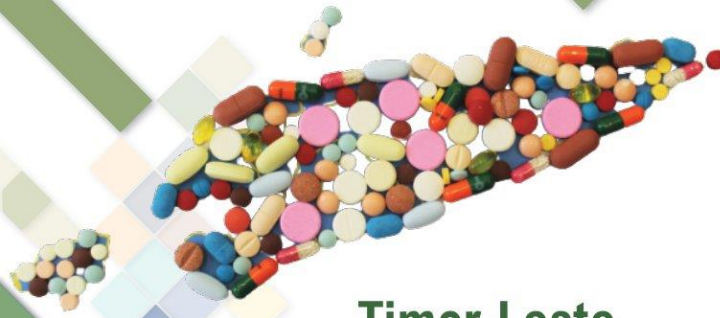


Timor-Leste Antimicrobial Guidelines

Timor-Leste, 2022

Timor-Leste Antimicrobial Guidelines 2022

Guidelines for implementation in Timor-Leste

República Democrática de Timor-Leste
Ministério da Saúde

Support from:

World Health Organization
Country Office for Timor-Leste

Menzies School of Health Research and
Fleming Fund Country Grant to Timor-Leste

Government of United Kingdom

This project is funded by the Department of Health and Social Care's Fleming Fund using UK aid. The views expressed in this publication are those of the authors and not necessarily those of the UK Department of Health and Social Care or its Management Agent, Mott Macdonald.

The Department of Health and Social Care's Fleming Fund is a UK aid programme supporting up to 25 countries across Africa and Asia to tackle antimicrobial resistance (AMR), a leading contributor to deaths from infectious diseases worldwide.

The Fleming Fund invests in strengthening surveillance systems through a portfolio of country grants, regional grants and fellowships managed by Mott MacDonald, and global projects managed by DHSC.

Acknowledgement

This second edition of Timor-Leste Empirical Antimicrobial Guideline, as a guide for all healthcare professional in Timor-Leste. Ministry of Health gratefully acknowledges the invaluable contribution of this edition of the following that have shown an extreme sense of commitment and contributing during the process.

» HNGV Antimicrobial Stewardship Sub-Committee writing group:
1. dr. Helio S.F. Guterres, SpPD (Internal medicine specialist) as a Chairman
2. Ágata do Espírito S. Soares, Senior Pharmacist as a Secretary
3. dr. Celia A. G. do Santos, MMed (Internal medicine specialist)
4. dr. Mateus Pinheiro, MMed (Internal medicine specialist)
5. dr. Andrade Monteiro, SpJP (k), FIHA (Cardiologist-Intervensionist)
6. dr. Brigidio de Deus, SpS (Neurologist)
7. dr. Raimundo dos Santos, MMed (Surgical specialist)
8. dr. Milena do Santos Lay, Paediatric specialist
9. dr. Agueida Li, SpOG (Gynaecologist and Obstetric specialist)
10. dr. Dulce Madalena C. Alberto, SpDV (Dermato-venerolologist)
11. dr. Saturnino Saldanha, Orthopaedist (k)
12. dr. Lurdes Leão, SpA (Paediatrics specialist)
13. dr. Jeronimo Baptista, Intensivist
14. dr. Leonita Jeronimo, Otorinolaringologist
15. drg. Luis da Silva, SpOrt (Orthodontist specialist)
16. dr. Ercia Sequeira, Pulmonologist
17. dr. Bernadete Maria Pereira, Ophthalmologist

» Menzies School of Research team have been reviewed all the document and translated to tetum:
1. dr. Joshua Francis; Associate Professor, Paediatric and Infectious Diseases Specialist and Timor-Leste project lead.
2. dr. Jennifer Yan; Paediatric Infectious Diseases Specialist and Timor-Leste project co-lead.
3. dr. Rodney Givney; Infectious Diseases doctor mentor
4. dr. Alice Coe; Infectious Diseases doctor mentor
5. dr. Michelle Mahony; Infectious Diseases doctor mentor
6. dr. Sze-Yen Tay, Infectious Diseases doctor mentor

7. dr. Elfiana Amaral; Infectious Diseases and Microbiology Liaison Doctor
8. dr. Lucia Toto; Infectious Diseases and Microbiology Liaison Doctor
9. Guilherme Ximenes Soares; AQUM Pharmacist
10. Virginia de Lourdes da Conceição; Senior Microbiology Scientist

The translation was supported by:

11. Antonio Fernandes; Human Resources officer
12. Apolonia Pereira; Translator and HR Assistant
13. Luisa Roade Tato; Infectious Diseases doctor mentor
14. Adriano Vieira; Project coordinator

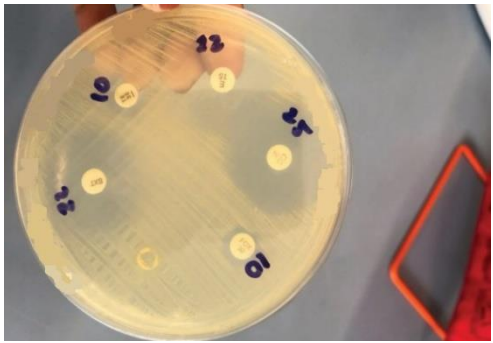
» dr. Alito Soares M.Med Surgery; Executive Director of HNGV, dr. Marcelino Correia M.Med Ophthalmologist; Clinical Director, and dr. Mingota da Costa Herculano M.Med Anesthesia; Diagnostic and Therapeutic Director.

» WHO representative Timor-Leste : Dr. Arvind Mathur

» Technical officer Epidemiologist: Dr. Dongbao and Team

» Endang Soares da Silva, BAppSc.Med.Sc.,MLabMed; Executive Director of LNS- TL and Carolina da Costa Maia; Senior Microbiology Scientist.

» National Director for Pharmaceutical and Medicine team: Delfim da Costa Xavier Ferreira; NDPM Director and Suzana Henriques Soares; Pharmacist, AMR Focal point.



Disc diffusion antibiotic testing (Disc AST)

Preface

I am delightful to present second edition of Timor-Leste Empirical Antimicrobial Guideline, as a guide for all healthcare professional in Timor-Leste.

Antimicrobial resistance is an emerging global issue. Antimicrobial resistance is an inevitable evolutionary process, two factors have accelerated the development of untreatable infections. Firstly, the pharmaceutical industry had lost interest in antimicrobial development, primarily for financial reasons, and so there are fewer new classes of antimicrobials in the pipeline as a consequence. The second, is the overuse and abuse of antimicrobials by the medical profession, the public, and the agricultural industry.

Having an empirical guideline of antimicrobial is an essential step to be taken to reduce antimicrobial resistance. An important strategy in combatting the development and spread of antimicrobial resistance is optimization of prescribing of antimicrobials in all clinical settings, ensuring antimicrobials are prescribed and utilized according to principles of evidence base medicine.

Timor-Leste ever had an Antibiotic Guideline for Hospital Nacional Guido Valadares on 2016 as the first edition. After a hard work of steering committee now we have antimicrobial guideline of 2022 which is can be used in all hospital setting in Timor-Leste.

I am hopeful this guideline will be used among healthcare professional with responsible and this empirical guideline guide us all to aware about the importance of microbiology testing in helping us to give a definitive therapy for our patient.

This guideline is developed in collaboration between Hospital Nacional Guido Valadares and Menzies school of research, Australia and supported by World Health Organization in Timor-Leste. I would like to thank all local clinicians in HNGV, international expert from Menzies and WHO for making this second edition of antimicrobial guideline available for the whole country Timor-Leste.

dr. **Odete Maria Freitas Belo,** MPH
Minister of Health, RDTL.

Non-Lactose Fermenter colony growth on MacConkey agar

Abbreviation List

AFB acid-fast bacillus
ARF acute rheumatic fever
ART antiretroviral therapy
BID two times a day
BV bacterial vaginosis
CAP community acquired pneumonia
CBC complete blood count
CGA corrected gestational age
CNS central nervous system
COPD chronic obstructive pulmonary disease
CPAP continuous positive airway pressure
CSF cerebrospinal fluid
CT computed tomography
CXR chest X ray
DAIR debridement, antibiotics, irrigation, and retention of the prosthesis
DCR dacryocystorhinostomy
DTP diphtheria, tetanus, and pertussis
ENT ears, nose and throat
ESBL extended spectrum β-lactamase
ESR erythrocyte sedimentation rate
GBS group B streptococcus
GIT gastrointestinal tract
GUT genitourinary tract
HAP Hospital acquired pneumonia
HBIG hepatitis B immunoglobulin
HBV hepatitis B virus
HBeAg hepatitis B e antigen
HBsAg hepatitis B surface antigen
HCV hepatitis C virus
HIV human immunodeficiency virus
HIB haemophilus influenzae type B
HNGV National Hospital Guido Valadares
HPV Human Papillomavirus
HSV herpes simplex virus
ICP intracranial pressure

ICU intensive care unit
IM intramuscular
IV intravenous
IRIS immune reconstitution inflammatory syndrome
IU international unit
KOH potassium hydroxide
LGV Lymphogranuloma venereum
LPA line probe assay
MIC minimum inhibitory concentration
MAC *Mycobacterium Avium Complex*
MAP mean arterial pressure
MDR multi-drug resistant
MODS multi-organ dysfunction
MR measles-rubella vaccine
MRI magnetic resonance imaging
MRSA methicillin-resistant *Staphylococcus aureus*
MSSA methicillin-susceptible *Staphylococcus aureus*
MTB mycobacterium tuberculosis
OD once a day
OPV oral polio vaccine
PCR polymerase chain reaction
PID pelvic inflammatory disease
PJI prosthetic joint infection
PJP *pneumocystis jirovecii* pneumonia
PO orally
PROM premature rupture of membranes
QID four times a day
RHD rheumatic heart disease
RSV Respiratory Syncytial Virus
SAM severe acute malnutrition
SBP spontaneous bacterial peritonitis
STI sexual transmitted infection
TDF tenofovir disoproxil fumarate
TB tuberculosis
TID three times a day
VZV varizela zoster virus
WHO World Health Organization

Contents

Treatment for infections in children are included throughout the guideline. See relevant sections.

- Well baby with obstetric risk factors for infection
- Neonatal sepsis, early and late onset.
- Neonatal sepsis with possible Staphylococcus aureus infection
- Neonatal Meningitis
- Necrotising Enterocolitis
- Skin pustules (without systemic symptoms) in neonate
- Neonatal Malaria
- Neonatal Gonorrhoea prophylaxis
- Neonatal Chlamydia prophylaxis
- Neonatal Conjunctivitis or Gonococcal Ophthalmia Neonatorum
- Neonatal oral candidiasis (thrush)
- Neonatal Syphilis prophylaxis / treatment
- Neonatal HIV Prophylaxis
- Neonatal TB Prophylaxis
- Neonatal Herpes Simplex Virus Prophylaxis / Treatment
- Neonatal Varicella Zoster Virus Prophylaxis / Treatment
- Hepatitis B in Neonates
- Childhood Malnutrition
- Pertussis in Children
- Paediatric TB

See Chapter 6: ENT / Respiratory Tract Infections for Community acquired pneumonia, Lung abscess and Empyema in children

- Sepsis without focus
- Septic Shock
- Gram-negative bacteraemia

- Staphylococcus aureus bacteraemia
- Candidaemia

page 166 - 193

Chapter 13: **Skin and Soft Tissue Infections**

- Impetigo
- Folliculitis, Boils, Carbuncles, and Skin Abscesses
- Cellulitis
- Bite wounds
- Traumatic Wound Prophylaxis and Infection
- Surgical Site Infection
- Diabetic foot infection
- Necrotising Soft Tissue Infection (Necrotising fasciitis, myonecrosis, gas gangrene, Fournier's gangrene)
- Streptococcus pyogenes Necrotising Soft Tissue Infection
- Clostridium spp. Necrotising Soft Tissue Infection (Gas gangrene)
- MRSA Necrotising Soft Tissue Infection
- Burns
- Mastitis
- Herpes Simplex
- Eczema Herpeticum
- Herpes Zoster / Shingles
- Tinea
- Cutaneous Candidiasis
- Pityriasis versicolour
- Head lice (Pediculosis capitis)
- Body lice (Pediculosis corporis)
- Pubic lice (Pediculosis pubis)
- Scabies (non-crusted)
- Crusted Scabies / Norwegian Scabies
- Cutaneous Larva Migrans
- Yaws

- Bartholin's abscess
- Vulvovaginal candidiasis
- Bacterial vaginosis (BV)
- Gynaecological surgery (hysterectomy, gynaecological-oncology procedures, pelvic organ prolapse) prophylaxis
- Caesarean Delivery Prophylaxis
- Anal sphincter laceration prophylaxis
- Neonatal Group B Streptococcus prophylaxis
- Premature rupture of membranes (PROM)
- Normal vaginal delivery
- Sexual Assault

page 230 - 264

Appendices:

