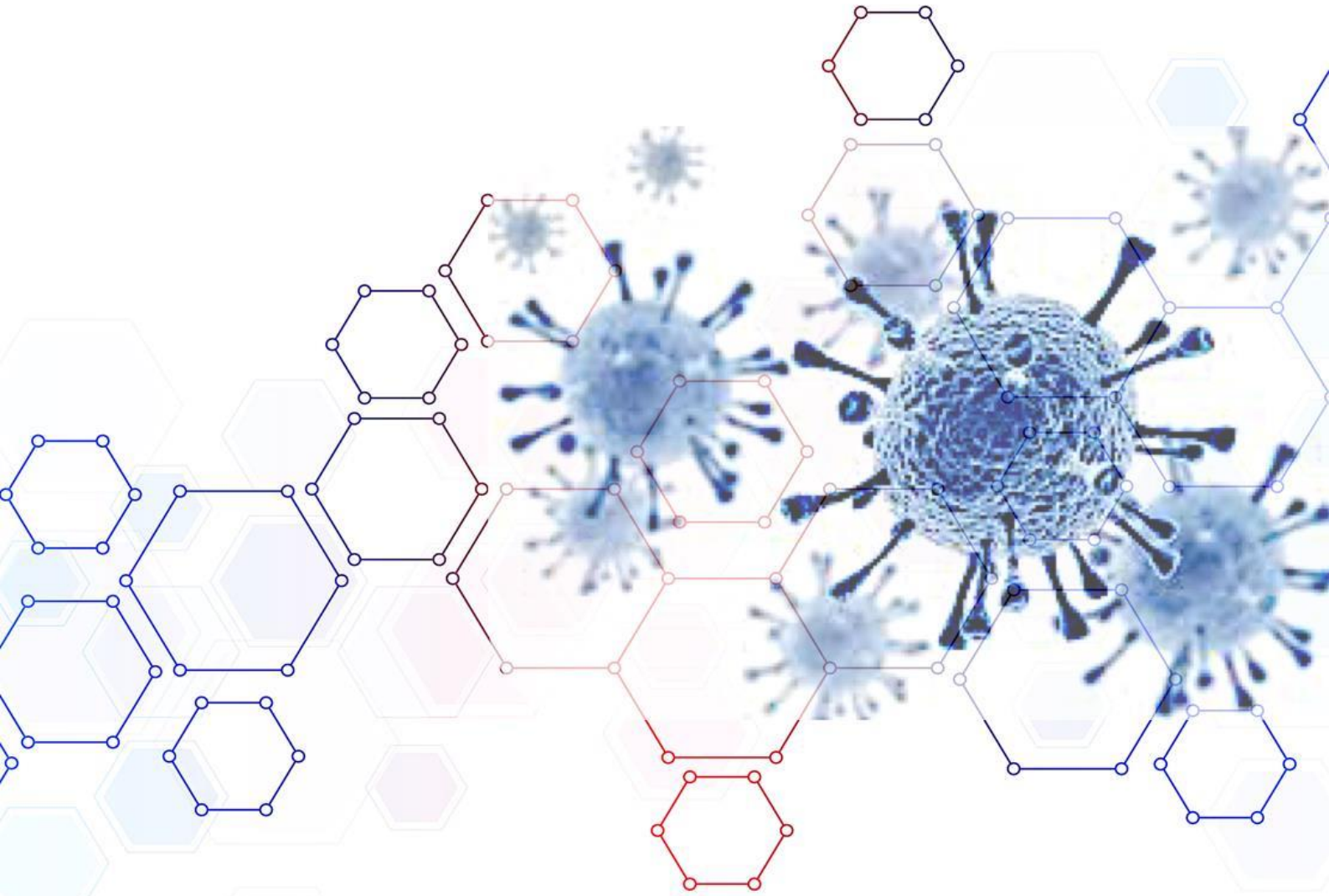
HOSPITAL PULAU PINANG



ANTIMICROBIAL GUIDELINE

EDITION 2018

ANTIMICROBIAL GUIDELINE
HOSPITAL PULAU PINANG
EDITION 2018

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FOREWORD

I would like to take this opportunity to congratulate all contributors and reviewers of the first edition Hospital Pulau Pinang Antimicrobial Guideline (HPP AMG) 2018. The writing group has taken great effort in compiling and drawing up the most appropriate antimicrobial therapy for each systemic infection taking into consideration of our own hospital antibiogram and clinicians' preference guided by evidence-based medicine.

In the report of the National Surveillance on Antimicrobial Utilization 2017, HPP was one of the 5 hospitals with the highest prescriptions of cephalosporins, especially the 4th generation cephalosporin and carbapenems. The utilization of these antibiotics continues to rise between the months of January to June 2018 as highlighted in the recent Infection Control Meeting 3/2018. The utilization of IV vancomycin increased by 40 %, IV imipenem/cilastatin increased 21%, IV meropenem increased 13% and IV colistin increased 25%. The rise in the rates of Multi Drug Resistant (MDR) organisms eg. Extended Spectrum Beta Lactamases (ESBL) *Klebsiella pneumoniae*, ESBL *E.coli*, Carbapenem Resistant Enterobacteriaceae (CRE) and Carbapenem Resistant *Acinetobacter baumannii* in this hospital is worrying to all clinicians.

This guideline aims to provide effective and appropriate treatment options for common infections presenting to HPP. It encourages the use of narrow spectrum antibiotics in mild to moderate infections but does not restrict broad spectrum antibiotics in more severe infections. Antimicrobial audit will be carried out yearly in Point Prevalence Study 2.0 from Ministry of Health in the month of October. It is imperative to document the indication of initiating antimicrobial in the patient's note clearly and a review of the need to either de-escalate, stop or continue therapy must be done 48-72 hours after initiation. This guideline will be used in the audit for appropriateness of therapy.

I sincerely hope that all the clinicians in HPP will give their support for this guideline in the management of infections in order to reduce inappropriate antimicrobial prescription.

Thank you.

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FOREWORD

Antimicrobial resistance (AMR) is increasing and is now a global public health threat. Infections caused by antimicrobial-resistant micro-organisms are associated with increased morbidity, mortality and healthcare costs. Inappropriate and non-judicious use of antimicrobials is associated with the emergence of AMR.

Recognizing the urgent need for an antibiotic guideline in Hospital Pulau Pinang (HPP), a group of adult and paediatric infectious disease physicians, clinical microbiologists and pharmacists have reviewed multiple international guidelines and our own Malaysia National Antimicrobial Guideline (NAG) 2014. This hospital antibiogram for past one year was also analysed in order to create an evidence based guideline for the use in HPP. We are thankful to all the Head of Departments who had given their expert opinions on the draft and agreed on the content. I am honoured to introduce the first edition HPP antimicrobial guideline 2018 which will be launched in conjunction with the World Antibiotic Awareness Week Campaign in our hospital.

It is estimated that 30- 40% of hospital antimicrobial use is inappropriate. With this guideline, we sincerely hope that all clinicians in HPP will adopt and support the use of it by prescribing antimicrobial according to what is stated in the document. In the future, any antimicrobial audit can be done as we have our own guideline for reference. This guideline will be updated on a regular basis taking into the consideration the changing antibiogram and cost effectiveness of treatment.

Thank you.

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Reminders from Editorial Board:

1. This guideline is designed to guide empirical and targeted antimicrobial selection.

2. Escalation or de-escalation of antimicrobial agents must be considered after reviewing the culture results.

3. Switching to oral antimicrobial agents is strongly recommended when patient clinically improved and able to take oral medicine.

4. Duration of therapy suggested in this guideline might not represent the true requirement for every patient. Clinical correlation is important.

5. The dosage of antimicrobial suggested in this guideline is based on normal renal function. Please refer to appendix 1 for dosage adjustment in renal impairment.

6. Please refer to appendix 2 for alternative therapy in penicillin allergy.

7. Please refer to National Tuberculosis Guideline as the chapter for anti TB has been excluded in this guideline.

8. Best practice in antibiotic care bundle includes:
    a. Start antibiotics ONLY if there is clinical evidence of bacterial infection.

    b. Documentation in patient note and medical chart is important:
        i. Treatment indication
        ii. Drug name, dose, frequency and route
        iii. Treatment duration (or review date)

    c. Obtain appropriate cultures before starting antibiotics.

    d. Ensure the antibiotics are given within 4 hours of prescription.
        i. Within 1 hour for severe sepsis or neutropenic sepsis.

    e. At 48- 72 hours after starting antibiotics, make an antimicrobial prescribing decision:
        i. Review the clinical diagnosis
        ii. Review laboratory/ radiological results
        iii. Modify the antibiotic prescribing options:
            1. Stop antibiotic if no evidence of bacterial infection
            2. Switch to oral therapy if clinically stable
            3. Change antibiotic according to culture result
            4. Continue current antibiotic and determine duration of therapy

CONTENTS

SECTION A : ADULT

SECTION B : PEADIATRICS

APPENDICES

SECTION A : ADULT

CHEMOPROPHYLAXIS

SURGICAL

1. It is the use of antibiotics to prevent infections at the surgical site.

2. The optimal time for administration is within 60 minutes before surgical incision.

3. Giving more than 1 or 2 doses post-operatively is generally not advised.

4. The practice of continuing prophylactic antibiotic until surgical drain removal is **NOT RECOMMENDED**.

5. A second dose may be required in the following situations:

    a. Delay in start of surgery.
    b. Prolonged operations when the time is more than 2 half-life of the usual dosing interval of the antibiotic.
    c. Excessive bleeding (more than 1.5L) intra-operatively.

6. Consider doubling the dose if BMI > 35.

7. Some agents, such as clindamycin, fluoroquinolones, gentamicin, metronidazole and vancomycin require administration over 1-2 hours; therefore, administration of these agents should begin within 120 minutes before surgical incision.

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
OBSTETRICS & GYNAECOLOGY			
Caesarean Section a. Elective b. Emergency	Cefuroxime 1.5gm IV stat	Ampicillin/sulbactam 3gm IV stat	
Elective surgery TAHBSO Hysterectomy (vaginal or abdominal)	Cefuroxime 1.5gm IV stat	Ampicillin/sulbactam 3gm IV stat	
Laparoscopic surgery Vagina and/or uterus not entered	Antibiotic not recommended	Antibiotic not recommended	

Reference:
1. *Antibiotic Prophylaxis in Gynaecology Procedure – SOGC Clinical Practice Guideline no 275, April 2012 (reviewed by SOGC ID committee in March 2015)*
2. *Antibiotic Prophylaxis in Obstetric Procedure - SOGC Clinical Practice Guideline no 247, September 2010*
3. *Finn ES, Jorgen VB, Jon MG, Hanne ME. The Effect of Antibiotic Prophylaxis Guidelines on surgical-site Infections associated with Caesarean Delivery. International Journal of Gynaecology and Obstetrics. 2014.*

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
OTORHINOLARYNGOLOGY SURGERY			
Head and neck Clean, adenotonsillectomy, otoplasty, lymphadenectomy, septoplasty, laryngeal microsurgery, tympanoplasty	Antibiotic not required		
Clean with placement of prosthesis, tissue flaps (excludes tympanostomy tubes)	Cefuroxime 1.5gm IV **PLUS** Metronidazole 500mg IV	Amoxicillin/clavulanate 1.2gm IV	May continue antibiotic for 1-5 days
Clean-contaminated cancer surgery Other clean-contaminated procedures Endoscopic sinus surgery with chronic rhinosinusitis, nasal graft surgery, cochlear implant, total laryngectomy, mastoidectomy, resection of nasal tumour, uvulopalatopharyngoplasty	Amoxicillin/clavulanate 1.2gm IV	Cefuroxime 1.5gm IV **PLUS** Metronidazole 500mg IV	Endoscopic sinus surgery with chronic rhinosinusitis suggest Amoxicillin/clavulanate 7 days preoperative and for total 14 days

References:

1. *Am J Health-System Pharm. 2013; 70:195-283, 2013@IDSA*
2. *Michael PV, Susan LD, Amy MW, John EM, Tamer AG. Considerations for Antibiotic Prophylaxis in head and Neck Cancer Surgery. Oral Oncology. 2017.*
3. *Skitarelić N, Morović M, Manestar D. Antibiotic prophylaxis in clean contaminated head and neck oncological surgery. J Craniomaxillofacial Surg.2007; 35:15-20.*
4. *National Institute for Health and Clinical Excellence. Surgical site infection (clinical guideline 74) 2008.*
5. *www.nice.org.uk/CG74 (accessed 2012 Dec 9)*
6. Fennessy BG, Harney M, O'Sullivan MJ et al. Antimicrobial prophylaxis in otorhinolaryngology/head and neck surgery. *Clin Otolaryngol*.2007; 32:204

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
ORAL / DENTAL SURGERY			
Clean Surgery (Class 1) • Submandibular gland surgery • TMJ surgery • Excision of benign tumours / cysts Minor Clean-contaminated surgery (Class 2) • soft tissue surgery • dentoalveolar surgery • periodontal surgery • lower 3rd molar	Not Indicated		May be indicated i. if the duration of the surgery is expected to be very long ii. for open reduction and internal fixation of facial bone fractures iii. higher degree of difficulty iv. immunocompromised patients
Minor clean-contaminated surgery (Class 2) • insertion of dental implants and use of graft material • high degree of difficulty / long duration	Amoxicillin/clavulanate 1.2gm IV		
Major Clean-contaminated surgery (Class 3) • Orthognathic surgery • All oral cancer surgery • Open reduction and internal fixation of facial bone fractures	Amoxicillin/clavulanate 1.2gm IV		

References:
1. KKM CPG: Antibiotic Prophylaxis in Oral Surgery for Prevention of Surgical Site Infection (second edition); November 2015.

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
PLASTIC SURGERY			
Lip repair, palatoplasty/ pharyngoplasty	Amoxicillin/clavulanate 1.2gm IV		
Cranio-facial surgery Maxillo-facial surgery	Amoxicillin/clavulanate 1.2gm IV	Metronidazole 500mg IV **PLUS** Cefuroxime1.5gm IV	
BURNS			
SSG/ Debridement	Ampicillin/sulbactam 3gm IV	Cefazolin 2gm IV	*MRSA* colonized patients: Vancomycin 15mg/kg IV
References: 1. *CPG: Burn Patient Management (ACI Statewide Burn Injury Service), August 2011.*			
VASCULAR SURGERY			
Vascular graft implants a. AVF graft b. Aortic graft / TEVAR / EVAR	Ampicillin/sulbactam 3gm IV	Cefazolin 2gm IV	

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
HEPATOBILIARY SURGERY			
Open cholecystectomy ERCP + stent	Ampicillin/sulbactam 3gm IV	Cefuroxime 1.5gm IV	Antibiotic can be continued for 4-7 days if perforation or gallbladder necrosis is encountered during operation
Laparoscopic cholecystectomy	Antibiotic not recommended		
GENERAL SURGERY			
Upper GIT (oesophagus, stomach & upper small bowel)	Amoxicillin/clavulanate 1.2gm IV	Cefuroxime 1.5gm IV	In intestinal obstruction **ADD** Metronidazole 500mg IV
Distal small bowel colorectal	Amoxicillin/clavulanate 1.2gm IV	Ceftriaxone 2gm IV **PLUS** Metronidazole 500mg IV	
Appendectomy procedure	Amoxicillin/clavulanate 1.2gm IV	Cefuroxime 1.5gm IV **PLUS** Metronidazole 500mg IV	

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Open Hernia repair +/- mesh	Amoxicillin/clavulanate 1.2gm IV	Cefuroxime 1.5gm IV	Laparoscopic hernia +/- mesh not required SAP
Breast Mastectomy with axillary clearance with/without reconstruction only recommended for high risk group	Amoxicillin/clavulanate 1.2gm IV	Cefuroxime 1.5gm IV	Not recommended for minor excisions

Reference:

1. *Dale WB, Patchen D, Keitg MO, Trish MP, Paul GA, Maureen KB, etal. Clinical Practice Guidelines for Antimicrobial Prophylaxis in Surgery. IDSA. Am J Health-Syst Pharm: 2013; 70:195-283.*
2. *CS Loozen, K. Kortram, V.N.N. Kornmann, B. van Ramshorst, C.A.J. Knibbe, et al. Randomised Clinical Trial of Extended versus Single-Dose Perioperative Antibiotive Prophylaxis for Acute Calculous Cholecystitis. Wiley Online Library. 2016.*
3. *Jashvant Poeran, M.d., Ph. D, Isaac Wasserman, M.P.H., Nicole Zubizarreta, et al. Characteristics of Antibiotic Prophylaxis and Risk of Surgical Site Infections in Open Colectomies. Disease of The Colon & Rectum Volume 59:8 (2016).*
4. *Rhiannon JD, MPH, Lillian GD, MD, FACS, Catherine Vick, et al. Choice of Intravenous Antibiotic Prophylaxis for colorectal Surgery Does Matter. American College of Surgeons. Elsevier; 2013.*
5. *F. Kockerling, R. Bittner, D. Jacob, C. Schug-Pass, C. Laurenz, D. Adolf, et al. Do We Need Antibiotic Prophylaxis in Endoscopic Inguinal Hernia Repair? Results of the Herniamed Registry. Surg Endosc (2015) 29: 3741-3749.*

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
ORTHOPAEDIC SURGERY			
Internal fixation of all closed fracture Total Joint Replacement Arthroscopy	Amoxicillin/clavulanate 1.2gm IV	Cefuroxime 1.5gm IV	Recommend to screen nasal *MRSA* carrier status Intranasal mupirocin if *MRSA* colonizer for 5 days
Spine surgery Simple (laminectomy and discectomy) Complicated procedure : Placement of prosthetic material	Cefazolin 2gm IV	Amoxicillin/clavulanate 1.2gm IV	Known MRSA colonization: add IV Vancomycin 15 mg/Kg once
Gun shot and other penetrating wounds	Amoxicillin/clavulanate 1.2gm IV	Cefuroxime 1.5gm IV **PLUS** Metronidazole 500mg IV	Thorough surgical debridement If gross contamination is seen, or fracture with major soft tissue injury, 5 days duration is recommended

References:

1. *Del Pozo JL. NEJM.2009 361(8): 787*
2. *IDSA guidelines, Clinical Infectious Diseases ; 2012 ; 54 : 132 -173 2012*
3. *Michealis et al.. EFORT Open Rev 2016;1:128*
4. *Nayagam S. et al. British Orthopaedic Association Standards for Trauma .2009*

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
UROLOGICAL SURGERY			
Transrectal ultrasound and prostate biopsy	Amoxicillin/clavulanate 1.2gm IV	Ampicillin/sulbactam 3gm IV	Start 1- 2 days before procedure. Continue up to 24 hours
Cystoscopy/ Urodynamics study/ simple cystourethroscopy/ ureteroscopy	Antibiotic not recommended		Prophylaxis only for immunocompromised patients
Endourological surgery	Amoxicillin/clavulanate 1.2gm IV	Ampicillin/sulbactam 3gm IV	Use < 72 hours
Clean operations, ESWL	Antibiotic not recommended		
Clean-contaminated (with opening of urinary tract) *Percutaneous renal surgery*	Amoxicillin/clavulanate 1.2gm IV	Ampicillin/sulbactam 3gm IV	
Clean-contaminated (with use of bowel segments)	Cefoperazone 1gm IV **PLUS** Metronidazole 500mg IV		
Implant of prosthetic devices	Amoxicillin/clavulanate 1.2gm IV	Ampicillin/sulbactam 3gm IV	

Reference:

1. *European Association of Urology Guidelines 2014*
2. *Urologic Surgery Antimicrobial Prophylaxis Guideline 2012*
3. *CUA Guidelines on antibiotic prophylaxis for urologic procedures*

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
NEUROLOGICAL SURGERY			
Clean +/- implant Clean contaminated	Cefazolin 2gm IV	Cefuroxime 1.5gm IV	***MRSA* colonisation**: Vancomycin 15mg/kg IV
Reference: 1. *Peter MV, MD, MSPH, Joseph Zen ga, Ryan SJ. Antibiotic Prophylaxis in Clean-Contaminated Head and Neck Surgery: A Systemic Review and Meta-analysis. American Academy of Otolaryngology- Head and Neck Surgery Foundation 2017.* 2. *Michael PV, Susan LD, Amy MW, John EM, Tamer AG. Considerations for Antibiotic Prophylaxis in head and Neck Cancer Surgery. 2017.*			
CARDIAC SURGERY			
Cardiac surgery	Cefazolin 2gm IV	Amoxicillin/clavulanate 1.2gm IV	***MRSA* colonisation**: Vancomycin 15mg/kg IV
Reference: 1. *Fathima Paruk, Fekade BS, Jefferey Lipman, Jason AR. Dosing Antibiotic Prophylaxis Cardiopulmonary Bypass-A higher Level of Complexity? A Structured Review. International Journal of Antimicrobial Agents. 2017.*			
OPHTHALMOLOGY			
Subconjunctival cefazolin 1mg at the end of procedure 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			
Reference: 1. *Lisa JH, Neal HS, MD, John FP, Liyan Liu, Richard C, et al. Comparative Effectiveness of Antibiotic Prophylaxis in Cataract Surgery. American Academy of Ophthalmology. 2016; pg 226.*			

NON-SURGICAL

Maintenance of optimal oral health and hygiene is essential to reduce the incidence of bacteraemia from daily activity. Infective endocarditis (IE) prophylaxis for dental procedures is indicated for the following cardiac conditions:

- Prosthetic heart valves, including bio prosthetic and homograft valves
- Prosthetic material used for cardiac valve repair
- A prior history of IE
- Following congenital heart disease
- Unrepaired cyanotic congenital heart disease, including palliative shunts and conduits
- Completely repaired congenital heart defects with prosthetic material or device, whether placed by surgery or by catheter intervention, during the 6 months after the procedure
- Repaired congenital heart disease with residual defects at the site or adjacent to the site of the prosthetic device (which inhibit endothelisation)
- Cardiac "valvulopathy" in a transplanted heart. Valvulopathy is defined as documentation of substantial leaflet pathology and regurgitation

Dental procedures for which prophylaxis is recommended

All dental procedures involve manipulation of gingival tissue or the periapical region of teeth or perforation of gingival mucosa.

