HOSPITAL BUKIT MERTAJAM

ANTIMICROBIAL GUIDELINE

EDITION 2019

SECTION A
ADULT

CARDIOVASCULAR INFECTIONS

A. INFECTIVE ENDOCARDITIS

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	
Empirical Treatment (native valve)			
	Benzylpenicillin 18MU/day IV q4-6h **OR** Ampicillin 12gm/day IV q4-6h **PLUS** Gentamicin 3mg/kg/day IV q24h **PLUS/MINUS** **Cloxacillin 12gm/day IV q4-6h	**Penicillin Allergy:** *Vancomycin 15-20mg/kg (actual body weight) IV q8-12h; not to exceed 2gm/dose **PLUS** Gentamicin 3mg/kg IV q24h	*Vancomycin loading dose refer to Appendix 1. **Cloxacillin: For patients with suspected *Staphylococcus aureus* infections (such as IVDU or patients with prosthesis) and acute presentation. Penicillin allergy refer to Appendix 8
Empirical Treatment (prosthetic valve)			
Prosthetic valve (early, <1 y)	*Vancomycin 15-20mg/kg (actual body weight) IV q8-12h; not to exceed 2gm/dose **PLUS** Gentamicin 3mg/kg IV q24h **PLUS/MINUS** **Rifampicin 300-450mg PO/IV q12h **PLUS/MINUS** ***Cefepime 2gm IV q8h		*Vancomycin loading dose refer to Appendix 1. **Rifampicin is only recommended for PVE and it should be started 3-5 days later than vancomycin and gentamicin ***Cefepime is indicated if local Epidemiology suggests for non-HACEK Gram- negative rod infections (such as Pseudomonas)
Prosthetic valve (late, ≥ 1 y)	Ampicillin 12gm/day IV q4-6h **PLUS** Gentamicin 3mg/kg IV q24h **PLUS/MINUS** **Cloxacillin 12gm/day IV in 4-6 equally divided doses	**Penicillin Allergy** : *Vancomycin 15-20 mg/kg (actual body weight) IV q8-12h; not to exceed 2gm/dose **PLUS** Gentamicin 3mg/kg IV q24h	*Vancomycin loading dose refer to Appendix 1. **Cloxacillin: For patients with suspected *Staphylococcus aureus* infections (such as IVDU or patients with prosthesis) and acute presentation.
Viridans Streptococci & *Streptococcus bovis* It is recommended MIC estimation is done for these isolates to facilitate management			

Native and Prosthetic Valves MIC: < 0.125µg/mL Penicillin-Susceptible Viridans Streptococci *& Streptococcus bovis*	Benzylpenicillin 3MU IV q4-6h for 4 weeks (native valves) or 6 weeks (prosthetic valves)	Ampicillin 2gm IV q4h for 4 weeks (native valves) or 6 weeks (prosthetic valves) **OR** Ceftriaxone 2gm IV q24h for 4 weeks (native valves) or 6 weeks (prosthetic valves) **<u>Penicillin Allergy:</u>** *Vancomycin 15-20mg/kg (actual body weight) IV q8-12h; not to exceed 2gm/dose, for 4 weeks (native valves) or 6 weeks (prosthetic valves)	Penicillin-susceptible viridans streptococci, monotherapy with benzylpenicilin, ampicillin or ceftriaxone is adequate. 4 weeks for NVE and 6 weeks for PVE. *Vancomycin: For loading dose refer to Appendix 1. Penicillin allergy refer to Appendix 8

Infection / Condition & Likely Organism	**Suggested Treatment**		**Comments**
	Preferred	**Alternative**	
Native and prosthetic Valves MIC: > 0.125µg/mL- 2µg/mL Penicillin-Relatively Resistant Viridans Streptococci *& Streptococcus bovis*	Benzylpenicillin 4MU IV q4h (total 24 MU/24h) or 24 MU IV continuously for 4 weeks (native valves) or 6 weeks (prosthetic valves) **PLUS** *Gentamicin 3mg/kg IV q24h for 2 weeks (native valves) or 6 weeks (prosthetic valves)	Ceftriaxone 2gm IV q24h for 4 weeks (native valves) or 6 weeks (prosthetic valves) **PLUS** *Gentamicin 3mg/kg IV q24h for 2 weeks (native valves) or 6 weeks (prosthetic valves) **<u>If unable to tolerate Penicillin/Ceftriaxone:</u>** **Vancomycin 15-20mg/kg (actual body weight) IV q8-12h; not to exceed 2gm/dose, for 4 weeks (native valves) or 6 weeks (prosthetic valves) **PLUS** *Gentamicin 3mg/kg IV q24h for 2 weeks (native valves) or 6 weeks (prosthetic valves)	Penicillin-relatively resistant streptococcus viridans, gentamicin has to be added to the regime. 2 weeks for NVE and 6 weeks for PVE. *Gentamicin: aim for pre-dose (trough) serum level of < 1mg/l **Vancomycin loading dose refer to Appendix 1. Penicillin allergy refer to Appendix 8
Native and Prosthetic Valves MIC > 2µg/mL Penicillin-resistant Viridans Streptococci *& Streptococcus bovis*	Treat as resistant enterococcal endocarditis - see below **		

Nutritionally variant streptococci; NVS (*Abiotrophia defective* and *Granulicatella* species, both formerly known as NVS)	Ampicillin 2gm IV q4h for 6 weeks **OR** Benzylpenicillin (Crystalline penicillin) 4MU IV q4h or 24MU/day as a continuous infusion) for 6 weeks **PLUS** Gentamicin 1mg/kg IV q8h for 2 weeks	Ceftriaxone 2gm IV q24h for 6 weeks **PLUS** Gentamicin 1mg/kg IV q8h for 2 weeks **OR** *Vancomycin 15-20mg/kg (actual body weight) IV q8-12h; not to exceed 2 gm/dose, for 6 weeks	*Vancomycin loading dose refer to Appendix 1.
**** Enterococcus (It is recommended that all these isolates are tested for high level resistance (HLR) to Gentamicin)**			

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	
Native and Prosthetic Valves Enterococcal Endocarditis (sensitive to Gentamicin)	Ampicillin 2gm IV q4h for 4 or 6 weeks **PLUS** *Gentamicin 1mg/kg IV q8h for 4 or 6 weeks		Duration of Therapy: • Symptoms < 3 months: 4 weeks therapy (4 weeks ampicillin, 2 weeks gentamicin) • Symptoms > 3 months or prosthetic valves: 6 weeks therapy (6 weeks ampicillin and gentamicin) *Gentamicin: In order to maximise synergistic effect, administer Gentamicin at the same time or temporally close to Ampicillin/Penicillin For Enterococcal Endocarditis with high level resistance to Gentamicin, consult Infectious Disease Specialist
Enterococcus (sensitive to Gentamicin) (renal impairment and elderly patients)	Ampicillin 2gm IV q4h for 6 weeks **PLUS** Ceftriaxone 2gm IV q12h for 6 weeks		
Enterococcus (resistance to gentamicin) (MIC > 500mg/l) Sensitive to penicillin and vancomycin	Ampicillin 2gm IV q4h for 6 weeks **PLUS** Ceftriaxone 2gm IV q12h for 6 weeks		Ceftriaxone should not be used alone for enterococcus infection, as they are intrinsically resistant.

Infection / Condition & Likely Organism	Suggested Treatment		Comments
			This combination is not active against *Enterococcus faecium*.
Enterococcus (resistance to penicillin and susceptible to aminoglycosides and vancomycin)	*Vancomycin 15-20mg/kg (actual body weight) IV q8-12h; not to exceed 2 gm/dose, for 6 weeks **PLUS** **Gentamicin 1 mg/kg IV q8h for 6 weeks		*Vancomycin loading dose refer to Appendix 1. **Gentamicin: aim for pre-dose (trough) serum level of < 1mg/l.
Staphylococcus aureus			
Native Valves Methicillin-Susceptible Staphylococci (MSSA)	**Left sided endocarditis or complicated right sided endocarditis:** Cloxacillin 2gm IV q4h for 4 to 6 weeks **Right sided endocarditis (tricuspid valve) in uncomplicated endocarditis** (see comments*): Cloxacillin 2gm IV in q4h for 2 to 4 weeks	**β-lactam Allergy:** **Immediate type hypersensitivity to penicillin (anaphylaxis):** ** Vancomycin 15-20mg/kg (actual body weight) IV q8-12h; not to exceed 2gm/dose, for 4 to 6 weeks **For non-immediate type hypersensitivity:** Cefazolin 2gm IV q8h for 4 to 6 weeks	*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) **Vancomycin loading dose refer to Appendix 1.
Prosthetic Valves Methicillin-Susceptible Staphylococci (MSSA)	Cloxacillin 2gm IV in q4h for ≥ 6 weeks **PLUS** Gentamicin 1mg/kg IM/IV q8h for 2 weeks **PLUS** *Rifampicin 300-450mg PO q12h for ≥ 6 weeks	**Regimen for β-lactam allergic patients, replace Cloxacillin with the following:** **Immediate type hypersensitivity to penicillin (anaphylaxis):** ** Vancomycin 15-20mg/kg (actual body weight) IV q8-12h; not to exceed 2gm/dose, for 4 to 6 weeks **OR** **For non-immediate type**	*Rifampicin: To avoid the development of resistance, it should be started after 3-5 days of effective initial cloxacillin therapy and/or once the bacteraemia has been cleared. **Vancomycin loading dose refer to Appendix 1.

Infection / Condition & Likely Organism	Suggested Treatment		Comments
		<u>hypersensitivity:</u> Cefazolin 2gm IV q8h for 4 to 6 weeks	
Native Valves Methicillin-Resistant Staphylococci (MRSA)	*Vancomycin 15-20mg/kg (actual body weight) IV q8-12h; not to exceed 2gm/dose, for 4 to 6 weeks	**Daptomycin 10mg/kg IV q24h for 4 to 6 weeks	*Vancomycin loading dose refer to Appendix 1. **Daptomycin: DG Item. Requires DG's approval. Daptomycin is superior to vancomycin for MRSA bacteraemia with vancomycin MIC > 1 mg/l.
Prosthetic Valves Methicillin-Resistant Staphylococci (MRSA)	*Vancomycin 15-20mg/kg (actual body weight) IV q8-12h; not to exceed 2gm/dose, for ≥ 6 weeks **PLUS** Gentamicin 1mg/kg IV q8h for 2 weeks **PLUS** **Rifampicin 300-450mg PO q12h for ≥ 6 weeks*		*Vancomycin loading dose refer to Appendix 1. **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 *(Haemophilus parainfluenzae, Haemophilus aphrophilus, Actinobacillus actinomycetemcomitans, Cardiobacterium hominis, Eikenella corrodens,* and *Kingella kingae)*			
Native and Prosthetic valves	Ceftriaxone 2gm IV q24h for 4 weeks (native valve) or 6 weeks (prosthetic valve)	Ampicillin/sulbactam 3gm IV q6h for 4 weeks (native valve) or 6 weeks (prosthetic valve) **OR** Ciprofloxacin 400mg IV or 500mg PO q12h for 4 weeks (native valve) or 6 weeks (prosthetic valve)	
Therapy for Culture-Negative Endocarditis - Consultation with an infectious disease specialist needed			
Brucella spp.	Doxycycline 100mg PO q12h **PLUS** Rifampicin 300-600mg PO q24h **PLUS** Streptomycin 15mg/kg IM q24h (For first 2-4 weeks only) **OR** Gentamicin 5mg/kg IV q24h		Duration of treatment 3-6 months depends on clinical response

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	(For first 2-4 weeks only)		
***Coxiella burnetii* (agent of Q fever)**	Doxycycline 100mg PO q12h **PLUS** Hydroxychloroquine 600mg PO q24h or 200mg PO q8h		For 18-24 months based on clinical and serological response
***Bartonella* spp.**	Doxycycline 100mg PO q12h for 6 weeks **PLUS** Gentamicin 3mg/kg IV q24h for 2 weeks		
Therapy for *Candida* Endocarditis (Native and Prosthetic valve)			
***Candida* Endocarditis** **(native and prosthetic valve)**	**Initial therapy:** Amphotericin B deoxycholate 0.6 -1mg/ kg IV q24h for at least 6 weeks after surgery **OR** Lipid formulation Amphotericin B 3-5mg/kg IV q24h for at least 6 weeks after surgery **PLUS/MINUS** *Flucytosine 25 mg/kg PO q6h for at least 6 weeks after surgery	**Initial therapy:** High dose of echinocandins are recommended.	Valve replacement surgery is mandatory. 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 400mg (6mg/kg) daily is recommended The duration of therapy will depend on patient response and surgical intervention Patients with *Candida* IE should be referred to ID physician *Flucytosine: For synergistic effect. Causes dose related marrow toxicity. Avoid using in patients with renal failure.
	Step down therapy: Fluconazole 400-800mg (6-12mg/kg) PO q24h for susceptible microorganism in stable patients with negative blood cultures (clearance of Candida from blood stream)		
Non- tunneled central venous catheter (subclavian, internal jugular) **Peripherally inserted central catheter** <u>Common organisms:</u> *Staphylococcus aureus* *Streptococcus epidermidis*	Cloxacillin 1-2gm IV q6h **OR** Cefazolin 1-2gm IV q8h	**If patient has risk factor for MRSA:** *Vancomycin 15-20mg/kg (actual body weight) IV q8-12h; not to exceed 2gm/dose	Peripheral blood C&S is mandatory when suspecting CRBSI. If blood C&S negative, consider alternative diagnosis. Antibiotic of choice depends on local epidemiology of CRBSI and guided by antibiogram results. Need to remove catheter as very low cure rates.
		If local epidemiology shows high ESBL prevalence AND if patient severely ill (eg: Hypotension, multiorgan failure): Meropenem 2gm IV q8h	

Infection / Condition & Likely Organism	Suggested Treatment		Comments
		OR Imipenem 1gm IV q8h	*Vancomycin loading dose refer to Appendix 1.
Tunnel type indwelling venous catheters and ports (Broviac, Hickman) **Haemodialysis catheter** Common organisms: CoNS, *Streptococcus epidermidis, Staphylococcus aureus,* Gram negative rods	Cloxacillin 2gm IV q4-6h **OR** Cefazolin 2gm IV q8h **PLUS** Ceftazidime 2gm IV q8h	**If patient has risk factor for MRSA:** *Vancomycin 15-20 mg/kg (actual body weight) IV q8-12h; not to exceed 2gm/dose **PLUS** Ceftazidime 2gm IV q8h	Adjust dose according to renal function. *Vancomycin loading dose refer to Appendix 1.

Footnotes for antibiotic treatment of endocarditis:

1. Vancomycin: aim for serum trough level of 15 – 20mg/L (10 – 14 µmol/L) for both adults and paediatrics. Vancomycin dose should be adjusted in patients with renal impairment. For dosing adult patients with renal impairment, obese patients and monitoring recommendations refer to Appendix 2 (Antibiotic Dosage in Adult with Impaired Renal Function).
2. Gentamicin: for obese patients use ideal body weight. Monitor gentamicin levels weekly. Aim for gentamicin peak level (one hour after injection) of 6 – 10 µmol/L (3 – 5 mcg/mL) and trough level of <2 µmol/L (<1mcg/mL) when 2 – 3 divided doses are used. Refer to Appendix 1 (Clinical Pharmacokinetic Guidelines (Aminoglycosides & Vancomycin)).
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 gentamicin resistance (i.e. MIC >128 mg/L) Ampicillin/Sulbactam 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 antistaphylococcal drug (ideally two active agents, ie. Cloxacillin) to minimize risk of resistance. Rifampicin increases hepatic clearance of warfarin and other drugs.

B. TREATMENT OF PACEMAKER INFECTIONS

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	**Alternative**	
Pacemaker Infection	Refer to Ministry of Health Malaysia's Clinical Practice Guidelines for the Prevention, Diagnosis & Management of Infective Endocarditis 2017		

Empirical therapy for superficial post-surgical Sternal Wounds	Cloxacillin 2gm IV q6h **OR** Cefazolin 1-2gm IV q8h **PLUS/MINUS** Gentamicin 5mg/kg IV q24h	*Vancomycin 15-20mg/kg (actual body weight) IV q8-12h; not to exceed 2gm/dose	Duration of treatment: 7-10 days To discuss with Cardiothoracic unit that operated on the patient if uncertain whether deep sternal wound infection is present. *Vancomycin loading dose refer to Appendix 1. Aim for serum trough level of 15–20 mg/L.

References:

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16. Raoult D, Houpikian P, Dupont H, Riss J, Arditi-Djiane J, Brouqui P. Treatment of Q fever endocarditis. Comparison of 2 regimens containing doxycycline and ofloxacin or hydroxychloroquine. *Arch Intern Med*. 1999;159(2):167-73.
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CENTRAL NERVOUS INFECTIONS

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	
Meningitis (acute)			
Empirical treatment on admission: Common organisms: *Streptococcus pneumoniae* *Neisseria meningitidis* *Haemophilus influenzae* Other organisms: Gram-negative rods	Ceftriaxone 2gm IV q12h **OR** Cefotaxime 2gm IV q6h	Chloramphenicol 1gm IV q6h **Alternative ONLY for immunocompromised host:** Meropenem 2gm IV q8h	Antibiotic 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 patient is responding, continue antibiotics for 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 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 > 60 years of age, immunosuppressed & pregnancy. Consider empirical cover for this organism especially if the course of disease is indolent or there is epidemiological risk (refer section on treatment of listeriosis). Duration: 10-14 days
Causative organism isolated:			

Infection / Condition & Likely Organism	Suggested Treatment		Comments
Haemophilus influenzae (Gram-negative bacilli)	Ceftriaxone 2gm IV q12h **OR** Cefotaxime 2gm IV q6h	Cefepime 2gm IV q8H **If organism is susceptible and patient is allergic to cephalosporins:** Chloramphenicol 50-100mg/kg/day IV q6h **OR** Ciprofloxacin 400mg IV q8h	Duration: 7-10 days
Streptococcus pneumoniae (Gram-positive cocci)	**Penicillin-sensitive strains (MIC to Penicillin < 0.12 mcg/ml)** Benzylpenicillin 4MU IV q4h		All attempts should be made to ascertain the MIC of isolated pneumococcus. Ceftriaxone or cefotaxime should be de-escalated to benzylpenicillin once the MIC result has been confirmed. Duration: 10-14 days *Vancomycin loading dose refer to Appendix 1.
	Penicillin resistant strains (MIC to Penicillin ≥0.12 mcg/ml) Ceftriaxone 2gm IV q12h **OR** Cefotaxime 2gm IV q6h	**Penicillin resistant strain (MIC to Penicillin ≥0.12 mcg/ml)** Cefepime 2gm IV q8h **OR** Meropenem 2gm IV q8h	
	Cephalosporin resistant strains (MIC to Cephalosporin ≥2 mcg/ml): *Vancomycin 25-30mg/kg loading dose then 15-20mg/kg IV q8-12h; not to exceed 2gm per dose **OR** Rifampicin 600mg IV/PO q12h **PLUS** Ceftriaxone 2gm IV q12h **OR** Cefotaxime 2gm IV q6h		
Neisseria meningitidis (Gram-negative diplococci)	Benzylpenicillin 4MU IV q4h (if MIC to Penicillin < 0.1 mcg/ml) **If MIC to penicillin is > 0.1 mcg/ml use:** Ceftriaxone 2gm IV q12h **OR** Cefotaxime 2gm IV q6h	**If organism is susceptible and patient is allergic to cephalosporins:** Chloramphenicol 50-100mg/kg/day IV q6h	Duration: 5-7 days

<table>
<tr><th>Infection / Condition & Likely Organism</th><th colspan="2">Suggested Treatment</th><th>Comments</th></tr>
<tr><td rowspan="2">Prophylaxis for household and close contacts of meningococcal meningitis cases</td><td><u>Age > 15 years:</u>

Ciprofloxacin 500mg PO as single dose
OR
Rifampicin 600mg PO q12h for 2 days (4 doses) [not recommended in pregnant women]</td><td>Ceftriaxone 250mg IM as single dose (especially in pregnancy and lactating mothers)
OR
Azithromycin 500mg PO as single dose</td><td rowspan="2">Close contacts are defined as those individuals who have had contact for > 8 hours and within 1 metre 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 chemoprophylaxis.

For index case who received only benzylpenicillin as therapy, chemoprophylaxis should also be given upon discharge to eliminate nasopharyngeal carriage.</td></tr>
<tr><td colspan="2"><u>Children/Adolescent < 15 years:</u>

Refer to Paediatric Non-Surgical Chemoprophylaxis (Meningococcal Exposure) Section</td></tr>
<tr><td>Listeriosis</td><td>Ampicillin 2gm IV q4h
OR
Benzylpenicillin 4MU IV q4h

PLUS/MINUS
Gentamicin 5mg/kg/day IV in 3 divided doses</td><td>Trimethoprim/sulfamethoxazole 10 to 20mg/kg/day [based on the TMP component] IV q6-12h
OR
Meropenem 2gm IV q8h</td><td>Duration of treatment is 3 weeks depending on clinical response. May be longer in immunocompromised host.

Gentamicin is given until symptoms improve (minimum of 1 week).</td></tr>
<tr><td rowspan="2">Brain abscess/subdural empyema

Common organisms:
Streptococci
Staphylococcus
Gram-negative bacilli
Anaerobes</td><td colspan="2">1. Brain abscess/subdural empyema suspected arising from an oral source:

Benzylpenicillin 4MU IV q4-6h
PLUS
Metronidazole 500mg IV q8h</td><td rowspan="2">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).

Third generation cephalosporins are recommended if the source is from the sinus or otogenic source.
Benzylpenicillin is recommended if the source is from oral cavity.

Add cloxacillin if suspected hematogenous</td></tr>
<tr><td colspan="2">2. Brain abscess/subdural empyema suspected arising from sinus or otogenic source:
Ceftriaxone 2gm IV q12h
OR
Cefotaxime 2gm IV q4-6h

PLUS
Metronidazole 500mg IV q8h</td></tr>
</table>

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	3. Brain abscess/subdural empyema arising from hematogenous spread or penetrating trauma (community acquired): Ceftriaxone 2gm IV q12h **OR** Cefotaxime 2gm IV q4-6h **PLUS** Cloxacillin 2gm IV q4h **PLUS** Metronidazole 500mg IV q8h		spread, post-neurosurgeries or post penetrating injuries. If post neurosurgery or trauma, consider cover for pseudomonas.
	4. Brain abscess arising from hematogenous spread (hospital acquired) or post-neurosurgical operation: *Vancomycin 25-30mg/kg loading dose then 15-20mg/kg IV q8-12h; not to exceed 2gm per dose **PLUS** Ceftazidime 2gm IV q8h **OR** Cefepime 2gm IV q8h **OR** Meropenem 2 g IV q8h		
Spinal Epidural abscess Common organism: *Streptococci* *Staphylococcus* Gram-negative bacilli	Cloxacillin 2gm IV q4h **OR** *Vancomycin 25-30mg/kg loading dose then 15mg/kg IV q8-12h; not to exceed 2gm per dose **PLUS** Gentamicin 4-7mg/kg/day IV in 3 divided doses **OR** **Ceftriaxone 2gm IV q12h **OR** **Cefotaxime 2gm IV q4-6h		Source control is strongly recommended. Duration to be determined by clinical response (usually 2-6 weeks with IV therapy for 2 weeks minimum, followed by oral depending on whether surgical drainage done, clinical and radiological response). *Vancomycin loading dose refer to Appendix 1. Vancomycin is indicated when suspecting MRSA or allergy to Cloxacillin. **3rd Generation Cephalosporin indicated when Gentamicin is contraindicated.

Infection / Condition & Likely Organism	Suggested Treatment		Comments
Viral encephalitis Common organisms: *Herpes simplex* *Varicella zoster*	*Acyclovir 10mg/kg IV q8h		*Consider using Ideal Body weight in obese patients. Duration: 14-21 days
Meningitis (Chronic)			
Tuberculous meningitis *Mycobacterium tuberculosis*	Intensive 2 months S/EHRZ **and** 10 months HR Isoniazid (H) 5(4-6)mg/kg/day PO (max: 300mg/day) **PLUS** Rifampicin (R) 10(8-12)mg/kg/day PO (max: 600mg/day) **PLUS** Pyrazinamide (Z) 25 (20-30)mg/kg/day PO (max: 2000mg/day) **PLUS** Streptomycin (S) 15 (12-18)mg/kg/day IM (max: 1000mg/day) **OR** Ethambutol (E) 15 (15-20)mg/kg/day PO (max: 1600mg/day) Pyridoxine 10-50mg PO q24h needs to be prescribed together with Isoniazid	<u>Infection in HIV patients:</u> Recommendations for the treatment of TB in HIV-infected adults are **identical** to those for HIV-uninfected adults when the disease is caused by organisms that are **known or presumed to be susceptible to the first-line drugs**. Daily dosing is recommended rather than intermittent dosing. Rifampicin is not recommended in combination with all protease inhibitors (PIs) and rifabutin should be used with PI-based HAART for HIV-TB co-infected adults.	Add dexamethasone 12-16mg daily in divided doses for 6 weeks in tapering doses (intravenously initially, then switch to oral when safe to do so). Alternatively, prednisolone 30-40mg/day PO in tapering doses for 6 weeks. Treatment is continued for 12 months. Refer to Clinical Practice Guidelines on Management of Tuberculosis (3rd edition) MOH/P/PAK/258.12(GU).

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	**Alternative**	

Cryptococcalmeningitis *Cryptococcus neoformans* (non-HIV, non-transplant pt)	**Induction Therapy:** Amphotericin B 0.7-1.0mg/kg/day IV q24h **PLUS** 5-Flucytosine 100-150mg/kg/day PO q6h **OR** Fluconazole 800-1200mg PO q24h	**Induction Therapy:** Fluconazole 1200mg PO q24h **PLUS** 5-flucytosine 100-150mg/kg/day PO q6h	Lipid formulations of amphotericin may be used in cases of severe nephrotoxicity. Duration of induction therapy: 4-6 weeks
	Consolidation Therapy: Fluconazole 400-800mg PO q24h		Duration of consolidation therapy: 8 weeks Duration of maintenance therapy: up to 12 months
	Maintenance Therapy: Fluconazole 200mg PO q24h		
Healthcare-associated ventriculitis and meningitis	Empirical treatment should be decided by the primary team based on local antibiogram and CSF gram stain result.		De-escalate antibiotics to targeted therapy when the culture results are available. *Vancomycin trough level should be 10-14µmol/L or 15-20mcg/L *Vancomycin loading dose refer to Appendix 1.
	If C&S is not available: Ceftazidime 2gm IV q8h **PLUS/MINUS** *Vancomycin 25-30mg/kg loading dose then 15-20mg/kg IV q8-12h; not to exceed 2gm per dose	Meropenem 2gm IV q8h **PLUS/MINUS** *Vancomycin 25-30mg/kg loading dose then 15-20mg/kg IV q8-12h; not to exceed 2gm per dose	
Cranial Trauma **1. Open fracture &** **2. Penetrating injuries**	Amoxicillin/clavulanate 1.2gm IV q8h	Cefuroxime 1.5gm IV q8H **PLUS** Metronidazole 500mg IV q8H	Duration: 5-7 days
Penetrating craniocerebral injuries	Ceftriaxone 2gm IV q12h **PLUS** Metronidazole 400mg PO q8h for 2 weeks initially and then review with microbiology		
Neurosyphilis	Refer to section (Sexually Transmitted Infections) Treatment is the same for neurosyphillis in patients with HIV infection		
Infection / Condition & Likely Organism	**Suggested Treatment**		**Comments**
	Preferred	**Alternative**	

HIV related CNS infection	Refer to section (Infections in Immunocompromised Patients - Human Immunodeficiency Virus)

References:

1. Brouwer MC et al. Corticosteroids for acute bacterial meningitis. Cochrane Database of Systematic Reviews 2015, Issue 9. Art. No.: CD004405
2. Pasquale Pagliano et al. Listeria monocytogenes meningitis in the elderly: epidemiological, clinical and therapeutic findings. Le Infezioni in Medicina, n. 2, 105-111, 2016
3. van de Beek, D. et al. ESCMID guideline: diagnosis and treatment of acute bacterial meningitis. Clinical Microbiology and Infection, Volume 22 , S37 - S62
4. McGill, F. et al. The UK joint specialist societies guideline on the diagnosis and management of acute meningitis and meningococcal sepsis in immunocompetent adults.Journal of Infection, Volume 7, Issue 4 , 405 – 438.
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8. The Sanford Guide to Antimicrobial Therapy 2018.
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10. R Bayston, J de Louvois, E M Brown, R A Johnston, P Lees, I K Pople, "Infection in Neurosurgery" Working Party of British Society for Antimicrobial Chemotherapy. Lancet 2000; 355: 1813–17
11. Chaudhuri A. et al. EFNS guideline on the management of community-acquired bacterial meningitis: report of an EFNS Task Force on acute bacterial meningitis in older children and adults. European Journal of Neurology 2008, 15: 649–659
12. Allan R. Tunkel et al. Practice Guidelines for the Management of Bacterial Meningitis Clinical Infectious Diseases 2004; 39:1267–84

CHEMOPROPHYLAXIS(SURGICAL)

SURGICAL

It is the use of antibiotics to prevent infections at the surgical site. It should be considered when there is significant risk of post-operative infection or where post-operative infection would have severe consequences. Ideally, the prophylaxis when given intravenously should be given as soon as the patient is stabilized after induction. Usually a single dose is sufficient. A second dose may be required in the following situations:

a.delay in start of surgery
b. in prolonged operations when the time is more than half of the usual dosing interval of the antibiotic

Pre-operative dose timing: The optimal time for administration of preoperative doses is within 60 minutes before surgical incision. Some agents, such as Clindamycin, Fluoroquinolones, Gentamicin, Metronidazole and Vancomycin, require administration over one to two hours; therefore, the administration of these agents should begin within 120 minutes before surgical incision (Reference: Am J Health-Syst Pharm Vol 70: 195-283, 2013@IDSA.

Giving more than 1 or 2 doses postoperatively is generally not advised. The practice of continuing prophylactic antibiotics until surgical drains have been removed is NOT RECOMMENDED.

The goal of antimicrobial prophylaxis is to prevent surgical site infection by reducing burden of microorganisms at the surgical site during the operative procedure.

Single-dose prophylaxis is usually sufficient. If antimicrobial prophylaxis is continued post-operatively, duration should be less than 24 hours (up to 48 hours for cardiac surgery), regardless of the presence of intravascular catheters or indwelling drains.

If presence of pre-existing infections (known or suspected), use appropriate treatment regimen instead of prophylactic regime for procedure. However, redosing is required just prior to skin incision.

The optimal time for administration of pre-operatve antibiotics is 60 minutes prior to surgical incision. Some agents, such as fluoroquinolones and vancomycin, required administration over 1 to 2 hours; therefore, the administration of these agents should begin within 120 minutes before surgical incision.

An additional dose of prophylactic antibiotic during operation is indicated if

- Excessive blood loss (> 1500ml)
- Procedure exceed 2 half-life of the drug
- If there are other factors that might shorten the half-life of prophylactic agent (eg. Extensive burn)

Antimicrobial	Recommended Redosing Interval in Adults with Normal Renal Function (From Initiation of Preoperative Dose), (hr)
Cefazolin	4
Cefuroxime	4
Ampicillin/Sulbactam	2
Metronidazole	NA
Clindamycin	6
Vancomycin	NA
Gentamicin	NA
Amoxicillin/Clavulanate	3
Benzylpenicillin	2

For patient with penicillin allergy, vancomycin or clindamycin is recommended unless stated otherwise. The dose of Vancomycin is according to patient's body weight, as follows:

- <75 kg : 1gm infused over 60 minutes
- ≥75 kg: 1.5 gm infused over 90 minutes

Administration of cefazolin in obese patients:

- 2gm if body weight < 120 kg
- 3gm if body weight ≥120 kg

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	
1. OBSTETRICS & GYNAECOLOGY			
Cesarean Section a. Elective b. Emergency	Cefuroxime 1.5gm stat and 750mg IV q8h for 2 doses (1day), then Cefuroxime PO 250mg q12h for 6days [total 7 days course]	Penicillin Allergy: Clindamycin 900mg IV OR Erythromycin Lactobionate 500mg IV (infusion)	Consider doubling the dose (Cefuroxime 1.5gm) if BMI >30kg/m2. To give second dose if surgery more than 4 hours or blood loss more than 1.5L.
Elective surgery TAHBSO Hysterectomy (vaginal or abdominal) Laparascopy vagina and/or uterus entered	Cefuroxime 1.5gm stat and 750mg IV q8h for 2 doses (1day), then Cefuroxime PO 250mg q12h for 6days [total 7 days course]	Penicillin Allergy: Clindamycin 900mg IV PLUS Gentamicin 5mg/kg IV OR Ampicillin/Sulbactam 3gm IV	Consider to give second or additional dose for prolonged procedures.
Laparoscopic surgery Vagina and/or uterus not entered	Antibiotic not recommended	Antibiotic not recommended	
Repair of Perineal Tear e.g. third or fourth degree tears	Cefuroxime 1.5gm stat and 750mg IV q8h for 2 doses (1day), then Cefuroxime PO 250mg q12h for 6days PLUS Metronidazole 500mg IV q8h for 1 day then PO Metronidazole 400mg q8h for 6 days (total 7 days course)		
Emergency Laparotomy	As per elective surgery		

Reference (as per recommended standards):
1. Antibiotic Prophylaxis in GynecologyProcedure – SOGC Clinical Practice Guideline no 275, April 2012
2. Antibiotic Prophylaxis in Obstetric Procedure - SOGC Clinical Practice Guideline no 247, September 2010

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	
2. OTORHINOLARYNGOLOGY			
HEAD AND NECK			
Clean	Antibiotic not required	Antibiotic not required	
Clean with placement of prosthesis (excludes tympanostomy tubes)	Cefuroxime 1.5gm IV **OR** Ampicillin/sulbactam 3gm IV	Cefazolin 2gm IV (3gm IV for patients weighing ≥120 kg)	
Clean-contaminated cancer surgery Other clean-contaminated procedures with the exception of tonsillectomy and functional endoscopic sinus procedures	Cefuroxime 1.5gm IV **PLUS** Metronidazole 500mg IV **OR** Ampicillin/sulbactam 3gm IV	Cefazolin 2gm IV (3gm IV for patients weighing ≥120 kg) **PLUS** Metronidazole 500mg IV	
References: 1. Simo R, French G. The use of prophylactic antibiotics in head and neck oncological surgery. CurrOpinOtolaryngolHead Neck Surg. 2006; 14:55-61 88			
3. ORAL/DENTAL SURGERY			
4. VASCULAR SURGERY			
Amputation of ischemic limbs Suspected organism: Staphylococcus spp. & anaerobic organism	Ampicillin/sulbactam 3 gm IV	Amoxicillin/clavulanate 1.2gm IV	
Open and endovascular repair of abdominal aneurysm	Amoxicillin/clavulanate 1.2gm IV	**Penicillin allergy:** Vancomycin 1gm IV (1.5gm IV for patient weighing ≥75kg)	Penicillin allergy refer to Appendix 8
Bypass surgery	Amoxicillin/clavulanate 1.2gm IV	**Penicillin allergy:** Vancomycin 1gm IV (1.5gm IV for patient weighing ≥75kg)	Penicillin allergy refer to Appendix 8
Arteriovenous graft	Amoxicillin/clavulanate 1.2gm IV If High Risk for MRSA: Vancomycin 1gm IV (1.5gm IV for patient weighing ≥75kg)		MRSA risk(defined as history of MRSA colonization or infection, OR, inpatient of high risk hospital or unit (where MRSA is endemic)

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	**Alternative**	
References: 1. Bratzler DW, Dellinger EP, Olsen KM et al. Clinical practice guideline for antimicrobial prophylaxis in surgery. *Am J Health-Syst Pharm*.2013; 70:195-283			
6. GENERAL SURGERY			
Appendectomy for uncomplicated appendicitis Colorectal	Cefuroxime 1.5gm IV **PLUS** Metronidazole 500mg IV **<u>Penicillin allergy:</u>** Clindamycin 600-900mg IV **PLUS** Gentamicin 5mg/kg IV	Cefazolin 2 gm IV (3gm IV for patient weighing ≥ 120 kg) **PLUS** Metronidazole 500mg IV **OR** Ampicillin/sulbactam 3gm IV	Penicillin allergy refer to Appendix 8
Small intestine	**<u>Non-obstructed:</u>** Cefuroxime 1.5gm IV **<u>Penicillin allergy:</u>** Clindamycin 600-900mg IV **PLUS** Gentamicin 5mg/kg IV	Cefazolin 2 gm IV (3gm IV for patient weighing ≥120 kg)	Penicillin allergy refer to Appendix 8
	<u>Obstructed</u> Cefuroxime 1.5gm IV **PLUS** Metronidazole 500mg IV **<u>Penicillin allergy:</u>** Clindamycin 600-900mg IV **PLUS** Gentamicin 5mg/kg IV	Cefazolin 2 gm IV (3gm IV for patient weighing ≥ 120 kg) **PLUS** Metronidazole 500mg IV	
Hernia repair with mesh	Amoxycillin/Clavulanate 1.2gm IV **OR** Ampicillin/Sulbactam 3 gm IV	Cefazolin 2 gm IV (3gm IV for patient weighing≥120 kg)	Include laparoscopic repair. Single/stat dose only.
Breast cancer surgery	Amoxycillin/Clavulanate 1.2gm IV **OR** Ampicillin/Sulbactam 3 gm IV	Cefazolin 2 gm IV (3gm IV for patient weighing≥120 kg)	The benefits of routine postoperative antibiotic doses in reconstruction surgery are uncertain; there may be a benefit in obese patients or those treated with radiation therapy. The need for postoperative doses should be considered on an individual patient basis; if used, postoperative prophylaxis should not exceed 24 hours.

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	
References: 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 Antibiotic Expert Groups. Therapeutic guidelines: antibiotic. Version 15. Melbourne: Therapeutic Guidelines Limited;2014.			
7. ORTHOPAEDIC SURGERY			
Clean operations involving hand, knee, or foot and not involving implantation of foreign materials	None	None	
Internal fixation of all closed Fracture Total Joint Replacement/ Spine surgery (with/without instrumentation) & Arthroscopy	Cefazolin 2gm IV (3gm IV for patients weighing ≥ 120 kg)	Cefuroxime 1.5gm IV, **<u>Penicillin/ Cephalosporin Allergy</u>** Clindamycin 600-900mg IV **OR** Vancomycin 15-20mg/kg IV stat	The benefits of routine postoperative antibiotic are uncertain. If used, postoperative prophylaxis should not exceed 24 hours. Penicillin allergy refer to Appendix 8.
Gun shot and other penetrating wound Likely organisms: *Staphylococcus* *Clostridium* spp	Cloxacillin 1gm IV **OR** Cefuroxime 1.5gm IV **PLUS** Metronidazole 500mg IV	Amoxycillin/Clavulanate 1.2gm IV **OR** Ampicillin/sulbactam 1.5gm IV	Thorough surgical debridement
Muscular, skeletal and soft tissue trauma, crush injuries and stab wound	Cloxacilllin 2gm IV q 6h **PLUS/MINUS** **Gentamicin 5mg/kg q 24h **PLUS/MINUS** **Metronidazole 500mg IV q 8h Duration should not be less than 5 days	Cefazolin 1-2gm IV q 8 h **OR** Cefuroxime 1.5gm IV as a loading dose followed by 750mg IV q 8 h **PLUS** **Metronidazole 500mg IV q 8h Duration: Should not be less than 5 days	In all cases, a patient's tetanus immunization status should be assessed. **Metronidazole: in soil/rust contamination or heavy machinery. **Gentamicin: If there's extensive skin & soft tissue involvement. Thorough surgical debridement, soft tissue and fracture stabilization. For severe penetrating injuries. Especially those involving joints and/or tendons, antibiotics must be given for at least **5 days.**

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	
References: 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.G Buckley,C.GMarani, AO principle of fracture management. A.H.R.W Simpson, BMJ 2015			
8. UROLOGICAL SURGERY			
A. Diagnostic Procedures			
Cystoscopy/ Urodynamics study/ Retrograde pyelogram/Ureteric stenting	Antibiotic not recommended	Antibiotic not recommended	Prophylaxis only for high risk cases (immunocompromised patients, e.g. debilitated patients on long term catheters, patient with prosthesis/heart valves, diabetics, transplant recipients): Cefuroxime 250mg PO stat If heart valve: Follow recommendation for SBE prophylaxis
Retrograde pyelogram/Ureteric stenting	Cefuroxime 250mg PO stat		
B. Open Surgery			
Clean operations e.g. orchidectomy, orchidopexy, varicocelectomy, deroofing renal cysts	Antibiotic not required	Antibiotic not required	
Laparoscopic surgery	As for open surgery	As for open surgery	Depending on type of procedure performed whether clean or clean – contaminated
Reference: Pickard R., Bartoletti R., Bjerklund-Johansen TE., Bonkat G., Bruyere F., Cek M. et al.members of the EAU-ESTRO-ESUR-SIOG Urological Infections Guidelines Panel. EAU-ESTRO-ESUR-SIOG Guidelines on Urological Infections. Edn. presented at the EAU Annual Congress London 2017.978-90-79754—91-5. Publisher:EAU Guidelines Office. Place published :Arnhem, The Netherlands.			
9. NEUROLOGICAL SURGERY			
10. CARDIAC SURGERY			
10. OPHTHALMOLOGY			
The use of povidone iodine 10% to the periorbital skin and 5% to the conjunctival sac as an antiseptic agent for preoperative surgical site preparation are recommended.			