A) Overview of Common Antibiotics
B) Antibiotic Spectra of Activity
C) Antibiotics during pregnancy and breastfeeding
D) Aminoglycoside dosing
E) Vancomycin dosing
F) Creatinine clearance calculation
G) Renal dose adjustment of common antimicrobials in adults
H) Neonatal antimicrobial dosing
I) Beta-lactam allergy
J) Childhood immunization Schedule

Chapter 1. **Antibiotic Prophylaxis**

Condition	Antimicrobial
Open Fracture prophylaxis **Grade 1** <1cm skin laceration, <8hrs since injury, no signs of infection and able to be adequately debrided/cleaned **Grade 2** As above but 1-10cm skin laceration **Grade 3** >10cm skin laceration or extensive soft tissue loss OR >8 hrs since injury OR infection established) Extreme high energy trauma Extensive soft tissue lost, extreme High energy trauma.	*Grade 1:* **Cloxacillin 2g (child 50mg/kg) IV QID** *Alternative:* **Cefazolin 2g (child 50mg/kg) IV TID** OR **Clindamycin 600mg (child 15mg/kg) IV TID** *Grade 2 and 3:* To Grade 1 prophylaxis, ADD: **Gentamicin 2mg/kg IV OD** *For severe injuries that are heavily contaminated ADD:* **Metronidazole 500mg (child 12.5mg/kg) PO/ IV BID** (adding metronidazole is not necessary if clindamycin is used). *For water exposed wounds ADD:* **Ciprofloxacin 400mg (child 10mg/kg) TID IV** OR **Ciprofloxacin 750mg (child 20mg/kg) PO BID** to above regimes (if ciprofloxacin is used, there is no need to add gentamicin).
Head injury prophylaxis Antibiotic prophylaxis is not indicated for all soft tissue injuries. In wounds that are heavily contaminated see **Traumatic Wound Prophylaxis** in Chapter 13: Skin and Soft Tissues infections.	Antibiotic prophylaxis is not indicated for base of skull fractures, linear closed skull fractures or other closed head injuries. *For elevated skull fractures, depressed skull fractures, or fractures associated with penetrating head injury use:* **Ceftriaxone 2g (child 50mg/kg) IV BID** PLUS **Metronidazole 500mg (child 12.5mg/kg) IV TID**

Comments and Duration of Therapy
All open fractures require debridement, washout, and fracture stabilisation. Antibiotics should be administered as soon as possible, ideally within 3 hours of injury. Check Tetanus immunization status of all patients and give DTP vaccine if required (See **Tetanus Prophylaxis** in Chapter 1: Antibiotic Prophylaxis). *Duration:* Grade 1 and 2: Discontinue antibiotics at wound closure. Grade 3: Do not continue antibiotics for more than 24 hours after wound closure. For all grades stop antibiotics at 72 hours even without definitive closure. If prosthetic material is placed into infected tissue, See **Infected fracture fixation** in Chapter 2: Bone and Joint Infections
If infection is present see **Meningitis following penetrating head trauma or neurosurgery** in Chapter 4: Central Nervous System Infections *Duration:* If antibiotic prophylaxis is indicated, treat for 5 days then stop.

Surgical Prophylaxis Surgical prophylaxis is the use of antibiotics to prevent infection as opposed to their use where infection is already established. Antibiotic choice is guided by the likely source of infective organisms. Most infections occur secondary to the patient's own organisms which may include multiple drug resistant organisms secondary to previous antibiotic use. All pre-existing infections should be treated prior to any surgery if possible.	Cephazolin is the antibiotic of choice for most surgical prophylaxis and has a relatively short half-life and therefore should be re-dosed if the procedure is 4 hours or longer. It should also be re-dosed if there is excessive (≥ 1.5L) blood loss intraoperatively. *For most procedures, use:* **Cephazolin 2g (child: 50mg/kg) IV** *Alternative:* **Cloxacillin 2g (child 50mg/kg) IV** OR **Clindamycin 600mg IV (child 15mg/kg) IV** *If patient is known to have **MRSA**, ADD:* **Vancomycin 15 mg/kg IV, to cefazolin.**
Head and Neck Surgery Prophylaxis	**Cefazolin 2 g (child: 50mg/kg) IV** For incisions through mucosal surfaces ADD: **Metronidazole 500mg (child 12.5mg/kg) IV** *Alternative:* If cefazolin is not available replace this in the above regime with: **Cloxacillin 2g (child 50mg/kg) IV** OR **Cefuroxime 1.5g (child 50mg/kg) IV** OR **Clindamycin 600mg (child 15mg/kg) IV** (if clindamycin is used, there is no need to add metronidazole) OR **Vancomycin 15mg/kg IV**

Give antibiotics within 1 hour before procedure (ideally 15-30 minutes before surgical incision).

Post-operative courses of antibiotics >24 hours are only necessary in established infection. Extended prophylaxis is not recommended, and is associated with increased rates of resistance and subsequent infection with resistant pathogens.

Ampicillin does not adequately cover *Staphylococcus aureus* and should not be used alone as surgical prophylaxis.
Ceftriaxone contributes to AMR and should be avoided as surgical prophylaxis.

Antibiotic prophylaxis is NOT indicated for the following:

- Uncomplicated ear, nose, or sinus surgery (including endoscopy)
- Otoplasty
- Stapedectomy
- Tonsillectomy
- Adenoidectomy

Antibiotic prophylaxis IS indicated for the following:

- Major ear surgery
- Complex septorhinoplasty
- Revision sinus surgery
- Laryngectomy
- Tympanomastoid surgery
- Hearing implant procedures

Duration:
Stop antibiotics after procedure. Do not continue prophylaxis beyond 24 hours.
If infection is present, see Chapter 6: ENT / Respiratory Tract Infections.

Thoracic Surgery Prophylaxis	**Cefazolin 2 g (child: 50mg/kg) IV** *Alternative:* **Cloxacillin 2g (child: 50mg/kg) IV** OR **Cefuroxime 1.5g (child 50mg/kg) IV** OR **Clindamycin 600mg (child 15mg/kg) IV** OR **Vancomycin 15mg/kg**
Chest drain insertion prophylaxis	Antibiotic prophylaxis is not indicated when a chest drain is inserted for spontaneous pneumothorax, or in elective operations. *In patients who require chest drain insertion following trauma use:* **Cefazolin 2 g (child: 50mg/kg) IV** *Alternative:* **Cloxacillin 2g (child: 50mg/kg) IV** OR **Cefuroxime 1.5g (child 50mg/kg) IV**
Gastrointestinal Tract and Biliary Tree Surgery Prophylaxis	**Cefazolin 2 g (child: 50mg/kg) IV** *Alternative:* **Cloxacillin 2g (child: 50mg/kg) IV + Gentamicin 2mg/kg (adult and child) IV** OR **Clindamycin 600mg (child 15mg/kg) IV + Gentamicin 2mg/kg (adult and child) IV** OR **Vancomycin 15mg/kg IV + Gentamicin (adult and child) 2mg/kg IV** *For colorectal surgery ADD:* **Metronidazole 500mg (child 12.5mg/kg) IV** (No need to add metronidazole if clindamycin is used).

Duration:
Stop antibiotics after procedure. Do not continue prophylaxis beyond 24 hours.

If infection is present, see Chapter 3: Cardiovascular Infections and *Chapter 6: ENT / Respiratory Tract Infections.*

Duration:
Stop antibiotics after procedure. Do not continue prophylaxis beyond 24 hours.

If infection is present, see Chapter 3: Cardiovascular Infections and Chapter 6: ENT / Respiratory Tract Infections.

Duration:
Stop antibiotics after procedure. Do not continue prophylaxis beyond 24 hours.

If infection is present, see Chapter 15: Surgical Gastrointestinal Infections.

Urological procedure prophylaxis

The risk of post-operative infection is increased in patients with bacteriuria. Urine should be sent for culture and bacteriuria treated prior to urological procedures where possible.

Use recent culture results where available to direct prophylaxis.

Endoscopic procedures and transurethral resection of the prostate:

Gentamicin (adult and child) 2mg/kg IV

Alternative:
Cefazolin 2g (child 50mg/kg) IV

Open or laparoscopic urological procedures:

Cefazolin 2g (child: 50mg/kg) IV
PLUS
Gentamicin 2mg/kg (adult and child) IV

Alternative:
Cloxacillin 2g (child: 50mg/kg) IV + Gentamicin 2mg/kg IV
OR
Clindamycin 600mg (child 15mg/kg) IV + Gentamicin 2mg/kg IV
OR
Vancomycin 15mg/kg IV + Gentamicin 2mg/kg IV

If there is accidental rectal / bowel injury ADD:
Metronidazole 500mg (child 12.5mg/kg) IV

Transrectal prostate biopsy:
Ciprofloxacin 500mg PO 120 minutes prior to procedure

Transperineal prostate biopsy:
Cefazolin 2g IV

Alternative:
Cloxacillin 2g IV + Gentamicin 2mg/kg

Send urine culture 3-5 days prior to procedure.

Duration:
Stop antibiotics after procedure. Do not continue prophylaxis beyond 24 hours.

If infection is present, see Chapter 16: Urinary Tract Infections.

Internal fixation of long bones and joint replacement surgery prophylaxis	**Cefazolin 2 g (child: 50mg/kg) IV** *Alternative:* **Cloxacillin 2g (child: 50mg/kg) IV** OR **Clindamycin 600mg (child 15mg/kg) IV** OR **Vancomycin 15mg/kg** *If patient is colonised or suspected to be colonised with MRSA ADD:* **Vancomycin 15mg/kg IV, to cefazolin.**
Tetanus Prophylaxis Tetanus prophylaxis needs to be considered in all patients presenting with wounds of any type.	*For patients with:* » At least 3 doses of tetanus toxoid vaccine AND » Last vaccine was given within 5 years **No prophylaxis required** *For patients with:* » Unknown vaccination status OR » Less than 3 doses of vaccine OR » Last vaccine over 5 years ago **Give Tetanus toxoid vaccine** *For patients who present with anything other than a minor, clean wound AND with:* » Unknown vaccination status OR » Less than 3 doses of vaccine **Give tetanus immunoglobulin 250 IU if <24 hours since injury, 500 IU if >24 hours since injury (if this is available), IN ADDITION to tetanus toxoid vaccine.**

Duration:
Stop antibiotics after procedure. Do not continue prophylaxis beyond 24 hours.

If infection is present, see Chapter 2: Bone and Joint Infections.

For treatment see **Tetanus** in Chapter 14: Special Infections.

Rheumatic Fever secondary prevention Continuous antimicrobial prophylaxis against Streptococcus pyogenes is recommended for patients with Rheumatic Fever.	**Benzathine Penicillin 1.2 million IU (900mg) (child <20kg 0.6 million IU (450mg)) IM for 1 dose every 28 days.** *In patients with severe RHD PLUS severe pulmonary hypertension or uncontrolled heart failure use:* **Penicillin V 250mg (child 15mg/kg) PO BID** OR **Amoxicillin 500mg for >20kg, 250mg <250mg PO OD** *Alternative:* **Erythromycin 250mg PO BID** (Oral therapy can also be used in patients where IM therapy is not possible, however this is not the preferred route).
Infective Endocarditis prophylaxis Antibiotic prophylaxis is only recommended for patients with the following: » A cardiac condition which places them at high risk. AND » Undergoing a high-risk procedure.	When infective endocarditis prophylaxis is indicated, it should be given in addition to usual recommended surgical prophylaxis. *For dental procedures:* **Amoxicillin 2g (child 50mg/kg) PO, 1 hour before procedure.** *For other procedures:* **Ampicillin 2g (child 50mg/kg) IV within the 60 minutes prior to procedure.** *Alternative:* **Cefazolin 2 g (child 30mg/kg) IV** OR **Clindamycin 600mg (child 20mg/kg) IV** OR **Vancomycin 15mg/kg**

See **also Timor-Leste Guidelines for the Prevention and Management of Acute Rheumatic Fever (ARF) and Rheumatic Heart Disease (RHD) 2021**

Duration:
No cardiac valve involvement: Treat for a minimum of 5 years or until age 21 (whichever is longer).
Mild cardiac valve involvement: Treat for a minimum of 10 years or until age 25 (whichever is longer).
Moderate cardiac valve involvement: Treat for a minimum of 10 years or until age 40 (whichever is longer).
Severe cardiac valve involvement: Continue prophylaxis for life.

See **Pharyngitis / Tonsilitis** in Chapter 6: ENT / Respiratory Infections for treatment of *Streptoccocus pyogenes* sore throat (primary prevention of ARF).

High risk procedures include:
- **Dental procedures** involving manipulation of gingival or periapical tissue, or perforation of the oral mucosa (e.g. Extraction, implant placement, biopsy, removal of soft tissue or bone, subgingival scaling, and root planing, replanting avulsed teeth)
- **Skin and musculoskeletal procedures** involving infected skin, skin structures or musculoskeletal tissue.
- **Respiratory tract and ENT procedures** tonsillectomy, adenoidectomy; invasive respiratory tract or ENT procedures to treat an established infection (e.g. abscess drainage)
- **GIT and GUT procedures** if usual surgical prophylaxis is indicated for patients with an established infection.

