins: ▪ Anidulafungin (age > 28 days) 1.5-3 mg/kg loading dose (max 200 mg/dose), then 0.75-1.5 mg/kg q24h (max 100 mg/dose)

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Suppurative Thrombophlebitis

Common organism: *Staphylococcus aureus*

Infection/Condition & Likely Organism	Suggested Treatment for Paediatric Patients		Comments
	Preferred	Alternative	
MSSA	Cloxacillin 200 mg/kg/day IV in 4-6 divided doses (max. 2 g/dose)	Cefazolin 100 mg/kg/day IV in 3 divided doses (max. 6 g/day if no endocarditis)	Diagnosis requires positive blood culture plus radiographic demonstration of thrombus. Remove catheter and a minimum antibiotic treatment of 3-4 weeks. Surgical resection of involved vein if failed conservative therapy.
MRSA	Vancomycin 60 mg/kg/day IV in 3-4 divided doses (max. 3600mg/day) *Target AUC24 of 400-600 mg.hr/L*	-	

REFERENCES

1. Malaysia National Antimicrobial Guideline 2024
2. IDSA guidelines for intravascular catheter-related infection. CID 2011;52(9): e162-e193
3. CDC Guidelines for prevention of intravascular catheter-related infections, 2011
4. Janum S et al. Bench to bedside review: Challenges in diagnosis, care and prevention of central catheter related blood stream infections in children. Critical Care 2013.17:238
5. The Sanford guide to antimicrobial therapy 2022

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SECTION C:
CLINICAL PATHWAYS IN PRIMARY CARE

C1: ACUTE BRONCHITIS AND PNEUMONIA

- Adult Patients
- Community Acquired Pneumonia (Children)

C2: ACUTE OTITIS MEDIA (AOM)

C3: ACUTE PHARYNGITIS

C4: ACUTE RHINOSINUSITIS

C5: ACUTE GASTROENTERITIS (AGE)

C6: SKIN AND SOFT TISSUE INFECTIONS (SSTI)

C7: URINARY TRACT INFECTION (UTI) IN NON-PREGNANT ADULT

C8: URINARY TRACT INFECTION (UTI) IN PREGNANCY (ASYMPTOMATIC BACTERIURIA)

C9: URINARY TRACT INFECTION IN PREGNANCY (SYMPTOMATIC)

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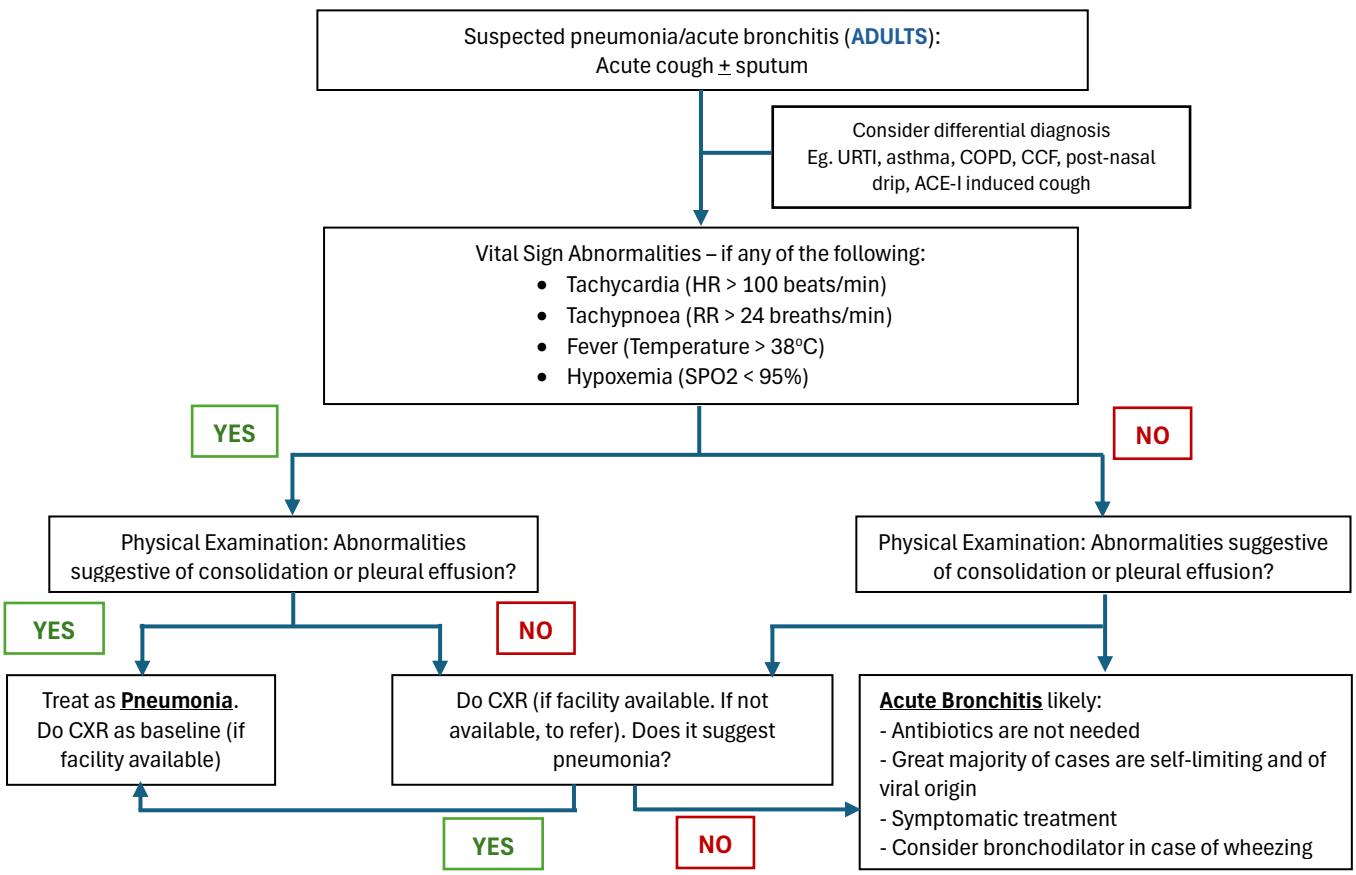
C1: ACUTE BRONCHITIS AND PNEUMONIA

Adult Patients



Recommended dosage (**adult outpatient**):

Antibiotics	*Dosing*	*Duration*	*Remarks*
Amoxycillin	*500 – 1000 mg PO q8h*	*5-7 days*	*Preferred*
Amoxycillin/clavulanate	*625 mg PO q8h*	*5-7 days*	*Alternative*
Doxycycline	*100 mg PO q12h*	*5-7 days*	*Alternative*

CRB – 65 (***consider hospitalization if ≥ 2***)

- Confusion (new onset)
- RR ≥ 30 breaths/min
- SBP < 90 or DBP ≤ 60mmHg

Other consideration for hospitalization: SpO2 < 95%, comorbidities and inability to maintain oral intake

Consider **Pertussis** during outbreak:

- Cough ≥ 2 weeks
- Paroxysms of cough
- Post-tussive vomiting
- Inspiratory whoop

Erythromycin Ethylsuccinate (EES) 800 mg PO q12h for 14 days

Consider **COVID-19**

Consider **Influenza** during outbreak:

- Acute fever and myalgia
- Oseltamivir 75mg PO q12h for 5 days indicated for high risk* patients (regardless of onset of symptom duration)
- For non-high-risk patients, clinical benefit is greatest if initiated within 48 hours

* ***Patients at higher risk for influenza***:

- Age <2 years or ≥ 65 years old
- Pregnant women or immunosuppressed individuals
- Patients with chronic medical conditions e.g. CCF, IHD, chronic lung disease, asthma, CKD, DM, malignancy, chronic liver disease, etc.
- Morbid obesity (BMI ≥ 40 kg/m^2)

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Community Acquired Pneumonia (Children)

Clinical presentation:

- New onset (<2 weeks) or worsening cough with fever (≥ 38.0°C), dyspnoea, tachypnoea, reduced oxygen saturation, crepitations, cyanosis, grunting, nasal flaring, pallor
- Pneumonia is diagnosed on: fast breathing for age and/or chest indrawing
- Check for hypoxia with pulse oximeter if available
- Children with runny nose and cough and no signs of severity usually do not have pneumonia and should not receive an antibiotic, only home care advice.