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	
Intracameral injection of 1mg Cefuroxime in 0.1ml at the end of cataract surgery is recommended. Careful dilution should be undertaken to prevent potential toxicity.			
Topical antibiotic at end of surgery.			
Reference: Prophylaxis for intraocular surgery-CPG for Management of Post-Operative Endophthalmitis, Ministry of Health Malaysia, August 2006			
11. HEPATOBILIARY SURGERY			
Laparoscopic procedures Low risk eg. Laparoscopic cholecystectomy	Cefuroxime 1.5gm IV	Cefazolin 2gm IV (3gm IV for patients weighing ≥ 120 kg)	1. Optimum antibiotic timing is to complete intravenous infusion ≤ 60 min (optimal window 15-45 min) prior to skin incision; to ensure adequate time to reach bactericidal serum and tissue concentration before skin is incised. 2. Repeat intraoperative dosing is recommended in • Prolonged surgery > 4 hours • Massive blood loss > 1.5 L Aminoglycosides should not be redosed.
Open surgery Low risk	Cefuroxime 1.5gm IV	Cefazolin 2gm IV (3gm IV for patients weighing ≥ 120 kg)	
Pre-exiting infection before surgery, GB empyema, ascending cholangitis	Initiate antibiotic based on culture results, or refer to treatment guidelines. If patient is at risk of infection with Multi-drug resistant organism, to discuss with consultant surgeons/ID physicians.		

NON-SURGICAL

Table 1: Patients with cardiac conditions are considered as being at increased risk of developing IE and are indicated for antimicrobial prophylaxis prior to certain procedures.

TABLE 1	
1.	Prosthetic cardiac valves or prosthetic material used for cardiac valve repair
2.	Established rheumatic heart disease
3.	Previous history of infective endocarditis
4.	Unrepaired cyanotic congenital heart disease (CHD), including palliative shunts and conduits
5.	Completely repaired CHD with prosthetic material or device, for first 6 months after the procedure
6.	Repaired CHD with residual defects at the site or adjacent to the site of the prosthetic device (which inhibit endothelisation)
7.	Cardiac transplantation recipients who develop cardiac valvulopathy

Dental Procedures
For patients considered as high risk (table 1), antimicrobial prophylaxis is recommended for invasive dental procedures involve manipulation of gingival tissue or the periapical region of teeth or perforation of gingival mucosa.

Even with high cardiac risk of infective endocarditis, antibiotic prophylaxis is not recommended for
- local anaesthetic injections in non-infected tissues
- treatment of superficial caries
- removal of sutures
- dental X-rays
- placement or adjustment of removable prosthodontic or orthodontic appliances or braces
- following the shedding of deciduous teeth
- trauma to the lips and oral mucosa

Respiratory Tract Procedures:
Antimicrobial prophylaxis is recommended for patients with increased risk of IE (table 1) 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 (table 1) 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 described in table 1 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.

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	
PROPHYLACTIC REGIMENS FOR HIGH-RISK DENTAL PROCEDURES IN HIGH-RISK PATIENTS			
Prophylactic Regimes	Amoxicillin 2gm PO single dose 30 to 60 minutes before procedure **OR** Ampicillin 2gm IV single dose 30 to 60 minutes before procedure	**Penicillin Allergy** : Clindamycin 600mg PO or IV single dose 30 to 60 minutes before procedure **Alternative:** Cefazolin 1gm IV single dose 30 to 60 minutes before procedure	See above for antibiotic prophylaxis in patients undergoing invasive surgical procedure to treat an established infection. Penicillin allergy refer to Appendix 8
SECONDARY PREVENTION OF RHEUMATIC FEVER			
Secondary Prevention of Rheumatic Fever	**Parenteral prophylaxis:** Benzathine Penicillin 1.2MU IM every 3 to 4 weeks **Oral prophylaxis:** Phenoxymethylpenicillin (Penicillin V) 250mg PO q12h	**Penicillin Allergy:** Erythromycin Ethylsuccinate 800mg PO q12h	Penicillin allergy refer to Appendix 8

Type of Infection	Duration of Treatment
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

References:
1. Ministry of Health Malaysia's Clinical Practice Guidelines For The Prevention, Diagnosis & Management Of Infective Endocarditis 2017
2. ESC Guidelines on Prevention of Infective Endocarditis 2015
3. The Australian guideline for prevention, diagnosis and management of acute rheumatic fever and rheumatic heart disease (2nd edition)

GASTROINTESTINAL INFECTIONS

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	
HELICOBACTER PYLORI INFECTION			
Helicobacter Pylori Infection	**First line Treatment** Triple Therapy: Proton Pump Inhibitors PO q12h **PLUS** Amoxicillin 1gm PO q12h **PLUS** Clarithromycin 500mg PO q12h **OR** Metronidazole 400mg PO q12h	**<u>Penicillin Allergy</u>** Proton Pump Inhibitors PO q12h **PLUS** Clarithromycin 500mg PO q12h **PLUS** Metronidazole 400mg PO q12h	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 First line therapy recommended in areas with <15-20% Clarithromycin resistance. Consider 2nd line if Clarithromycin resistance exceed more than 15%[1] Duration of therapy = 14 days Meta-analysis of RCTs found 14 days duration of therapy showed greater eradication rate[2, 3]. Penicillin allergy refer to Appendix 8
	Second Line Treatment[1] <u>Bismuth Quadruple regimen:</u> Proton Pump Inhibitors PO q12h **PLUS** Bismuth subsalicylate 300mg **OR** Bismuth subcitrate 120-300mg PO q6h **PLUS** Tetracycline hydrochloride 500mg PO q6h **PLUS** Metronidazole 400mg PO q8h <u>Fluroquinolone triple therapy:</u> Proton Pump Inhibitors PO q12h **PLUS** Levofloxacin 500mg PO q24h **PLUS** Amoxicillin 1gm PO q12h **OR** Metronidazole 400mg PO q12h		

References :
1. Malfertheiner P et al.Management of *Helicobacter pylori* infection--the Maastricht IV/ Florence Consensus Report .Gut 2012;61: 646 – 64.
2. V. Mahachaiet al., “H. Pylori management in ASEAN: the Bangkok consensus report,” Journal of Gastroenterology and Hepatology, vol. 33, no. 1, pp. 37–56, 2017
3. Chey WD et al. ACG clinical guideline: Treatment of *Helicobacter pylori* infection. Am J Gastroenterol 2017 Jan10.

Infection / Condition & Likely Organism	Suggested Treatment		Comments
OROPHARYNGEAL CANDIDIASIS			
Refer to section (Infections in Immunocompromised Patients - HIV)			
ESOPHAGITIS			
Candida	Refer to section (Infections in Immunocompromised Patients - HIV)		
Herpes simplex virus	Refer to section (Sexually Transmitted Infections)		
INFECTIOUS DIARRHOEA			
Most community-acquired diarrhoea is viral in origin (norovirus, rotavirus, and adenovirus), antibiotic therapy does not shorten the duration of symptoms, therefore should be discouraged. When to consider empirical treatment for acute diarrhea? • Immunocompetent host with high grade or persistent fever, or with dysentery or in sepsis • Immunocompromised host • Suspected enteric fever			
EMPIRICAL THERAPY			
Empirical treatment	Ciprofloxacin 500mg PO q12h **OR** Azithromycin 500mg PO q24h		Duration: 3 days
PATHOGEN-DIRECTED THERAPY			
Non-shiga toxin producing (STEC), A*eromonas/Plesiomonas* *Yersinia* species	Trimethoprim/sulfamethoxazole 160/800mg PO q12h	Ciprofloxacin 500mg PO q12h	Duration: 3 days
Campylobacter jejuni	Azithromycin 500mg PO q24h		Duration**:** 3 days In immunocompromised: consider longer duration of therapy
Salmonella, non-typhi	Trimethoprim/sulfamethoxazole 160/800mg PO q12h	Ciprofloxacin 500mg PO q12h **OR** Azithromycin 500mg PO q24h **OR** Ceftriaxone 2gm IV q24h	Duration: Immunocompetent: 5-7 days Immunocompromised: 14 days Antibiotic is usually not indicated , except in patient - < 6 months old or >50 years old

Infection / Condition & Likely Organism	Suggested Treatment		Comments
			- with severe illness or in septic shock - with prostheses, valvular heart disease or severe atherosclerosis - with malignancy - who is immunocompromised
Salmonella, non-typhi (in HIV patients)	Refer to section (Infections in Immunocompromised Patients - HIV)		
Salmonella typhi	Refer to section (Tropical Infections)		
Vibrio cholera	Primary therapy is rehydration. Azithromycin 1gm PO single dose **OR** Doxycycline 300 mg PO single dose	Erythromycin Ethylsuccinate 800mg PO q12h for 3 days	Antibiotic is to reduce the shedding time
Shigella sp. (Fever and bloody stool)	Ciprofloxacin 750mg PO q12hr for 3 days	Azithromycin 500mg PO q24h for 3 days **OR** Trimethoprim/Sulfamethoxazole 160/800mg PO q12h for 3 days **For severe disease:** Ceftriaxone 2gm IV q24h for 2-5 days	In immunocompromised patients duration of antibiotic 7-10 days.
Giardiasis	Metronidazole 400mg PO q8h		Duration: 7 – 10 days
Entamoeba histolytica	Metronidazole 800mg PO q8h for 5–10 days **PLUS** *Paromomycin 500mg PO q8h for 7 days		*Requires DG's Approval
CLOSTRIDIUM DIFFICILE INFECTION			
Discontinue therapy with inciting antibiotic agent as soon as possible as may influence risk of CDI recurrence.			
Initial (Non-severe)	Vancomycin 125mg PO q6h	Metronidazole 400 mg PO q8h	Duration: 10 days

Infection / Condition & Likely Organism	Suggested Treatment		Comments
Initial (Severe)	Vancomycin 125mg PO q6h	Metronidazole 500mg IV q8h **PLUS** Vancomycin 125mg PO q6h	Symptoms to indicate severe colitis: • WCC >15 x 109 • Creatinine 50% increase from baseline • Temperature > 38.5ºC • Evidence of severe colitis (abdominal signs; radiography) Duration: 10 days
Initial (Fulminant/Severe with complications)	*Vancomycin 500mg PO q6h **PLUS** Metronidazole 500mg IV q8h		*If ileus, consider rectal instillation of Vancomycin (enema): Vancomycin 500mg (in 100 mL normal saline) q6h via enemas or by nasogastric tube Duration: 10 days
Recurrent	**If vancomycin was used for the initial episode:** Vancomycin pulsed-tapered regimen: 125mg PO q6h for 10-14 days, then 125mg PO q12h for 7 days, then 125mg PO q24h for 7 days, then 125mg PO q48-72h for 2-8 weeks	**If Metronidazole was used for the initial episode:** Vancomycin 125mg PO q6h for 10-14 days	Duration: 10 - 14 days
References : 1. Riddle et al. ACG clinical guideline: diagnosis, treatment, and prevention of acute diarrheal infections in adults. Am J Gastroenterol. 2016;111:602–622 2. Shane et al. 2017 IDSA CPG for the Diagnosis and Management of Infectious Diarrhea.CID 2017:65. 3. McDonald et al. Clinical Practice Guidelines for Clostridium difficile Infection in Adults and Children: 2017 Update by IDSA and Society for Healthcare Epidemiology of America (SHEA).Clin Infect Dis.Feb 15,2018. doi:10.1093/cid/cix1085 4. UK: https://www.guidelines.co.uk/infection/phe-infectious-diarrhoea-guideline/252651.article **5.** AUS: https://www.ncbi.nlm.nih.gov/pubmed/27062204			
TRAVELLERS' DIARRHEA			
Mild Diarrhea Diarrhea that is tolerable, not distressing	Antibiotic is not indicated		
Moderate Diarrhea Diarrhea that is distressing or interferes with planned activities	Azithromycin 1gm PO single dose or 500mg PO q24h	Ciprofloxacin 750mg PO stat **OR** 500mg PO q12h	Antibiotic therapy may be considered Duration: 3 days

Infection / Condition & Likely Organism	Suggested Treatment		Comments
Severe Diarrhea Diarrhea that incapacitating or completely prevents planned activities; Including all dysentery	Azithromycin 1gm PO single dose or 500mg PO	Ciprofloxacin 750mg stat **OR** 500mg PO q12h	Antibiotic therapy should be considered Duration: 3 days
References: 1. Riddle et al. Guidelines for the prevention and treatment of travelers' diarrhea: a graded expert panel report. J Travel Med 2017; 24:S57 2. https://www.racgp.org.au/afp/2015/januaryfebruary/advising-travellers-about-management-of-travellers%E2%80%99-diarrhoea/ (aus)			
LIVER ABSCESS			
Pyogenic liver abscess Common pathogens: Klebsiella spp *Escherichia coli*	**Empirical therapy** Ceftriaxone 2gm IV q24h **OR** Cefotaxime 2gm IV q8h **PLUS/MINUS** Metronidazole 500mg IV q8h	**Empirical therapy** Ceftriaxone 2gm IV q24h **PLUS/MINUS** *Metronidazole 500mg IV q8h	Duration : 4-6 weeks To consider drainage if abscess size is ≥5cm or impending rupture. *Metronidazole**:** Risk factors of anaerobic liver abscess: • acute and chronic inflammatory bowel disease with or without perforation • malignancy of gastrointestinal tract • surgery of the gastrointestinal • tract or pelvic organs Metronidazole has excellent bioavailability: consider IV to PO switch (refer to appendix 7).
Amoebic liver abscess *Entamoeba histolytica*	Amoebicidal agent: *Metronidazole 750mg IV q8h for 10 days followed by Luminal agent: -To eradicate intestinal colonization after Amoebicidal treatment **Paromomycin 25-35mg/kg/day PO q8h for 7 days		*May switch to PO when there is satisfactory clinical improvement. dose: Metronidazole 800 mg PO q8h Drainage of amoebic liver abscess is not usually required but is necessary if: 1. The patient does not respond to antibiotic therapy 2. The abscess is >5 cm in diameter 3. The abscess is in the left lobe of the liver 4. The diagnosis remains in doubt ** Requires DG's approval.

Infection / Condition & Likely Organism	Suggested Treatment		Comments
References 1. Anesi,J and GluckmanS.Amebic Liver Abscess Clinical Liver Disease, Vol 6, No 2, August 2015 2. Stanley etal. Amoebiasis , *Lancet* 2003; 361: 1025–34 3. Hope etl. Optimal treatment of hepatic abscess. Am Surg. 2008;74:178-182			
CHOLECYSTITIS AND CHOLANGITIS			
Community acquired Common organisms: • Enterobacteriaceae is the commonest organism(>50%)[1] • Bacteroides only comprise 4-20% of biliary infection	Amoxicillin/clavulanate 1.2gm q8h	3rd gen. Cephalosporins: Cefoperazone 1-2gm IV q12h **OR** Cefotaxime 2gm IV q8h **PLUS/MINUS** Metronidazole 500mg IV q8h (if biliary enteric anastomosis is present)	Duration: 4- 7 days Appropriate source control to drain infected foci and restoration of anatomic and physiological function is recommended for all patients, as antibiotics will not enter bile in the presence of obstruction. *Piperacillin/tazobactam: If given as q8h, to be given as extended infusion (over 3-4 hours).
Hospital acquired	*Piperacillin/tazobactam 4.5 gm IV q6-8h		
References: 1. Gomi,H. et al. Tokyo Guidelines 2018: antimicrobial therapy for acute cholangitis and cholecystitis. J Hepatobiliary Pancreat Sci, 25: 3–16. doi:10.1002/jhbp.518 2. Joseph et al, Diagnosis and Management of Complicated Intra-abdominal Infection in Adults and Children: Guidelines by the Surgical Infection Society and the Infectious Diseases Society of America , CID 2010; 50:133–64			
SPONTANEOUS BACTERIAL PERITONITIS (SBP)			
Primary SBP Common organisms: *Enterobacteriacea (eg: E. coli, K. pneumoniae, and Streptococcus sp.)*	Cefotaxime 2gm IV q8h **OR** Ceftriaxone 1gm IV q12h	Amoxicillin/clavulanate 1.2gm IV q8h	Duration: 5 days
In cirrhotic with upper gastrointestinal hemorrhage	Ceftriaxone 1gm IV q12h **OR** Cefotaxime 2gm IV q8h	Norfloxacin 400mg PO q12h	Duration: 7 days

References:
1. Bhuva et al. Spontaneous bacterial peritonitis: An update on evaluation, management, and prevention *Am J Med* 1994;97:169–175.
2. Rimola et al. Diagnosis, treatment and prophylaxis of spontaneous bacterial peritonitis: a consensus document. *Journal of Hepatology 2000; 32: 142-153*

3. Rimola A, Salmerón JM, Clemente G, Rodrigo L, Obrador A, Miranda ML,et al. Two different dosages of cefotaxime in the treatment of spontaneous bacterial peritonitis in cirrhosis: results of a prospective, randomized,multicenter study. Hepatology 1995;21:674–679.
4. Navasa M, Follo A, Llovet JM, Clemente G, Vargas V, Rimola A, et al. Randomized, comparative study of oral ofloxacin versus intravenous cefotaxime in spontaneous bacterial peritonitis. Gastroenterology 1996;111:1011–1017.
5. Sort P, Navasa M, Arroyo V, Aldeguer X, Planas R, Ruiz delArbol L, et al. Effect of intravenous albumin on renal impairment and mortality in patients with cirrhosis and spontaneous bacterial peritonitis. N Engl J Med1999;341:403–409.
6. Ricart E, Soriano G, Novella MT, Ortiz J, Sàbat M, Kolle L, et al. Amoxicillin– clavulanic acid versus cefotaxime in the therapy of bacterial infections in cirrhotic patients. J Hepatol 2000;32:596–602.
7. UK: https://gut.bmj.com/content/55/suppl_6/vi1

ORAL/DENTAL INFECTIONS

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	
1. ANTIMICROBIAL USE FOR BACTERIAL INFECTIONS			
A. Infections of the Teeth and Supporting Structures			
Reversible/ Irreversible Pulpitis	Systemic antibiotic use not recommended	Systemic antibiotic use not recommended	Antibiotics and The Treatment of Endodontic Infections Endodontics colleagues for Excellence 2006; American Association of Endodontics
Localised Dentoalveolar Abscess	If patient medically compromised besides local treatment can consider : Amoxycillin 500mg PO q8h 5 days Tablet Metronidazole 400mg q8h 5 days	**Penicillin Allergy:** Clindamycin 150-300mg PO q6h	Incision and Drainage and Management of Cause of Abscess and Symptomatic Relief of Pain JCan Dent Assoc 2003 Nov 69 (10):660 Clin.Microbiol.Rev.2013,26(2):255
Dry Socket	Systemic antibiotic use not recommended	Systemic antibiotic use not recommended	Local treatment with saline irrigation and antiseptic/ analgesic dressings and symptomatic relief of pain Med Oral Patol Oral Cir Bucal 2005; 10:77-85
Localised Pericoronitis	Systemic antibiotic use not recommended in absence of regional or systemic signs and symptoms (sweeling/fever) **<u>Mild infection:</u>** Amoxicillin 500mg PO q8h for 3 days OR Metronidazole 400mg q8h for 3 days **<u>Severe infection:</u>** Amoxicillin 500mg PO q8h PLUS Metronidazole 400mg q8h for 5 days	Systemic antibiotic use not recommended in absence of regional or systemic signs and symptoms	Local treatment with antiseptic irrigation and mouthwash and symptomatic relief of pain JClinMicrobiol.2003;41(12):5794-7 Journal of the Irish Dental Association 2009; 55 (4): 190 – 192

Infection / Condition & Likely Organism	Suggested Treatment		Comments
Chronic Gingivitis	Systemic antibiotic use not recommended	Systemic antibiotic use not recommended	1st line treatment-Mechanical and chemical plaque control . *0.2% Aqueous Chlorhexidine Gluconate not be used alone but as an adjunct to mechanical debridement Clinical Periodontology-12thed.2014 2ndline treatment-Antimicrobial mouthrinse Clinical Periodontology-9thed.2002
Chronic Periodontitis	Systemic antibiotic use generally not recommended. Can be considered in cases of: 1. Unresponsive to conventional 2. Episodes of acute infection 3. Medically compromised patients	Systemic antibiotic use generally not recommended.	1stline treatment-Mechanical plaque Control Periodontology 2000, Vol. 62, 2013, 218- 231 CPG Management of chronic periodontitis Nov 2012 MOH,Malaysia
Aggressive Periodontitis A. actinomycetemcomitans, P. gingivalis, Tannerella forsythensis, P. intermedia, Spirochaetes	Amoxycillin 500mg PO q8h PLUS Metronidazole 400mg PO q8h	Azithromycin 500mg q24h for 3 days	Antibiotics are not used alone but are used as an adjunct to scaling and root debridement JClin Periodontol.2012;39:284-294 Clin Periodontol.2011;38:43-49 J Clin Periodontol 2008; 35: 696–704 J Periodont Res 2012; 47: 137–148
Local missed Periodontal Abscess	Amoxycillin 500mg PO q8h PLUS Metronidazole 400mg PO q8h for 5 days		Incision and Drainage and management of cause of abscess and symptomatic relief of pain Periodontology 2000. Jun2014, Vol. 65 Issue 1, p149-177. 29p. Malaysian Dental Journal (2008) 29(2) 154-157 CPG=Managementofperiodontal abscess-MOH,Malaysia 2003
B. Infections of the Jaws			
Osteomyelitis of the jaws of dental origin Different organisms maybe involved	For acute cases,start with: Phenoxymethylpenicillin 250-500mg PO q6h* OR **Benzylpenicillin 1-2MU IV q6h	**Clindamycin150-300mg PO q6h OR **Clindamycin 150-450mg IV q6h	Culture and sensitivity is necessary For chronic cases,start with surgical treatment first.Antibiotics only when causative organisms are identified **Duration of antibiotic therapy can be 4-6 weeks depending on patient response /

Infection / Condition & Likely Organism	Suggested Treatment		Comments
			microbiological clearance of the pathogen
C. Spreading Infections and Infections of Fascial Spaces (with/without Systemic Signs)			
Cellulitis±Abscess of dental origin Viridans Streptococci, Staphylococci, Prevotella, Peptostreptococcus Fusobacterium nucleatum Clostridium sp Surgical site infection & Traumatic wound infection (Infection is usually by endogenous organisms rather than exogenous) Viridans Streptococci Staphylococci Prevotella, Peptostreptococcus, Eubacterium,and Fusobacterium	Oral administration Amoxycillin 250-750mg PO q8h PLUS/MINUS Metronidazole 400mg PO q8- 12h OR Amoxycillin/Clavulanate 625mg PO q8h. OR Cefuroxime 250-500mg PO q12h OR Clindamycin 150-450mg PO q6h		Empirical antibiotics are started Incision and drainange is advised and antibiotics is changed in accordance with result of culture and sensitivity.
Traumatic wound involving skin / Infection of skin origin	Cloxacillin 500mg PO q6h for 5 days If involved oral mucosa, **PLUS** Metronidazole 400mg PO q8h for 5 days		
D. Post Implant Infections ("Periimplantitis")			
Causative Organisms: Actinomyces sp. Eubacterium sp. Propionibacterium sp. Lactobacillus sp. Veillonella sp. P.gingivalis Prevotella intermedia	Amoxycillin/ Clavulanate 625mg PO q8h OR Amoxycillin 500mg PO q8h PLUS Metronidazole 400mg PO q8h	Penicillin Allergy: Doxycycline100mg PO q12-24h OR Clindamycin 150-300mg PO q6h	Bacteria associated with periimplantitis are extremely resistant to antibiotics. Antibiotics are not used alone but are used as an adjunct to local mechanical and chemical debridement. Also irrigation with Chlorhexidine and optimal oral hygiene by patient.

Infection / Condition & Likely Organism	Suggested Treatment		Comments
F. nucleatum			Locally delivered antibiotics is preferred compared to systemic administration Currently there is no reliable study to suggest most effective antibiotic therapy. Eur J Oral Implantol 2012; 5 (Suppl): S21-S41 Clin Oral Impl Res 2012 (23): 205-210 Int.J Oral Maxillofac Implants 2014 (29): 325-345 Maintenance system -CIST protocol Clin Oral Impl Res 2000:11(suppl): 146-155
2. ANTIMICROBIAL USE FOR FUNGAL INFECTIOS			
A. Oral Candidiasis			
Acute Pseudomembranous Candidiasis Hyperplastic Candidiasis (Candidal Leukoplakia)	Topical antifungal Adult, adolescent, children: Nystatin (oral suspension) 500,000-1,000,000U 6h /day (to continue for 2 days after perioral symptoms disappeared or cultures show eradication of candida sp.) Neonate & infants: Nystatin (oral suspension) 200,000U 6h /day Premature Neonate: Nystatin (oral suspension) 100,000U 6h /day (each dose is divided so that half of the dose is placed in each side of the mouth, avoid feeding 5-10 minutes) Systemic antifungal for severe infections,immunocompromised patients and for infections resistant to topical antifungal: Fluconazole 50-100mg PO/IV q24h for 2 weeks		Am Fam Physician. 2008;78(&):845-852 Journal of Oral Microbiology 2011,3:5771-DOI: 10.3402/jom.v3i0.5771 Med Oral Patol Oral Cir Bucal. 2011 Mar 1:16(2):el 39-43 Australia Dental Journal 2010; 55:(1 suppl):48

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	OR Itraconazole 100mg PO q24h for 2 weeks		
Chronic Erythematous Candidosis (candida-associated denture stomatitis with and without angular chelitis)	Local measures- denture cleansers, remove dentures at night Soak dentures in Chlorhexidine mouthwash 2% Topical antifungals if local measures fail - Nystatin (oral suspension) 500,000-1,000,000U q6h-8h (to continue for 2 days after perioral symptoms disappeared or cultures show eradication of candida sp.)		Am Fam Physician. 2008;78(&):845-852 Journal of Oral Microbiology 2011,3:5771-DOI:10.3402/jom.v3i0.5771 Med Oral Patol Oral Cir Bucal. 2011 Mar 1:16(2):el 39-43 Australia Dental Journal 2010; 55:(1 suppl):48-54
3. 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) Epstein-Barr virus Eg : Infectious mononucleosis, oral hairy leukoplakia Varicella-zoster virus Coxsackie virus -Herpangina -Hand, foot and mouth disease	Symptomatic treatment in most cases. Can also consider: Systemic antiviral Acyclovir 400mg PO 5 times daily for 7 days (for immunocompromised patient only) OR Acyclovir 5mg/kg IV q8h for 5 days for severe infection or immunocompromised patients OR Acyclovir 10mg/kg IV q8h for 10-21 days for varicella zoster in immunocompromised and simplex encephalitis		Aust Dent J 2005;50 Suppl 2: S31-S35

OBSTETRICS & GYNEACOLOGICAL INFECTIONS

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	
Septic Abortion	Cefuroxime 750mg IV q8h PLUS Metronidazole 500mg IV q8h	Augmentin 1.2gm IV q8h PLUS Gentamicin 3 - 5mg/kg IV q24h PLUS Metronidazole 500mg IV q8h	Intravenous antibiotics are administered until the patient has improved and been afebrile for 48 hours, then are typically followed by oral antibiotics to complete a 10- to 14-day course.
Intrapartum prophylaxis for Group B Strep., positive mothers (more than 18 hours) 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 3gm IV initial dose, then 1.5gm IV q4h until delivery.	Ampicillin 2gm IV initial dose, then 1gm IV q4h until delivery. **Mild Penicilin Allergy:** Cefuroxime 1.5gm IV initial dose, then 750mg IV q8h until delivery If life threatening (anaphylactic): Erythromycin Lactobionate 500mg IV q6h (infusion) **Severe Penicillin Allergy** Vancomycin 15-20 mg/kg IV q8-12h until delivery **OR** Clindamycin 900mg IV q8h until delivery OR (if susceptible)	Prophylaxis begins at hospital admission for labor or rupture of membranes and continued every four hours until the infant is delivered. Treatment is NOT INDICATED if C-section performed before onset of labour with intact membrane (please use standard surgical prophylaxis) Antenatal treatment is **NOT RECOMMENDED** for GBS cultured from a vaginal or rectal swab.
Preterm Premature Rupture of Membranes (PPROM)	Erythromycin ethylsuccinate (EES) 400mg PO q12h for 10 days		
Premature Rupture of Membranes (PROM) More than 18 hours	Benzylpenicillin 3gm IV stat, then 1.5gm IV q4h until delivery		
Chorioamnionitis	Cefuroxime 1.5gm IV stat, and 750mg IV q8h PLUS Metronidazole 500mg IV q8h	Ampicillin/Sulbactam 1.5gm IV q8h **Mild penicillin allergy:** Cefazolin 2gm IV q8h PLUS	Duration – 7days (can be converted to oral once patient able to tolerate orally)

Infection / Condition & Likely Organism	Suggested Treatment		Comments
		Gentamicin 5mg/kg IV q24h **Severe penicillin allergy:** Clindamycin 900mg IV q8h	
Pelvic Inflammatory Disease Common organisms: *Neisseria gonorrhoeae* *Chlamydia trachomatis* *Bacteroides* sp *Enterobactericiae* *Haemophilus influenza* *Streptococcus* sp *especially Streptococcus agalactiae (*GBS*)* *Gardnerella vaginalis* *Ureaplasma urealyticum* *Mycoplasma hominis*	**Outpatient therapy (for mild to moderate disease)** Ceftriaxone 250mg IM in a single dose PLUS Doxycycline 100 mg PO q12h for 14 days PLUS Metronidazole 400 mg PO q8h for 14 days	Ceftriaxone 250mg IM in a single dose PLUS Azithromycin (1gm once per week for 2 weeks)	
	IV Therapy (for moderate to severe disease): Cefuroxime 1.5gm IV q8h OR Ceftriaxone 2gm IV q24h PLUS Doxycycline 100mg PO q12h PLUS Metronidazole 500mg IV/PO q8h Duration of treatment is 14 days	Ampicillin/Sulbactam 3gm IV q6h PLUS Doxycycline100mg PO q12h	
Endometritis	**Non-pregnancy:** Cefuroxime 1.5gm IV q8h OR Ceftriaxone 2gm IV q24h PLUS Doxycycline 100mg PO q12h PLUS Metronidazole 500mg IV/PO q8h **Post-partum endometritis:** Cefuroxime 1.5g stat and 750mg IV q8h PLUS Metronidazole 500mg IV q8h	Ampicillin/Sulbactam 3gm IV q6h PLUS Doxycycline100mg PO q12h Ampicilin/sulbactam 3gm IV q6h	Duration of treatment: 7 days

Infection / Condition & Likely Organism	Suggested Treatment		Comments
Vaginitis Bacterial vaginosis	Metronidazole 400mg PO q8h for 7 days	Clindamycin 300mg PO q12h for 7 days	Meta-analysis has not found any relationship between metronidazole exposure during the first trimester of pregnancy and birth defects and the CDC no longer discourage the use of metronidazole in the first trimester.
Candidiasis Uncomplicated infection Candida Albicans Complicated infection 1. Severe vaginitis symptoms 2. Recurrent vulvovaginal Candidiasis	Clotrimazole 500mg as a single vaginal pessary (Stat dose) Fluconazole 150-200mg PO q72h for 3 doses then weekly for 6 months	Fluconazole 150-200mg PO for one dose Clotrimazole 500mg vaginal suppository once weekly for 6 months	Pregnancy: Treat with topical therapy if indicated as oral therapy is **CONTRAINDICATED**
Trichomoniasis Trichomonas vaginalis	Metronidazole 2gm PO as single dose OR Metronidazole 400mg PO q8h for 7 days	In Pregnancy: Metronidazole 400mg PO q8h for 7 days	If post-partum and breastfeeding, not advisable to breastfeed during treatment. May resume breastfeeding after 24 hours of the last dose. Screen other STIs Sexual contact(s) should be treated simultaneously and patients should be advised to abstain for at least one week until they and their partner(s) have completed treatment and follow-up. Any partners within the 4 weeks prior to presentation should be screened for the full range of STIs and treated for TV. TOC only recommended if the patient remains symptomatic following treatment, or if symptoms recur. **Higher-dose of metronidazole is required if failing second regimen.

Infection / Condition & Likely Organism	Suggested Treatment		Comments
Cervicitis	Azithromycin 1gm single dose	Doxycycline 100mg PO q12h for 7 days	
Postpartum mastitis Common organisms: *Staphylococcus aureus (MSSA)* *Streptococcus pyogenes* (Grp A, B) *Escherichia coli* *Bacteroides* sp *Corynebacterium* sp *CoNS*	**Outpatient** Cephalexin 500mg PO q6h for 5-7 days **Inpatient** Cloxacillin 2gm IV q6h	Cefazolin 1-2gm IV q8h	Duration of therapy for 5-7 days may be adequate but if poor response consider extending to 10-14 days. Milk culture for less severe infection if severe infection (hemodynamic instability) blood cultured required.
Post episiotomy tear	**1st and 2nd degree tear:** Antibiotic not required **3rd and 4th degree tear:** Cefuroxime 1.5gm IV as single dose	**Penicillin allergy** Clindamycin 600mg IV as single dose	
Manual removal of placenta	Cefuroxime 1.5gm stat and 750mg IV q8h for 2 doses (1day), then Cefuroxime PO 250mg q12h for 6 days PLUS Metronidazole 500mg IV q8h for 1 day then PO Metronidazole 400mg q8h for 6 days (total 7 days course)	Cefazolin 2gm IV as single dose	
Post Lower Segment Caesarean Section (LSCS) infection	In mild surgical site infection (SSI), antibiotic is generally not indicated. Appropriate dressing is the primary treatment.		
	Cloxacillin 2gm q6h OR Cefazolin 1-2gm IV q8h	Risk of Gram negative or anaerobic infection (eg: Diabetes): Ampicillin/sulbactam 3gm IV q6-8h	
Acute Uncomplicated Cystitis	Refer to Urinary Tract Infections Section		
Recurrent Urinary Tract Infection	Refer to Urinary Tract Infections Section (Depending on culture sensitivity)		

INFECTIONS IN IMMUNOCOMPROMISED PATIENTS

A5.i HAEMATOLOGY - ONCOLOGY

1. Any infection in the immunocompromised host is life-threatening and needs immediate attention. Febrile neutropenia is defined as a temperature of >38.3°C on a single occasion or >38°C for 2 hours and ANC (Absolute Neutrophil Count) <500 cells/uL or <1000 cells/uL in those with anticipated declining counts.

2. Cultures maybe 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. Potential pathogens are dependent on the underlying defect, e.g.

Neutropaenia	Gram –ve organisms, Gram +ve organisms, Fungi
Hypogammaglobulinaemia **Post splenectomy/hyposplenic patients**	Encapsulated organisms
Defective cellular immunity	Pneumocystis jirovecii,Toxoplasma, Fungi, Viruses, Mycobacteria

4. The use of growth factors e.g. G-CSF may be considered as prophylactic use if the risk of febrile neutropenia is ≥ 20% due to chemotherapy which is used for treatment of hematological or solid tumour malignancy. The prophylactic use of growth factors significantly reduced the relative risk for severe neutropenia, febrile neutropenia and infection. It should be considered in high-risk patients with ANC<100/uL multiple organ dysfunction syndrome, pneumonia, invasive fungal infections or septic shock or patients with reduced bone marrow reserve due to extensive radiotherapy. However, there is no evidence that either G-CSF reduced the number of patients requiring intravenous antibiotics or lowered infection related mortality.

5. Attention must be paid to:
    a. Strict isolation measures.
    b. Patient's personal hygiene and diet.
    c. Modification of antibiotic regime if deterioration of clinical status or if there is no clinical improvement over 72-96 hours in a stable patient.
    d. 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 ≥ 0.5x109/l. (*refer to comment on low risk (out patient))
    e. Regular surveillance culture.
    f. Handwashing and strict aseptic technique.
    g. Venous cannula must be inspected daily for signs of phlebitis and changed every 72 hours or when necessary. Central devices are to be removed if there is clinical deterioration in spite of appropriate antibiotics for 48-72 hours, tunnel or pocket infections (implanted port system), atypical mycobacterial infection and candidemia

SUGGESTED EMPIRICAL ANTIBIOTIC THERAPY IN ADULT FEBRILE NEUTROPENIC PATIENTS

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:

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	
Low Risk (Outpatient)	Amoxicillin/clavulanate 625mg PO q8h **PLUS/MINUS** *Ciprofloxacin* 500mg PO q12h		Treat till counts > 0.5 x 109/L 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. *Add ciprofloxacin if patient is previously colonized by *Pseudomonas aeruginosa*

High Risk (Inpatient)

Risk assessment for complication of severe infection should be done during triage. Patient are deemed high risk if there is:
- prolonged and profound neutropenia with ANC <0.1x109/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 cultures. The suggested antibiotics are listed below.
Consider switch from intravenous to oral antibiotic in a clinically stable patient who has no gastrointestinal absorption issue.

Infection / Condition & Likely Organism	Suggested Treatment	Comments	Infection / Condition & Likely Organism
	Preferred	Alternative	

First line therapy	*Piperacillin/tazobactam 4.5gm IV q6-8h **PLUS/MINUS** **Amikacin 15mg/kg IV q24h	Cefepime 2gm IV q8h **PLUS/MINUS** **Amikacin 15mg/kg IV q24h **PLUS/MINUS** ***Metronidazole 500mg IV q8h	*Piperacillin/tazobactam: If given as q8h, to be given as extended infusion (over 3-4 hours). **Amikacin may be added in patient with severe sepsis for broader gram negative coverage. It can be discontinued if microbiological cultures showed isolated organisms sensitive to Piperacillin/tazobactam or Cefepime and patient is clinically stable. ***Metronidazole may be added in the presence of: - severe mucositis - intra-abdominal infections - peri-anal abscesses - colitis
Severe sepsis **or** **Second line therapy for persistent fever of 4 - 7 days and deterioration of clinical signs**	Meropenem 1gm q8h **PLUS/MINUS** *Vancomycin 15-20mg/kg (actual body weight) IV q8-12h; not to exceed 2gm/dose	Imipenem 500mg q6h or 1gm q8h (in severe sepsis) IV **PLUS/MINUS** *Vancomycin 15-20mg/kg (actual body weight) IV q8-12h; not to exceed 2gm/dose	*Vancomycin loading dose refer to Appendix 1 *Vancomycin is not a routine in the initial antibiotic regime. Consider add vancomycin for 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.
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 empirical therapy based on local availability and costs.

Voriconazole is an alternative to amphotericin B for preemptive and directed therapy for invasive aspergillosis.

In candidiasis, echinocandins, azoles and amphothericin B are antifungals of choice.

ANTIFUNGAL AGENT	**DAILY DOSE**
ABCD ***(amphotericin B colloidal dispersion)***	3-4mg/kg (6mg/kg/day for IA) q24h
ABLC ***(amphotericin B lipid complex)***	5mg/kg q24h
Ampho B deoxycholate ***(conventional)***	0.7-1.0mg/kg q24h
Liposomal ampho B	3-5mg/kg q24h
Anidulafungin	200mg loading dose, followed by 100mg q24H
Caspofungin	70mg loading dose, followed by 50mg q24h
Micafungin	100mg q24h
Fluconazole	12mg/kg/day on Day 1, then 6mg/kg q24h
Itraconazole	200mg q8h for 3 days, followed by 200mg q12h
Posaconazole	800mg (syrup), 300mg (tablet) q12h for 1 day, followed by 300mg q24h
Voriconazole	6mg/kg q12h for 2 doses, followed by 3-4 mg/kg q12h

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	
For patients on fluconazole or no antifungal prophylaxis, if - new clinical signs or symptoms suggestive of invasive fungal infections (IFI)* - fever persists ≥7days with no identified fever source	Micafungin 100mg IV q24H	Anidulafungin 200mg IV single dose, then 100mg IV q24H **OR** Caspofungin 70mg IV single dose, then 50mg 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.
If signs and symptoms suggestive of invasive fungal infections (IFI)* AND Sinus ± chest CT suggestive of fungal infection.	Voriconazole 6mg/kg IV q12H for 2 doses, then 4mg/kg IV q12H	*Amphotericin B deoxycholate 0.7-1mg/kg IV q24H **OR** *Liposomal Amphotericin B 3-5mg/kg IV q24H	*For patients on voriconazole or posaconazole as prophylaxis, empirical antifungal of choice will be Amphothericin B.