High risk cardiac conditions include:
- Rheumatic heart disease
- Prosthetic heart valve or other prosthetic cardiac material
- Previous infective endocarditis

Unrepaired cyanotic congenital heart disease

See Chapter 3: Cardiovascular Infections for treatment of infective Endocarditis

Cirrhosis, antibiotic prophylaxis Patients with cirrhosis have an increased susceptibility to infection due to disease-related immune-dysfunction.	*Variceal bleeding:* **Ceftriaxone 1 g IV OD** *Alternative:* **Ciprofloxacin 400mg PO BID** *Spontaneous Bacterial Peritonitis (after first episode of SBP):* **Cotrimoxazole 160/800mg PO OD**
Post-splenectomy prophylaxis In addition to antibiotics, all patients should also receive immunisations (if available) against the encapsulated organisms Streptococcus pneumoniae, Neisseria meningitidis and Haemophilus influenzae B.	**Amoxicillin 250mg (child: 15mg/kg) PO OD** All patients should have an emergency supply of antibiotics to begin taking immediately at home when they become unwell with fever, and be reviewed as soon as possible by a doctor. *In the event of a sudden onset of unexplained fever use:* *Adult:* **Amoxicillin 3g PO for 1 dose then 1g TID until review.** *Child:* **Amoxicillin/Clavulanic acid 25/6.25 mg/kg (max 500/125mg) PO TID until review.**
Febrile Neutropaenia prophylaxis Antimicrobial prophylaxis is recommended for patients who have, or are expected to have, severe neutropaenia (Neutrophils <0.5 X109/L) for 7 days or more.	**Ciprofloxacin 500mg (child 10mg/kg) PO BID** PLUS **Fluconazole 200 mg (child 6-12mg/kg) PO OD**

Duration:
Variceal bleeding: Treat for 3-7 days
Spontaneous Bacterial Peritonitis: Continue lifelong if tolerated.

See **Spontaneous bacterial peritonitis** in Chapter 9: Gastrointestinal infections for treatment.

Duration:
Children with congenital haemoglobinopathies (e.g. thalassaemia) should remain on prophylaxis at least until the age of 5.
Post splenectomy patients should receive prophylaxis for at least 3 years.
Consider lifelong prophylaxis in the following:
- Immunocompromised patients
- Patients with haematological malignancy

Patients who have experienced significant post-splenectomy infection (particularly with *Streptococcus pneumoniae*).

Duration:
Continue for duration of expected neutropaenia.

***Pneumocystis jirovecii* (PJP) prophylaxis** See **Timor-Leste Comprehensive ART Guidelines**	Indications in Timor-Leste: » ≥ 20mg prednisone (or equivalent corticosteroid) for more than 4 weeks » Acute lymphocytic leukaemia » HIV with CD4 count <350 cells/microlitre or CD4 percentage <14%. **Co-trimoxazole 160 / 800mg (child 3-5kg 20/100mg, 6-13kg 40/200mg, 14-30kg 80/400mg) PO OD daily or BID three times a week**
***Toxoplasma gondii* prophylaxis in patients with HIV** See **Timor-Leste Comprehensive ART Guidelines**	Start when CD4 count is <100 cells/microlitre. **Co-trimoxazole 160 / 800mg (child 3-5kg 20/100mg, 6-13kg 40/200mg, 14-30kg 80/400mg) PO OD daily or BID three times a week**
***Mycobacterium Avium* Complex (MAC) Prophylaxis in patients with HIV** See **Timor-Leste Comprehensive ART Guidelines**	Prophylaxis is not routinely recommended in patients who start ART. Consider in patients who remain viraemic on ART AND have CD4 <50 cells/microlitre. **Azithromycin 1250mg (child 20mg/kg) PO once per week** *Alternative:* **Clarithromycin 500mg (7.5mg/kg) PO BID**

References

ARF/RHD technical working group. Timor-Leste guidelines for the prevention and management of acute rheumatic fever (ARF) and rheumatic heart disease (RHD). Timor-Leste: Ministerio da Saude; 2021

Bratzler D, Dellinger E, Olsen K, Perl T, Auwaerter P, Bolon M, et al. American Society of Health-System Pharmacists; Infectious Disease Society of America; Surgical Infection Society; Society for Healthcare Epidemiology of America. Clinical practice guidelines for antimicrobial prophylaxis in surgery. Am J Health Syst Pharm 2013; 70 (3): 195-283. doi: 10.2146/ajhp120568

	Duration: Corticosteroids: Continue for 6 weeks after steroid dose is reduced below 20mg of prednisone (or equivalent), then cease. HIV: Stop when on ART AND CD4 count >350 cells/microlitre for 6 months. See ***Pneumocystis jirovecii (PJP)*** in Chapter 14: Special Infections for treatment.
	Duration: Stop when on ART with suppressed viral load AND CD4 count >200 cells/microlitre for 3 months. See ***Toxoplasma gondii*** in Chapter 14: Special Infections for treatment.
	Rule out active infection before commencing prophylaxis in all patients, as monotherapy with a macrolide may result in the development of resistance. *Duration:* Stop when on ART with suppressed viral load AND CD4 count >100 cells/microlitre for 3 months See ***Mycobacterium avium Complex (MAC)*** in Chapter 14: Special Infections for treatment.

Bryson D, Morris D, Shivji F, Rolling s, Snape S. Antibiotic prophylaxis in orthopaedic surgery difficult decision in an era of evolving antibiotic resistance. Bone Joint J 2016; 98-B (8): 1014-1019. doi: 10.1302/0301-620X.98B8.37359

Dhammi I, Haq R, Kumar S. Prophylactic antibiotics in orthopaedic surgery: controversial issues in its use. Indian J Orthop 2015; 49 (4):373-376. doi: 10.4103/0019-5413.159556

eTG complete. Prevention of infection. In: Therapeutic Guidelines [digital]. Melbourne: Therapeutic Guidelines Limited; 2019. http://www.tg.org.au
Gusmao dos Santos C, Francis J, Guterres J, Janson S, Lopes N, Marr I, et al. HNGV Antibiotic guidelines writing group. Antibiotic guidelines Hospital Nacional Guideo Valadares. Timor-Leste; 2016

Habib G, Lancellotti P, Antunes MJ, Bongiorni MG, Casalta J-P, Del Zotti F, et al., ESC Scientific Document Group, 2015 ESC Guidelines for the management of infective endocarditis: The Task Force for the Management of Infective Endocarditis of the European Society of Cardiology (ESC) Endorsed by: European Association for Cardio-Thoracic Surgery (EACTS), the European Association of Nuclear Medicine (EANM), Eur Heart J 2015; 36 (44): 3075–3128. https://doi.org/10.1093/eurheartj/ehv319

National HIV/AIDS programme Timor-Leste. Guidelines for antiretroviral therapy and management of opportunistic infections for children, adolescents and adults living with HIV. Timor-Leste: Ministerio da Saude; 2021

RHD Australia (ARF/RHD writing group). The 2020 Australian guideline for prevention diagnosis and management of acute rheumatic fever and rheumatic heart disease (3rd edition); 2020

Schmitt S. Osteomyelitis associated with open fractures in adults. In Spelman D, Hall K, editors. UpToDate [internet]. Waltham (MA): UpToDate Inc; 2021. https://www.uptodate.com/contents/osteomyelitis-associated-with-open-fractures-in-adults?search=prophylaxis%20for%20open%20fractures&source=-search_result&selectedTitle=2~150&usage_type=default&display_rank=2#H7

Taplitz R, Kennedy E, Bow E, Crews J, Gleason C, Hawley D, et al. Antimicrobial prophylaxis for adult patients with cancer-related immunosuppression: ASCO and IDSA clinical practice guideline update. J Clin Oncol 2018; 36 (30): 3043-3054. DOI: https://doi.org/10.1200/JCO.18.00374

The European Association for the Study of the Liver. EASL Clinical Practice Guidelines for the management of patients with decompensated cirrhosis. J Hepatol 2018; 69 (2):406-460. https://doi.org/10.1016/j.jhep.2018.03.024

Vila P, Zenga J, Jackson R. Antibiotic prophylaxis in clean-contaminated head and neck surgery: A systematic review and meta-analysis. Otolaryngol Head Neck Surg 2017; 157 (4):580-588. doi: 10.1177/0194599817712215

Mucoid, Lactose Fermenter colony growth on MacConkey agar (*Klebsiella pneumonia* on MacConkey agar)

Condition	Antimicrobial
Acute Osteomyelitis Infection of the bone with symptoms for <14 days *Staphylococcus aureus* is the most common pathogen.	**Cloxacillin 2g (child 50mg/kg) IV QID** *Alternative:* **Cefazolin 2g (child 50mg/kg) IV TID** OR **Clindamycin 600mg (child 15mg/kg) IV TID** OR **Vancomycin IV, dose according to Vancomycin dosing section** *Change to oral antibiotics when appropriate (see comments). If susceptibility results are not available use:* **Cloxacillin 1g (child 25mg/kg) PO QID**
Chronic Osteomyelitis Infection of bone with symptoms over months to years. Cortical destruction with sequestrum (necrotic bone) and involucrum (new bone) may be present. The presence of a sinus tract is pathognomonic for chronic osteomyelitis. Consider Tuberculosis as a potential pathogen.	Unless septic do not give antibiotics until after bone has been debrided and culture results are available. Use directed treatment wherever possible. **Cloxacillin 2g (child 50mg/kg) IV QID.** *Alternative:* **Cefazolin 2g (child 50mg/kg) IV TID** OR **Clindamycin 600mg (child 15mg/kg) IV TID** OR **Vancomycin IV dose according to Vancomycin dosing section** *Followed by:* Cloxacillin 1g (child 25mg/kg) PO QID

Comments and Duration of Therapy
Take blood cultures prior to antibiotics. Acute osteomyelitis is potentially curable with antibiotics alone. In adults who respond to treatment rapidly an early IV to PO switch can be considered if susceptibilities are known, and antibiotics with good oral bioavailability are used (e.g. clindamycin, co-trimoxazole, ciprofloxacin). Adults with an associated ***Staphylococcus aureus bacteraemia*** should receive at least 4 weeks IV therapy (see Staphylococcus bacteraemia in Sepsis and Directed Therapy for Blood Stream Infections chapter). *Duration:* **Adults:** Treat for a total of 6 weeks, with a minimum of 2-4 weeks IV. **Children:** Uncomplicated: Treat for at least 3 weeks, with a minimum of 3 days IV. Complicated (non-long bone, associated abscess, delayed presentation, slow clinical improvement): Treat as per adult.
Send tissue and deep sinus tract swab for cultures. Send blood cultures if systemically unwell. Change antibiotics according to culture results. Aggressive debridement of necrotic bone is important to achieve cure. Patients on long-term antibiotic therapy should have CBC, and liver and renal function monitored regularly. *Duration:* **Adults:** Change to oral antibiotics after 2 weeks IV. Treat for a total of 3 months. Longer therapy may be required if inflammatory markers (ESR, CRP) do not normalize. **Children:** Change to oral antibiotics when well. Treat for a minimum of 6 weeks.

Infected fracture fixation device Management of infected hardware is complicated by the formation of biofilm on foreign material. Many antibiotics do not achieve high enough concentrations within biofilms to cure infection. Often hardware removal is required to achieve cure, however this must be balanced against the importance of fracture stability for union and for the treatment of infection. Where hardware cannot be removed seek review by **Infectious Diseases** if available.	Unless septic do not give antibiotics (except surgical prophylaxis) until after bone has been debrided and sent for culture. Commence empiric treatment after debridement, or after blood cultures if septic. **Cloxacillin 2g (child 50mg/kg) IV QID** *Alternative:* **Cefazolin 2g (child 50mg/kg) IV TID** OR **Clindamycin 600mg (child 15mg/kg) IV TID** OR **Vancomycin IV, dose according to Vancomycin dosing section** In the case of *Staphylococcus aureus* infection with retention of hardware, after thorough debridement and a course of IV antibiotics consider the use of biofilm active agents: **Rifampicin 300mg PO BID** PLUS **Ciprofloxacin 500mg PO BID** Do not use either of these agents alone, and ensure there are no symptoms of TB before commencing rifampicin.
Septic Arthritis Usually presents as a monoarticular arthritis, spontaneously or following trauma. It can also occur in the setting of multifocal Staphylococcus aureus disease. If relevant see *Staphylococcus bacteraemia* in Sepsis and Directed Therapy for Blood Stream Infections chapter.	**Cloxacillin 2g (child 50mg/kg) IV QID** *Alternative:* **Cefazolin 2g (child 50mg/kg) IV TID** OR **Clindamycin 600mg (child 15mg/kg) IV TID** OR **Vancomycin IV, dose according to Vancomycin dosing section**

Send tissue and deep sinus tract swab for cultures. Send blood cultures if systemically unwell.

Where hardware is no longer required for bone stability, it should be removed and necrotic bone and tissue thoroughly debrided.

Where hardware must be retained for fracture nonunion, continue antibiotics until fracture union is achieved, then remove hardware.