Assessment of Severity:

Age < 2 months	Age 2 months – 5 years
	Mild Pneumonia
	• Tachypnoea
Severe Pneumonia	**Severe Pneumonia**
• Severe chest indrawing • Tachypnoea	• Chest indrawing
Very Severe Pneumonia	
• Not feeding • Convulsions • Abnormally sleepy, difficult to wake • Fever, or Hypothermia	• Not able to drink • Convulsions • Drowsiness • Malnutrition

Footnotes:
• *The predictive value of respiratory rate for the diagnosis of pneumonia may be improved by making it age specific.*
• *Tachypnoea is defined as follows**:*
  ◦ *<2 months age: >60/min*
  ◦ *2 to 12 months age: > 50/min*
  ◦ *12 months to 5 years age: >40/min*
• *For the normal value of respiratory rate and heart rate according to age group, refer to Paediatric Protocol*	

Investigation:

- Children with bacterial pneumonia cannot be reliably distinguished from those with viral disease on the basis of any single parameter: Clinical, laboratory or chest X-ray findings
- Chest radiograph: Not always necessary if facilities are not available or if pneumonia is mild
- White blood cell count
  - Increased counts with predominance of polymorphonuclear cells suggest bacterial cause
  - Leucopenia suggests either a viral cause or severe overwhelming infection
- Tests for COVID-19 and influenza can be considered if clinically indicated and available

Criteria for hospitalization:

• Children aged 3 months and below, whatever the severity of pneumonia • Fever (more than 38.5°C) • Refusal to feed and vomiting • Fast breathing (*refer to Assessment of Severity table footnotes*) with or without cyanosis	• Associated systemic manifestation e.g. convulsion, lethargic or reduced level of consciousness • Failure of previous antibiotic therapy • Recurrent pneumonia • Severe underlying disorder e.g. immunodeficiency

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Outpatient management:

1. In children with mild pneumonia, their breathing is fast but there is no chest indrawing
2. Oral antibiotics can be prescribed

Treatment: Recommended dosage (children outpatient):

Antibiotics	Dosing	Duration	Remarks
Amoxicillin	80-90 mg/kg/day PO q8-12h (max 4 gm/day) **Oral weight bands:** 3 to <6 kg : 250 mg q12h 6 to <10 kg : 375 mg q12h 10 to <15 kg : 500 mg q12h 15 to <20 kg : 750 mg q12h ≥ 20 kg : 500 mg q8h or 1 g q12h	5-7 days	Preferred
Erythromycin Ethylsuccinate (EES)*	30 – 50 mg/kg/day PO q12h (max 2gm/day)	5-7 days	Alternative

**Macrolide antibiotics should be used if either mycoplasma or chlamydia pneumonia is suspected. It may be started in school-going children where disease predominates.*

1. The WHO AWaRe (Access, Watch, Reserve) antibiotic book 2022.
2. Paediatric Protocols for Malaysian Hospitals 4th Edition, 2018.

3. Educate parents/caregivers about management of fever, preventing dehydration and identifying signs of deterioration
4. The child should return in 2-days for reassessment or earlier if the condition is getting worse

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C2: ACUTE OTITIS MEDIA (AOM)

Suspected acute otitis media:
- Otalgia
- Fever
- Crying
- Irritable
- URTI symptoms
- Poor appetite
- Vomiting
- Diarrhoea

(not all symptoms may be present)

TM = Tympanic membrane

Otoscopy signs of:
Middle ear effusion (reduced TM mobility, bulging TM, otorrhea)
AND
Middle ear inflammation (erythematous TM, otalgia)

NO → **Not AOM**

YES → Assess severity / perforation

TM intact **AND** non-severe illness
(mild otalgia and T < 39°C)

Observe for 48 – 72 hours
Paracetamol for pain relief

Resolution → END

Not resolving → **Start antibiotic** *(see below)*

Perforated TM **OR** severe illness
(moderate to severe otalgia or T > 39°C or systemically unwell)

Other risk factor for severe infection:
Immunocompromised, craniofacial abnormalities (e.g: cleft palate)

Start antibiotic *(see below)*

Review in 48 – 72 hours

Resolution → END

Not resolving → *Refer ORL

***RED FLAG!**
1. Recurrent AOM
2. Persistent otorrhea
3. Concerns about mastoiditis or other complications of AOM
4. Perceived need for tympanocyntesis and /or myringotomy
5. Abnormal audiological evaluation

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Recommended antibiotics (Adults)

Antibiotics	Dosing	Duration	Remarks
Amoxycillin	500 mg PO q8H	5-7 days	Preferred
Amoxycillin/Clavulanate	625 mg PO q8H	5-7 days	Alternative
Erythromycin ethylsuccinate (EES)	400 mg PO q6h **OR** 800 mg PO q12h	5-7 days	Alternative

1. The WHO AWaRe (Access, Watch, Reserve) antibiotic book, 2022
2. Otitis media (acute): Antimicrobial prescribing. NICE Guideline March 2022

Recommended antibiotics (Children)

Antibiotics	Dosing	Duration	Remarks
Amoxycillin	80-90 mg/kg/day PO q8-12H (max 3 g/day)	• <2 years old : 7-10 days • ≥ 2 years old : 5-7 days	Preferred
Amoxycillin/Clavulanate* **Preferred choice if amoxicillin exposure within 30 days.*	Amoxicillin/clavulanate (Augmentin) 20-25 mg/kg/dose PO q12h *(dose based on Augmentin component, applicable for Syrup 7:1 and Tablet 4:1 formulation)*		Alternative
Erythromycin ethylsuccinate (EES)	30 – 50 mg/kg/day PO q12h (max 4 g/day)		Alternative

1. The WHO AWaRe (Access, Watch, Reserve) antibiotic book, 2022
2. Otitis media (acute): Antimicrobial prescribing. NICE Guideline March 2022
3. John Hopikins Guide: www.hopkinsguide .com

Prevention

The pneumococcal conjugate vaccine should be administered to all children according to the recommended schedule

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C3: ACUTE PHARYNGITIS

Suspected acute tonsillo-pharyngitis
e.g. sore throat, painful swallowing

CRITERIA	SCORE
Absence of cough	1
Swollen and tender anterior cervical lymph nodes	1
Temperature (> 38°C)	1
Tonsillar exudates or severe swelling	1
Age: • 3 t0 14 years • 15 to 44 years • ≥ 45 years	 1 0 -1

Total score < 3 → **Symptomatic treatment:**
e.g. anti-pyretic, analgesic, hydration

Total score ≥ 3 → **1. Symptomatic treatment**
2. Antimicrobial treatment

Recommended antibiotics (Adults)

Antibiotics	Dosing	Duration*	Remarks
Phenoxymethylpenicillin (Pen V)	500 mg PO q6h **OR** 1 g PO q12H	5 – 10 days	Preferred
Amoxycillin	500 mg PO q8H	5 - 10 days	Preferred
Erythromycin Ethylsuccinate (EES)	800 mg PO q12h	5 - 10 days	Alternative

**Consider 10 days in settings with a high prevalence of rheumatic fever or in patients with a history of rheumatic fever or rheumatic heart disease and who are aged between 3 and 21 years.*

1. The WHO AWaRe (Access, Watch, Reserve) Antibiotic Book 2022
2. Sore Throat (Acute): Antimiccrobial Prescribing. Nice Guideline February 2023

Recommended antibiotics (Children)

Antibiotics	Dosing	Duration	Remarks
Phenoxymethylpenicillin (Pen V)	25-50 mg/kg/day PO q6H (max 2 g/day)	10 days	Preferred
Amoxycillin	50 mg/kg/day PO q12 - 24h (max 1 g/day)	10 days	Preferred
Cephalexin	25-50 mg/kg/day PO q12H (max 2 g/day)	10 days	Alternative
Erythromycin Ethylsuccinate (EES)	40-50 mg/kg/day PO q12h (max 4 g/day)	10 days	Alternative

1. The Sanford Guide to Antimicrobial Therapy 2022
2. American Academy of Paediatrics Committee

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C4: ACUTE RHINOSINUSITIS

ACUTE RHINOSINUSITIS

Defined by:
Sudden onset of nasal blockage/obstruction/congestion **OR**
Nasal discharge (anterior/posterior nasal drip) with
± facial pain or pressure
± reduction or loss of smell

[Sudden onset is defined as symptoms lasting < 12 weeks, with a symptom-free interval in the case of recurrent episodes. If symptoms persist continuously ≥ 12 weeks (without symptoms-free interval), for immediate referral to ENT]

Check for likely Acute Bacterial Rhinosinusitis (ABRS):
If have ≥ 3 of the following
- Discoloured mucus
- Severe local pain
- Fever >38°C
- Raised CRP/ESR
- Double sickening

Double sickening: significant worsening of symptoms after initial mild phase

< 3 symptoms

Check duration of current episode

Duration of ARS symptoms < 10 days

Acute viral rhinosinusitis

Increase of ARS symptoms after 5 days
OR
Persistent ARS symptoms > 10 days

Acute post-viral rhinosinusitis

No antibiotics
Symptomatic treatment

≥ 3 symptoms

Likely Acute Bacterial Rhinosinusitis

< 3 episode/year

Consider antibiotic (*see next page*)
No other investigation.