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A5.ii OPPORTUNISTIC INFECTIONS (OI) IN PATIENTS WITH HUMAN IMMUNODEFICIENCY VIRUS (HIV)

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	
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 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)**			
Treatment	Trimethoprim/Sulfamethoxazole 15-20mg/kg/day [TMP component] IV/PO in 3-4 divided doses	**<u>For mild to moderate cases:</u>** **(PO_2 70-80mmHg)** Clindamycin 600mg IV/PO q8h **PLUS** Primaquine 30mg (base) PO q24h **OR** Dapsone 100mg PO q24h **PLUS** Trimethoprim 15mg/kg/day PO in 3-4 divided doses **<u>For severe cases:</u>** **(PO_2 < 70mmHg)** *Pentamidine 4mg/kg/day IV (in 1 pint D5% or NS run over 1-2 hours) **OR** Clindamycin 600mg IV q6h or 900mg IV q8h **PLUS** Primaquine 30mg (base) PO q24h	Duration: 21 days Patients with severe disease should receive corticosteroids as soon as possible (within 72 hours of starting PCP treatment): **<u>Prednisolone dose:</u>** 40mg PO q12h for 5 days, then 40mg PO q24h for 5 days, then 20mg PO q24h for 11 days (Total duration is 21 days) Trimethoprim/sulfamethoxazole Clindamycin has excellent bioavailability, may switch to PO after clinical improvement. Patients given dapsone or primaquine should be tested for G6PD deficiency. *Requires DG's Approval

Infection / Condition & Likely Organism	Suggested Treatment		Comments
Prophylaxis **(primary and secondary)** Indications: • CD4 count <200 cells/µL • CD4 count 200-250 cells/µL if ART cannot be initiated	Trimethoprim/sulfamethoxazole (80/400mg) 1–2 tablets PO q24h	Dapsone 100mg PO q24h **OR** *Aerosolized Pentamidine 300mg 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. *Requires DG's Approval
Toxoplasma Gondii Encephalitis			
Acute Infection (up to 97% patients are Toxo IgG +ve)	Trimethoprim/sulfamethoxazole 10mg/kg/day (TMP component) IV/PO in 2 divided doses	*Pyrimethamine 200mg PO loading dose followed by Pyrimethamine: • 50mg PO q24h (if BW≤60kg) • 75mg PO q24h (if BW>60kg) **PLUS** Folinic acid 10-25mg IV/PO q24h **PLUS** Clindamycin 600mg IV/PO q6h **OR** *Sulfadiazine 1gm PO q6h	Duration: At least 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. *Pyrimethamine & Fansidar® (Sulfadoxine/Pyrimethamine) can be used interchangeably depending on availability; however Fansidar is associated with higher incidence of adverse drug reactions. 1 tab of Fansidar equals to 25mg of Pyrimethamine. *Requires DG's Approval
Suppressive/ Maintenance Therapy	Trimethoprim/ Sulfamethoxazole (80/400mg) 2 tablets PO q12h	Dapsone 100mg PO q24h **OR** Clindamycin 600mg PO q8h **PLUS** *Pyrimethamine 50mg PO twice-weekly	**Discontinuation:** Consider when CD4 >200 cells/µL if HIV RNA is suppressed for 6 months with ART. *Requires DG's Approval

Infection / Condition & Likely Organism	Suggested Treatment		Comments
		PLUS/MINUS Folinic acid 10-25mg PO twice-weekly **OR** *Sulfadiazine 0.5-1gm PO q6h **PLUS** *Pyrimethamine 25-50mg PO q24h **PLUS** Folinic acid 10-25mg PO q24h	
Primary Prophylaxis <u>Indications:</u> Toxoplasma IgG +ve with CD4<100	Trimethoprim/ Sulfamethoxazole (80/400mg) 2 tablets PO q24h	Dapsone 50mg PO q24h **PLUS** *Pyrimethamine 50mg PO once weekly **PLUS** Folinic acid 25mg PO once weekly **OR** Dapsone 200mg PO once weekly **PLUS** *Pyrimethamine 75mg PO once weekly **PLUS** Folinic Acid 25mg PO once weekly	**Discontinuation:** CD4>200 cells/µL for >3months CD4>100 cells/µL, if HIV viral load suppressed for 3 to 6 months *Requires DG's Approval
Mucocutaneous Candidiasis			
Oropharyngeal (oral thrush)	Nystatin suspension 500,000units PO 4-5 times daily **OR** *Itraconazole 200mg PO q24h	Fluconazole 100mg PO q24h	Duration: 7-14 days Chronic suppressive therapy is usually not recommended. *Itraconazole: Absorption depends on gut acidity. Take capsule with food and acidic beverage (eg: Cola drinks). Avoid PPIs and H2 blockers. Significant drug-drug interaction with p450 enzyme inducers (eg: Rifampicin). Consider fluconazole if in doubt.

Infection / Condition & Likely Organism	Suggested Treatment		Comments
Oesophageal	Itraconazole 200mg PO q24h	Fluconazole 200-400mg PO/IV q24h **OR** Amphotericin B deoxycholate 0.6mg/kg IV q24h	Duration: 14-21 days Candidiasis is the most common cause of oesophagitis with HIV infection, but CMV, HSV and aphthous ulcerations can present with similar complaints. Endoscopy required with unusual presentations or lack of response to azole within several days.
Vulvovaginal	Refer to section (Obstetrics & Gynaecology Infections)		
Cryptococcal meningitis or meningoencephalitis (*Cryptococcus neoformans)*			
Induction therapy	*Amphotericin B deoxycholate 0.7-1mg/kg IV q24h **PLUS** Flucytosine 25mg/kg PO q6h	*Amphotericin B deoxycholate 0.7-1mg/kg IV q24h **PLUS** Fluconazole 800-1200mg IV/PO q24h (may be given in divided dosing)	Duration: At least 2 weeks *The lipid formulations (Amphotericin B lipid complex 5mg/kg or liposomal 3-4mg/kg IV q24h) may be used instead if available. For severe/recurrent infection, please refer to ID physician.
Consolidation therapy (continued after successful induction therapy; defined as substantial clinical improvement and negative CSF culture after repeat LP)	Fluconazole 400mg PO/IV q24h (if Flucytosine used in induction therapy) OR 800mg PO/IV q24h (if Fluconazole used in induction therapy)	Itraconazole 200mg PO q12h	Duration: 8 weeks
Maintenance Therapy (continued after consolidation therapy)	Fluconazole 200mg PO q24h	Itraconazole 200mg PO q24h for patients intolerant or failed fluconazole (however less effective and higher relapse rate)	**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

Infection / Condition & Likely Organism	Suggested Treatment		Comments
Secondary prophylaxis	Fluconazole 200mg PO q24h		**Restarting secondary prophylaxis:** CD4 count <100 cells/µL
Cryptococcosis (localized non-meningeal disease)			
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 400mg PO q24h for 6-12 months Then, consolidation: Fluconazole 400mg PO q24h for 8 weeks Then, maintenance (secondary prophylaxis): Fluconazole 200mg q24h	*Itraconazole 200mg PO given q8h for 3 days Then, consolidation: Itraconazole 200mg PO given q12h for 8 weeks Then, maintenance (secondary prophylaxis): Itraconazole 200mg q24h	**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. *Itraconazole: Absorption depends on gut acidity. Take capsule with food and acidic beverage (eg: Cola drinks). Avoid PPIs and H2 blockers.
Severe pulmonary or extra-pulmonary non-CNS Disease	Treat as per cryptococcal meningitis		
References: 1. WHO Guidelines for the Diagnosis, Prevention and Management of Cryptococcal Disease in HIV-Infected Adults, Adolescents and Children, March 2018. (Supplement to the 2016 Consolidated Guidelines on the Use of Antiretroviral Drugs for Treating and Preventing HIV Infection) 2. The BMJ Best Practices: HIV-related opportunistic infections			
Histoplasmosis (*Histoplasma capsulatum*)			
Moderate to severe disseminated disease or CNS involvement	**Induction therapy** *Amphotericin B deoxycholate 0.7-1.0mg/kg IV q24h for at least 2 weeks followed by **Maintenance therapy** Itraconazole 200mg PO q8h for 3 days, then 200mg q12h for at least 12 months		*The lipid formulations of amphotericin B may be used instead if available. All the triazole antifungals have the potential to interact with certain ARV agents and other anti-infective agents.
Mild disseminated disease (Blood culture positive but patient is asymptomatic)	**Induction & maintenance therapy** *Itraconazole 200mg PO q8h for 3 days, then 200mg PO q12h	**For patients intolerant to Itraconazole:** Fluconazole 800mg PO q24h **OR** Voriconazole 400mg PO q12h on day 1, then 200mg PO q12h	Duration: At least 12 months *Itraconazole: Absorption depends on gut acidity. Take capsule with food and acidic

Infection / Condition & Likely Organism	Suggested Treatment		Comments
			beverage (eg: Cola drinks). Avoid PPIs and H2 blockers.
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 200mg PO q24h	Fluconazole 400mg 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 *Itraconazole: Absorption depends on gut acidity. Take capsule with food and acidic beverage (eg: cola drinks). Avoid PPIs and H2 blockers.
Penicilliosis (*Penicillium/Talaromyces marneffei*)			
Acute infection (Severely-ill patients)	**Induction therapy** *Amphotericin B deoxycholate 0.6-0.7mg/kg IV for 2 weeks Must be followed by consolidation therapy	Voriconazole 6mg/kg IV q12h on day 1, then 4mg/kg IV q12h for at least 3 days Must be followed by consolidation therapy.	*The lipid formulations of amphotericin B may be used instead if available All the triazole antifungals have the potential to interact with certain ARV agents and other anti-infective agents. **Itraconazole: Absorption depends on gut acidity: • Capsule: Take with food and acidic beverage (eg: cola drinks)
	Consolidation therapy **Itraconazole 200mg PO q12h for 10 weeks Must be followed by maintenance therapy	Fluconazole 400mg PO q12h for 10 weeks Must be followed by maintenance therapy	
Acute infection (Mild disease)	**Itraconazole 200mg PO q12h for at least 8-12 weeks Must be followed by maintenance therapy	Fluconazole 400mg PO q12h for at least 8-12 weeks Must be followed by maintenance therapy	• Liquid preparation: Take on empty stomach • Avoid PPIs and H2 blockers
Maintenance therapy/ Secondary prophylaxis	**Itraconazole 200mg PO q24h	Fluconazole 400mg PO q24h	**Discontinuation:** CD4 count >100 cells/μL for ≥6 months on ART
Mycobacterium tuberculosis infection and diseases			

Infection / Condition & Likely Organism	Suggested Treatment		Comments
Refer to (Ministry of Health's CPG on Management of Tuberculosis)			
***Mycobacterium Avium* Complex (MAC) Disease**			
Treatment	Clarithromycin 500mg PO q12h **PLUS** Ethambutol 15mg/kg PO q24h ****PLUS/MINUS** <u>3rd/ 4th drug:</u> Amikacin 10-15mg/kg IV q24h **OR** Streptomycin 15mg/kg IM q24h **OR** Levofloxacin 500mg PO q24h **OR** Ciprofloxacin 500-750mg PO q12h	*Azithromycin 500mg PO q24h **PLUS** Ethambutol 15mg/kg PO q24h ****PLUS/MINUS** <u>3rd/ 4th drug:</u> Amikacin 10-15mg/kg IV q24h **OR** Streptomycin 15mg/kg IM q24h **OR** Levofloxacin 500mg PO q24h **OR** Ciprofloxacin 500-750mg PO q12h	Duration: At least 12 months *Azithromycin: use if drug interaction or intolerance precludes the use of clarithromycin. **Addition of 3rd/4th drug should be considered for patients with disseminated disease, CD4 count <50 cells/µL or in the absence of effective ART. **Discontinuation:** Consider if patient is on ART and viral load is suppressed, CD4 >100 cells/µL >6 months, asymptomatic of MAC, and has completed >12 months of therapy.
Maintenance/ Secondary Prophylaxis **Primary Prophylaxis** **<u>Indications:</u> CD4 < 50 cells/µL Ruled out active MAC and TB**	Same as the treatment regimen Azithromycin 1250mg PO once weekly	 Clarithromycin 500mg PO q12h	**Restarting secondary prophylaxis:** CD4 <100 cells/µL again. **Discontinuation:** Consider if patient is on ART **AND** Viral load is suppressed, CD4 >100 cells/µL ≥ >3 months
Cytomegalovirus (CMV) Disease			
Treatment (CMV Retinitis) (Immediate Sight-Threatening Lesions (Adjacent to the Optic Nerve or Fovea))	Intravitreal injections of Ganciclovir (2mg/injection) biweekly until scarring **PLUS** Ganciclovir 5mg/kg IV q12h for **OR** Valganciclovir 900mg PO q12h Followed by maintenance	Intravitreal injections of Foscarnet (2.4mg/injection) biweekly until scarring **PLUS** Ganciclovir 5mg/kg IV q12h **OR** Valganciclovir 900mg PO q12h Followed by maintenance	Duration: 14-21 days Immune recovery is essential for successful treatment. Start ART within 2 weeks if possible

Infection / Condition & Likely Organism	Suggested Treatment		Comments
Treatment (CMV Retinitis) **(For Small Peripheral Lesions)**	Ganciclovir 5mg/kg IV q12h Followed by maintenance	Valganciclovir 900mg PO q12h Followed by maintenance	
Treatment (Extraocular CMV diseases) **(Oesophagitis, colitis, interstitial pneumonitis, neurological disease)**	Ganciclovir 5mg/kg IV q12h Followed by maintenance	May consider switch to Valganciclovir 900mg PO q12h once patient tolerate orally (in CMV oesophagitis and colitis only) Followed by maintenance	Duration: 21-42 days or until signs and symptoms have been resolved Immune recovery is essential for successful treatment. Start ART within 2 weeks if possible
Maintenance/ Secondary prophylaxis **(CD4 <100 cells/µL)**	Ganciclovir 5mg/kg IV q24h 5–7 times weekly	Valganciclovir 900mg 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.
Herpes Simplex Virus (HSV) Infections			
Refer to section (Sexually Transmitted Infection)			
Varicella-Zoster Virus (VZV) Diseases			
Refer to section (Skin and Soft Tissue Infection (SSTI))			
Bacterial Enteric Infections			
Salmonellosis **Salmonella non-typhi**	Ciprofloxacin 500-750mg PO or 400 mg IV q12h **OR** Ceftriaxone 2gm IV q24h	Ampicillin 2gm IV q4-6h **OR** Trimethoprim/sulfamethoxazole (80/400mg) 2 tablets PO or 2 ampoules IV q12h	Susceptibility profile may help guide final choice. Duration: If CD4≥200: 7-14 days. If CD4< 200 and with bacteraemia: 6 weeks. Longer course with debridement and drainage needed for persistent bacteraemia or metastatic disease.

Infection / Condition & Likely Organism	Suggested Treatment	Comments

	Preferred	Alternative	
Rhodococcus infections (Rhodococcus equi, formerly *Corynebacterium equi*)			
Induction Treatment	*Vancomycin 15-20mg/kg (actual body weight) IV q8-12H; not to exceed 2gm/dose **PLUS (antibiotics with intracellular activity)** Azithromycin 500mg stat and then 250 mg IV/PO q24h **PLUS** Ciprofloxacin 500-750mg PO q12h or 400 mg IV q8-12h **OR** Levofloxacin 500-750mg IV/PO q24h	**Addition of 4th drug should be considered in non-responding patients or CNS involvement: ****4th drug:** Imipenem/Cilastatin 500mg IV q6h	Duration: 4-8 weeks Adjust antibiotics according to susceptibility data. Use at least two susceptible agents. *Consider Vancomycin loading dose 25-30mg/kg for critically ill/septic patient to achieve faster steady state. Aim trough of 15-20mcg/mL.
Maintenance/ Secondary prophylaxis	Azithromycin 250mg PO q24h **PLUS** Ciprofloxacin 500-750mg PO q12h **OR** Levofloxacin 500-750mg PO q24h	*Rifampicin 600mg PO q24h **PLUS** Azithromycin 250mg PO q24h **OR** Ciprofloxacin 500-750mg PO q12h **OR** Levofloxacin 500-750mg PO q24h	Duration: Until CD4>200 cells/µL *Alternative regime can be used if concomitant tuberculosis can be ruled out.

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	
PML (Progressive Multifocal Leucoencephalopathy)			
Polyoma virus JC virus (JCV)	No effective therapy exists		With ART, some patients improve and others stabilize. Few may deteriorate due to immune reconstitution
Isospora Belli Infection			
Initial Therapy	Trimethoprim/sulfamethoxazole (160/800mg) IV/PO q6h	Pyrimethamine 50-75mg PO q24h **PLUS** Folinic acid 10-25mg PO q24h **OR** Ciprofloxacin 500mg PO q12h	Duration: 10 days
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 400mg PO q12h for 2-4 weeks **PLUS** Symptomatic treatment of diarrhoea (The best treatment option is ART and fluid support)		Effective ART (to increase CD4 >100 cells/µL) can result in complete, sustained clinical, microbiological and histologic resolution.

Infection / Condition & Likely Organism	**Suggested Treatment**		**Comments**
	Preferred	**Alternative**	
Syphilis (*Treponema pallidum* Infection)			
Refer to section (Sexually Transmitted Disease)			
Bartonellosis			
For Bacillary Angiomatosis, Peliosis Hepatis, Bacteraemia, and Osteomyelitis	Doxycycline 100mg PO q12h **OR** Erythromycin 500mg PO/IV q6h	Azithromycin 500mg PO q24h **OR** Clarithromycin 500mg 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 100mg PO/IV q12h **PLUS/MINUS** Rifampicin 300mg PO/IV q12h **OR** Erythromycin 500mg PO/IV q6h		

	PLUS/MINUS Rifampicin 300mg PO/IV q12h		
Confirmed *Bartonella* Endocarditis	refer to section (Cardiovascular infections)		

References:
1. Guidelines for the Prevention and Treatment of Opportunistic Infections in HIV-Infected Adults and Adolescents by panel members of National Institutes of Health (NIH), the Centers for Disease Control and Prevention (CDC) and HIV Medicine Association of the Infectious Disease Society of America (HIVMA/IDSA) 2017.
2. The BMJ Best Practices: HIV-related opportunistic infections
3. The Sanford Guide to Antimicrobial Therapy (updated 16/02/2018)
4. The John Hopkins POC-IT ABX Guide 2000-2017
5. European AIDS Clinical Society Guidelines

C. SOLID TRANSPLANT

For infections related to renal transplant – please refer to the MOH Renal Replacement Therapy Guidelines

OCULAR INFECTIONS

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	**Alternative**	
Dosage alterations in Ophthalmology NAG: Dose alteration may be needed for systemic and intravitreal antibiotics in paediatric patients.			
Blepharitis Common organisms: Staphylococcus aureus Staphylooccus epidermidis	Eyelid hygiene/scrubs is the mainstay of therapy Oxytetracycline with Polymyxin B eye ointment applied q12h to the lid margin	Fusidic Acid 1% eye ointment applied q12h to the lid margin	
Meibomian Gland Dysfunction	Systemic therapy is not indicated as an initial therapy	In resistant cases: *Doxycycline 100mg PO q12h for 4-6 weeks OR Tetracycline 250mg PO q6h for 4-6weeks or as necessary	*Tetracyclines are contraindicated in children <8 years. The option would be Erythromycin Ethylsuccinate 30-50mg/kg/day PO q6h
Internal Hordeolum with Secondary Infection Staphylococcus aureus Systemic antibiotics are indicated in the presence of superficial cellulitis or abscess.	Warm compresses Cloxacillin 500mg PO q6h for 5 days	Amoxicillin 500mg PO q8h for 5 days	Systemic antibiotics are indicated in the presence of superficial cellulitis or abscess.
External Hordeolum (Stye) Staphylococcus aureus In the presence of superficial cellulitis or abscess	Epilation of affected eye lash and warm compresses Cloxacillin 500mg PO q6h for 5 days	Amoxicillin 500mg PO q8h for 5 days OR Amoxicillin/clavulanate 625mg PO q8h	Systemic antibiotics are indicated in the presence of superficial cellulitis or abscess.
Bacterial Conjunctivitis Common organisms: Staphylococcus aureus Streptococcus pneumonia Haemophilus influenzae	Chloramphenicol 0.5% eye drop q6h OR Ciprofloxacin 0.3% eye drop q6h	Moxifloxacin 0.5% eye drop q6h OR Levofloxacin 0.5% eye drop q6h	

Gonococcal Conjunctivitis (including neonates) *Neisseria Gonorrhoea*	Requires systemic therapy. Refer to Sexually Transmitted Infections & Neonatal Infection Sections		Copious irrigation with topical saline drops or artificial tears every 30-60 minutes Topical antibiotics may be considered as ancillary therapy.
Chlamydial Conjunctivitis (including neonates) *Chlamydial Trachomatis*	Requires systemic therapy. Refer to Sexually Transmitted Infections & Neonatal Infection Sections		Topical antibiotics are not indicated
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	*Cefuroxime 5% eye drop q1-2h Or Ceftazidime 5% eye drop q1-2h PLUS *Gentamicin 0.9% or 1.4% eye drop q1-2h	*Prepared extemporaneously using injectable forms
Contact Lens Related Bacterial Keratitis	Ciprofloxacin 0.3% eye drop q1-2h OR Levofloxacin 0.5% eye drop q1-2h	*Gentamicin 0.9% or 1.4% eye drop q1-2h PLUS *Ceftazidime 5% eye drop q1-2h	*Prepared extemporaneously using injectable forms
Bacterial Keratitis Gram-Positive Cocci Gram-Negative Rods	 Moxifloxacin 0 .5% eye drop q1-2h Ciprofloxacin 0.3% eye drop q1-2h OR Levofloxacin 0.5% eye drop q1-2h	 *Cefuroxime 5% eye drop q1-2h For MRSA: * Vancomycin 5% eye drop q1-2h *Gentamicin 0.9% or 1.4% eye drop q1-2h PLUS *Ceftazidime 5% eye drop q1-2h	*Prepared extemporaneously using injectable forms
Acanthamoeba Keratitis	*Chlorhexidine 0.02% eye drop q1-2h PLUS **Propamidine isethionate 0.1% eye drop q1-2h		*Prepared ready to use extemporaneously using injectable forms **Requires DG's Approval
Fungal Keratitis	*Fluconozole 0.2% eye drop q1-2h OR *Amphotericin B 0.15%-0.2% eye drop q1-	***Voriconazole 1% eye drop q1-2h OR **Natamycin 5% eye drop q1-2h	*Prepared ready to use extemporaneously using injectable forms **Requires DG's Approval

	2h	**Oral Therapy:** May be considered in the absence of contraindications Fluconozole 200mg PO q24h OR Ketoconazole 200mg PO q24h	
Herpes Simplex Keratitis **Herpes Simplex Type 1 & 2**	Acyclovir 3% eye ointment 5 times/day		
	In presence of stromal or endothelial disease: Acyclovir 400mg PO 5 times/day for 7-14 days		
	Prophylaxis for recurrent cases: Acyclovir 400mg PO q12h for 12 months		
Herpes Zoster Ophthalmicus Herpes Zoster Virus	Needs systemic therapy. Refer to Skin & Soft Tissue Infections Section		
Ocular Toxoplasmosis Toxoplasma gondii	Trimethoprim/sulfamethoxazole (80/400mg) TMP 10mg/kg/q24h in 2 divided doses for at least 6 weeks	Pyrimethamine 25-50mg PO q24H PLUS Folinic acid 10-25mg PO q24H PLUS Azitromycin 500mg PO q24h OR Clindamycin 300mg PO q6h for 3-4 weeks, then 150mg q6h PO for 3-4 weeks	Pregnancy : May consider Intravitreal Clindamycin 1.0mg/0.1ml Systemic steroids are usually indicated in immunocompetent patients.
	Prophylaxis for recurrent lesions: Trimethoprim/sulfamethoxazole 80/400mg q12h PO for 3 times a week		
Acute Retinal Necrosis *Herpes Simplex*	Acyclovir 10mg/kg/dose IV q8h (not more than 800mg) for 10-14 days **FOLLOWED BY** Acyclovir 800mg PO 5 times/day for 6 weeks	* Valacyclovir 1gm PO q8H 6 weeks	**Requires DG's Approval Systemic steroid is indicated depending on location or severity of the infection.

CMV Retinitis	Systemic therapy: Ganciclovir 5mg/kg IV q12h for 2-3 weeks	Systemic therapy: ** Valganciclovir: 900mg PO q12h for 3 weeks (induction) followed by 900mg PO q24h (maintenance)	Maintenance may need to continue until CD4 count is >150 cells/mm3 for 3 consecutive months.
	Intravitreal therapy: Intravitreal Ganciclovir 2mg/0.1ml biweekly	Intravitreal therapy: **Intravitreal Foscarnet 2.4mg/0.1ml (1-2weekly)	Intravitreal therapy is indicated in zone 1 and 2 lesions. Intravitreal to be tapered according to clinical response. Ganciclovir implant: 4.5gm an option for prolonged usage of intravitreal Ganciclovir. **Requires DG's Approval
Ocular Syphilis Treponemap Pallidum	Ocular Syphilis (syphilitic uveitis) should be treated as Neurosyphilis Refer to Sexually Transmitted Infections Section		Referral to Dermatologist/ID Physician
Ocular Tuberculosis Mycobacterium Tuberculosis	Needs systemic therapy. Refer to Ministry of Health's CPG on Management of Tuberculosis (Extra pulmonary TB) Ethambutol may cause optic neuropathy and should 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 maybe 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 steroid maybe indicated but is only for -non-active systemic TB

			- immunocompetent patients - severe ocular inflammation developing after starting anti-TB treatment and - vision threatening condition Systemic steroids should not be started ALONE without anti-TB treatment.
Post Operative Bacterial Endophthalmitis	**Intravitreal antibiotic injections** Vancomycin 1-2mg/0.1ml PLUS Ceftazidime 2mg/0.1ml	Intravitreal antibiotic injections: Vancomycin 1-2mg/0.1ml PLUS Amikacin 0.4mg/0.1ml	Systemic antibiotics are indicated in severe, virulent endophthalmitis Repeat intravitreal antibiotics after 48 to 72 hours if indicated *Prepared ready to use extemporaneously by injectable forms
	Topical treatment-options: - *Ceftazidime 5% eye drop - *Vancomycin 5% eye drop - *Gentamycin 1.4% eye drop - Moxifloxacin 0.5% eye drop - Levofloxacin 0.5% eye drop (monotherapy or combination)		
	Systemic treatment: Ciprofloxacin 750mg PO q12h for 10 days For culture negative cases: ADD Clarithromycin 250-500mg PO q12h for 7-14 days	Systemic treatment: Moxifloxacin 400mg PO q24h for 10 days (caution in children) OR Vancomycin and Ceftazidime IV	
Post Operative Fungal Endophthalmitis	Intravitreal therapy: Intravitreal Amphotericin B 0.005mg/0.1ml	Intravitreal therapy: **Intravitreal Miconazole 0.01mg/0.1ml OR **Intravitreal Voriconazole 50ug-100ug/0.1ml	Intravitreal and Systemic therapy are indicated in all cases *Requires DG approval
	Systemic therapy: Fluconazole 200mg PO q24h for 6 weeks (minimum)	Systemic therapy: ** Voriconazole 200mg PO q12h	

Endogenous Endophthalmitis **Systemic treatment**	Systemic therapy: Ciprofloxacin 750mg PO q12h for 10 days For culture negative cases: ADD Clarithromycin 250-500mg PO q12h for 7-14 days	Systemic therapy: Moxifloxacin 400mg PO q24h for 10 days (caution in children) OR Vancomycin and Ceftazidime IV	Treatment is based on primary infection (bacterial/fungal etc) 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. *Prepared ready to use extemporaneously by injectable forms
	Topical treatment-options: • *Ceftazidime 5% eye drop • *Vancomycin 5% eye drop • Gentamycin 0.3% eye drop • Moxifloxacin 0.5% eye drop • Levofloxacin 0.5% eye drop (monotherapy or combination)		
	Intravitreal antibiotic injections: Vancomycin 1-2mg/0.1ml PLUS Ceftazidime 2mg/0.1ml	Intravitreal antibiotic injections: Vancomycin 1-2mg/0.1ml PLUS Amikacin 0.4mg/0.1ml	
Ocular Melioidosis	For ocular manifestations of Melioidosis, refer to treatment of Melioidosis infection.		
Ocular Bartonellosis	For ocular manifestations of Bartonella, refer to treatment of Bartonella infection.		
Ocular Leptospirosis	For ocular manifestations of Leptospira, refer to treatment of Leptospira infection.		
Dacryocystitis	Cefuroxime 250mg PO q12h	Amoxicillin/clavulanate 625mg PO q8h	Consider intravenous antibiotics in severe infections. Duration: 7 days
Preseptal Cellulitis	Amoxycillin/Clavulanate 625mg PO q8h for 7 days	Ceftriaxone 1-2gm IV q24h	Consider intravenous antibiotics in severe infections

Orbital Cellulitis/abcess	Amoxicillin/clavulanate 1.2gm IV q8h for 7-10 days Or Cefuroxime 750mg IV q8h If Anaerobes suspected: ADD Metronidazole 500mg IV q8h for 7-10 days	Ceftriaxone 1-2gm IV q24h for 7-10days	Duration: 7-10 days

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OTORHINOLARYNGOLOGY INFECTIONS

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	
General Sore Throat			
The modified Centor score can be used to help physicians decide which patients need no testing, throat culture/rapid antigen detection testing, or empiric antibiotic therapy. The cumulative score determines the likelihood of streptococcal pharyngitis and the need for antibiotics **Criteria / Score / Age / Score** **Absence of cough** 1 — 3 to 14 years 1 **Swollen and tender anterior cervical lymph nodes** 1 — 15 to 44 years 0 **Temperature > 100.4° F (38° C)** 1 — 45 years and older -1 **Tonsillar exudates or swelling** 1 **Cumulative score** **0 or 1** — Low risk — Do not require testing or antibiotic therapy **2 or 3** — Testing recommended. Positive results warrants antibiotics. If test not available, antibiotics maybe considered **4 or more** — High risk — Empiric therapy may be considered References : A clinical score to reduce unnecessary antibiotic use in patients with sore throat. CAN MED ASSOC J • JAN. 13, 1998			
1. Throat And Upper Respiratory			
Tonsillitis / Pharyngitis Group A Streptococcus	Phenoxymethylpenicillin (Pen V) 500mg PO q6h or 1gm PO q12h for 5-10 days **OR** Benzathine Penicillin 1.2MU IM, one single dose **Inpatient:** Benzylpenicillin (Penicillin G) 2MU IV STAT, 1.5MU IV q6H	Amoxicillin 500mg PO q8h for 5-10 days **OR** Ampicillin/Sulbactam 375mg PO q12h for 5-10 days **Penicillin Allergy:** Erythromycin Ethylsuccinate 800mg q12h for 5-10 days	Antibiotics should be prescribed in suspected/proven bacterial infections, only as sore throats are common viral in origin.
Acute Peritonsillar Abscess Group A Streptococcus	Ampicillin/sulbactam 3gm IV q6h	Amoxicillin/clavulanate 625mg PO q8h	Abscess to be drained

Infection / Condition & Likely Organism	Suggested Treatment		Comments
Staphylococcus aureus Haemophilus influenza Fusobacterium necrophorum	OR Amoxicillin/clavulanate 1.2gm IV q8h OR Benzylpenicillin 2MU IV q6h PLUS Metronidazole 500mg IV q6-8h for 10-14 days	OR Phenoxymethylpenicillin (Pen V) 500mg PO q6h PLUS Metronidazole 500mg PO q6h OR Clindamycin 300-450mg PO q6h <u>Penicillin Allergy:</u> Clindamycin 600mg IV q8h	
Diphteria Corynebacterium diphtheriae	Antitoxin PLUS Erythromycin Lactobionate 500mg IV q6h followed by Erythromycin Ethylsuccinate 800mg PO q12h for total of 14 days OR Benzylpenicillin 50,000 units/kg to a maximum of 1.2 MU IV q12h followed by Phenoxymethylpenicillin (Pen V) 250mg PO q6h total of 14 days		***Diphtheria Antitoxin:** **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 toxin rapidly
Acute Epiglottitis Haemophilus influenzae Type b, Streptococcus pneumoniae	Ceftriaxone 2gm IV q24h OR Ampicillin/Sulbactam 3gm IV q6h **Oral step down therapy:** Amoxicillin/Clavulanate 625mg PO q8h for 7 – 14 days	**Penicillin Allergy:** Clindamycin 600-900mg IV q8h PLUS Ciprofloxacin 400mg IV q12h	Urgent hospitalisation. May present with life threatening upper airway obstruction, especially in paediatrics Consider adding Vancomycin for patients with moderate to severe sepsis, meningitis or previously colonized with MRSA.
Deep Neck Space Abscess Streptococcus pyogenes Staphylococcus aureus Fusobacterium necrophorum	Ampicillin/sulbactam 3gm IV q6h OR Ceftriaxone 2gm IV q24h PLUS Metronidazole 500mg IV q6h		Duration: 10 – 14 days. If methicillin-resistant S aureus (MRSA) is suspected, change to vancomycin 15mg/kg IV q12h

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	OR Clindamycin 600mg IV q8h only		
2. Rhinology			
Acute Bacterial Rhinosinusitis (ABRS) Streptococcus pneumoniae, Haemophilus influenzae, Moraxella catarrhalis Severe infection requiring hospitalization:	Amoxicillin 500mg PO q8h for 5-10 days OR Amoxicillin/clavulanate 625mg PO q8h for 5-7 days OR Ampicillin/Sulbactam 375mg PO q12h *If no improvement after 3 days of oral antibiotic, refer ENT.	**Penicillin allergy:** Doxycycline 100 mg q12h for 5-7 days Pregnant patients with penicillin allergy would need to be treated with Azithromycin 500mg PO q24hr for 3 days	Consider antibiotic if present at least 3 of below:[4] • Purulent/ greenish nasal discharge • Severe local pain (VAS 8-10) • Fever • Elevated ESR/CRP • Double sickening (becoming worse after initial recovery) VAS: Visual Analogue Score. The patient is asked: "How troublesome are your symptoms?" Not troublesome (0) to Worst thinkable troublesome (10)
3. Otology			
Acute otitis media (AOM) Streptococcus pneumoniae, Haemophilus influenzae Moraxella catarrhalis	***For non-severe AOM:** Amoxicillin 500mg PO q8h for 5days If symptoms not improved in 48-72 hours, treat as severe AOM ****For severe AOM or perforated tympanic membrane:** Amoxicillin/clavulanate 625mg PO q8h for 5 days OR Ampicillin/Sulbactam 375mg PO q12h	**<u>Penicillin Allergy:</u>** Azithromycin 500mg PO on day 1, followed by 250mg PO q24h until day 5	***Non-severe AOM:** • Mild otalgia • Temp <39ºC May consider 48-72hours of observation with symptomatic therapy before prescribing antibiotic. ****Severe AOM:** • Moderate to severe otalgia • Temperature >39ºC If symptoms not resolving after 48-72hours, refer ENT.
Malignant Otitis Externa/ Necrotizing Otitis Externa Pseudomonas aeruginosa	Ciprofloxacin 400mg IV q8h OR Ceftazidime 2gm IV q8h followed by Once showing clinical response, consider switching to oral therapy:		

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Ciprofloxacin 750mg PO q12h for 6 weeks		
Acute Diffuse Otitis Externa P. aeruginosa Staph aureus	Ofloxacin 0.3% otic solution Instill 10 drops into affected ear(s) once daily for 7 days		Aural toileting required in discharging ears
Chronic Suppurative Otitis Media P. aeruginosa Staph aureus	Ofloxacin 0.3% otic solution Instill 10 drops into affected ear(s) twice daily for 10-14 days		Aural toileting required in discharging ears
Otomycosis Aspergillus sp.	Clotrimazole 1% ear solution, applied twice daily for 10 to 14 days		Aural toileting required.

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RESPIRATORY INFECTIONS

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	
LOWER RESPIRATORY TRACT INFECTIONS			
1. 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) • CURB-65 is a clinical prediction rule that has been validated for predicting mortality in CAP. i. Confusion ii. BUN > 7 mmol/l iii. Respiratory rate of ≥ 30 BPM iv. Blood pressure ≤ 90/60 mmHg v. Age ≥ 65 Score 0-1 : Manage Outpatient (unless patient has co-morbidity or has difficult social circumstances) Score 2 and above : Consider Admission • Physicians should use CURB-65 prediction tools to support, not replace clinical judgments.			
Outpatient	Amoxicillin 500mg PO q8h for 5-7 days	Amoxicillin/clavulanate 625mg PO q8h for 5-7 days **OR** Doxycycline 100mg PO q12h for 7 days	
Inpatient (CURB ≥2)	Amoxicillin/clavulanate 1.2gm IV q8h for 5-7 days **PLUS** Azithromycin 500mg IV/PO q24h for 3-5 days	Ceftriaxone 2gm IV q24h for 5-7 days **PLUS** Azithromycin 500mg IV/PO q24h for 3-5 days **<u>Penicillin Allergy</u>** **Levofloxacin 500-750mg IV/PO q24h for 5-7 days	Penicillin allergy refer to Appendix 8 **Levofloxacin should be strictly reserved for penicillin allergy due to higher risk of adverse events. To switch to oral therapy when clinical condition improves and patient is able to tolerate orally. If suspected melioidosis infection, please refer to the section on tropical infections.
2. VIRAL PNEUMONIA			

Infection / Condition & Likely Organism	Suggested Treatment		Comments
Influenza	Oseltamivir 75mg PO q12h for 5 days		
Varicella zoster	Acyclovir 10mg/kg IV q8h for 7 days		
3. LUNG ABSCESS AND EMPYEMA			
Empirical	Amoxicillin/clavulanate 1.2gm IV q6-8h	Ceftriaxone 2gm IV q24h **PLUS** *Metronidazole 500mg IV q8h **<u>Penicillin Allergy</u>** Clindamycin 600mg IV/PO q6h	Duration of treatment: - Drained abscess / empyema may require 2-4 weeks of antibiotics - Undrained abscess/ Empyema may require 4-6 weeks of antibiotics **Lung empyema:** Attempts should be made to drain the collection. May change to oral regime once clinical improvement seen *Metronidazole: in cases of lung abscess when aspiration is suspected If melioidosis is suspected, please refer to the section on tropical infections. Penicillin allergy refer to Appendix 8
Staphylococcus aureus	Cloxacillin 2gm IV q4-6h	Cefazolin 2gm IV q8h	Duration: 4-6 weeks, depending on clinical response. In rare cases (slow response to antibiotics) may need prolonged therapy. May change to oral therapy (e.g. Amoxicillin/clavulanate 625mg PO q8h) to complete the duration once patient stabilized and improved.
4. INFECTIVE EXACERBATION OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)			

Infection / Condition & Likely Organism	Suggested Treatment		Comments
Antibiotics only considered if there is: Increased purulence in sputum **AND** one of the following: • Increased sputum volume • Increased dyspnoea **OR** Patient intubated (GOLD 2019)			
Outpatient	Amoxicillin/clavulanate 625mg PO q8h for 5-7 days	Cefuroxime 500mg PO q12h for 5-7 days **OR** Doxycycline 100mg PO q12h for 5-7 days	
Inpatient	Amoxycillin/clavulanate 1.2gm IV q8h for 5-7days **PLUS/MINUS** Azithromycin 500mg IV/PO for 3-5 days	Ceftriaxone 2gm IV q24h for 5-7 days **PLUS/MINUS** Azithromycin 500mg IV/PO for 3-5 days	
*If suspect Pseudomonas infection	**Piperacillin/tazobactam 4.5gm IV q6-8h **OR** Cefepime 2gm IV q8h **PLUS/MINUS** Azithromycin 500mg IV/PO for 3-5 days	Ceftazidime 2gm IV q8h **PLUS/MINUS** Azithromycin 500mg IV/PO for 3-5 days	*Pseudomonas sp risk factors: 1. Frequent exacerbation 2. Severe airflow limitation 3. Exacerbation requiring mechanical ventilation Reference: COPD (GOLD) 2019 Guideline **Piperacillin/tazobactam: If given as q8h, to be given as extended infusion (over 3-4 hours).

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	
5. HOSPITAL ACQUIRED PNEUMONIA (HAP/VAP)			
Risk factors for multi-drug resistance (MDR) organisms: 1. Prior intravenous antibiotic use within 90 days 2. More than 5 days of hospitalization in high risk ward (ICU, HDU) 3. Previous colonization with MDR pathogens Risk of MDR organisms is lower with early onset HAP/VAP.			
Early Onset HAP/VAP (2-4 days of admission/intubation)	Amoxicillin/clavulanate 1.2gm IV q8h for 5-7 days	Ceftriaxone 2gm IV q24h for 5-7 days	Need to adjust to local antibiogram/ prevalent organisms
Late Onset HAP/VAP (5 days or more of admission/intubation) Causative organism is determined by local prevalence.	*Piperacillin/tazobactam 4.5gm IV q6-8h for 7 days **OR** Cefepime 2gm IV q8h for 7 days	Imipenem/cilastatin 500mg IV q6h for 7 days **OR** Meropenem 1gm IV q8h for 7 days	Ideal empirical antibiotic coverage depends on local prevalence of organisms. Duration of antibiotics could be shortened to 7 days even for MDR *Pseudomonas aeruginosa* and *Acinetobacter baumanii* infections. Longer duration may be indicated depending upon clinical, radiological and laboratory parameters. To de-escalate antibiotics according to culture and sensitivity results *Piperacillin/tazobactam: If given as q8h, to be given as extended infusion (over 3-4 hours).
6. ASPIRATION PNEUMONIA			
	Amoxicillin/clavulanate 1.2gm IV q8h	Ceftriaxone 2gm IV q24h **PLUS** Metronidazole 500mg IV q8h	Duration: 7- 10 days To switch to oral therapy when clinical condition improves and patient is able to tolerate orally. Antibiotics are not indicated for aspiration (chemical) pneumonitis.