Cure of infection with retention of hardware is more likely to be achieved if infection has occurred within 3 weeks of hardware insertion.

Duration:
With removal of hardware: Treat for 2-6 weeks IV, then change to oral antibiotics. Continue antibiotics for 6 weeks after removal of hardware.
Without removal of hardware: If hardware cannot be removed continue antibiotics for 12 weeks and consider ongoing long-term suppression after this.

See **Open Fracture prophylaxis** in Chapter 1: Antibiotic Prophylaxis.

Send blood cultures prior to commencement of antibiotics. Unless patient is septic send synovial fluid for culture prior to commencement of antibiotics.

Exclude acute rheumatic fever in young patients.

Consider Gonococcal arthritis in patient with risk factors. Send urine and synovial fluid for gonococcal PCR, and send urethral, vaginal, or rectal swabs for PCR and culture.

Send synovial fluid for TB PCR if consistent clinical picture.

Surgical washout is required. Send joint fluid for microscopy, culture and susceptibility testing.	*In neonates, Group B Streptococcus and Haemophilus influenzae are common pathogens, ADD:* **Ampicillin 50mg/kg IV QID** *If Neisseria gonorrhoea is confirmed change to:* **Ceftriaxone 2g (child: 50mg/kg) IV OD**
Prosthetic Joint Infection (PJI) Management of infected hardware is complicated by the formation of biofilm on foreign material. Many antibiotics do not achieve high enough concentrations within biofilms to cure infection. Extensive debridement with or without hardware removal are required to cure PJI. In some cases cure cannot be achieved and long-term antibiotic suppression is required.	Unless septic do not give antibiotics until after synovial fluid, tissue and/or hardware have been debrided and sent for culture. Send at least 3-6 tissue samples and synovial fluid for culture. Use new, fresh, sterile surgical instruments for each collection to avoid cross-contamination. If septic take 2 sets of blood cultures prior to antibiotics. *For empiric treatment while awaiting culture results use:* **Vancomycin IV, dose according to Vancomycin dosing section** Once culture results are available change to directed therapy. *For two-stage exchange arthroplasty:* After removal of infected prosthesis and insertion of spacer, treat with at least 6 weeks of antibiotics. Stop antibiotics for 7-14 days prior to second operation. Take intraoperative cultures (3-6 samples) from bone/synovium/

If no response to empiric treatment and no microbiological diagnosis, seek Infectious Diseases review.

Duration:
Adults: Treat for a total of 4 weeks, with a minimum of 2 weeks IV. Use antibiotics with good oral bioavailability (see below) if changing to oral antibiotics at 2 weeks.
Children: Treat for a total of 2-3 weeks. If rapid clinical response change to oral antibiotics after 5-7 days.
Neisseria gonorrhoeae: Treat for 10-14 days, longer if slow response or immunocompromised.

Antibiotics with good oral bioavailability include:

- Fluoroquinolones
- Co-trimoxazole
- Clindamycin
- Doxycycline
- Metronidazole
- Azithromycin

In adults do not use ciprofloxacin alone to treat a *Staphylococcus aureus* infection.

Consider DAIR in patients with all of the following:

- No sinus tract
- < 30 days since joint replacement OR < 3 weeks of symptoms
- Well-fixed arthroplasty
- Good soft tissue condition
- No associated sepsis
- Monomicrobial infection (only a single organism cultured)
- Infection with bacteria which are sensitive to antibiotics with good oral bioavailability and biofilm activity
- Absence of multiple comorbidities or immune compromise.

In patients who meet these conditions eradication of infection is possible in up to 70% of patients.
Antibiotics with good oral bioavailability include:

- Fluoroquinolones
- Rifampicin
- Co-trimoxazole
- Clindamycin
- Doxycycline
- Metronidazole
- Azithromycin

Surgical options for treatment of PJI include one and two-stage exchange arthroplasty, debridement and retention of prosthesis (DAIR), excision arthroplasty and implant retention without curative intent. Two-stage arthroplasty has the highest cure rates (85-95%).

Seek review by Infectious Diseases if available.

fluid at second operation then restart antibiotics. If cultures are positive from second operation treat for a further 6 weeks. If cultures are negative stop antibiotics.

For one-stage exchange arthroplasty:
After joint exchange treat with IV antibiotics for 2-6 weeks. After this for Staphylococcus aureus PJI treat with rifampicin 300mg BID PLUS ciprofloxacin 500mg BID. For gram negative PJI treat with ciprofloxacin 500mg BID if susceptible. If treating with 6 weeks of IV antibiotics consider adding rifampicin 300mg BID once bacteraemia has cleared. Treat for a total of 6-12 weeks.

For DAIR:
Following debridement and replacement of exchangeable components treat with 2-6 weeks of directed IV antibiotics. After this for Staphylococcus aureus PJI treat with rifampicin 300mg BID PLUS ciprofloxacin 500mg BID. For gram negative PJI treat with ciprofloxacin 500mg BID if susceptible. If treating with 6 weeks of IV antibiotics consider adding rifampicin 300mg BID once bacteraemia has cleared. Treat for a total of 3-6 months.

For resection arthroplasty:
Treat with 2-6 weeks of IV antibiotics. Change to oral antibiotics with good oral bioavailability. Treat for 6-12 weeks total.

For implant retention without curative intent:
Treat with IV antibiotics until patient is clinically improving. Change to oral antibiotics according to susceptibilities. Chose antibiotics which are well tolerated; biofilm activity is not necessary. Continue treatment lifelong.

Do not use rifampicin alone and ensure there are no symptoms of TB before commencing this. Do not use ciprofloxacin alone to treat a *Staphylococcus aureus* infection.

Antibiotics with biofilm activity include:

- Fluoroquinolones
- Rifampicin

References

Bernard L, Arvieux C, Brunschweiler B, Touchais S, Ansert S, Bru J-P, et al. Antibiotic therapy for 6 or 12 weeks for prosthetic joint infection. NEJM 2021; 384:1001-2001. DOI: 10.1056/NEJMoa2020198

Depypere M, Morgenstern M, Kuehl R, Senneville E, Moriarty T, Obremskey W, et al. Narrative review: Pathogenesis and management of fracture-related infection. Clin Microbiol Infect 2020; 26: 572-578. DOI: https://doi.org/10.1016/j.cmi.2019.08.006

eTG complete. Bone and Joint Infections. In: Therapeutic Guidelines [digital]. Melbourne: Therapeutic Guidelines Limited; 2019. http://www.tg.org.au

Fantoni M, Taccari F, Giovannenze F. Systemic antibiotic treatment of chronic osteomyelitis in adults. Eur Rev Med Pharmacol Sci 2019; 23 (2 Suppl):258-270. doi: 10.26355/eurrev_201904_17500

Gusmao dos Santos C, Francis J, Guterres J, Janson S, Lopes N, Marr I, et al. HNGV Antibiotic guidelines writing group. Antibiotic guidelines Hospital Nacional Guideo Valadares. Timor-Leste; 2016

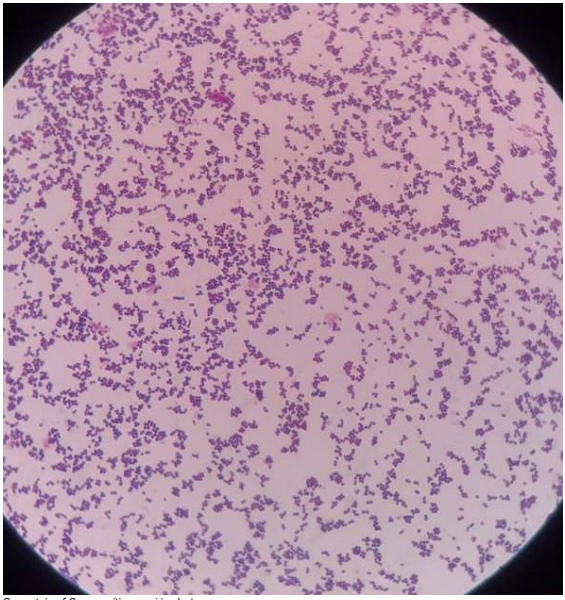
Li H-K, Rombach I, Zambellas R, Walker A, McNally M, Atkins B, et al. Oral versus intravenous antibiotics for bone and joint infection. NEJM 2019; 380: 425-436. DOI: 10.1056/NEJMoa1710926

Malaysian antimicrobial guideline technical working group. National antimicrobial guideline. Ministry of Health Malaysia; 2019

Metsemakers W, Morgenstern M, Senneville E, Borens O, Govaert G, Onsea J, et al. General treatment principles for fracture-related infection: recommendations from an international expert group. Arch Orthop Trauma Surg 2020; 140: 1013-1027. DOI: https://doi.org/10.1007/s00402-019-03287-4

Nanchahal J, Nayagam S, Khan U, Moran C, Barrett S, Sanderson F et al. Standards for the management of open fractures of the lower limb. British Association of Plastic Reconstructive and Aesthetic Surgeons, British Orthopaedic Association. London: Royal Society of Medicine Press Limited; 2009

Osmon D, Berbari E, Berendt A, Lew D, Zimmerli W, Steckelberf J, et al. Diagnosis and management of prosthetic joint infections: clinical practice guidelines by the Infectious Diseases Society of America. Clin Infect Dis 2013; 56(1):e1-25. DOI: 10.1093/cid/cis803



Gram stain of Gram positive cocci in cluster

Condition	Antimicrobial
Empiric Treatment for Native Valve Endocarditis (not in septic shock) Infective endocarditis is diagnosed based on Modified Duke Criteria. Empiric antibiotics should be given to all patients who are haemodynamically unstable or who have an acute presentation, after blood cultures are taken. In patients who are haemodynamically stable, with a subacute, indolent presentation, delay antibiotics until culture results are available.	**Benzylpenicillin 3 million IU (1.8g) (child 80 000 IU (50mg)/kg) IV Q4H** PLUS **Cloxacillin 2g (child 50mg/kg) IV Q4H** PLUS **Gentamicin 4-5mg/kg (child <10 years old: 7.5mg/kg) IV OD** *Alternative:* If benzylpenicillin is not available replace this with: **Ampicillin 2g (child 50mg/kg) IV Q4H** *For severe penicillin allergy or if cloxacillin is not available use:* **Vancomycin IV 25-30mg/kg loading dose then dose according to Vancomycin dosing section** PLUS **Gentamicin 4-5mg/kg (child <10 years old: 7.5mg/kg) IV OD**
Empiric Treatment for Prosthetic Valve Endocarditis, Endocarditis- associated Septic shock, Healthcare-associated Endocarditis, OR where MRSA is suspected.	**Vancomycin IV 25-30mg/kg loading dose, then dose according to Vancomycin dosing section** PLUS **Cloxacillin 2g (child 50mg/kg) IV Q4H** PLUS **Gentamicin 4-5mg/kg (child <10 years old: 7.5mg/kg) IV OD** *If patient is in **septic shock** replace Gentamicin with:*

Comments and Duration of Therapy

If bacterial endocarditis is suspected it is recommended that at least **3 set of blood cultures** be taken, before initiating therapy. If culture is positive, direct antibiotics to treat specific pathogen (see below).

Seek review by **Cardiology** and **Infectious Diseases** where available.

Important principles of management include:

- Treatment must be given IV
- Treatment is usually 4-6 weeks in duration
- Adequate drug concentrations and duration are essential

Cloxacillin is used in addition to vancomycin as it is more effective than vancomycin for methicillin-sensitive Staphylococcus aureus.

Seek review by **Cardiology** and **Infectious Diseases** where available.

	Amikacin 28mg/kg IV OD as single dose in patients with creatinine clearance >60ml/minute. Use 16-20mg/kg if creatinine clearance <60ml/minute. For subsequent dosing see **Aminoglycoside dosing section.** **Child 15mg/kg IV OD** If amikacin is not available and patient is likely to have normal renal function give above regime but increase Gentamicin dose to 7mg/kg IV for first dose.
***Streptococcus viridans* and *bovis* group Endocarditis**	**Benzylpenicillin 3 million IU (1.8g) (child 80 000 IU (50mg)/kg) Q4H** PLUS If gentamicin dose monitoring is available and there no contraindications to use. **Gentamicin 1mg/kg IV TID or 3mg/kg (child 5mg/kg) IV OD for 2 weeks then stop.** See **Aminoglycoside dosing** section. *Alternative:* If benzylpenicillin is not available replace with: **Ampicillin 2g (child 50mg/kg) IV Q4H** OR **Ceftriaxone 2g (child 50mg/kg) IV OD** For patients with severe allergy to penicillin use: **Vancomycin IV, dose according to Vancomycin dosing section**
***Staphylococcus aureus* Native Valve Endocarditis** Cloxacillin is more effective than vancomycin for methicillin-sensitive *Staphylococcus aureus*.	*For MSSA:* **Cloxacillin 2g (child 50mg/kg) IV Q4H** *Alternative:* **Cefazolin 2g (child 50mg/kg) IV TID** OR **Vancomycin 25-30mg/kg IV loading dose, then dose according to Vancomycin dosing section** *For MRSA:* **Vancomycin 25-30mg/kg IV loading dose, then dose according to Vancomycin dosing section**

Patients treated with long term gentamicin should have renal function monitored every two days and should be asked regularly about symptoms of ototoxicity such as vertigo or hearing loss. If symptoms occur cease gentamicin.