Improvement after 10 days of antibiotic

NO

YES

END

≥ 3 episode/year

Refer to ORL

If presence of alarming symptoms, for immediate referral to respective discipline:

- Periorbital oedema/erythema
- Displaced globe
- Double vision
- Ophthalmoplegia
- Reduced visual acuity
- Severe headache
- Frontal swelling
- Signs of sepsis
- Signs of meningitis
- Neurological sign

References:

1. Fokkens WJ, Lund VJ, Hopkins C, Hellings PW, Kern R, Reitsma S, et.al. European Position Paper on Rhinosinusitis and Nasal Polyps 2020 Rhinology. 2020 Suppl 29; 1-464.
2. Fokkens WJ et al. Executive summary of EPOS 2020 including integrated care pathways. Rhinology 58: 2, 82- 111, 2020 https/doi.org/10.4193/Rhin20.601

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Recommended antibiotics (Adults)

Antibiotics	Dosing	Duration	Remarks
Amoxycillin	500 – 1000 mg PO q8H	5 days	Preferred
Amoxycillin/Clavulanate	625 mg PO q8H	5 days	Preferred
Doxycycline	100mg PO q12h	5-7 days	Alternative

1. The WHO AWaRe (Access, Watch, Reserve) antibiotic book, 2022
2. European Position Paper on Rhinosinutis and Nasal Polyps (EPOS) 2020

Recommended antibiotics (Children)

Antibiotics	Dosing	Duration	Remarks
Amoxycillin	80-90 mg/kg/day PO q8-12H (max 2 g/day)	5 days	Preferred
Cefuroxime	30 mg/kg/day PO q12h (max 1 g/day)	5 days	Alternative

1. The Sanford Guide to Antimicrobial Therapy 2022
2. The WHO AWaRe (Access, Watch, Reserve) antibiotic book, 2022

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C5: ACUTE GASTROENTERITIS (AGE)

Symptoms of acute gastroenteritis (<2 weeks)
Vomiting, diarrhea, colicky abdominal pain

→ Consider other causes of non-infective diarrhea

Presence of:

- Immunocompetent host with high grade fever more than 3 days, or in sepsis
- Suspected enteric fever
  Dysenteric diarrhea (passage of grossly bloody stool)
- Recently traveled internationally with body temperature ≥ 38.5 °C and/or signs of sepsis
- Immunocompromised host

***In the absence of these features, the etiology is usually viral in origin and antibiotic therapy is not needed**

NO → Initiate symptomatic treatment
e.g encourage clear fluid intake, ORS

YES → Refer hospital for microbiologic investigations and pathogen directed treatment

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C6: SKIN AND SOFT TISSUE INFECTIONS (SSTI)

Signs and symptoms of possible skin and soft tissue infection (SSTI)
Erythema, swelling, increased temperature, pain, tender on palpation, fever

Consistent with SSTI

NO → Consider alternative cause

YES

Severe infection or systemic illness

→ Admit to hospital

NO

Fluctuancy

Abscess

Incision & Drainage

Antibiotic therapy indicated?

- Extensive surrounding cellulitis
- Inadequate drainage
- Diabetes Mellitus
- Valvular heart disease

NO → Antibiotic therapy not indicated

Before starting antibiotics, take pus for C&S and gram stain

Cephalexin 1000 mg PO q12h
OR
Cloxacillin 500 mg PO q6h
OR
Amoxycillin/Clavulanate 625 mg PO q8h

Duration: for 5-7 days

Not abscess

Impetigo

Localised:
Reserve topical antibiotics for localized lesion to reduce risk of bacteria becoming resistant eg. MRSA

Topical 2% fusidic acid q8-12h
OR
Topical 2% mupirocin q8

Duration: for 5 days

Generalised:
Cephalexin 1000 mg PO q12h
OR
Cloxacillin 500 mg PO q6h

Alternative:
Amoxycillin/Clavulanate 625 mg PO q8h

Antibiotic allergy:
Erythromycin Ethylsuccinate (EES) 800 mg PO q12h

Duration: for 5-7 days

Cellulits

Cephalexin 1000 mg PO q12h
OR
Cloxacillin 500 mg PO q6h
OR
Amoxycillin 500 mg PO q8h

Alternative:
Amoxycillin/Clavulanate 625 mg PO q8h
OR
Ampicillin/Sulbactam 375 mg PO q12h

Duration: for 5-10 days

1. The WHO AWaRe (Access, Watch, Reserve) antibiotic book 2022
2. Cellulitis and Erysipelas: Antimicrobial Prescribing. NICE Guideline September 2019

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Recommended dosage (children)*

Antibiotics	Dosing	Duration	Remarks
Cephalexin	25-50 mg/kg/day PO q12h (max 2 gm/day)	5-7 days	Preferred
Cloxacillin	50-100 mg/kg/day PO q6h (max 1 gm/day)	5-7 days	Preferred

*The choice of antibiotics, dosing and duration above applies to the diagnosis of abscess, impetigo and cellulitis. For localized impetigo, use topical treatment e.g. fusidic acid.

1. The Sanford Guide to Antimicrobial Therapy 2022
2. American Academy of Paediatrics Committee on Infectious Diseases. Red Book: Report of the Committee on Infectious Diseases 2021-2024.

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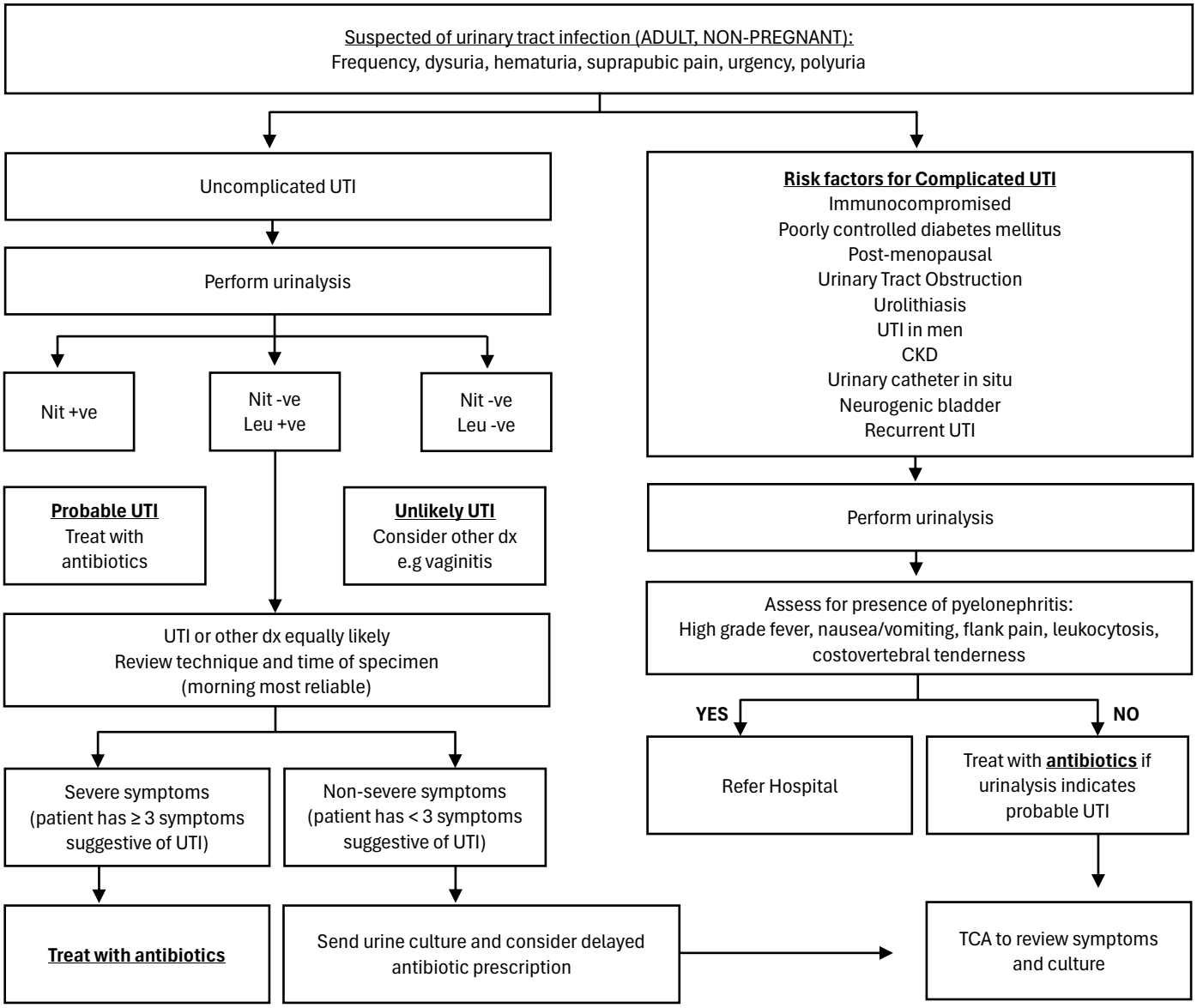
C7: URINARY TRACT INFECTION (UTI) IN NON-PREGNANT ADULT



Antibiotics	Dosing	Duration	Remarks
Nitrofurantoin*	50-100 mg PO q6h (immediate release) **OR** 100 mg PO q12h (modified release)	5 days	Preferred
Cephalexin	500 mg PO q6h-q12h**	5 days	Preferred
Amoxycillin/Clavulanate**	625 mg PO q8h	3-5 days	Alternative
Ampicillin/Sulbactam	375-750 mg PO q12h	3-5 days	Alternative
Cefuroxime	500 mg PO q12h	3-5 days	Alternative

* Nitrofurantoin is contraindicated if eGFR is < 30 ml/min.
** Consider q6h frequency in patients at risk of complicated UTI.

References:

1. Consensus Guideline on the Management of Urinary Tract Infections in Pregnancy 2021.
2. UTI (lower): Antimicrobial Prescribing: NICE Guideline May 2022.
3. The WHO AWaRe (Access, Watch, Reserve) Antibiotic Book 2022.