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SEXUALLY TRANSMITTED INFECTIONS

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	
SEXUALLY TRANSMITTED INFECTIONS (STIs) • Ideally diagnosis of STI (apart from syphilis) should be Nucleic Acid Amplification Test (NAAT) based testing. • Contact tracing/partner notification is important in all STIs. • Duration of contact tracing/partner notification depends on the type of STIs			
Syphilis (*Treponema pallidum* Infection)			
Primary Syphilis **Secondary Syphilis** **Early Latent Syphilis** (History of syphilis infection within the last 2 years)	Benzathine Penicillin 2.4MU IM STAT **OR** Procaine Penicillin 600,000units IM q24h for 10 days	**Penicillin Allergy** Doxycycline 100mg PO q12h for 14 days	If drug administration is interrupted for ≥ 1 day at any point during the treatment course, it is recommended that the entire course is restarted. Patients should be warned of possible reactions to treatment: • Jarisch-Herxheimer reaction • Anaphylaxis/Allergy Abstain from sex for 2 weeks after they and their partner(s) have completed treatment. Screen for HIV. All sexual partners should be examined, investigated and treated epidemiologically. Partner notification: Primary syphilis (3 months), Others (6 months – 12 months). Penicillin allergy refer to Appendix 8
Late Latent Syphilis **Gummatous Syphilis** **Cardiovascular Syphilis**	Benzathine Penicillin 2.4MU IM weekly for 3 weeks (Day 1, 8, & 15) **OR** Procaine Penicillin 600,000units IM q24h for 14 days	**Penicillin Allergy** Doxycycline 100mg PO q12h for 28 days	For cardiovascular syphilis: Consider Prednisolone 40-60 mg OD for 3 days starting 24 hours before the antibiotics. If a patient defaults Benzathine Penicillin treatment by ≥ two weeks in between the weekly doses, the whole regime needs to be

Infection / Condition & Likely Organism	Suggested Treatment		Comments
			restarted. Contact tracing and partner notification as above. Penicillin allergy refer to Appendix 8
Neurosyphilis	Benzylpenicillin 4MU q4h IV for 14 days **OR** Procaine Penicillin 2.4MU IM q24h **PLUS** Probenecid 500mg PO q6h, both for 14 days	**Penicillin Allergy** Ceftriaxone 2gm IM or IV q24h for 14 days (if no anaphylaxis to penicillin) **OR** Doxycycline 200mg PO q12h for 28 days	Consider Prednisolone 40-60 mg OD for 3 days starting 24 hours before the antibiotics. CSF examination should be done in: 1. Patients with neurological and/or ocular symptoms or signs. 2. Nontreponemal test titres do not decrease by fourfold within 12 months of therapy. Contact tracing and partner notification as above. ** IM Ceftriaxone – dilute with Lidocaine Penicillin allergy refer to Appendix 8
Syphilis in HIV Primary, secondary, early and late latent and neurosyphilis	Treatment as appropriate for stage of infection	Treatment as appropriate for stage of infection	Perform full neurological examination Contact tracing and partner notification as above.
Syphilis in Pregnancy			
Primary, secondary, early latent	**1st & 2nd Trimesters** **(up to and including 27 weeks):** Benzathine penicillin G 2.4MU IM single dose **3rd Trimester** **(from week 28 to term):** Benzathine penicillin G 2.4MU IM weekly for 2 weeks (Day 1 & 8) **OR**	**<u>Penicillin Allergy</u>** **(All three trimesters)** Ceftriaxone 500mg IM q24h for 10 days **OR** Azithromycin 500mg PO q24h for 10 days **OR**	Tetracycline and Doxycycline are contraindicated in pregnancy Penicillin allergy refer to Appendix 8 <u>If Macrolide therapy:</u> Neonate require assessment and treatment at birth

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	(All three trimesters) Procaine penicillin G 600,000unit IM q24h for 10 days	Erythromycin Ethylsuccinate 800mg PO q6h for 14 days	
Late latent, gummatous, cardiovascular	Treat as for non-pregnant patients (**DO NOT USE DOXYCYCLINE** in pregnancy)		
Neurosyphilis	Treat as for non-pregnant patients with Neurosyphilis (**DO NOT USE DOXYCYCLINE** in pregnancy)		

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	**Alternative**	
Gonorrhoea (*Neisseria Gonorrhoeae* Infection)			
Uncomplicated (Urogenital, Anorectal, Pharyngeal)	Ceftriaxone 500mg IM as a single dose **PLUS** *Azithromycin 1gm PO as a single dose	**<u>β-lactam Allergy:</u>** Gentamicin 240mg IM as a single dose **PLUS** *Azithromycin 2gm PO as a single dose **Pregnancy and breastfeeding:** Ceftriaxone 500mg I.M. as a single dose **PLUS** *Azithromycin 1gm P.O as a single dose	*Azithromycin: Dual therapy to treat for coexisting *Chlamydia trachomatis* infection (35-40%), synergistic effect & reduce cephalosporin resistance Avoid unprotected sexual intercourse for 1 week following treatment (partner(s) need to be treated as well) Test of cure in 2 weeks post treatment with NAAT is advisable Partner notification: Symptomatic partners in last 2 weeks. Asymptomatic partners in last 3 months Sexual partners should be treated for gonorrhoea even though they are asymptomatic. **β-lactam** allergy refer to Appendix 8
Gonococcal Conjunctivitis	IM Ceftriaxone 500mg q24h for 3 days	**<u>Anaphylaxis to Penicillin or established allergy to Cephalosporin</u>** Azithromycin 2gm PO single dose **PLUS** Doxycycline 100mg PO q12h for 7 days **PLUS**	Penicillin or cephalosporin allergy refer to Appendix 8

Infection / Condition & Likely Organism	Suggested Treatment		Comments
		Ciprofloxacin 250mg PO q24h for 3 days	
Epididymitis/ Epididymo-orchitis	**Caused by gonorrhoea and chlamydia:** Ceftriaxone 500mg IM STAT **PLUS** Azithromycin 1gm PO STAT **PLUS** Doxycycline 100mg PO q12h for 14 days **STI related but unlikely gonorrhoea:** Doxycycline 100mg q12h for 14 days **Non-STI related (Enteric organisms)**: Ciprofloxacin 500mg q12h for 10 days		
Disseminated Gonorrhoea	Ceftriaxone 1-2gm IV q24h for 7 days	Cefotaxime 1gm IV q8h for 7 days	May be switched to Ciprofloxacin 500mg PO q12h 24-48hrs after symptoms improve.
Chlamydia Infections (*Chlamydia trachomatis*)			
Uncomplicated (urogenital, pharyngeal and rectal infection)	Doxycycline 100mg PO q12h for 7 days	Azithromycin 1gm PO stat, then 500mg PO q24h for 2 days	Avoid unprotected sexual intercourse for 1 week following treatment (partner(s) need to be treated as well) Test of cure (TOC) is not routinely recommended. Only consider TOC in pregnancy, poor compliance, and persistent symptoms. TOC ideally between 4-6 weeks post treatment with NAAT test Partner notification: Symptomatic partners in last 6 weeks. Asymptomatic partners in last 6 months Sexual partners should be treated for chlamydia even though they are asymptomatic.
Chlamydia in pregnancy	Azithromycin 1gm PO stat, then 500mg PO q24h for 2 days	Amoxicillin 500mg PO q8h for 7 days **OR** Erythromycin Ethylsuccinate 800mg PO q6h	Doxycycline is contraindicated in pregnancy

Infection / Condition & Likely Organism	Suggested Treatment		Comments
		for 7 days	
Non-Gonococcal Urethritis (NGU)			
First episode of Non-gonococcal urethritis (NGU)	Doxycycline 100mg PO q12h for 7 days	Azithromycin 500mg PO STAT then 250mg q24h for 4 days	
Recurrent and persistent Non-gonococcal urethritis (NGU)	**If treated with Doxycycline first line:** Azithromycin 500mg PO stat then 250mg PO q24h for the next 4 days **PLUS** Metronidazole 400mg PO q12h for 5 days **If treated with Azithromycin first line:** Moxifloxacin 400mg PO q24h for 10-14 days **PLUS** Metronidazole 400mg PO q24h for 5 days		Most common cause of recurrent or persistent NGU is *Mycoplasma genitalium*. Also consider infection with *Trichomonas vaginalis* Partner notification: preceding 6 months from diagnosis Abstain from sexual intercourse until has completed therapy and his partner(s) have been treated – at least 1 week Follow-up is recommended after 2-3 weeks TOC in asymptomatic patient not recommended For confirmed *Mycoplasma genitalium* infection, TOC in 3 weeks post treatment is recommended using PCR

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	**Alternative**	
Herpes Simplex Virus Type-1 and 2 (HSV-1 & 2) Infections			
Herpes Genitalis	**First episode:** Acyclovir 400mg PO q8h for 5 days	Valaciclovir 500mg PO q12h for 5 days	Physical supportive measures: saline bathing, analgesia, local anaesthetics and psychological support.

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Recurrent episode: **<u>Short-course</u>** Acyclovir 800mg PO q8h for 2 days **<u>5-day regimens</u>** Acyclovir 400mg PO q8h	Valaciclovir 500mg PO q12h for 3-5 days	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.
Herpes Genitalis **Suppressive therapy:** (Indicated if > 6 recurrences per year, severe, prolonged, or with psychosocial problems)	Acyclovir 400mg PO q12h	Valaciclovir 500mg PO q24h	Duration: All for up to 1 year, then reassess If breakthrough recurrences occur, dosage should be increased (refer: Recurrent episode dose)
Herpes Genitalis in pregnancy First episode	**First or second trimester acquisition (until 27+6 weeks):** Acyclovir 400mg PO q8h for 5 days	Valaciclovir 500mg PO q12h for 5 days	Do not delay treatment whilst awaiting results (HSV PCR recommended) **<u>Third trimester acquisition:</u>** No additional monitoring of the pregnancy is required Continue daily suppressive Acyclovir 400 mg PO q8h until delivery
	Third trimester acquisition (from 28 weeks): Acyclovir 400mg PO q8h for 5 days	Valaciclovir 500mg PO q12h for 5 days	
Suppressive therapy for recurrent Herpes Genitalis in pregnancy	Acyclovir 400mg PO q8h Treatment recommended starting at 36 weeks of gestation until delivery		

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	**Alternative**	
Other Sexually Transmitted Infections			
Chancroid *Haemophilus ducreyi*	Azithromycin 1gm PO in a single dose **OR** Ceftriaxone 250mg IM in a single dose **OR** *Ciprofloxacin 500mg PO q12h for 3 days		Avoid unprotected sexual intercourse until they and their partner(s) have completed treatment and follow-up. Sexual contacts within 10 days before onset

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	**preferred in HIV +ve patients*		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-epithelisation occurs within 7 days after onset of therapy.
Lymphogranuloma Venereum *Chlamydia trachomatis* *Serovars L1,2,3*	Doxycycline 100mg PO q12h for 21 days	Azithromycin 1gm PO weekly for 3 weeks	Fluctuant buboes: Should be aspirated through healthy adjacent skin. Surgical incision contraindicated. Sexual contacts within 1 month prior to patient's symptoms, or the last 3 months of detected asymptomatic LGV, should be examined and tested for chlamydial infection and treated with the same regimen. Should be followed up until symptoms resolve. Routine TOC not necessary if recommended regimen is used and completed. If TOC is required (tetracycline allergy or pregnant), should be performed 2 weeks post completion of treatment.
Granuloma Inguinale (Donovanosis) *Klebsiella granulomatis*	Azithromycin 1gm PO weekly or 500mg q24h **PLUS/MINUS** Gentamicin 1mg/kg IM/IV q8h (in patients whose lesions do not respond in the first few days to other agents)	Doxycycline 100mg PO q12h **OR** Trimethoprim/Sulfamethoxazole 160/800mg PO q12h **OR** Ciprofloxacin 750mg PO q12h **PLUS/MINUS**	**Treatment duration**: for at least 3 weeks or until all lesions completely heal In the absence of any reliable screening test and the long incubation period, all sexual contacts in the last 6 months should be examined for possible lesions by clinical examination. Patients should be followed up until lesions have healed completely.

Infection / Condition & Likely Organism	Suggested Treatment		Comments
		Gentamicin 1mg/kg IM/IV q8h (in patients whose lesions do not respond in the first few days to other agents)	
Trichomoniasis *Trichomonas vaginalis*	Metronidazole 2gm PO in a single dose **OR** 400mg PO q12h for 5 days		Screen other STIs Sexual contact(s) should be treated simultaneously and patients should be advised to abstain for at least one week until they and their partner(s) have completed treatment and follow-up. Any partners within the 4 weeks prior to presentation should be screened for the full range of STIs and treated for TV. TOC only recommended if the patient remains symptomatic following treatment, or if symptoms recur. **Higher-dose of metronidazole is required if failing second regimen.
Treatment failure (Second regimen)	Metronidazole 400mg PO q12h for 7 days		
Bacterial vaginosis Common organisms: Anaerobic bacteria *(*e.g., *Prevotella sp., Mobiluncus sp., Gardnerella vaginalis,* and *Mycoplasma hominis)*	Metronidazole 400mg PO BD for 5-7 days **OR** 2gm PO as single dose	Clindamycin 300mg PO q12h for 7 days	Not an STI but frequently detected during STI screening

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SKIN & SOFT TISSUE INFECTIONS

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	
1. PURULENT SKIN & SOFT TISSUE INFECTION			
Localized Impetigo Common organisms: *Staphylococcus aureus* *Sreptococcus pyogenes*	*Topical 2% Fusidic acid q8-12h for 5 days (Outpatient use only) **OR** Cloxacillin 500-1000mg PO q6h for 5-7 days **OR** Cephalexin 250-500mg PO q6h for 5-7 days		*Only can be used by Dermatologist
Generalised Impetigo/Ecthyma	Cephalexin 250-500mg PO q6h	Amoxicillin/clavulanate 625mg PO q8h	**Duration: 5-7 days**
	Penicillin Allergy: Erythromycin Ethylsuccinate 800mg PO q12h	**Other alternative/in case of CA-MRSA:** Clindamycin 600mg PO q8h **OR** Trimethoprim/sulfamethoxazole 160/800mg PO q12h	Penicillin allergy refer to Appendix 8.
Ecthyma gangrenosum Most common causative organism is *Pseudomonas sp.* however antibiotics need to be tailored according to culture result	Ciprofloxacin 500mg PO q12h **OR** *Piperacillin/tazobactam 4.5gm IV q6-8h	Ceftazidime 2gm IV q8h **OR** Cefepime 2gm IV q8h	Consider adding aminoglycoside in selected cases such as in immunocompromised/neutropenic and septic shock patients. Use synergistic combination therapy with aminoglycosides until susceptibility are known. *Piperacillin/tazobactam if given as q8h to be given as extended infusion (over 3-4 hours).
2. NON-PURULENT SKIN & SOFT TISSUE INFECTION			

Infection / Condition & Likely Organism	Suggested Treatment		Comments
Furuncles	Cloxacillin 500mg PO q6h for 5-7days	Amoxicillin/clavulanate 625mg PO q8h for 5-7days	
Carbuncles Common organism: *Staphylococcus aureus*	Cloxacillin 1-2gm IV q6h	Amoxicillin/clavulanate 1.2gm IV q8h **OR** Cefazolin 1gm IV q8h	Surgical drainage is the mainstay of treatment. **Duration : 7-10 days**
Erysipelas Common organism: *Streptococcus pyogenes*	Phenoxymethylpenicillin 500mg PO q6h **OR** Amoxicillin 500mg PO q8h	Cephalexin 500mg PO q6h	**Duration : 7-10 days**
	If severe: Benzylpenicillin 2-4MU IV q4-6h	**If severe:** Cefazolin 1gm IV q8h **OR** Cefuroxime 750mg IV q8h	
	MRSA: *Vancomycin 15-20mg/kg q8-12h; not to exceed 2gm/dose		*Vancomycin loading dose refer to Appendix 1
Diabetic Foot Infections	Refer to section Surgical Infection-Bone and Joint Infections		
Gas Gangrene/ Myonecrosis / Necrotizing Fasciitis	Refer to section Surgical Infection-Bone and Joint Infections		
Yaws ***Treponema pertenue***	Benzathine Penicillin 1.2 MU IM Single dose	Doxycycline 100mg PO q12h for 15 days **OR** Azithromycin 30mg/kg (max 2gm) single dose **<u>Penicillin Allergy:</u>** Tetracycline 500mg PO q6h for 15 days **OR** Erythromycin Ethylsuccinate 800mg PO q12h for 15 days	Penicillin allergy refer to Appendix 8
CELLULITIS			

Infection / Condition & Likely Organism	Suggested Treatment		Comments
Mild: Common organisms: *Staphylococcus aureus* & *Streptococcus pyogenes*	Cephalexin 500mg PO q6h	Cefuroxime 250-500mg PO q12h **OR** Amoxicillin/clavulanate 625mg PO q8h	**Duration : 5-10 days according to clinical response** Change to oral once condition improves. Gram negative coverage may be necessary in the following circumstances: 1. Potential relation of the cellulitis to a decubitus ulcer 2. Crepitant cellulitis 3. Prominent skin necrosis/gangrene 4. Location : a. Perioral b. Perirectal cellulitis 5. Clinical condition : a. Septicaemic shock b. Suspecting necrotizing fasciitis 6. Immunocompromised patients. 7. Specific exposures**
Moderate: Common organisms: *Staphylococcus aureus* & *Streptococcus pyogenes*	Cloxacillin 1-2gm IV q6h	Cefazolin 1-2gm IV q8h	
Severe : Common organisms: *Staphylococcus aureus* & *Streptococcus pyogenes*	Ampicillin/sulbactam 3gm IV q6-8h **PLUS/MINUS** Clindamycin 600mg IV q6h (Deescalate once cultures are available/ Necrotizing fasciitis ruled out)	*Piperacillin/tazobactam 4.5gm IV q6-8h **PLUS/MINUS** Clindamycin 600mg IV q6h (Deescalate once cultures are available/ Necrotizing fasciitis ruled out)	
****Consider alternative organisms in the following circumstances:**			
Dog/cat bite: Common organisms: *Pasteurella multocida, Capnocytophaga canimorsus*	Amoxicillin/clavulanate 625mg PO q8h		*** Consider adding 3rd generation cephalosporin in severe infection
Cat scratch disease *Bartonella henselae*	Azithromycin 500mg PO on Day 1, then 250mg PO q24h for 4 days		
Human bite: Common organisms: *Eikenella corrodens*, anaerobes, *Staphylococcus aureus*	Amoxicillin/Clavulanate 625mg PO q8h		
Salt water exposure: Common organism: *Vibrio sp.*	Doxycycline 200mg stat then 100mg PO q12h **PLUS/MINUS** ***Ceftriaxone 2gm IV q24h		

Infection / Condition & Likely Organism	Suggested Treatment		Comments
Fresh or brackish water exposure: Common organisms: *Aeromonas sp., Plesiomonas*	Ciprofloxacin 400mg IV q12h **OR** Ciprofloxacin 750mg PO q12h		*Piperacillin/tazobactam: if given as q8h to be given as extended infusion (over 3-4 hours) Vancomycin loading dose refer Appendix 1 *** **Consider CA-MRSA if:** **1. Outbreak of known CA-MRSA** 2. **If non-resolving cellulitis**
Neutropenic patients: Common organisms: *Pseudomonas aeruginosa*, other Gram negatives	*Piperacillin/tazobactam 4.5gm IV q6-8h	Ceftazidime 2gm IV q8h **OR** Cefepime 2gm IV q8h	
MRSA	Vancomycin 15-20mg/kg IV q8-12h **In severe infections:** To load with Vancomycin 25-30mg/kg IV, followed by 15-20mg/kg (actual body weight) IV q8-12h; not exceeding 2gm/dose	Linezolid 600mg IV/PO q12h	
***If CA-MRSA suspected	Clindamycin 300mg-450mg IV/PO q8h **OR** Doxycycline 100mg PO q12h **OR** Trimethoprim/sulphamethoxazole 160/800 mg PO q12h		
3. PERIPHERAL PHLEBITIS/THROMBOPHLEBITIS			
Common organisms: *Staphylococcus aureus,* Coagulase negative *Staphylococcus* , Gram negative rods	**Early stage phlebitis:** Remove the intravenous cannula		Peripheral intravenous catheters with associated pain, induration, erythema, or exudate should be removed.
	Medium and advanced stage phlebitis or thrombophlebitis: Remove the intravenous cannula and take blood culture Can consider empirical treatment if persistent fever: Cephalexin 500mg PO q6h		

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	OR Cloxacillin 1-2gm IV q6h		
4. BED SORE/PRESSURE SORE/DECUBITUS ULCER			
	Local treatment is preferred. **If there is surrounding cellulitis/signs of bacteremia/fasciitis/surrounding intramuscular abscess/OM changes:** Ampicillin/sulbactam 3gm IV q6-8h		
5. MYCOBACTERIAL INFECTIONS			
Hansen's Disease (Leprosy) ***Mycobacterium Leprae***	**Paucibacillary** Rifampicin 600mg PO monthly (supervised) **PLUS** Dapsone 100mg PO q24h Duration: 6 months (Completion of 6 doses within 9 months) Surveillance: 5 years	***Bacterial resistance or hypersensitivity to first line** Can be substituted with one of the following: Ofloxacin 400mg PO q24h **OR** Minocycline 100mg PO q24h **OR** Clarithromycin 500mg PO q24h **OR** Ethionamide 250mg PO q24h	*Second line can only be initiated by a dermatologist.
	Multibacillary Rifampicin 600mg PO monthly **PLUS** Clofazimine 300mg PO monthly and 50-100mg PO q24h **PLUS** Dapsone 100mg PO q24h Duration: 1 year (if initial BI<4) or 2 years (if BI≥4) Completion of 12 doses within 18 months (BI<4) Completion of 18 doses within 36 months (BI≥4) Surveillance: 15 years		

Infection / Condition & Likely Organism	Suggested Treatment		Comments
Hansen's Disease (Leprosy) in HIV	Same as non HIV patients		
NON-TUBERCULOUS MYCOBACTERIAL INFECTIONS			
Mycobacterium marinum	Clarithromycin 500mg PO q12h **PLUS** Minocycline/Doxycycline 100mg PO q12h Duration: At least 2 months of treatment until clearance	Rifampicin 600mg PO q24h **PLUS** Ethambutol 15mg/kg PO q24h for 4-6 months, and continue for at least 1 month after lesions have been cleared **OR** Monotherapy Doxycyline 100mg PO q12h for 1-2 months after lesion clearance (3-4 months)	Often resistant to Isoniazid.
Mycobacterium kansasii	Isoniazid 300mg PO q24h **PLUS** Rifampicin 600mg PO q24h **PLUS** Ethambutol 15mg/kg PO q24h for 18 months		
Mycobacterium ulcerans (Buruli ulcer)	Rifampicin 10mg/kg PO q24h **PLUS** Streptomycin 15mg/kg IM q24h for 8 weeks	Rifampicin 10mg/kg PO q24h **PLUS** Streptomycin 15mg/kg IM q24h for 4 weeks followed by: Rifampicin 10mg/kg PO q24h **PLUS** Clarithromycin 7.5mg/kg PO q12h	Wide surgical excision and debridement are important. **Duration:** For 4-6 months, and continue for at least 1 month after lesions have been cleared.
Mycobacterium fortuitum/ chelonei	**Combination therapy (2 of the following:** Clarithromycin 500mg PO q12h **OR** Doxycycline/Minocycline 100mg PO q12h **OR** Ciprofloxacin 500-750mg PO q12h		*Amikacin: Started for severe infection until clinical improvement (together with 2 oral agents), then continue with just 2 oral agents.

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	PLUS/MINUS *Amikacin 15mg/kg IV q24h		
6. FUNGAL INFECTIONS			
Tinea capitis *Trichophyton, Microsporum*	Griseofulvin 500mg PO q12h for 6 to 12 weeks or longer till fungal cultures are negative **OR** Terbinafine 250mg PO q24h **PLUS** 2.5% Selenium sulphide shampoo **OR** 2% Ketoconazole shampoo, 2 – 3 times per week for 2 weeks	Itraconazole 200mg PO q24h **OR** Fluconazole 6mg/kg PO q24h Duration is based on mycological agent: *Trichophyton sp* : 2-4 weeks *Microsporum sp* : 8-12 weeks	**Other recommendations:** 1. For kerion, Griseofulvin should be considered as first line unless *Tricophyton* has been cultured as the pathogen. Duration of treatment may be longer. 2. Contacts of patient may be treated with 2% Ketoconazole shampoo 2 – 3 times per week for 2 weeks. 3. Surgical excision is to be avoided. 4. Topical therapy alone is not recommended for the management of tinea capitis. 5. Consider adding oral prednisolone in selected cases.
Tinea barbae	Same as treatment of **Tinea capitis**		
Tinea corporis/ Tinea cruris/ Tinea faciei *Trichophyton, Microsporum, Epidermophyton*	**Mild infections:** Topical imidazoles or allylamines cream/lotion: e.g.: Clotrimazole 1% **OR** Miconazole 2% **OR**		**Recommendations:** 1. In patients with renal or hepatic impairment, caution should be exercised while prescribing systemic antifungals. 2. Terbinafine clearance significantly reduced in patient with renal impairment. Other systemic antifungals

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Ketoconazole **OR** Terbinafine Duration: till clinical clearance with additional 2 weeks		are preferred in these patients. 3. Topical Nystatin should not be used in dermatophytosis as they are not effective against dermatophytes
	Extensive infections: Terbinafine 250mg PO q24h for 2 weeks **OR** Itraconazole 200mg PO q24h for 2 weeks **OR** Griseofulvin 500mg PO q12h or q24h for 4-6 weeks	Fluconazole 150-300mg per week PO for 3-4 weeks	
Tinea manuum/ Tinea pedis *Trichophyton, Microsporum, Epidermophyton*	**First line:** Topical antifungals as mentioned in tinea corporis for 4-8 weeks		**Recommendations:** 1) Topical keratolytic agents can be used in conjunction with antifungals for hyperkeratotic type of tinea pedis/manuum. 2) KMnO4 in 1:10,000 dilution wet dressings, applied for 20 min 2–3 times/day, may be helpful if vesiculation or maceration is present. 3) Systemic antifungals can be prescribed as first line treatment in severe moccasin-type tinea pedis or severe recurrent tinea with blisters.
	Resistant cases: Terbinafine 250mg PO q24h for 2-4 weeks **OR** Itraconazole 200mg PO q24h for 2-4 weeks **OR** Griseofulvin 500mg PO q12h for 6-12 weeks	Fluconazole 150mg/week PO for 4 weeks	
Tinea unguium *Trichophyton, Microsporum, Epidermophyton*	Amorolfine 5% Nail Lacquer weekly application **Duration:** For 6 months (fingernails) For 12 months (toenails) **OR** Pulse Itraconazole 200mg PO q12h for 1 week per month **Duration:** For 2 months (fingernails) For 3 months (toenails)	Griseofulvin 500mg PO q12h **Duration:** For 6 months (fingernails) For 12 months (toenails) **OR** Fluconazole 150mg PO once weekly **Duration:** For ≥ 3 months (fingernails) For 6-12 months (toenails)	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, culture, or PAS Stain. Empirical treatment is not recommended.

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	OR Terbinafine 250mg PO q24h **Duration:** For 6 weeks (fingernails) For 12 weeks (toenails)		
Tinea versicolor *Malassezia Furfur, Pityrosporum Orbiculare*	**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** 2% Ketoconazole 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, Tioconazole 1% cream	Sulfur + 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 200mg PO q24h for 1 week **OR** Fluconazole 150-300mg PO weekly dose for 2 to 4 weeks		

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	**Alternative**	
Candidiasis *Candida albicans*	**Mild cutaneous candidiasis:** Topical Imidazole q12h till clear e.g., Miconazole 2% cream, Clotrimazole 1% cream, Tioconazole 1% cream		Treatment of sexual partner is advisable in case of recurrent infection. *Itraconazole: Absorption depends on gut acidity. Take capsule with food and acidic beverage (e.g.: Cola drinks). Avoid PPIs and H2 blockers.
	Extensive cutaneous candidiasis: *Itraconazole 200mg PO q24h for 1 week	Fluconazole 100mg PO q24h for 1 week (in severe and immunocompromised patients)	

Infection / Condition & Likely Organism	Suggested Treatment		Comments
Subcutaneous Fungal Infections Lymphocutaneous and Cutaneous Sporotrichosis	*Itraconazole 200mg PO q12h until all lesions have resolved (usually for a total of 3–6 months)	**For patients not able to tolerate Itraconazole:** Terbinafine 250mg PO q12h **OR** Fluconazole 400-800mg q24h	In some immunocompromised condition such as AIDS, longer treatment may be necessary. Refer to Opportunistic Infections In HIV Patients. *Itraconazole: Absorption depends on gut acidity. Take capsule with food and acidic beverage (e.g.: Cola drinks). Avoid PPIs and H2 blockers. **Avoid azole in pregnancy
Systemic sporotrichosis (pulmonary, osteoarticular, meningeal, or disseminated sporotrichosis)	Amphotericin B deoxycholate 0.7-1mg/kg q24h for 2 weeks followed by, *Itraconazole 200mg PO q12-24h for 12 months		
Sporotrichosis In Pregnancy**	Tebinafine 250mg PO q24h	Amphotericin B deoxycholate 0.7-1mg/kg q24h	
Cutaneous fungal infection in immunocompromised patients	Refer to treatment of disseminated fungal infection in immunocompromised/HIV patients		Skin biopsy for HPE and culture are advised before commencing treatment.
Aspergillus sp, Scedosporium apiospermum, and Fusarium sp infection	Voriconazole 6mg/kg IV q12h for 2 doses, followed by 4mg/kg IV q12h	Amphotericin B (deoxycholate) 0.7–1mg/kg q24h **OR** Amphotericin B (lipid formulation) 3–5mg/kg q24h	
Cryptococcal infections **1)Mild** **2) Life threatening**	Fluconazole 100–400mg PO q24 h Refer to Treatment of disseminated fungal infection in immunocompromised/HIV patients		
Penciciliosis and life threatening acute severe disseminated Histoplasmosis	Refer to Treatment of disseminated fungal infection in immunocompromised/HIV patients		
7. VIRAL INFECTIONS			
Herpes Simplex Infections	**i) Mild infection:** Acyclovir 400mg PO q8h for 5 days		
	ii) Severe life threatening: Acyclovir 5-10mg/kg IV q8h for 5 days or until able to take orally, then change to oral		

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	iii) Genitalia: Refer to section [Sexually Transmitted Infections]		
Chickenpox (Varicella zoster)	**i) Immunocompetent** Acyclovir 800mg PO 5 times daily for 7 days		Advisable to start treatment early within 48 hours.
	ii) Immunocompromised Acyclovir 10mg/kg IV q8h for 7 days (change to oral once there is an improvement)		
Herpes Zoster	Please refer to varicella zoster treatment		Topical antiviral treatment is not recommended for Herpes Zoster. Systemic antiviral treatment is recommended for all immunocompromised patient or for immunocompetent patients with following criteria: (1) >50 years of age (2) have moderate or severe pain (3) have moderate or severe rash; (4) have non-truncal involvement Advisable to start treatment early within 48-72 hours
8. PARASITIC INFESTATION			
Scabies *Sarcoptes scabiei*	Benzyl Benzoate emulsion 25% (EBB) apply from neck down and leave for 24 hours for 2-3 days **OR** Permethrin 5% lotion/cream apply and leave for 8 hours Repeat application after 1 week		
	In pregnancy/ Immunocompromised: Permethrin 5% lotion/cream apply and leave for 8 hours Repeat application after 1 week		

Infection / Condition & Likely Organism	Suggested Treatment		Comments
Head Lice *Pediculus humanus Capitis*	Permethrin 1% lotion apply to scalp for 10 min and wash off **OR** Malathion 1% shampoo Repeat application after 1 week		
Body Lice/pubic Lice *Pediculus humanus*	Malathion lotion 0.5% for 8-12 hours and wash off **OR** Permethrin 1% cream apply to affected area for 10 min and wash off		

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SURGICAL INFECTIONS

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	
1. GENERAL SURGERY			
ACUTE PANCREATITIS			
Mild to Moderate	No antibiotic		Antibiotic should be given for extra-pancreatic infection, such as cholangitis, catheter acquired infections, bacteremia, urinary tract infections & pneumonia.
Severe Antibiotic mainly indicated for infected pancreatic necrosis. Possible causative organisms: *Eneterobactericiae* *Enterococci* *Staphylococcus aureus* *Streptococcus* *Staphylacoccus epidermis* Anaerobes *Candida spp* (rarely)	*Piperacillin/tazobactam 4.5gm IV q6-8h	Cefoperazone 1-2gm IV q 12 h PLUS Metronidazole 500mg IV q 8h	Modify antibiotics once culture and sensitivity is available. Reserve carbapenem for infections caused by resistant pathogens. *Piperacillin/tazobactam: If given as q8h, to be given as extended infusion (3-4 hours)
Diverticullitis Antibiotic considered for patients with the following: Fever, elevated WBC, patients who failed to respond to conservative management			
Diverticulitis (Not undergoing a source control procedure)	Amoxicillin/clavulanic acid 625 mg PO q8h for 5 days **OR** Ampicillin/sulbactam IV 3gm q6h	**Non-severe penicillin allergy:** Cefuroxime 1.5 gm IV q 8h **PLUS** Metronidazole 500mg IV q 8h	Penicillin allergy refer for Appendix 8
Diverticulitis (Severe infection/life threatening infection)	*Piperacillin/tazobactam 4.5gm IV q 6-8h for 7 days	** **Severe penicillin allergy** Ciprofloxacin 400mg IV q 12 h **PLUS** Metronidazole 500 mg IV q 8h	*Piperacillin/tazobactam: If given as q8h, to be given as extended infusion (3-4 hours) Penicillin allergy refer for Appendix 8
Abscess /Masitis Common organism: *Staphylococcus aureus*	Cloxacillin 1gm IV q6h **OR** Cefazolin 1-2gm IV q 8h	Amoxicillin/clavulanate 625mg PO q8h **OR** Ampicillin/sulbactam 750 mg PO q 12 h **Penicillin Allergy:** Clindamycin 600mg IV q8h	Drainage maybe required for abscess <u>For lactating mastitis:</u> Consider sending breast milk for C&S if not responding after 48 h of initial antibiotic therapy or recurring mastitis. Duration: 10-14 days but shorter courses (5-7days) can be used if the response to therapy

Infection / Condition & Likely Organism	Suggested Treatment		Comments
			is rapid and complete. Penicillin allergy refer to Appendix 8.
Hernia repair with mesh	Refer to section Chemoprophylaxis-Surgical		
Appendicitis Common organisms: *Enterobacteriaceae* *Enterococci* *Bacteroides*	Cefuroxime 1.5gm IV q8h **PLUS** Metronidazole 500mg IV q8h	Ampicillin/ Sulbactam 1.5gm IV q6-8h **OR** Amoxycillin/ Clavulanate 1.2gm IV q8h	Acute appendicitis without evidence of perforation, abscess, or local peritonitis; treatment should be discontinued after 24 hours. For patient with various forms of appendicitis not undergoing a source control procedure, change to early oral therapy. Duration 4-7 days
Perforated Appendix/ Appendicular Mass	Cefuroxime 1.5gm IV q8h Or Cefoperazone 1-2gm IV q12h **PLUS** Metronidazole 500mg IV q8h	Ampicillin/ Sulbactam 1.5-3gm IV q6-8h **OR** Amoxycillin/ Clavulanate 1.2gm IV q8h	Duration 4-7 days
Perforated Viscus Peritonitis	Cefuroxime 1.5gm IV q8h **OR** Cefoperazone 2-4gm/day IV q12h **PLUS** Metronidazole 500mg IV q8h	Ampicillin/ Sulbactam 1.5-3gm IV q6-8h **OR** Amoxycillin/ Clavulanate 1.2gm IV q8h	Duration: 4-7days (if adequate source control, no delay in surgical intervention and patient has rapid clinical recovery)
Abdominal Trauma **Stab Wound** **Suspected bowel or solid organ injury** Common organisms: Gram negative enteric aerobes and anaerobes	Amoxycillin/ Clavulanate 1.2gm IV q8h	Cefuroxime 1.5gm IV q8h **PLUS** Metronidazole 500mg IV q8h	Duration: 4-7days (if adequate source control, no delay in surgical intervention and patient has rapid clinical recovery) *Piperacillin/tazobactam: If given as q8h, to be given as extended infusion (over 3-4 hours)
	Severe infected wound: Cefazolin 2gm IV q8h **PLUS** Metronidazole 500mg IV q8h **OR** * Piperacillin/tazobactam 4.5gm IV q6-8h	Severe infected wound: Ciprofloxacin 400mg IV q 12 h PLUS Clindamycin 450-600mg IV q 8h	

Infection / Condition & Likely Organism	Suggested Treatment		Comments
Anal/Rectal abscess	Amoxycillin/ Clavulanate 1.2gm IV or 625mg PO q8h		Drainage is required. Duration: 4-7days (if adequate source control, no delay in surgical intervention and patient has rapid clinical recovery). Routine antibiotic is not recommended in otherwise healthy patients.
VASCULAR			
Mycotic aneurysm (Initial treatment) Vascular prosthesis infection Common organisms: *Streptococcus pneumoniae* *Staphylococcus aureus* (30%) *Salmonella sp* (50%)	Ceftriaxone 2 gm IV q 24 h	*Piperacillin/tazobactam 4.5gm IV q6-8h	Duration: At least six week (IV then oral based on clinical response and cultures) *Piperacillin/tazobactam: If given as q8h, to be given as extended infusion (over 3-4 hours) Consider adding Vancomycin if suspecting MRSA/CoNS or vascular prosthesis infection If *Burkholderia pseudomallei* is suspected, refer to Tropical Infection section *CRP monitoring upon follow-up
	*** Step down therapy:** Ciprofloxacin 250mg PO q 12 h **OR** Amoxycillin/ Clavulanate 625mg PO q8h		
Ischaemic limb ulcers with infection	Ampicillin/ Sulbactam 1.5gm IV q8h for 7 days (to continue until C&S available)	Amoxycillin/ Clavulanate 1.2gm IV q8h for 7 days (to continue until C&S available)	Duration depends on the extend of the infection (longer is bone is involved)
BITES (penetrating injuries)			
Animal bite Common organisms:	Amoxycillin/ Clavulanate 625mg PO q8h	Doxycycline 100mg PO q12h **PLUS** Clindamycin 300mg PO q6h	Prophylactic duration:3-5 days -Associated crush injury -In the hands or proximity to a joint

Infection / Condition & Likely Organism	Suggested Treatment		Comments
Staphylococcus aureus Streptococcus Gram negative Bacilli Anaerobes Pasturella (50% dog bites and 75% cat bites) *Eikenella corrodens* *Pseudomonas sp*	**If severe/ life threatening:** Ampicillin/ Sulbactam 1.5-3gm IV q6-8h	**If severe/ life threatening:** *Piperacillin/ Tazobactam 4.5gm IV q6h	-Associated edema If wound is infected: 10 days or longer is recommended *Piperacillin/tazobactam: If given as q8h, to be given as extended infusion (over 3-4 hours)
Human bite Common organisms: *Staphylococcus aureus,* Anaerobes *Eikenella* *Strep. (esp viridans)*	Amoxycillin/ Clavulanate 625mg PO q8h	**Penicillin Allergy:** Clindamycin 300mg PO q6h **PLUS** Ciprofloxacin 500-750mg PO q12h **OR** Trimethoprim/ Suphamethoxazole 160/800mg PO q12h	Penicillin allergy refer to Appendix 8.

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2. BONE AND JOINT INFECTIONS

OSTEOMYELITIS

Acute Osteomyelitis Common organisms: *Staphylococcus aureus (80%)*	Empirical coverage: Cloxacillin 2gm IV q 6h	**<u>Penicillin Allergy:</u>** Cefazolin 2gm IV q6-8h	Duration: Initial IV therapy for 2-4weeks followed by oral therapy. Minimum 6 weeks. Modify according to clinical response.