Duration:
For uncomplicated native valve disease, with MIC of 0.125mg/L or lower, in which gentamicin is used for two weeks, treat for a total of 2 weeks.

For patients with complicated disease (large vegetation, slow response to treatment, extra-cardiac infection), MIC of >0.125mg/L, OR where 2 weeks of gentamicin cannot be used, treat for a total of 4 weeks.

For patients with prosthetic valves, treat for 6 weeks.

If vancomycin is used, treat for 6 weeks.

Duration:
MSSA: For uncomplicated infection treat for 4 weeks. For patients with perivalvular abscess, or septic embolic complications treat for 6 weeks.
MRSA: Treat for 6 weeks IV

See ***Staphylococcus aureus bacteraemia*** *in Chapter 12: Sepsis and Directed Therapy for Blood Stream Infections*.

Prosthetic Valve Endocarditis with *Staphylococcus aureus* **or Coagulase-negative Staphylococcus spp.**	*For methicillin-sensitive Staphylococci:* **Cloxacillin 2g IV Q4H** *Consider ADDING:* **Gentamicin 1mg/kg IV TID, or 3mg/kg OD for 2 weeks,** if organism is susceptible, there are no contraindications, and gentamicin dose monitoring is available. See **Aminoglycoside dosing** section. *Consider ADDING:* **Rifampicin 300mg PO TID** after 3-5 days of cloxacillin, for 6 weeks, if organism is susceptible, drug is tolerated, and active TB has been ruled out. *For MRSA:* *Replace cloxacillin with:* **Vancomycin 25-30mg/kg IV loading dose, then dose according to Vancomycin dosing section.** Add gentamicin and rifampicin where appropriate as described above.
Enterococcus Endocarditis	*For beta-lactam susceptible:* **Ampicillin 2g (child 50mg/kg) IV Q4H** PLUS **Gentamicin 1mg/kg IV TID, or 3mg/kg IV OD for 2 weeks,** if no contraindications, and gentamicin is monitoring available. See **Aminoglycoside dosing** section. *If high level resistance to gentamicin, or gentamicin cannot be used ADD:* **Ceftriaxone 2g (child >1 month, 50mg/kg) IV BID** to ampicillin. *For beta-lactam resistant:* **Vancomycin IV, dose according to Vancomycin dosing section** PLUS **Gentamicin 1mg/kg IV TID, or 3mg/kg IV OD for 6 weeks,** if no contraindications, and gentamicin monitoring available. See **Aminoglycoside dosing** section.

Patients treated with long term gentamicin should have renal function monitored every two days and should be asked regularly about symptoms of ototoxicity such as vertigo or hearing loss. If symptoms occur cease gentamicin.

Delayed commencement of rifampicin is important to reduce the development of rifampicin resistance when the bacterial burden is high early in infection.

Duration:
Treat for 6 weeks IV.
If rifampicin is used, continue this for 6 weeks.
If gentamicin is used, stop this after 2 weeks.

See ***Staphylococcus aureus bacteraemia*** *in Chapter 12: Sepsis and Directed Therapy for Blood Stream Infections*.

Duration:
Beta-lactam susceptible: Treat for 4 weeks if uncomplicated native valve disease, and rapid response to therapy. Otherwise treat for 6 weeks. Stop gentamicin after 2 weeks.
Beta-lactam resistant: Treat for 6 weeks with both ampicillin and gentamicin if no contraindications.

Patients treated with long term gentamicin should have renal function monitored every two days and should be asked regularly about symptoms of ototoxicity such as vertigo or hearing loss. If symptoms occur cease gentamicin

HACEK Endocarditis *Haemophilus parainfluenzae, Aggregatibacter spp., Cardiobacterium spp., Eikenella corrodens, and Kingella spp.*	**Ceftriaxone 2g (child >1 month 50mg/kg) IV OD**
Culture Negative Endocarditis Culture negative endocarditis is commonly due to prior antibiotic therapy, but can also be caused by unusual pathogens including *Bartonella, Brucella, Coxiella burnetii, Legionella, Mycoplasma and Tropheryma whipplei,* however these cannot currently be diagnosed in Timor-Leste. Where possible seek review by **Infectious Diseases.**	*Brucella spp.:* **Doxycycline 100mg PO BID** PLUS **Cotrimoxazole 160/800mg PO BID** PLUS **Rifampicin 300mg PO BID, or 600mg PO OD** *Coxiella burnetii (Q fever):* **Doxycycline 100mg PO BID** PLUS **Hydroxychloroquine 600mg PO OD orally** *Bartonella:* **Doxycycline 100 mg PO BID** PLUS **Gentamicin 1mg/kg TID, or 3mg/kg OD for 2 weeks** *Legionella spp.:* **Levofloxacin 500mg IV/PO BID** PLUS **Rifampicin 300mg PO BID** *Mycoplasma spp:* **Levofloxacin 500mg IV/PO BID** *Tropheryma whipplei:* **Doxycycline 100mg PO BID** PLUS **Hydroxychloroquine 600mg PO OD**

Duration:
Treat for 4-6 weeks IV

Duration:
Brucella: Treat for 3-6 months
Coxiella burnetii (Q fever): Treat for at least 18 months
Bartonella: Treat for 6 weeks. Stop gentamicin after 2 weeks.
Legionella: Treat for at least 6 weeks
Mycoplasma: Treat for at least 6 months
Tropheryma whipplei: Treat for at least 18 months

See **Aminoglycoside dosing** section where relevant.

Bacterial Pericarditis

Bacterial pericarditis may occur as a consequence of direct spread from an intrathoracic focus, haematogenous spread or extension from a subdiaphragmatic focus. Prior to widespread antibiotic use bacterial pericarditis was a frequent complication of pneumococcal pneumonia. Where antibiotic use is common, bacterial pericarditis is most often associated with nosocomial bacteraemia, thoracic surgery, or immunosuppression, and *Staphylococcus aureus* is the most common cause. Tuberculosis is the most common cause of subacute or chronic purulent pericarditis.

Pericardial drainage should be performed in all patients.

Ceftriaxone 2g (child 50mg/kg) IV OD
PLUS
Vancomycin 25-30mg/kg loading dose, then dose according to Vancomycin dosing section.

Change to oral antibiotics when clinical signs of infection have resolved, and white cell count has normalized, according to susceptibility results. If susceptibility results are not available use:

Amoxicillin/Clavulanic acid 500/125mg (child 25/6.25 mg/kg) PO TID

References

eTG complete. Cardiovascular System Infections. In: Therapeutic Guidelines [digital]. Melbourne: Therapeutic Guidelines Limited; 2019. http://www.tg.org.au

Gusmao dos Santos C, Francis J, Guterres J, Janson S, Lopes N, Marr I, et al. HNGV Antibiotic guidelines writing group. Antibiotic guidelines Hospital Nacional Guido Valadares. Timor-Leste; 2016

Habib G, Lancellotti P, Antunes MJ, Bongiorni MG, Casalta J-P, Del Zotti F, et al., ESC Scientific Document Group, 2015 ESC Guidelines for the man-

Perform echocardiography in all patients with suspected pericardial disease. Send blood cultures. Send pericardial fluid for protein, glucose, cell count, gram stain and culture, AFB and mycobacterial cultures, TB GeneXpert, and cytology. Pericardial biopsy should be considered if there is ongoing diagnostic uncertainty.

Seek review by **Cardiology** and **Infectious Diseases** where available.

Duration:
Treat for a total of 2-4 weeks depending on clinical response and adequacy of drainage.

agement of infective endocarditis: The Task Force for the Management of Infective Endocarditis of the European Society of Cardiology (ESC) Endorsed by: European Association for Cardio-Thoracic Surgery (EACTS), the European Association of Nuclear Medicine (EANM), Eur Heart J 2015; 36 (44): 3075–3128. https://doi.org/10.1093/eurheartj/ehv319

Condition	Antimicrobial
Acute Bacterial Meningitis Classic symptoms of meningitis include headache, fever, and neck stiffness. Common organisms include *Streptococcus pneumoniae, Neisseria meningitis and Haemophilus influenzae.* Symptoms and clinical signs in young infants may be subtle and non-specific, including fever, lethargy, irritability, vomiting or a bulging fontanelle. Neck stiffness may not be present. Empirical therapy should be commenced without delay.	**Ceftriaxone 2g (child 50mg/kg) IV BID** PLUS **Dexamethasone 10mg (child 0.15mg/kg) IV QID for 4 days** If immunocompromised, over 50 years old, or neonate, to cover the possibility of Listeria, ADD: **Benzylpenicillin 4 million IU (2.4g) (child 100 000 IU (60mg)/kg) IV Q4H** Alternative: If ceftriaxone is unavailable use: **Cefotaxime 2g (child 50mg/kg) IV QID** OR **Chloramphenicol 1g (child 25mg/kg) IV QID** OR **Meropenem 2g (child 40mg/kg) IV TID** If benzylpenicillin is unavailable and patient is at risk of Listeria use: **Ampicillin 2g (child 50mg/kg) IV Q4H** (No need to add additional listeria cover if meropenem is used)
Meningitis following penetrating head trauma or neurosurgery Common organisms include *Staphylococcus aureus, coagulase-negative Staphylococci,* and gram-negative bacilli including *Pseudomonas aeruginosa.*	**Meropenem 2g (child 40mg/kg) IV TID** PLUS **Vancomycin loading dose 25-30mg/kg IV, then dose according to Vancomycin dosing section.**

Comments and Duration of Therapy
Perform blood cultures on all patients prior to antibiotics. Lumbar puncture should be performed for CSF protein, glucose, microscopy, and culture, wherever possible, ideally prior to antibiotics, however treatment should not be delayed if there is difficulty obtaining CSF. Raised intracranial pressure is generally a contraindication to performing lumbar puncture. Raised intracranial pressure may cause coma or focal neurological signs. Fundoscopy and CT (to rule out a space occupying lesion) can be performed prior to lumbar puncture, if there are concerns. CNS tuberculosis is an important differential diagnosis. If patient has chronic meningitis symptoms with persisting headache or patient is immunocompromised, also consider cryptococcal meningitis. Request Cryptococcal antigen on CSF or blood if this is suspected. See **Neonatal Meningitis** in Chapter 11: Paediatric Infections (Neonates, Infants and Children).
Perform blood cultures on all patients, obtain CSF where possible. Direct antibiotics once culture results are available.

***Neisseria meningitidis* Meningitis**	**Ceftriaxone 2g (child 50mg/kg) IV BID** *If penicillin susceptible use:* **Benzylpenicillin 4 million IU (2.4g) (child 100 000 IU (60mg)/kg) IV Q4H** *Alternative:* **Ampicillin 2g (child 50mg/kg) Q4H**
***Streptococcus pneumoniae* Meningitis**	**Ceftriaxone 2g (child 50mg/kg) IV BID** *If penicillin MIC <0.125mg/L use:* **Benzylpenicillin 4 million IU (2.4g) (child 100 000 IU (60mg)/kg) IV Q4H** *Alternative:* **Ampicillin 2g (child 50mg/kg) Q4H** *If penicillin MIC >0.125mg/L AND ceftriaxone MIC 1-2mg/L, in addition to ceftriaxone ADD:* **Vancomycin, dose according to Vancomycin dosing section**
***Haemophilus influenzae* Meningitis**	**Ceftriaxone 2g (child 50mg/kg) IV BID** *If penicillin susceptible use:* **Benzylpenicillin 4 million IU (2.4g) (child 100 000 IU (60mg)/kg) IV Q4H** *Alternative:* **Ampicillin 2g (child 50mg/kg) IV Q4H**
***Listeria monocytogenes* Meningitis**	**Benzylpenicillin 4 million IU (2.4g) (child 100 000 IU (60mg)/kg) IV Q4H** *Alternative:* **Ampicillin 2g (child 50mg/kg) IV Q4H** *After 3 weeks of IV therapy, in patients who are immunocompromised give:* **Co-trimoxazole (adult >60kg 320mg/1600mg; adult 40-60kg 240mg/1200mg; child >1month 6mg/kg /30mg/kg) PO BID.**

Duration:
Treat for 5 days.
Stop empiric dexamethasone.