Other procedures for which prophylaxis is recommended

Antibiotic prophylaxis may be given to high risk patients who undergo invasive procedure:

- Procedures of respiratory tract that involve incision or biopsy of the respiratory mucosa
- GI or GU procedures in patients with ongoing GI or GU tract infection
- Procedures on infected skin, skin structure, or musculoskeletal tissue
- Surgery for prosthetic heart valves or prosthetic intravascular or intracardiac materials

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Prophylactic regime for dental, oral, respiratory tract, skin and musculoskeletal tissue	Amoxicillin 2gm PO single dose 1 hour before procedure	Ampicillin 2gm IV single dose 1 hour before procedure	
Secondary prevention of rheumatic fever	Benzathine penicillin G 1.2 MU IM every 3 weeks	Penicillin V 250mg PO q12h	

References:

1. *The Australian guideline for prevention, diagnosis and management of acute rheumatic fever and rheumatic heart disease (2nd edition)*
2. *Antimicrobial prophylaxis for the prevention of bacterial endocarditis. UpToDate.*

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 need 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

SEPSIS

NEW SEPSIS-3 DEFINITION

SEPSIS

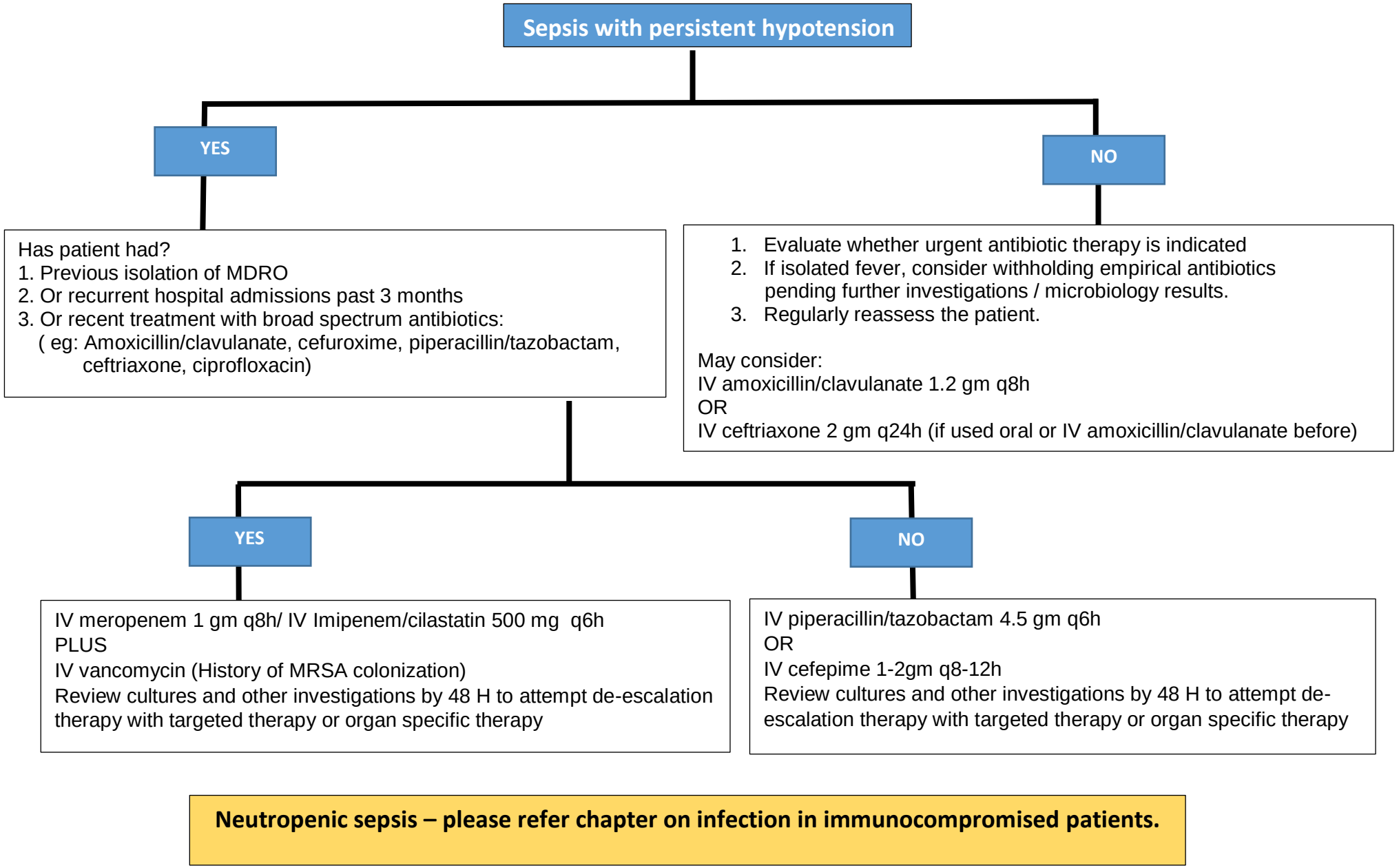
- Life threatening organ dysfunction caused by a dysregulated host response to infection
- Suspected & documented infection and
- Acute increase of ≥ 2 SOFA (or *qSOFA) points
- Hospital mortality >10%

SEPSIS WITH PERSISTENT HYPOTENSION

- Requiring vasopressor to maintain MAP≥ 65mmHg and
- Serum lactate level > 2 mmol/L despite adequate fluid resuscitation
- Hospital mortality > 40%.

1. If a diagnosis of sepsis has been made, then it is a **MUST** to search for the source of sepsis.
2. Complete history taking and careful clinical examination need to be done.
3. Septic screen
    a. Take 2 sets of peripheral blood cultures.
    b. Other microbiological specimens if indicated e.g. joint aspirates, sputum, etc.
    c. Radiological examinations are essential.
4. Review past microbiological results, especially multidrug resistant organisms (MDRO) eg. MRSA, ESBL Gram Negative, CRE etc.
5. If a source is identified, refer to the specific guidance for antimicrobial therapy for that body site.
6. If no source of infection is evident, refer to the treatment algorithm in the next page.

***qSOFA score calculation – refer to appendix 5.**



Neutropenic sepsis – please refer chapter on infection in immunocompromised patients.

BONE & JOINT INFECTIONS

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Acute osteomyelitis	Cloxacillin 2gm IV q6h	Cefazolin 2gm IV 6-8hrly	Duration: Initial IV therapy for 2-4 weeks followed by oral therapy Total duration of treatment minimum 6 weeks Modify according to clinical response A shorter duration of antibiotics can be considered if the osteomyelitic bone is fully resected (i.e amputation with a clear margin)
Chronic osteomyelitis	Empirical treatment before taking adequate cultures is not recommended. Choice of antibiotic depends on C&S result from tissue/bone as swab culture NOT reliable.		Duration : 6 weeks but usually > 3 months. A shorter duration of antibiotics can be considered if the osteomyelitis is fully resected (i.e amputation with a clear margin) Treat until inflammatory parameters are normal. Thorough surgical debridement required. (Removal of dead bone/ orthopaedic hardware)

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Acute monoarticular septic arthritis	Cloxacillin 2gm IV q 4-6h		Duration for pyogenic septic arthritis: Parenteral therapy 2 to 4 weeks then step down to appropriate oral therapy Treatment duration: 4- 6 weeks Drainage, debridement and washout of infected joint is important to limit further damage
PROSTHETIC JOINT INFECTIONS			
Early: <3 months after surgery Delayed onset :from 3 to 12 months after surgery Late Onset : >12 months after surgery	Empirical therapy is not recommended Treatment is based on culture and sensitivity Rifampicin should never be used alone and should start only after clearance of bacteraemia if applicable		Duration of treatment should be individualized according to treatment strategy/ approach
Definite Prosthetic Joint infection Methicillin sensitive *Staphylococcus aureus*	Cloxacillin 2gm IV q4-6h **OR** Cefazolin 2gm IV q8h	**PLUS /MINUS** Rifampicin (10-15mg/kg/day) 450mg - 600mg PO q24h	Duration of treatment according to treatment strategy Intravenous treatment should be given for 2-6 weeks before stepping down to oral combination therapy according to susceptibility
Methicillin resistant *Staphylococcus aureus*	Vancomycin 15-20mg/kg IV q12h	**PLUS /MINUS** Rifampicin (10-15mg/kg/day) 450mg - 600mg PO q24h	Rifampicin should be included in the intensive and oral maintenance therapy if implant is retained and after blood culture clearance

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Diabetic Foot Infections			
Antibiotics should not be used unless there are local or systemic symptoms of infection. Surgical debridement is important. Antibiotic selection should be based on the most recent culture and sensitivity report.			
Mild Infections: a. Local infection involving skin & subcutaneous tissue b. Erythema, less than 2 cm around the ulcer c. No systemic signs of infection	Amoxicillin/clavulanate 625mg PO q8hrly **OR** Ampicillin/sulbactam 375mg-750mg PO q12hrly	Cephalexin 500 mg PO q8H **PLUS** Metronidazole 400 mg PO q8H	Duration: 5 to 7 days
Moderate Infections: a. Deep tissue infection b. Erythema more than 2 cm around ulcer c. No SEPSIS criteria	Ampicillin/sulbactam 3gm IV q6h	Cefazolin 2gmIV q 8hrly **PLUS** Metronidazole 500mg IV q8h	Duration: 7 to 14 days Modify according to clinical response If proven osteomyelitis or margin of resection is inadequate : at least 4-6 weeks However, a shorter duration (1 to 2 weeks) is sufficient if margin of surgical resection is adequate
Severe Infections: All of the above PLUS 2 or more SIRS	Piperacillin/tazobactam 4.5gm IV q6-8h **URGENT** Surgical debridement	Cefepime 2 gm IV 8hrly **Plus** Metronidazole 500mg IV q8hrly	

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Necrotizing Fasciitis			
Severe	Piperacillin/tazobactam 4.5gm IV q8h **PLUS/MINUS** Clindamycin 600-900mg IV q8h		Immediate surgical debridement is the primary treatment modality Repeated surgical debridement for source control is needed
Mild to moderate	Ampicillin/sulbactam 1.5–3gm IV q6h (inpatient) **PLUS/MINUS** Clindamycin 600-900mg IV q8h		Antibiotic should be streamlined based on intraoperative culture and sensitivity Consider adding clindamycin if risk of *Group A streptococcus* or presence of gas crepitus
Marine related *Vibrio vulnificus* *Aeromonas hydrophilia* -consider in water related injuries and patients with liver cirrhosis and ingestion of raw shellfish	Ceftriaxone 1 gm IV q12hr **PLUS** Doxycycline 100mg PO q12hrly		Duration of treatment 7-14 days depending on clinical response

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Muscular, skeletal and soft tissue trauma	Cefazolin 2gm IV q8hrly	Cefuroxime 1.5gm IV q8hly	Duration: 3- 5 days
Compound Fractures/ Open Fractures			
Gustilo 1 & 2 fractures	Cefazolin 1gm IV q8h **OR** Cefuroxime 1.5gm IV q8h	Amoxicillin/clavulanate 1.2gm IV q8h	Pre-debridement and post debridement cultures are not representative of actual infection Duration of antibiotics for open fractures: Gustilo type I - stop after 24 hrs Gustilo type II - discontinue after 24 hours to 48 hrs Gustilo type III - 24 hrs after wound closure or up to a maximum of 72 hrs (whichever is earlier)
Gustilo 3 fractures	Cefazolin 1gm IV q8h **OR** Cefuroxime 1.5gm IV q8h **PLUS** Gentamicin 5mg/kg IV q24h	Amoxicillin/clavulanate 1.2gm IV q8h **PLUS** Gentamicin 5mg/kg IV q24h	

References:

1. *IDSA guidelines, Clinical Infectious Diseases ; 2012 ; 54 : 132 -173 2012*
2. *Luca L.et al.International Journal of Infectious Diseases (2005) 9, 127*
3. *Michealis et al.. EFORT Open Rev 2016;1:128*
4. *Dennis L et al. N engl j med 377;23*
5. *Katie A. et.al. Curr Rheumatol Rep (2013) 15:332*
6. *Mathews CJ et al Lancet 2010 375(9717): 846*
7. *Barberi et al . CID2015*
8. *Michales pentali.EFORT Open Rev 2016*

CARDIOVASCULAR INFECTIONS

A. INFECTIVE ENDOCARDITIS

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Empirical Treatment			
Community acquired native valves or late prosthetic valves (≥ 12 months post-surgery) endocarditis	Ampicillin 12g IV in 4-6 divided doses **PLUS** Gentamicin 3mg/kg/d IV q24h **PLUS/MINUS** *Cloxacillin 12g IV in 4-6 divided doses (see comments)	For patients who are allergic to B-lactam antimicrobials: Vancomycin 15-20mg/kg/dose IV q12h; not to exceed 2g/dose **PLUS** Gentamicin 3mg/kg/d IV q24h	Duration of treatment = 6 weeks * for patients with suspected *S. aureus* infections (such as IVDU or patients with prosthesis) and acute presentation
Early prosthetic valves (< 12 months post-surgery) or nosocomial and non-nosocomial healthcare associated endocarditis	Vancomycin 15mg-20mg/kg/dose IV q12hr; not to exceed 2g/dose **PLUS** Gentamicin 3mg/kg/day IV q24h **PLUS/MINUS** **Rifampicin 300-450mg PO q12h **PLUS/MINUS** ^Cefepime 2g IV q8h		**Rifampicin is only recommended for prosthetic valve endocarditis 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 infection (such as *Pseudomonas*)

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
***Viridans streptococci & Streptococcus bovis* (Native and Prosthetic Valves)**			
MIC: < 0.125µg/mL Penicillin-susceptible	Benzylpenicillin 2-3MU IV q4h or IV continuously (total 12-18MU/24h) for 4 weeks (native valves) or 6 weeks (prosthetic valves)	Ceftriaxone 2gm IV q24h for 4 weeks (native valves) or 6 weeks (prosthetic valves)	A 2-week treatment regimen that includes gentamicin is reasonable in patients with uncomplicated IE, rapid response to therapy, and no underlying renal disease
MIC: > 0.125µg/mL- < 2µg/mL Penicillin-relatively resistant	Benzylpenicillin 4MU IV q4h or IV continuously (total 24MU/24h) 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 25-30mg/kg loading dose then 15-20mg/kg IV q12h	<u>For MIC >0.5 to <2ug/ml</u> Use gentamicin 1mg/kg IV q8h for 2 weeks (native valves) or 6 weeks (prosthetic valves)
***Enterococcus* (It is recommended that all these isolates are tested for high level resistance (HLR) to gentamicin)**			
<u>Native and Prosthetic Valves</u> Sensitive to gentamicin	Ampicillin 2gm IV q4h for 4-6 weeks **PLUS** Gentamicin 1mg/kg IV q8h	**Penicillin Allergy:** Vancomycin 25-30mg/kg loading dose then 15-20mg/kg IV q12h for 6 weeks	*To maximize synergistic effect, administer gentamicin at the same time close to ampicillin Native valve: Symptoms < 3 months – 4 weeks therapy Symptoms > 3 months or prosthetic valve – 6 weeks therapy
Resistant to gentamicin	Ampicillin 2g q4h **PLUS** Ceftriaxone 2g q12h	**PLUS** Gentamicin 1mg/kg IV q8h for 6 weeks	

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Staphylococcus aureus			
Native Valves ***Methicillin-susceptible Staphylococcus aureus*** Right sided endocarditis (tricuspid valve) in uncomplicated endocarditis Left sided endocarditis and complicated right sided	Cloxacillin 2gm IV q4-6h for 2 weeks Cloxacillin 2gm IV q4-6h for 6 weeks	Regimen for β-lactam allergic: <u>Immediate type hypersensitivity to penicillin (anaphylaxis)</u>: Vancomycin 25-30mg/kg loading dose then 15-20mg/kg IV q12h for 6 weeks <u>For non-immediate type hypersensitivity</u>: Cefazolin 2gm IV q8h for 4-6 weeks	Vancomycin is inferior to cloxacillin for treatment of MSSA Vancomycin therapy is recommended **only** for patients with immediate-type penicillin hypersensitivity
Prosthetic Valves ***Methicillin-susceptible Staphylococcus aureus***	Cloxacillin 2gm IV q4h for > 6 weeks **PLUS** Rifampicin 300mg PO q8h or 450mg PO q12h for > 6 weeks **PLUS** Gentamicin 1mg/kg IV q8h for 2 weeks	Regimen for β-lactam allergic: <u>Immediate type hypersensitivity to penicillin (anaphylaxis)</u>: Vancomycin 25-30mg/kg loading dose then 15-20mg/kg IV q12h for > 6 weeks, **PLUS** Rifampicin 300mg PO q8h for > 6 weeks **PLUS** Gentamicin 1mg/kg IM/IV q8h for 2 weeks <u>For non-immediate type:</u> Cefazolin 2gm IV q8h for 6 weeks **PLUS** Rifampicin 300mg PO q8h or 450mg PO q12h for > 6 weeks **PLUS** Gentamicin 1mg/kg IV q8h for 2 weeks	Rifampicin has better penetration. However to avoid the development of resistance, it should be started after 3-5 days of effective initial cloxacillin therapy and/or once the bacteremia has been cleared

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Native valves **Methicillin-resistant** ***Staphylococcus aureus***	Vancomycin 25-30mg/kg loading dose then 15-20mg/kg IV q12h for 6 weeks, not to exceed 2g/dose		
Prosthetic valves **Methicillin-resistant** ***Staphylococcus aureus***	Vancomycin 25-30mg/kg loading dose then 15-20mg/kg IV q12h for ≥ 6 weeks, not to exceed 2g/dose **PLUS** Rifampicin 450mg PO q12h for ≥ 6 weeks **PLUS** Gentamicin 1mg/kg IV q8h for 2 weeks		
HACEK Microorganisms	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 q12h or 500mg PO q12h for 4 weeks (native valve) or 6 weeks (prosthetic valve)	
Brucella spp	Doxycycline 100mg PO q12h **PLUS** Rifampicin 300-600mg q24h **PLUS** Streptomycin 1gm IM q24h **Or** Gentamicin 5mg/kg IV q24h		Doxycycline and rifampicin should be continued for 3-6 months Streptomycin or gentamicin for 2-3 weeks

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
***C burnetti* (Q fever)**	Doxycycline 100mg PO q12h **PLUS** Hydroxychloroquine 600mg PO q24h		Duration of treatment: 18-24 months based on clinical and serological response
Bartonella spp	Doxycycline 100mg PO q12h for 6 weeks **PLUS** Gentamicin 3mg IV q24h for 2 weeks		
Therapy for Candida Endocarditis (Native and Prosthetic valve)			
Candida Endocarditis	Amphotericin B 0.6 -1.0mg/ kg IV q24h for at least 6/52 after surgery **PLUS/MINUS** Flucytosine 100mg/kg/day PO q6-8h for at least 6/52 after surgery		Step down therapy: Fluconazole 400-800mg (6-12mg/kg) orally daily for susceptible organism and in stable patients with culture clearance
• Valve replacement is mandatory. Continue therapy for 6 weeks after 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 • All patients with *Candida* IE should be referred to ID physician			

B. **CIED (CARDIAC IMPLANTABLE EXTERNAL DEVICE) INFECTION**

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Empirical treatment	Cloxacillin 2gm q4-6h **Duration of therapy:** 7 to 14 days (after CIED removal) 4- 6 weeks (if endocarditis)		Removal of CIED is the recommended treatment Blood cultures should be drawn after device removal and should be negative for at least 72 hours before new device placement is performed Long-term suppressive therapy should be considered for patients who have CIED infection and who are not candidates for complete device removal

C. MEDIASTINITIS POST CARDIAC SURGERY

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Mediastinitis	Cloxacillin 2gm IV q4-6h **PLUS** Piperacillin/tazobactam 4.5gm IV q6h	Vancomycin 15- 20mg/kg IV q8h- q12h, not to exceed 2g/dose **PLUS** Piperacillin/tazobactam 4.5gm IV q6h	The duration of therapy generally ranges from 2-6 weeks and depends on the extend of surgical debridement performed. If osteomyelitis treats for 4- 6 weeks

References:

1. *Updates on Cardiovascular Implantable Electronic Device Infections and Their Management (A AHA scientific meeting from the American Heart Association)- 2010*
2. *Infective Endocarditis in Adults: Diagnosis, Antimicrobial Therapy, and Management of Complications: A Scientific Statement for Healthcare Professionals from the American Heart Association 2015*
3. *Clinical practice guidelines for the prevention, diagnosis & management of infective endocarditis*

CENTRAL NERVOUS INFECTIONS

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Acute bacterial meningitis	Ceftriaxone 2gm IV q12h Duration of treatment : 10-14 days	Cefotaxime 2gm IV q6h	Consider empirical cover for listeriosis in patient >60 years old and the course of disease is indolent.
Streptococcus pneumoniae			
Penicillin sensitive strains (MIC < 0.12 mcg/ml) Penicillin resistant strains (MIC > 0.12 mcg/ml) Penicillin resistant strains (≥2 mcg/ml)	Benzylpenicillin 4MU IV q4h Ceftriaxone 2gm IV q12h **OR** Cefotaxime 2gm IV q6h Vancomycin 25-30mg/kg loading dose then 15mg/kg IV q12h (not to exceed 2gm per dose) **PLUS** Ceftriaxone 2gm IV q12h **OR** Cefotaxime 2gm IV q6h		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 is known Duration of treatment: 10-14 days (depending on clinical response)
Neisseria meningitidis MIC to penicillin < 0.1 mcg/ml MIC to penicillin is > 0.1 mcg/ml	Benzylpenicillin 4MU IV q4h Ceftriaxone 2gm IV q12h	Cefotaxime 2gm IV q6h	Duration of treatment is 7 days (depending on clinical response)

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Prophylaxis for household and close contacts of meningococcal meningitis cases (age > 12 years) Prophylaxis for children < 12 years	Ciprofloxacin 500mg PO as single dose **OR** Rifampicin 600mg PO q12h for 2 days (4 doses) [not recommended in pregnant women] Ciprofloxacin 250 mg as single dose (age 5-12 years) or 125 mg (age < 5 years) **OR** Rifampicin 10 mg/kg q12H for 2 days	Ceftriaxone 250mg IM as single dose (especially in pregnancy and lactating mothers) **OR** Azithromycin 500mg PO as single dose.	Close contacts are defined as those individuals who have had contact for > 8 hours and within 1 meter of the index case. Individuals who were in contact with oropharyngeal secretions of the index case in the last 7 days before onset of symptoms up to 24 hours after appropriate antibiotics should also receive chemoprophylaxis. For index case who received only benzylpenicillin as therapy, chemoprophylaxis should also be given upon discharge to eliminate nasopharyngeal carriage
Listeriosis	Ampicillin 2gm IV q4h **OR** Benzylpenicillin 4MU IV q4h **PLUS/MINUS** Gentamicin 4-7mg/kg/day IV in 3 divided doses	Trimethoprim(TMP)/ Sulfamethoxazole (80/400mg) TMP 10 to 20 mg/kg/day IV in 4 divided doses	Duration of treatment is 3 weeks depending on clinical response Gentamicin is given until symptoms improve (minimum of 1 week)
Brain abscess/subdural empyema	Ceftriaxone 2 gm IV q12h **PLUS** Metronidazole 500mg IV q8h	Cefotaxime 2 gm IV q4-6h **PLUS** Metronidazole 500mg IV q8h	Duration to be determined by clinical response, usually 2-6 weeks.

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Spinal epidural abscess	Ceftriaxone 2 gm IV q12h	Cloxacillin 2gm IV q4-6h (after culture results are available)	Source control is strongly recommended
Viral encephalitis *Herpes simplex* *Varicella zoster*	Acyclovir 500mg IV q8h for 14 days		
Cytomegalovirus (CMV) **Induction phase:**	Ganciclovir 5mg/kg IV q12h for 14-21 days.	Valganciclovir PO 900mg PO q12h for 14-21 days	Oral valganciclovir is only recommended for CMV polyradiculopathy or mononeuritis multiplex who has mild motor deficits
Maintenance phase:	Ganciclovir 5mg/kg IV q24h for 6 months depending on severity of disease, time to response and end organ involvement. May switch to oral valganciclovir if available	Valganciclovir PO 900mg PO q24h for 6 months depending on severity of disease, time to response and end organ involvement.	
Cryptococcal meningitis *(non-HIV, non-transplant patient)* Induction therapy:	Amphotericin B 0.7-1.0mg/kg/24h IV **PLUS** Flucytosine 100mg/kg/24h PO in 4 divided doses for 4-6 weeks	Amphotericin B 0.7-1.0mg/kg/24h IV **PLUS** Fluconazole 800-1200mg PO/IV q24h for 4-6 weeks **OR** Fluconazole 1200mg PO q24h **PLUS** Flucytosine 100mg/kg/24 h PO for 4 divided doses for 4-6 weeks	Lipid formulations of amphotericin may be used in cases of severe nephrotoxicity
Consolidation therapy:	Fluconazole 400-800mg PO q24h for 8 weeks		
Maintenance therapy:	Fluconazole 200mg PO q24h up to 12 months		

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Healthcare-associated ventriculitis and meningitis	Vancomycin 25-30mg/kg loading dose then 15mg/kg IV q12h (not to exceed 2gm per dose) **PLUS** Ceftazidime 2 gm IV q8h **OR** Meropenem 2 gm IV q8h		Vancomycin trough level should be 10-14 mmol/L or 15-20 mcg/L Empirical treatment should be decided by the primary team based on local antibiogram.
Cranial trauma **Open fracture** **Penetrating injuries**	Amoxicillin/clavulanic acid 1.2gm IV q8H	Cefuroxime 1.5 gm IV q8H **PLUS** Metronidazole 500 mg IV q8H	Duration 5-7 days
Neurosyphilis	Refer to section (Sexually Transmitted Infections)		

Reference:

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.*
5. *Allan R. Tunkel et al. 2017 Infectious Diseases Society of America's Clinical Practice Guidelines for Healthcare-Associated Ventriculitis and Meningitis, Clinical Infectious Diseases, Volume 64, Issue 6, 15 March 2017,*
6. *Peter R. Williamson et al. Cryptococcal meningitis: epidemiology, immunology, diagnosis and therapy. Nature Reviews Neurology volume 13, pages 13–24 (2017)*
7. *The Sanford Guide to Antimicrobial Therapy 2018*

GASTROINTESTINAL INFECTIONS

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Oropharyngeal Candidiasis Mild Moderate to severe	Nystatin suspension 500 000 units PO q6h Fluconazole 100-200mg PO q24h	Itraconazole 200mg PO q24h	Duration: 7-14 days
Candida Esophagitis	Fluconazole 200-400mg PO q24h	Itraconazole 200mg PO q24h	Duration: 14 days
Herpes simplex virus Immunocompetent host Immunocompromised host	Acyclovir 400mg PO q8h for 7 days Acyclovir 400mg PO q8h for 14 days		
Helicobacter pylori	*Proton Pump Inhibitors(PPI) PO **PLUS** Clarithromycin 500mg PO q12h **PLUS** Amoxicillin 1gm PO q12h **OR** Metronidazole 400mg PO q12h (if penicillin allergy)	**Recurrence of *H.pylori* disease/ macrolide exposure** Avoid antibiotics that have been previously taken.	Duration: 14 days

References:
1. American College of Gastroenterology guideline: Treatment of Helicobacter pylori Infection 2017; 112:212-238

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Infectious Diarrhoea **-** Most infectious diarrhoea is self-limiting and only requires supportive management. -Treatment with antibiotics is not recommended for mild-moderate disease. -Treatment recommended for: • severe illness • age <6/12 or >50 years old • gross blood in stool • high grade fever >38°C • worsening or relapse/persistent of symptoms >1 week • immunocompromised host • excessive bowel movement >8 times a day			
Shiga toxin producing *E.coli*, *Klebsiella oxytoca*, *Aeromonas/Plesiomonas, Yersinia* species	Ciprofloxacin 500mg PO q12h for 3-5 days	Trimethoprim/Sulfamethoxazole (80/400mg) PO 2 tabs q12h for 3-5 days	
Campylobacter jejuni	Azithromycin 500mg PO q24h for 3 days	Ciprofloxacin 500mg PO q12h	
Salmonella, non-typhi	**Do not routinely require treatment, unless immunocompromised** Ciprofloxacin 400mg IV q8 h	Trimethoprim/Sulfamethoxazole (80/400mg) PO 2 tabs q12h (if susceptible) **OR** Ceftriaxone IV 1g q24h	Duration of treatment 5-7 days, 14 days if relapse
Vibrio cholerae	Doxycycline 300 mg PO single dose	**Azithromycin 500mg PO q24h for 3 days	Primary therapy is rehydration. Select antibiotics based on local susceptibility **Pregnant use Azithromycin

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Shigella sp.	Ciprofloxacin 750mg PO q12hr for 3 days **OR** Azithromycin 500mg PO q24h for 3 days	Ceftriaxone 50-75mg/kg IV daily for 5 days. (for severe disease)	In immunocompromised patients duration of antibiotic 10 days Avoid prescribing fluoroquinolones if the ciprofloxacin MIC is 0.12ug/mL or higher
Giardia	Metronidazole 400mg PO q8h for 7 days		
Entamoeba histolytica	Metronidazole 800 mg PO q8h for 5–10 days		
Clostridium difficile Mild to moderate severe, complicated First recurrence Second recurrence	 Vancomycin 125mg PO q6h for 10- 14 days Vancomycin 250mg- 500mg PO q6h **PLUS** Metronidazole 500mg IV q8h for 10-14 days Same as for initial episode Vancomycin 125mg PO q6h for 7-14 days then 125mg PO q12h for 7 days then 125mg PO q24 for 7 days then 125mg PO every other day for 7 days then 125mg PO every 3 days for 14 days		Repeating test on stool within 7 days is **not** recommended **Oral vancomycin preparation guide:** -Use the vial with 500mg vancomycin. -Dilute it with 10ml water for injection. -The solution becomes 50mg /ml -For 125mg PO draw out 2.5ml. -Add 30ml of drinking water to the 2.5ml. (optional) -Administer orally or through NG tube.