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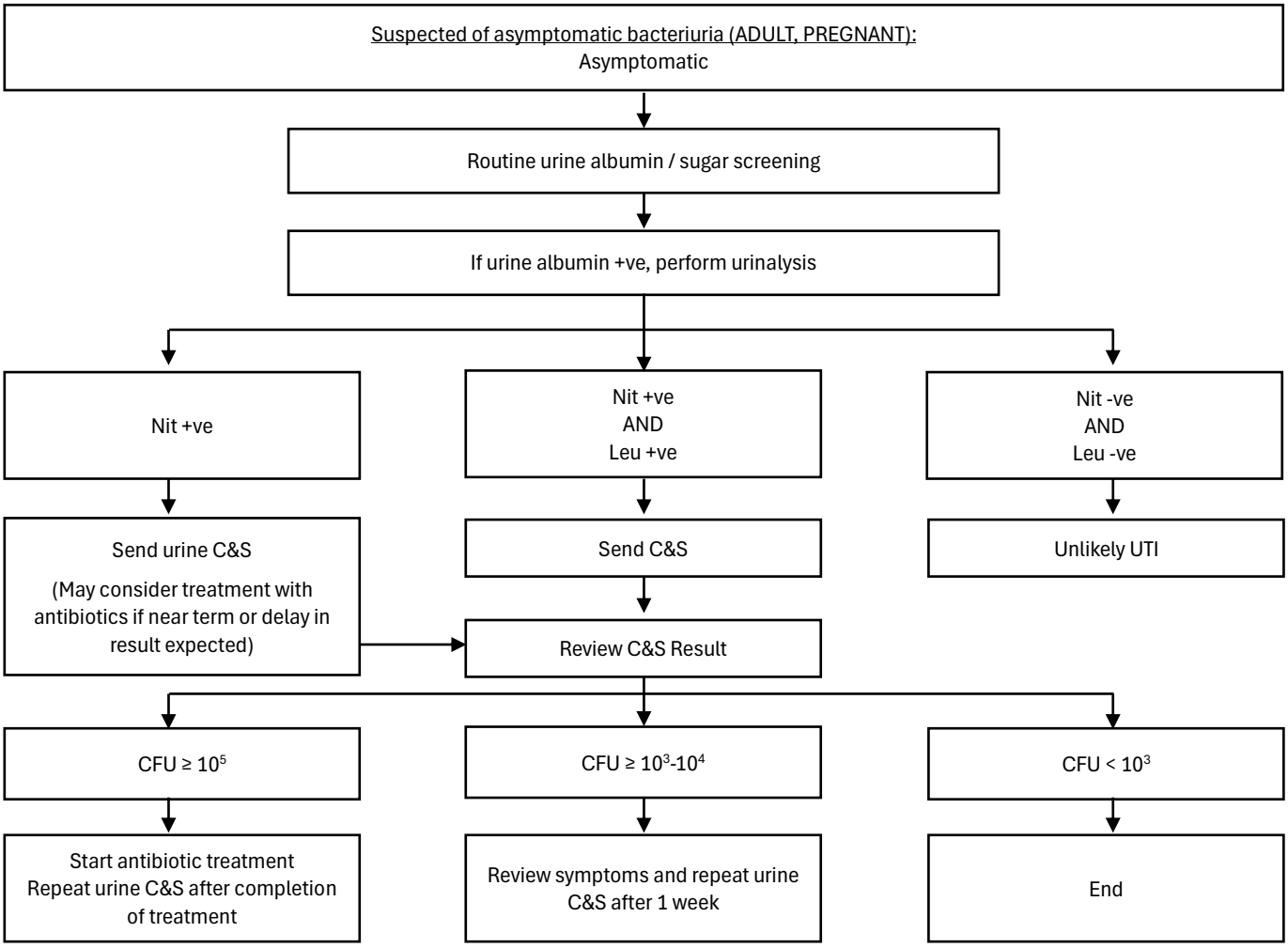
C8: URINARY TRACT INFECTION (UTI) IN PREGNANCY (ASYMPTOMATIC BACTERIURIA)



Antibiotics	Dosing	Duration	Remarks
Cefuroxime	500 mg PO q12h	5 days	Preferred
Ampicillin/Sulbactam	375-750 mg PO q12h	5 days	Preferred
Cephalexin	500 mg PO q6h	5 days	Alternative
Nitrofurantoin*	50-100 mg PO q6h (immediate release) **OR** 100 mg PO q12h (modified release)	5 days	Alternative

* Nitrofurantoin is contraindicated if eGFR is < 30 ml/min and in third trimester
** Amoxycillin/Clavulanate is generally safe in pregnancy (category B) except for an increasing incidence of necrotizing enterocolitis in preterm babies and in babies born after premature rupture of membrane.
*** Any Group B Streptococcus in urine C&S, should be treated accordingly and be given intrapartum antibiotic.

References:

4. Consensus Guideline on the Management of Urinary Tract Infections in Pregnancy 2021.
5. UTI (lower): Antimicrobial Prescribing: NICE Guideline May 2022.
6. The WHO AWaRe (Access, Watch, Reserve) Antibiotic Book 2022.

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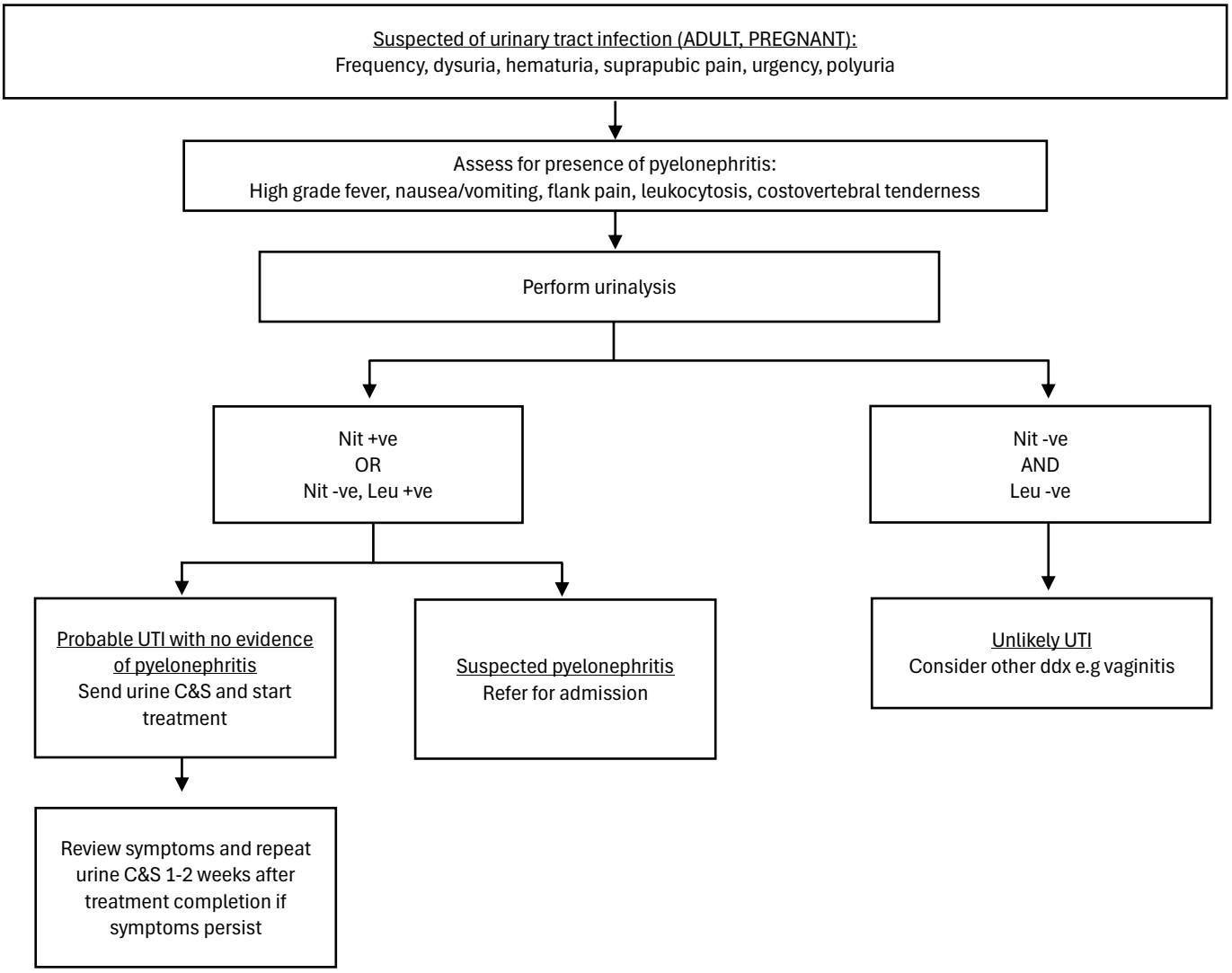
C9: URINARY TRACT INFECTION IN PREGNANCY (SYMPTOMATIC)



Antibiotics	Dosing	Duration	Remarks
Cefuroxime	500 mg PO q12h	5 days	Preferred
Ampicillin/Sulbactam	375-750 mg PO q12h	5 days	Preferred
Cephalexin	500 mg PO q6h	5 days	Alternative
Nitrofurantoin*	50-100 mg PO q6h (immediate release) **OR** 100 mg PO q12h (modified release)	5 days	Alternative

* Nitrofurantoin is contraindicated if eGFR is < 30 ml/min and in third trimester
** Amoxycillin/Clavulanate is generally safe in pregnancy (category B) except for an increasing incidence of necrotizing enterocolitis in preterm babies and in babies born after premature rupture of membrane.