Infection / Condition & Likely Organism	Suggested Treatment		Comments
Group A Streptococcus pyrogenes Rarely gram positive bacilli	To tailor antibiotic according to definitive cultures.		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 Penicillin allergy refer to Appendix 8.
Chronic Osteomyelitis <u>Definition</u> -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 Commonest organism: *Staphylococcus aureus*	Empirical treatment before taking adequate culture is not recommended. Choice of antibiotic depends on C&S result from tissue/bone as swab culture not reliable. Thorough surgical debridement required (removal of dead bone/orthopedic hardware)		Duration: 6 weeks but usually > 3 months. Treat until inflammatory parameters are normal.
			-
SEPTIC ARTHRITIS			

Infection / Condition & Likely Organism	Suggested Treatment		Comments
Acute monoarticular In person who do not have any risk factors for STD (*Staphylococcus/ Streptococcus)*	Cloxacillin 2gm IV q4-6h Duration: Parenteral therapy 2-4 weeks Oral therapy to complete total 4-6 weeks	**<u>Penicillin Allergy:</u>** Cefazolin 2gm IV q 6-8h **OR** Vancomycin 15-20mg/kg (actual body weight)IV q8-12h; not to exceed 2gm/dose	Drainage, debridement and washout of infected joint is important to limit further damage. A shorter duration of therapy is possible in immunocompetent patient who had adequate surgical drainage. Penicillin allergy refer Appendix 8. **Vancomycin: If suspected/confirmed MRSA. Consider loading done 25-30mg/kg for critically ill/septic patient to achieve faster steady state. Empirical therapy wherever possible should be directed by the result of the Gram stain of the joint aspirate
Acute monoarticular In person who have risk factors for STD (Gonorrhea, *Streptococcus / Streptococcus /* gram -ve bacilli)	Ceftriaxone 2gm IV q24h for 1-2 weeks **PLUS** Azithromycin 1gm PO stat **OR** Doxycycline 100mg PO q12h for 7 days	Cefotaxime 2gm IV q8h for 1-2 weeks PLUS Azithromycin 1gm PO stat OR Doxycycline 100mg PO q12h for 7 days	
Polyarticular *Gonorrhoae*	Ceftriaxone 2gm IV q24h for 7 days		

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PROSTHETIC JOINT INFECTIONS

Infection / Condition & Likely Organism	Suggested Treatment		Comments
Prosthetic Joint Infections (Empirical) **Early:** < 3 months after surgery *Staphylococcus aureus* Gram negative bacilli **Delayed onset:** from 3-12 months after surgery Less virulent organism; CONS/Enterococcus/anaerobes **Late onset**:> 12 months after surgery *Staphylococcus aureus* Enterobacteriaceae B hemolytic Streptococcus Anaerobes			**Treatment concept:** 1. Empiric therapy is NOT recommended. 2. Treatment is based on C&S. 3. Rifampicin should never be used alone and should be started only after the clearance of bacteremia. 4. Treatment strategy and duration of treatment depends on surgical strategy.
Definitive Prosthetic Joint Infection treatment Methicillin-sensitive *Staphylococcus aureus* (MSSA)	Cloxacillin 2gm IV q4-6h (IV treatment: 2-6 weeks then stepping down to oral treatment) **OR** Cefazolin 2gm IV q8h **PLUS/MINUS** Rifampicin 450-600mg PO q24h (usually 2-6 weeks)		Duration: 2-6 weeks (according to treatment strategy) Followed by an oral combination therapy according to susceptibility. Rifampicin should be included if implant in situ.

Infection / Condition & Likely Organism	Suggested Treatment		Comments
Definitive Prosthetic Joint Infection treatment Methicillin-resistant *Staphylococcus aureus* (**MRSA)**	Vancomycin 15-20mg/kg IV q12h **PLUS/MINUS** Rifampicin 450-600mg PO q24h (usually 2-6 weeks)		
Diabetic Foot Infections			
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.			
Mild Infections: a. local infection involving skin and SC tissues b. Erythema, less than 2cm around the ulcer c. No systemic signs	Amoxycillin/ Clavulanate 625mg PO q8h **OR** Ampicillin/sulbactam 375-750mg PO q12 h	Cephalexin 500mg PO q6h **PLUS** Metronidazole 400mg PO q8h	Duration: 5-7days
Moderate Infections: a. Deep tissue infection b. Erythema more than 2cm around ulcer c. No SIRS	Ampicillin/ Sulbactam 3gm IV q6-8h	**Penicillin allergy:** Ciprofloxacin 400mg IV q8-12h **PLUS** Clindamycin 600mg IV q8h	Duration: usually 7-14 weeks Modify according to clinical response. If proven osteomyelitis or margin of resection is inadequate: at least 4-6 weeks.

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	If pseudomonas is suspected: **Piperacillin/ Tazobactam 4.5gm IV q6-8h		However, a shorter duration (1-2 weeks) is sufficient if margin of resection is adequate. Penicillin allergy refer Appendix 8. ** Piperacillin/ Tazobactam: If given as q8h, to be given as extended infusion(over 3- 4 hr)
Severe Infections: All of the above 2 or more SIRS -History of previous antibiotics exposure -Recurrent admission -Risk of pseudomonas infection -Immunocompromised	*Piperacillin/ Tazobactam 4.5gm IV q6-8h If given as q8h, to be given as extended infusion(over 3- 4 hr)	Cefepime 2gm IV q8h PLUS Metronidazole 500mg IV q 8h	Surgical debridement is URGENT. Based on intra-operative culture and sensitivity, antibiotic should be streamlined. Duration of treatment: 7-14 days (subjected to clinical improvement) If proven osteomyelitis or margin of resection is inadequate: at least 4-6 weeks. A shorter duration of antibiotics can be considered if the osteomyelitis is fully resected (i.e., amputation with clear margin) • No surrounding soft tissue infection: 5 days • Evidence of soft tissue infection:10-14 days
NECROTIZING FASCITIS			
Type 1 **Polymicrobial infection** Primarily occurs in patients who are immunocompromised or have certain chronic diseases such as diabetes	*Piperacillin/ Tazobactam 4.5gm IV q6h **PLUS/MINUS** **Clindamycin 600-900mg IV q8h	Cefotaxime 2gm IV q8h **PLUS** Metronidazole 500mg IV q8h **OR** **Clindamycin 600-900mg IV q8h **OR** Ampicillin/ Sulbactam 3gm IV q6-8h **PLUS /MINUS** **Clindamycin 600-900mg IV q8h	*Piperacillin/tazobactam: If given as q8h, to be given as extended infusion (over 3-4 hours) **Clindamycin: Only necessary if risk of group A streptococcus/ presence of gas crepticus Immediate aggressive surgical debridement is the primary treatment modality. Repeated surgical debridement for source

Infection / Condition & Likely Organism	Suggested Treatment		Comments
			control are normally necessary. Urgent gram stain. Based on intra-operative culture and sensitivity, antibiotic should be streamlined.
Type 2 **Monomicrobial infection** Group A streptococcus (most common)	Benzylpenicillin 2-4 MU IV q 4h **PLUS** *Clindamycin 600-900mg IV q8h		*Clindamycin: Only necessary if risk of group A streptococcus/ presence of gas crepticus Duration: 7-14 days (subjected to clinical assessment)
Vibrio vulnificus *Aeromonas hydrophilia* Consider in water related injuries and patient with liver cirrhosis and ingestion of raw osyster	Ceftriaxone 1gm IV q 12h **PLUS** Doxycycline 100mg PO q12h		
SOFT TISSUE INFECTION SECONDARY TO GAS PRODUCING ORGANISM			
Common organisms: *Clostridium* spp, Gram -ve organism	Benzylpeniciilin 4MU IV q4h **PLUS** Clindamycin 600-900mg IV q6h **PLUS/ MINUS** *Gentamicin 5mg/kg IV q24h	Cefotaxime 2gm IV q8h **PLUS** Clindamycin 600-900mg IV q6h	Duration: 10-28 days *Gentamicin: if suspects Gram negative infection Early aggressive surgical debridement is essential.
SUPPORTIVE WOUND INFECTIONS, SURGICAL OR TRAUMATIC			
Suppurative wound infections, surgical or traumatic	If there is surrounding cellulitis and/ or systemic symptoms are present: Cloxacillin 500mg PO/IV q6h **PLUS/MINUS** Gentamicin 5mg/kg IV q24h (if gram negative organisms suspected or known to be involved)		Change antibiotics accordingly after C&S result are available Topical antibiotics are not recommended for treatment of would infections as it may result in the emergence of resistant organisms

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	OR As monotherapy: Cefuroxime 1.5gm IV q8h		Patient tetanus immunization status should be assessed in all cases
MUSCULAR, SKELETAL AND SOFT TISSUE TRAUMA, CRUSH INJURIES AND STAB WOUND			
Muscular, skeletal and soft tissue trauma, crush injuries and stab wounds	Cloxacillin 2gm IV q6h **PLUS/MINUS** Metronidazole 500mg IV q8h **PLUS /MINUS** **Gentamicin 5mg/kg IV q24h	Cefazolin 2gm IV q6-8h **OR** Cefuroxime 1.5gm as loading dose, followed by 750mg IV q8h **PLUS** *Metronidazole 500mg IV q8h	*Metronidazole: In soil/rust contamination or heavy machinery **Gentamicin: If there's extensive skin & soft tissue involvement Thorough surgical debridement, soft tissue and fracture stabilization For severe penetrating injuries, especially those involving joints and/or tendons, antibiotics must be given for at least **5 days**
COMPOUND FRACTURES /OPEN FRACTURES			
Compound fractures: Antibiotics are administered as prophylaxis within 3 hours of injuries			
Gustilo 1 & 2 fractures	Cefazolin 1-2gm IV q8h OR Cefuroxime 1.5gm IV q 8h	Amoxycillin/clavulanate 1.2gm IV q 8h	Pre-debridement and post debridement cultures are not representative of actual infection. Duration of antibiotic for open fractures

Infection / Condition & Likely Organism	Suggested Treatment		Comments
Gustilo 3 fractures Mostly nosocomial and gram positive	**As per Gustilo 1 & 2 fractures** **PLUS** *Gentamicin 3-5mg/kg IV STAT **PLUS/MINUS** **Metronidazole 500mg IV q8h		classification: -Gustilo Type 1: Stop after 24 hours -Gustilo Type 2: discontinue after 24 hours to 48 hours -Gustilo Type 3: 24 hours after wound closure or up to maximum of 72 hours (whichever is earlier) * Gentamicin: If initial debridement is expected to last more than 2 hours will need higher dose of gentamicin 5mg/kg IV stat dose. ** Metronidazole: In soil/rust contamination or heavy machinery If soft tissue injury is of concern, to follow antibiotic guide for soft tissue injury

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3. UROLOGY

Pyonephrosis/ Perinephric Abscess / Renal abscess Common organisms: *Enterobactericiae* *Enterococci* *Pseudomonas sp* Staphylococcus aureus	Amoxicyllin/clavulanate 1.2 gm IV q8h **OR** Cefuroxime 750mg IV q 8h **OR** Ampicillin/sulbactam 3gm IV q 6-8h **PLUS/MINUS** Gentamicin 5mg/kg IV q 24 h	Ceftriaxone 1-2gm IV q24h **PLUS/MINUS** Gentamicin 5mg/kg IV q 24 h	Obtain blood and urine culture before starting treatment. Drainage is the mainstay of treatment followed by definitive surgical therapy if warranted. Send pus for culture and sensitivity. Step down to oral antibiotic guided by culture and sensitivity result once can tolerate orally and afebrile > 48 hours

Infection / Condition & Likely Organism	Suggested Treatment		Comments
			following catheter removal. Duration:2-3 weeks(of both IV and oral) Longer course of antibiotic if: -difficult to drain abscess -slow resolution on follow-up imaging
Acute Prostatitis Common organisms: *Enterobacteriaceae* *Enterococci* *Pseudomonas sp* Fever, chills, malaise, myalgia, dysuria, irritative urinary symptoms(frequency, urgency, urge incontinence), pelvic or perineal pain, and cloudy urine	**Outpatient treatment:** Trimethoprim/Sulfamethoxazole 160/800mg PO q12h OR Ciprofloxacin 500mg PO q12 h		Duration: 2 weeks or up to 4 weeks in severe illness or concomitant bacteremia.
	Inpatient treatment: Amoxicyllin/clavulanate 1.2 gm IV q8h **OR** Cefuroxime 750mg IV q 8h **OR** Ampicillin/sulbactam 3gm IV q 6-8h **PLUS/MINUS** Gentamicin 5mg/kg IV q 24 h	Ceftriaxone 1-2gm IV q24h **PLUS/MINUS** Gentamicin 5mg/kg IV q 24 h	
Chronic Bacterial Prostatitis (NIH Type II) Chronic or recurrent urogenital symptoms that persist for at least 3 months. Relapsing UTI with repeated isolation of same organism from urine is the hallmark	Ciprofloxacin 500mg PO q12h for 2 weeks	Trimethoprim/ Sulfamethoxazole 160/800mg PO q12h	Reassess after 2 weeks of antimicrobial therapy. Only continue antibiotics if pre-treatment cultures are positive and/or symptoms improve. Duration: 4-6 weeks
Epididymo-orchitis (Non STD related) Common organisms: *Enterobacteriaceae* *Enterococci* *Pseudomonas sp* Acute onset, usually unilateral scrotal pain swelling with or without fever, rigors, and lower urinary tract symptoms	Ciprofloxacin 500mg PO q12h minimum of 2 weeks		

Infection / Condition & Likely Organism	Suggested Treatment		Comments
Epididymo-orchitis (STD related)	Refer to Sexually Transmitted Infections Section		
Testicular Abscess Common organisms: *Enterobacteriaceae* *Enterococci* *Pseudomonas sp*	Amoxycillin/ Clavulanate 1.2gm IV q8h **OR** Ampicillin/ Sulbactam 1.5gm IV q8h **OR** Cefuroxime 750 mg IV q 8h **PLUS/MINUS** Gentamicin 5mg/kg IV q 24 h	Ceftriaxone 1-2gm IV q24h **PLUS/MINUS** Gentamicin 5mg/kg IV q 24 h	**PLUS** drainage Send pus for culture and sensitivity
Fournier's Gangrene	Refer to Page Necrotizing Fascilitis Section		
4. NEUROSURGERY			
Antibiotic prophylaxis NOT RECOMMENDED for • Basal skull fracture • Traumatic CSF fistula • Post-surgical CSF leak			
Depressed skull fractures	Cefuroxime 1.5 gm IV q 8 h **PLUS** Metronidazole 500mg IV q 8h		Duration: 5-7 days Review tetanus status of patient and consider vaccination.
Penetrating craniocerebral injuries	Ceftriaxone 2 gm IV q 12 h **PLUS** Metronidazole 400mg PO q8h		Duration: 2 weeks initially and then review with microbiology

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TROPICAL INFECTIONS

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	**Alternative**	
1. TYPHOID FEVER (*Salmonella enterica* serovar Typhi and Paratyphi)			
Uncomplicated	Ceftriaxone 50-75mg/kg/24h (2-4 gm/day) IV q12-24h for 5-7 days	Ciprofloxacin 500mg PO q12h for 5-7 days	Ceftriaxone recommended for quinolone resistance. Recommend for early IV to Oral switch once symptoms improve or stable.
Complicated/severe (patients with systemic toxicity, depressed consciousness or organ system dysfunction)	Ceftriaxone 50-75mg/kg/24h (2-4 gm/day) IV q12-24h for 10-14 days **OR** Cefotaxime 40-80mg/kg/24h (2-6 gm/day) IV q8-12h for 10-14 days **PLUS/MINUS** *Dexamethasone 3mg/kg IV loading, then 1mg/kg IV q6h for 2 days	Ciprofloxacin 400mg IV q12h for 10-14 days **PLUS/MINUS** *Dexamethasone 3mg/kg IV loading, then 1mg/kg IV q6h for 2 days	*Indication of Dexamethasone: i) Typhoid psychosis ii) Septic shock and other indications (discuss with ID physician) Recommend for early IV to Oral switch once symptoms improve or stable.
2. CHOLERA *(Vibrio cholerae)*			
Non-Tetracycline resistance	Doxycycline 300mg PO stat	Ciprofloxacin 1gm PO stat	**Indication for antibiotics:** i) Oral or intravenous hydration is the mainstay of cholera treatment. ii) Antibiotics is recommended for severely ill patients, especially who are severely or moderately dehydrated and continue to pass a large volume of stool during rehydration treatment. Antibiotic treatment is also recommended for all patients who are hospitalized and moderate to severe cases.
Tetracycline resistance	Ciprofloxacin 1gm PO stat **OR** *Azithromycin 1gm PO stat	*Erythromycin Ethylsuccinate 800mg PO q12h for 3 days	

Infection / Condition & Likely Organism	Suggested Treatment		Comments
			*Azithromycin/Erythromycin: Recommended alternative for pregnant woman
3. SCRUB TYPHUS (*Orientia tsutsugamushi* (*rickettsia tsutsugamushi*))			
Uncomplicated	Doxycycline 100mg PO q12h for 7 days	*Azithromycin 500mg PO stat	*Azithromycin: Recommended for pregnant woman
Complicated (ARDS, septic shock, myocarditis, meningoencephalitis, hepatitis, renal failure)	*Azithromycin 500mg IV q24h for 5 days	**<u>If not responding to Azithromycin:</u>** Rifampicin 600mg PO q24h for 5 days	*Recommend for early IV to Oral switch once symptoms improve or stable.
4. BRUCELLOSIS			
Brucella melitensis, Brucella abortus, Brucella suis and Brucella canis	Doxycycline 100mg PO q12h for 6 weeks **PLUS** Streptomycin 1gm (15 mg/kg) IM q24h for 2-3 weeks	Doxycycline 100mg PO q12h for 6 weeks **PLUS** Gentamicin 5mg/kg/24h IV for 7 days **OR** Doxycycline 100mg PO q12h for 6 weeks **PLUS** Rifampicin 600-900mg (15mg/kg) PO q24h for 6 weeks **OR** **<u>Recommended alternative for pregnant woman:</u>** Rifampicin 600-900mg (15 mg/kg) PO q24h for 6 weeks **PLUS** Trimethoprim/ Sulphamethoxazole 160/800mg PO q12h for 6 weeks	Longer duration (up to 12 weeks) is required in complicated cases i.e. spondylitis, neurobrucellosis, IE, localized suppurated lesions.
5. LEPTOSPIROSIS (*Leptospira* sp.)			
Mild to Moderate disease	Doxycycline 100mg PO q12h for 5-7 days	Azithromycin 500mg PO q24h for 3 days	

Infection / Condition & Likely Organism	Suggested Treatment		Comments
Severe disease (Leptospiral pulmonary syndrome, multiorgan involvement, sepsis)	Ceftriaxone 2gm IV q24h for 7 days (to deescalate to Benzylpenicillin once symptoms improve/stable) **OR** Benzylpenicillin 1.5MU IV q6h for 7 days		May consider Methylprednisolone 500-1000 mg IV for 3 days if pulmonary haemorrhage present. However, there is insufficient evidence to support the routine use corticosteroid.
6. TETANUS			
Clostridium tetani	Metronidazole 500mg IV q6-8h for 7-10 days **PLUS** Human Tetanus Immunoglobulin 3000-6000IU IM stat **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 3000-6000IU IM stat **PLUS** Anti-tetanus toxoid vaccine IM (initiate age appropriate active immunization at a different site)	Human Tetanus Immunoglobulin 500IU might be as effective as higher doses of 3,000 to 6,000IU and causes less discomfort. All patients with tetanus should undergo wound debridement to eradicate spores and necrotic tissue.
7. MELIOIDOSIS (*Burkholderia pseudomallei)*			
Intensive Therapy (Uncomplicated)	Ceftazidime 100-120mg/kg/24h IV q6-8h (usual dose: 2gm IV q6h) **PLUS/MINUS** *Trimethoprim/ Sulphamethoxazole • < 40 kg: 160/800mg PO q12h • 40-60kg: 240/1200mg PO q12h • >60kg: 320/1600 mg PO q12h		*Add on Trimethoprim/ Sulphamethoxazole in eye, neurologic, testicular, prostatic, pericardium, bone and joint melioidosis. Dose as per eradication therapy. Drainage of abscesses should be attempted where ever appropriate such as prostatic, empyema and pericardium.
Intensive Therapy (Complicated) (Severe melioidosis or neuromelioidosis)	Meropenem 75mg/kg/24h IV q8h (usual dose: 1gm IV q8h; if neurologic, 2gm IV q8h) **OR** Imipenem 50mg/kg/24h IV q6h (usual dose: 500-1000mg q6h) **PLUS/MINUS** *Trimethoprim/ Sulphamethoxazole (to deescalate to Ceftazidime once symptoms improve/stable)		**Duration of intensive therapy:** • Skin, bacteraemia with no foci, mild pneumonia: 2 weeks • Complicated pneumonia, prostatic, deep-seated foci, septic arthritis: 4 weeks • Osteomyelitis: 6 weeks • Neurologic/CNS: 8 weeks To use clinical judgement to guide prolongation of intensive phase if improvement is slow/persistent bacteraemia.

Infection / Condition & Likely Organism	Suggested Treatment		Comments
Eradication/Maintenance Therapy	Trimethoprim/ Sulphamethoxazole • < 40 kg: 160/800mg PO q12h • 40-60kg: 240/1200mg PO q12h • >60kg: 320/1600 mg PO q12h	Amoxicillin/clavulanate • <60kg: 1250mg (2 tabs of 625 mg) PO q8h • >60kg: 1875mg (3 tabs of 625 mg) PO q8h	**Duration of eradication therapy:** • Osteomyelitis, Neurologic/CNS: 24 weeks • Others: minimum 12 weeks
8. MALARIA			
Refer to the Ministry of Health's latest guideline on management of malaria.			

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TUBERCULOSIS INFECTIONS

(Adapted from the Clinical Practice Guidelines For The Management of Tuberculosis, Ministry of Health Malaysia, 3rd edition 2012)

1. Drugs

1.1 First-line AntiTB Drugs

Drug	Recommended Dose			
	Daily		3 times/ week	
	Dose (range) in mg/kg	Max/day In mg	Dose (range) in mg/kg	Max/day in mg
Isoniazid (H)*	5 (4-6)	300	10 (8-12)	900
Rifampicin (R)	10 (8-12)	600	10 (8-12)	600
Pyrazinamide (Z)	25 (20-30)	2000	35 (30-40) **	3000**
Ethambutol (E)	15 (15-20)	1600	30 (25-35) **	2400**
Streptomycin (S)	15 (12-18)	1000	15 (12-18) **	1500**

*Pyrazinamide 10-50mg/day needs to be added.
** Daily treatment is the preferred regimen.

1.2 Fixed-Dose Combination (FDC) Dosing

The two FDCs available in MOH Drug Formulary for adults are:
(i) 4-Drug FDC: Isoniazid 75mg, Rifampicin 150mg, Pyrazinamide 400mg and Ethambutol 275mg tablet
(ii) 3-Drug FDC: Isoniazid 75mg, Rifampicin 150mg and Pyrazinamide 400mg tablet

The recommended dosages for the two FDCs are:

Body weight (kg)	Recommended dose
30-37	2 tabs daily
38-54	3 tabs daily
55-70	4 tabs daily
>70	5 tabs daily

*Pyridoxine 10-50mg/day needs to be added.

1.3 Second-line AntiTB Drugs

Drug	Route	Recommended dose		
		Dose (range) in mg/kg	**Max/day in mg**	**Frequency**
Kanamycin	IV	15-20	1000	OD
Amikacin	IV	15-20	1000	OD
Ethionamide	PO	15-20	1000	OD
p-aminosalicylic acid (PAS)*	PO	150	12000	2-3 equally divided doses
Capreomycin*	IV	15-20	1000	OD
Cycloserine**	PO	15-20	1000	BD
Clofazimine	PO	100-300mg/ day	300	OD
Ofloxacin	PO	15-20	1000	BD (commonly given as 400mg BD)
Levofloxacin	PO	7.5-10	1000	OD (commonly given as 750mg OD)
Moxifloxacin	IV/PO	7.5-10	400	OD

*Requires DG approval
**Pyridoxine 50mg needs to be added for every 250mg of cycloserine.

2. Treatment regimens

Treatment regimens are divided into:
(i) Initial or intensive phase
(ii) Continuation or maintenance phase

2.1 New Case of Pulmonary Tuberculosis (PTB)

- New patients with pulmonary tuberculosis should receive daily 2EHRZ* (2 months of intensive phase), followed by daily 4HR* (4 months of maintenance phase).
- Regimen shpuld contain six months of Rifampicin.
- Rifampicin should be rounded to higher recommended dose if tolerated.
- If Ethambutol is contraindicated, Streptomycin can be substituted.

*The number preceding the treatment regimen refers to the treatment duration in months.

2.2 Treatment of Previously Treated Cases

- Previously treated TB patients include those patients treated as new cases who have taken treatment for more than one month and are currently smear or culture positive again (i.e. failure, relapse, or return after default).
- Drug sensitivity test (DST) must be done for the patients. When the results become available, the drug regimen should be adjusted appropriately.
- Physician with experience in TB management should be consulted for all patients requiring retreatment of TB.

2.3 Extra-pulmonary Tuberculosis

- The regimen of treatment is similar as for pulmonary tuberculosis but the duration may be extended and it varies from 6 months to 12 months or longer.

- All extrapulmonary tuberculosis should be treated with antiTB for a minimum of 6 months except for bone (including spine) and joint tuberculosis for 6-9 months and tuberculosis meningitis for 9-12 months.
- Streptomycin should be used instead of Ethambutol in adult TB meningitis.
- Steroids should be given in tuberculosis meningitis or pericarditis.

2.4 Multi-Drug Resistant Tuberculosis (MDR-TB)

- MDR-TB is defined as *Mycobacterium tuberculosis* infection resistant to both Isoniazid and Rifampicin with or without resistance to other drugs.
- Extensively drug-resistant tuberculosis (XDR-TB) is when the *Mycobacterium tuberculosis* is resistant to Isoniazid and Rifampicin plus resistant to quinolones and at least one second-line aminoglycosides.
- Newly MDR-TB (i.e. not previously treated for MDR-TB), total treatment duration is 20 months for most patients.
- Treatment usually consist of
    - Fluoroquinolone
    - Ethionamide
    - A parenteral agent
    - Pyrazinamide
    - Cycloserine or PAS (if cycloserine cannot be used)

3. Management of Tuberculosis in Special Situations

3.1 Tuberculosis during pregnancy and lactation

- First-line antiTB drugs except Streptomycin are safe for pregnancy and lactation.
- Standard treatment using Isoniazid, Pyrazinamide and Ethambutol is used.
- Streptomycin should be avoided in pregnancy due to foetal ototoxicity.
- Pyridoxine (25mg daily) should be given to all pregnant/lactating women on Isoniazid to prevent foetal neurotoxicity.
- Once active TB in the baby is ruled out, the baby should be given six months Isoniazid prophylaxis, followed by BCG vaccination.

3.2 Tuberculosis and use of oral contraceptive pill

- Rifamycin drugs such as Rifampicin and Rifabutin reduce the contraceptive efficacy of both combined oral contraceptives and progesterone-only pills.
- Alternative contraception methods are recommended during Rifampicin therapy and also up to one month stopping the therapy even if it has been administered for less than a week.

3.3 Tuberculosis in patient with liver impairment

- If baseline ALT is more than three times upper limit of normal before the initiation of treatment, one of the following antiTB regimens should be considered.
    - Two hepatotoxic drugs: 9HRE or 2SHRE/ 6HR
    - One hepatotoxic drug: 2SHE/ 10HE
    - No hepatotoxic drug: 18-24 months of Streptomycin, Ethambutol and Fluoroquinolones
- The more unstable or severe the liver disease, the fewer hepatotoxic drugs should be used.
- Regular monitoring of liver enzymes should be performed in patients with pre-existing liver disease or at risk of drug-induced hepatitis.

3.4 Tuberculosis in patients with renal impairment

- Frequency of Pyrazinamide and Ethambutol should be adjusted.
- Streptomycin should be avoided if possible.

- The usual regime is $2E_3HRZ_3$ / 4HR (The subscript indicates number of doses per week)

3.5 Tuberculosis-HIV Co-Infection

- AntiTB regimen offered to HIV-positive adults should be the same as for the HIV-negative adults.
- Daily treatment should be offered in the maintenance phase.
- Minimum duration of antiTB in HIV-infected adults is 6 months in PTB and 6-12 months in extrapulmonary TB.
- The timing of initiation of HAART in TB patients depends on the type of TB and CD4 counts.

URINARY TRACT INFECTIONS

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	
1. CYSTITIS			
Uncomplicated Cystitis Common organisms: *Escherichia coli* *Staphylococcus saprophyticus* Enterobacteriaceae: *Klebsiella, Proteus* In non-pregnant, pre-menopausal women with structurally and functionally normal urinary tract.	*Nitrofurantoin 50-100mg PO q6h (macrocrystals) or 100mg PO q12h (monohydrate/macrocrystals) **OR** Cephalexin 500mg PO q12h	Cefuroxime 250mg PO q12h **OR** Amoxicillin/clavulanate 625mg PO q8h **OR** Ampicillin/sulbactam 375-750mg PO q12h **OR** **Fosfomycin 3gm PO x 1 dose	Urine culture is indicated only if symptoms unresolved or recur. *Avoid Nitrofurantoin if GFR < 30ml/min. Ciprofloxacin and other quinolones are not recommended as empirical treatment in UTIs due to ; • selection of resistance, and • potential serious adverse events i.e. aortic aneurysm or dissection, tendinopathy or tendon rupture and peripheral neuropathy Consider use of quinolones only in patient with history of anaphylactic reaction to β-lactam antibiotics. **Consider Fosfomycin for patients suspected to have MDR Gram Negative Infection. Duration: 5-7 days
Cystitis in Pregnancy	*Nitrofurantoin 50-100mg PO q6h (macrocrystals) or 100mg PO q12h (monohydrate/macrocrystals)	Cefuroxime 250mg PO q12h **OR** #Amoxicillin/clavulanate 625mg PO q8h	Obtain urine culture before starting treatment and repeat 1-2 weeks after completion of antibiotics to ensure eradication.

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	OR Cephalexin 500mg PO q12h	**OR** Ampicillin/sulbactam 375-750mg PO q12h **OR** **Fosfomycin 3gm PO x 1 dose	Duration: 5-7 days Treat for 7 days if recurrent. *Avoid Nitrofurantoin at third trimester if another option available due to small risk of haemolyticanaemia in newborn. #Amoxicillin/clavulanate is generally safe in pregnancy (Category B), but there may be an increased risk of necrotising enterocolitis associated with use in preterm, premature rupture of membranes. **Consider Fosfomycin for patients suspected to have MDR Gram-negative Infection.
2. PYELONEPHRITIS			
Uncomplicated Pyelonephritis Common organisms: Enterobacteriaceae Enterococci In non-pregnant, pre-menopausal women without urological abnormalities or comorbidities.	**<u>Outpatient treatment :</u>** Amoxicillin/clavulanate 625mg PO q8h for 14 days **OR** Ampicillin/sulbactam 375-750mg PO q12h for 14 days		Obtain urine culture before starting treatment. Perform ultrasound of the upper urinary tract to exclude obstructive pyelonephritis. May step down to oral antibiotic guided by culture and sensitivity result once can tolerate orally and afebrile ≥ 48 hours.
	<u>Inpatient treatment:</u> Amoxicillin/clavulanate 1.2gm IV q8h **OR** Cefuroxime 750mg IV q8h **OR** Ampicillin/sulbactam 1.5-3gm IV q8h	Ceftriaxone 1gm IV q24h	
Pyelonephritis in other categories (eg: Pregnancy)	Treat as In-patient treatment for Uncomplicated Pyelonephritis		
3. OTHER URINARY TRACT INFECTIONS (UTI)			
Complicated UTIs Common organisms: Enterobacteriaceae	**<u>Oral Therapy:</u>** Amoxicillin/clavulanate 625mg PO q8h for 7 days **OR** Cephalexin 500mg PO q6h for 7 days		Obtain urine culture before starting treatment. Treat for 10-14 days in patients with upper

Infection / Condition & Likely Organism	Suggested Treatment		Comments
Enterococci Pseudomonas sp. UTI symptoms in men OR presence of a structural or functional abnormality: - Urinary tract obstruction - Chronic kidney disease - Poorly-controlled type 2 diabetes - Immunosuppression - Urinary catheter in situ - Neurogenic bladder - Post-menopausal women - History of recurrent UTIs - Nephrolithiasis	**<u>Parenteral Therapy:</u>** Amoxicillin/clavulanate 1.2gm IV q8h **OR** Ampicillin/sulbactam 1.5-3gm IV q8h **OR** Cefuroxime 750mg IV q8h **PLUS/MINUS** Aminoglycoside	Ceftriaxone 1gm IV q24h **PLUS/MINUS** Aminoglycoside	tract symptoms, delayed response or sepsis. May step down to oral antibiotic guided by culture and sensitivity result once can tolerate orally and afebrile ≥ 48 hours.
Asymptomatic Bacteriuria (ABU) Urine bacterial growth ≥ 10^5cfu/mL in 2 serial samples in women or a single sample in men without UTI symptoms.	Screening for, and treating asymptomatic bacteriuria is not recommended, except; - in pregnant women, OR - prior to transurethral resection of prostate (TURP) or urological procedures breaching the mucosa *(refer "surgical prophylaxis" for treatment)* Whenever indicated, treatment should be guided by urine culture and sensitivity result.		Duration of treatment for pregnant women: 5-7 days
Catheter-associated UTIs (CA-UTI) Urine colony count ≥ 10^3cfu/mL with at least one sign or symptom compatible with UTI, with no other identifiable source of infection.	Refer to *"Complicated UTIs"*		Routine screening and treating asymptomatic catheterized patients is not recommended. 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. Treat for 10-14 days in patients with delayed response or sepsis.
Prophylaxis for Recurrent Urinary Tract Infections (rUTIs) 2 episodes/6 months OR >3 episodes/year	Nitrofurantoin 50-100mg PO ON (macrocrystals) or 100mg PO ON (monohydrate/macrocrystals) **OR** Cephalexin 250mg PO ON	Trimethoprim/sulfamethoxazole 80/400mg PO ON **OR** Trimethoprim 100mg PO ON	Antimicrobial prophylaxis is indicated if non-antimicrobial measures fail. Post-coital prophylaxis may be appropriate for sexually related rUTIs. Duration: 3-6 months

Infection / Condition & Likely Organism	Suggested Treatment	Comments
#The ORACLE trials demonstrated an increased risk of necrotising enterocolitis in women with preterm, premature rupture of membranes (and to a lesser extent for those with preterm labour) who received Amoxicillin/clavulanate compared to those who did not[13]. A much smaller study also reported an increased risk of necrotizing enterocolitis with Amoxicillin/clavulanate[14], but a retrospective study of Ampicillin/sulbactam+Amoxicillin/clavulanate compared with Cefazolin/Cephalexin/Erythromycin demonstrated no difference in rates of necrotising enterocolitis[15]. Many expert sources do not suggest avoiding Amoxicillin/clavulanate in pregnancy[16-20].		

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SECTION B
PAEDIATRICS

CARDIOVASCULAR INFECTIONS

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	**Alternative**	
1. ACUTE MYOCARDITIS			
Viral (commonest cause) *Enteroviruses* *Adenovirus* *Influenza* *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.
2. ACUTE PERICARDITIS			
Viral (commonest cause) Bacterial: *Staphylococcus aureus* *Haemophilus influenza* *Salmonella spp.* *M. tuberculosis*	Treatment mainly supportive Empiric for purulent pericarditis: Cloxacillin 200mg/kg/day IV in 4-6 divided doses PLUS Cefotaxime 200-300mg/kg/day IV in 4 divided doses	Penicillin allergy: Cefazolin 100mg/kg/day IV in 3 divided doses (max. 6gm/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. Penicillin allergy refer to Appendix 8
3. INFECTIVE ENDOCARDITIS			
Empirical therapy for infective endocarditis			
Community-acquired organisms: Streptococcus, Enterococcus HACEK Gram-negative organisms	Ampicillin 200-300mg/kg/day in 4-6 divided doses PLUS Gentamicin 1mg/kg/dose IV q8h	PLUS/MINUS *Cloxacillin 200 mg/kg/day IV in 4-6 divided doses	*For acute presentation, need to cover for MSSA since Streptococcus & Enterococcus HACEK presentations are usually sub-acute.
Healthcare-associated organisms: MRSA Non-HACEK Gram-negative organisms Enterococcus sp.	Vancomycin 60mg/kg/day IV in 2- 3 divided doses (max. 2gm/day if unable to achieve therapeutic level) PLUS Gentamicin 1mg/kg/dose IV q8h PLUS/MINUS *Rifampicin 20mg/kg/day in 3 divided doses (max. 900mg/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 50mg/kg/dose IV q8h until cultures are known. Once cultures are available, adjust accordingly
Specific Organisms :			

Infective Endocarditis (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 12-18MU/day)	Ampicillin 300mg/kg/day IV in 4-6 divided doses (max. 12gm/day) OR Ceftriaxone 100mg/kg/day IV in 1-2 divided doses (max. 4gm/day) OR Penicillin Allergy **Vancomycin 40mg/kg/day IV in 2-3 divided doses (max. 2gm/ day)	Duration: • 4 weeks for native valve • 6 weeks for prosthetic valve Vancomycin dose adjusted for trough concentration of 10-15 mg/ml. Penicillin allergy refer to Appendix 8 *Vancomycin therapy is recommended only for patients with immediate type penicillin hypersensitivity. For this strain (MIC>0.125): Antibiotic of choice is either penicillin with gentamicin or ceftriaxone with gentamicin.
Strains with MIC>0.125 to 2 µg/ml	PLUS Gentamicin 1mg/kg/dose IV q8h for 2 weeks (add to first line regimen of penicillin/ceftriaxone) Do not use ampicillin.		
Infective Endocarditis (Enterococcus sp.)			
Penicillin-sensitive (MIC≤ 8 mg/l)	Ampicillin 200-300mg/kg/day IV in 4-6 divided doses for *4-6 weeks PLUS Gentamicin 1mg/kg/dose IV q8h for *2-6 weeks	Ampicillin 200-300mg/kg/day IV in 4-6 equally-divided doses PLUS Ceftriaxone 100mg/kg/day IV in 1-2 divided doses	*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. Ampicillin plus ceftriaxone is preferred for individuals with renal impairment (CrCl ≤50ml/min) ONLY. Can not use ceftriaxone alone since enterococcus is intrinsically resistant to this drug. This combination is NOT ACTIVE against *E. faecium.* **Maximum dose of vancomycin: 2gm/day unless not able to achieve therapeutic range. Aim for serum trough of 10-20mg/l.
Sensitive to penicillin & vancomycin but high-level resistance to gentamicin (MIC>500 mg/l)	Ampicillin 300mg/kg/day IV in 4-6 divided doses PLUS Ceftriaxone 100mg/kg/day IV in 1-2 divided doses (max. 4gm/day) Duration: 6 weeks		
Resistant to penicillin but susceptible to vancomycin & gentamicin	**Vancomycin 40mg/kg/day IV in 3 divided doses PLUS Gentamicin 1mg/kg/dose IV q8h Duration: 6 weeks		
Infective Endocarditis (Staphylococcus aureus)			

Methicillin-sensitive (left-sided)	Cloxacillin 200-300mg/kg/day IV in 4-6 divided doses for 4-6 weeks	Penicillin allergy Cefazolin 100mg/kg/day IV in 3 divided doses for 4-6 weeks OR Vancomycin 60mg/kg/day IV in 2-3 divided doses for 4-6 weeks	If allergy to penicillin but not immediate type hypersensitivity, use cefazolin. Penicillin allergy refer to Appendix 8 Methicillin-sensitive (right sided): Can 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 (right-sided)	Cloxacillin 200-300mg/kg/day IV in 4-6 divided doses for 4 weeks		
Methicillin-resistant (left & right)	Vancomycin 60mg/kg/day IV in 2-3 divided doses (max. 2gm/day) for 4-6 weeks	Daptomycin 10 mg/kg IV daily for 4-6 weeks	Daptomycin is superior to vancomycin for MRSA bacteremia with MIC >1 mg/l.
Methicillin-sensitive (prosthetic valve)	Cloxacillin 200-300mg/kg/day in 4-6 divided doses for ≥6 weeks PLUS Gentamicin 1mg/kg/dose IV q8h for 2 weeks PLUS *Rifampicin 20mg/kg/day PO in 3 divided doses for ≥6 weeks		*Rifampicin has better penetration but to protect against development of resistance, use only after 3-5 days of cloxacillin &/or bacteremia has been cleared. MRSA (prosthetic valve): Vancomycin & rifampicin for 6 weeks or more.
Methicillin-resistant (prosthetic valve)	Vancomycin 60mg/kg/day in 2-3 divided doses for ≥ 6 weeks PLUS Gentamicin 1mg/kg/dose IV q8h for 2 weeks PLUS *Rifampicin 20mg/kg/day PO in 3 divided doses ≥6 weeks		
Culture-negative endocarditis	Ampicillin/sulbactam 300mg/kg/day IV in 4-6 divided doses for 4-6 weeks PLUS Gentamicin 1mg/kg/dose IV q8h for 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 organism is suspected, need to 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 (2018).
2. Malaysian Clinical Practise Guideline for the Prevention, Diagnosis and Management of Infective Endocarditis 2017.