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Travellers' diarrhoea	Azithromycin 1gm PO single dose	Ciprofloxacin 750mg PO single dose	
References: 1. *Clinical Practice Guidelines for Clostridium difficile Infection in Adults: 2017 Update by the Society for Healthcare Epidemiology of America (SHEA) and the Infectious Diseases Society of America (IDSA)* 2. *Practice Guidelines for the Diagnosis and Management of Infectious Diarrhoea, IDSA GUIDELINES ,2017*			
Pyogenic liver abscess	Ampicillin/sulbactam 3gm IV q6h	Metronidazole 500mg IV q8h **PLUS** Ceftriaxone 1-2gm IV q24h	Duration : 4-6 weeks Abscess drainage is the optimal therapy.
Amoebic liver abscess *Entamoeba histolytica*	Metronidazole 800mg PO q8h		Duration: 7-10 days
References: 1. *John Hopkins antibiotics guide: Hepatic Abscess. October 4, 2017.*			
Cholecystitis and Cholangitis	Amoxicillin/clavulanate 1.2gm IV q8h **OR** Ampicillin/sulbactam 3gm IV q6h	Ceftriaxone 2gm IV q24h **PLUS** Metronidazole 500mg IV q6h	No need antibiotic if the obstruction is relieved. Complicated with sepsis : 4-7 days, if source control is achieved.
References: **1.** *Gastroenterology & hepatology: Management of Acute Cholangitis. 2011 Feb: 7(2);121-123*			

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Spontaneous bacterial peritonitis (SBP)			
Primary SBP	Cefotaxime 2gm IV q8h for 5-7 days	Ceftriaxone 2gm IV q24h for 5-7 days	Duration of therapy: 2 weeks if blood culture positive.
SBP Prophylaxis	Ceftriaxone 1 gm IV q24h	Cefotaxime 2gm IV q24h	Duration: 5-7 days
Recurrent SBP	Ciprofloxacin 750mg PO per week		
References: 1. *Management of Ascites, Spontaneous Bacterial Peritonitis in Cirrhosis, Journal of Hepatology, 2010: volume 53, no3*			
CAPD Peritonitis	Intra peritoneal Cefazolin 15 mg/kg per bag once daily **PLUS** Intra peritoneal Ceftazidime 1-1.5gm per bag once daily		Consider catheter removal in relapsing or refractory peritonitis and for fungal peritonitis.

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Infected pancreatic necrosis	Imipenem/cilastatin 500mg IV q6h **OR** Meropenem 1gm IV q8h	Ciprofloxacin 400mg IV q12h **PLUS** Metronidazole 500 mg IV q8h	**No need for antibiotic in:** ▪ Mild to moderate pancreatitis ▪ Severe acute pancreatitis ▪ Sterile necrosis CT guided needle aspiration for gram-stain & culture should be performed
References: *1. American College of Gastroenterology guideline: Management of Acute Pancreatitis 2013*			
Diverticulitis	Amoxicillin/clavulanate 1.2g IV q8h **OR** Ampicillin/sulbactam 3gm IV q6h	Piperacillin/tazobactam 4.5gm IV q6h **Penicillin Allergy:** Ciprofloxacin 400mg IV q12h	Duration: 4-7 days, can be longer if adequate source control is not obtained
References: *1. IDSA Guideline for Intrabdominal infection ; Clin Infect Dis 2010:50; 133-164*			
Hepatosplenic candidiasis	Fluconazole 400mg (6mg/kg) IV q24h	Amphotericin B 0.5–0.7mg/kg IV q24h	Duration of therapy is until lesions have resolved (usually months) and should continue through periods of immunosuppression
References: *1. IDSA guideline on Management of candidiasis*			

INFECTIONS IN IMMUNOCOMPROMISED PATIENTS

A. HAEMATOLOGY

1. Any infection in the immunocompromised host is life-threatening and needs immediate attention.

2. Febrile neutropenia is defined as a temperature of >38.3ºC on a single occasion or >38 ºC over one hour and ANC (Absolute Neutrophil Count) <500cells/uL or <1000cells/uL in those with anticipated declining counts.

3. Cultures maybe positive in **less** than 40% of cases.

4. Patients have impaired inflammatory responses and hence may have no localizing signs. The usual sign is fever>38ºC or hypothermia.

5. The common portals of infection include the oral cavity, gastrointestinal tract, perianal region, lungs and IV lines.

6. Potential pathogens are dependent on the underlying defect, e.g.

Neutropenia	Gram –ve organisms, gram +ve organisms, fungi
Hypogammaglobulinemia Post splenectomy/ hyposplenic patients	Encapsulated organisms
Defective cellular immunity	Pneumocystis, toxoplasma, fungi, viruses , mycobacteria

7. The choice of antibiotic is based on local organisms and sensitivity patterns. The clinical state of the patient, prior infections with drug resistant bacteria, recent outbreaks e.g. *MRSA* or multi-drug resistant *Enterobacteriaceae*, as well as the availability and cost of the antibiotics.

8. The administration of the first dose of empirical anti-pseudomonal antibiotic should be done as soon as possible following triage (within the first hour) after taking blood cultures. The following regimens are suggested:

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
First line therapy **Second line therapy**	Piperacillin/tazobactam 4.5gm IV q6h **OR** Cefepime 2gm IV q8h **PLUS/MINUS** Aminoglycosides **PLUS/MINUS** **Vancomycin 15mg/kg IV q12h **OR** q8h Imipenem/cilastatin 500mg IV q8h/q6h **OR** Meropenem 1gm q8h	Ceftazidime 2gm IV q8h #Linezolid	Duration: until neutrophils count recovers to > 500 /u or longer if clinically indicated **Suspected central device infections, known colonizers by *MRSA*, severe mucositis, skin or soft tissue infection suspected *MRSA/MRSE* infections and severe sepsis, septic shock or respiratory distress. # In those with suspected or confirmed *VRE, VISA or VRSA.*

9. **Anaerobic infections** account for <5% of all cases of bacteraemia.
    a. Metronidazole 500mg IV q8h may be added to cefepime in the presence of severe mucositis, intra-abdominal infections, peri-anal abscesses or colitis.

10. Consider adding **antifungal therapy** if fever persisted or evidence of new infection after 5 to 7 days of broad spectrum antibiotic therapy or earlier especially in the presence of severe mucositis, oral thrush, painful swallowing, suspicious skin infiltrates or pulmonary infiltrates, fundal exudates or prolonged steroid/antibiotic use more than 2 weeks.

    a. Amphotericin B remains the empirical therapy of choice for invasive fungal infections.

    b. 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.

Antifungal agent	Dose
Liposomal amphotericin B	3 mg/ kg/ day
Amphotericin B deoxycholate	0.5-1 mg/kg/ day
Amphotericin B colloidal dispersion	4 mg/kg/ day
Amphotericin B lipid complex	5 mg/kg/ day
Caspofungin	Load 70mg followed by 50 mg daily
Micafungin	Load 200mg followed by 100mg daily
Anidulafungin	Load 200mg followed by 100mg daily
Itraconazole	200 mg q12h
Fluconazole	Load 800mg followed by 400 mg daily
Voriconazole	6 mg/kg q12h followed by 4 mg/kg q12h
Posaconazole (delayed release tablet)	Load 300 mg q12h then 300mg daily (with food)

11. **Low risk patients:** Ciprofloxacin and amoxicillin /clavulanate, may be considered after careful assessment.

12. **Prophylaxis against bacterial, viral or fungal infections** is advised after bone marrow or haematopoietic stem cell transplantation or in high-risk patient after chemotherapy.

	Disease / therapy Examples	Antimicrobial prophylaxis	Duration
Antibacterial	Autologous HSCT Allogenic HSCT	Ciprofloxacin Penicillin V	Start at time of conditioning Until resolution of neutropenia or initiation antibacterial therapy for febrile neutropenia Post-transplant until discontinuation of immunosuppression
Antifungal	AML CML in blast crisis Autologous HSCT Allogenic HSCT	Fluconazole	During neutropenia until resolution and achievement of complete remission Until resolution of neutropenia
Antiviral	Autologous HSCT Allogenic HSCT Bortezomib (only in myeloma patients) Purine Analog therapy (fludarabine / cladribine)	Acyclovir **OR** Valacyclovir	During 30 days after HSCT Until discontinuation of Bortezomib At least 3 months after discontinuation of purine analogue
Anti PCJ therapy	Autologous HSCT Allogenic HSCT Purine Analog therapy	Trimethoprim/sulfamethoxazole	Start when achieved engraftment, continue until resolution of immunosuppression At least 3 months after discontinuation of purine analogue

(HSCT: haematopoietic stem cell transplant)

13. **Infections following haematopoietic stem cell transplant** are generally similar to that in the solid organ transplant setting.

    a. In addition to the usual bacterial, fungal infections and viral infections especially *CMV* reactivation and parasitic infections e.g. *Pneumocystis jiroveci* (PJP) and toxoplasma infection can occur.

    b. It is recommended that prophylactic use of ganciclovir or pre-emptive monitoring for *CMV* reactivation should be carried out during the first 100 days.

    c. Trimethoprim/sulfamethoxazole (80/400mg) once daily is extremely effective in the prevention of PJP or toxoplasmosis.

    a. It is recommended that these measures be continued in patients with active graft-vs-host disease and in those remaining on high dose immunosuppressive agents.

14. Attention must be paid to:

    a. Strict isolation measures with good personal hygiene and diet.
    b. Modification of antibiotic regimen if deterioration of clinical status
    c. The antibiotics are generally kept for a minimal duration of 5 to 7 days or stopped if afebrile for 3 days in patients with improving neutrophil counts
    d. Regular culture and surveillance
    e. HANDWASHING and strict aseptic technique
    f. Venous cannula must be inspected daily for signs of phlebitis and changed every 72h or when necessary. Central devices are to be removed if there is clinical deterioration in spite of appropriate antibiotics for 48-72h

References:

1. *Bohlius J, Herbst C, Reiser M, Schwarzer G, Engert A. Granulopoiesis-stimulating factors to prevent adverse effects in the treatment of malignant lymphoma. Cochrane Database of Systematic Reviews 2008, Issue 4.*
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Human Immunodeficiency Virus (HIV)

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Pneumocystis pneumonia (PJP)	Trimethoprim(TMP)/sulfamethoxazole (80/400mg) TMP 15-20mg/kg/24h IV/PO (excellent bioavailability) in 3 divided doses for 21 days	Pentamidine 4mg/kg/24h IV (in 1 pint D5% or N/S run over 1-2 hours) for 21 days **OR** Clindamycin 600mg IV/PO q8h **PLUS** Primaquine 30mg base PO q24h for 21 days	Patients with severe disease should receive steroids as soon as possible (within 72 hours of starting PJP treatment): Prednisolone 40mg PO q12h for 5 days, then 40mg PO q24h for 5 days, then 20mg PO q24h for 11 days Patients given primaquine should be tested for G6PD deficiency
Prophylaxis (primary and secondary)	Trimethoprim/Sulfamethoxazole (80/400mg) 2 tabs PO q24h	Dapsone 100mg PO q24h	
Mucocutaneous Candidiasis			
Oropharyngeal (oral thrush)	Fluconazole 100-200mg PO q24h **OR** Nystatin suspension 500,000 units PO q6h	Itraconazole 200mg PO q24h	Duration: 7-14 days
Oesophageal	Fluconazole 200-400mg PO/IV q24h	Itraconazole 200mg PO q24h	Duration : 14-21 days
Vulvovaginal	Fluconazole 200mg PO stat	Itraconazole 200mg PO q24h for 3 days	

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Cryptococcus meningitis Induction therapy (for at least 2 weeks)	Amphotericin B deoxycholate[ł] 0.7-1mg/kg IV q24h **PLUS** Flucytosine 100mg/kg/24h PO in 4 divided doses (For 2 weeks) **OR** Fluconazole 1200mg PO q24h **PLUS** 5-Flucytosine 100mg/kg/24h PO in 4 divided doses (For 2 weeks)	Amphotericin B deoxycholate[ł] 1mg/kg IV q24h (1 week) **PLUS** Flucytosine 100mg/kg/24h PO in 4 divided doses (For 1 week) **Followed by** Fluconazole 1200mg OD for 1 week	[ł] The lipid formulations (Amphotericin B lipid complex 5mg/kg or liposomal 3-4mg/kg IV q24h) may be used instead if available If ICP >250mmH_2O or signs & symptoms of increase ICP, do daily LP to reduce pressure until patient is improved If clinical signs of increase ICP do not improve after about 2 weeks of daily LPs, consider placement of a lumbar drain or VP shunt **Discontinuation:** • Completed induction, consolidation therapy, and at least 1 year on maintenance therapy, and • Remains asymptomatic from cryptococcal infection, and • CD4 count ≥200 cells/μL for ≥6 months and suppressed HIV RNA in response to effective ART
Consolidation therapy	Fluconazole 800mg PO q24h for 10 weeks		
Maintenance Therapy	Fluconazole 200mg PO q24h		

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
***Toxoplasma Gondii* Encephalitis** Acute Infection	Trimethoprim(TMP)/sulfamethoxazole (80/400mg) TMP 10mg/kg IV/PO q24h in 2 divided doses for at least 6 weeks	Pyrimethamine* 4 tablets BD for 1 day, followed by 2 tablets OD **PLUS** Folinic acid 10-25mg PO q24h **PLUS** Clindamycin 600mg IV/PO q6h for 6-8 weeks	**Adjunctive corticosteroids** (e.g. dexamethasone) should be administered when clinically indicated to treat a mass effect associated with focal lesions or associated edema. Because of the potential immunosuppressive effects of corticosteroids, they should be discontinued as soon as clinically feasible Fansidar®: Sulfadoxine/Pyrimethamine 500/25mg **Discontinuation:** Consider when on HAART, CD4 >100 >3 months and viral load well suppressed *requires DG approval
Suppressive/ Maintenance Therapy	Trimethoprim/ Sulfamethoxazole (80/400mg) PO 2 tabs q12h	Pyrimethamine 2 tablets daily **PLUS** Clindamycin 600mg PO q8h **PLUS** Folinic acid 10-25mg q24h	
Primary Prophylaxis	Trimethoprim/ Sulfamethoxazole (80/400mg) PO 2 tabs q24h	Dapsone 200mg PO weekly **PLUS** Pyrimethamine 3 tablets PO weekly **PLUS** Folinic Acid 25mg PO weekly	

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
***Mycobacterium Avium* Complex (MAC) Disease**			
Treatment Nodular Cavitatory, Disseminated	Clarithromycin 500mg PO q12h **OR** Azithromycin 500-1000mg PO q24h **PLUS** Ethambutol 25mg/kg PO q24h **PLUS** Rifampicin 600mg PO q24h **To add** Amikacin 10-15mg/kg/q24h IV	Addition of moxifloxacin 400mg PO q24h **OR** Levofloxacin 750mg PO q24h to the preferred regime if poor response	**Discontinuation:** Consider if patient is on HAART and viral load well suppressed, CD4 > 100 or ≥6 months, asymptomatic of MAC, and has completed > 12 months of therapy
***Cytomegalovirus (CMV)* Disease**			
CMV Retinitis	Intravitreal injections of ganciclovir (2mg/injection) 1-4 doses over 7-10 days – eye to review **PLUS** Ganciclovir 5mg/kg IV q12h for 14-21 days	Foscarnet* (2.4mg/injection) for 1-4 doses over a period of 7-10 days **PLUS** Ganciclovir 5mg/kg IV q12h for 14-21 days Maintenance therapy with Valganciclovir* 900mg PO q24h (if available)	Immune recovery is essential for successful treatment. Start HAART within 2 weeks if possible **Discontinuation:** Consider if patient is on HAART and viral load well suppressed, CD4 > 100 ≥3 months and after 3-6 months of *CMV* treatment. *Requires DG approval

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Extraocular *CMV* diseases (Oesophagitis, colitis, interstitial pneumonitis, neurological)	Ganciclovir 5mg/kg IV q12h for 14-21 days or until signs and symptoms have been resolved	Maintenance therapy with valganciclovir* 900mg PO q24h	Maintenance therapy is generally not necessary; HAART offers best hope for prevention of relapses
Salmonellosis (Bacteraemia) *Salmonella* non-typhi	Ceftriaxone 2gm IV q24h	Trimethoprim(TMP)/sulfamethoxazole (80/400mg) TMP 10mg/kg/q24h IV/PO in 2 divided doses	**Duration:** CD4≥200: 7-14 days. CD4 <200 and with bacteraemia: 4-6 weeks. Longer course with debridement and drainage needed for persistent bacteraemia or metastatic disease
***Herpes Simplex Virus (HSV)* Infections**			
Genital or orolabial Mild Moderate-to-severe mucocutaneous infections Suppressive therapy	 Acyclovir 400mg PO q8h Acyclovir 5mg/kg IV q8h Acyclovir 400mg PO q12h		**Duration:** Genital : 5-14 days Orolabial: 5-10 days Suppressive therapy indicated if severe/frequent recurrences Duration: Continue until immunity is restored
***Varicella-Zoster* Virus Diseases** Uncomplicated/Acute Localized Dermatomal Severe infection (CNS, ocular, disseminated)	 Acyclovir 800mg PO 5x/day Acyclovir 10-15mg/kg IV q8h, then switch to oral regime as above when improved		 **Duration:** Shingles : 7-10 days Chickenpox : 7 days **Duration:** Shingles : 10-14 days Chickenpox : 7-10 days

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Histoplasmosis & Penicilliosis			
Mild (Outpatient) Moderate- to-severe disseminated disease Induction therapy Maintenance therapy (moderate to severe)	Itraconazole 200mg PO q8h for 3 days (loading) then 200mg PO q12h for 12 weeks Conventional amphotericin B[ł] 0.7mg/kg IV q24h for at least 2 weeks or clinical improvement Itraconazole 200mg OD until immunity is restored.	Voriconazole 6mg/kg PO/IV q12h for 2 weeks then 4mg/kg PO/IV q12h for 10 days	Itraconazole oral suspension is preferred over capsule because of improved bioavailability. Beware of drug-drug interaction with ARV. (Voriconazole is contraindicated with Efavirenz) [ł] The lipid formulations of amphotericin B (3-5mg/kg/day) may be used instead if available
***Nocardia* infection** Initial Therapy	Trimethoprim (TMP)**/** sulfamethoxazole (80/400mg) TMP 15mg/kg/q24h IV/PO in 3 divided doses May consider decreasing to Trimethoprim (TMP)**/** sulfamethoxazole (80/400mg) 10mg/kg/24h after IV/PO clinical improvement	Imipenem/cilastatin 500mg IV q6h **PLUS** Amikacin 7.5mg/kg IV q12h for 2-4 weeks or clinical improvement followed by oral regimen	Duration of oral regimen is to be continued until immunity is restored

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OBSTETRICS & GYNAECOLOGICAL INFECTIONS

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Septic Abortion	Ampicillin 2gm IV q4h **PLUS** Gentamicin 5mg/kg IV q24h **PLUS** Metronidazole 500mg IV q8h	Ampicillin/sulbactam 3gm IV q6h **PLUS** Doxycycline 100mg PO q12h **OR** Clindamycin 900mg IV q8h **PLUS** Gentamicin 5mg/kg IV q24h	To complete a 10-14 days
Intrapartum antibiotic prophylaxis(IAP) for *Group B Strep.* positive mothers	Penicillin G 5MU IV initial dose, then 2.5 – 3MU IV q4h until delivery	Ampicillin 2gm IV initial dose, then 1gm IV q4h until delivery.	Prophylaxis should be started at labour or rupture of membranes and continued every four hours until the infant is delivered.
Preterm Premature Rupture of Membranes (PPROM) If non-GBS carrier: If GBS carrier:	Erythromycin ethylsuccinate (EES) 400mg PO q12h for 7-10 days Ampicillin 2gm IV q6h for 48 hours followed by Amoxicillin 500mg PO q8h for an additional 5-7 days or until delivery (whichever comes first) **PLUS** Azithromycin 1gm PO one dose		

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Chorioamnionitis	Cefuroxime 1.5gm IV q8h **PLUS** Metronidazole 500mg IV q8h	Ampicillin/sulbactam 3gm IV q6h	Antibiotic regimen is continued postpartum until patient is afebrile and asymptomatic for AT LEAST 48 HOURS
Pelvic Inflammatory Disease Mild-moderate	Azithromycin 1gm PO in a single dose **PLUS** Metronidazole 400mg PO q12h **PLUS** Doxycycline 100 mg PO q12h for 14 days	Ampicillin/sulbactam 3gm IV q6h **PLUS** Doxycycline100mg PO q12h	Duration of treatment is 14 days
Inpatient Regimen (Moderate-severe)	Cefuroxime 1.5gm IV q8h **PLUS** Doxycycline 100mg PO q12h **PLUS** Metronidazole 500mg IV/PO q8h		
Tubo-ovarian abscess	Cefuroxime 1.5gm IV q8h **PLUS** Doxycycline 100mg PO q12h **PLUS** Metronidazole 500mg IV/PO q8h		
Endometritis Non pregnancy/ Post-partum endometritis	Cefuroxime 1.5gm IV q8h **PLUS** Doxycycline 100mg PO q12h **PLUS** Metronidazole 500mg IV/PO q8h	Amoxicillin/clavulanic 1.2g IV q8h **OR** Ampicillin/sulbactam 3gm IV q6h	Surgical intervention for source control may be required. Duration of treatment is 10-14 days