Duration:
Treat for 10-14 days
Continue dexamethasone for 5 days

Duration:
Treat for 7 days
Continue dexamethasone for 5 days

Duration:
Treat for 3 weeks IV. After this in patients who are immunocompromised change to oral antibiotics and treat for an additional 3 weeks. In patients who are not immunocompromised stop treatment at 3 weeks if well.
Stop empiric dexamethasone.º

***Streptococcus agalactiae* Meningitis**	**Benzylpenicillin 4 million IU (2.4g) (child 100 000 IU (60mg)/kg) IV Q4H** *Alternative:* **Ampicillin 2g (child 50mg/kg) IV Q4H**
Cryptococcus Meningitis Cryptococcal meningitis should be suspected in patients who present with subacute or chronic symptoms, particularly in patients who are immunosuppressed. It can also present as an intracerebral mass. Request Cryptococcal antigen on blood and/or CSF. Seek **Infectious Diseases** review where available. Test all patients for HIV. See **Timor-Leste Comprehensive ART Guidelines**	*Induction:* **Fluconazole 1200mg (child 12mg/kg) IV / PO OD** THEN *Consolidation:* **Fluconazole 800mg (child 6-12mg/kg) PO OD.** THEN *Eradication:* **Fluconazole 200mg - 400mg (child 6mg/kg) PO OD** *In patients with Cryptococcomas:* Extend duration of induction to at least 6 weeks. Following induction treat with fluconazole 400mg-800mg (child 6mg/kg) for 12 to 18 months. *In patients with HIV, who are asymptomatic, and have a negative CSF, but serum CrAg is positive:* **Fluconazole 400mg (child 6 mg/kg) PO OD** ART can be started without delay. Continue until patient is on ART AND has a CD4 count >100 cells/microL for at least 3 months
Encephalitis Encephalitis is an infection of brain tissue that presents with a level of brain dysfunction and signs of infection	**Acyclovir 10mg/kg (child < 5 years 20mg/kg, 5-12 years 15mg/kg, >12 years use adult dosing) IV TID** *Alternative (not preferred):* **Acyclovir 400mg PO 5 times a day**

Duration:
Treat for 2 weeks IV. Extend duration to 3 weeks in complicated infection.
Stop empiric dexamethasone.

Raised intracranial pressure (ICP):
Daily lumbar punctures should be performed to manage raised ICP due to Cryptococcal meningitis, until the patient is asymptomatic and CSF pressure is normal (<20cm).
In symptomatic patients with CSF pressure ≥50cm aim to reduce intracranial pressure by 50% of the opening pressure.

There is no role for acetazolamide, or mannitol to reduce intracranial pressure in cryptococcal meningitis.

There is no role for corticosteroids to reduce intracranial pressure in cryptococcal meningitis except in the setting of IRIS or cerebral oedema surrounding a cryptococcoma.

Duration:
Induction: At least 2 weeks. Extend if no clinical improvement, or if CSF sterilization not achieved (i.e. CSF cultures still grow cryptococcus at 2 weeks).
Consolidation: At least 8 weeks. Extend if slow clinical response, CSF sterilization not achieved by 2 weeks, or ART delayed by >10 weeks.
Eradication: At least 12 months.

In HIV delay commencement of antiretroviral therapy (ART) until 2-10 weeks after antifungal therapy has started.
After 12 months fluconazole can be stopped if the patient is on ART, with a CD4 count >100 and an undetectable viral load.

As it is difficult to differentiate clinically between viral and bacterial causes of CNS infection perform blood cultures, and lumbar puncture where safe to do so.

Many other disorders can mimic viral encephalitis and are also worth considering. This may include cerebral Toxoplasmosis (particularly if HIV positive),

such as fever. In the setting of meningoencephalitis it can often be difficult to differentiate between viral and bacterial causes, particularly if there are no typical associated features. If there is uncertainty it is important to also commence empirical antibiotics early (see **Acute Bacterial Meningitis** in Central Nervous System Infections chapter). VZV encephalitis should be suspected if associated with a typical rash (see **Zoster / Shingles** in Skin and Soft Tissue Infections chapter).	Consider empiric treatment for Listeria if at risk. See **Acute Bacterial Meningitis** above. Consider Toxoplasma encephalitis in immunocompromised patients. See ***Toxoplasma gondii*** in Special Infections chapter.
Brain abscess and Subdural Empyema Often polymicrobial and requires surgical consultation. Consideration of the source of spread is necessary but not always successful. Potential sources include paranasal sinusitis, otitis media, malignant otitis externa, dental infection, endocarditis, or penetrating trauma. Organisms may include anaerobes, Streptococcus and Gram-negative bacteria. Subdural empyema commonly occurs as a consequence of bacterial meningitis or frontal sinus infection.	**Ceftriaxone 2g (child 50mg/kg) IV BID** PLUS **Metronidazole 500mg (child 12.5mg/kg) IV TID** *If multiple abscesses or probable haematogenous spread ADD:* **Cloxacillin 2g (child 50mg/kg) IV QID** OR If increased risk of MRSA (recent prolonged or frequent hospital admission, prior colonization with MRSA). **Vancomycin IV, dose according to Vancomycin dosing section dosing section** For brain abscess after penetrating trauma or neurosurgery treat **Meningitis following penetrating head trauma or neurosurgery** (for duration follow **Brain abscess and Subdural Empyema)**

Tuberculosis or Anti-NMDAR encephalitis.

Many viruses such as Japanese encephalitis and Nipah virus cannot be treated with antivirals and should be managed with supportive care alone if diagnosis can be confirmed.

Duration:
If Herpes simplex (HSV) encephalitis is confirmed, or cannot be ruled out, treat with acyclovir for 14 to 21 days.

See also **Dendritic corneal ulceration caused by Herpes Simplex** virus in Chapter 7: Eye Infections, **Genital Herpes simplex virus** in Chapter 8: Genital Infections, **Neonatal Herpes simplex prophylaxis / treatment** in Chapter 11: Paediatric Infections (Neonates, Infants and Children), and **Herpes Simplex** in Chapter 13: Skin and Soft Tissue Infections

Surgical drainage is required. If present, infected sinus or ear should be drained and infected bone removed where possible. Send blood cultures, and tissue for culture and TB testing. Send Cryptococcal antigen. Change antibiotics according to culture results.

Seizures are frequent and prophylactic anticonvulsants should be given

In those who are immunocompromised consider other diagnoses including Toxoplasmosis, Cryptococcosis, Nocardiosis, and TB. Malignancy should also be considered if there is no improvement with empiric therapy.

Duration:
Treat for 6-8 weeks with a minimum of 2-4 weeks IV. If used, oral antibiotics should have good CNS penetration (e.g. Co-trimoxazole, fluoroquinolones). Do not use oral beta-lactams. IV treatment should be extended if surgical drainage cannot be performed.

Tuberculoma / Tuberculous Meningitis (Adult)	See **Timor-Leste Comprehensive TB Guidelines for National Tuberculosis Program.** To standard RHZE regime add corticosteroids for 6-8 weeks.
Epidural abscess Epidural abscesses are most commonly caused by *Staphylococcus aureus.* Tuberculosis is an important differential diagnosis in high prevalence settings like Timor-Leste.	**Cloxacillin 2g (child 50mg/kg) IV QID** PLUS In adults only: **Ceftriaxone 2g IV BID** *If increased risk of MRSA (recent prolonged or frequent hospital admission, prior colonization with MRSA) ADD:* **Vancomycin, dose according to Vancomycin dosing section.**
Neurocysticercoses Caused by the larval stage of the pork tapeworm *Taenia solium.* Patients with neurocysticercosis often present with seizures. Use of albendazole reduces long-term seizure frequency in patients with active lesions. Corticosteroids should always be administered with antiparasitic therapy. Corticosteroids should also be used in the treatment of cysticercal encephalitis.	*If antiparasitic treatment is indicated (see comments) USE:* **Albendazole 7mg/kg (maximum dose 600mg) PO BID** PLUS **Dexamethasone 0.1mg/kg PO OD** OR **Prednisone 1mg/kg PO OD** *(begin steroids one day before antiparasitic)* Patients should also be commenced on anti-epileptic treatment.

Test all patients for HIV.
In patients with HIV and TB meningitis delay ART for 8 weeks after commencement of TB treatment. Monitor for IRIS

Duration:
Treat for 9-12 months
Wean corticosteroids, and stop after 6-8 weeks

Take two sets of blood cultures prior to antibiotics.
Perform CT or MRI for diagnosis.
Change antibiotics according to culture results. If no microbiological diagnosis is obtained modify antibiotics according to the most likely cause of infection.

Duration:
Treat for at least 6 weeks, with a minimum of 2-4 weeks IV.

Diagnose based on consistent clinical picture and radiology (CT and/or MRI). Serologic testing is not currently available in Timor.
All patients should be evaluated for ocular cysticercosis by ophthalmology. Only treat patients with active lesions. Patients with calcified cysts and no active cysts do not benefit from treatment. Do not give antiparasitic therapy to patients with untreated hydrocephalus, ocular cysticercosis or high cyst burden disease with diffuse cerebral oedema, as inflammation around the degenerating cysts may worsen symptoms.

Oedema surrounding active lesions may cause raised intracranial pressure; this should be managed with corticosteroids.

Duration:
Treat for 10 days

References

Chang C, Hall V, Cooper C, Grigoriadis G, Beardsley J, Sorrell T, et al. Consensus guidelines for the diagnosis and management of cryptococcus and rare yeast infections in the haematology/oncology setting, 2021. Intern Med J 2021; 51 (Suppl. 7): 118-142

Chen S, Sorrell T. Cryptococcus gattii infection: treatment. In: Kauffman C, Mitty J, editors. UpToDate [internet]. Waltham (MA): UpToDate Inc; 2019. https://www.uptodate.com/contents/cryptococcus-gattii-infection-treatment?search=cryptococcoma&source=search_result&selectedTitle=3~16&usage_type=default&display_rank=3#H16486381

Cox G, Perfect J. Cryptococcus neoformans meningoencephalitis in patients with HIV: treatment and prevention. In: Bartell J, Bogorodskaya M, editors. UpToDate [internet]. Waltham (MA): UpToDate Inc; 2021. https://www.uptodate.com/contents/cryptococcus-neoformans-meningoencephalitis-in-patients-with-hiv-treatment-and-prevention?search=cryptococcal%20meningitis&source=search_result&selectedTitle=3~79&usage_type=default&display_rank=3

Cox G, Perfect J. Cryptococcus neoformans: treatment of meningoencephalitis and disseminated infection in HIV seronegative patients. In: Kauffman C, Kaplan S, Bogorodskaya M, editors. UpToDate [internet]. Waltham (MA): UpToDate Inc; 2019. https://www.uptodate.com/contents/cryptococcus-neoformans-treatment-of-meningoencephalitis-and-disseminated-infection-in-hiv-seronegative-patients?search=cryptococcal%20meningitis&topicRef=2447&source=see_link#H1351839573

eTG complete. Central Nervous System Infections. In: Therapeutic Guidelines [digital]. Melbourne: Therapeutic Guidelines Limited; 2019. http://www.tg.org.au

Gusmao dos Santos C, Francis J, Guterres J, Janson S, Lopes N, Marr I, et al. HNGV Antibiotic guidelines writing group. Antibiotic guidelines Hospital Nacional Guideo Valadares. Timor-Leste; 2016

Kurniawan M, Suharjanti I, Pinzon R, editors. Panduan Paktik Klinis Neurologis. Indonesia: PERDOSSI; 2016

National HIV/AIDS programme Timor-Leste. Guidelines for antiretroviral therapy and management of opportunistic infections for children, adolescents and adults living with HIV. Timor-Leste: Ministerio da Saude; 2021

Ropper A, Samuels M, editors. Infection of the Nervous System (bacterial, fungal, spirochetal, parasitic) and sarcoidosis. In: Adams and Victor's Principles of Neurology. 9th ed. New York: McGraw Hill; 2014

Samuels M, Ropper A, editors. Samuel's Manual of Neurological Therapeutics. 8th ed. Philadelphia: Lippincot Williams and Wilkins; 2010

Scheld M, Whitley R, Marra C, editors. Infections of the central nervous system. 3rd ed. Philadelphia: Lippincot Williams and Wilkins; 2004

White C. Cysticercosis: Treatment. In: Weller P, Baron E, editors. UpToDate [internet]. Waltham (MA): UpToDate Inc; 2021. https://www.uptodate.com/contents/cysticercosis-treatment?search=neurocysticercosis&source=-search_result&selectedTitle=2~24&usage_type=default&display_rank=2

Yeager C, Koffman L, Bleck T, editors. Treatment of infectious meningitis and encephalitis in neurocritical care unit. In: Nelson S, Nyquist P, editors, Neurointensive care unit: clinical practice and organization. Switzerland: Humana Press; 2020

Condition	Antimicrobial
Acute Odontogenic Infections The most important element of management is surgical drainage and removal of necrotic tissue with dental extraction where indicated.	*Localized without systemic symptoms:* Antibiotic use is not recommended *Infection with facial swelling but without severe or systemic symptoms:* **Amoxicillin 500mg (child 25mg/kg) PO TID** PLUS **Metronidazole 500mg (child 10mg/kg) PO BID** *Alternative:* **Amoxicillin/Clavulanic acid 500/125mg (child 25/6.25 mg/kg) PO TID** OR **Clindamycin 300mg (child7.5mg/kg) PO TID** *Infection with severe features or systemic involvement (including Ludwig angina):* Arrange urgent transfer to hospital. **Benzylpenicillin 3 million IU (1.8g) (if in ICU 4 million IU (2.4g)) (child 80 000 IU (50mg)/kg) IV Q4H** PLUS **Metronidazole 500mg (child 12.5mg/kg) IV BID** *Alternative:* If benzylpenicillin is not available replace with: **Ampicillin 2g (child 50mg/kg) IV Q4H** OR **Cefazolin 2g (child 50mg/kg) IV TID** OR **Clindamycin 600mg (child 15mg/kg) IV TID (no need for metronidazole if clindamycin is used)**

Comments and Duration of Therapy

For infection requiring hospital admission, take blood cultures and send operative specimens for culture.