References:

1. Consensus Guideline on the Management of Urinary Tract Infections in Pregnancy 2021.
2. UTI (lower): Antimicrobial Prescribing: NICE Guideline May 2022.
3. The WHO AWaRe (Access, Watch, Reserve) Antibiotic Book 2022.

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APPENDICES

Antibiotic Allergy

- Practical Guide for the Evaluation and Management of Penicillin Allergy
- Penicillin Allergy Risk Stratification, and Relative Contraindication to Re-Administration.
- Test Dose Challenge and Medications to Have On-Site
- Comparison of R1 & R2 Structural Similarities Between B-Lactams Drugs:
- Alternative Approach & Reference for Reported Antibiotic Allergy

Penicillin Desensitization Protocol

Cephalosporin Desensitization Protocol

Antimicrobial in Pregnancy and Lactation

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Antibiotic Allergy

Practical Guide for the Evaluation and Management of Penicillin Allergy

Risk assessment before referring for testing, using the PEN-FAST Clinical Decision Tool for possible point-of-care testing

Risk assessment should be performed using the recently published and validated PEN-FAST clinical decision tool - a predictive screening tool for true penicillin allergy to identify low risk penicillin allergy patients that do not require referral for formal allergy testing.

PEN-FAST is a validated clinical decision-making tool with a high negative predictive value for patients ≥12 years old. It is **a point-of-care screening tool** that identifies adult patients with low risk of penicillin allergy and therefore, do not require formal allergy testing when the total score is <3 (Table 3)[13]; therefore, a **drug provocation test (DPT) by the treating physician is recommended**.

All routes of administration are possible for a DPT (oral, subcutaneous, intramuscular or intravenous). Nevertheless, the oral route is preferred as the risk of a severe reaction with the oral route is low. The cumulative dose should be documented and may be 10-20% more than the therapeutic dose. For patients with **a PEN-FAST score of <3 (interpreted as very low risk and low risk), a test dose challenge is recommended.**

Test dose challenge:

- Giving 1/10 of the normal concentration intravenous medication or ¼ of the oral dosage being given followed by a 20-minute observation.
- If no objective symptom(s) is/are observed, a full dose x 1 (or the remaining 9/10) is given followed by a 2-hour observation period (Table 4).

Follow up Documentation

- If provocation is not tolerated, document the BL(s) intolerance in the patient records
- If provocation is tolerated, de-label and/or document the BL(s) tolerance in the patient records
- An allergy card/passport/medic alert should be issued for future avoidance of the allergic BL(s)

PEN-FAST Penicillin Allergy Clinical Decision Rule Criteria and Interpretation

PEN	Penicillin allergy reported by patient	☐ *If yes, proceed with assessment*
F	Five years or less since reaction[a]	☐ 2 points
A	Anaphylaxis or angioedema	☐ 2 points
	OR	
S	Severe cutaneous adverse reaction[b]	
T	Treatment required for reaction[a]	☐ 1 point
		☐ Total points

Interpretation

Points	
0	**Very low risk** of positive penicillin allergy test <1% (<1 in 100 patients reporting penicillin allergy)
1-2	**Low risk** of positive penicillin allergy test 5% (1 in 20 patients)
3	**Moderate risk** of positive penicillin allergy test 20% (1 in 5 patients)
4-5	**High risk** of positive penicillin allergy test 50% (1 in 2 patients)

The PEN-FAST clinical decision rule for patients reporting a penicillin allergy uses 3 clinical criteria of time from penicillin allergy episode, phenotype, and treatment required. A total score is calculated using PEN-FAST score in the upper panel, and interpretation for risk strategy is provided in the lower panel.

[a] Includes unknown.
[b] Forms of severe delayed reactions include potential Stevens-Johnson syndrome, toxic epidermal necrolysis, drug reaction with eosinophilia and systemic symptoms, and acute generalized exanthematous pustulosis. Patients with a severe delayed rash with mucosal involvement should be considered to have a severe cutaneous adverse reaction. Acute interstitial nephritis, drug induced liver injury, serum sickness and isolated drug fever were excluded phenotypes from the derivation and validation cohorts.

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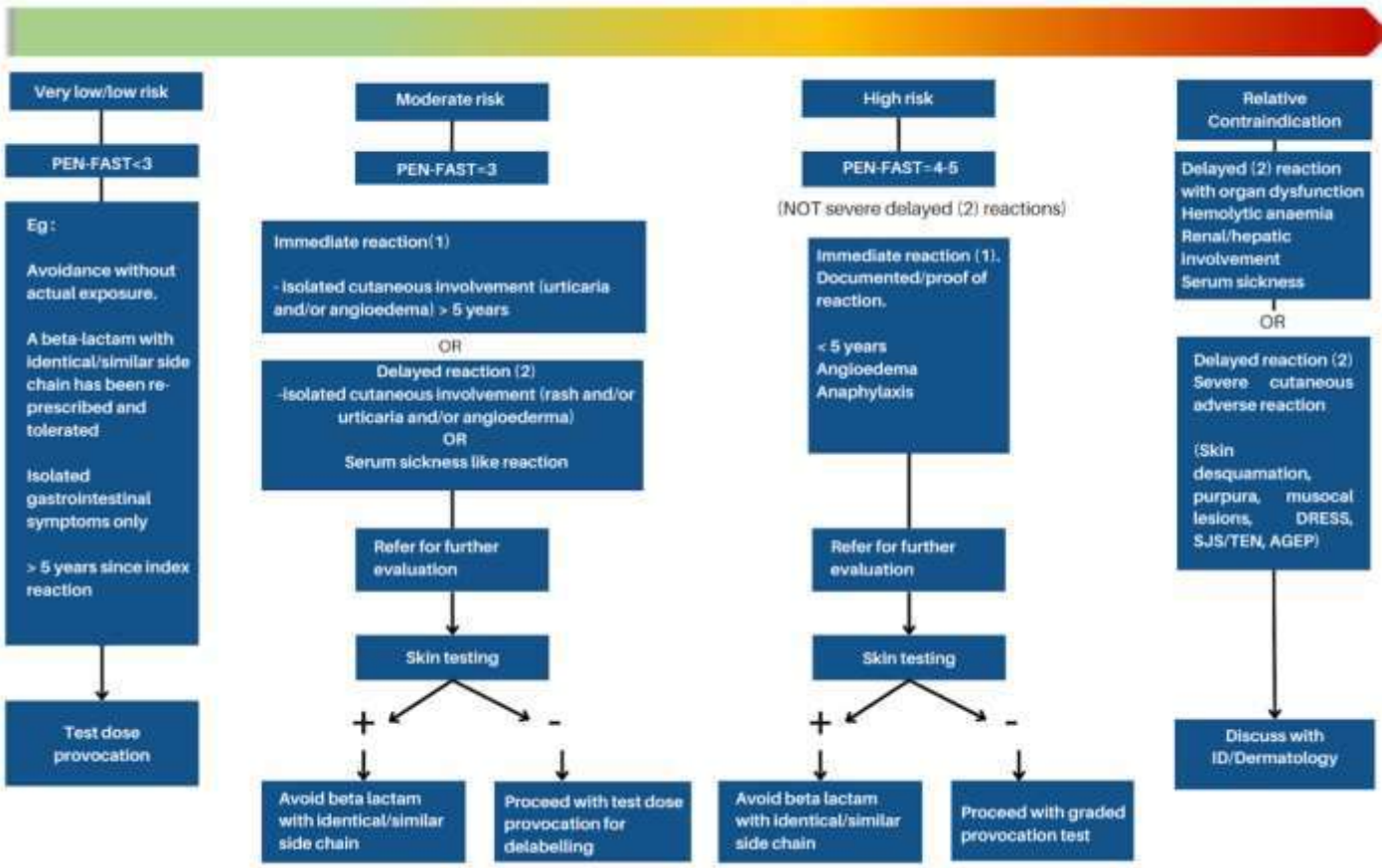
Penicillin Allergy Risk Stratification, and Relative Contraindication to Re-Administration.



Footnote:

(1) Immediate reaction: Type 1 or IgE-mediated reaction: symptoms within 2 hours after first dose, duration < 24 hours.

(2) Delayed reaction: Type II, III, IV: symptoms >2 hours after drug administration.