CENTRAL NERVOUS INFECTIONS

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	**Alternative**	
Meningitis empirical treatment Age groups: 1-3 months: *Group B streptococcus (GBS), E. coli, S. pneumoniae & N. meningitidis* >3 months: *S. pneumoniae, Hib, E. coli, Salmonellosis & N. meningitidis*	Cefotaxime 200-300mg/kg/day IV in 4 divided doses (max. 2gm/dose) OR Ceftriaxone 100mg/kg/day IV in 1-2 divided doses (max. 2gm/dose; 4gm/day) PLUS Benzylpenicillin 300,000-400,000 units/kg/day IV in 4-6 divided doses (max. 24MU/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). Once organism is known, please refer below to adjust antibiotics.
Specific Organisms			
Haemophilus influenza (HI)	Cefotaxime 200-300mg/kg/day IV in 4 divided doses (max. 2gm/dose) OR Ceftriaxone 100mg/kg/day IV in 1 or 2 divided doses (max. 2gm/dose; 4gm/day)	Ampicillin 300mg/kg/day q6h (if MIC <1mcg/ml)	Duration: 10 days (HI)
Neisseria meningitidis	Benzylpenicillin 300,000-400,000 units/kg/day; max. 12MU/day) IV in 4-6 divided doses for 7 days	Cefotaxime 200-300mg/kg/day IV in 4 divided doses (max. 2gm/dose) for 7 days OR Ceftriaxone 100mg/kg/day IV in 1-2 divided doses (max. 2gm/dose; 4gm/day) for 7 days	Prophylaxis for all household contacts & health care workers involved in unprotected contact during intubation & suctioning of airway/mouth-to-mouth resuscitation.
Strepcoccus pneumonia (SP)			
Penicillin-susceptible (MIC≤0.06 mcg/ml)	Benzylpenicillin 300,00-400,000 units/kg/day in 4-6 divided doses (max. 24MU/day)		Duration: 14 days (SP)
Penicillin-resistant (MIC≥0.12 mcg/ml) & cefotaxime/ ceftriaxone- sensitive (MIC ≤0.5 mcg/ml)	Cefotaxime 200-300mg/kg/day IV in 4 divided doses (max. 2gm/dose) OR Ceftriaxone 100mg/kg/day IV in 1 or 2 divided doses (max. 2gm/dose; 4gm/day)		
Penicillin & cefotaxime/ceftriazone-resistant (MIC ≥2.0 mcg/ml) (drug-resistant Streptococcus pneumoniae, DRSP)	High dose cefotaxime or ceftriaxone PLUS Vancomycin 60mg/kg/day in 4 divided doses		Treat in consultation with ID specialist.

Cryptococcal meningitis *Cryptococcus neoformans*	Induction Therapy: Amphotericin B 1.0mg/kg/day IV q24h PLUS/MINUS 5-flucytosine 25mg/kg/dose (max. 2gm/dose) PO q6h for 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 6mg/kg/dose (max. 400mg/dose) IV/PO q12h for 8 weeks		
***Herpes Simplex* Encephalitis**	4 months to 12 years old: Acyclovir 30-45mg/kg/day IV in 3 divided doses		Duration for 14-21 days. Doses of 60mg/kg/day OR dosing exceeding 15mg/kg or 500mg/m2 is associated with acute kidney injury.
Brain Abscess	Cefotaxime 200-300mg/kg/day IV in 4 divided doses (max. 2gm/dose) OR Ceftriaxone 100mg/kg/day IV in 1-2 divided doses (max. 2gm/dose; 4gm/day) PLUS Metronidazole 15mg/kg IV stat then 7.5mg/kg IV q8h	If secondary to trauma: PLUS Cloxacillin 200-300mg/kg/day in 4-6 divided doses (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 (2018).
2. Sanford Guide to antimicrobial therapy 2018

CHEMOPROPHYLAXIS

i SURGICAL

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. Minimize 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 if there is excessive blood loss.

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	
Cardiac surgery			
S. epidermidis, S. aureus, Corynebacterium sp., Enteric Gram-negative bacilli	Cefazolin 30 mg/kg IV; max. 2gm Recommended re-dosing interval from initiation of pre -operative dose: every 4 hours	If known to have MRSA/MRSE colonisation, use Vancomycin 15mg/kg IV	β-lactam Allergy: Clindamycin 10mg/kg IV; max 900mg Recommended re-dosing interval from initiation of pre-operative dose: every 6 hours β-lactam allergy refer to Appendix 8
Thoracic surgery			
Non-cardiac including lobectomy, pneumonectomy, lung resection & thoracotomy	Cefazolin 30mg/kg IV; max. 2gm Recommended re-dosing interval from initiation of pre -operative dose:every 4 hours	Ampicillin/sulbactam 50mg/kg (of ampicillin component) IV Recommended re-dosing interval from initiation of pre -operative dose: every 2 hours	β-lactam Allergy: Clindamycin 10mg/kg IV; max 900mg Recommended re-dosing interval from initiation of pre-operative dose: every 6 hours β-lactam allergy refer to Appendix 8
Abdominal Surgery			

Infection / Condition & Likely Organism	Suggested Treatment		Comments
Gastroduodenale	Cefazolin 30mg/kg IV; max. 2gm Recommended re-dosing interval from initiation of pre -operative dose: every 4 hours	Ampicillin/sulbactam 50mg/kg (of ampicillin component) IV Recommended re-dosing interval from initiation of pre -operative dose: every 2 hours	β-lactam Allergy: Clindamycin 10mg/kg IV; max 900mg Recommended re-dosing interval from initiation of pre -operative dose: every 6 hours AND Gentamicin 2.5 mg/kg IV β-lactam allergy refer to Appendix 8
Biliary tract (Open procedure/Laparoscopic procedure/Appendectomy/Small intestine/Hernia repair (hernioplasty & herniorrhaphy) /Colorectal	Cefuroxime 50mg/kg IV; max. 1.5gm	Ceftriaxone 50-75mg/kg IV; max. 2gm	β-lactam Allergy: Clindamycin 10mg/kg IV; max 900mg Recommended re-dosing interval from initiation of pre -operative dose: every 6 hours PLUS Gentamicin 2.5 mg/kg IV β-lactam allergy refer to Appendix 8
Head & neck			
Clean (tonsillectomy, adenoidectomy, tracheostomy, thyroglossal cyst excision, precauricular sinus, dermoid cyst, brachial anomaly, thyroidectomy, paroidectoy, lymph node biopsy etc.)	No antibiotic routinely	No antibiotic routinely	
Clean with placement of prosthesis (excludes tympanostomy tubes	Cefuroxime 50mg/kg IV; max. 1.5gm Recommended re-dosing interval from initiation of pre -operative dose: every 4 hours **OR** Ampicillin/sulbactam 50mg/kg (of ampicillin component) IV Recommended re-dosing interval from initiation of pre-operative dose: every 2 hours	Cefazolin 30mg/kg IV; max. 2gm Recommended re-dosing interval from initiation of pre -operative dose: every 4 hours	**β-lactam Allergy:** Clindamycin 10mg/kg IV; max 900mg Recommended re-dosing interval from initiation of pre-operative dose: every 6 hours

Clean-contaminated procedures with the exception of tonsillectomy & functional endoscopic sinus procedure	Cefuroxime 50mg/kg IV; max. 1.5gm Recommended re-dosing interval from initiation of pre -operative dose: every 4 hours **PLUS** Metronidazole 15mg/kg IV **OR** Ampicillin/sulbactam 50mg/kg (of ampicillin component) IV Recommended re-dosing interval from initiation of pre -operative dose: every 2 hours	Cefazolin 30mg/kg IV; max. 2gm Recommended re-dosing interval from initiation of pre -operative dose: every 4 hours **PLUS** Metronidazole 15mg/kg IV	**β-lactam Allergy:** Clindamycin 10mg/kg IV; max 900mg Recommended re-dosing interval from initiation of pre-operative dose: every 6 hours
Clean-contaminated cancer surgery	Cefuroxime 50mg/kg IV; max. 1.5gm Recommended re-dosing interval from initiation of pre -operative dose: every 4 hours **PLUS** Metronidazole 15mg/kg IV **OR** Ampicillin/sulbactam 50mg/kg (of ampicillin component) IV *Recommended re-dosing interval from initiation of pre -operative dose: every 2 hours*	Cefazolin 30mg/kg IV; max. 2gm *Recommended re-dosing interval from initiation of pre -operative dose: every 4 hours* **PLUS** Metronidazole 15mg/kg IV	**β-lactam Allergy:** Clindamycin 10mg/kg IV; max. 900mg *Recommended re-dosing interval from initiation of pre-operative dose: every 6 hours*
Neurosurgery			
Elective craniotomy & cerebrospinal fluid-shunting procedures	Cefazolin 30mg/kg IV; max. 2gm Recommended re-dosing interval from initiation of pre -operative dose: every 4 hours	If known to have MRSA/MRSE colonisation, use Vancomycin 15mg/kg IV	β-lactam Allergy: Clindamycin 10mg/kg; max. 900 mg Recommended re-dosing interval from initiation of pre -operative dose: every 6 hours β-lactam allergy refer to Appendix 8
Orthopaedics			
Clean operations involving hand, knee, or foot & not involving implantation of foreign materials	None	None	
Spinal procedure with or without instrumentation/hip surgery/ Implantation of internal fixation devices (e.g. nails, screws, plates, wires)	Cefazolin 30mg/kg IV; max. 2gm Recommended re-dosing interval from initiation of pre -operative dose: every 4 hours		β-lactam Allergy: Clindamycin 10mg/kg; max. 900 mg Recommended re-dosing interval from initiation of pre -operative dose: every 6 hours

			β-lactam allergy refer to Appendix 8
Urology			
Low tract instrumentation with risk factors for infections	No antibiotic	Cefuroxime 50mg/kg IV; max 1.5gm	β-lactam Allergy: Gentamicin 2.5mg/kg IV β-lactam allergy refer to Appendix 8
Clean-contaminated (entering gastrointestinal tract)	Cefuroxime 50mg/kg IV; max 1.5gm	Amoxicillin/clavulanate 30mg/kg IV;max 1.2 gm Recommended re-dosing interval from initiation of pre-operative dose: every 4 hours	β-lactam Allergy: Gentamicin 2.5mg/kg IV β-lactam allergy refer to Appendix 8
Plastic Surgery			
Elective soft tissue surgery	No prophylaxis unless complex prolonged procedure If complex, Cloxacillin 25mg/kg IV; max 1gm Recommended re-dosing interval from initiation of pre -operative dose: every 4 hours		
Elective hand or foot surgery involving bone	Cloxacillin 25mg/kg IV; max 1gm Recommended re-dosing interval from initiation of pre -operative dose: every 4 hours		β-lactam Allergy: Clindamycin 10mg/kg IV; max. 900mg Recommended re-dosing interval from initiation of pre -operative dose: every 6 hours β-lactam allergy refer to Appendix 8
Cleft lip & palate surgery	Amoxicillin/clavulanate 30mg/kg; max. 1.2gm Recommended re-dosing interval from initiation of pre -operative dose: every 4 hours		β-lactam Allergy: Clindamycin 10mg/kg; max. 900mg Recommended re-dosing interval from initiation of pre -operative dose: every 6 hours β-lactam allergy refer to Appendix 8
Excision & grafting surgery	Amoxicillin/clavulanate 30mg/kg; max. 1.2gm Recommended re-dosing interval from initiation of pre -operative dose: every 4 hours		β-lactam Allergy: Clindamycin 10mg/kg; max. 900mg Recommended re-dosing interval from initiation of pre -operative dose: every 6 hours β-lactam allergy refer to Appendix 8
Interventional radiology			
Percutaneous endoscpic gastrostomy (PEG) or jejunostomy (PEJ) or nephrostomy tube	Cefuroxime 50mg/kg IV; max 1.5gm	Amoxicillin/clavulanate 30mg/kg IV; max. 1.2gm Recommended re-	

placement		dosing interval from initiation of pre - operative dose: every 4 hours	
Micturating cystourethrogram (MCUG)	Trimethoprim 2mg/kg PO; max. 150 mg (if patient is already on existing antibiotic UTI prophylaxis, increase antibiotic to therapeutic dose for a single dose prior procedure)		
Tenckhoff peritoneal dialysis cathether insertion	Cefuroxime 50mg/kg IV; max 1.5gm OR Cefoperazone 25-60mg/kg (max 1g-3g) q6-12h in one hour infusion	Amoxicillin/clavulanate 30 mg/kg IV; max. 1.2gm Recommended re-dosing interval from initiation of pre -operative dose: every 4 hours	
Burns	No prophylaxis required		

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.

ii NON-SURGICAL

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	
Rheumatic fever (Secondary prevention)	Benzathine penicillin 1.2MU (>27kg); 0.6MU (27 kg) IM every 3-4 weeks 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.	Phenoxymethylpenicillin (Penicillin V) 250 mg PO q12h Penicillin Allergy: Erythromycin Ethylsuccinate 15-20mg/kg/dose PO q12h	Penicillin allergy refer to Appendix 8
Infective Endocarditis (IE)	Amoxicillin 50mg/kg PO 30-60 minutes before procedure OR Ampicillin 50mg/kg IV 30-60 minutes before procedure	Penicillin Allergy: Clindamycin 20mg/kg IV/PO 30-60 minutes before procedure Other alternative:	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

Infection / Condition & Likely Organism	Suggested Treatment		Comments
		Cefazolin 50mg/kg IV (cephalosporin should not be used in children with anaphylaxis, angioedema or urticaria)	endocarditis. Prophylaxis 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 (dacryo cystitis), epidural, lung, orbital area, per rectal area, liver (pyogenic liver), tooth & surgical procedure through infected skin. 3. Percutaneous endoscopic gastrotomy. Prophylaxis is required in some circumstances. Please refer page 132 CPG for Infective Endocarditis 2017. Maintenance of optimal oral hygiene may reduce the incidence of bacteremia from daily activities & is more important than prophylactic antibiotics for a dental procedure to reduce the risk of IE. Penicillin allergy refer to Appendix 8
Post splenectomy At risk for Pneumococcus, Meningococcus, Haemophilus	Phenoxymethylpenicillin (Penicillin V) 125mg PO q12h for ≤5 years old 250mg PO q12h for >5 years old Duration of chemoprophylaxis: - Minimum 3 years post splenectomy or until 18 years of age (some expert) OR at least 1 year post splenectomy Asplenia attributable to other causes unknown most expert recommend throughout	Amoxicillin: 20mg/kg/day (250 – 500mg PO q12h; 500mg daily if poor compliance i.e. adult dose) Penicillin Allergy: Erythromycin Ethylsuccinate 15-20mg/kg/dose PO q12h	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). Yearly influenza vaccine is also recommended.

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	childhood & into adulthood		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 spticaemia can be subtle. Penicillin allergy refer to Appendix 8
Haemophilus influenza b exposure	Rifampicin < 1 month of age: 10mg/kg/dose PO q24h for 4 days Children: 20mg/kg/dose PO q24h for 4 days		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 complete the primary Hib series. 2. Nursery Contact For ALL attendees in childcare & preschool (regardless of age or vaccination status) when unimmunised or incompletely immunised children attend the facility & 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 & infants younger than 2 years. For contacts <2 years old who are not immunised: complete immunisation.

Infection / Condition & Likely Organism	Suggested Treatment		Comments
Meningococcal exposure	Rifampicin <1 month old: 5mg/kg/dose PO q12h for 2 days ≥1 month old: 15-20mg/kg/dose (max. 600mg) PO q12h for 2 days	Ceftriaxone IM <15 years old: 125mg stat >15 years old: 250mg stat	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 anytime 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. 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	Intrapartum maternal prophylaxis: Benzylpenicillin 5MU IV loading, then 2.5-3.0MU IV q6h till delivery	Ampicillin 2gm IV loading, then 1gm q6h till delivery Penicillin Allergy: *Clindamycin 2gm IV loading, then 1gm IV q8h till delivery (according to susceptibility)	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 >38ºC Penicillin allergy refer to Appendix 8 *For high risk of anaphylaxis from β-lactam antibiotics.

Infection / Condition & Likely Organism	Suggested Treatment		Comments
Malaria prophylaxis	Chloroquine dose (chloroquine-sensitive area) 5mg/kg base (8.3mg/kg salt) orally, once weekly, up to maximum adult dose of 300mg base (begin 1-2 weeks before travelling & take weekly through-out & 4 weeks after leaving area) Artemether-lumefantrine (20/120mg) <5 kg : Not recommended 5-15 kg : 1 tablet in a single dose, then 1 tablet again after 8 hours, then 1 tablet q12h for 2 days 15-25 kg : 2 tablets in a single dose, then 2 tablets again after 8 hours, then 2 tablets q12h for 2 days 25-<35 kg: 3 tablets* in a single dose, then 3 tablets again after 8 hours, then 3 tablets q12h for 2 days. >35 kg : as per adult dose.	For prophylaxis (chloroquine- resistant): Paediatrics: Atovaquone-proguanil (Malarone®) Age >8 years old: Doxycycline 2.2mg/kg once daily up to 100mg/day. Take 1-2 days before, during & 4 weeks after travelling. 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 : 1/2 adult tablet weekly>30-45 kg : ¾ adult tablet weekly >45 kg : 1 adult tablet weekly Start 2-3 weeks efore, continue weekly during exposure & for 4 weeks thereafter.	Atovaquone/proguanil is another drug used in malaria prophylaxis in children (for chloroquine-resistance) BUT not yet registered in Blue Book (available commercially in Malaysia). 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 & 4 weeks thereafter. To carefully assess risk and benefit of starting antimalarial prophylaxis to any children to prevent development of drug resistant.
Pertussis (Post-exposure prophylaxis, PEP)	<1 month old: Azithromycin 10mg/kg/day in a single dose q24h for 5 days. 1-5 months old: Azithromycin 10mg/kg/day as single dose q24h for 5 days. 6 months & older: Erythromycin Ethylsuccinate 15-20mg/kg/dose PO q12h for 14 days. OR Azithromycin 10mg/kg/day in a single dose on Day 1, then 5mg/kg/dose on Day 2-Day 5.	Erythromycin is not preferred in young infants. *Use only if azithromycin is not available. Erythromycin Ethylsuccinate: 15-20mg/kg/dose PO q12h for 14 days. 2 months & older: Trimethoprim/sulfamethoxazole 8mg/kg/day in 2 divided doses for 14 days.	Drug of choice for PEP & treatment is a macrolide. Azithromycin is the preferred macrolide. *Association between orally-admistered azithromycin & 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 outweights 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. 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.

Infection / Condition & Likely Organism	Suggested Treatment		Comments
			young infant, pregnant women, person who has contact with infants) Close contacts who are unimmunised or underimmunised should have pertussis immunisation initiated or continued using age-appropiate 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 & people with pre-existing health conditions that may be exacerbated by pertussis infection (not limited to immunocompromised individuals & those with moderate to severe asthma).
Chicken pox (Post-exposure prophylaxis) Potential interventions for people without evidence of immunity exposed to varicella (chicken pox) following significant exposure¥: 1. Vaccine	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)		¥ 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
2. When indicated & available, Varicella zoster immune globulin (VZIG) 3. When VZIG not available	For patients who are at high risk for severe infection & complications*∞ & significant exposure¥ (& have contraindications to vaccine): VZIG dose as per product information; weight-based as soon as possible after exposure up to10 days after OR IVIG (400mg/kg) IV once if VZIG not available OR Acyclovir 20mg/kg/dose PO q6h (max. 3200mg of daily dose) beginning 7-10 days	Patients receiving monthly high dose IVIG	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.

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	after exposure & continue for 7 days.	(≥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.	

References:

1. Davies JM, Lewis MP, and Wimperis J et al. Review of guidelines for the prevention and treatment of infection in patients with an absent or dysfunctional spleen: prepared on behalf of the British Committee for Standards in Haematology by a working party of the Haemato-Oncology taskforce. Br J Haematol. 2011; 155:308-17.
2. Rubin LG, Schaffner W. Care of the Asplenic Patient. N Engl J Med 2014; 317:349-56. 3. Gardner P. Clinical practice. Prevention of meningococcal disease. N Engl J Med. 2006; 355:1466.
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5. Verani JR, McGee L, Schrag SJ, Division of Bacterial Diseases, National Center for Immunization and Respiratory Diseases, Centers for Disease Control and Prevention (CDC). Prevention of perinatal group B streptococcal disease--revised guidelines from CDC, 2010. MMWR Recomm Rep 2010; 59:1 6. Updated recommendations for use of VariZIG--United States, 2013. Centers for Disease Control and Prevention (CDC). MMWR Morb Mortal Wkly Rep. 2013;62(28):574 7. WHO Malaria Treatment Guideline 2015.
8. The Sanford Guide to Antimicrobial therapy 2018.
9. American Academy of Paediatrics. Commitee on Infectious Diseases. Red Book: Report of the committee on Infectious Diseases (2018)

GASTROINTESTINAL INFECTIONS

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	**Alternative**	
Acute Gastroenteritis Usually viruses eg: rotavirus	Antibiotics not recommended		Oral rehydration is the cornerstone of treatment Antibiotic therapy may prolong carriage state of salmonellosis
Dysentery			
Dysentery *Shingella, E. coli, Campylobacter*	Most mild infections resolved spontaneously without antibiotics		Resistance patterns towards amoxicillin, trimethoprim sulphamethazole, ciprofloxacin & azithromycin are in the rise. Adjust antibiotic once culture & sensitivity (C&S) results are available. For immunocompromised host-treat longer (7-10 days). Reserve fluoroquinolone only for isolate where there is no other antibiotic option available due to its many side effects.
Mild or uncomplicated	No treatment required	Ampicillin 100mg/kg/24h PO in 4 divided doses for 5-7 days for hospitalized children	
Severe illness (hospitalisation, invasive or other complications) or immunocompromised patients	Empiric: Ceftriaxone 50-75mg/kg/day IV q24h for 5 days (origin of infections: Asia	Ciprofloxacin 20-30mg/kg/day IV in 2 divided doses for 3 days OR Azithromycin 10mg/kg/dose IV q24h (max. 500mg/dose). Total course: 3 days	
Dysentery Amoebiasis	Metronidazole 30-50mg/kg/day PO in 3 divided doses for 7-10 days		Similar dosage for extraintestinal disease.
Giardiasis	Metronidazole 15mg/kg/day PO (max. 250mg) in 3 divided dose for 5-7 days		
Dysentery *Amoebiasis*	Metronidazole 30-50mg/kg/24h PO in 3 divided doses for 5 days (10 days for severe infection)		
Giardiasis	Metronidazole 30mg/kg/24h PO once daily for 3 days		
Thyphoid fever			

Thyphoid fever *Salmonella* Typhi *S. paratyphi A & B*	Empirical treatment: Ceftriaxone 50-75mg/kg/day IV q24h (max. 2gm) for 7-14 days		Adjust antibiotic once C&S results are known. Duration of antibiotics: 7 days (uncomplicated) to 14 days (severe disease or if using ampicillin or trimethoprim/ sulphamethoxazole). Choice of antibiotics & duration depends on disease, C&S results & whether oral route is preferred. 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 & trimethoprim/ sulphamethaxazole may be consided for susceptible strain. More strains now becoming sensitive to these agents except for certain countries
Mild or uncomplicated	Ciprofloxacin 20-40mg/kg/day (max. 1.5gm per day) PO in 2 divided doses for 5-7 days	Chloramphenicol 50-100mg/kg/day PO in 4 divided doses for minimum 14 days	
Severe infection or suspected resistant organism	Ceftriaxone 60-80mg/kg/day IV q24h for 7-14 days	Ciprofloxacin 20-30mg/kg/day IV (max. 0.8-1.2gm/day) in 2 divided doses for 7-10 days	
Chronic carrier state (> 1 year)	Ampicillin 100mg/kg/day PO in 4 divided doses for 6 weeks OR Amoxicillin 100mg/kg/day PO in 2 divided doses for 6 weeks OR Trimethoprim/sulfamethoxazole 8mg (TMP)/kg/day PO in two divided doses for 6 weeks	Ciprofloxacin 20-30mg/kg/day PO in 2 divided doses for 4 weeks. OR Ampicillin 200-300mg/kg/day IV maximum in 4-6 divided doses. (If oral therapy not tolerated & strain is susceptible)	
Cholera	Azithromycin 20mg/kg/day PO in a single dose (max. 1gm) OR Erythromycin Ethylsuccinate 12.5mg/kg/dose PO q6h for 3 days (max. 250mg/dose) OR Doxycycline 4.4mg/kg/day (max. 200mg/day) PO daily (children > 8 years old) OR Tetracycline 12.5mg/kg/dose PO in q6h (max. 500mg/dose) for 3 days (children > 8 years old)		Oral or IV rehydration is the cornerstone of treatment. Prompt initiation of antibiotic therapy reduces the volume & duration of diarrhoea. Antimicrobials should be considered for people who are moderately to severely ill. Choice dependent on age & pattern of resistance. Monitor antimicrobial sensitivity pattern at beginning of & during the outbreak as it can change. Avoid using tetracycline or 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.

Liver abscess (amoebic) *Entamoeba histolytica*	Metronidazole 35-50mg/kg/day PO in 3 divided doses for 7-10 days		Amoebic abscess tend to be solitary lesion. Consider surgical drainage if needed.
Liver abscess (pyogenic) Klebsiella spp., E. coli, Streptococcus milleri, other Gram-negative organisms, anaerobes, S. aureus	Cefotaxime 200mg-300mg/kg/day IV in 4 divided doses (max. 2gm/dose) OR Ceftriaxone 100mg/kg/day IV in 1-2 divided doses (max. 2gm/dose; 4 g/day) PLUS Metronidazole 22.5-40mg/kg/day IV in 3 divided doses (max. 4gm/day)	Piperacillin/tazobactam 300mg/kg/day (of piperacillin component) IV in 3-4 divided doses (max. 16gm/day) ESBL-Klebsiella Ertapenem 30mg/kg/day in 2 divided doses (max. 1gm/day) (above 3 months of age)	Surgical drainage is needed in most cases Duration: 4-6 weeks
Acute cholangitis Gram-positive & Gram-negative organisms, anaerobes	Cefotaxime 200mg -300mg/kg IV in 4 divided doses (max. 2gm/dose) OR Ceftriaxone 100 mg/kg/day IV in 1-2 divided doses (max. 2gm/dose; 4gm/day) PLUS Metronidazole 22.5-40 mg/kg/day IV in 3 divided doses (max. 4gm/day)	Piperacillin/tazobactam 300mg/kg/day (of piperacillin component) in 3-4 divided doses IV (max. 16gm/day) OR Ampicillin/sulbactam 200-300mg/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 percutaneuous cholecystectomy. In treatment failure, need source control.
Peritonitis Gram-positive & Gram-negative organisms, anaerobes	Primary/spontaneous bacterial peritonitis Cefotaxime 200mg -300mg/kg IV in 4 divided doses (max. 2gm/dose) Secondary (nosocomial) peritonitis Piperacillin/tazobactam IV 300mg/kg/day in 3-4 divided doses (max. 16gm/day If culture proven ESBL: Imipenem/cilastatin 60-100mg/kg/day IV in 4 divided doses Meropenem 60-100mg/kg/day IV in 3 divided doses De-escalate treatment to ertapenem 30mg/kg/day IV in 2 divided doses (max. 1gm/day) once patient is stable.	Ampicillin 100mg/kg/day PO in 4 divided doses PLUS Gentamicin 5mg/kg/day IV OD PLUS Metronidazole 7.5mg/kg/dose IV 8h for 7-14 days	May omit metronidazole in primary peritonitis. In immunocompetent patient with mild to moderate peritonitis & source control, suggest 5 days of therapy. Ertapenem is not licenced to be used in infants less than 3 months old.

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INFECTIONS IN IMMUNOCOMPROMISED PATIENTS

Infection/Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	**Alternative**	
First line: **Febrile neutropenia** Fever >38°C, neutrophil<500mm³ *Enterobacteriaceae (Klebsiella* sp., *E. coli* etc.), *Pseudomonas*, aerobic Gram- positive *(Staphylococci, Streptococci)*	Cefepime 50mg/kg/dose IV in q8h	Piperacillin/tazobactam 300 mg/kg/day IV in 3-4 divided doses (max. 16gm/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 & aminoglycoside combination therapy. Also need to look at local epidemiological data.
Second line: Persistent fever > 72 hours* *Enterobacteriaceae (Klebsiella sp, E. coli* etc.), *Pseudomonas*, aerobic Gram- positive *(Staphylococci, Streptococci), Enterococci* or other resistant organisms ***DO NOT MODIFY INITIAL COVERAGE BASED SOLELY ON PERSISTENCE OF FEVER.**	Meropenem 60-120mg/kg/day IV in 3 divided doses (max. 6gm/day) **PLUS/MINUS** Vancomycin 60 mg/kg/day in 3-4 divided doses (max. 2gm/day)		Escalate to second line if patient unstable to cover resistant Gram- negative, Gram-positive & anaerobes. Consider adding vancomycin in suspected catheter-related infections, positive blood culture for Gram-positive cocci, hypotensive patients & patients who are known to be colonised with MRSA. 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 *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. 4gm/day) **PLUS** Amphotericin B 0.5mg/kg/dose IV q24h & gradually escalate by (0.25-1mg/kg/dose) q24h (max. 1.5mg/kg/day) OR Lipid formulation of amphotericin B 3-5mg/kg/day	Imipenem/cilastatin 60-100 mg/kg/day IV in 4 divided doses (max. 4gm/day) **PLUS** Caspofungin 70mg/m2/dose IV q24h at Day 1, then 50mg/m2/dose IV q24h	1/3 of febrile neutropenic patients with persistent fever >1 week have systemic fungal infections2 In patients at high risk of invasive fungal disease with prolonged (≥96 hours) febrile neutropenia unresponsive to broad spectrum antibacterial agents, initiate antifungal. Amphotericin based anti-fungal is considered more broad spectrum than echinocandin (eg Caspofungin)

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NEONATAL INFECTIONS

Infection/Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	**Alternative**	
Congenital & Perinatal Infections			
Meningitis GBS *E. coli* Listeria other Gram-negative bacilli/rod (GNR)	Empirical therapy. Benzylpenicillin (Penicillin G) **GA <34 weeks:** 100,000units/kg/dose IV postnatal age <7 days: q12h postnatal age >7 days: q8h **GA >34 weeks:** 100,000units/kg/dose IV postnatal age <7 days: q8h postnatal age >7 days: q6h **OR** **< 1 week of age:** Ampicillin 200-300mg/kg/day IV in 3 divided doses **>1 week of age:** Ampicillin 300mg/kg/day IV in 4 divided doses **PLUS** Cefotaxime 50mg/kg/dose IV < 1 week of age: q12h > 1 week of age: q8h		Once cultures are known, adjust antibiotics accordingly.
Necrotising enterocolitis (NEC) Klebsiella, *E. coli,* Clostridia, Coagulase-negative Staphylococci, Enterococci, Bacteroides	Ampicillin 100mg/kg/dose IV <1 week of age: q12h >1 week of age: q8h **PLUS** Gentamicin 5mg/kg/dose IV < 30 weeks of CGA: q48h 30-34 weeks of CGA: q36h ≥35 weeks CGA: q24h **PLUS** Metronidazole Loading dose:15mg/kg/dose IV Maintainence dose: <34 weeks of age: 7.5mg/kg/dose IV q12h 35-40 weeks of age: 7.5mg/kg/dose IV q8h >40 weeks of age: 10mg/kg/dose IV q8h		There is insufficient evidence regarding 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).

	Duration: 10-14 days		
Early onset sepsis (<48 hrs) Group B Streptococcus (GBS), Listeria, Streptococcus sp., E. coli, Haemophilus influenza, Klebsiella sp. etc.	Benzylpenicillin (Penicillin G) GA<34 weeks: 100,000units/kg/dose IV postnatal age <7 days: q12h postnatal age >7 days: q8h GA >34 weeks: 100,000units/kg/dose IV postnatal age <7 days: q8h postnatal age >7 days: q6h OR < 1 week of age: Ampicillin 200-300mg/kg/day IV in 3 divided doses > 1 week of age: Ampicillin 200-300mg/kg/day IV in 4 divided doses **PLUS** Gentamicin 5mg/kg/dose IV <30 weeks of CGA: q48h 30-34 weeks of CGA: q36h ≥35 weeks CGA: q24h		If negative blood culture, initial clinical suspicion not strong & reassuring baby's condition with low CRP, consider stopping antibiotics at 48 hours. If positive blood culture or strong clinical suspicion of sepsis but negative culture, may give 5-7 days of antibiotics. Consider antibiotics for more than 5-7 days if baby not fully recovered & 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 **Methicillin-sensitive/resistant S. aureus (MSSA/MRSA), Coagulase- negative Staphylococci (CONS), Gram-negative rods (depending on local epidemiological data)**	First line: Cloxacillin 50mg/kg/dose IV <1 week of age: q12h >1 week of age: q8h PLUS Gentamicin 5mg/kg/dose IV < 30 weeks of CGA: q48h 30-34 weeks of CGA: q36h ≥35 weeks of CGA: q24h		For late onset sepsis, the most common organisms are predominantly Gram-positive cocci, namely Staphylococci, especially CONS, in premature neonates & also neonates with central catheters. Piperacillin/tazobactam is a good second line option in pneumonia & 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 & ESBL producing organism such as Klebsiella, Serratia & E. coli in some NICU in Malaysia hence need to look at local epidemiology before deciding on suitable
	Second line: Piperacillin/tazobactam IV PMA <30 weeks: 100mg/kg/dose q8h PMA >30 weeks: 80mg/kg/dose q6h		
	Other options: Cefepime GA < 36 weeks: 30mg/kg/dose q12h GA >36 weeks: 50mg/kg/dose q12h OR		

	Meropenem GA **<32 weeks:** 20mg/kg/dose IV PNA<14 days: q12h PNA 14 days: q8h GA **≥ 32 weeks:** PNA <14 days: 20mg/kg/dose IV q8h PNA ≥14 days: 30mg/kg/dose IV q8h **OR** Imipenem/cilastatin 25mg/kg/dose IV PNA<1 week: q12h PNA>1 week q8h	Meropenem for CNS infections: 40mg/kg/dose q8h for ALL Age groups.	second line. Cefepime is the preferred agent when there are Gram-negative bacteria with extended spectrum cephalosporin resistance due to AmpC-β-lactamases (also termed Class C or Group 1). Studies comparing imipenem/ cilastin & meropenem for indication other than meningitis found no significant differences in efficacy or safety between the two. However, a recent meta- analysis suggested that meropenem may be better than imipenem/cilastin in efficacy & safety especially due to more cases of seizure with imipenem (WHO Subcommittee Meeting of the Expert Committee on the Selection & Use of Essential Medicine 2008).
Congenital syphilis *T. pallidum*	Benzylpenicillin (Penicillin G) 50,000units/kg/dose IV for first 7 days of life: q12h thereafter: q8h Duration : 10 days If diagnosed with congenital syphilis after one month of age: Benzylpenicillin (Penicillin G) : 200,000-300,000units/kg/day IV in 4-6 divided doses for 10-14 days. In infants considered less likely to have syphilis & normal CSF examination including normal physical examination & long bone radiograph: Benzathine penicillin 50,000units/kg/dose IM in a single dose can be given.	Procaine penicillin 50,000units/kg/dose IM in a single daily dose for 10 days.	Only severe cases are clinically apparent at birth. Refer to algorithm for diagnosing & evaluation. Re-evaluate & possibly re-treat. Please refer Red Book 2018.

Congenital toxoplasmosis *T. gondii*	Pyrimethamine/sulfadoxine (Fansidar®) Pyrimethamine (1.25mg/kg/dose PO every 10 days) **PLUS** Sulfadoxine (25mg/kg/dose PO every 10 days) **PLUS** Folinic acid 50mg PO every 7 days for 12 months	Pyrimethamine 1mg/kg/day PO for 2 months, followed by 0.5 mg/kg/day PO for 10 months **PLUS** Sulfadiazine 100mg/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 ≥1g/dL or active severe chorioretinitis. Streoids given till CSF protein<1g/dL or resolution of severe chorioretinitis. Fansidar is currently an "orphan" drug that need special procurement measures to buy. Refer to paediatric ID consultant for treatment and availability of drug.
Herpes simplex neonatal • Localised skin, eye & mouth (SEM) • Central nervous system (CNS) with or without SEM • Disseminated disease involving multiple organs	Acyclovir 60mg/kg/day IV in 3 divided doses Duration: Skin, eyes, mouth: 14 days CNS/disseminated: minimum of 21 days 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.		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 & 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:** 10mg/kg/dose IV q8h Duration : 10 days	Benzylpenicillin (Penicillin G) **GA<34 weeks:** 100,000units/kg/dose IV postnatal age <7 days: q12h postnatal age >7 days: q8h **GA >34 weeks:** 100,000units/kg/dose IV postnatal age <7 days: q8h postnatal age >7 days: q6h	
Congenital gonococcal ophthalmitis/conjunctivitis	Immediate & frequent saline eye irrigation. **Non-disseminated disease:** Cefotaxime 100mg/kg/dose IV in a single dose. May need to continue for 48-72 hours until systemic infection has been ruled out. **Disseminated disease:**	If penicillin-sensitive, may give benzylpenicillin **GA <34 weeks:** 100,000units/kg/dose IV -postnatal age <7 days: q12h -postnatal age >7 days: q8h	Evaluate for signs of disseminated infection (e.g. sepsis, arthritis & meningitis). Screen mother & baby for chlamydial infection. Screen for other STDs. Investigate & treat

	Cefotaxime 50 mg/kg/dose IV < 1 week of age: q12h > 1 week of age: q8h For 7 days, with a duration of 10–14 days, if meningitis is documented.	**GA >34 weeks:** 100,000units/kg/dose IV -postnatal age <7 days: q8h -postnatal age >7 days: q6h	parents.
Chlamydia trachomatis **Conjunctivitis**	Erythromycin Ethylsuccinate 10 mg/kg/dose PO <1 week of age: q12h >1 week of age: q8h Duration : 14 days. Local eye toilet until discharge stops.	Azithromycin 20 mg/kg/day PO, once daily for 3 days.	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.
GBS *Streptococcus agalactiae*			
Sepsis	Benzylpenicillin (Penicillin G) **GA<34 weeks:** 100,000 units/kg/dose IV postnatal age ≤7 days: q12h postnatal age >7 days: q8h **GA >34 weeks:** 100,000 units/kg/dose IV postnatal age ≤7 days: q8h postnatal age >7 days: q6h **OR** **< 1 week of age:** Ampicillin 200-300 mg/kg/day IV in 3 divided doses **> 1 week of age:** Ampicillin 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 of CGA: q24h		Duration of treatment for GBS: Uncomplicated: 14 days (bacteremia without a defined focus). Meningitis: 21 days. Gentamicin can be discontinued once the infection is under control.

Meningitis	Benzylpenicillin (Penicillin G) **<34 weeks of age:** 100,000 units/kg/dose IV postnatal age <7 days: q12h postnatal age >7 days: q8h **>34 weeks of age:** 100,000 units/kg/dose IV postnatal age <7 days: q8h postnatal age >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		Duration for treatment Meningitis: 21 days. Doses of penicillin for meningitis is higher as recommended by experts (as high as 500,000 unit/kg/day (> 7 days of age).
E. coli Sepsis/Meningitis	Cefotaxime 50 mg/kg/dose IV < 1 week of age: q12h > 1 week of age: q8h Cefotaxime (Red Book 2018) **GA <32 weeks** 50mg/kg/dose IV PNA < 14 days: q12h PNA ≥ 14 days: q8h **GA ≥32 weeks** 50mg/kg/dose IV 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		Duration in bacteremia: 14 days. Duration for meningitis: 21 days. All cases of bacteremia need lumbar puncture to exclude meningitis. Treatment duration of 14 days can be decided on case-by-case basis if meningitis excluded & good clinical response.

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OCULAR INFECTIONS

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	**Alternative**	
Preseptal cellulitis *Streptococcus pneumoniae* *Staphylococcus aureus* *Streptococcus pyogenes* *Haemophilus influenzae*	**Mild:** Amoxicillin/clavulanate 45mg/kg/day PO in 2 divided doses **Systemically unwell:** Cloxacillin 200mg/kg/day (max. 2g/dose) IV in 4 divided doses **PLUS** Cefotaxime 150-200mg/kg/day (max. 2gm/dose) IV in 3 divided doses **OR** Ceftriaxone 50mg/kg/dose (max. 2gm/dose) IV q12h	Cephalexin 25-50mg/kg/day PO in 2 divided doses for 10 days	Failure to respond within 24-48 hours may indicate orbital cellulitis or underlying sinus disease. When improving & no organism identified, change to Amoxicillin/clavulanate & complete for 7 days.
Orbital cellulitis/abscess *Streptococcus pyogenes* *Streptococcus pneumoniae* *Staphylococcus aureus* *Haemophilus influenzae*	Ceftriaxone 50mg/kg/dose (max. 2gm) IV q12h for 7-14 days **PLUS** Cloxacillin 200mg/kg/day (max. 12gm) IV in 4 divided doses for 7-14 days **Inpatient:** 48-72 hours antibiotic, then oral to complete 14 days following good response (no positive culture)	**Penicillin allergy:** Clindamycin 30-40mg/kg/day PO in 3 or 4 divided doses **Also for CA-MRSA** (adjust accordingly with sensitivity)	This condition is considered surgical emergency & require immediate consultation with ENT surgeon & ophthalmologist. Urgent CT scan needed to exclude associated abscess & intracranial extension. Urgent surgical drainage of the ethmoid sinuses or of an orbital, subperiosteal or intracranial abscess may be needed. Penicillin allergy refer to Appendix 8

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OTORHINOLARYNGOLOGY INFECTIONS

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	**Alternative**	
Tonsillitis/Pharyngitis Group A *Streptococcus*	Phenoxymethylpenicillin (penicillin V) 25-50mg/kg/day PO in 4 divided doses (max. 2g/day) for 10 days **OR** Amoxicillin 50mg/kg/day PO in 3 divided doses (max. 1000-1200mg) for 10 days **OR** Ampicillin/Sulbactam Below 30kg: 25-50mg/kg/day PO q12h for 10days	**Penicillin allergy (non- anaphylaxis):** Cephalexin 25-50mg/kg/day PO in 2 divided doses for 10 days **OR** Erythromycin Ethylsuccinate 40- 50mg/kg/day PO in 3 to 4 divided doses for 10 days	
Rhinosinusitis *Streptococcus pneumoniae* *Haemophilus influenzae* *Moraxella catarrhalis* Group A Streptococcus	Amoxicillin 45-90 mg/kg/day in 2 divided doses PO for 10 days* **Second line:** Amoxicillin/clavulanate 45mg/kg/day PO in 2 divided doses **OR** Ampicillin/Sulbactam Below 30kg: 25-50mg/kg/day PO q12h **Failing amoxicillin/clavulanate:** Clindamycin 30-40mg/kg/day PO in 3 divided doses **AND** Cefuroxime 30mg/kg/day PO in 2 divided doses **Inpatient (sevee):** Ampicillin/sulbactam 100-200mg ampicillin/kg/day IV in 4 divided doses (max. 8g/day)	**Penicillin allergy:** Clindamycin 30-40mg/kg/day PO in 3 or 4 divided doses. Ceftriaxone 50mg/kg/dose IV daily	The most common causes are viral infections. Acute bacterial sinusitis is suspected when child with URI 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 expert recommend using high dose amoxicillin (90mg/kg/day).