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Vaginitis *Bacterial vaginosis*	Metronidazole 400mg PO q8h	Clindamycin 300mg PO q12h	Metronidazole can be use in any stage of pregnancy Duration of treatment is 7 days
Vaginal Candidiasis Uncomplicated	Clotrimazole 500mg as a single vaginal pessary (Stat dose) **OR** Clotrimazole 200mg as vaginal pessary for 3 nights	Fluconazole 200mg PO for one dose	Pregnancy: Treat with topical therapy if indicated as oral therapy is **CONTRAINDICATED**
Complicated infection 1.Severe vaginitis symptoms 2.Recurrent vulvovaginal candidiasis	Fluconazole 200mg PO q72h for 3 doses then weekly for 6 months	Clotrimazole 500mg vaginal suppository once weekly for 6 months	
Trichomoniasis *Trichomonas vaginalis*	Metronidazole 400mg PO q8h for 7 days	Metronidazole 2gm PO as single dose	Not advisable to breastfeed during treatment. May resume breastfeeding after 24 hrs of the last dose
Cervicitis	Azithromycin 1g PO single dose	Doxycycline 100mg PO q12h for 7 days	

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Postpartum mastitis			
Outpatient:	Cloxacillin 500mg PO q6h for 5-7days	Cephalexin 500mg PO q6h for 5-7days	Duration of therapy for 5-7 days
Inpatient:	Cloxacillin 2g IV q6h	Cefazolin 1gm IV q8h	If poor response consider extending to 10-14days

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5. *UK National Guideline for Management of Pelvic Inflammatory Disease 2011. Clinical Effectiveness Group British Association for Sexual Health and HIV. 2011*
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OCULAR INFECTIONS

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Blepharitis	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	Topical antibiotics are not indicated as an initial therapy
Meibomian Gland Dysfunction	Systemic therapy is not indicated as an initial therapy	In resistant cases Doxycycline 100mg PO q12h or tetracycline 250mg PO q6h for 2-6 weeks or as necessary	Tetracyclines are contraindicated in children <8 years. The option would be Erythromycin Ethylsuccinate30-50mg/kg/day PO q6h
Internal Hordeolum with Secondary Infection	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)	Epilation of affected eye lash and 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
Bacterial Conjunctivitis	Chloramphenicol 0.5% eye drop q6h **OR** Moxifloxacin 0.5% eye drop q6h	Ciprofloxacin 0.3% eye drop q6h **OR** Levofloxacin 0.5% eye drops q6h	

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
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)	Requires systemic therapy. Refer to Sexually Transmitted Infections & Neonatal Infection Sections		
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 **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 ready to use extemporaneously using injectable forms
Acanthamoeba Keratitis	*Chlorhexidine 0.02% eye drop q1-2h **PLUS** **Propamidine isethionate 0.1% q1-2h		*Prepared ready to use extemporaneously using injectable forms **Requires DG approval

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Fungal Keratitis	**Natamycin 5% eye drop q1-2h **OR** *Amphotericin B 0.15%-0.2% eye drop q1-2h	***Voriconazole 1% eye drop q1-2h **OR** *Fluconozole 0.2% eye drop q1-2h <u>Oral Therapy</u> May be considered in the absence of contraindications Fluconazole 200mg PO q24h **OR** Ketoconazole 200mg POq24h	*Prepared ready to use extemporaneously by injectable forms **Requires DG approval .
Herpes Simplex Keratitis Herpes Simplex Type 1 & 2 In presence of stromal or endothelial disease Prophylaxis for recurrent cases:	Acyclovir 3% eye ointment 5 times/day Acyclovir 400mg PO 5 times/day 7-14 days Acyclovir 400mg PO q12h for 12 months		

Medical Retina

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
***Herpes zoster* Ophthalmicus**	Needs systemic therapy Refer to Skin & Soft Tissue Infections Section		
Ocular toxoplasmosis Prophylaxis for recurrent lesions:	Trimethoprim(TMP)/sulfamethoxazole (80/400mg) TMP 10mg/kg/q24h in 2 divided doses for at least 6 weeks Trimethoprim(TMP)/sulfamethoxazole (80/400mg) 2 tabs daily	**Pyrimethamine 25-50mg PO q24H **PLUS** Azithromycin 500mg PO q24h **OR** Clindamycin 300mg PO q6H x 3-4 weeks, then 150mg q6H PO x 3-4 weeks	Pregnancy : May consider Intravitreal clindamycin 1.0mg /0.1mls Systemic steroids are usually indicated in immunocompetent patients **Add Folinic acid 10-25mg PO q24H
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 for 6 weeks	** Requires DG approval Systemic steroid is indicated depending on location or severity of the infection

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
***CMV* Retinitis**	Ganciclovir 5mg/kg IV q12h for 2-3 weeks **PLUS** Intravitreal ganciclovir 2mg/0.1ml biweekly	** Valganciclovir: 900mg PO q12h for 3 weeks (induction) followed by 900mg PO q24h (maintenance) Intravitreal **Foscarnet 2.4mg/0.1ml (1-2weekly)	Maintenance may need to continue until CD4 count is >150 cells/mm3 for 3 consecutive months Intravitreal therapy is indicated in zone 1 and 2 lesions. Ganciclovir implant: 4.5gm an option for prolonged usage of intravitreal ganciclovir **Requires DG approval
Ocular Syphilis	Ocular Syphilis (syphilitic uveitis) should be treated as Neurosyphilis Refer to Sexually Transmitted Infections Section		Referral to Dermatologist/ID Physician

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Post-operative Bacterial Endophthalmitis Topical treatment-options Systemic treatment	**Intravitreal antibiotic injections** Vancomycin 1-2mg in 0.1ml **PLUS** Ceftazidime 2mg in 0.1ml *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) Ciprofloxacin 750mg PO q12h for 10 days For culture negative cases add: Clarithromycin 250-500mg PO q12h for 7-14 days	**Intravitreal antibiotic injections:** Vancomycin 1-2mg in 0.1ml **PLUS** Amikacin 0.4mg in 0.1ml Moxifloxacin 400mg PO q24h for 10 days (caution in children) **OR** Vancomycin and ceftazidime IV	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
Post-operative Fungal Endophthalmitis	Intravitreal Amphotericin B 0.005mg in 0.1ml **PLUS** Fluconazole 200mg PO q24h for 6 weeks (minimum)	**Intravitreal miconazole (0.01mg in 0.1ml) **OR** **Intravitreal voriconazole 50ug-100ug/0.1mls ** Voriconazole 200mg PO q12h	Intravitreal and Systemic therapy are indicated in all cases **Requires DG approval

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Endogenous Endophthalmitis **Systemic treatment**	Ciprofloxacin 750mg PO q12h for 10days For culture negative cases add: Clarithromycin 250-500mg PO q12h for 7-14 days	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 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)	Vancomycin 1-2mg in 0.1ml **PLUS** Amikacin 0.4mg in 0.1ml	Topical therapy may supplement therapy. Not to use systemic steroids in these cases *Prepared ready to use extemporaneously by injectable forms
Intravitreal antibiotic injections:	Vancomycin 1-2mg in 0.1ml **PLUS** Ceftazidime 2mg in 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		

Oculoplasty

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Dacryocystitis	Cefuroxime 250mg PO q12h for 7 days	Amoxicillin/clavulanate 625mg PO q8h for 7 days	Consider intravenous antibiotics in severe infections
Preseptal Cellulitis	Amoxicillin/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 q8h IV for 7-10 days If Anaerobes suspected: **ADD** Metronidazole 500mg IV q8h for 7-10 days	Ceftriaxone 1-2gm q24h IV for 7-10 days	

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ORAL/DENTAL INFECTIONS

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Infections of the teeth and supporting structures			
Reversible/ Irreversible pulpitis	Systemic antibiotic use not recommended		
Localised dentoalveolar abscess	Systemic antibiotic use not recommended If patient medically compromised Amoxicillin 500mg PO q8h **PLUS/MINUS** Metronidazole 400mg PO q8h		
Dry socket	Systemic antibiotic use not recommended If patient medically compromised Metronidazole 400mg PO q8h		Socket debridement with irrigation socket with 0.2% Aqueous chlorhexidine gluconate mouthwash **OR** Normal saline
Localised pericoronitis	Systemic antibiotic use not recommended If patient medically compromised Metronidazole 400mg PO q8h		

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Chronic gingivitis	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 (dental scaling/ root planning)
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 patient		
Aggressive periodontitis	Amoxicillin 500mg PO q8h **PLUS** Metronidazole 400mg PO q8h	Azithromycin 500mg q24h for 3 days	Antibiotics are used as an adjunct to dental scaling and root debridement
Local missed periodontal abscess	Systemic antibiotic use not recommended If patient medically compromised Metronidazole 400mg PO q8h		Incision and drainage of abscess

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Infections of the jaws			
Osteomyelitis of the jaws of dental origin	For acute cases, start with: Phenoxymethylpenicillin (Pen V) 250-500mg PO q6h* **PLUS/MINUS** Metronidazole 400mg PO q8h **OR** **Benzylpenicillin 8-12MU IV q24h in 4-6 divided doses **PLUS/MINUS** Metronidazole 500mg IV q8h	**Clindamycin 300mg-600mg PO/IV q6h-q8h	Bone debridement is advised 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 / microbiological clearance of the pathogen
Spreading infections and infections of fascial spaces (with/without systemic signs)			
Cellulitis ± abscess of dental origin Surgical site infection & traumatic wound infection	Benzylpenicillin 8-12MU IV q24h in 4-6 divided doses **PLUS/MINUS** Metronidazole 500mg IV q8h **OR** Amoxicillin/clavulanate 1.2gm IV q8h	<u>Oral administration</u>: Amoxicillin 250-750mg PO q8h **PLUS/MINUS** Metronidazole 400mg PO q8-12h **OR** Amoxicillin/clavulanate 625mg PO q8h. **OR** Cefuroxime 250-500mg PO q12h	Empirical antibiotics are started Incision and drainage is advised

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Traumatic wound involving skin / Infection of skin origin	Cloxacillin 1gm IV q6h <u>Oral administration</u>: Amoxicillin 500mg PO q8h **PLUS/MINUS** Metronidazole 400mg PO q8-12h		Wound debridement is advised Incision and drainage of abscess is advised
Post Implant Infections ("Periimplantitis")	Amoxicillin/clavulanate 625mg PO q8h **OR** Amoxicillin 500mg PO q8h **PLUS** Metronidazole 400mg PO q8h	**Penicillin Allergy:** Doxycycline100mg PO q12h **OR** Clindamycin 300mg-600mg PO q6-8h	Antibiotics are used as an adjunct to local mechanical and chemical debridement. Oral hygiene instruction/education should deliver to patient Locally delivered antibiotics is preferred compared to systemic administration

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Acute oral pseudomembranous candidiasis Hyperplastic candidiasis (Candidal leukoplakia)	Nystatin (oral suspension) 500,000-1,000,000 units q6-8h /day For 1 week	Fluconazole 100mg PO/IV q24h for 2 weeks **OR** Itraconazole 100mg PO q24h for 2 weeks	Gentle oral toilet /oral debridement is advised Advise patient to maintain good oral hygiene
Chronic erythematous candidiasis (*candida*-associated denture stomatitis with or without angular chelitis)	Local measures- denture cleansers, remove dentures at night Soak dentures in chlorhexidine mouthwash 2%	Nystatin (oral suspension) 500,000-1,000,000 units q6h-8h	If acute , advise patient not to wear denture temporarily for few weeks until the candidiasis lesion subsided Revise or redo denture
Herpetic gingivostomatitis	**Symptomatic treatment in most cases**. Can also consider: **Topical acyclovir** 5% cream q4h for 5-10 days in prodromal phase for recurrent herpes labialis	**Systemic antiviral** Acyclovir 400-800mg PO 5 times daily for 7-14 days **OR** Acyclovir 5mg/kg IV q8h for 5 days for severe infection or immunocompromised patients	

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3. *CPG Management of chronic periodontitis Nov 2012, MOH,Malaysia*
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OTORHINOLARYNGOLOGY INFECTIONS

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Throat and upper respiratory			
Tonsillitis / Pharyngitis	Phenoxymethylpenicillin (Pen-V) 500mg PO q12h for 7 days Severe: Amoxicillin/clavulanate 1.2gm IV q8h	Amoxicillin 500mg PO q8h **Penicillin Allergy:** Azithromycin 500mg PO q24h for 3-5 days	Antibiotics should be prescribed in suspected/proven bacterial infections.
Acute peritonsillar abscess	Ampicillin/sulbactam 3gm IV q6h	Severe case: Piperacillin/tazobactam 4.5gm IV q8h	Oral regimen can be given in mild disease. Abscess need to be drained
Diphtheria	Antitoxin **PLUS** Erythromycin lactobionate 500mg IV q6h followed by erythromycin ethylsuccinate 800mg PO q12h for total of 14 days	Antitoxin **PLUS** Benzylpenicillin 2-4 MU IV q4-6h followed by Pen V 250mg PO q6h total of 14 days	
Acute Epiglottitis	Ampicillin/sulbactam 3gm IV q6h	Ceftriaxone 2gm IV q24h	Urgent hospitalisation
Deep Neck Space Abscess	Ampicillin/sulbactam 3gm IV q6h	Cefuroxime 1.5gm IV q8h **PLUS** Metronidazole 500mg IV q6h	Duration: 10-14 days

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Rhinology			
Acute Bacterial Rhinosinusitis (ABRS) *Mild infection* Severe infection requiring hospitalization:	Amoxicillin 500mg PO q8h Ampicillin/sulbactam 3gm IV q6h **OR** Amoxicillin/clavulanate 1.2gm IV q8h	Cefuroxime 250mg-500mg PO q12h	Duration: 5-10 days Pregnant patients with penicillin allergy would need to be treated with azithromycin 500mg PO q24hr
Otology			
Acute otitis media For severe disease or when risk of complications	Amoxicillin 500mg PO q8h If not responding 48-72hrs; Amoxicillin/clavulanate 625mg PO q8h for 5 days **OR** Ampicillin/sulbactam 375mg PO q12h	**Penicillin Allergy:** Clarithromycin 500mg PO q12h **OR** Azithromycin 500mg PO on day 1, followed by 250mg PO OD on day 2 through day 5	Antibiotics should *not* be routinely prescribed for uncomplicated AOM.
Malignant Otitis Externa/ Necrotizing Otitis Externa	Ceftazidime 2gm IV q8h followed by Ciprofloxacin 750mg PO q12h for 6 weeks		

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Acute diffuse otitis externa	Ofloxacin 0.3% otic solution Instil 10 drops into affected ear(s) once daily for 7 days	Amoxicillin/clavulanate 625mg PO q8h if not responding	Aural toileting required in discharging ears
Chronic Suppurative Otitis Media	Ofloxacin 0.3% otic solution instil 10 drops into affected ear(s) twice daily for 10-14 days	Amoxicillin/clavulanate 625mg PO q8h if not responding	Aural toileting required in discharging ears
Otomycosis	Clotrimazole 1% ear solution, applied twice daily for 10 to 14 days		Aural toileting required.
Perichondritis	Ciprofloxacin 750mg PO q12h **PLUS/MINUS** Clindamycin 600mg QID For 7 days		Targeted therapy is recommended once culture is available.
Acute Mastoiditis	Amoxicillin/clavulanate 1.2gm IV q8h **OR** Ampicillin/sulbactam 3g q8h	Ceftriaxone 2gm IV q12-24h	

References:

1. *Thanaviratananich S, Laopaiboon M, Vatanasapt P. Once or twice daily versus three times daily amoxicillin with or without clavulanate for the treatment of acute otitis media. Cochrane Database Syst Rev 2013; 12:CD004975.*
2. *Wessels MR. Clinical practice. Streptococcal pharyngitis. N Engl J Med 2011; 364:648.*
3. *Lieberthal AS, Carroll AE, Chonmaitree T, et al. The diagnosis and management of acute otitis media. Pediatrics 2013; 131:e964.*
4. *Kaplan EL, Gooch III WM, Notario GF, Craft JC. Macrolide therapy of group A streptococcal pharyngitis: 10 days of macrolide therapy (clarithromycin) is more effective in streptococcal eradication than 5 days (azithromycin). Clin Infect Dis 2001; 32:1798.*

RESPIRATORY INFECTIONS

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Community Acquired Pneumonia (CAP) Outpatient	Amoxicillin 500mg PO q8h for 5-7 days	Amoxicillin/clavulanate 625mg PO q8h for 5-7 days **Or** Doxycycline 100mg PO q12h for 1 week	
Inpatient	Amoxicillin/clavulanate 1.2gm IV q8h for 5-7 days **PLUS/MINUS** Azithromycin 500mg IV/PO q24h 3-5 days	Ceftriaxone 2g IV q24h for 5-7 days **PLUS/MINUS** Azithromycin 500mg IV/PO q24h for 3-5 days	To switch to oral therapy when clinical condition improves and patient is able to tolerate orally
Viral pneumonia *Influenza* *Varicella zoster*	Oseltamivir 75mg PO q12h for 5 days Acyclovir 10mg/kg IV q8h for 7 days		
Lung Abscess and empyema	Ampicillin/sulbactam 3gm IV q6h **OR** Amoxicillin/clavulanate 1.2gm IV q8h	Ceftriaxone 2gm IV q24h **PLUS/MINUS** Metronidazole 500mg IV q8h	Drained abscess / empyema may require 2 -4 weeks of antibiotics Undrained abscess/ empyema may require 4-6 weeks of antibiotics

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Infective Exacerbation Of Chronic Obstructive Pulmonary Disease (COPD)			
Outpatient	Amoxicillin/clavulanate 625mg PO q8h	Cefuroxime 500mg PO q12h **OR** Doxycycline 100mg PO q12h	Duration: 5 days
Inpatient	Amoxicillin/clavulanate 1.2gm IV q8h	Ceftriaxone 2gm IV q24h	Duration: 5 – 7 days
Hospital Acquired Pneumonia			
Early Onset (2-4 days of admission/intubation)	Amoxicillin/clavulanate 1.2gm IV q8h	Ceftriaxone 2gm IV q24h	Duration: 5 – 7 days
Late Onset (5 days or more of admission/intubation)	Piperacillin/tazobactam 4.5gm IV q6h **OR** Cefepime 2gm IV q8h	Imipenem/cilastatin 500mg IV q6h **OR** Meropenem1gm IV q8h	Duration: 7 days Longer duration may be indicated depending upon clinical, radiological and laboratory parameters.

References:

1. *Malaysian Society of Intensive Care. Guide to antimicrobial therapy in the adult ICU 2017. Available from: http://www.msic.org.my*
2. *Kalil AC, Metersky ML, Klompas M, Muscedere J, Sweeney DA, Palmer LB, et al. Management of adults with hospital-acquired and ventilator-associated pneumonia: 2016*
3. *Clinical practice guidelines by the infectious diseases society of America and the American thoracic society. Clinical Infectious Diseases 2016; 63(5):e61-111.*
4. *Australian Clinical Practice Guidelines – Therapeutic guidelines antibiotic version 15*
5. *Global Initiative for Chronic Obstructive Lung Disease – Pocket Guide to COPD Diagnosis, Management and Prevention 2017 Report*
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SEXUALLY TRANSMITTED INFECTIONS

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Syphilis			
Primary Secondary Early latent	Benzathine penicillin G 2.4MU IM STAT	**Penicillin Allergy** Doxycycline 100mg PO q12h for 14 days	Contact tracing: Examine and investigate sex partner and treat when indicated
Late latent syphilis Gummatous syphilis Cardiovascular syphilis	Benzathine penicillin G 2.4MU IM weekly for 3 weeks	**Penicillin Allergy** Doxycycline 100mg PO q12h for 28 days	
Neurosyphilis Ocular syphilis	IV Benzylpenicillin 18-24 MU/day, administered 3 - 4 MU q4h IV for 14 days	**Penicillin allergy:** Ceftriaxone 2gm IM (with Lidocaine as diluent) or IV (with water for injection as diluent) for 10-14 days (if no anaphylaxis to penicillin)	All patients with neurosyphilis should be considered for corticosteroid cover at the start of the therapy to prevent the Jarisch-Herxheimer reaction (Prednisolone 10-20mg PO q8h for 3 days commencing one day prior to syphilis treatment)
Syphilis in pregnancy Primary, secondary and early latent	Benzathine penicillin G 2.4 MU IM	Only penicillin is currently recommended.	Pregnant ladies with syphilis and history of penicillin allergy to be desensitized only in tertiary centre Tetracycline and doxycycline are contraindicated in pregnancy

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Gonorrhoea			
Uncomplicated (Urogenital, Anorectal, Pharyngeal)	Ceftriaxone 500mg IM STAT **PLUS** Azithromycin 1gm PO Stat	Azithromycin 2gm PO stat (for severe cephalosporin allergy)	Contact tracing Also treat for non-specific urethritis (NSU) in view of high incidence of coexisting NSU in patients with gonorrhoea
Gonococcal Conjunctivitis	Ceftriaxone 1gm IM STAT **PLUS** Azithromycin 1gm PO Stat		
Gonococcal Epididymitis/ Epididymo-orchitis	Ceftriaxone 500mg IM STAT **PLUS** Azithromycin 1gm PO stat	Doxycycline 100mg PO q12h for 10 days	Contact tracing
Disseminated Gonorrhoea (Acral pustules, arthralgia, tenosynovitis, septic arthritis)	Ceftriaxone 1gm IV q24h for 7 days **PLUS** Azithromycin 1gm PO stat	Cefotaxime 1gm IV q8h for 7 days	Manage inpatient Contact tracing
Gonococcal Meningitis	Ceftriaxone 2gm IV q12h		Duration: 10 -14 days
Gonococcal Endocarditis	Ceftriaxone 2gm IV q12h		Duration: at least 4 weeks

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Chlamydial/ Non-Specific Urethritis (NSU)/ Non-Specific Genital Infection in Women (NSGI) **Infection in Pregnancy**	Doxycycline 100mg PO q12h for 7 days Azithromycin 1gm PO STAT	Azithromycin 1gm PO stat Amoxicillin 500mg PO q8h for 7 days	Contact tracing Doxycycline is contraindicated in pregnancy and children less than 18 years old
Chancroid *Haemophilus ducreyi*	Ceftriaxone 500mg IM stat	Azithromycin 1gm PO stat	Contact tracing
Lymphogranuloma Venereum *Chlamydia trachomatis*	Doxycycline 100mg PO q12h for 21 days	Azithromycin 1gm PO weekly for 3 weeks	Contact tracing Final duration depends on clinical response
Granuloma Inguinale *Klebsiella granulomatis*	Doxycycline 100mg PO q12h for minimal 3 weeks and until all lesions completely heal	Trimethoprim/Sulfamethoxazole (80/400mg) 2 tabs PO q12h for minimal 3 weeks and until all lesions completely heal	Contact tracing Add gentamicin 1.5mg/kg IM/IV q8h in patients whose lesions do not respond in the first few days to other agents
Trichomoniasis	Refer to Obstetrics & Gynaecology Infections Section		
Bacterial vaginosis	Refer to Obstetrics & Gynaecology Infections Section		

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Herpes Genitalis First episode and in pregnancy Suppressive therapy: (may be indicated if > 6 recurrences per year)	Acyclovir 400mg q8h PO for 5 days Acyclovir 400mg PO q12h for up to 1 year, then reassess		**First and second trimester acquisition:** Acyclovir is not licensed for use in pregnancy; however, there is substantial clinical experience supporting its safety i.e. the benefits of antiviral therapy outweigh the risk of withholding treatment (pregnancy category. Vaginal delivery should be anticipated **Third trimester acquisition:** If a true first episode is confirmed, caesarean section should be considered for all women, particularly those developing symptoms after 34 weeks of gestation, as the risk of viral shedding is very high. If vaginal delivery is unavoidable, acyclovir treatment of mother and baby may be indicated

References:

1. *Malaysian Guideline in the Management of Sexually Transmitted Infections 2008.*
2. *Syphilis: A Provider's Guide to Treatment and Prevention 2017. CDC United States.*
3. *UK National Guidelines on the Management of Syphilis 2008*
4. *British Association of Sexual Health and HIV Clinical Effectiveness Guidelines 2016*

SKIN & SOFT TISSUE INFECTIONS

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Impetigo	Cloxacillin 500mg PO q6h for 5-7 days **Penicillin Allergy** Erythromycin ethylsuccinate 800mg PO q12h for 5-7 days	Cephalexin 500mg PO q6h for 5-7 days **OR** Amoxicillin/clavulanate 625mg PO q8h for 7-10 days	
Ecthyma gangrenosum	Piperacillin/tazobactam 4.5gm IV q6h	Cefepime 2gm IV q8h	
Boils/Carbuncles	Cloxacillin 500mg PO q6h	Cefuroxime 500mg PO q12h **OR** Amoxicillin/clavulanate 625mg PO q8h	Surgical drainage is important in the management Duration: 7-10 days
Erysipelas *out-patient* *In-patient*	Penicillin PO 500mg q6h Ampicillin/sulbactam 1.5–3gm IV q6h **OR** Amoxicillin/clavulanate 1.2gm IV q8h	Amoxicillin 500mg PO q8h Cefazolin 1gm IV q8h	Treatment duration: 5-14 days, depending on clinical response