Severe features include:
- Significant facial swelling and pain
- Neck swelling
- Trismus
- Dysphagia
- Difficulty breathing

Systemic features include:
- Fever >38 degrees C
- Tachycardia
- Pallor
- Diaphoresis

Duration:
Infection with facial swelling but without severe or systemic symptoms: Treat for 5 days
Infection with severe features or systemic involvement (including Ludwig angina): Change to oral antibiotics once improving. Treat until signs and symptoms of infection have resolved (10-14 days).

Infection following dentoalveolar surgery:
Most infections can be managed by dental treatment alone.
If there are systemic features of infection or the patient is immunocompromised treat as 'Infection with facial swelling but without severe or systemic symptoms', or 'Infection with severe features or systemic involvement', depending on severity.

See **Necrotising Soft Tissue Infection** in Chapter 13: Skin and Soft Tissue Infections.

Periodontitis (including Rapidly Progressing Periodontitis) Antibiotics are rarely needed for periodontitis.	Where antibiotics are indicated: **Amoxicillin 500mg (child 25mg/kg) PO TID** PLUS **Metronidazole 500mg (child 10mg/kg) PO BID** *Alternative:* **Amoxicillin/Clavulanic acid 500/125mg (child 25/6.25 mg/kg) PO TID** OR **Clindamycin 300mg (child 7.5mg/kg) PO TID**
Mandibular osteomyelitis of dental origin	For chronic osteomyelitis only commence antibiotics when causative organisms are identified following debridement. For acute osteomyelitis treat as **'Infection with severe features or systemic involvement (including Ludwig angina)'.** Change antibiotics according to culture results.
Alveolar osteitis (dry socket)	Systemic antibiotic use not recommended
Pulpitis (reversible and irreversible)	Systemic antibiotic use not recommended
Localized Pericoronitis	Systemic antibiotic use not recommended
Chronic gingivitis	Systemic antibiotic use not recommended
Dental caries	Systemic antibiotic use not recommended
Prophylaxis for dental procedures (see also Prophylaxis for Infective Endocarditis Prevention in Antibiotic Prophylaxis chapter)	No antibiotic prophylaxis is required for the following procedures: » Tooth extraction » Third molar surgery » Dental implant insertion » Periodontal surgery » Periapical surgery » Soft and hard tissue removal

First line treatment is mechanical plaque control with scaling and root debridement.
Only consider antibiotics in patients
With the following:

- Rapidly progressing periodontitis
- Periodontitis which has not responded to dental treatment
- Immunocompromised patients (including poorly controlled diabetes).

Duration:
Treat for 7 days

Surgical debridement with dental extraction where indicated is important.

Culture and antibiotic sensitivity testing is necessary to guide antibiotic treatment. Send tissue specimens from debridement for culture. If systemically unwell send blood cultures.

Duration:
Acute osteomyelitis: Treat for 6 weeks with at least 4 weeks IV.
Chronic osteomyelitis: Treat for 3 months with at least 2 weeks IV.

Local treatment with saline irrigation and antiseptic/analgesic dressings, in addition to symptomatic relief of pain.

Analgesic dressings and symptomatic relief of pain.

Local treatment with antiseptic irrigation and mouthwash, and symptomatic relief of pain

First line treatment is scaling and chemical plaque control, and mouthwash.

References

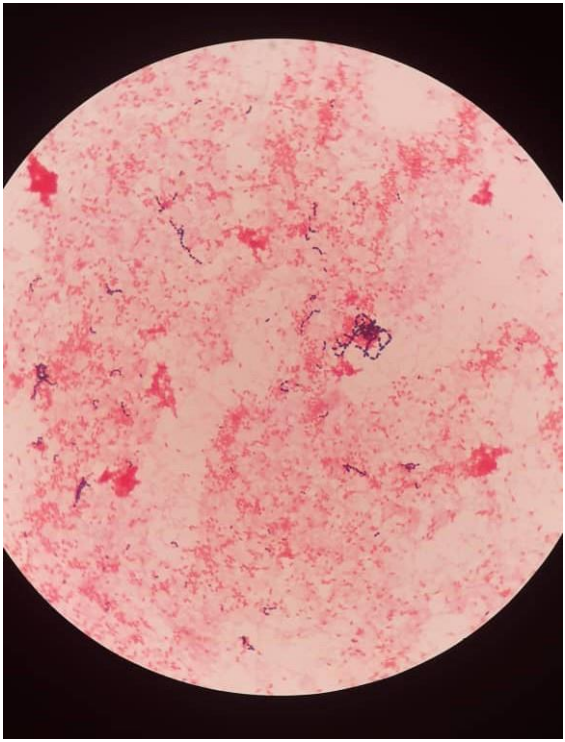
eTG complete. Acute Odontogenic Infections. In: Therapeutic Guidelines [digital]. Melbourne: Therapeutic Guidelines Limited; 2019. http://www.tg.org.au
Holmes C, Pellecchia R. Antimicrobial therapy in management of odontogenic infections in general dentistry. Dent Clin North Am 2016; 60 (2):497-507. Doi: 10.1016/j.cden.2015.11.013

Kementrian Kesehatan Republik Indonesia. Peraturan Menteri Kesehatan Republik Indonesia. Tentang pedoman penggunaan antibiotic. Indonesia; 2021
Ogle O. Odontogenic infections. Dent Clin North Am 2017; 61 (20):235-252. Doi: 10.1016/j.cden.2016.11.004.

Oral health division, Ministry of Health Malaysia. Guidelines for treatment of odontogenic infections in hospitalized adults. 3rd ed. Malaysia; 2019

University of Michigan. Guidelines for treatment of odontogenic infections in hospitalized adult. Michigan; 2021

Wilder R, Moretti A. Overview of gingivitis and periodontitis in adults. In: Deschler D, Kunins L, editors. UpToDate [internet]. Waltham (MA): UpToDate Inc; 2019. https://www.uptodate.com/contents/overview-of-gingivitis-and-periodontitis-in-adults?search=Necrotising%20gingivitis&source=search_result&selectedTitle=1~9&usage_type=default&display_rank=1#H858625715



Gram positive cocci in chain and gram negative bacilli on gram stain

Condition	Antimicrobial
Community acquired pneumonia (CAP) in children Pneumonia is an acute inflammation of the lung parenchyma. Children typically present with cough, difficulty breathing, and fever. Clinical signs include bronchial breath sounds and focal crackles. In infants <12 months, bronchiolitis is a more common cause of fast breathing and chest indrawing than pneumonia.	*Infants under 3 months:* Admit to hospital. **Ampicillin 50mg/kg IV TID** PLUS **Gentamicin 5mg/kg IV OD** *Infants and children over 3 months:* *Mild:* **Amoxicillin 40mg/kg (max 1g) PO BID** *Moderate:* **Ampicillin 50mg/kg (max 2g) IV TID** *If atypical infection (Mycoplasma, Legionella, B. pertussis) is suspected ADD:* **Azithromycin 10mg/kg IV/PO** *Severe:* **Ceftriaxone 50mg/kg (max 2g) IV OD** PLUS **Azithromycin 10mg/kg IV/PO OD** *If a parapneumonic effusion is present, or Staphylococcus aureus is considered likely, add:* **Cloxacillin 50mg/kg (max 2g) IV QID** (See Appendix H for neonatal dose intervals)
Community acquired pneumonia (CAP) in adults For adults with pneumonia use CORB score to assess severity: C = acute confusion = 1 O = oxygen saturation ≤90% = 1	*Mild:* **Amoxicillin 1g PO TID** *Alternative:* **Procaine penicillin 2.5 million IU (1.5g) IM OD** OR **Doxycycline 100mg PO BID**

Comments and Duration of Therapy

Take blood cultures prior to antibiotics if systemically unwell.

If cough has been present for more than 3 weeks, or there is associated weight loss or a known TB contact, consider TB in the differential diagnosis.

Severe pneumonia in children is associated with grunting, chest indrawing, oxygen saturation <90% or danger signs including inability to feed, lethargy or convulsions. See Community acquired pneumonia (CAP) in adults below for when to suspect Staphylococcus aureus infection.

Duration:
Mild-Moderate: Treat for 3-5 days
Severe: Change to oral antibiotics when improving. Treat for a total of 5-7 days.
Azithromycin: Stop after 5 days.

See **Community acquired pneumonia (CAP) in adults** in Chapter 6: ENT / Respiratory Tract Infections, comments section for further work-up if there is failure to improve despite broad spectrum antibiotics.

Send sputum culture in patients admitted with moderate or severe pneumonia, and patients with mild pneumonia who fail to respond to empiric treatment. Take blood cultures prior to antibiotics in patients who are systemically unwell. Consider performing nasopharyngeal swabs for influenza, RSV and COVID.

In patients with severe CAP suspect Staphylococcus aureus if any of the following:

- Rapid progression to sepsis

R = respiratory rate ≥30 = 1
B = blood pressure <90mmHg systolic, or <60mmHg diastolic = 1

Treat as severe if score is 2 or more.

Community acquired pneumonia is commonly caused by *Streptococcus pneumoniae*. Atypical bacteria including *Mycoplasma pneumonia, Chlamydophila pneumonia*e and *Legionella* spp. are also important causes of CAP. These atypical organisms are not adequately treated with beta-lactam antibiotics; this is the rational for the inclusion of doxycycline or azithromycin in empiric treatment regimes.

If cough persists for longer than 2-3 weeks, investigate for TB.

Moderate:
Benzylpenicillin 2 million IU (1.2g) IV QID
PLUS
Doxycycline 100mg PO BID

Alternative:
If benzylpenicillin is unavailable, replace this with:
Ampicillin 1g IV QID

Change to oral antibiotics when well, according to susceptibility results. If susceptibility results are not available use empiric treatment for mild pneumonia.

Severe:
Ceftriaxone 2g IV OD
PLUS
Azithromycin 500mg IV/PO OD

If Staphylococcus aureus is considered likely ADD:
Vancomycin IV loading dose 25-30mg/kg IV, then dose according to Vancomycin dosing section.

Alternative:
Cloxacillin 2g Q4H IV

If no improvement after 48 hours or ICU admission with pneumonia change to:
Meropenem 1g IV TID
PLUS
Azithromycin 500mg IV OD
And consider adding MRSA cover.

Change to oral antibiotics when well, according to susceptibility results. If susceptibility results are not available use:
Amoxicillin 1g PO TID

- Cavitary or necrotising pneumonia
- Multilobar consolidation
- Multiple lung abscesses or empyema
- Significant history of Staphylococcus skin and soft tissue infection
- Gram positive cocci in clusters in sputum gram stain

Duration:
Mild: Treat for 5-7 days
Moderate: Change to oral antibiotic when improving. Treat for a total of 7 days.
Severe: Stop azithromycin after 5 days. Change to oral antibiotics when well and treat for a total of 7-10 days.

If there is failure to improve despite broad spectrum antibiotics consider the following:
- TB testing
- CXR and / or CT to look for empyema, abscess, tumour
- HIV testing
- Non-infective cause of presentation (e.g. pulmonary oedema, pulmonary thromboembolic disease)

Hospital acquired pneumonia (HAP) Pneumonia that develops more than 48 hours after admission to hospital. This typically presents with fever, purulent sputum, new radiological infiltrate, raised inflammatory markers and deterioration in gas exchange.	*Mild:* **Amoxicillin/Clavulanic acid 500/125mg (child 25/6.25 mg/kg) PO TID** *Moderate to severe:* **Ceftriaxone 1g (child: 50mg/kg) IV BID** Change to oral antibiotics when well, according to susceptibility results. If susceptibility results are not available use: **Amoxicillin/Clavulanic acid 500/125mg (child 25/6.25 mg/kg) PO TID** *If no improvement after 48 hours and microbiology results are not available to direct treatment, change to:* **Meropenem 1g (child 25mg/kg) IV TID**
Ventilator associated pneumonia Pneumonia that develops in patient who has been mechanically ventilated for longer than 48 hours. This typically presents as fever, increased or purulent lower respiratory track secretions, new radiological infiltrates, raised inflammatory markers, and deterioration in gas exchange.	**Meropenem 1g (child 25mg/kg) IV TID** *If Staphylococcus aureus is considered likely ADD:* **Vancomycin loading dose 25-30mg/kg IV, then dose according to Vancomycin dosing section.** Change to oral antibiotics when well, according to susceptibility results. If susceptibility results are not available use: **Amoxicillin/Clavulanic acid 500/125mg (child 25/6.25 mg/kg) PO TID**

Take blood cultures prior to antibiotics in patients who are systemically unwell, and send sputum culture in all patients with HAP.