Infection / Condition & Likely Organism	Suggested Treatment		Comments
Acute otitis media *Streptococcus pneumonia* *Haemophilus influenzae* *Moraxella catarrhalis*	Amoxicillin 80-90mg/kg/day in 2 divided doses <2 years old : 10 days 2-5 years old: 7 days >5years old : 5 days. For clinical failure, history of using amoxicillin in the last 30 days & has concurrent purulent conjunctivitis: Amoxicillin/clavulanate 45mg/kg/ day PO in 2 divided doses **OR** Ampicillin/Sulbactam Below 30kg: 25-50mg/kg/day PO q12h	**Penicillin allergy:** Erythromycin Ethylsuccinate 15- 20mg/kg/dose PO q12h **OR** Clarithromycin 7.5mg/kg/dose PO q12h **OR** Azithromycin 10 mg/kg/dose PO on Day 1 (max. 500mg/day), followed by 5 mg/kg/dose PO q24h on Day 2-Day 5 (max. 250mg/day) **OR** Azithromycin 10 mg/kg/dose PO q24h for 3 days	
Acute otitis externa *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 7 days Indication: for 1-12 years old		• 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.

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2. Chow AW, Benninger MS, Brook I, et al. IDSA clinical practice guideline for acute bacterial rhinosinusitis in children and adults. Clin Infect Dis 2012; 54: e72.
3. Charles PS Hui: Canadian Paediatric Society.Paediatr Child Health 2013:18(2):96-98
4. The Sanford Guide to Antimicrobial therapy 2018.
5. American Academy of Paediatrics. Commitee on Infectious Diseases. Red Book: Report of the committee on Infectious Diseases (2018).

RESPIRATORY INFECTIONS

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	
Lower Respiratory Tract Infection			
COMMUNITY-ACQUIRED PNEUMONIA			
Pneumonia (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. influenza*)	*High dose amoxicillin (80-90mg/kg/day) PO in 2 divided doses for 5-7 days For influenza: Oseltamivir • **<9 months old:** 3mg/kg/dose PO q12h for 5 days • **9-11 months old:** 3.5mg/kg/dose PO q12h for 5 days • **1-12 years old**: ≤15 kg: 30mg PO q12h >15-23 kg: 45mg PO q12h >23-40 kg: 60mg PO q12h >40 kg: 75mg PO q12h	Erythromycin Ethylsuccinate 15-20mg/kg/dose PO q12h	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 either mycoplasma or chlamydia pneumonia is suspected. It may be started in school-going children where disease predominates. Duration: minimum 5 days & until afebrile for 2-3 days in empiric therapy with absence of an identified specific etiology & specific therapy with known pneumonia due to pneumococcus, *HI* & *Moraxella catarrhalis*. * Dosing of amoxicillin has undergone major changes in terms of dose & frequency: Standard dose: Amoxicillin 45- 50mg/kg/day PO in 3 divided doses for 5-7 days. Experts recommend using high dose amoxicillin to overcome resistance conferred by cell wall changes of the bacteria (pneumococcus). If a child cannot tolerate high dose, the standard amoxicillin dose can be used.

Pneumonia (inpatient, fully immunised) Benzylpenicillin 200,000units/kg/day IV in 4-6 divided doses for 5- 7 days		**Second line/partially treated** Cefuroxime 100-150mg/kg/day IV in 3 divided doses (max. 6gm/day) **OR** Amoxicillin/clavulanate 30mg/kg/dose IV q8h (max. 1.2gm/dose)	Macrolide antibiotics should be used if either mycoplasma or *Chlamydia pneumonia* is suspected.
Severe Community-acquired Pneumonia			
Severe community-acquired pneumonia (child not fully immunised/life-threatening)	Cefotaxime150-200mg/kg/day in 3 divided doses **OR** Ceftriaxone 75-100mg/kg/day in 2 divided doses **PLUS/MINUS** Azithromycin 10mg/kg/dose (max. 500mg) IV q24h on Day 1; then 5mg/kg/dose (max. 250mg) on Day 2-5 if considering atypical organisms.	Cefuroxime 100-150mg/kg/day IV in 3 divided doses (max. 6gm/day) **PLUS/MINUS** Azithromycin 10mg/kg/dose (max. 500mg) IV q24h on Day 1; then 5mg/kg/dose (max. 250mg) on Day 2-5 if considering atypical organisms.	For the management of empyema, look at different section.

References:

1. M. Harris, J. Clark, N. Coote et al. British Thoracic Society guidelines for the management of community acquired pneumonia In children: update 2011. Thorax, vol. 66, no. 2, pp. ii1– ii23.The Management of Community-Acquired Pneumonia in Infants and Children Older Than 3 Months of Age: Clinical Practice Guidelines by the Pediatric Infectious Diseases Society and the Infectious Diseases Society of America Clinical Infectious Diseases 2011;53(7):e25–e76
2. Daniele Dona et al. Treatment of Community-Acquired Pneumonia: Are All Countries Treating Children in the Same Way? A Literature Review. International Journal of Pediatrics Volume 2017.
3. The Sanford guide to antimicrobial therapy 2018.
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SKIN AND SOFT TISSUE INFECTIONS

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	**Alternative**	
Abscess *Staphylococcus aureus*	**Mild:** *Cloxacillin 25-50mg/kg/day PO in 4 divided doses (max. 1gm/day) for 5-7 days	Cephalexin 25-50mg/kg/day PO in 2 divided doses for 5-7days	Incision & drainage (I&D) is the MAINSTAY of therapy. Needle aspiration is inadequate, can sent 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). *Doses recommended in previous columns are for children weigh less than 25kg. For children weigh more than 25kg, use adult dosage (500mg PO q6h).
	Severe: Cloxacillin 200mg/kg/day IV in 4 divided doses (max. 12gm/day) for 5-7 days		
	CA-MRSA: Clindamycin 30-40mg/kg/day PO in 3-4 divided doses for 5-7 days **OR** Trimethoprim/sulfamethoxazole 8- 10mg/kg/day (TMP dose) PO in 2 divided doses for 5-7 days		
Animal bites *Pasteurella multocida, Staphylococcus* spp., *Streptococcus* spp., *Capnocytophaga* sp, anaerobes	Amoxicillin/clavulanate 45mg/kg/day PO in 2 divided doses for 5- 7 days	Amoxicillin/clavulanate 30mg/kg/dose IV q8h (max. 1.2gm)	Consider rabies prophylaxis according to local epidemiology.
Cellulitis *Staphylococcus aureus* *Streptococcus pyogenes*	Cloxacillin 200mg/kg/day IV in 4 divided doses (max. 12gm/day) for 5-7 days	Amoxicillin 25-50mg/kg/day PO in 3 divided doses for 7 days **OR** Cephalexin 25-50mg/kg/day PO in 2 divided doses for 5-7days	Administer using parenteral route for extensive lesions. Total treatment until 3 days after acute inflammation disappears.
Hansen's Disease (leprosy) in children	**Paucibacillary:** **10-14 years old:** Rifampicin 450mg PO monthly **PLUS** Dapsone 50mg PO daily **<10 years old:** Rifampicin 10mg/kg PO monthly **PLUS** Dapsone 2mg/kg PO q24h		Duration of treatment: 6 months Surveillance: 5 years

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Multibacillary: **10-14 years old:** Rifampicin 450mg PO monthly **PLUS** Dapsone 50mg PO q24h **PLUS** Clofazimine 150mg PO monthly & 50mg q48h **<10 years old:** Rifampicin 10mg/kg PO monthly **PLUS** Dapsone 2mg/kg PO q24h **PLUS** Clofazimine 6mg/kg PO monthly & 1mg/kg PO q48h		Duration of treatment: 1 year for BI<4; 2 years for BI≥4 (BI: Bacteriological index) Surveillance: 15 years
Impetigo *Staphylococcus aureus* *Streptococcus pyogenes*	**Localised:** Topical 2% fusidic acid 2-3 times daily for 7 days (outpatient) **Generalised:** Cloxacillin 25-50mg/kg/day PO (max. 1gm/day) in 4 divided doses for 5-7 days	Cephalexin 25-50mg/kg/day PO in 2 divided doses for 5-7 days	
Necrotising fasciitis *Streptococcus sp.:* Group A *Streptococcus (GABHS*) Other streptococcus Staphylococcal: *Staphylococcal aureus* (MSSA & CA- MRSA)	**Streptococcal necrotising fasciitis:** Benzylpenicillin 200,000- 300,000units/kg/day IV in 4-6 divided doses **PLUS** Clindamycin 20-40mg/kg/day IV in 3-4 divided doses (max. 2.7gm/day)		50% of patients have associated streptococcal toxic shock syndrome (STSS). Aggressive surgical debridement of the deep-seated infection is the mainstay of therapy. Combination therapy is needed with clindamycin to block toxin production whether or not patient manifests toxic shock syndrome. Tissues should be sent for Gram staining & C&S. IVIG can be used as an adjunct, typically at 1gm/kg on Day 1, followed by 0.5mg/kg on 1-2 subsequent days. Vancomycin is NOT RECOMMENDED for the treatment of serious MSSA infections because outcomes are INFERIOR compared with cases in which anti- staphylococcus β-lactam
	Staphylococcal necrotising fasciitis: Cloxacillin 200mg/kg/day IV in 4-6 divided doses **PLUS** **Clindamycin 20-40mg/kg/day IV (max. 2.7gm/day) in 3-4 divided doses**	**If CA-MRSA is suspected:** Vancomycin 60mg/kg/day IV in 3-4 divided doses (max. 2gm/day)	

Infection / Condition & Likely Organism	Suggested Treatment		Comments
			(cloxacillin) is used AND to minimise the emergence of vancomycin resistance. Duration of treatment: at least 2 weeks if no foci is found (no deep-seated involvement plus no involvement of heart, bone, joint etc.)
Scalded skin syndrome (SSSS) *Staphylococcus aureus*	Cloxacillin 200mg/kg/day IV in 4-6 divided doses **Step down** Cloxacillin 25-50mg/kg/day PO in 4 divided doses (max. 1gm/day) Total treatment duration: 7-10 days		If no positive blood culture associated with SSSS, then intravenous therapy can be stopped following clinical improvement & switch to oral. Doses recommended in previous column are for children weigh less than 25 kg. For children weigh more than 25 kg, use adult dosage.

References:

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SURGICAL INFECTIONS

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	
A. GENERAL SURGERY			
Empyema thoracis (lung empyema) *Staphylococcus aureus Streptococcus pneumoniae* Empirical treatment needs to cover organisms mentioned above. 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 100-200mg/kg/day IV in 3 divided doses **PLUS** Cloxacillin 200-300mg/kg/day IV in 4-6 divided doses Duration: 4-6 weeks	***Stapylococcus aureus* (methicillin- sensitive):** Cloxacillin 200-300mg/kg/day IV in 4-6 divided doses for 4-6 weeks ***Streptococcus pneumoniae* (penicillin-sensitive):** Benzylpenicillin 200,000- 300,00units/kg/day IV in 4-6 divided doses ***Streptococcus pneumoniae* (penicillin-resistant, use result of C&S):** Cefotaxime 200-300mg/kg/day IV in 4 divided doses **OR** Ceftriaxone 100mg/kg/day IV in 1-2 divided doses (max. 2gm/dose; 4gm/day)	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. Pneumatocoele on chest x-ray indicate *S. aureus* BUT they can also be seen in pneumococcal disease. There is NO need to routinely use a macrolide antibiotic but its use should be considered in children whom *Mycoplasma pneumonia* is thought to be the cause (*Mycoplasma* usually cause effusion, not empyema). There is NO CONSENSUS on how long antibiotic need to be given. Most recommend 4-6 weeks of total antibiotics. For other adjunct therapy, refer MOH consensus guideline 2013.
Enterocolitis *Enterobacteriaceae , Enterococci, Bacteroides*	Ampicillin 200mg/kg/day IV in 4-6 divided doses (max. 12gm/day) **PLUS** Metronidazole 15mg/kg loading dose, followed by 7.5mg/kg/dose IV q8h	Cefotaxime 200mg/kg/day IV in 4 divided doses **PLUS** Metronidazole 15mg/kg loading dose, followed by 7.5mg/kg/dose IV q8h	Antibiotics should be adjusted with results of C&S.
B. BONE AND JOINT INFECTIONS			
Septic arthritis (SA) & Osteomyelitis (OM) Common organisms: 0-2 months old:	**0-2 months old:** Cloxacillin 200mg/kg/day IV in 4-6 divided doses **PLUS** Cefotaxime 200mg/kg/day IV in 4 divided doses	Optimise antimicrobial treatment based on C&S.	Empiric antibiotics should be started based on clinical diagnosis of SA or OM. Surgical debridement often not required in OM.

<table>
<tr><th>Infection / Condition & Likely Organism</th><th colspan="2">Suggested Treatment</th><th>Comments</th></tr>
<tr><td rowspan="2">S. aureus
Streptococcus agalactiae
Gram-negative enteric organism

Less than 5 years old:
Staphylococcus aureus
Streptococcus pyogenes
Streptococcus pneumoniae
Non-typeable Haemophilus spp.
Kingella kingae

Older than 5 years: Staphylococcus aureus Streptococcus pyogenes</td><td>Less than 5 years old:
Cefuroxime 100-200mg/kg/day IV in 3 divided doses (monotherapy)</td><td>Cefazolin 100-150mg/kg/day IV in 3 divided doses
(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; sensitive to β-lactam antibiotics e.g. cefuroxime or amoxicillin/clavulanate.</td><td rowspan="2">Urgent wash out & drainage is needed in SA in hip & other joints to reduce pressure on growth plate.

*IV antibiotics can be switch to oral if no concurrent bacteremia when:
Child afebrile & pain-free for at least 24 hours & CRP <20mg/L or CRP decreased by ≥2/3 of the highest value.

Duration of antibiotics:
SA: total of 3-4 weeks OM: 4-6 weeks
In complex disease (multifocal, significant bone destruction, immunocompromised host & resistant/unusual pathogens), prolonged intravenous antibiotics are needed & duration might exceed 6 weeks.</td></tr>
<tr><td>More than 5 years old: Cloxacillin 200 mg/kg/day IV in 4-6 divided doses</td><td></td></tr>
</table>

References:

1. American Academy of Pediatrics: Pickering LK, BakerCJ, Kimberlin DW, Long SS, eds. Red Book 2012 Report of the committee on Infectious Diseases.
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5. Kathleen Gutierrez. Bone and joint infections in children. *Pediatr Clin N Am* 52(2005); 779-794.
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TROPICAL INFECTIONS

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	**Alternative**	
Typhoid fever	Refer to Gastrointestinal Infections Section		
Cholera	Refer to Gastrointestinal Infections Section		
Scrub thyphus			
Ricketsia tsutsugamushi	Doxycycline 2-4mg/kg/day IV/PO in 1-2 divided dose for 5-7 days (max. 200mg/day)	Azithromycin 10mg/kg/dose (max. 500mg) PO q24h for 3 days	Doxycycline can be used in young children (even below 8 years old) since safety data approved its use for ricketsial diseases.
Brucellosis			
B. melitensis, B. abortus, B. suis & B. canis	Rifampicin 15-20mg/kg/day (max. 600-900mg/day) PO in 1-2 divided doses for 6 weeks **PLUS** **For children <8 years old**: Trimethoprim/sulfamethoxazole (TMP dose) 10mg/kg/day (max. 480mg TMP/day) PO in 2 divided doses for 6 weeks **OR** **For children >8 years old:** Doxycycline 4.4mg/kg/day PO (max. 200mg/day) in 2 divided doses for 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 PLUS Gentamicin 5mg/kg/dose IV q24h for 7- 14 days		
Leptospirosis *L. icterohaemorrhagiae, L. canicola*			
Moderate to severe disease	Benzylpenicillin 200,000units/kg/day IV in 4 divided doses (max. 12-18MU/day)	Ceftriaxone 100mg/kg/day IV q24h (max. 2gm/day) **OR** Cefotaxime 150-200mg/kg/day IV in 3-4 divided doses (max. 12gm/day)	Duration: 7 days
Mild disease	Amoxicillin 40-45 mg/kg/day PO in 3 divided doses (max. 500 mg/dose)	**For children >8 years old:** Doxycycline 2mg/kg/dose PO q12h (max. 200mg/day)	
Tetanus *Clostridium tetani*			

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Metronidazole 30mg/kg/day IV in 4 divided doses for 7-10 days **Neutralisation of toxin:** Human tetanus globulin (TIG) 500IU IM as a single dose	Benzylpenicillin 200,000units/kg/day IV in 4 divided doses (max. 12-18MU/day) for 7-10 days If TIG not available: IVIG 200-400mg/kg as a single dose	Primary tetanus infection: Clinical diagnosis to be made as negative culture is often. Steps in care: 1. Early airway protection & treatment of reflex spasm with benzodiazepam (midazolam) 2. Neutralisation of toxin: TIG single dose, administered IM (optimal dose not established) 3. Surgical debridement of infected tissues 4. Tetanus wound prophylaxis-refer table.
Melioidosis *Burkholderia pseudomallei*			
Intensive/Induction therapy:	Ceftazidime 200mg/kg/day IV in 3 divided doses	Imipenem/cilastatin 75-100mg/kg/day IV in 4 divided doses **OR** Meropenem 75mg/kg/day IV in 3 divided doses (neurological melioidosis: 150mg/kg/day IV in 3 divided 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 8mg/kg/day (of TMP component) PO in 2 divided doses **PLUS** Doxycycline 4mg/kg/day PO in 2 divided doses (children above 8 years old)	**Children below 8 years old:** Amoxicillin/clavulanate 20mg/kg/dose (of amoxicillin component) PO q8h (higher relapse rate)	Duration: 20 weeks Folic acid 5mg PO q24h to be given for patients on Trimethoprim/sulfamethoxazole. Consider combination therapy of two drugs in maintenance phase if high risk of relapse.
Malaria			

Infection / Condition & Likely Organism	Suggested Treatment		Comments
Plasmodium falciparum A. Uncomplicated B. Treatment failure C. Complicated (Almost always due to *P. falciparum*. Suspect mixed infections if *P. vivax/P. knowlesi* malaria appears more severe than usual)	**Uncomplicated** Artemether/lumefantrine (Riamet®) (20mg artemether/ 120mg 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	Artesunate/mefloquine FDC (ASMQ) (ASMQ is available as FDC tablet 25/55mg & 100/220mg) 5–8 kg : 25/55mg PO q24h 9-17 kg : 50/110mg PO q24h 18-29 kg: 100/220mg PO q24h >30 kg : 200/440mg 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 0.25mg 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). 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. Do not use IV artesunate as monotherapy. If IV artesunate needs to be continued indefinitely, clindamycin must be added to the regimen to complete 7 days of treatment. IM artesunate (same dose as IV) can be used in patients with difficult intravenous access. Children with severe malaria should be started on broad-spectrum antibiotic treatment immediately at the same time as antimalarial treatment. *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.
	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) **Complicated:** <u>Children >20 kg & adults</u> Day 1 : IV artesunate 2.4mg/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 <u>Children <20 kg</u> Day 1 : IV artesunate 3.0 mg/kg on admission, then repeat again at 12 & 24 hours Day 2-7: IV artesunate 3.0mg/kg OD or switch to oral ACT Duration: 7 days (Parenteral artesunate should be given for a minimum of 24 hours (3 doses) or until patient is able to tolerate orally & thereafter to complete treatment with a complete course of oral ACT (3 days of ASMQ or Riamet®).	Artesunate 4mg/kg/dose PO q24h **PLUS** Clindamycin 10mg/kg/dose PO q12h for 7 days **OR** Quinine 10mg salt/kg/dose PO q8h **PLUS** Clindamycin 10mg/kg/dose PO q12h for 7 days Day 1: *Quinine loading dose 20mg/kg IV (dilute in 250 ml D5%) run over 4 hours; followed by maintenance dose 8 hours later; Quinine 10mg/kg IV q8h till Day 7 (max. 600mg base) **PLUS** Doxycycline 2.2mg/kg/dose (max. 100mg/dose) PO q12h **OR** Clindamycin 10mg/kg/dose PO q12h Duration: 7 days	

Infection / Condition & Likely Organism	Suggested Treatment		Comments
P. vivax, P. malariae, P. knowlesi (*P. malariae* & *P. knowlesi* are chloroquine-sensitive) A. New infection B. Chloroquine-resistant *(P. vivax)* or relapse C. Severe & complicated *P. vivax, P. knowlesi or P. malariae*	**New infection:** Total chloroquine: 25 mg base/kg divided over 3 days, as below: Day 1: 10mg base/kg PO stat then 5mg base/kg 6 hours later Day 2: 5mg base/kg PO q24h Day 3: 5mg base/kg PO q24h **PLUS** Primaquine 0.5mg base/kg PO q24h for 14 days		• Primaquine is ONLY needed for *P. vivax* for a total of 14 days. • Primaquine (0.5mg/kg) may cause haemolysis in individuals with G6PD deficiency, hence G6PD testing is required before administration of primaquine above 0.25mg/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 & should not be used. • *P. knowlesi* (monkey malaria) can cause severe malaria & should be treated as severe malaria secondary to *P. falciparum*.∞
	Chloroquine-resistant *(P. vivax)* or relapse: (* In Sabah, considered chloroquine-resistant) ACT (Riamet® or ASMQ) (dosing as per *P. falciparum* treatment) **PLUS** Primaquine 0.5mg/kg PO q24h for 14 days	Quinine 10mg salt/kg PO q8h for 7 days **PLUS** Primaquine 0.5mg/kg PO q24h for 14 days Mefloquine 15 mg/kg single dose combined with primaquine have been found to be effective (except for *P. knowlesi*)	
	Severe & complicated *P. vivax, P. knowlesi or P. malariae* Treat as per severe *P. falciparum* malaria		
3. Mixed Infection	Treat as *P. falciparum*		

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

TIG = Tetanus immune globulin

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

Note: DTAP is 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.

Adapted from the Red Book: 2015 report of the Committee on Infectious Diseases, p. 709:

TUBERCULOSIS INFECTION IN CHILDREN

1. First-line Anti-TB Drugs

Table 1: Recommended doses of first-line anti-TB drugs for children

Drug	Recommended daily dose	
	Dose (range) in mg/kg	Maximum dose in mg
Isoniazid (H)	10 (10 - 15)	300
Rifampicin (R)	15 (10 - 20)	600
Pyrazinamide (Z)	35 (30 - 40)	2000
Ethambutol (E)	20 (15 - 25)c	1000

Source: Malaysia Health Technology Assessment Section, Clinical Practice Guideline Management of Tuberculosis 3rd edition 2012.

- Pyridoxine 5 – 10 mg/day needs to be added if isoniazid is prescribed.
- The recommended daily dose of ethambutol is higher in children (20 mg/kg) than in adults (15 mg/kg, because the pharmacokinetics is different. A systematic review showed that ethambutol can be used safely in children, especially in situations where it is possible to monitor the complications (particularly optic neuritis) regularly.
- Streptomycin and amikacin should be reserved for the treatment of multi-drug resistant tuberculosis in children with known drug susceptibility to this medicines. since these drugs have auditory and vestibular toxic effects and nephtoxic effects.

2. Treatment Regimens

- Treatment have 2 phases: an initial intensive phase and a second continuation phase.
- Daily directly-observed therapy is required for treatment of active disease.
- Use of steroids:
    - Corticosteroids should be used in tuberculous meningitis, endobronchial TB or pericarditis (pericardial effusion).
    - Prednisolone: Dosage of 2 mg/kg daily or its equivalent.

Maximum dosage of 60 mg/day for 4-6 weeks followed by tapering dose in 1-2 weeks before stopping.

Table 2: Recommended treatment regimens for children in each TB diagnostic category

TB cases	Regimen*		Remarks
	Intensive phase	Continuation phase	
New smear positive PTB*	2HRZE	4HR	Ethambutol can be stopped if the
New smear negative PTB Less severe	2HRZ	4HR	TB culture is sensitive to
EPTB	2HRZ	4HR	HRZE*
Severe concomitant HIV disease or other immunocompromised	2HRZE	4-10HR	Depending on the site of infection

state		
Severe form of EPTB	2HRZE 10HR	
TB meningitis/spine/bone		
Previously treated smear positive PTB including relapse & treatment after interruption	Treatment will be individualised; need to refer to paediatric infectious disease specialist	All attempts should be made to obtain C&S result
Treatment failure TB/ MDR-TB	Treatment will be individualised; need to refer to paediatric infectious disease specialist	All attempts should be made to obtain C&S result

***Direct observation of drug ingestion(DOTS) is required throughout the treatment**

PTB= pulmonary tuberculosis, EPTB= extrapulmonary tuberculosis, MDR-TB = multidrug-resistant tuberculosis

Source:

Clinical Practice Guideline Management of Tuberculosis 3rd edition 2012 (Modified from World Health Organization. Rapid advice - treatment of tuberculosis in children. Geneva: WHO; 2010. & World Health Organization. Guidance for national tuberculosis programmes on the management of tuberculosis in children. 2nd Edition. Geneva: WHO; 2010)

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URINARY TRACT INFECTIONS

Infection / Condition & Likely Organism	Suggested Treatment	Comments

Infection / Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	
Urinary Tract Infection (UTI) *Escherichia coli* Proteus spp. Klebsiella spp. Enterobacter spp.	**0-2 months old:** Ampicillin 50mg/kg/dose IV <1week of age: q12h >1week of age: q8h **PLUS** Gentamicin 5mg/kg/dose IV < 30 week of CGA: q48h > 30-34 week of CGA: q36h ≥35 week CGA:q24h **>2 months old:** Cefuroxime 100-150mg/kg/day IV in 3 divided doses (max. 6gm/day) **PLUS/MINUS** Gentamicin 5mg/kg/dose IV daily	**Ill young infant:** Cefotaxime 150-200mg/kg/day IV in 3 divided doses (max. 8gm/day)	Duration: 10-14days. Adjust therapy based on culture result. Duration: 7-14 days. Switch to oral therapy when improving and able to tolerate oral therapy.
Prophylaxis for UTI for infants & children with recurrent UTI	Trimethoprim 1-2mg/kg PO at night	Nitrofurantoin 1-2mg/kg at night	Antibiotic prophylaxis should not be routinely recommended in children with first-time UTI. Prophylactic antibiotics should be given for 3 days with MCUG (micturatingcystourethogram) taking place on the second day Children with Grade I-IV vesicoureteral reflux (VUR) may experience decrease in recurrent UTI by 50% following first or second febrile or symptomatic UTI with increased detection of resistant organism following antibiotic prophylaxis.

References:
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2. UTI Clinical Practise Guideline, Pediatrics 2011.
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4. The Sanford guide to antimicrobial therapy 2018.

VASCULAR INFECTIONS

Infection / Condition & Likely Organism	Suggested Treatment	Comments

	Preferred	Alternative	
Catheter Related Blood Stream Infection (CRBSI)			
***Coagulase-negative staphylococcus (CoNS)**			Diagnosis needs: 1. Paired blood cultures drawn from both catheters & 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 continues 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 established in children with or without catheter removal. 10-14 days after first negative blood culture is usually recommended. *For CONS, need to decide whether isolates from blood culture is coloniser or true pathogen.
Methicillin-sensitive (MSCoNS)	Cloxacillin 200mg/kg/day IV in 4-6 divided doses	Cefazolin 100mg/kg/day IV in 3 divided doses max. 6 g/day (if no endocarditis)	
Methicillin-resistant (MRCoNS)	Vancomycin 60mg/kg/day IV in 2-3 divided doses		
Coagulase-positive staphylococcus			
Methicillin-sensitive (MSSA)	Cloxacillin 200mg/kg/day IV in 4-6 divided doses	Cefazolin 100mg/kg/day IV in 3 divided doses max. 6 g/day (if no endocarditis)	
Methicillin-resistant (MRSA)	Vancomycin 60mg/kg/day in 2-3 divided doses		

Infection/Condition & Likely Organism	Suggested Treatment		Comments
	Preferred	Alternative	
Gram-negative bacilli Enterobacteriaeceae (*Escherichia coli, Klebsiella pneumoniae*, Enterobacter, Proteus sp etc.)			

ESBL –ve	*Piperacillin/tazobactam∞: 300mg 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 (Enterobacteriaceae), Gram-positive organisms & pseudomonas; follow through with C&S.
ESBL +ve	Ertapenem 30mg/kg/day IV in 2 divided doses	Imipenem 60-100mg/kg/day IV in 4 divided doses (max 4g/day) **OR** Meropenem 60-120mg/kg/day IV in 3 divided doses (max 6g/day)	
Pseudomonas aeruginosa	Piperacillin/tazobactam: 300mg of piperacillin/kg/day in 3-4 divided doses (max. 16 g/day)	Cefepime 50mg/kg/dose IV q8h	Not all pseudomonas is drug resistant. If ceftazidime remains susceptible, please use ceftazidime with anti-pseudomonas aminoglycoside to treat. De-escalation is important to preserve antibiotic for future use.
***Candida albicans* or other Candida species**			
	Fluconazole 12mg/kg IV q24h	Caspofungin loading dose 70 mg/m^2/dose IV q24hr on Day 1, followed by 50 mg/m^2/dose IV q24hr thereafter (max. 70 mg) **OR** Amphotericin B lipid complex 3-5 mg/kg/dose IV q24hr	Fungaemia: treatment without catheter removal is associated with low success rate & higher mortality.
Suppurative Thrombophlebitis *Staphylococcus aureus*			
MSSA	Cloxacillin 200mg/kg/day IV in 4-6 divided doses	Cefazolin 100mg/kg/day IV in 3 divided doses (max. 6 g/day	Diagnosis requires positive blood culture plus radiographic demonstration of thrombus. Remove catheter & a minimum antibiotic treatment of 3-4 weeks. Surgical resection of involved vein if failed conservative therapy.
MRSA	Vancomycin 60mg/kg/day in 2-3 divided doses		

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5. The Sanford guide to antimicrobial therapy 2018

APPENDICES

CLINICAL PHARMACOKINETIC GUIDELINES
(UPDATED ON 10th Nov 2014)

AMINOGLYCOSIDE DOSING STRATEGIES

A. EXTENDED-INTERVAL THERAPY / SINGLE DAILY DOSING (EID/SDD)

EID/SDD is an approach of giving high-dose aminoglycoside over 30 minutes at an extended interval (e.g 24 hourly, 36 hourly or more).

The theoretical benefits of EID/SDD:

- Aminoglycosides display concentration-dependent bactericidal action-that is, higher dose and serum concentrations result in more rapid bacterial killing. [1]
- Optimise concentration-dependent bacterial killing by achieving a high peak (>10x MIC).[2]
- Minimize nephrotoxicity by administering larger, less frequent doses and potentially decreasing renal cortical aminoglycoside concentrations.
- Utilize the post-antibiotic effect (PAE)(2-8 hours), defined as a recovery period before organisms can resume growth after drug removal.[1]
- Minimize the development of adaptive resistance by allowing a recovery period during the dosing interval.

Exclusion criteria;

EID/ SDD is reasonable in most patients, with the following exceptions:[3]

- Pregnancy
- Ascites
- Burns (>20%)
- Endocarditis
- Creatinine clearance <30ml/min
- Dialysis
- Neutropenic patients
- Patients with gram positive infections (synergistic effect).
- Heamodynamically unstable.
- History of hearing loss/vestibular dysfunction.
- Mycobacterium infection.

SDD Dosing Strategy Based On Creatinine Clearance:[4]

Creatinine Clearance (ml/min)	Dose in 24 hours	
	Gentamicin	Amikacin
> 80	5mg/kg	15mg/kg
60 -79	4mg/kg	12mg/kg
40 – 59	3.5mg/kg	7.5mg/kg
30 – 39	2.5mg/kg	4mg/kg
< 30	Conventional dosing	Conventional dosing

EID Dosing Strategy Based On Serum Concentration:[5]

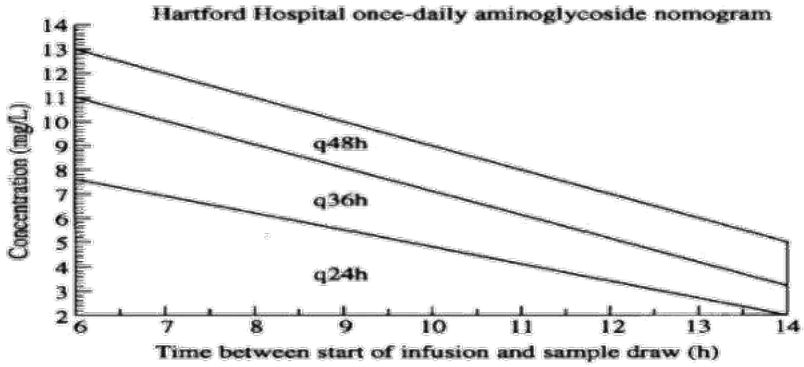
Gentamicin	Amikacin
7mg/kg per dose	15mg/kg per dose

1. Initial level monitoring*

Single level drawn 8-12 hours after the first dose (Only applicable for 7 mg/kg– plotting doses lower or higher than 7 mg/kg may under or overestimate clearance)

Concentration Gentamicin (7 mg/kg/dose): Plot level on graph.
Concentration Amikacin (15 mg/kg/dose): Divide level in half, then, plot on graph.

Please consult pharmacist for dosage adjustment.



2. Follow up trough level monitoring

Trough monitoring (30-60 minutes prior to dose) should be considered in patients demonstrating acute changes in renal function or suspicion of extended interval failure.

Maintenance trough levels should be monitored at least once weekly.

Sample Parameters	Gentamicin		Amikacin	
Time to sample10	At the 2nd dose			
Sampling time10	Take two samples at minimum 4 hours interval (e.g. post-2H and post-6H)			
Target levels (mcg/ml)5,6	TROUGH	PEAK*	TROUGH	PEAK*
	<1	16-30	<1	56-64

*The target reference range may be individualized based on institutional MIC value.

B. CONVENTIONAL / TRADITIONAL DOSING

Tradition dosing includes reduced doses and frequent administration of aminoglycosides using pharmacokinetic parameters to determine dose and frequency.

Creatinine Clearance (ml/min)	Gentamicin	Amikacin
>607	1.5 – 2mg/kg every 8 hourly	5 – 7.5mg/kg every 8 hourly
40 - 607	1.5 – 2mg/kg every 12 hourly	5 – 7.5mg/kg every 12 hourly
20 -407	1.5 – 2mg/kg every 24 hourly	5 – 7.5mg/kg every 24 hourly
<207	1.5 – 2mg/kg every 48 – 72 hourly	5 – 7.5mg/kg every 48 – 72 hourly
CVVH/ CVVHD/CVVHDF8	Loading dose 3mg/kg followed by 2mg/kg every 24 – 48 hourly	Loading dose 10mg/kg followed by 7.5mg/kg every 24 – 48 hourly
CAPD9	Intermittent: 0.6mg/kg in night dwell Continuous: Loading dose 8mg/L followed by 4mg/L	Intermittent: 2mg/kg in night dwell Continuous: Loading dose 25mg/L followed by 12mg/L

Sample Parameters	Gentamicin		Amikacin	
Time to sample10	After the 3rd dose			
Sampling time10	PRE: obtained just prior to the next dose OR within 30 minutes before the next dose POST: 30 minutes after completion of 30 minutes infusion OR Bolus: 1 hour after dose is given			
Sampling time for ESRF11	PRE dialysis			
Target levels (mcg/ml)6,10	Trough	Peak*	Trough	Peak*
	<2	5 -10	<10	20 -30

*The target reference range may be individualized based on institutional MIC value.

VANCOMYCIN DOSING STRATEGIES

Vancomycin activity is considered to be time-dependent - that is, antimicrobial activity depends on the duration that the drug level exceeds the minimum inhibitory concentration (MIC) of the target organism. Thus, peak levels have not been shown to correlate with efficacy or toxicity - indeed concentration monitoring is unnecessary in most cases.

Sample Parameters[12]	Recommendation[12]
Time to sample	Just before the 4th dose.
Optimal trough concentration– non-complicated infections	Mininum trough concentration should always be maintained above 10mg/L (10-20mg/L) to avoid development of resistance. For a pathogen with an MIC of 1mg/L, the minimum trough concentration would have to be at least 15mg/L to generate the target AUC:MIC of 400.
Optimal trough concentration – complicated infections (bacteremia, endocarditis, osteomyelitis, meningitis, and hospital-acquired pneumonia cased by Staphylococcus aureus)	Trough concentration of 15-20mg/L is recommended to improve penetration, increase the probability of obtaining optimal target serum concentrations and improve clinical outcomes.

Vancomycin Dosing Strategy For Intermittent Infusion:

Renal Function	Dose
Normal[12]	2 – 3 g/day (20 – 45 mg/kg/day) in divided doses every 6 – 12 h; Max 4g/day Obese: Dose based on TBW
Clcr > 50 ml/min[13]	15-20mg/kg/dose every 12 hours (usual : 750 – 1500 mg)
Clcr 20 – 49 ml/min[13]	15-20mg/kg/dose every 24 hours (usual : 750 – 1500 mg)
Clcr< 20 ml/min[13]	Need longer intervals, determine by serum concentration monitoring
HD[13]	Following loading dose of 15-20mg/kg, given 500mg to 1000mg after each dialysis session. Pre dosing based on pre-HD level*: <10mg/L: administer 1000mg after HD 10-25 mg/L: administer 500-750mg after HD >25mg/L: Hold vancomycin *based on clinical judgement
CVVH[13]	Following loading dose of 15-20mg/kg, give 1g every 48 hours
CVVHD / CVVHDF[13]	Following loading dose of 15-20mg/kg, give 1g every 24 hours
CAPD[9]	**Intermittent dose (once/day):** 15-30 mg/kg every 5-7 days **Continuous dose (per/L exchange):** Loading :1000mg/L Maintenance : 25mg/L

Vancomycin dosing strategy for continuous infusion [14,15] :

Body weight	Loading Dose
< 40kg	500mg IV in 100 mls 0.9% sodium chloride or 5% glucose over 1 hour
< 70 kg	1 g IV in 250 mls 0.9% sodium chloride or 5% glucose over 2 hours
≥ 70 kg	1.5 g IV in 250 mls 0.9% sodium chloride or 5% glucose over 2.5 hours

Start the maintenance IV infusion immediately after the loading dose. The dose depends on the patient's renal function. Infusions should be administered in 250 ml 0.9% sodium chloride or 5% glucose over 12 hours. The total daily dose should be split into two and the infusion rate set at 20.8 ml/hr.