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Cellulitis **(**outpatient)	Penicillin 500mg PO q6h		Change to oral once condition improves
(inpatient)	Ampicillin/sulbactam 1.5–3gm IV q6h **OR** Amoxicillin/clavulanate 1.2gm IV q8h	Cefazolin 1gm IV q8h	
MRSA	Vancomycin 15-20mg/kg IV q8-12h		
If *CA-MRSA* suspected	Trimethoprim/sulfamethoxazole (80/400mg) 2 tabs PO q12h	Linezolid 600mg IV/PO q12h	
Diabetic Foot Infections	Refer to Bone & Joint Infections Section		
Gas Gangrene/ Myonecrosis/ Necrotizing Fasciitis	Refer to Bone & Joint Infections Section		

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Mycobacterial Infections			
Hansen's Disease (Leprosy) *(in non-HIV & HIV patient)* Paucibacillary	Rifampicin 600mg PO monthly **PLUS** Dapsone 100mg PO q24h Duration: 6 months (Completion of 6 doses within 9 months) Surveillance: **5 years**	**<u>Bacterial resistance or hypersensitivity to first line</u>** Can be substituted with one of the following: Ofloxacin 200mg PO q12h **PLUS** Minocycline 100mg q24h **OR** Clarithromycin 500mg PO q12h **OR** Ethionamide 250mg PO q24h	Remarks: Second line can only be initiated by a dermatologist
Multibacillary	Rifampicin 600mg PO monthly **PLUS** Clofazimine 300mg PO monthly **PLUS** Dapsone 100mg PO q24h **PLUS** Clofazimine 50mg PO q24h Duration: 1 year (if initial BI<4) or 18 months (if BI≥4) Completion of 12 doses within 18 months (BI<4) Completion of 18 doses within 24 months (BI≥4) Surveillance: **15 years**		

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Fungal Infections			
Tinea capitis ***Tinea barbae***	Griseofulvin 20-25mg/kg/24h PO (microsized) Griseofulvin 10-15mg/kg/day PO (ultramicrosized) **OR** Griseofulvin 500mg q12h or q24h for 6 to 12 weeks or longer till fungal cultures are negative **PLUS** 2.5% Selenium sulphide shampoo **OR** 2% ketoconazole shampoo , 2 – 3 times per week for 2 weeks	Terbinafine 250mg PO q24h **OR** Itraconazole 200mg PO q24h Duration is based on mycological agent: *Trichophyton* spp : 2-4 weeks *Microsporum* spp : 8-12 weeks	Contacts of patient may be treated with 2% ketoconazole shampoo 2 – 3 times per week for 2 weeks Surgical excision is to be avoided
Tinea corporis / Tinea cruris / Tinea faciei Mild infections: Extensive infections:	Topical imidazole cream: Clotrimazole 1% **OR** Miconazole 2% Griseofulvin 500mg PO q12h or q24h for 4-6 weeks	Tioconazole 1% Duration: till clinical clearance with additional 2 weeks Terbinafine 250mg POq24h for 2 weeks **OR** Itraconazole 200mg PO q24h for 2 weeks	

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Tinea manuum/ Tinea pedis	Griseofulvin 500mg PO q12h for 6-12 weeks **OR** Itraconazole 200mg PO q12h for 2-4 weeks	Terbinafine 250mg PO q24h for 2-4 weeks	Patients with contraindications to systemic agents may consider topical antifungal agents
Tinea unguium	Terbinafine 250mg PO q24h For 6 weeks (finger nails) For 12 weeks (toe nails) **OR** Pulse Itraconazole 200mg PO q12h for 1 week per month for 2 months (finger nails) for 3 months (toe nails)	Amorolfine 5% nail lacquer weekly application For 6 months (finger nails) For 12 months (toe nails) **OR** Griseofulvin 500mg PO q12h For 6 months (finger nails) For 12 months (toe nails) **OR** Fluconazole 150mg PO once weekly 6-12 months for toenail ≥3 months for fingernail	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
Tinea versicolor For face:	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) Topical imidazole for 4-6 weeks e.g. miconazole 2% cream, clotrimazole 1% cream, tioconazole 1% cream	Itraconazole 200mg PO q24h for 1 week (recurrent cases)	

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Candidiasis Mild cutaneous candidiasis Extensive cutaneous candidiasis	Topical imidazole q12h till clear e.g. miconazole 2% cream, clotrimazole 1% cream, tioconazole 1% cream Itraconazole 200mg PO q24h for 1 week	Fluconazole 100mg PO q24h for 1 week (in severe and immunocompromised patients)	Treatment of sexual partner is advisable in case of recurrent infection.
Subcutaneous Fungal Infections (*Sporotrichosis)* Localized to skin only Severe life threatening	Itraconazole 200mg PO q24h for 3-6 months for at least 2-4 weeks after recovery. (max 200mg q12h, if no response) **OR** Terbinafine 250mg q24h/q12h (max 500mg BD, if no response) Amphotericin B, (lipid formulation) 3–5mg/kg q24h, or amphotericin B (deoxycholate), 0.7–1mg/kg q24h, Step down therapy: Itraconazole 6–10mg/kg (maximum of 400mg)PO q24h	Fluconazole 400-800mg q24h **OR** Potassium iodide (saturated solution 50mg/drop) 5 drops q8h may increase to 40-50 drops q8h	In some immunocompromised condition such as AIDS, longer treatment may be necessary. Refer to Opportunistic Infections In HIV Patients Avoid azole in pregnancy

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Histoplasmosis **Penicilliosis** In less severe: In severe case:	 Itraconazole 200mg PO q8h for 3 days, then 200mg q12h for 12 weeks Amphotericin B IV 0.6-1mg/kg q24h for 2 weeks followed with Itraconazole 400mg q24h for 10 weeks		 Immunosuppressed patients. Refer to chapter on HIV
Viral Infections			
***Herpes Simplex* Infections** Primary Genitalia Eczema herpeticum Severe cases	 Acyclovir 200-400mg PO 5 times daily for 5 days *Refer to Sexually Transmitted Infections-herpes genitalis* Acyclovir 200mg PO 5 times daily for 7-10 days Acyclovir 5mg/kg IV q8h for 5 days or until able to take orally, then change to oral	 Valacyclovir 500mg q8h for 10 days	 Immunosuppressed patients. Refer to chapter on HIV

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Chickenpox Immunocompetent Immunocompromised	Acyclovir 800mg PO 5 times daily for 7 days Acyclovir 10mg/kg IV q8h for 7 days (change to oral once there is an improvement)		Advisable to start treatment early within 48 hours
Herpes Zoster Immunocompromised patients, ophthalmicus, Ramsay- Hunt syndrome Elderly Involve face/ genitalia	Acyclovir 800mg PO 5 times daily for 7days		Advisable to start treatment early within 48 hours
Parasitic Infestations			
Scabies In pregnancy	Emulsion benzyl benzoate 25% (EBB) apply from neck down and leave for 24 hours for 3 days 2x Permethrin 5% lotion/cream apply and leave for 8 hours 1 week apart	Gamma benzene hexachloride 1% (Lindane) apply and leave for 8 hours (repeated in a week) **OR** 2x Permethrin 5% cream apply and leave for 8 hours 1 week apart	
Head lice	Gamma benzene hexachloride 0.1% (Lindane) apply and leave for 8 hours **OR** Malathion 1% shampoo	4% Dimeticone apply for 8hrs day 1 and day 7	

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Body lice/pubic lice	Malathion lotion 0.5% for 8-12 hours and washed off **OR** Permethrin 1% cream apply to affected area for 10min and washed off		
Peripheral thrombophlebitis	Remove the intravenous cannula and take blood culture Cloxacillin 500 mg PO q6h	Consider broad spectrum antibiotics (e.g. Piperacillin/tazobactam) in ill patients. Deescalate if blood cultures taken prior to starting are negative.	Duration: 3-5 days

References:

1. *NHS Wiltshire CCG,BaNES CCG & Swindon CCG Guidelines for Antibiotic Prescribing in the Community 2013-15*
2. *Manual of Childhood infections. Infectious Disease Society of America 2011*
3. *Malaysian Clinical Practice Guideline on Management of leprosy 2014*
4. *RxFiles Newsletter : Antifungal newsletter (April 2010) Canadian : Bugs and Drugs*
5. *Craig G Burkhart et al.Tinea Versicolor Treatment & Management. Medscape. updated Dec 2013*
6. *Clinical Practice Guidelines for the Management of Sporotrichosis: 2007 Update by the Infectious Diseases Society of America*

SURGICAL INFECTIONS

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Appendicitis	Ampicillin/sulbactam 1.5gm IV q6h **OR** Amoxicillin/clavulanate 1.2gm IV q8h	Cefoperazone 1gm IV q12h **PLUS** Metronidazole 1g stat then 500mg IV q6h	Duration of antibiotic should not exceed 24 hours if operation performed within 12 hours. If operation not performed within 12 hours, consider antibiotics 5-7days
Perforated appendix / Appendicular mass	Ampicillin/sulbactam 1.5-3g gm IV q6h **OR** Amoxicillin/clavulanate 1.2gm IV q8h	High risk: Piperacillin/tazobactam 4.5gm IV q6-8h for 4 days	Duration 5-7 days
Low risk (CA-IAI) Trauma related	Ampicillin/sulbactam 1.5gm- 3gm IV q6h **OR** Amoxicillin/clavulanate 1.2gm IV q8h	Cefoperazone 1gm IV q12h **PLUS** Metronidazole 1g stat then 500mg IV q6h	Source control is needed to prevent on going contamination in patient with IAI. Duration of antibiotic should not exceed 24 hours if operation performed within 12 hours. Antibiotic should not be given more than 4 days if adequate source control. In bacteraemic patient, 7 days of antibiotic therapy should be adequate.
High risk (**HA-IAI)** Post op infection Obese Advance age Co morbidities Leucocytosis on presentation Hypoalbuminemia	Piperacillin/tazobactam 4.5gm IV q6-8h for 4 days	Ertapenem 1gm IV q24h	

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Breast abscess	Cloxacillin 1gm IV q6h	Cefazolin 2gm IV q8h	Drainage maybe required
Burn wound sepsis	Piperacillin/tazobactam 4.5gm IV q6-8h	Cefepime 1 -2gm IV q8h	
Mycotic aneurysm Vascular prosthesis infection If colonized *MRSA*	Ampicillin/sulbactam 3gm IV q6h **OR** Amoxicillin/clavulanate 1.2gm IV q8h Vancomycin 25mg/kg IV stat then 1gm q12h		
Ischaemic ulcers with infection	Ampicillin/sulbactam 1.5gm- 3gm IV q6h **OR** Amoxicillin/clavulanate 1.2gm IV q8h		Duration of treatment: 7 days
Animal or human bite	Amoxicillin/clavulanate 1.2gm IV q8h		Surgical debridement if necessary Duration of treatment: 3-5 days

Reference:

1. *IDSA Practise Guideline, April 2014*
2. *The Surgical Infection Society Revised Guidelines on the Management of Intra-abdominal infection: Volume 18, Number 1, 2017*

TROPICAL INFECTIONS

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Typhoid Fever			
Salmonella typhi Fully sensitive	Ampicillin 2gm q6h for 7-14 days	Ciprofloxacin 400mg IV q12h for 7-10 days **OR** Ciprofloxacin 750mg PO q12h for 7-10 days (if able to take orally)	Complicated cases will need dexamethasone dose: 3mg/kg loading, then 1mg/kg q6h for 2 days Indication of dexamethasone: Typhoid psychosis
Quinolone resistance	Ceftriaxone 2gm IV q24h 7-14 days	Azithromycin 1gm PO loading, then 500mg q24h for 5-7 days	
Cholera			
Non tetracycline resistance	Doxycycline 300mg PO stat (once patient can take orally)	Ciprofloxacin 1gm PO stat	Principle of treatment: Rehydration ORS if tolerating orally Monitor urine output Avoid antidiarrheal agents Antibiotic therapy for severe cases
Tetracycline resistance	Azithromycin 1gm PO stat	Ciprofloxacin 1gm PO stat	
Scrub Typhus	Doxycycline 100mg PO q12h for 7 days	Azithromycin 500mg PO stat	Recommended alternative for pregnant woman

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Brucellosis	Streptomycin 1gm (15mg/kg) IM q24h for 2 - 3 weeks **PLUS** Doxycycline PO 100mg q12h for 6 weeks **OR** Doxycycline 100mg PO q12h for 6 weeks **PLUS** Rifampicin 600-900mg (15mg/kg) PO q24h for 6 weeks	Gentamicin 5mg/kg/24h IV for 7 days **PLUS** Doxycycline 100mg PO q12h for 6 weeks **OR** Rifampicin 600-900mg (15mg/kg) PO q24h for 6 weeks[ŧ] **PLUS** Trimethoprim/sulfamethoxazole (80/400mg) PO 2 tabs q12h for 6 weeks[ŧ]	Longer duration (up to 12 weeks) maybe required in spondylitis, neurobrusellosis, IE, localized suppurated lesions. Please discuss with ID specialists. [ŧ] Recommended alternative for pregnant woman Prophylaxis for laboratory exposure: Doxycycline + rifampicin for 3 weeks. For pregnant, bactrim + rifampicin 3 weeks.
Leptospirosis Severe disease (Leptospiral pulmonary syndrome, multiorgan involvement, sepsis) Mild to Moderate disease	Benzylpenicillin 2MU IV q6h for 5-7 days Doxycycline 100mg PO q12h for 5-7 days	Ceftriaxone 1-2gm IV q24h **(If penicillin allergy)** Azithromycin 500mg PO q24h for 3 days	Jarisch-Herxheimer reaction may occur upon initiation of antimicrobial
Tetanus	Metronidazole 500mg IV q6h for 7-10 days	Benzylpenicillin 2MU IV q6h for 7-10 days	Human tetanus immunoglobulin 3000- 6000 units IM stat At a different site initiate age appropriate active immunization All patients with tetanus should undergo wound debridement to eradicate spores and necrotic tissue

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Melioidosis Intensive/Induction Therapy	Ceftazidime 100-200mg/kg/24h IV in divided doses (usual dose : 2gm q6h) **PLUS/MINUS** Trimethoprim(TMP)/ sulfamethoxazole (80/400mg) TMP 10mg/kg/24h IV/PO in divided doses	Meropenem 25mg/kg/24h IV q8h (usual dose: 1gm q8h; if CNS infection 2gm q8h) **OR** Imipenem/cilastatin 50-60mg/kg/24h IV q6h (usual dose: 1gm q8h) **PLUS/MINUS** Trimethoprim(TMP)/ sulfamethoxazole (80/400mg) TMP 10mg/kg/24h IV/PO in divided doses	Duration: 2 - 3 weeks 4 - 8 weeks if severe/ deep focal infection Consider to add on Trimethoprim/ sulfamethoxazole in neurologic, prostatic, bone, joint and deep seated infection To consider IV G-CSF for severe cases within 72 hours of admission Look for source of infection Amoxicillin/clavulanate has higher rate of relapse
Eradication/Maintenance Therapy	Trimethoprim/ sulfamethoxazole (80/400mg) < 40 kg : 2 tabs q12h; 40-60kg: 3 tabs q12h; >60kg. : 4 tabs q12h	Amoxicillin/clavulanate 1250mg (2 tabs of 625mg) PO q8h	Duration: minimum 3 months In patients with neurological, osteomyelitis or non-resolving abscess up to 6 months treatment is recommended

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Malaria			
Uncomplicated malaria ***All Plasmodium species***	Riamet® (Artemether/ lumefantrine 20/120mg) 4 tablets stat, followed by 2nd dose 8 hours later, then 4 tablets q12h for 2 days. Total: 24 tablets	Quinine 10mg/kg PO q8h **PLUS** Doxycycline 100mg PO q12h for 7 days **OR** Quinine 10mg/kg PO q8h **PLUS** ǂ Clindamycin 600mg PO q12h for 7 days	Give a single dose of primaquine 0.25 mg/kg with ACT to patients with P. falciparum malaria (except pregnant women, infants aged < 6 months and women breastfeeding infants aged < 6 months) to reduce transmission. G6PD testing is not required. ǂ For pregnancy, doxycycline should not be used
P. vivax/P. ovale	**PLUS** Primaquine 0.5mg/kg for 14 days (Need to check for G6PD)		
Complicated	Artesunate 2.4mg/kg IV at 0 hour, 12 hour, 24 hour and q24h till day 7*	Loading dose Quinine 20mg/kg IV over 4 hours in D5% on day 1, then quinine 10mg/kg IV/PO q8h (renal adjustment is required) **PLUS** Doxycycline 100mg PO q12h for 7 days	*Parenteral artesunate should be given for a minimum of 24 hours (3 doses) or until patient can tolerate orally then it can be switched to a complete course of oral ACT regime, eg: Riamet® In severe malaria, add single dose primaquine in areas of low transmission.

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Malaria Chemoprophylaxis	Doxycycline 100mg PO q24h Start: 1-2 days before departure, continue daily until 4 weeks after travel. Max duration: 2 years **OR** Atovaquone/proguanil (Malarone®)* 100/250mg q24h Start: 1-2 days before departure, continue daily until 7 days after travel	Mefloquine 250mg PO weekly Start: 2 weeks before departure, continue weekly until 4 weeks after travel Max duration: 1 year	Pregnancy: Only mefloquine can be used Refer to the drug resistance pattern and recommended prophylaxis in the travel destination Mefloquine can cause neuropsychiatric symptoms. Mefloquine and malarone are not in KKM formulary

References:

1. *Parry CM et al. Typhoid fever. N Engl J Med 2002; 347:1770.*
2. *Saha D et al. Single-dose azithromycin for the treatment of cholera in adults. N Engl J Med 2006; 354:2452.*
3. *CPG Brucellosis, Ministry of Health 2012.*
4. *Melioidosis: The 2014 Revised RDH Guideline. Royal Darwin Hospital and Menzies School of Health Research, Darwin. The Northern Territory Disease Control Bulletin Vol 21 No. 2 June 2014.*
5. *CPG Leptosiprosis, Ministry of Health 2011.*

URINARY TRACT INFECTIONS

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Acute uncomplicated cystitis	**Nitrofurantoin 50-100mg q6h for 5 days (avoid using in 3rd trimester of pregnancy)	Trimethoprim/ sulfamethoxazole (80/400mg) 2 tabs q12h for 3 days. (avoid using in 3rd trimester of pregnancy)	Duration of treatment should be up to 7 days in male ** avoid in G6PD patient
Acute cystitis in pregnancy	Amoxicillin 500mg PO q8h	Cefuroxime 500mg PO q12hr for 7 days	
Recurrent urinary tract infection prophylaxis: >3 episodes/year	Nitrofurantoin 50mg PO nocte for 3-12months **OR** Trimethoprim/sulfamethoxazole (80/400mg) 2 tabs PO q24h for 3-12months	Cephalexin 250mg PO nocte for 3-6 months during pregnancy	
Acute pyelonephritis Pregnancy	Ampicillin/sulbactam 3gm IV q6h **OR** Amoxicillin/clavulanate 1.2gm IV q8h Cefuroxime 750mg IV q8h	Ceftriaxone 1-2gm q24h IV	Duration 7-10 days

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Asymptomatic bacteriuria Recommendation for treatment is only for the following conditions:- a) Pregnant women b) Patients who undergo invasive urologic interventions	Trimethoprim/ sulfamethoxazole (80/400mg) 2 tabs q12h for 7 days **OR** Nitrofurantoin 50mg PO q6h for 7 days	Cephalexin 500mg PO q12h for 7 days	

References:

1. *Guidelines on Urological Infections: 2015.*
2. *International clinical Practice Guidelines for the Treatment of Acute Uncomplicated Cystitis and Pyelonephritis in Women: A 2010 Update by IDSA and European Society of Microbiology and Infectious Diseases: 2011:52*
3. *Diagnosis, Prevention, and Treatment of Catheter Associated Urinary Tract Infection in Adults:2009 International Clinical Practice Guideline*

UROLOGY INFECTIONS

Infection/ Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Pyonephrosis **Perinephric abscess** **Renal abscess**	Ampicillin/sulbactam 1.5gm-3gm IV q6h **OR** Amoxicillin/clavulanate 1.2gm IV q8h	Ceftriaxone 1-2gm IV q24h	Drainage followed by definitive surgery is recommended
Acute prostatitis	Ciprofloxacin 400mg IV q12h	Trimethoprim/sulfamethoxazole (80/400mg) 2 tabs PO q12h	Duration of treatment: 2-4 weeks
Chronic bacterial prostatitis	Ciprofloxacin 400mg IV q12h	Trimethoprim/sulfamethoxazole (80/400mg) 2 tabs PO q12h	Duration of treatment: 2 weeks
Prostatic abscess **Testicular abscess**	Ciprofloxacin 400mg IV q12h for 2 weeks	Trimethoprim/sulfamethoxazole (80/400mg) 2 tabs PO q12h	Drainage is mandatory
Epididymo-orchitis	Doxycycline 100mg PO q12h for 2 weeks.		In case of *C. trachomatis*, the sexual partner should be treated
Urosepsis	Ampicillin/sulbactam 1.5gm-3gm IV q6h **OR** Amoxicillin/clavulanate 1.2gm IV q8h	Ceftriaxone 1-2gm IV q24h	

References:

1. *Guidelines on Urological Infections: 2015.*
2. *International clinical Practice Guidelines for the Treatment of Acute Uncomplicated Cystitis and Pyelonephritis in Women: A 2010 Update by IDSA and European Society of Microbiology and Infectious Diseases: 2011:52*
3. *Diagnosis, Prevention, and Treatment of Catheter Associated Urinary Tract Infection in Adults:2009 International Clinical Practice Guidelines from the IDSA.*

SECTION B

PEADIATRICS

CHEMOPROPHYLAXIS

Infective Endocarditis

IE prophylaxis recommended for patients with the highest risk cardiac conditions undergoing procedures likely to result in bacteraemia with a microorganism that has the potential ability to cause bacterial endocarditis

For highest risk procedures:
- Dental procedures that involve manipulation of either gingival tissue or the periapical region of teeth or perforation of the oral mucosa; this does not include routine dental cleaning.
- Procedures of the respiratory tract that involve incision or biopsy of the respiratory mucosa
- Procedures in patients with ongoing gastrointestinal (GI) or genitourinary (GU) tract infection
- Procedures on infected skin, skin structure, or musculoskeletal tissue
- Surgery to place prosthetic heart valves or prosthetic intravascular or intracardiac materials

Genitourinary or gastrointestinal procedures:
IE prophylaxis only if ongoing GI or GU tract infection. Require activity against enterococci (amoxicillin or ampicillin) or vancomycin for penicillin allergic

Maintenance of optimal oral hygiene may reduce the incidence of bacteraemia from daily activities and is more important than prophylactic antibiotics for a dental procedure to reduce the risk of IE.

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Infective Endocarditis (IE) Include coverage for *staphylococcus* for surgical procedures on infected skin, skin structure, or musculoskeletal tissue	Amoxicillin 50mg/kg PO 0.5-1 hour before procedure	Ampicillin IV 50mg/kg **Penicillin Allergy** : Clindamycin 20mg/kg IV/PO 0.5-1 hour before procedure	

Post splenectomy

Duration
Preferably life long, or at least

- Children up to the age of 16 years
- A minimum of 2 years
- Indefinitely for patients with an underlying immunodeficiency or immunocompromised state and asplenia

Important adjunct:
Immunization against *Pneumococcus, Haemophilus, Meningococcus* at least 14 days prior to splenectomy.

(If not possible then 14 days postoperative day)

Yearly influenza vaccine also recommended.
(Please refer relevant immunization guidelines for schedule)

To seek immediate medical attention when febrile or to instruct on immediate self-directed empiric antibiotics (amoxicillin/clavulanate or cefuroxime axetil) before promptly seeking medical care.