[Adapted and modified from Jeimy S et al. Practical guide for evaluation and management of beta-lactam allergy: position statement from the Canadian Society of allergy and clinical immunology. 2020.Allergy Asthma Clin Immunol;1695]

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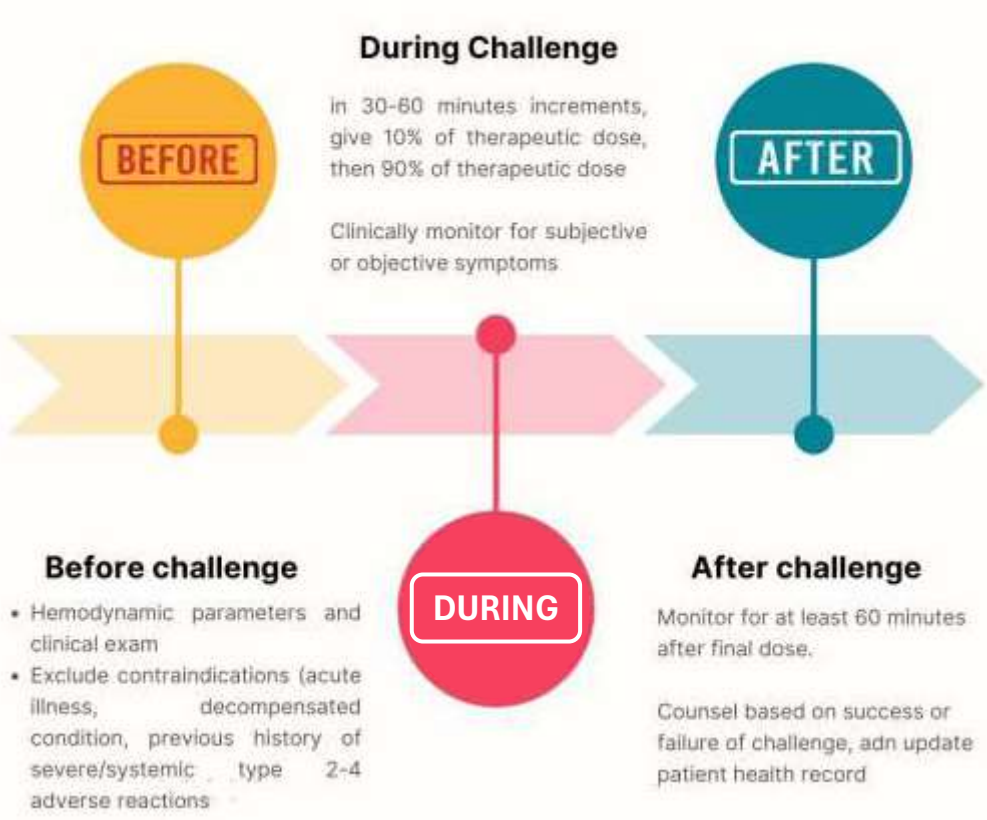
Test Dose Challenge and Medications to Have On-Site



Medications to have on-site		
Medication	**Dose**	
	Paediatric	**Adult**
Adrenaline 1mg/mL (1:1000) administered IM	0.01 mg/kg *>25 kg: use adult dosing	0.5 mg
Antihistamine	Syrup Diphenhydramine 1-2 mg/kg/dose maximum: 50 mg/dose	25 – 50 mg
	Cetirizine 6 mths to < 2 yrs : 2.5 mg 2 yrs to 5 years : 2.5 mg-5 mg ≥6 yrs : use adult dosing	10 – 20 mg
Glucocorticoids	Prednisolone 1-2 mg/kg	20 – 60 mg
Short-acting bronchodilator (metered dose inhaler spacer)	4-8 inhalations every 20 mins for 3 doses	4-8 inhalations every 20 mins for up to 4 hours

Adapted and modified from Jeimy S et al. Practical guide for evaluation and management of beta-lactam allergy: position statement from the Canadian Society of allergy and clinical immunology. 2020.Allergy Asthma Clin Immunol;1695.

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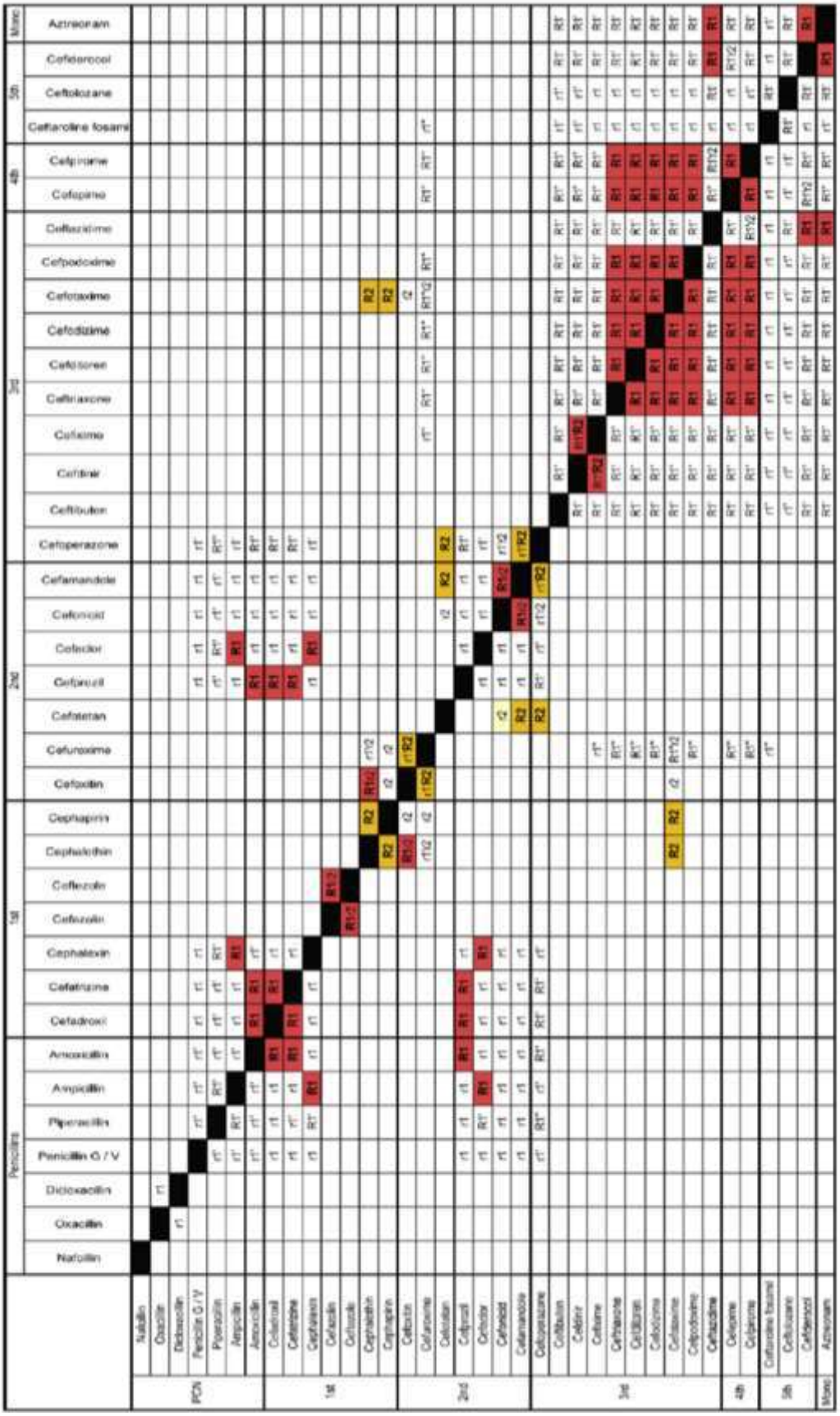
Comparison of R1 & R2 Structural Similarities Between B-Lactams Drugs:



Footnotes:

- Drugs that have identical R1 or R2 are listed as R1 (red cell) or R2 (gold cell).
- If ONLY the ring or branch chain moiety of the R1 structure is identical, it is listed as R1' or R'', respectively.
- Drugs that have similar R1 or R2 structures are listed as r1 or r2.
- If ONLY the ring or branch chain moiety of R1 structure is similar, it is listed as r1' or r1'', respectively. Blank cells imply NO R1 or R2 structural similarities.

(Zagursky & Pichichero, 2018)

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Alternative Approach & Reference for Reported Antibiotic Allergy