Creatinine Clearance* (ml/min)	Daily maintenance dose	Dose in each 250 mls infusion bag for administration over 12 hours
<20	500 mg	250 mg
20-34	750 mg	375 mg

35-59	1000 mg	500 mg
60-79	1500 mg	750 mg
80-99	2000 mg	1000 mg
>100	2500 mg	1250 mg

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Appendix 2: Antibiotic Dosages In Patients With Impaired Renal Function (Adult)

Unless stated, adjusted doses are % of dose for normal renal function
For critical care patient, kindly refer to Guide to Antimicrobial Therapy in the Adult ICU 2017

$$CrCL\left(ml/_{min}\right) = \frac{(140 - age)xBW}{Serum\ creatinine\left(micromol/_{l}\right)} x(1.04\ for\ female)\ or\ (1.23\ for\ male)$$

ANTIBACTERIAL	DOSE FOR NORMAL RENAL FUNCTION	ADJUSTMENT FOR RENAL FAILURE Estimated creatinine clearance (CrCl), ml/min			SUPPLEMENT FOR DIALYSIS	COMMENTS
		>50	10-50	<10		
Aminoglycoside						
Amikacin	7.5mg/kg q12h or 15mg/kg/day	100%	100% q24-72h by levels	100% q48h-72h by levels	Extra 1/2 of normal renal function dose AD	Dosage adjustment should be based on TDM level where possible
Gentamicin	1.7mg/kg q8h or 5mg/kg/day	100%	100% q12-48h by levels	100% q48-72h by levels	Extra 1/2 of normal renal function dose AD	
Streptomycin	15mg/kg (max. of 1gm) q24h	100%	100% q24-72h	100% q72-96h	Extra 1/2 of normal renal function dose AD	
AD = after dialysis. "Dose AD" refers only to timing of dose with NO extra drug D = dosage reduction, I = interval extension, SGC=Soft gel capsule, HD – Haemodialysis, PD – Peritoneal dialysis						
Carbapenem						
Meropenem	1-2gm q8h	100%	26-50ml/min: 100% q12h 10-25ml/min: 50% q12h	50% q24h	Dose AD	
Ertapenem	1gm q24h	100%	<30ml/min: 50% q24h		PD : Dose for CrCl <10	

ANTIBACTERIAL	DOSE FOR NORMAL RENAL FUNCTION	ADJUSTMENT FOR RENAL FAILURE Estimated creatinine clearance (CrCl), ml/min			SUPPLEMENT FOR DIALYSIS	COMMENTS
		41-70	21-40	6-20		
Imipenem/cilastatin	1000mg q6h	750mg q8h	500mg q6h	500mg q12h	Dose AD	
	1000mg q8h	500mg q6h	500mg q8h	500mg q12h		
	500mg q8h	500mg q8h	250mg q6h	250mg q12h		
AD = after dialysis. "Dose AD" refers only to timing of dose with NO extra drug D = dosage reduction, I = interval extension, SGC=Soft gel capsule, HD – Haemodialysis, PD – Peritoneal dialysis						

ANTIBACTERIAL	DOSE FOR NORMAL RENAL FUNCTION	ADJUSTMENT FOR RENAL FAILURE Estimated creatinine clearance (CrCl), ml/min			SUPPLEMENT FOR DIALYSIS	COMMENTS
		>50	10-50	<10		
Cephalosporin						
Cefazolin	250mg- 2000mg q6h	100% q8h	100% q12h	50% q24-48h	15-20mg/kg AD	
Cefotaxime	1-2gm q6-12h	q6h	q6-12h	q24h or ½ dose	0.5-2gm AD	
Cefoperazone/ sulbactam	2gm q12h	2gm q12h	2gm q12h	1gm q12h	Dose AD	
Ceftazidime	1-2gm q8h	100%	q12-24h	q24-48h	Dose AD	
Cefuroxime sodium	0.75-1.5gm q8h	q8h	q8-12h	q24h	Dose AD	
Cefuroxime axetil	250mg-500mg q12h	100%	100%	100%	Dose AD	

ANTIBACTERIAL	DOSE FOR NORMAL RENAL FUNCTION	ADJUSTMENT FOR RENAL FAILURE Estimated creatinine clearance (CrCl), ml/min			SUPPLEMENT FOR DIALYSIS	COMMENTS
		30-60	11-29	<11		
Cefepime	2g q8h	2g q8h	2g q12-24h	1g q24h	Dose for CrCl<10	
	2g q12h	2g q12h	1-2g q24h	500mg q24h		
	1g q12h	1g q12h	500mg-1g q24h	250mg q24h		

ANTIBACTERIAL	DOSE FOR NORMAL RENAL FUNCTION	ADJUSTMENT FOR RENAL FAILURE Estimated creatinine clearance (CrCl), ml/min			SUPPLEMENT FOR DIALYSIS	COMMENTS
		>50	10-50	<10		
Fluoroquinolone						
500-750mg PO (or 400mg IV) q12h	100%	50-75%	50%	250mg PO or 200mg IV q12h		
250mg-750mg q24h	100%	250-750mg q24-48h	250-500mg q48h	Dose for CrCl <10		
200-400mg q12h	100%	100% q24h	50% q24h	100-200mg AD		
Macrolide						
250-500mg q12h	100%	<30ml/min: 50%	No data. Dose AD			
Miscellaneous						
Colistin	*Please refer Guide to Antimicrobial Therapy in the Adult ICU for dosage recommendation*					
50-100mg q6h	Avoid < 60	Avoid	Avoid	Not applicable		
Trimethoprim/sulfamethoxazole	5mg/kg **TMP** q8h-q6h	100%	100%q12h	Avoid or 2.5-5mg/kg **TMP** q24h	Dose AD	Higher doses in PJP

ANTIBACTERIAL	ACTUAL BODY WEIGHT	ADJUSTMENT FOR RENAL FAILURE Estimated creatinine clearance (CrCl), ml/min				COMMENTS
		>90	50-90	15-49	<15	
Vancomycin	<60kg	750mg q8h	750mg q12h	750mg q24h	750mg	*Initial dose, subsequently based on TDM level Alternative: Loading dose 15-20mg/kg, then dose adjusted based on TDM level (not to exceed 2g/dose)
	60-80kg	1000mg q8h	1000mg q12h	1000mg q24h	1000mg	
	81-100kg	1250mg q8h	1250mg q12h	1250mg q24h	1250mg	
	>100kg	1500mg q8h	1500mg q12h	1500mg q24h	1500mg	

ANTIBACTERIAL	DOSE FOR NORMAL RENAL FUNCTION	ADJUSTMENT FOR RENAL FAILURE Estimated creatinine clearance (CrCl), ml/min			SUPPLEMENT FOR DIALYSIS	COMMENTS
		>50	10-50	<10		
Penicillins						
Amoxicillin (oral)	250-500mg q8h	100%	q8-12h	q24h	Dose AD	
Ampicillin	250mg-2gm q8h	100%	q6-12h	q12-24h	Dose AD	
Amoxicillin/clavulanate (oral)	500/125mg q8h	100%	q12h	q24h	extra dose after dialysis	
Amoxicillin/clavulanate (IV)	1.2g q8h	100%	10-30ml/min: 100% q12h	100% q24h	extra dose after dialysis	
Ampicillin/sulbactam (IV)	1.5g-3g q6h	100%	15-29ml/min: 100% q12h	<15ml/min: 100% q24h	Dose AD	
Benzylpenicillin	0.5-4 million U q4-6h	100%	75%	20-50%	Dose AD	
Piperacillin/tazobactam	4.5gm q6-8h	100%	2.25gm q6h (q8h if <20)	2.25g q8h	extra 1.125g after HD	
Tetracycline						
Tetracycline	250-500mg q6-12h	q8-12h	q12-24h	q24h	None	Avoid in ESRD

ANTIFUNGAL	DOSE FOR NORMAL RENAL FUNCTION	ADJUSTMENT FOR RENAL FAILURE Estimated creatinine clearance (CrCl), ml/min			SUPPLEMENT FOR DIALYSIS	COMMENTS
		>50	10-50	<10		
Fluconazole	100-400mg q24h	100%	50%	50%	100% Dose AD	
Flucytosine	25mg/kg q6h	>40ml/min: 100%	20-40ml/min: q12h 10-20ml/min: q24h	q48h	Dose AD	
Voriconazole IV	6mg/kg IV q12h x 2 doses. Then, 4mg/kg q12h	100%	If CrCl < 50ml/min, accumulation of IV vehicle (cyclodextrin). Switch to PO or suspension (no dose adjustment).			
Voriconazole PO	200mg PO q12h	100%	100%	100%	No adjustment necessary	
Amphotericin B	0.5mg-1mg/kg q24h	100%	100%	100% q24h-q36h	No adjustment	

ANTIFUNGAL	DOSE FOR NORMAL RENAL FUNCTION	ADJUSTMENT FOR RENAL FAILURE Estimated creatinine clearance (CrCl), ml/min			SUPPLEMENT FOR DIALYSIS	COMMENTS
		>50	10-50	<10		
(conventional)					necessary	
Amphotericin B lipid complex	5mg/kg q24h	100%	100%	100% q24h-q36h	No adjustment necessary	

ANTIPARASITIC	DOSE FOR NORMAL RENAL FUNCTION	ADJUSTMENT FOR RENAL FAILURE Estimated creatinine clearance (CrCl), ml/min			SUPPLEMENT FOR DIALYSIS	COMMENTS
		>50	10-50	<10		
Pentamidine IV	4mg/kg q24h	q24h	q24h	q24-36h	0.75gm after each dialysis	Nephrotoxic

ANTIVIRAL	DOSE FOR NORMAL RENAL FUNCTION	ADJUSTMENT FOR RENAL FAILURE Estimated creatinine clearance (CrCl), ml/min			SUPPLEMENT FOR DIALYSIS	COMMENTS
		>50	10-50	<10		
Acyclovir IV	5-10mg/kg q8h	100% q8h	30-50ml/min: q12h 10-30ml/min: q24h	50% q24h	Dose AD	Rapid IV infusion can cause renal failure.
Ganciclovir IV	Induction: 5mg/kg q12h	2.5mg/kg q12h	CrCl 25-49: 2.5mg/kg q24h CrCl 10-24: 1.25mg/kg q24h	1.25mg/kg 3x/wk	Dose AD	
	Maintenance 5mg/kg q24h	2.5mg/kg q24h	CrCl 25-49: 2.5mg/kg q24h CrCl 10-24: 1.25mg/kg q24h	0.625mg/kg 3x/wk	0.625mg/kg 3x/wk AD	
Valganciclovir	Induction: 900mg q12h	450mg q24h	CrCl 25-39: 450mg q48h CrCl 10-24: 450mg 2x/wk	Avoid (use adjusted dose of ganciclovir)		
	Maintenance: 900mg q24h	450mg q24h	CrCl 25-39: 450mg q48h CrCl 10-24: 450mg 2x/wk	Avoid (use adjusted dose of ganciclovir)		

AD = after dialysis. “Dose AD” refers only to timing of dose with NO extra drug
D = dosage reduction, I = interval extension, SGC=Soft gel capsule, HD – Hemodialysis, PD – Peritoneal dialysis

Appendix 3 : Antibiotic Dosages in Children With Impaired Renal Function

ANTIMICROBIAL	DOSE FOR NORMAL RENAL FUNCTION	ADJUSTMENT FOR RENAL FAILURE Estimated creatinine clearance (CrCl), ml/min			HD IP PD	COMMENTS
		30-50	**10-29**	**< 10**		
ANTIBACTERIAL						
Aminoglycosides: Single daily dose						

ANTIMICROBIAL	DOSE FOR NORMAL RENAL FUNCTION	ADJUSTMENT FOR RENAL FAILURE Estimated creatinine clearance (CrCl), ml/min			HD IP PD	COMMENTS
		30-50	**10-29**	**< 10**		
Amikacin	LD 20mg/kg IV MD 15mg/kg IV q24h Max 1.5gm/d	Take trough level before the 2nd dose. If trough level is high, recheck level 12 hours after that level was taken. Redose when trough level is in range; adjust dosing interval accordingly.		15mg/kg on D1 then take blood level on D3; adjust dosing interval accordingly. See comment for HD dosing.		a) High flux hemodialysis membranes may lead to unpredictable aminoglycoside clearance, measure post- dialysis drug levels for efficacy (Peak) and toxicity (Trough). Refer level range in TDM section. b) Dosing adjustment for overweight for grossly eodematous patients: [IBW + 0.4(ABW-IBW)] IBW: Ideal body weight ABW: Actual body weight c) Where possible dosage modifications should be based on monitoring of individual pharmacokinetic
Gentamicin **Netilmicin**	LD 7mg/kg IV MD 5mg/kg IV q24h Max 240-360mg/d			5mg/kg on D1 then take blood level on D3; adjust dosing interval accordingly. See comment for HD dosing.		
Streptomycin	15mg/kg/dose IM q24h Max 1gm/d	7.5mg/kg q24h	7.5mg/kg q48h	7.5mg/kg q72-96h		TDM level monitoring is currently not available locally
Carbapenem						
Imipenem (+cilastatin)	15-25mg/kg/dose IV q6h	7-13 mg/kg/dose q8h	7-13 mg/kg/dose q12h	7-13 mg/kg/dose q24h		
Meropenem	20-40mg/kg q8h Increase up to 40mg/kg in severe infection. Max 6gm/day	100% q12h	50% q12h	50% q24h		
Cephalosporin						
Cefazolin	10-15mg/kg/dose (max 1g/dose) q8h Severe infection 50mg/kg/dose, max 2gm/dose q6h	q8h	q12h	q24h		
Cefepime	25mg/kg q12h Severe infection 50mg/kg q8h	q24h	q24h	q48h		
Cefotaxime **Injection 500mg, 1gm, 2gm**	25mg/kg q8h Severe infection 50mg/kg q4-6h	q8-12h	q12h	q24h		

ANTIMICROBIAL	DOSE FOR NORMAL RENAL FUNCTION		ADJUSTMENT FOR RENAL FAILURE Estimated creatinine clearance (CrCl), ml/min			HD IP PD	COMMENTS
			30-50	10-29	< 10		
Ceftriaxone Injection 250mg, 1gm, 2gm	**Infection**		100%	100%	Dose should not exceed 40mg/kg/day (max 2gm/day)		a) Should not be administered to premature, acidotic, jaundiced neonates or those with impaired liver function (e.g. prematurity, acute/chronic liver failure). b) Administration time in neonates in over 60 minutes to reduce risk of bilirubin encephalopathy. c) Doses over 80mg/kg may increase risk of biliary precipitates. d) Incompatible with calcium containing solutions and must not be given simultaneously with calcium containing solutions – even in different infusion lines.
	Neonates	**20-50mg/kg IV**					
	>1mo	20-50mg/kg IV/IM q24h (increase to 80mg/kg infusion for severe infection or meningitis). Max 4gm/day					
	Prophylaxis of meningococcal meningitis∞						
	1 – 12yo **>12yo**	125mg IM single dose (in 1% lignocaine) 250mg IM single dose (in 1% lignocaine)					
Cefoperazone/Sulbactam							
Ceftazidime Injection 500mg, 1gm	**Infection** IV/IM injection		q12h	q24h	q48h		
	<2mo	30mg/kg q12h (50mg/kg q12h for meningitis)					
	≥2mo	30-50mg/kg q8-12h					
	Doses up to 50mg/kg q8h (max 2gm q8h) may be given in severe infection, immunocompromised or cystic fibrosis. Single dose over 1gm should not be given via IM.						
Cefuroxime Injection 250mg, 750mg, 1.5gm Caplet 125mg, 250mg Liquid	**Infection**		100%	q12h	q24h		
	Neonates	30mg/kg IV q12h					
	Infants/ Children	10-30mg/kg q8h					
	Severe infection/ Cystic fibrosis						
	Neonates	50mg/kg IV q12h; reduce to 25mg/kg q12h on clinical improvement					

ANTIMICROBIAL	DOSE FOR NORMAL RENAL FUNCTION		ADJUSTMENT FOR RENAL FAILURE Estimated creatinine clearance (CrCl), ml/min			HD IP PD	COMMENTS
			30-50	10-29	< 10		
	Infants/ Children	50-60mg/kg q6-8h					
	Prophylaxis for cardiothoracic surgery for 24h						
	All ages	30mg/kg on induction followed by 2nd dose after 12h					
Fluoroquinolone							
Ciprofloxacin **Injection 100mg, 250mg** **Tablet 100mg, 250mg** **Liquid 250mg/5ml**	**Severe infection**		100%	50% q12h	50% q24h		
	Neonates	10-15mg/kg q12h IV/PO					
	1mo-18yo	10-15mg/kg (max 400mg) q12h IV 10mg/kg (max 750mg) q12h PO					
	Cystic fibrosis						
	All ages	15-20mg q12h					
	Prophylaxis for meningococcal disease						
	6-12yo	250mg as a single dose PO					
	<12yo	500mg as a single dose PO					
Levofloxacin	<5yo	10-15mg/kg q12h IV/PO	100%	5-10mg/kg q24h	5-10mg/kg q24h		
	>5yo	5-10mg/kg q24h IV/PO					
Ofloxacin	5mg/kg q8-12h IV/PO 10mg/kg q12h IV/PO		7.5mg/kg q24h	7.5mg/kg q24h	7.5mg/kg q48h		IV infusion over 1 hour
Macrolide							
Clarithromycin	7.5-15mg/kg q12h PO Slow release tablet: 0.5gm or 1gm q24h		100%	4mg/kg q12h	4mg/kg q24h		
Erythromycin **Injection 1gm** **Tablet 250mg, 500mg** **Liquid 125mg/5ml, 250mg/5ml**	**Infection** **Infants (>2mo)/ children**	10mg/kg q6h	100%	100%	q8h		
	Severe infection						
	Infants (>2mo)/ children	15 – 25 mg/kg q6h					
	Rheumatic Fever						
	Infants (>2mo)/ children	NOT /kg 250 mg q12h					

ANTIMICROBIAL	DOSE FOR NORMAL RENAL FUNCTION		ADJUSTMENT FOR RENAL FAILURE Estimated creatinine clearance (CrCl), ml/min			HD IP PD	COMMENTS
			30-50	**10-29**	**< 10**		
	GUT Prokinetic						
	Infants (>2mo)/ children	2 mg/kg q8h					
Miscellaneous antibacterials							
Colistin	**IV**						
	All ages	40,000unit/kg or 1.25 – 2.5 mg/kg of colistin base q12h					
	PO or inhalation						
	All ages	30,000 – 60,000unit/kg q8h					
Linezolid	**Infants/ Children**	10mg/kg IV q8h (max 600mg)	100%	100%	100%		Recommended treatment duration in 10-14 days, maximum 28 consecutive days.
Metronidazole	**All ages**	15mg/kg stat, 7.5 mg/kg IV/PO q12h (MD) to start 48H after loading dose (LD) in Preterm, 24H in term). MD q8h for neonate> 4 weeks	100%	100%	100%		Metronidazole is rapidly removed by HD and CAPD, therefore dose should be administered post dialysis.
Nitrofurantoin	**Infection**		Avoid use in Crcl <60ml/min/1.73m2				
	All ages	1.5mg/kg IV q6h					
	Prophylaxis						
	All ages	1-2mg/kg at night					
Sulfamethoxazole	**Trimethoprim component**						
	Infection						
	All ages	4mg/kg IV/PO q12h					
	Prophylaxis for renal						
	All ages	2mg/kg PO OD					
Trimethoprim	**Infection**						
	All ages	4mg/kg IV/PO q12h					
	Severe infection						
	All ages	6 - 8mg/kg IV/PO q12h					
	Prophylaxis for Urine						
	All ages	2mg/kg PO OD					
Vancomycin	**Infection**						
	LD 25mg/kg IV MD 15 - 20mg/kg IV q8-12h Max 30gm/d						

ANTIMICROBIAL	DOSE FOR NORMAL RENAL FUNCTION		ADJUSTMENT FOR RENAL FAILURE Estimated creatinine clearance (CrCl), ml/min			HD IP PD	COMMENTS
			30-50	10-29	< 10		
Polymyxin B	**Infection**						Avoid parenteral route when possible
	< 2 yo	15,000 – 45,000 units/kg/day continuous IV infusion or IV q12h					
	> 2 yo	15,000 – 25,000 units/kg/day continuous IV infusion or IV q12h Max: 2,000,000 units/day					
Penicillin							
Amoxycillin, Ampicillin			100%	q12h	q24h		
Amoxycillin/ Clavulanate	**Infection All ages**	15 – 25mg/kg q8h	100%	q12h	q24h		
	Severe infection						
	All ages	50mg/kg q8h					
Ampicillin/ Sulbactam	**Infection**		q8h	q12h	q24h		
	Infants > 1mo/ children	25 - 50mg/kg q6h					
	Severe infection/ Meningitis						
	Infants > 1mo/ children	50 - 100mg/kg q6h					
Benzylpenicillin (C-Penicillin)	**Infection**				q8h		1Mu is approximately 1.6gm
	Neonates	50,000 units/kg IV q12h					
	Infants/ Children	25,000 – 50,000/kg/day q4-6h					
	Severe infection						
	Neonates	80,000 units/kg IV q12h					
	Infants/ Children	25,000 – 80,000/kg in q4-6h					
Piperacillin	**Infection**		q8h	q12h	q12h		
	< 6 mo	100mg/kg IV q8h					
	> 6 mo	100mg/kg IV q6-8h					
	Severe infection						
	Same as above but as continuous infusion						

ANTIMICROBIAL	DOSE FOR NORMAL RENAL FUNCTION		ADJUSTMENT FOR RENAL FAILURE Estimated creatinine clearance (CrCl), ml/min			HD IP PD	COMMENTS
			30-50	10-29	< 10		
Pip(P) / Tazo(T)	Use Piperacillin component As Piperacillin		q6h	q8h	q8h		
ANTIMICROBIAL	DOSE FOR NORMAL RENAL FUNCTION		ADJUSTMENT FOR RENAL FAILURE Estimated creatinine clearance (CrCl), ml/min			HD IP PD	COMMENTS
			30-50	10-29	< 10		
Tetracycline							
Tetracycline	>8 yo	NOT /kg: 250 – 500 mg q8h					
ANTIFUNGAL							
Amphotericin B & ampho B lipid complex	**Amphotericin B**		100%	100%	100%		
	All ages	1.5 - 2mg/kg continuous IV q24h					
	Amphotericin B Lipid Complex						
	Infant/ children	3 – 6 mg/kg IV over 2h q24h					
Fluconazole	**Infection**		q24h	q24h	q48h		
	Neonates	5 - 6mg/kg IV q72h (age<14 days); q48h (age 15 – 28 days); q24h (age> 28 days)					
	Infants/ Children	6 mg/kg stat, 3 - 12mg/kg q24h					
	Severe infection/ Cystic fibrosis						
	Neonates	6 - 12mg/kg IV q72h (age<14 days), q48h (age 15 – 28 days), q24h (age> 28 days)					
	Infants/ Children	6 - 12mg/kg q24h					
Itraconazole PO	All ages 3-5mg/kg q12h		100%	100%	100%		
Flucytosine	400 - 1200mg/m2 q6h PO						
Voriconazole, IV	**Oral**		100%	100%	100%		
	<40kg	9mg/kg q12h					
	>40kg	Load 400mg q12h x 2 doses, then 200-300mg q12h.					
	IV injection						
	<40kg	Load 9mg/kg q12h x 2 doses, then 8mg/kg q12h					
	>40kg	Load 6mg/kg q12h, then 3-4mg/kg q12h					

ANTIMICROBIAL	DOSE FOR NORMAL RENAL FUNCTION	ADJUSTMENT FOR RENAL FAILURE Estimated creatinine clearance (CrCl), ml/min			HD IP PD	COMMENTS
		30-50	10-29	< 10		
ANTIPARASITIC						
Pentamidine Injection 200mg	3 - 4 mg/kg/dose IV/IM q24h for 10 – 14 days	100%	q36h	q48h		
Ethambutol Tab 400mg	25mg/kg q24h PO	100%	q36h	q48h		

ANTIMICROBIAL	DOSE FOR NORMAL RENAL FUNCTION		ADJUSTMENT FOR RENAL FAILURE Estimated creatinine clearance (CrCl), ml/min			HD IP PD	COMMENTS
			30-50	10-29	< 10		
Isoniazid Tablet 100mg Liquid 50mg/5ml	10mg/kg q24h PO (max 300mg)		100%	100%	100%		
Pyrazinamide Tablet 500mg	35mg/kg q24h PO (max 2000mg)		100%	40mg 3x/week	40mg 3x/week		
Rifampin Capsule 150mg, 300mg Liquid 100mg/5ml	15mg/kg q24h PO (max 600mg)						
Ethionamide Tablet 250mg	15 – 20 mg/kg q24h PO (max 1000mg) at night						
ANTIVIRAL							
Acyclovir Injection 250mg Tablet 200mg, 800mg	**EBV, herpes encephalopathy or sepsis, immunodeficiency, varicella**		q12h	q24h	50% q24h		
	>35wk – 12y	500mg/m2 IV q8h					
	Varicella zoster						
	<2y	400mg (NOT/kg) x 5/day for 7 days					
	≥2y	800mg (NOT/kg) x 5/day for 7 days					
Adefovir Tablet 10mg	2-6 yo	0.3mg/kg q24h PO (max 10mg)			q8h		1Mu is approximately 1.6gm
	7-11 yo	0.25mg/kg q24h PO (max 10mg)					
	>12 yo	10mg q24h PO (max 10mg)					
Ganciclovir Injection 250mg	5 mg/kg IV q12h for 2-3 weeks, then 5 mg/kg IV q24h 20 mg/kg PO q8h		2.5mg/kg IV day 1, then 1.25mg/kg q24	1.25mg/kg IV day 1, then	1.25mg/kg IV 3x/week, then 0.625mg/kg		

ANTIMICROBIAL	DOSE FOR NORMAL RENAL FUNCTION	ADJUSTMENT FOR RENAL FAILURE Estimated creatinine clearance (CrCl), ml/min			HD IP PD	COMMENTS
		30-50	10-29	< 10		
		OR 100% PO	0.625mg/kg q24 **OR** 30mg/kg q12h PO	3x/week **OR** 30mg/kg q24h PO		
Indinavir/ Nelfinavir/ Nevirapine Indinavir Tab 400mg Nevirapine Tab 200mg Liquid 50mg/5ml	Indinavir: 500 mg/m2 q8h PO Nelfinavir: 45-55 mg/kg PO q12h or 25-35 mg/kg PO q8h Nevirapine: <8 yo 200mg/m2 q24h PO (max 200mg) >8 yo 120-150 mg/m2 q24h PO (max 200mg)					
ANTIMICROBIAL	DOSE FOR NORMAL RENAL FUNCTION	ADJUSTMENT FOR RENAL FAILURE Estimated creatinine clearance (CrCl), ml/min			HD IP PD	COMMENTS
		30-50	**10-29**	**< 10**		
Lamivudine(HIV) Liquid 10mg/ml	< 30 days 2mg/kg q12h PO > 30 days 4mg/kg q12h PO	q24h	q24h	q24h		
Lamivudine (Hep B) Liquid 10mg/ml	2-7 yo 3mg/kg q24h PO (max 100mg)	q24h	q24h	q24h		
Ritonavir & Saquinavir, SGC **Ritonavir Tablet & capsule 100mg** **Saquinavir Capsule 200mg, tab 500mg**	5-14kg RTV 3mg/kg + SQV 50mg/kg q12h PO 15 - 39kg RTV 2.5mg/kg + SQV 50mg/kg q12h PO >40kg RTV 100mg + SQV 50mg/kg q12h PO					
Stavudine, PO Tab 30mg	<14 days 0.5mg/kg q12h PO <30kg 1mg/kg q12h PO 30-59kg 30mg q12h PO	<30kg: 0.5mg/kg q12h 30-59kg: 15mg q12h	<30kg: 0.25mg/kg q24h 30-59kg: 7.5mg q24h	<30kg: 0.25mg/kg q24h 30-59kg: 15mg q24h		
Zidovudine Capsule 100mg Liquid 10mg/ml	180 - 240 mg/m2 q12h PO 120 mg/m2 q6h IV	100%	100%	50% q8h		

Appendix 4: Antibiotic in Pregnancy and Lactation

Types of Antibiotics / Antiviral / Antiviral / Anti TB	FDA Pregnancy category	Compatibility with Breastfeeding (Reference: Therapeutic Goods Administration;TGA)
Abacavir	C	Avoid, insufficient data Compatible; may cause diarrhea in infant
Acyclovir	B	Compatible
Adefovir	C	Avoid, insufficient data
Amikacin	D	Compatible; may cause diarrhea in infant
Amoxycillin	B	Compatible; may cause diarrhea in infant
Amoxycillin / clavulanate	B	Compatible; may cause diarrhea in infant
Amphotericin B	B	Compatible
Ampicillin	B	Compatible; may cause diarrhea in infant
Ampicillin / Sulbactam	-	No data available
Artesunate	NA	Caution, insufficient data
Azithromycin	B	Compatible; may cause diarrhea in infant
Bacampicillin	B	No data available
Benzathine Penicillin	B	Compatible; may cause diarrhea in infant
Benzylpenicillin	B	Compatible; may cause diarrhea in infant
Caspofungin	C	Caution, insufficient data
Cefaclor	B	Compatible; may cause diarrhea in infant
Cefepime	B	Compatible; may cause diarrhea in infant
Cefoperazone	B	Infant risk cannot be ruled out
Cefoperazone / Sulbactam	-	No data available
Cefotaxime	B	Compatible; may cause diarrhea in infant
Ceftazidime	B	Compatible; may cause diarrhea in infant
Ceftriaxone	B	Compatible: may cause diarrhea in infant
Cefuroxime Axetil	B	Compatible; may cause diarrhea in infant
Cefuroxime Sodium	B	Compatible; may cause diarrhea in infant
Cephalexin Monohydrate	B	Compatible; may cause diarrhea in infant
Chloramphenicol	C	oral or IV use: avoid Topical use; compatible
Ciprofloxacin	C	Compatible; may cause diarrhea in infant
Clarithromycin	C	Compatible; may cause diarrhea in infant
Clindamycin	B	Compatible; may cause diarrhea in infant
Clofazimine	C	Avoid, insufficient data
Clotrimazole	B	Compatible
Cloxacillin	B	Compatible; may cause diarrhea in infant
Cycloserine	C	No data available
Dapsone	C	Caution, insufficient data: monitor for haemolysis, do not use in infants with G6PD deficiency
Didanosine	B	Avoid, insufficient data
Doxycycline	D	Compatible for short courses (eg 10 days) if alternative drug not appropriate; may cause diarrhea in infant
Efavirenz	C	Avoid, insufficient data
Ertapenem	B	Compatible; may cause diarrhea in infant
Erythromycin	B	Compatible; may cause diarrhea in infant
Ethambutol	C	Compatible
Fluconazole	D	Compatible
Flucytosine	C	Caution, insufficient data
Fusidate sodium	C	Compatible; may cause diarrhea in infant
Ganciclovir	C	Avoid, insufficient data
Gentamicin	C (Ophthalmic / Otic / Aural / Topical / Cutaneous) D (Parenteral)	Compatible; may cause diarrhea in infant
Griseofulvin	C	Avoid, insufficient data
Imipenem / Cilastatin	C	Compatible; may cause diarrhea in infant

Types of Antibiotics / Antiviral / Antiviral / Anti TB	FDA Pregnancy category	Compatibility with Breastfeeding (Reference: Therapeutic Goods Administration;TGA)
Indinavir	C	Avoid, insufficient data
Isoniazid	C	Compatible
Itraconazole	C	Caution, insufficient data
Kanamycin	D	No data available
Ketoconazole	C	Systemic use: caution, insufficient data Topical use: compatible
Lamivudine	C	Avoid, insufficient data
Levofloxacin	C	Compatible; may cause diarrhea in infant
Linezolid	C	Caution, insufficient data; may cause diarrhea in infant
Lopinavir / Ritonavir	C	Avoid, insufficient data
Meropenem	B	Compatible; may cause diarrhea in infant
Metronidazole	B	Compatible; may cause diarrhea in infant
Miconazole	C	Compatible
Minocycline	D	Avoid, possibility of staining infant's teeth with prolonged courses
Netilmicin	D	
Nevirapine	C	Avoid, insufficient data
Nitrofurantoin	B	Compatible; may cause diarrhea in infant
Nystatin	C	Compatible
Ofloxacin	C	Compatible
Phenoxymethyl penicillin	B	Compatible; may cause diarrhea in infant
Piperacillin	B	Compatible; may cause diarrhea in infant
Piperacillin / Tazobactam	Piperacillin – B, Tazobactam – unknown	Compatible; may cause diarrhea in infant
Procaine benzylpenicillin	B	Compatible; may cause diarrhea in infant
Pyrazinamide	C	Caution, insufficient data
Ribavirin	X	Avoid, insufficient data
Rifampicin	C	Compatible; may cause diarrhea in infant. Monitor infant for jaundice
Ritonavir	B	Avoid, insufficient data
Stavudine	C	Avoid, insufficient data
Streptomycin	D	Caution, insufficient data; may cause diarrhea in infant
Sulphamethoxazole / Trimethoprim	D	Compatible in infants older than one month; may cause diarrhea in infant
Terbinafine HCl	B	Compatible in infants older than one month; may cause diarrhea in infant
Tetracycline	D	Compatible for short courses (eg 10 days) if alternative drug not appropriate; may cause diarrhea in infant
Tinidazole	C	Caution, insufficient data; may cause diarrhea in infant
Trimethoprim	C	Compatible
Vancomycin	C	Compatible; may cause diarrhea in infant
Voriconazole	D	Avoid, insufficient data
Zidovudine	C	Avoid, insufficient data

Definitions for compatibility with breastfeeding:
Compatible — there are sufficient data available to demonstrate an acceptably low relative infant dose and/or no significant plasma concentrations and/or no adverse effects in breastfed infants
Caution — there are insufficient data showing low relative infant dose and/or no significant plasma concentrations and/or no adverse effects in breastfed infants
Avoid, insufficient data — there are no data on transfer into milk, or on plasma concentrations or adverse effects in the breastfed infant
Avoid — significant plasma concentrations in exposed infants, or adverse effects in breastfed infants reported or predictable from the properties of the molecule.

In Australia, breastfeeding is not recommended for HIV-positive women because of the possibility of HIV transmission and because suitable formula milk is readily available. In countries in which no acceptable, feasible, sustainable and safe replacement feeding is available, exclusive breastfeeding for 6 months is recommended for HIV-infected mothers to reduce the risk of HIV transmission from the mother to the infant compared with mixed feeding. The amount of drug transferred via milk in these cases is also of interest as it may exert antiviral actions in the infant.

Appendix 5: Antifungal Activity Spectrum

DRUG	ORGANISMS INHIBIT / CLINICAL SYNDROMES		
	Yeast	**Mould**	**Dimorphic Fungi**
POLYENES			
Amphotericin B • **Conventional** • **Ampho B lipid complex (ABLC)** • **Ampho B cholesteryl Complex** • **Liposomal Ampho B**	*Candida albicans* *Candida tropicalis* *Candida parapsilosis* *Candida glabrata* *Candida krusei* *Candida dubliniensis* *Candida guillermondil* *Cryptococcus neoformans*	*Aspergillus fumigatus* *Aspergillus flavus* (higher MIC but ABLC has greater activity) **Mucorales* **Fusarium species* (better with ABLC) (resistant is common) **Trichosporon* spp (least active clinically) *Mucormycosis* (with ABLC)	*Histoplasma capsulatum* *Blastomyces dermatitidis* *Coccidioides immitis* *Sporothrix schenoki*
Nystatin	*Candida* spp. *Cryptococcus* spp	*Aspergillus* spp	*Blastomyces* spp. *Coccidioides* spp. *Histoplasma capsulatum*
PYRAMIDINE ANALOG			
5-Flucytosine	**Candida albicans* **Candida tropicalis* **Candida parapsilosis* **Candida krusei* **Candida glabrata* **Cryptococcus neoformans* (resistant is common)		
AZOLES			
Ketoconazole	*Candida* spp.	*Dematiaceous molds*	*Blastomyces dermatitidis* *Histoplasma capsulatum* *Coccidioides immitis*
Fluconazole	*Candida albicans* *Candida dubliniensis* *Candida tropicalis* *Candida parapsilosis* *Candida guillermondil* **Candida lusitaniae* (least active clinically) **Candida glabrata* (possibly active but resistant is common) *Cryptococcus neoformans*		
Itraconazole	*Candida albicans* *Candida dubliniensis* *Candida tropicalis* *Candida parapsilosis*	*Aspergillus fumigatus* *Aspergillus flavus* *Aspergillus terreus*	*Histoplasma capsulatum* *Blastomyces dermatitidis* *Coccidioides immitis* *Sporothrix schenoki*

DRUG	ORGANISMS INHIBIT / CLINICAL SYNDROMES		
	Yeast	**Mould**	**Dimorphic Fungi**
	Candida guillermondil **Candida krusei* (least active clinically) **Candida glabrata* (resistant is common) **Cryptococcus neoformans* (least active clinically)	**Fusarium* species (possibly active) **Trichosporon* spp (least active clinically) *Dematiaceous molds*	
Voriconazole	*Candida albicans* *Candida dubliniensis* *Candida tropicalis* *Candida parapsilosis* *Candida guillermondil* *Candida krusei* *Candida lusitaniae* **Candida glabrata* (resistant is common) *Cryptococcus neoformans*	*Aspergillus fumigatus* *Aspergillus flavus* *Aspergillus terreus* *Fusarium species* *Scedosporium aplospermum* *Trichosporon* spp *Mucormycosis* *Dematiaceous molds*	*Histoplasma capsulatum* *Blastomyces dermatitidis* *Coccidioides immitis*
Posaconazole	*Candida albicans* *Candida dubliniensis* *Candida tropicalis* *Candida parapsilosis* *Candida krusei* *Candida guillermondil* *Candida lusitaniae* **Candida glabrata* (resistant is common) *Cryptococcus neoformans*	*Aspergillus fumigatus* *Aspergillus flavus* *Aspergillus terreus* *Mucorales* *Fusarium* species *Scedosporium aplospermum* *Trichosporon* spp *Mucormycosis* *Dematiaceous molds*	*Histoplasma capsulatum* *Blastomyces dermatitidis* *Coccidioides immitis* **Sporothrix schenoki* (least active clinically)
ECHINOCANDIN			
Anidulafungin	*Candida albicans* *Candida dubliniensis* *Candida glabrata* *Candida tropicalis* *Candida krusei* *Candida lusitaniae* **Candida parapsilosis* (high MIC) **Candida guillermondil* (high MIC)	*Aspergillus fumigatus* *Aspergillus flavus* *Aspergillus terreus* *Dematiaceous molds* (least active clinically)	
Caspofungin	*Candida albicans* *Candida dubliniensis* *Candida glabrata* *Candida tropicalis* *Candida krusei* *Candida lusitaniae* **Candida parapsilosis* (high MIC) **Candida guillermondil* (high MIC)	*Aspergillus fumigatus* *Aspergillus flavus* *Aspergillus terreus* *Dematiaceous molds* (least active clinically)	

DRUG	ORGANISMS INHIBIT / CLINICAL SYNDROMES		
	Yeast	**Mould**	**Dimorphic Fungi**
Micafungin	*Candida albicans* *Candida dubliniensis* *Candida glabrata* *Candida tropicalis* *Candida krusei* *Candida lusitaniae* **Candida parapsilosis* (high MIC) **Candida guillermondil* (high MIC)	*Aspergillus fumigatus* *Aspergillus flavus* *Aspergillus terreus* *Dematiaceous molds* (least active clinically)	
Remarks: **1. Echinocandins, Voriconazole, Posaconazole and Polyenes have poor urine penetration.** **2. Successful treatment of infection with Candida parapsilosis requires removal of foreign body or intravascular device.** **3. Infections from mucormycosis,some Aspergillus spp., and dermaticeous molds often require surgical debridement.**			

References:
1. Russell E. Lewis. Current concept in antifungal pharmacology. Mayo Clin Proc. 2011;86(8):805-817 Doi: 10.4065/mcp. 2011.0247. www.mayoclinicproceedings.com
2. The Sanford Guide To Antimicrobial Therapy 2014. 44th Ed. Antimicrobial Therapy Inc. ISBN 978-1-930808-78-2

Appendix 6: Guide To Collection & Transport Of Clinical Specimen

SPECIMEN	COLLECTION CONTAINER	TRANSPORT
Blood / Bone Marrow Aspirate	Commercial blood culture bottle (aerobe, anaerobe, paediatric, fungal, TB)	-
CSF	Sterile Bijou bottle	Immediately
Ear	Sterile swab	Amies Transport Medium
Eye	Sterile swab	Amies Transport Medium
	Corneal scrapping	Bacteriologic / Mycology culture media
Stool	Clean / Sterile container	Selenite F broth / Alkaline Peptone Water (during outbreak)
Stool for *Clostridium difficile* toxin	Sterile container	Immediately
Rectal swab (CRE / VRE screening)	Sterile swab	Amies Transport Medium
Genital	Sterile swab	Amies Transport Medium
Endocervical swab for *Chlamydia trachomatis*	Glass slide	Immediately or fixed with methanol if expected delay
Nose	Sterile swab	Amies Transport Medium
Sinus	Sterile swab	Amies Transport Medium
Bronchoalveolar lavage	Sterile container	Immediately
Sputum / Tracheal aspirate	Sterile container	-
Sterile body fluid (peritoneal / pericardial / pleural / vitrous / synovial fluid)	Sterile container	Immediately
Throat	Sterile swab	Amies Transport Medium
Tissue	Sterile container filled with sterile normal saline (not formalin)	-
	Thioglycolate / RCMM for anaerobic infection	-
Urine	Sterile container	Within 30 minutes
Pus	Sterile swab	Amies Transport Medium
	Sterile container (aspirated from abscess)	-
	Thioglycolate / RCMM for anaerobic infection	-
Central venous catheter tip	Sterile container	Send along with peripheral blood culture
Gastric biopsy for *Helicobacter pylori*	Bullet tube filled with 0.5 ml sterile saline	Immediately
Blood film for malaria parasite (BFMP)	Thin & thick smear on glass slide	Immediately