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Post splenectomy At risk for *Pneumococcus, Meningococcus, Haemophilus*	Penicillin V PO 125mg q12h for ≤ 2yo 250mg q12h for > 2yo	Amoxicillin (20mg/kg/day) **Penicillin Allergy** : Erythromycin ethylsuccinate 200mg PO daily < 2 yo 400mg daily > 2 yo	

Haemophilus influenza b

Close (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 contacts

- Household with at least one contact <4 years who has not received an age-appropriate number of doses of Hib conjugate vaccine
- Household with a contact who is an immunocompromised child (<18 years), regardless of that child's Hib immunization status

Nursery Contact

For child-care and preschool contacts (regardless of age or vaccine status) when unimmunized or incompletely immunized children attend the facility and two or more cases of Hib invasive disease have occurred among attendees within 60 days

Give chemoprophylaxis to index case if treated with regimens other than cefotaxime or ceftriaxone

For Contacts < 2 years not immunized: complete immunization

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Haemophilus influenza b Close contacts	Rifampicin PO Children: 20mg/kg/day q24h for 4 days Infants: 10mg/kg/day q24h for 4 days		

Meningococcal exposure

CLOSE contact defined as individuals who have had prolonged (>8 hours) contact while in close proximity (<3 ft) to the patient or who have been directly exposed to the patient's oral secretions during the seven days before the onset of the patient's symptoms and until 24 hours after initiation of appropriate antibiotic therapy:

All household, child care and nursery, school contacts

Others

- Close contact for at least 4 hours during the week before illness onset
- Exposure to index's nasopharyngeal secretions (eg kissing, sharing of toothbrushes, eating utensils)
- Airline flights lasting >8 hours: directly next to case

Healthcare staff

Routine prophylaxis not recommended, unless exposure to secretions such as unprotected mouth to mouth resuscitation, intubation or suctioning

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Meningococcal exposure	Rifampicin PO Children: <1 month: 5mg/kg/dose q12h for 2 days >1 month: 10mg/kg/dose (max 600mg) q12h for 2 days	Ceftriaxone IM <15 yo : 125mg stat >15 yo : 250mg stat Ciprofloxacin PO >18 yo: 500mg single dose	

Pertussis

Antimicrobial prophylaxis for close contacts of the index case and for exposed individuals at high risk for severe or complicated pertussis

Close contact definition:

- Face-to-face exposure within three feet of a symptomatic patient
- Direct contact with respiratory, oral, or nasal secretions from a symptomatic patient
- Sharing the same confined space in close proximity with a symptomatic patient for ≥1 hour

At risk:

- Infants younger than one year, especially <4 months of age
- Persons with immunodeficiency
- Persons with underlying medical conditions (chronic lung disease, respiratory insufficiency, cystic fibrosis)
- People in close contact with high risk patients

Complete immunization for close contact ≤ 7 years of age

Routine vaccination of children, adolescents, and adults (including pregnant women) is the most important preventive strategy

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Pertussis	<1 month : Azithromycin 10mg/kg q24h for 5 days >1 month : Erythromycin ethylsuccinate 40-50mg/kg/day q6-12h for 14 days	>1 month: Clarithromycin 15 mg /kg /day PO q12h for 7 days Azithromycin 10mg/kg q24h for 5 days	

Chicken pox

For passive PEP

Susceptible hosts include

- Immunocompromised children and adults who lack evidence of immunity to VZV
- New-borns of mothers with varicella shortly before or after delivery (i.e. 5 days before to 2 days after delivery)
- Premature infants born at ≥28 weeks of gestation who are exposed during their hospitalization and whose mothers do not have evidence of immunity
- Premature infants born at <28 weeks of gestation or who weigh ≤1000 g at birth and were exposed during their hospitalization, regardless of their mothers' evidence of immunity to varicella

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Chicken pox Active Passive	Varicella vaccine: Within 3-5 days of exposure for the susceptible healthy adult/child For patients who are at high risk for severe infection and complications, and who are not candidates for the VZV vaccine *Varicella zoster* immune globulin 25iu/kg (refer to product information) **OR** 125iu/10kg (max 625iu) IM **OR** IVIG (400mg/kg) As soon as possible after exposure up to10 days after Patients receiving monthly high dose (≥400mg/kg) IVIG are likely to be protected and probably do not require VariZIG if the most recent dose of IVIG was administered ≤3 weeks before exposure	>1 month: Clarithromycin 15 mg /kg /day PO q12h for 7 days Azithromycin 10mg/kg q24h for 5 days	

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Rheumatic fever (Secondary prevention)	Benzathine penicillin G IM 1.2 MU (>25kg) ; 0.6 MU (<25 kg) every 3-4 weeks	Penicillin V 250mg PO q12h **Penicillin Allergy** : Erythromycin stearate 250mg PO q12h	Duration With carditis: 10 yo or until 21 yo With carditis and residual heart disease: 10 years or until 40 yo Without carditis: 5 yo or until 21 yo
Neonatal *Group B Strep* Infection	Intrapartum maternal prophylaxis till delivery Penicillin G IV (5MU load then 2.5MU q6h till delivery)	Ampicillin 2gm IV load then 1gm q6h <u>Penicillin allergy</u> Clindamycin 900mg IV q8h (according to susceptibility) **OR** Vancomycin (weight based dosing 20mg/kg, max 2gm q12h)	Treat during labour if previously delivered infant with invasive GBS, GBS bacteriuria or antenatal screening swabs positive OR if GBS status not known AND any of the following: • Preterm <37 weeks • PROM >18 hours • Intrapartum temp >38ºC

References:

1. *Davies JM, Lewis MP, 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 task force. Br J Haematol. 2011;155:308-17*
2. *American Academy of Pediatrics. Haemophilus influenzae infections. In: Red Book: 2012 Report of the Committee on Infectious Diseases, 29th, Pickering LK. (Ed), American Academy of Pediatrics, Elk Grove Village, IL 2012. p.345*
3. *American Academy of Pediatrics. Pertussis (whooping cough). In: Red Book: 2012 Report of the Committee on Infectious Diseases, 29th, Pickering LK. (Ed), American Academy of Pediatrics, Elk Grove Village, IL 2012. p.553*
4. *Updated recommendations for use of VariZIG--United States, 2013. Centers for Disease Control and Prevention (CDC). MMWR Morb Mortal Wkly Rep. 201*

BONE & JOINTS INFECTIONS

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Septic Arthritis(SA) & Osteomyelitis (OM):	• Empiric antibiotics should be started based on clinical diagnosis of SA or OM • Surgical debridement often not required in OM • Urgent wash out& drainage is needed in SA in hip and other joints to reduce pressure on growth plate • *IV antibiotics can be switch to oral if no concurrent bacteraemia when: ○ Child afebrile and pain free for at least 24 hrs and CRP <20mg/L or CRP decreased by≥2/3 of highest value		
0-2 months: *Staph. aureus.* *Streptococcus agalactiae* Gram negative enteric organism Less than 5 yrs: *Staph. aureus.* *Streptococcus pyogens* *Streptococcus pneumoniae* Non- type able *Haemophilus* spp. *K.Kingae* *Older than 5 yrs:* *Staph. aureus.* *Streptococcus pyogens*	Cloxacillin 50mg/kg dose IV q6h **PLUS** Cefotaxime 50mg/kg/dose q6-8h Cefuroxime 50mg/kg/dose IV q8h (monotherapy) **OR** Cloxacillin 50mg/kg dose IV q6h **PLUS** Ceftriaxone 50mg/kg/dose q12h Cloxacillin 50mg/kg/dose IV q6h	Amoxicillin/clavulanate 30-50mg/kg/dose IV q8h (based on amoxicillin dose) Cefazolin 25mg/kg/dose IV q8h Can be use in children with suspected *Staph aureus* or *Strep pyogenes*;	**Duration of antibiotics:** SA: total of 3-4 weeks OM: 4-6 weeks In complex disease (multifocal, significant bone destruction, immunocompromised host and resistant /unusual pathogens-need prolonged intravenous antibiotics and duration might exceed 6 weeks

References:

1. *Kathleen Gutierrez. Bone and Joint infections in children. Pediatr Clin N Am 52(2005); 779-794.*

CARDIOVASCULAR INFECTIONS

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Acute myocarditis Commonly caused by viruses	Treatment mainly supportive		
Acute pericarditis Viral (commonest cause) Bacterial: *Staphylococcus aureus*	Treatment mainly supportive Cloxacillin 200 mg/kg/24h IV q4-6h for 6 weeks **PLUS/MINUS** Gentamicin 1 mg/kg IV/IM q8h for 3 - 5 days	 **Penicillin Allergic:** Cefazolin 100 mg/kg/24h IV q8h **OR** Vancomycin 40 mg/kg/24h IV in 2-4 divided doses	Consider surgical drainage if pericardial empyema detected
Infective Endocarditis			
Empirical therapy	Benzylpenicillin 200,000-300,000 units/kg/24h IV q4-6h for 4 weeks **PLUS** Gentamicin 1 mg/kg IV/IM q8h for 2 weeks	Vancomycin 15 mg/kg q12h IV for 4-6 weeks **PLUS** Gentamicin 1 mg/kg IV/IM q8h for 2 weeks	

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Infective Endocarditis			
Streptococcus viridans Strains fully susceptible to penicillin (MIC < 0.125 mg/l) Strains resistant to penicillin (MIC ≥ 0.2 mg/l)	Benzylpenicillin 200,000-300,000 units/kg/24h IV q4-6h for 4 weeks Benzylpenicillin 200,000-300,000 units/kg/24h IV q4-6h for 4 weeks **PLUS** Gentamicin 1mg/kg IV/IM q8h for 2 weeks	Ceftriaxone 100mg/kg IV/IM q24h for 4 weeks **PLUS/MINUS** Gentamicin 1mg/kg IV/IM q8h for 2 weeks **Penicillin/Ceftriaxone allergic:** Vancomycin 40mg/kg/24h IV q8-12h for 4 weeks	Maximum dosages per 24 hours: penicillin 12-24 MU; ampicillin 12gm; ceftriaxone 4gm, gentamicin 240 mg. Vancomycin dose adjusted for trough concentration of 15-20 mg/ml
Enterococcus	Ampicillin 300 mg/kg/24h IV q4-6h for 4-6weeks **PLUS** Gentamicin 1mg/kg IV/IM q8h for 4-6 weeks	Penicillin allergic: Vancomycin 40 mg/kg/day IV q8-12h **PLUS** Gentamicin 1mg/kg IV/IM q8h for 2 weeks for 4-6 weeks	
Staphylococcus Methicillin sensitive Methicillin Resistant	Cloxacillin 200 mg/kg/24h IV q4-6h for 6 weeks **PLUS** Gentamicin 1mg/kg IV/IM q8h for 3-5 days Vancomycin 60 mg/kg/24h IV q6h for 6 weeks	**Penicillin allergic:** Cefazolin 100 mg/kg/24h IV q8h for 6 weeks **OR** Vancomycin 40 mg/kg/24h IV q2-4h for 6 weeks (Target trough concentration between 15-20 µg/ml)	Clinical benefit of aminoglycosides has not been established. Cefazolin or other first-generation cephalosporin in equivalent dosages may be used in patients who do not have a history of immediate type hypersensitivity to penicillin or ampicillin.

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Culture-negative endocarditis	Ampicillin/sulbactam 300 mg/kg/24h IV q4-6h for 4-6 weeks **PLUS** Gentamicin 1mg/kg IV/IM q8h for 4-6 weeks		Patients with culture-negative endocarditis should be treated in consultation with an ID specialist
Gram negative enteric bacilli / HACEK group organisms	Cefotaxime 200mg/kg/24h IV q4-6h for 4-6 weeks **OR** Ceftriaxone 100mg/kg IV q24h for 4-6 weeks		

CENTRAL NERVOUS INFECTIONS

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Meningitis			
Empirical treatment ***Haemophilus influenza*** ***Streptococcus pneumoniae*** MIC < 0.1mcg/mL: MIC 0.1-1 mcg/mL: MIC ≥ 2mcg/mL:	Ceftriaxone 50-75mg/kg IV q12-24h for 10-14 days. If < 3 month-old, Ampicillin 50mg/kg IV q4-6h **PLUS** Cefotaxime 50mg/kg IV q4-6h Ceftriaxone 50-75mg/kg IV q12-24h for 10-14 days. Benzylpenicillin 250,000-400,000 iu/kg/day IV q4-6h Ceftriaxone 50mg/kg IV q12h Vancomycin IV *15mg/kg IV q6h* **PLUS** Ceftriaxone 50mg/kg IV q12h	Cefotaxime 50mg/kg IV q4-6h **PLUS** Vancomycin 15mg/kg IV q6h	Prophylaxis for all household contacts if there are unimmunised or partially immunised children < 4 years old. (*H influenza* and *N meningitides* meningitis) TDM trough target 15-20 μg/mL
Neisseria meningitidis	Benzylpenicillin 50mg/kg IV q4-6h for 7 days	Ceftriaxone 50-75mg/kg IV q12-24h for 7 days.	Prophylaxis for all household contacts and health care workers involved in intubation and suctioning of airway

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Cryptococcal meningitis *Cryptococcus neoformans* Induction therapy**:** Consolidation therapy**:**	 Amphotericin B 1.0mg/kg/24h IV **PLUS/ MINUS** Flucytosine 400-1200mg/m^2 (max 2gm) PO in q6h for 2-4 weeks. Fluconazole 10-12mg/kg/24h PO in q12h for 8-10 weeks.		
***Herpes Simplex* Encephalitis** < 12 weeks old: 12 weeks-12 years old: > 12 years olds:	 Acyclovir 20mg/kg IV q8h Acyclovir 500mg/m^2 IV q8h Acyclovir 10mg/kg IV q8h		Duration: for 21 days
Brain abscess	Cefotaxime 50mg/kg IV q4-6h **OR** Ceftriaxone 50-75mg/kg IV q12-24h **PLUS** Metronidazole 15mg/kg IV stat then 7.5mg/kg IV q8h	If secondary to trauma: **ADD** Cloxacillin 25-50mg/kg IV q4-6h.	Surgical drainage may be indicated if appropriate Duration 6-8 weeks, depending on response as seen from neuroimaging

References :
1. *NICE Clinical Guideline (2010). Bacterial meningitis and meningococcal septicaemia*
2. *Royal Children Hospital Melbourne (2012). Meningitis/encephalitis guideline*
3. *The Sanford Guide to Antimicrobial therapy 2011-2012*
4. *Felsenstein S,Bhanu W, Shingadia D, et al. Clinical and Microbiologic Features Guiding Treatment Recommendations for Brain Abscesses in Children.Pediatr Infect Dis J 2013;32:129-135.*
5. *Drug Doses Frank Shann*

GASTROINTESTINAL INFECTIONS

Infection/Condition	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 *Shigella, E. coli, Campylobacter* Mild or uncomplicated Severe	Most mild infections resolved spontaneously without antibiotics Trimethoprim/sulfamethoxazole (TMP: 10mg/kg/24h) PO in 2 divided doses for 5-days Ceftriaxone 25mg/kg q12h IV for 2-5 days	Ciprofloxacin 12.5mg/kg PO q12h for 5 days	
Dysentery *Amoebiasis*	Metronidazole 15mg/kg PO q8h for 10 days, followed by Paromomycin 10mg/kg PO q8h for 10 days		
Giardiasis	Metronidazole 30mg/kg/24h PO once daily for 3 days		

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Typhoid fever *Salmonella* Typhi *S. paratyphi* Mild or uncomplicated Severe infection or suspected resistant organism Chronic carrier state (> 1 year)	Ceftriaxone 50mg/kg q12h IV Ceftriaxone 50mg/kg IV q12h for 5-7days Ampicillin/amoxicillin 100mg/kg/24h PO in q6-8h for 6 weeks	Ciprofloxacin 15mg/kg PO q12h for 5-7 days Ciprofloxacin IV 10-15mg/kg IV q12h for 7-14 days Trimethoprim(TMP)/sulfamethoxazole TMP 8 mg/kg/24h PO in q12h for 6 weeks	*Fluoroquinolones need to be used with caution in children due to possible arthropathy and rapid development of resistance. However, there is now increasing data on safety and efficacy of quinolones in children
Cholera	>8kg: Doxycycline 4.4mg/kg PO daily as single dose **OR** Azithromycin: 12 mg/kg PO daily at Day 1, Day 2-3: 6 mg/kg PO daily	Trimethoprim(TMP)/ sulfamethoxazole TMP 8-10mg/kg/24h PO in q12h for 3 days Erythromycin 50mg/kg/24h PO in q6h for 3 days (for strains resistant to tetracyclines)	Oral or IV rehydration is the cornerstone of treatment. Antibiotics therapy reduces the volume and duration of diarrhoea 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
Liver abscess (amoebic) *Entamoeba histolytica*	Metronidazole 7.5mg/kg IV q8h for 10-14 days		Amoebic abscess tend to be solitary lesion. Consider surgical drainage if needed

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Liver abscess (pyogenic) *S. aureus,* Gram negative, Anaerobes	Empiric: Cloxacillin 50mg/kg IV q6h **PLUS** Ceftriaxone 50mg/kg IV q12h **PLUS** Metronidazole 7.5mg/kg IV q8h	Clindamycin 10 mg/kg IV q8h **PLUS** Gentamicin ≤10 yr: 8mg/kg IV day1, then 6mg/kg daily >10 yr: 7mg/kg IV day1, then 5mg/kg daily	Surgical drainage is needed in most cases
Acute cholangitis Gram negative, anaerobes, gram positive	Ampicillin 25-50mg/kg IV q6h **PLUS** Gentamicin 5mg/kg IV q24h **PLUS** Metronidazole 7.5mg/kg IV q8h for 7-14 days	Cefoperazone 25-50mg/kg IV q6-8h **PLUS** Metronidazole 7.5mg/kg IV q8h	
Peritonitis Spontaneous bacterial peritonitis: mostly Enterobacteriaceae Secondary peritonitis: polymicrobial	Ceftriaxone 50mg/kg IV q12h Ceftriaxone 50mg/kg IV q12h **Plus** Metronidazole 7.5mg/kg IV q8h	Cefotaxime 50mg/kg IV q6h Cefotaxime 50mg/kg IV q6h **Plus** Metronidazole 7.5mg/kg IV q8h	Penicillin in case of nephrotic syndrome

References :
1. *Cunha BA. Antibiotic Essentials 2012. 11th Edition*
2. *The Sanford Guide to Antimicrobial Therapy 2011-2012*
3. *Liver Abscess in Children: A 10-year Single Centre Experience Saudi J Gastroenterology 2011; 17(3)199*
4. *Cherry J, Demmler-Harisson GJ, Kaplan SL, et al. Feigin & Cherry's Textbook of Paediatric Infectious Diseases 6th Ed*
5. *Frank Shann, Sixteenth Edition 2014*

INFECTIONS IN IMMUNOCOMPROMISED PATIENTS

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
First Line Febrile neutropenia Fever >38°C Neutrophil<500mm^3 *Klebsiella* sp (non ESBL), *E.coli, Pseudomonas*	Cefepime 50mg/kg IV q8h	Piperacillin/tazobactam <9 months : 80 mg/kg IV q8h 9mth-<40kg : 100 mg/kg IVq8h >40 kg : 3gm IV q6h	Meta-analysis has shown that there is no clinical advantage with β lactam- aminoglycoside combination therapy
Second Line Persistent fever > 72 hours MRSA , *ESBL Klebsiella,* coagulase -ve *staph*	Imipenem/cilastatin 25mg/kg IV q6h **PLUS/MINUS** Vancomycin 15mg/kg IV q6h	Meropenem 40mg/kg IV q8h **PLUS/MINUS** Vancomycin 15mg/kg IV q6h	Consider adding vancomycin in suspected catheter related infections, positive blood culture for gram +ve cocci, hypotension patients and patients who are known to be colonised with *MRSA*
Third Line Fever > 4- 7 days with no identified source of fever *Candida* sp. *Aspergillus* sp.	Imipenem/cilastatin 25mg/kg IV q6h **PLUS** Amphotericin B 0.5mg/kg IV and gradually escalate by 0.25 to 1mg/kg q24h (max. 1.5 mg/kg/d)	Meropenem 40mg/kg IV q8h **PLUS** Amphotericin B 0.5mg/kg IV and gradually escalate by 0.25 to 1mg/kg q24h (max. 1.5 g/kg/d)	1/3 of febrile neutropenia patients with persistent fever >1 week have systemic fungal infections

References :

1. β lactam monotherapy versus β lactam-aminoglycoside combination therapy for fever with neutropenia: systematic review and meta-analysis. BMJ 2003; 326:1111
2. Clinical practice guideline for the use of antimicrobial agents in neutropenic patients with cancer: 2010 update by the Infectious Diseases Society of America. Freifeld AG, Bow EJ, Sepkowitz KA, Boeckh MJ, Ito JI, Mullen CA, Raad II, Rolston KV, Young JA, Wingard JR, Clin Infect Dis. 2011;52(4):e56.
3. Guideline for the management of fever and neutropenia in children with cancer and/or undergoing hematopoietic stem-cell transplantation. Lehrnbecher T, Phillips R, Alexander S, Alvaro F, Carlesse F, Fisher B, Hakim H, Santolaya M, Castagnola E, Davis BL, Dupuis LL, Gibson F, Groll AH, Gaur A, Gupta A, Kebudi R, Petrilli S, Steinbach WJ, Villarroel M, Zaoutis T, Sung L , J Clin Oncol. 2012;30(35):4427.

NEONATAL INFECTIONS

Infection/Condition	Suggested Treatment		Comments
	Preferred	**Alternative**	
Congenital & Perinatal Infections			
Congenital Syphilis *T. pallidum*	Only severe cases are clinically apparent at birth. Refer to algorithm for diagnosing and evaluation in: American Academy of Paediatrics. Syphilis. In: Red Book: 2012 Report of the Committee on Infectious Diseases, 29th ed, Pickering LK (Ed) • Isolate till non-infectious (at least 24 hours of treatment) • Screen for other STDs and HIV • If more than one day of penicillin therapy is missed, the entire course should be restarted • Investigate and treat parents • Evaluation of the siblings of an index case of congenital syphilis may be warranted if such an evaluation did not occur previously Follow-up: Nontreponemal serologic tests at 3,6,12 and 24 months. (Should become neg by 6 months) For those with abnormal CSF – recommended to repeat CSF FEME and VDRL at 6 month intervals. Persistent +VDRL of CSF requires re-evaluation and possible re-treatment		
If diagnosed with congenital syphilis after one month of age:	Aqueous crystalline penicillin G: 50,000 units/kg IV q12h during the first 7 days of life and q8h thereafter Aqueous penicillin G 50,000 units/kg IV q4-6h	Procaine penicillin G, 50,000 units/kg IM daily in a single dose	Duration: 10 days If findings compatible with CNS involvement, some experts suggest that 10 days course of aqueous penicillin be followed with a single dose of benzathine penicillin G 50,000 units/kg IM

Infection/Condition	Suggested Treatment		Comments
	Preferred	**Alternative**	
Congenital Toxoplasmosis *T. gondii*	Drug regimen not definitively established. Clinical trials ongoing. Prednisolone (0.5 mg twice per day) can be added if cerebrospinal fluid (CSF) protein is >1 gm/dL or when active chorioretinitis threatens vision and continued until resolution of elevated CSF protein or active chorioretinitis that threatens vision. Clindamycin may be substituted for sulfadiazine in children with G6PD deficiency or who develop allergy to sulfadiazine Regular FBC recommended: Main adverse effect of pyrimethamine is neutropenia. The folinic acid dose should be increased if the ANC falls below 1000 cells/microL. Pyrimethamine should be temporarily withheld if the ANC is below 500 cells/microL. Persistent neutropenia despite withholding of pyrimethamine may be caused by Sulfadiazine.		
	Pyrimethamine (1.25 mg/kg every 15 days) **PLUS** Sulfadoxine (25 mg/kg every 15 days) for 24 months **PLUS** Folinic Acid, 5 mg/week PO (IV formulation can be used for oral)		
Herpes Simplex **Neonatal** • Localized skin, eye, and mouth • Central nervous system with or without SEM • Disseminated disease involving multiple organs	Isolate Ocular involvement requires topical antiviral Screen for other STDs For CNS disease, repeat LP at end therapy for *HSV* PCR and treat till negative Investigate and treat parents Recurrence of *HSV* can occur and may be a lifelong problem		
	Acyclovir 60mg/kg/day IV q8h		Duration: Skin, eyes, mouth: 14 days CNS/ Disseminated: 21 days

<table>
<tr><th>Infection/Condition</th><th colspan="2">Suggested Treatment</th><th>Comments</th></tr>
<tr><th></th><th>Preferred</th><th>Alternative</th><th></th></tr>
<tr><td>Tetanus neonatorum</td><td colspan="3">Debridement
Human tetanus IG IM
Optimum dose for IM human TIG yet to be established.
Traditional recommendations: single dose of 3000-6000U.
Limited data suggests doses as low as 500U as effective.

Penicillin - GABA antagonist and associated with seizures. Metronidazole recommended as choice.