Source: BC Medical Journal vol. 61 no. 9 | November 2019

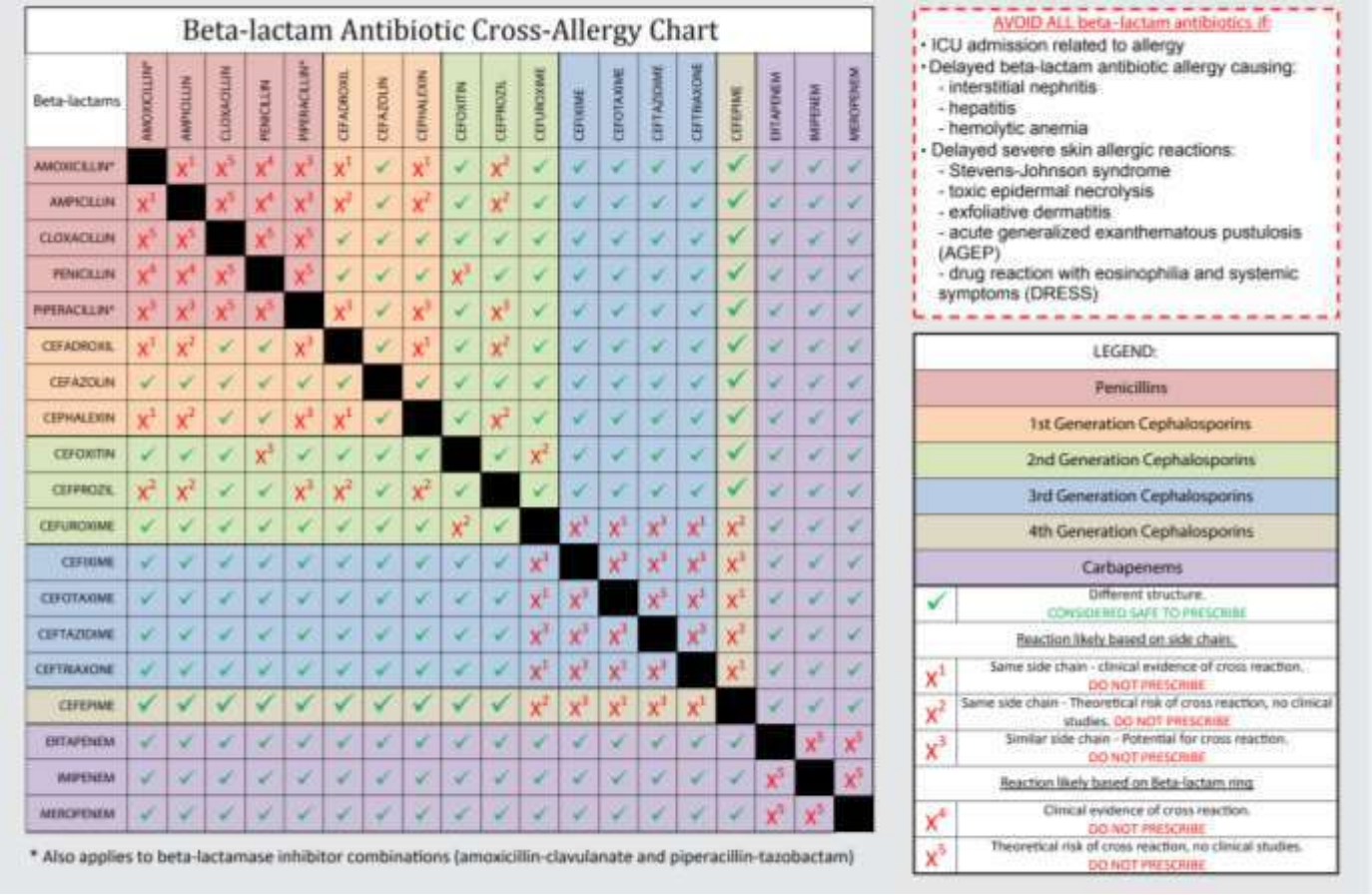

Figure 1. Beta-lactam cross-allergy chart.
Source: Source: Interior Health Authority

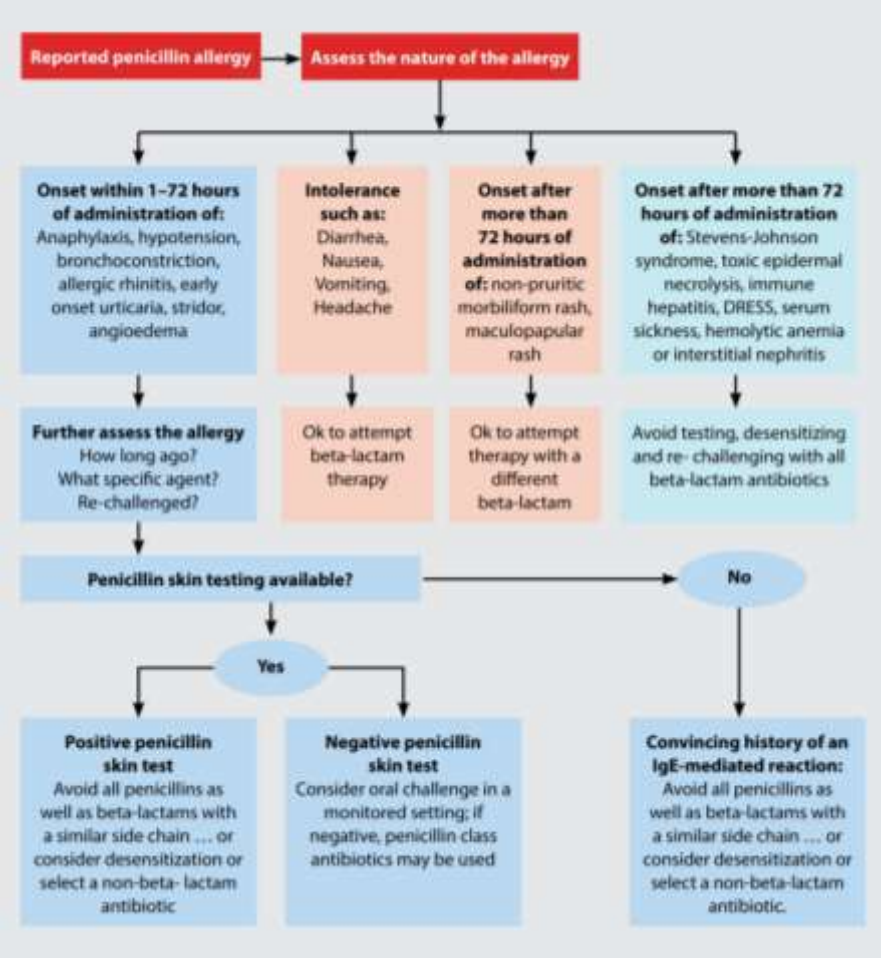

Figure 2. Flowchart from New Brunswick for assessing penicillin allergy.

Source: New Brunswick Provincial Health Authorities Anti-infective Stewardship Committee (https://en.horizonnb.ca/media/951180/antimicrobial_treatment_guidelines_for_common_infections_en.pdf

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Penicillin Desensitization Protocol

Desensitization with **Oral Phenoxymethylpenicillin (Penicillin V)** is preferred over parenteral benzylpenicillin.

- 1/3 of patients may develop a transient reaction, usually mild, during desensitization or treatment.
- Discontinue all β-blockers. Have IV Line, epinephrine, ECG, and spirometer available.
- A history of Stevens-Johnson Syndrome (SJS), exfoliative dermatitis, or erythroderma is absolute contraindications to desensitization.
- Prepare dilutions using Penicillin V oral solution 125mg/5ml.
- Administer each dose at **15-minute intervals** in **30 ml water or flavoured beverage.**
- After step 14 has been completed, observe the patient for 30 minutes and then administer the full therapeutic dose by route of choice

Step	Drug Dilution		mL to be administered	Drug Dose Per Step		Cumulative Dose Administered	
		(mg/mL)		mg	units	mg	Units
1	**1 ml** of Syr. Penicillin V 125 mg/5 ml diluted to **50 ml**	0.5	**0.1**	0.05	80	0.05	80
2		0.5	**0.2**	0.1	160	0.15	240
3		0.5	**0.4**	0.2	320	0.35	560
4		0.5	**0.8**	0.4	640	0.75	1200
5		0.5	**1.6**	0.8	1280	1.55	2480
6		0.5	**3.2**	1.6	2560	3.15	5040
7		0.5	**6.4**	3.2	5120	6.35	10,160
8	**2 ml** Syr. Penicillin V 125 mg/5 ml diluted to **10 ml**	5	**1.2**	6	9600	12.35	19,760
9		5	**2.4**	12	19,200	24.35	38,960
10		5	**4.8**	24	38,400	48.35	77,360
11	Syr. Penicillin V 125 mg/5 ml	25	**2**	50	80,000	98.35	157,360
12		25	**4**	100	160,000	198.35	317,360
13		25	**8**	200	320,000	398.35	637,360
14		25	**16**	400	640,000	798.35	1,277,360

If allergy /reaction occur during desensitization procedure:

- Stop the procedure immediately.
- If symptoms persist, symptomatic treatment should be given.

Symptoms	Treatment
Mild skin reaction (i.e., erythema, rash, pruritis, urticaria)	**PO Cetirizine 20 mg STAT**
Systemic reaction (i.e., hypotension, wheezing, bronchospasm, angioedema)	**IM Epinephrine 0.3 mg STAT** **IV Methylprednisolone 125 mg STAT** **MDI Salbutamol with aerochamber 4 – 8 puffs** (if respiratory involvement)

- When the symptoms have resolved, the protocol can be resumed by repeating the dose that caused the reaction or restarting at a lower dose.
- However, the procedure should be discontinued if severe reaction (such as serum sickness, laryngeal edema that does not respond to epinephrine).

Adapted from:

1. *Sanford Guide to Antimicrobial Therapy. (Jun, 2020)*
2. *NB Provincial Health Authorities Anti-Infective Stewardship Committee. Antimicrobial Desensitization. (2019). Accessed from: https://en.horizonnb.ca/media/1036904/antimicrobial_desensitization.pdf*

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Cephalosporin Desensitization Protocol

- This protocol is only recommended for patients who had an allergy towards cephalosporins with a reaction of either immediate HSR or those with non-severe delayed HSR.
- IV cephalosporins that can be used in this protocol included cefazolin, ceftriaxone, and cefepime.
- Administer each dose at **15-minute intervals.**
- Use **Table 1** when the dose prescribed is 1g/dose and **Table 2** when the dose prescribed is 2g.