Check maternal immunization</td></tr>
<tr><td></td><td>Metronidazole IV/PO for 10 days

<u>Neonates (Neofax dosing):</u>
• Loading dose: 15mg/ kg/dose IV/PO x 1
• Maintenance dose: 7.5mg/ kg/dose IV/PO

<table>
<tr><td colspan="3">Metronidazole Dosing Interval Chart</td></tr>
<tr><td>Post-menstrual age (weeks)</td><td>Post-natal age (days)</td><td>Dosing interval (hours)</td></tr>
<tr><td>≤ 29 weeks</td><td>0-28 days
>28 days</td><td>q48h
q24h</td></tr>
<tr><td>30 to 36 weeks</td><td>0-14 days
>14 days</td><td>q24h
q12h</td></tr>
<tr><td>37 to 44 weeks</td><td>0-7 days
>7 days</td><td>q24h
q12h</td></tr>
<tr><td>≥ 45 weeks</td><td>AL</td><td>q8h</td></tr>
</table>
</td><td>Penicillin G IV
(100 000U/kg q12h for 1st week of life and q6h after 1st week) for 10 days</td><td></td></tr>
</table>

Infection/Condition	Suggested Treatment		Comments
	Preferred	**Alternative**	
Gonococcal Ophthalmitis Non-disseminated disease Disseminated disease Neonates with hyperbilirubinemia	 Immediate and frequent saline eye irrigation Ceftriaxone 50mg/kg IV once (max 125mg) Ceftriaxone IV (50mg/kg daily 1st week of life, 12H >1week of life) for 7 days Duration 10-14 days if meningitis documented Cefotaxime 25 mg/kg IV/IM q12h for 7 days, with a duration of 10–14 days, if meningitis is documented		Evaluate for signs of disseminated infection (e.g., sepsis, arthritis, and meningitis) Screen mother and baby for chlamydial infection Screen for other STDs Investigate and treat parents
***Chlamydia trachomatis* conjunctivitis**	Initial treatment for chlamydial conjunctivitis should be based upon a positive diagnostic test Diagnosis by tissue culture, antigen detection (IFA, EIA) or NAAT Eye swab from conjunctiva of everted eyelid with Dacron tipped swab or swab from test kit Test also for gonococcus. Treat mother & sexual partner Efficacy of treatment 80%, follow-up necessary. Second course of treatment may be required.		
	Erythromycin base or ethylsuccinate 50mg/kg/day PO q6h for 14 days (Topical therapy not necessary if systemic treatment given)	Azithromycin 20 mg/kg/day PO, 1 dose daily for 3 days	

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Early onset sepsis (<48 hrs) Sepsis / pneumonia / meningitis) GBS, GNB	Suspect in maternal chorioamnionitis, sepsis, PROM (>18 hours) Do full septic workup, CXR In babies given antibiotics because of risk factors for infection or clinical indicators of possible infection, review need for continued antibiotics at 36 hours with culture results No evidence from randomised trials to suggest that any antibiotic regimen may be better than any other in the treatment of presumed early neonatal sepsis Tailor according to culture results **Drug Dosages – Refer Frank Shann or Neofax**		
	Penicillin G IV **OR** Ampicillin IV **PLUS** Gentamycin IV		Duration: Sepsis: 7-10 days Gram positive meningitis: 2 weeks Gram negative meningitis: 3 weeks
<u>For meningitis</u> Pathogen unknown	Ampicillin IV **PLUS** Cefotaxime IV		

Infection/Condition	Suggested Treatment		Comments
	Preferred	**Alternative**	
GBS Infection *Streptococcus agalactiae*	Penicillin G IV **OR** Ampicillin IV (300mg/kg/day) **PLUS** Gentamycin IV		Duration: Sepsis: 10 days Meningitis: 14 days Osteomyelitis: 4 weeks
Postnatal Infections			
Community Acquired Infections (Late onset sepsis >48 hrs) Pneumonia, Sepsis *Group B Strep, E. coli, Klebsiella, Enterobacter, Staphylococcus aureus* Possible *Listeria*	Inadequate evidence from randomised trials in favour of any particular antibiotic regimen for the treatment of suspected late onset neonatal sepsis Discuss with ID/neonatologist / microbiologist for the prevalence pathogens Discontinue antibiotics after 72 hours if culture negative or course does not support diagnosis **Drug Dosages – Refer Frank Shann or Neofax**		
	Cloxacillin IV **PLUS** Gentamicin IV		
Hospital Acquired Infection (Pneumonia, sepsis, meningitis) Based on predominant flora and susceptibility Coagulase-negative *staphylococci*, *Staphylococcus aureus, E. coli, Klebsiella, Pseudomonas, Enterobacter, Candida,* GBS, *Serratia, Acinetobacter*	CloxacillinIV **PLUS** Amikacin IV (Use cloxacillin if *Staph aureus* is a problem in the respective nursery. Otherwise replace Cloxacillin with any other antibiotic appropriate for the predominant flora)	Cefepime (Discuss with ID/neonatologist / microbiologist for the prevalence pathogens)	Possibility of GNB with inducible β-lactamases and ESBL producing *Klebsiella and E. coli* where β-lactams are avoided and may require carbepenems (Drug Dosages – Refer Frank Shann or Neofax)

Infection/Condition	Suggested Treatment		Comments
	Preferred	**Alternative**	
Necrotising Enterocolitis (NEC) *Klebsiella, E. coli, Clostridia, coagulase* negative *Staphylococcus*, *Enterococci*, *Bacteroides* (typically NEC occurs at second or third week of life)	There is insufficient evidence regarding choice of antibiotic regimens or duration of antibiotic treatment of NEC. Decisions regarding antibiotic choice and duration might best be guided by culture results as well as flora & antibiotic resistance patterns present within nurseries Empiric regimens can be modified based upon the results of cultures of blood, peritoneal fluid, or surgical specimens		
	Ampicillin IV **PLUS** Gentamycin IV **PLUS** Metronidazole IV	Amoxicillin/clavulanate **PLUS** Gentamicin **OR** Amikacin	<u>Duration</u> 10-14 days (Vancomycin if CoNS *MRSA or VRE* suspected)

References

1. *American Academy of Pediatrics. 2012 Red Book: Report of the Committee on Infectious Diseases. 29th ed. Elk Grove Village, IL: American Academy of Pediatrics.*
2. *Workowski KA, Berman S Sexually transmitted diseases treatment guidelines, 2010. , Centers for Disease Control and Prevention (CDC) MMWR Recomm Rep. 2010;59(RR-12):1.*
3. *Kimberlin, D.W., Neonatal Herpes simplex infectio . Clinical Microbiology reviews. 2004;17:1-13*
4. *American Academy of Pediatrics. 2003 Red Book: Report of the Committee on Infectious Diseases. 26th ed. Elk Grove Village, IL: American Academy of Pediatrics, 2003:611-616*
5. *American Academy of Pediatrics. 2003 Red Book: Report of the Committee on Infectious Diseases. 26th ed. Elk Grove Village, IL: American Academy of Pediatrics, 2003:285-291*
6. *Mtitimila EI, Cooke RWI. Antibiotic Regimens for suspected early-onset sepsis. Cochrane Database of Systematic Reviews. 2006. Issue 4.*
7. *Antibiotics for early-onset neonatal infection. NICE clinical guideline 149. Aug 2012*
8. *Gordon A, Jeffrey HE. Antibiotic Regimens for suspected late-onset sepsis in newborn. Cochrane Database of Systematic Reviews. 2006. Issue 4*
9. *Shah D, Sinn JK. Antibiotic regimens for the empirical treatment of newborn infants with necrotising enterocolitis Cochrane Database Syst Rev. 2012;8:CD007448.*
10. *Centers for Disease Control and Prevention. STD Surveillance case definitions. http://www.cdc.gov/std/stats/CaseDefinitions-2014.pdf*

OCULAR INFECTIONS

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Preseptal cellulitis *Strep pneumoniae, Staph aureus, Streptococcus* ssp. Systemically unwell	Amoxicillin/clavulanate 22.5mg/kg PO q12h for 5-7 days Cloxacillin 25-50mg/kg (max 2gm) IV q6h **PLUS** Cefotaxime 50mg/kg (max 2gm) IV q8h	Amoxicillin/clavulanate 50mg/kg IV q12h Ceftriaxone 50mg/kg IV (max 2gm) q12h	Failure to respond within 24-48 hours may indicate orbital cellulitis or underlying sinus disease
Orbital Cellulitis/ Abscess *Strep pyogenes, Strep pneumonia, Staph aureus* *H. influenza* (unvaccinated child or untypeable strains)	Ceftriaxone 50mg/kg(max 2gm) IV q12h **PLUS** Cloxacillin 50mg/kg (max 2gm) IV q6h for 7-14 days	**Penicillin allergic** : may consider clindamycin (discuss with ID)	This condition is considered surgical emergency and require immediate consultation with ENT surgeon and ophthalmologist. Urgent CT scan is needed to exclude associated abscess and intracranial extension. Urgent surgical drainage of the ethmoid sinuses or of an orbital, subperiosteal or intracranial abscess may be needed.

References:

1. *Clinical Practice Guideline: Periorbital and orbital cellulitis; The Royal Children's Hospiral, Melbourne. Last updated 25 August 2013.*
2. *Therapeutic Guideline: Antibiotics 14th edition. Therapeutic Guideline Ltd: Melbourne 2010.*
3. *Ellen R. W. Chapter 87: Periorbital and Orbital Infection in Principles and Practice of Pediatric Infectious Diseases edited by Sarah S. Long, 4th Edition, 2012.*
4. *Botting AM, McIntosh D, Mahadevan M; Paediatric pre- and post-septal peri-orbital infections are different diseases. A retrospective review of 262 cases.*
5. *Int J Pediatr Otorhinolaryngol. 2008 Mar;72(3):377-83. doi: 10.1016/j.ijporl.2007.11.013. Epub 2008 Jan 11.*

OTORHINOLARYNGOLOGY INFECTIONS

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Tonsillitis/Pharyngitis Group A *streptococcal*	Phenoxymethylpenicillin 25-50mg/kg/day in 4 divided doses PO x 10 days **OR** Amoxicillin 25 mg/kg q8h or 25-40mg/kg q12h PO (max 500mg) for 10 days	**Penicillin allergy:** Azithromycin 12 mg/kg PO q24h for 5 days **OR** Clarithromycin 7.5mg/kg/dose q12h for 10 days	
Rhinosinusitis *Streptococcus pneumonia* *Haemophilus influenza* *Moraxella catarrhalis* Severe infection:	Amoxicillin 90mg/kg/day in 2 divided doses or for 10-14 days Ampicillin/sulbactam 200–400 mg/kg/day IV q6h **OR** Ceftriaxone 50 mg/kg/day IV q12h	**Risk for antibiotic resistance or failed initial therapy:** Amoxicillin/clavulanate 90mg/kg/day in 2 divided doses for 10-14 days **Penicillin allergy:** Clindamycin 30-40mg/kg/day in 3-4 divided doses for 10-14 days	Antibiotic therapy for acute bacterial sinusitis in children with severe onset or worsening course, of high grade fever, purulent nasal discharge.

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Acute Otitis Media *Streptococcus pneumonia* *Haemophilus influenza* *Moraxella catarrhalis*	If no antibiotic in prior month: Amoxicillin 90mg/kg/day in 2-3 divided doses Duration: <2 yrs old: 10days ≥2 yrs old: 5-7 days	Received antibiotics prior month: Amoxicillin/clavulanate 90mg/kg/day PO in 2 divided doses **OR** Cefuroxime 15 mg/kg PO q12h **Penicillin Allergy:** Clarithromycin 7.5mg /kg PO q12h **OR** Azithromycin 10mg/kg PO on day 1, followed by 5mg/kg PO q24h on day 2 to day 5	
Acute Diffuse Otitis Externa *P. aeruginosa and Staph. aureus*	Ofloxacin 0.3% otic solution instil 5 drops into affected ear(s) once daily for 7 days		Aural toileting required in discharging ears 1-12 years > 12 years refer to adult dose

References:

1. *Wald ER, Applegate KE, Bordley C, et al. Clinical practice guideline for the diagnosis and management of acute bacterial sinusitis in children aged 1 to 18 years. Pediatrics 2013; 132:e262.*
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. *Bradley JS, Jackson MA, Committee on Infectious Diseases, American Academy of Pediatrics. The use of systemic and topical fluoroquinolones. Pediatrics 2011; 128:e1034.*
4. *Lieberthal AS, Carroll AE, Chonmaitree T, et al. The diagnosis and management of acute otitis media. Pediatrics 2013; 131:e964.*
5. *Altamimi S, Khalil A, Khalaiwi KA, et al. Short-term late-generation antibiotics versus longer term penicillin for acute streptococcal pharyngitis in children. Cochrane Database Syst Rev 2012; 8:CD004872.*
6. *Wroe PC, Lee GM, Finkelstein JA, et al. Pneumococcal carriage and antibiotic resistance in young children before 13-valent conjugate vaccine. Pediatr Infect Dis J 2012; 31:249.*

RESPIRATORY INFECTIONS

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Community Acquired Pneumonia Outpatient	Amoxicillin 45-75mg/kg/24h PO q8h for 5-7 days	Erythromycin Azithromycin Clarithromycin	Macrolide antibiotics should be used if either mycoplasma or chlamydia pneumonia is suspected. It may be added at any age if there is no response to first-line empirical therapy. Azithromycin 15mg/kg IV loading dose then 7.5mg/kg q24h if considering atypical organisms. Investigate for TB if clinically indicated
Inpatient	Benzylpenicillin 30-60mg/kg IV q6h for 7 days		
Severe community acquired	Ceftriaxone 50mg/kg q12h **PLUS** Cloxacillin 50mg/kg IV q6h (if suspected *Staphylococcus aureus*)	Cefuroxime 50mg/kg IV q8h	

References:

1. *Empiric Antibiotic Guidelines- Sydney Childrens Hospital 2012*
2. *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*
3. *Paediatric Protocols For Malaysian Hospitals 3st Edition 2012 Ministry Of Health Malaysia*
4. *Drug Doses Frank Shann 15th edition.*

SKIN & SOFT TISSUE INFECTIONS

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Abscess *Staphylococcus aureus*	Cloxacillin 100-200mg/ kg/24h PO/IV q6h for 7-10 days		Incision & drainage if indicated. Send pus for culture. Parenteral route for severe infections. Consider CA-*MRSA* if poorly resolving , based on local epidemiology.
Animal bites *Pasteurella multocida, Staphy.* spp, *Streptococcus* spp , *Capnocytophaga,* anaerobes	Amoxicillin/clavulanate 25-30mg/kg PO oral Severe: Amoxicillin/clavulanate 50mg/kg IV (amoxicillin component) for 7 days	Ampicillin/sulbactam 50 mg/kg (ampicillin component) IV q6h for 7 days	Consider rabies prophylaxis according to local epidemiology
Cellulitis *Staphylococcus aureus* *Streptococcus pyogenes*	Cloxacillin 25-50mg/ kg IV or 15mg/kg PO q6h for 7-10 days	Amoxicillin 25-30mg/kg PO q8h for 7 days **OR** Cephalexin 12.5mg/kg PO q6h for 7 days	Parenteral route for extensive lesions

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Hansen's Disease (Leprosy) Paucibacillary	**10-14 years** Rifampicin 450mg PO monthly **PLUS** Dapsone 50mg PO q24h **<10 years** Rifampicin 10mg/kg PO monthly **PLUS** Dapsone 2mg/kg PO q24h		Duration: 6 months Surveillance: 5 years
Multibacillary	**10-14 years** Rifampicin 450mg PO monthly **PLUS** Dapsone 50mg PO q24h **PLUS** Clofazimine 150mg PO monthly and 50mg EOD **<10 years** Rifampicin 10mg/kg PO monthly **PLUS** Dapsone 2mg/kg PO q24h **PLUS** Clofazimine 6mg/kg PO monthly and 1mg/kg EOD		Duration: 1 year for BI < 4 and 2 years for BI ≥ 4 Surveillance: 15 years

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Impetigo *Staphylococcus aureus, Streptococcus pyogenes* Localised Generalised	Topical 2% fusidic acid q8-12h for 7 days (outpatient) Cloxacillin 50-100 mg/kg/24h PO q6h for 7 days	Penicillin V 15mg/kg PO q6h **OR** Trimethoprim(TMP)/sulfamethoxazole 4-5mg/kg PO q12h	
Necrotizing fasciitis *Group A Streptococcus* Polymicrobial: Gram +ve cocci, Anaerobes , Gram-ve rods	Benzylpenicillin 50,000 units/kg IV q4h **PLUS** Clindamycin 15-20 mg/kg IV q6-8h	Piperacillin/tazobactam 100 mg/kg/dose IV q6h **PLUS** Vancomycin 10-13 mg/kg/dose IV q8h	Aggressive surgical debridement; consider adding IVIG to bind toxin for streptococcal infection with toxic shock. Tissues should be gram stained and cultured. Refer IDSA 2014 guidelines
Scalded skin syndrome *Staphylococcus aureus*	Cloxacillin 150-200 mg/kg/24h IV in q6h then, step down to 50mg/kg/24h PO q6h for 7 days		

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Scabies *Sarcoptes scabeii*	Permethrin 5% lotion apply and leave for 12 hours (not for babies less than 2 months) - Usually single application - Second application , a week apart if new lesions appear		Pay special attention to hands, feet, web spaces and skin folds. Treat household members
Babies less than 2 month :	Sulphur 6% in calamine lotion q12h, apply from neck down and apply nightly for 3 days **OR** Crotamiton (Eurax) cream 10%, apply nightly for 2 nights		
For children 7-12 year old:	Benzyl benzoate emulsion (EBB) 12.5% apply from neck down and apply nightly for 3 days (>12 year old, use 25% emulsion) Gamma benzene hexachloride 0.5% (Lindane) apply and leave for 8 hours (not to be repeated in less than a week)		

References:

1. *Drug doses Frank Shann 15th edition*
2. *Antibiotic guideline Royal Children's Hospital http://www.rch.org.au/clinicalguide/*
3. *John Hopkins Antibiotic guideline 2013-2014*
4. *Empiric Antibiotic Guidelines 2012 - Sydney Children Hospital http://www.cdc.gov/parasites/scabies/health_professionals/meds.html Practice*
5. *Guidelines for the Diagnosis and Management of Skin and Soft Tissue Infections: 2014 Update by the Infectious Diseases Society of America Stevens DL ,Bisno AL, Chambers HF et al. DOI: 10.1093/cid/ciu296*
6. *Refer IDSA 2014 guidelines*
7. *Malaysian Clinical practice Guideline on Management of Leprosy 2014*

SURGICAL INFECTIONS

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
REFER TO ADULT GUIDELINE WITH DOSE ADJUSTMENT FOR CHILDREN			
Empyema thoracis (Lung empyema): *Staphylococcus aureus* *Streptococcus pneumonia* Empiric treatment: Need to cover organisms mentioned above. Other bacteria implicated: Streptococcus pyogenes, Haemophilus influenza, other gram negative organisms in immunocompromised individuals	All children with empyema need to receive high dose antibiotic therapy via intravenous route to ensure pleural penetration Pneumatocele on CXR indicate *Staph. aureus* BUT they can also been 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 i*s 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. In patients not responding to treatment need to rule out TB		
Staph aureus **(**methicillin sensitive): *Streptococcus pneumonia* (penicillin sensitive): *Streptococcus pneumonia* (penicillin resistant):	(empirical) Cefuroxime 50mg/kg/dose IV q8h OR Ceftriaxone 50mg/kg IV q12h **PLUS** Cloxacillin 50mg/kg/dose IV q6h (if *Staph aureus* suspected) Cloxacillin 50mg/kg/dose IV q6h Benzylpenicillin 200-400,000 MU/kg/day IV q4-6h Ceftriaxone 50mg/kg IV q12h (refer to MIC result)	Amoxicillin/clavulanate: 30mg/kg/dose q8h	

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Enterocolitis *Enterobacteriaceae , Enterococci, Bacteroides*	Ampicillin 50mg/kg/dose IV q8h **PLUS** Metronidazole 15mg/kg loading followed by 7.5mg/kg/dose IV q8h	Amoxicillin/clavulanate: 30mg/kg/dose IV q8h **OR** Cefotaxime 50mg/kg/dose q8h **PLUS** Metronidazole 15mg/kg loading followed by 7.5mg/kg/dose IV q8h	Antibiotics should be adjusted with results of C&S

References:

1. *American Academy of Pediatrics: Pickering LK, BakerCJ, Kimberlin DW, Long SS, eds.Red Book 2012 Report of the committee on Infectious Diseases.*
2. *Paediatric Empyema Thoracis recommendations for management-Position Statement from the Thoracic society of Australia and New Zealand 2010.*
3. *Manual of childhood infections-Blue Book 3rd edition; Oxford University Press.*
4. *Guideline for the management of community acquired pneumonia in children; update 2011.Thorax October 2011: vol 66 (supplement 2)*
5. *Approach and management of empyema thoracis in children: a consensus guideline from the paediatric empyema working group 2013-MOH.*

TROPICAL INFECTIONS

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Typhoid fever	Refer to Gastrointestinal infections Section		
Cholera	Refer to Gastrointestinal infections Section		
Scrub Typhus *Ricketsia tsutsugamushi*	For children > 8 yr: Doxycycline 2-4mg/kg/24h q12-24h for 5-7 days	Azithromycin 10mg /kg PO q24h for 5 days	Avoid using tetracycline or doxycycline for young children as they can cause staining of the teeth
Brucellosis *B. melitensis, B. abortus, B. suis and B. canis*	For children < 8 yr: Trimethoprim(TMP) / Sulfamethoxazole TMP 8-10mg /kg/24h PO q12h for 6 weeks **PLUS** Streptomycin 30 mg/kg (max 1gm) IM q24h **OR** Gentamicin 5mg/kg IV q24h for 3 weeks	Trimethoprim(TMP)/ sulfamethoxazole TMP 8-10mg/kg/24h PO q12h for6 weeks **PLUS** Rifampicin 15-20mg/kg PO q24h for 6 weeks	For children > 8 yr: Refer adult regime

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Leptospirosis *L. icterohaemorrhagiae* Moderate to severe disease	Benzylpenicillin 100,000 units/kg IV q6h (max 6-12 millions unit/day) for 7 days	Ceftriaxone 80-100mg/kg IV q24h (max 2gm/day) for 7 days **OR** Cefotaxime 150-200mg/kg/24h IV q6h-q8h (max 12gm/day) for 7 days	
Mild disease	Amoxicillin 25-50mg/kg PO q6h-q8h (max 500mg/dose) for 7 days	For children > 8 yr: Doxycycline 2mg/kg PO q12h (max 200mg/day) for 7 days	
Tetanus	Refer to Neonatal Infections Section		
Melioidosis *Burkholderia pseudomallei*			
Intensive/Induction therapy:	Ceftazidime 200mg/kg/24h IV q6h for 10-14 days	For children > 8 yr: Imipenem/cilastatin 75-100mg/kg/24h IV q6-8h **OR** Meropenem 75mg/kg/24h IV q8h	Parenteral treatment should be used for at least 10-14 days or until clear improvement is noted
Maintenance therapy:	Amoxicillin (60mg/kg/24h)/ clavulanate PO q8h **OR** Trimethoprim(TMP)/sulfamethoxazole TMP 8mg/kg PO q12h		Folic Acid 5mg PO q24h to be given for patient on trimethoprim/ sulfamethoxazole Duration: 12-20 weeks

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Malaria			
Plasmodium falciparum	Artesunate /mefloquine available as FDC tablet: 25/55mg and 100/220mg Artesunate /mefloquine may cause seizure in children with epilepsy Lumefantrine absorption is enhanced by co-administration with fat containing food or milk Primaquine 0.75mg base/kg to be given on Day 1 as a single dose in addition to ACT (check G6PD status before use). Parenteral artesunate should be given for a minimum of 24h or until patient is able to tolerate orally and thereafter to complete treatment with a complete course of oral ACT (ASMQ or Riamet). Change to Quinine PO if able to tolerate orally. (Maximum quinine per dose = 600mg.) Reduce quinine IV dose by one third of total dose if unable to change to quinine PO after 48hours or in renal failure or liver impairment		
a)Uncomplicated	Artesunate /mefloquine 5 - 8kg, 6 -11 mths : 25/55mg PO q24h 9 - 17kg, 1-6 yr : 50/110mg PO q24h 18 - 29kg, 7-12 yr : 100/220mg PO q24h ≥30kg, >13 yr : 200/440mg PO q24h for 3 days	Riamet® (1 tablet: Artemether/ lumefantrine 20/120mg) The patient should receive an initial dose, followed by 2nd dose 8 hours later, then 1 dose q12h for the following 2 days 5- <15kg : 1 tab per dose 15 - <25kg: 2 tab per dose 25 - <35kg: 3 tab per dose ≥35kg : 4 tab per dose	
b) Treatment failure	An alternative ACT regimen to be used. (eg: If Riamet® is used as the first line regimen, so the choice will be artesunate /mefloquine and vice versa)		