Drug	Brand	Reconstitution *(Solution A)*	Dilution for (Solution B) *Diluent: NS or D5*
Ceftriaxone 1 g	Unocef	9.6 ml WFI	further dilute up to 100 ml to make 10 mg/mL
Cefazolin 1 g	Cefazolin-AFT	3 ml WFI	further dilute up to 100 ml to make 10 mg/mL
Cefepime 1 g	Cefmex Vaxcel Cefepime	10 ml WFI	further dilute up to 100 ml to make 10 mg/mL

Table 1: Therapeutic dose 1 g Cephalosporin

Steps	Futher Drug Dilution	Concentration (mg/mL)	Dose (mg)	mL to be administered	Cumulative Dose (mg)
1	Take **1 ml** of **(Solution B)** and further dilute in **100 mL**	0.1	0.1	**1**	0.1
2		0.1	0.2	**2**	0.3
3		0.1	1.0	**10**	1.3
4		0.1	2.0	**20**	3.3
5	Use **(Solution B)** (10 mg/mL)	10	10.0	**1**	13.3
6		10	20.0	**2**	33.3
7		10	70.0	**7**	103.3
8	Take a **new vial** and reconstitute and **further dilute up to 25 mL**	40	200.0	**5**	303.3
9		40	700.0	**17.5**	1003.3

- The interval between doses is 15 minutes, with a total time of 2 hours and 15 minutes.
- Observation before the full therapeutic dose is 30 mins.

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Table 2: Therapeutic dose 2 g Cephalosporin

Steps	Further Drug Dilution	Concentration (mg/mL)	Dose (mg)	mL to be administered	Cumulative Dose (mg)
1	Take **1 ml** of **(Solution B)** and further dilute in **100 mL**	0.1	0.1	**1**	0.1
2		0.1	0.4	**4**	0.5
3		0.1	1.0	**10**	1.5
4		0.1	4.0	**40**	5.5
5	Use **(Solution B)** (10 mg/mL)	10	10.0	**1**	15.5
6		10	40.0	**4**	55.5
7		10	140.0	**14**	195.5
8	Take **TWO** new vials and reconstitute and further dilute up to **25 ml diluent** for **each** vial	40	400.0	**10**	595.5
9		40	1400.0	**35**	1995.5

- The interval between doses is 15 minutes, with a total time of 2 hours and 15 minutes.
- Observation before the full therapeutic dose is 30 mins.

If allergy /reaction occur during desensitization procedure:

- Stopped the procedure immediately.
- If symptoms persist, symptomatic treatment should be given.

Symptoms	Treatment
Mild skin reaction (i.e., erythema, rash, pruritis, urticaria)	**PO Cetirizine 20 mg STAT**
Systemic reaction (i.e., hypotension, wheezing, bronchospasm, angioedema)	**IM Epinephrine 0.3 mg STAT** **IV Methylprednisolone 125 mg STAT** **MDI Salbutamol with aerochamber 4 – 8 puffs** (if respiratory involvement)

- When the symptoms have resolved, the protocol can be resumed by repeating the dose that caused the reaction or restarting at a lower dose.
- However, the procedure should be discontinued if severe reaction (such as serum sickness, laryngeal edema that does not respond to epinephrine).

Adapted from:

1. *Chastain, D. B., Hutzley, V. J., Parekh, J., & Alegro, J. V. G. (2019). Antimicrobial desensitization: A review of published protocols. Pharmacy, 7(3), 112. https://doi.org/10.3390/pharmacy7030112*
2. *Win, P. H., Brown, H., Zankar, A., Ballas, Z. K., & Hussain, I. (2005). Rapid intravenous cephalosporin desensitization. Journal of Allergy and Clinical Immunology, 116(1), 225–228. https://doi.org/10.1016/j.jaci.2005.03.037*
3. *Schull, P. D. McGraw Hill's IV Drug Handbook. (2009).*
4. *NB Provincial Health Authorities Anti-Infective Stewardship Committee. Antimicrobial Desensitization. (2019). Accessed from: https://en.horizonnb.ca/media/1036904/antimicrobial_desensitization.pdf*

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Antimicrobial in Pregnancy and Lactation

Types of Antibiotics / Antiviral / Antiretroviral / Anti TB	FDA Pregnancy Category	Lactation Considerations
Abacavir	C	Present in human milk; Not recommended
Acyclovir	B	Present in human milk; Compatible
Adefovir	C	Insufficient data; Not recommended
Amikacin	D	Present in human milk; Compatible
Amoxicillin	B	Present in human milk; Compatible
Amoxicillin / Clavulanate	B	Present in human milk; Compatible * Note: Amoxicillin/Clavulanate use during pregnancy is associated with neonatal necrotising enterocolitis
Amphotericin B	B	Insufficient data; Not recommended
Ampicillin	B	Present in human milk; Compatible
Ampicillin / Sulbactam	B	Present in human milk; Compatible
Artesunate	Limited data for 1st trimester	Insufficient data; Caution
Azithromycin	B	Present in human milk; Caution
Bacampicillin	B	Insufficient data
Benzathine Penicillin	B	Present in human milk; Caution
Benzylpenicillin	B	Present in human milk; Caution
Caspofungin	C	Insufficient data; Caution
Cefaclor	B	Insufficient data; Caution
Cefepime	B	Present in human milk; Caution
Cefoperazone	B	Insufficient data
Cefoperazone / Sulbactam	B	Insufficient data
Cefotaxime	B	Present in human milk; Caution
Ceftazidime	B	Present in human milk; Caution
Ceftriaxone	B	Present in human milk; Caution
Cefuroxime Axetil	B	Present in human milk; Caution
Cefuroxime Sodium	B	Present in human milk; Caution
Cephalexin Monohydrate	B	Present in human milk; Caution
Chloramphenicol	C	Present in human milk; Not recommended
Ciprofloxacin	C	Present in human milk; Not recommended
Clarithromycin	C	Present in human milk; Caution
Clindamycin	B	Present in human milk; Not recommended
Clofazimine	C	Present in human milk; Not recommended
Clotrimazole	B	Insufficient data
Cloxacillin	B	Present in human milk; Caution
Cycloserine	C	Present in human milk; Not recommended
Dapsone	C	Present in human milk; Not recommended
Didanosine	B	Insufficient data; Not recommended
Doxycycline	D	Present in human milk; Insufficient data; Compatible for short courses (e.g., 10 days); Long-term therapy is not recommended
Efavirenz	D	Present in human milk; Not recommended
Ertapenem	B	Present in human milk; Caution
Erythromycin	B	Present in human milk; Compatible
Ethambutol	C	Present in human milk; Compatible
Fluconazole	D	Present in human milk; Compatible

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Types of Antibiotics / Antiviral / Antiretroviral / Anti TB	FDA Pregnancy Category	Lactation Considerations
Flucytosine	C	Insufficient data
Fusidate sodium	C	Insufficient data
Ganciclovir	C	Insufficient data; Not recommended
Gentamicin	D	Present in human milk; Compatible
Griseofulvin	C	Insufficient data; Not recommended
Imipenem / Cilastatin	C	Present in human milk; Caution
Indinavir	C	Insufficient data; Not recommended
Isoniazid	C	Present in human milk; Compatible
Itraconazole	C	Present in human milk; Caution
Kanamycin	D	No data available
Ketoconazole	C	Present in human milk; Caution
Lamivudine	C	Insufficient data; Not recommended
Levofloxacin	C	Present in human milk; Not recommended
Linezolid	C	Present in human milk; Caution
Lopinavir / Ritonavir	C	Present in human milk; Not recommended
Meropenem	B	Present in human milk; Caution
Metronidazole	B	Present in human milk; Not recommended
Miconazole	C	Insufficient data; Caution
Minocycline	D	Present in human milk; Insufficient data; Compatible for short courses (e.g., 10 days); Long-term therapy is not recommended
Netilmicin	D	Insufficient data
Nevirapine	C	Present in human milk; Not recommended
Nitrofurantoin	B	Present in human milk; Not recommended
Nystatin	C	Insufficient data; Caution
Ofloxacin	C	Present in human milk; Not recommended
Phenoxymethyl penicillin	B	Present in human milk; Compatible
Piperacillin	B	Present in human milk; Compatible
Piperacillin / Tazobactam	B	Present in human milk; Compatible
Benzylpenicillin	B	Present in human milk; Caution
Pyrazinamide	C	Present in human milk; Caution
Ribavirin	X	Insufficient data
Rifampicin	C	Compatible; may cause diarrhea in infants. Monitor infant for jaundice
Ritonavir	B	Insufficient data; Not recommended
Stavudine	C	Insufficient data; Not recommended
Streptomycin	D	Present in human milk; Not recommended
Sulphamethoxazole / Trimethoprim (Bactrim)	D	Present in human milk; Caution; Not recommended in infants <2 months
Terbinafine HCL	B	Present in human milk; Not recommended
Tetracycline	D	Present in human milk; Insufficient data; Compatible for short courses (e.g., 10 days); Long-term therapy is not recommended
Tinidazole	C	Present in human milk; Not recommended
Trimethoprim	C	Present in human milk; Caution
Vancomycin	B (oral)	Present in human milk; Caution
Voriconazole	D	Insufficient data; Not recommended
Zidovudine	C	Present in human milk; Not recommended

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