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
c) Complicated - Almost always due to *P. falciparum* - Always suspect mixed infections if *vivax / knowlesi* malaria appear more severe than usual	D1: Artesunate 2.4 mg/kg IV on admission, then repeat again at 12h D2-7: Artesunate 2.4 mg/kg IV q24h or switch to oral ACT	Artesunate 4mg/kg PO q24h **PLUS** Clindamycin 10mg/kg PO q12h for 7 days **OR** Quinine 10mg salt/kg PO q8h **PLUS** Clindamycin 10mg/kg PO q12h for 7 days D1: Quinine loading dose 7mg/kg IV over 1 hour, followed by 10mg/kg in 250ml D5% over 4 hours **OR** D1: Quinine loading dose 20mg/kg IV in 250ml D5% over 4 hours Then, D2-7: Quinine 10mg/kg IV q8h on day 2 -7 **PLUS** For children >8yr: Doxycycline 3.5mg/kg PO q24h for 7 days **OR** For children <8yr: Clindamycin 10mg/kg PO q12h for 7 days	

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Plasmodium vivax New infection	Total Chloroquine 25mg base/kg divided over 3 days, as below: D1: 10mg base/kg PO stat then 5mg base/kg 6 hours later D2: 5mg base/kg PO q24h D3: 5mg base/kg PO q24h **PLUS** Primaquine 0.5mg base/kg PO q24h for 14 days		Check G6PD status before giving Primaquine. G6PD deficiency: Primaquine 0.75mg base/kg q7d for 8 weeks If severe *P.vivax*, treatment is as complicated *P.falciparum*
Chloroquine resistant or relapse	Riamet® (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	
Plasmodium malariae/ knowlesi	Chloroquine PO (dosing as per *P. vivax*)		If severe *P.vivax*, treatment is as complicated *P.falciparum*
Mixed Infection	Treat as *P.falciparum*		

References:

1. *Panaphut T. Ceftriaxone compared with sodium penicillin G for treatment of severe leptospirosis. Clin Infect Dis 2003; 36:1507-13*
2. *Suputtamongkol Y. An Open, Randomized, Controlled Trial of Penicillin, Doxycycline, and Cefotaxime for Patients with Severe Leptospirosis. Clin Infect Dis 2004; 39:1417-24*
3. *White NJ. Melioidosis. Lancet 2003; 361:1715-22*
4. *Silpapojakul K. Paediatric scub typhus in Thailand: a study of 73 confirmed cases. Trans R Soc Trop Med & Hygiene 2004;98:354-9*
5. *Guidelines for the Diagnosis, Management, Prevention and Control of Leptospirosis in Malaysia, MOH 2011.*
6. *Cheng AC, Chierakul W, Chaowagul W, et al. Consensus guidelines for dosing of amoxicillin-clavulanate in melioidosis. Consensus guidelines for dosing of amoxicillin-clavulanate in melioidosis. Am J Trop Med Hyg. 2008;78(2):208*
7. *Phimda K et al. Doxycycline versus azithromycin for treatment of leptospirosis and scrub typhus. Antimicrob Agents Chemother. 2007;51(9):3259*

URINARY TRACT INFECTIONS

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Acute cystitis *E. coli* *Proteus* spp	Cefuroxime 30 mg/kg IV q12h (max 1gm/day) PO for 5-7 days	Nitrofurantoin 6mg/kg/day PO q6h (max 100mg) for 5-7days	Amoxicillin/clavulanate and trimethoprim are alternative for acute cystitis Note: single dose of antibiotic therapy not recommended. Empirical antibiotic choices guided by local organism resistant pattern
Acute pyelonephritis *E. coli* *Proteus* spp	Cefotaxime 50 mg/kg IV q8h **OR** Ceftriaxone 50-75 mg/kg q24h	Cefuroxime 50 mg/kg IV q8h **OR** Gentamicin 5mg/kg IV q24h	Culture should be repeated within 48hours. Antibiotic may need to be changed according to sensitivity Suggest to continue intravenous antibiotic until child is afebrile for 3-4 days and then switch to appropriate oral therapy after culture results *e.g.* cefuroxime, for total of 10-14 days if susceptible
Prophylaxis for UTI For infants and children with recurrent UTI	Trimethoprim 1-2mg/kg PO nocte	Nitrofurantoin 1-2mg/kg PO nocte (long term use may associated with chronic pulmonary or hepatic reaction)	Antibiotic prophylaxis should not be routinely recommended in children with first-time UTI (refer paediatric protocols 3rd edition) MCUG prophylactic antibiotics: • 3 days oral antibiotics with MCUG taking place on the 2nd day (uncomplicated) • Gentamicin IV just before procedure

References:
1. *The Cochrane Database of Systematic Reviews*
2. *NICE Guidelines: Urinary tract infection: diagnosis, treatment and long term management of urinary tract infection in children 2007*
3. *UTI Clinical Practise Guideline, Paediatrics 2011*
4. *Frank Shann (2014) Drug doses, Intensive Care Unit Royal Children's Hospital, Australia 16th Edition.*

VASCULAR INFECTIONS

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Catheter Related Blood Stream Infection *S. epidermidis(CoNS)* *S. aureus*	<u>For infant and children:</u> Vancomycin 10-15 mg/kg/day IV q6h		Indication of catheter removal are similar to adult but benefit of catheter removal must be weight against the difficulties of obtaining alternate venous access. Treatment without catheter removal should be closely monitored clinically with additional blood culture; removed catheter if there is persistent or recurrent infection Antibiotic lock therapy should be used for catheter salvage in combination with conventional antibiotic therapy for 10-14 days. *S.aureus* may require longer course up to 4-6 weeks 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. Fungaemia: treatment without catheter removal associated with low success rate and higher mortality
MSSA	Cloxacillin IV 200 mg/kg/day q6h		
Candida albicans or Other *Candida* species	Fluconazole 6-12 mg/kg IV q24h	For children 3 months-17 years: Caspofungin loading dose 70 mg/m³/day IV on day 1 followed by 50 mg/ m³/day thereafter (max 70mg)	
Gram –ve bacilli (*E.coli*, *Enterobacter, Klebsiella, Pseudomonas, Acinetobacter*)			
ESBL –ve	Ceftriaxone/cefotaxime/ceftazidime **PLUS/MINUS** Aminoglycoside		
ESBL +ve	Imipenem/cilastatin 25mg/kg IV q6-8h **OR** Meropenem 20-40mg/kg IV q8h		

Infection/Condition	Suggested Treatment		Comments
	Preferred	Alternative	
Suppurative thrombophlebitis			
S. aureus *MSSA*	Cloxacillin 100-200mg/kg/day IV q6h		Diagnosis require positive blood culture plus radiographic demonstration of thrombus.
MRSA	Vancomycin 10-15 mg/kg/day IV q6h		Removed catheter and minimum of 3-4 weeks of antibiotics. Surgical resection of involved vein if failed conservative therapy

References:

1. *IDSA Guidelines for Intravascular Catheter-Related Infection • CID 2009;49:1-45*
2. *Patricia MF. Diagnosis and Management of Central-Venous Catheter-Related Bloodstream Infections in Pediatric Patients. Paediatric Infect Dis J. 2009;28(11):1016-1017*
3. *Michael JS, Catheter Related Bloodstream Infection In Children. Am J Infect Control 2008;36:S173.e1-S173.e3.*

APPENDICES

Appendix 1 : 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 (ml/min)= $\frac{(140\text{-Age}) \times \text{BW (kg)}}{\text{Serum creatinine (micromol/l)}}$ x (1.04 for female) or (1.23 for males)

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

ANTIBACTERIAL	DOSE FOR NORMAL RENAL FUNCTION	ADJUSTMENT FOR RENAL FAILURE Estimated creatinine clearance (CrCl), ml/min			SUPPLEMENT FOR DIALYSIS	COMMENTS
		> 50	10-50	< 10		
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

ANTIMICROBIAL	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		

ANTIMICROBIAL	DOSE FOR NORMAL RENAL FUNCTION	ADJUSTMENT FOR RENAL FAILURE Estimated creatinine clearance (CrCl), ml/min			SUPPLEMENT FOR DIALYSIS	COMMENTS
		> 50	10-50	< 10		
Fluoroquinolone						
Ciprofloxacin	500-750mg PO (or 400mg IV) q12h	100%	50-75%	50%	250mg PO or 200mg IV q12h	
Levofloxacin	250mg-750mg q24h	100%	250-750mg q24-48h	250-500mg q48h	Dose for CrCl <10	
Ofloxacin	200-400mg q12h	100%	100% q24h	50% q24h	100-200mg AD	
Macrolide						
Clarithromycin	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*					
Nitrofurantoin	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	

ANTIMICROBIAL	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 q6h	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 <50 ml/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 (conventional)	0.5mg-1mg/kg q24h	100%	100%	100% q24h-q36h	No adjustment 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 q12h	CrCl 25-39: 450mg q24h CrCl 10-24: 450mg q48h	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 2: Penicillin Allergy

Severe allergy	Non- severe allergy
Anaphylaxis Angioedema Urticarial rash Wheezing/ stridor Stevens-Johnson syndrome Drug Rash with Eosinophilia and systemic Symptoms (DRESS) Toxic Epidermal Necrolysis (TEN)	Maculopapular/ morbilliform rash Serum sickness • Fever • Rash • Arthralgia • Glomerulonephritis

Considered Safe	Caution	Contraindicated
	Avoid in severe allergy	Avoid in all penicillin allergy
Amikacin Azithromycin Chloramphenicol Ciprofloxacin Clarithromycin Clindamycin Colistin Co-trimoxazole Doxycycline Erythromycin Fosfomycin Gentamycin Levofloxacin Linezolid Metronidazole Nitrofurantoin Norfloxacin Ofloxacin Rifampicin Teicoplanin Tetracycline Tigecycline Trimethoprim Vancomycin	Cefalexin Cefixime Cefotaxime Ceftazidime Ceftriaxone Cefuroxime Ertapenem Imipenem/cilastatin Meropenem Aztreonam	Amoxicillin Ampicillin Amoxicillin/clavulanate Ampicillin/sulbactam Cloxacillin Flucloxacillin Penicillin G Penicillin V Piperacillin/tazobactam Ticarcillin/ tazobactam

Appendix 3 : Guide to Antimicrobial Intravenous To Oral Conversion

Patients with infection who are treated by an initial course of intravenous antibiotics are candidates for conversion to oral antibiotic therapy.

RATIONALE:

1. Oral therapy can be as effective as parenterally administered anti-infectives in the treatment of infections
2. Reduce adverse effects due to parenteral therapy such as line infections and phlebitis
3. Oral antimicrobials are easier to administer than IV antimicrobial
4. Oral antimicrobial are always cheaper than IV therapy

TYPES OF CONVERSION

SEQUENTIAL

Act of replacing a parenteral version of a medication with its oral counterpart

Eg. IV azithromycin 500mg OD to PO azithromycin 500mg OD

SWITCH THERAPY

Conversion from IV medication to the PO equivalent that may be within the same class and have the level of potency, but is a different compound

STEP-DOWN

Conversion from injectable medication to an oral agent in another class or to a different medication within the same class where the frequency, dose and the spectrum of activity may not be exactly the same

Eg. Ceftriaxone 1gm IV q12h to Amoxicillin/clavulanate 625mg PO q8h-12h

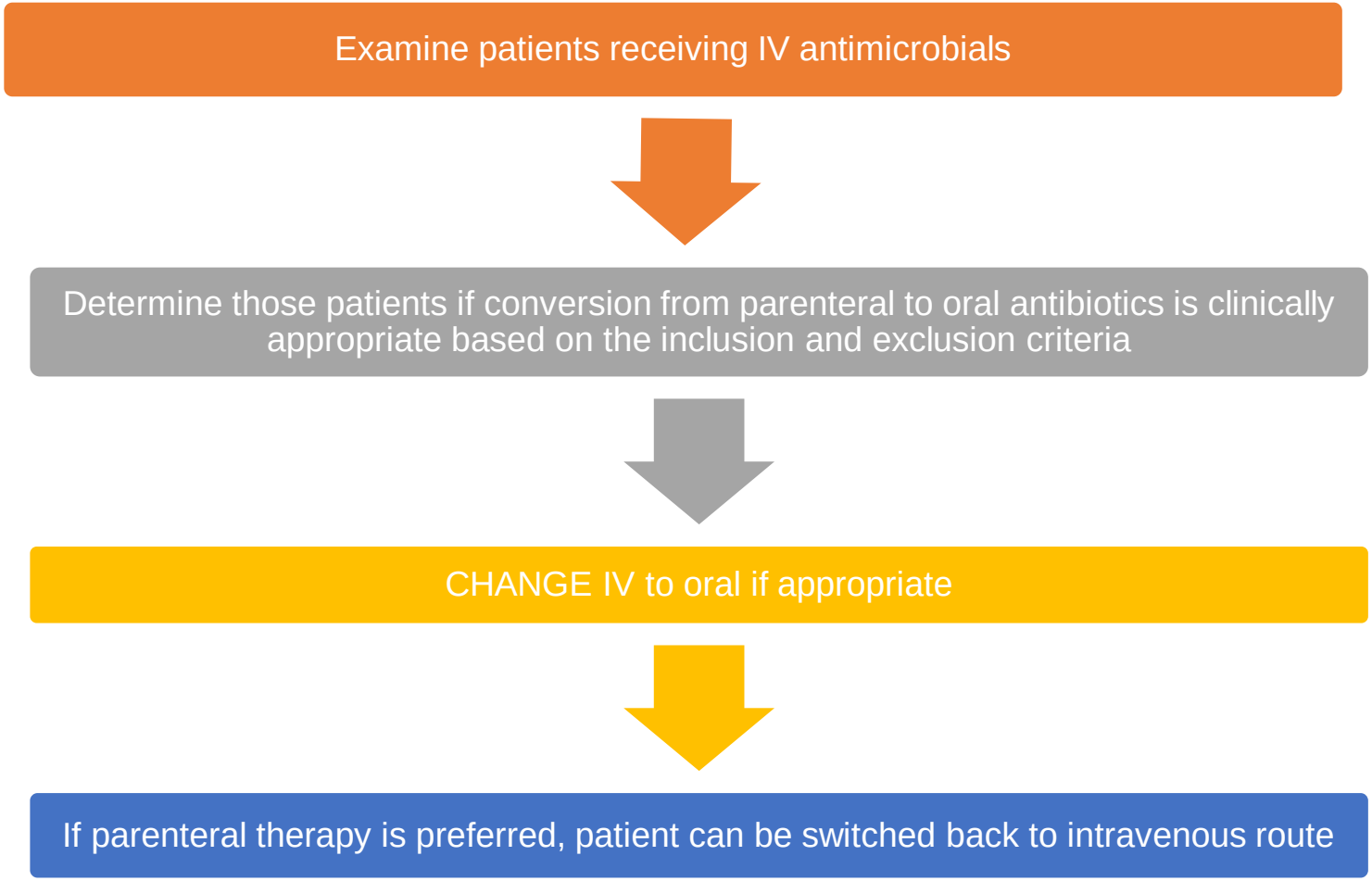
INCLUSION CRITERIA

- Clinical improvement is observed
- Able to swallow and tolerate oral fluids
- Afebrile (Temperature >36°C or < 38°C)
- Heart rate < 90 bpm for the last 12 hours
- Normalization of white cell count and inflammatory markers (eg. CRP, ESR)
- Non neutropenic sepsis

EXCLUSION CRITERIA

- Deep seated infection that may require an initial 2 weeks of IV therapy for example, liver abscesses, osteomyelitis, septic arthritis, empyema, cavitating pneumonia, melioidosis
- High risk infections requiring prolonged therapy, for example, Staphylococcus bacteraemia, severe necrotising soft tissue infections, severe infections during chemotherapy related neutropenia, infected implants/prosthesis, meningitis/encephalitis, intracranial abscesses, mediastinitis, endocarditis, inadequate drained abscesses/empyema
- Persistent nausea and vomiting, diarrhoea
- Patient with the following GI conditions:
    - Ileus or suspected ileus with no active bowel sound
    - Patient is known to have malabsorption syndrome
    - Proximal resection of small intestines
    - High nasogastric tube output or requiring continuous GI suction (>500mL/day)
    - Active GI bleed
- Neutropenic patient

Procedure:


Examine patients receiving IV antimicrobials
Determine those patients if conversion from parenteral to oral antibiotics is clinically appropriate based on the inclusion and exclusion criteria
CHANGE IV to oral if appropriate
If parenteral therapy is preferred, patient can be switched back to intravenous route

EXAMPLES OF CONVERSION REGIMENS	IV DOSAGE	ORAL EQUIVALENT
Amoxicillin/ clavulanate	1.2g IV every 8 hours	625mg PO every 8 hours OR 375 – 750mg every 12 hours
Ampicillin/ sulbactam	1.5g IV every 8 hours	
Azithromycin	250mg IV daily	250mg PO daily
	500mg IV daily	500mg PO daily
Benzylpenicillin	1.2g IV every 6 hours	Phenoxymethylpenicillin (Pen V) 500mg PO every 6 hours
Cefazolin	1g IV every 8 hours	Cephalexin 500mg PO every 6 hours/ Cloxacillin 500mg every 6 hours
Ceftriaxone	Choice of oral antibiotic depends on infection site/microbiology	
Cefuroxime	750mg every 8 hours	Cefuroxime axetil 500mg PO every 12 hours OR Amoxicillin/clavulanate 625mg PO every 8 hours OR Ampicillin/sulbactam 375 – 750mg every 12 hours
	1.5g every 8 hours	Amoxicillin/clavulanate 625mg PO every 8 hours OR Ampicillin/sulbactam 375 – 750mg every 12 hours
Clindamycin	600mg IV every 8 hours	300mg PO every 6 hours OR 600mg PO every 8 hours
Cloxacillin	1g IV every 6 hours	500mg every 6 hours
Fluconazole	100mg IV daily	100mg PO daily
	200mg IV daily	200mg PO daily
	400mg IV daily	400mg PO daily
Levofloxacin	500mg IV daily	500mg PO daily
Linezolid	600mg IV every 12 hours	600mg PO every 12 hours
Metronidazole	500mg IV every 8 hours	400mg PO every 8 hours
Moxifloxacin	400mg IV daily	400mg PO daily
Piperacillin/ tazobactam	Choice of oral antibiotic depends on infection site/microbiology	
Trimethoprim/ sulfamethoxazole	5 – 15mg of TMP/kg/day in 2 – 4 divided doses	5 – 15mg of TMP/kg/day in 2 – 4 divided doses

Appendix 4 : Antimicrobial Formulary Restriction HPP

1. **Restricted:** Requires prior authorization from Infectious Diseases Physician / Paediatrician /Certain Approved Unit/Department before use.
2. **Conditional:** Can be prescribed initially but all prescriptions will be reviewed at 72 hours by the Antimicrobial Stewardship Team with feedback except those with *.
3. **Controlled/General**: Can be prescribed but will be subject to audit and review from time to time and if usage is high.
4. *Review by AMS team when necessary.
5. Pharmacy will not be issuing the medication if Antimicrobial Order Form (HPP/FAR/BR-03) is not filled completely and signed according to the formulary.
6. Verbal order by designated consultant (conditional category)/specialist (controlled category) is accepted for cases after office hours, weekend and Public Holidays. The MO on call should sign on behalf in the antimicrobial order form first. The incomplete antimicrobial order form has to be signed by the ordering consultant/ specialist on the next working day.

Resticted/Pre-Authorization (HOD/HOU/ Consultant)		Conditional (HOD/HOU/ Consultant)	Controlled (Specialist)	General use/Available List B (MO)
(ID) • All Oral Antiretrovirals • Ceftaroline 600mg Inj • Chloroquine phosphate 250mg (base 150mg) Tab • Daptomycin 500mg Inj • Diethylcarbamazine 100mg • Flucytosine 500 mg Tab • Foscarnet 6g Inj • Fosfomycin 3g Granules (Oral)	**(ID, Hemato-adult)** • Anidulafungin 100mg Inj • Caspofungin 70mg Inj, 50mg Inj • Itraconazole 10mg/mL Syrup • Linezolid 600mg Inj , 600mg Tab • Micafungin 50 mg Inj • Pentamidine 300mg Inj	**(ALL Departments)** • Cefepime* 1g Inj • Cefoperazone/sulbactam 1g Inj* • Ciprofloxacin 200 mg Inj* • Ertapenem 1 g Inj • Fucidic acid 250mg Tab* • Imipenem/cilastatin 500mg Inj • Meropenem 1g Inj • Piperacillin/tazobactam 4.5g Inj* • Vancomycin 500mg Inj	**(ALL Departments)** • Acyclovir 250mg Inj, 200mg Tab, 800mg Tab. • Amikacin 250mg Inj, 500mg Inj • Amoxicillin/clavulanate 1.2g Inj, 625mg Tab, 228mg/5mL Syrup • Ampicillin/sulbactam 1.5g Inj, 375mg Tab, 250mg/5mL Syrup • Amphotericin B (conventional) 50mg Inj	**(ALL Departments)** • Albendazole 200mg Tab, 200mg/5mL Syrup • Amoxicillin 250mg Cap, 125mg/5mL Syrup • Ampicillin 500mg Inj, 125mg/5mL Syrup • Benzathine penicillin G 2.4 Mega Inj • Benzylpenicillin 1 MU Inj, 5MU Inj • Cephalexin 125mg/5mL Syrup, 250mg Cap • Cloxacillin 500mg Inj, 125mg/5mL Syrup, 250mg Cap

• Lipid Complex Amphotericin B 50mg Inj • Polymyxin B 500,000IU Inj • Polymyxin E 80mg Inj • Primaquine 7.5mg base Tab • Quinine 600mg Inj, 300mg Tab • Tigecycline 50mg Inj **(ID, Respi-adult)** • Levofloxacin 500mg Inj, 500mg Tab • Moxifloxacin 400mg Inj, 400mg Tab • Streptomycin 1gm Inj **(ID, Respi-adult, Dermato)** • Ofloxacin 100mg Tab **(ID, Gynae)** • Zidovudine 200mg Inj	• Voriconazole 50mg Tab, 200mg Tab , 200mg Inj **(ID, Hemato-adult, Nephro-adult)** • Ganciclovir 500mg Inj **(Hemato-adult only)** • Posaconazole 40mg/mL Syrup • Valgancyclovir 450 mg Tab **(Respi-adult only)** • Cycloserine 250mg Cap • Ethionamide 250mg Tab • Kanamycin 1gm Inj **(Gastro-adult only)** • Adefovir 10mg Tab • Entecavir 0.5mg Tab • Lamivudine 100mg Tab • Ribavirin 200mg Cap • Tenofovir 300mg Tab **(Dermato-Adult only)** • Ceftriaxone 250mg Inj		• Arthemether 20mg+lumefantrine 120mg Tab • Artesunate 60mg Inj • Azithromycin 500mg Inj, 250mg Tab, 200mg/5mL • Cefazolin 1 g Inj • Cefoperazone 1g Inj • Cefotaxime 1g Inj • Ceftazidime 1g Inj, 2g Inj • Ceftriaxone 1g Inj • Cefuroxime 1.5 g Inj, 750mg Inj, 125mg Tab, 125mg/5mL Syrup • Ciprofloxacin 250 mg Tab • Clarithromycin 250mg Tab, 125mg/5mL Syrup • Clindamycin 300mg Inj, 300mg cap • Erythromycin 500mg Inj • Fluconazole 100mg Inj, 100mg Cap • Gentamicin 80mg Inj • Itraconazole 100mg Cap • Ketoconazole 200mg Tab • Metronidazole 500mg Inj • Netilmicin 150mg Inj • Oseltamivir 75mg Cap • Sulphamethoxazole 400mg+ trimethoprim 80mg Inj • Terbinafine 250mg Tab	• Doxycycline 100mg Cap • Erythromycin 400mg/5mL, 400mg Tab • Griseofulvin 250mg Tab • Metronidazole 200mg Tab • Nitrofurantoin 100mg Tab • Phenoxymethylpenicillin 125mg tab, 125mg/5mL Syrup • Sulphamethoxazole 200mg+ trimethoprim 40mg/5mL Syrup • Sulphamethoxazole 400mg+ trimethoprim 80mg Tab • Tetracycline 250mg Cap **(ID, Respi-adult)** • Ethambutol 400mg Tab • Isoniazid 100mg Tab • Pyrazinamide 500mg Tab • Rifampicin 150mg, 300mg Cap • Akurit 2 (HR) • Akurit 4 (EHRZ) **(Dermatology)** • Rifampicin 150mg, 300mg Cap

Appendix 5: qSOFA score

qSOFA Criteria	Points
Respiratory rate ≥ 22/min	1
Change in mental status	1
Systolic blood pressure ≤100mmHg	1

2 or more criteria suggests a greater risk of a poor outcome.

~END~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