Most HAP is caused by micro-aspiration of bacteria that colonise the oropharynx. Prolonged hospitalization can result in changes to the oropharyngeal flora, with an increase in gram-negative colonization.

If there is no improvement despite broad-spectrum antibiotics, consider repeat CXR and/or CT to look for complications such as pleural effusion, empyema, or abscess.

Duration:
Mild: Treat for 7 days
Moderate to severe: Change to orals when well. Treat for 7-10 days

In all patients send tracheal aspirate for culture and send blood cultures prior to antibiotics.

Change from meropenem to targeted antibiotic cover as soon as culture and antibiotic sensitivity results available, to minimise development of antibiotic resistance in the ICU.

See **Community acquired pneumonia (CAP)** in adults in Chapter 6: ENT / Respiratory Tract Infections, for when to suspect *Staphylococcus aureus* pneumonia.
If there is no improvement despite broad-spectrum antibiotics, consider repeat CXR and/or CT to look for complications such as pleural effusion, empyema, or abscess.

Duration:
Change to orals when well. Treat for 7-10 days

Aspiration pneumonia This is a bacterial infection caused by aspiration of organisms from the oropharynx. Minor aspirations and aspiration without evidence of infection do not require treatment.	**Benzylpenicillin 2 million IU (1.2g) (child 80 000 IU (50mg)/kg) IV QID** *Alternative:* **Ampicillin 1g (child: 50mg/kg) IV TID** *If anaerobic organisms suspected, ADD:* **Metronidazole 500mg (child: 12.5mg/kg) IV/ PO BID** *If Staphylococcus aureus is considered likely ADD:* **Vancomycin loading dose 25-30mg/kg IV, then dose according to Vancomycin dosing section.** OR **Cloxacillin 2g (child 50mg/kg) IV QID** Change to oral antibiotics when well, according to susceptibility results. If susceptibility results are not available use: **Amoxicillin 1g PO TID (child: 40mg/kg PO BID)** OR (if Staphylococcus or anaerobes suspected) **Amoxicillin/Clavulanic acid 500/125mg (child 25/5 mg/kg) PO TID**
Lung abscess and empyema in adults Lung abscess is due to pulmonary tissue necrosis and formation of cavities containing necrotic debris and purulent fluid. Lung abscesses may be caused by aspiration of oral bacteria (polymicrobial including anaerobic organisms), a complication of pneumonia (e.g. Klebsiella pneumoniae, Staphylococ	*Mild to moderate:* **Benzylpenicillin 2 million IU (1.2g) IV QID** PLUS **Metronidazole 500mg IV/PO BID** *Alternative:* If benzylpenicillin is unavailable, replace this with: **Ampicillin 1g IV TID** *Severe:* **Ceftriaxone 2g IV BID** PLUS **Clindamycin 600mg IV/PO TID**

Take blood cultures prior to antibiotics in patients who are systemically unwell, and send sputum culture in all patients.

Causative organisms may be oral Streptococci, anaerobes, occasionally Gram-negative bacilli, and Staphylococcus aureus.

Anaerobic cover should only be considered in the setting of severe periodontal disease, malodorous sputum, or hazardous alcohol consumption.

See **Community acquired pneumonia (CAP)** in adults in Chapter 6: ENT / Respiratory Tract Infections, for when to suspect Staphylococcus aureus pneumonia.

Duration:
Change to orals when well. Treat for 7 days.

Take blood cultures prior to antibiotics, and send sputum culture in all patients. Send pleural fluid aspirate for culture, TB testing if indicated, and chemistry.

Change antibiotics according to results of cultures and susceptibilities when available.

Duration:
Change to orals when well. Treat for a total of 3-4 weeks.

If there is failure to improve despite antibiotics, adequate drainage, and no microbiology results are available, consider alternative diagnosis:

- TB
- Nocardia

cus aureus), or a metastatic complication of bacteraemia (e.g. Staphylococcus aureus).

Empyema is a collection of pus in the pleural space and usually occurs as a complication of pneumonia. Adequate drainage is essential for cure of empyema. Seek Surgical review.

Alternative:
If clindamycin is unavailable, replace this with:
Metronidazole 500mg IV BID

If patient is in septic shock treat with:
Meropenem 1g IV TID
AND
Vancomycin loading dose 25-30mg/kg IV, then dose according to Vancomycin dosing section.

Alternative:
Vancomycin loading dose 25-30mg/kg IV, then dose according to Vancomycin dosing section.
PLUS
Amikacin 28mg/kg IV OD as a first dose in patients with creatinine clearance >60ml/minute. Use 16-20mg/kg if creatinine clearance <60ml/minute. For subsequent doses see **Aminoglycoside dosing** section.
If amikacin is not available and patient is likely to have normal renal function add Gentamicin 7mg/kg IV for first dose. If renal function is likely to be abnormal give Gentamicin 4-5mg/kg.

Change to oral antibiotics when well, according to susceptibility results. If susceptibility results are not available use:
Amoxicillin/Clavulanic acid 500/125mg PO BID

Alternative:
Cefuroxime 500mg PO BID
PLUS
Metronidazole 500mg PO BID

OR
Amoxicillin 1 g PO TID
PLUS
Metronidazole 500 mg PO BID

» Cryptococcus
» Melioidosis
» Non-infective cause (e.g. tumour, vasculitis).

See ***Staphylococcus aureus bacteraemia*** in Chapter 12: Sepsis and Directed Therapy for Blood Stream Infections if this is present.

Lung abscess and empyema in children Adequate drainage is essential. Seek Surgical opinion for consideration of intercostal drain insertion.	**Ceftriaxone 50mg/kg (max 2g) IV BID** PLUS **Clindamycin 15mg/kg (max 600mg) IV/PO TID**
Bronchiectasis – acute exacerbation Bronchiectasis is irreversible abnormal dilatation of one or more bronchi with chronic airway inflammation. Clinical features include chronic sputum production, recurrent chest infections, and airflow obstruction. An exacerbation of bronchiectasis is an acute deterioration in a patient's symptoms from their usual baseline as evidenced by increased cough, sputum volume or purulence, dyspnoea, hypoxia or fever. Patients should only be treated with antibiotics during an acute exacerbation.	*Mild to moderate:* **Amoxicillin 1 g (child: 25mg/kg) PO TID** *Alternative:* **Doxycycline 100 mg PO BID** OR **Chloramphenicol 500mg (child 10mg/kg) PO QID** *Severe:* **Benzylpenicillin 2 million IU (1.2g) (child 80 000 IU (50mg)/kg) IV, QID** PLUS **Ciprofloxacin 500mg (child 10mg/kg) PO BID** *If no improvement after 48 hours and microbiology results are not available change to:* **Meropenem 1g (child 25mg/kg) IV TID** *Change to oral antibiotics when well, according to susceptibility results. If susceptibility results are not available use:* **Amoxicillin/Clavulanic acid 500/125mg (child 25/6.25 mg/kg) PO TID** OR if Pseudomonas suspected **Ciprofloxacin 500mg (child 15mg/kg) PO BID**

Take blood cultures prior to antibiotics. Send pleural fluid aspirate for culture, TB testing if indicated, and chemistry.

If no improvement despite adequate drainage, and no microbiology results available, consider alternative diagnoses such as:

- TB
- Nocardia infection
- Melioidosis

Duration:
Step down to oral antibiotics based on susceptibilities when improving. Treat for a total of 3-6 weeks.

Send sputum culture, and if systemically unwell send blood cultures prior to antibiotics. Consider performing nasopharyngeal swabs for influenza, RSV and COVID.

Patients with bronchiectasis are commonly colonized with pathogens including *Haemophilus influenzae, Streptococcus pneumoniae, Moraxella catarrhalis, Pseudomonas aeruginosa* and *Staphylococcus aureus.* Sputum cultures need to be interpreted in the clinical context, as organisms isolated may be colonizing rather than causing infection. If patient is improving on empiric antibiotics there is no need to change the antibiotics if a resistant organism is grown from sputum cultures.

Duration:
Treat for 10-14 days

Chronic obstructive pulmonary disease (COPD) – acute exacerbation An exacerbation of COPD is an acute deterioration in a patient's symptoms from their usual baseline as evidenced by increased cough, sputum volume or purulence, dyspnoea, hypoxia or fever. Acute exacerbations may be triggered by viral or bacterial infection, or non-infective causes. Respiratory viruses are the most common cause.	Only use antibiotics if patient has symptoms suggestive of a bacterial infection. **Amoxicillin 500mg PO TID** *Alternative:* **Doxycycline 100mg PO BID**
Asthma – acute exacerbation Most respiratory infections that trigger asthma exacerbations are viruses. Routine antibiotic use is not beneficial.	**Avoid routine antibiotic use.**
Acute Bronchitis Characterised by inflammation and bronchospasm of the airways with coughing, wheeze, and shortness of breath.	**Avoid routine antibiotic use**
Bronchiolitis Acute bronchiolitis is a lower respiratory viral infection in children <24 months, which typically occurs in annual epidemics and is characterized by airways obstruction and chest wheeze. Respiratory Syncytial Virus (RSV) is the most common cause, and secondary bacterial infection is uncommon (<2%).	*If antibiotics are indicated give:* **Ampicillin 50mg/kg IM/IV QID**

Consider performing nasopharyngeal swabs for influenza, RSV and COVID.

Increased sputum volume, increased sputum purulence or change in colour, and fever can suggest a bacterial cause.

If consolidation on CXR treat as **Community-acquired pneumonia.**

D*uration:*
Treat for 5 days

Consider performing nasopharyngeal swabs for influenza, RSV and COVID.
If there is consolidation on CXR treat as **Community-acquired pneumonia.**

Most patients have a viral infection or history of exposure to cigarette smoke or other toxic inhaled substances.
If consolidation on CXR, purulent sputum and/or increased work of breathing, treat as **Community-acquired pneumonia.**

Consider performing nasopharyngeal swabs for influenza, RSV and COVID.

Antibiotics are not indicated routinely, but should be given for severe disease, infants < 2 months, or when secondary bacterial infection is suspected based on CXR changes.

If evidence of sepsis, aspiration, or acute consolidation on CXR, treat as **Community-acquired pneumonia.**

Duration:
Treat for 3 days.

Tuberculosis (TB) TB is an infectious disease that is spread by airborne droplets containing Mycobacterium tuberculosis complex. Symptoms and signs include persistent cough for more than two weeks, haemoptysis, fever, chest pain, night sweats, lethargy, anorexia, and weight loss. See Timor-Leste Comprehensive TB Guidelines for National Tuberculosis Program. If drug resistant TB is detected or suspected refer to Pulmonology and Infectious Diseases if available.	*Adult:* Intensive phase: **Four drug fixed combination (Rifampicin 150mg / Isoniazid 75mg / Pyrazinamide 400mg / Ethambutol 275mg**) Dosed according to body weight. *Continuation phase:* **Two drug fixed combination (Rifampicin 150mg / Isoniazid 75mg)** Dosed according to body weight. *Children:* Intensive phase: **Three drug fixed combination (Rifampicin 75mg / Isoniazid 50mg / Pyrazinamide 150mg)** Dosed according to body weight. *Continuation phase:* **Two drug fixed combination (Rifampicin 75mg / Isoniazid 50mg)** Dosed according to body weight.
Acute Bacterial Otitis Media Viral upper respiratory tract infections are often accompanied by mild inflammation of the middle ear. Acute otitis media is very likely if there is an acute onset of symptoms with an erythematous, bulging, immobile tympanic membrane or pus draining from the ear for <2 weeks.	*Without perforation:* **Amoxicillin 500mg PO TID (child 50mg/kg PO BID)** If no improvement after 3 days change to: **Amoxicillin/Clavulanic acid 500/125mg (child 25/6.25 mg/kg) PO TID** *Alternative:* **Cotrimoxazole 160/800 mg (child 4/20 mg/kg) PO BID**

Send sputum (and other relevant samples) for TB GeneXpert, AFB, and culture. If suspicion of pulmonary TB is high, but sputum is negative, repeat sputum testing twice more.

All patients with TB should be tested for HIV. Monitor chemistry and liver function in all patients on TB treatment.

A bacteriologically confirmed TB case is one from whom a biological specimen is positive by smear microscopy or GeneXpert MTB/RIF, LPA, or culture. A clinically diagnosed TB case is someone who does not fulfil the criteria for bacteriological confirmation but has been diagnosed with active TB by a clinician, or other medical practitioner who has decided to give the patient a full course of TB treatment. This definition includes cases diagnosed on the basis of CXR abnormalities or suggestive histology and extrapulmonary cases without laboratory confirmation.

Duration:
Intensive phase: Treat for 2 months.
Continuation phase: Treat for 4 months.

Adult pulmonary TB patients should be asked if they have close household contacts <5 years of age, who are at high risk of progressing to TB disease following likely exposure. Household contacts should be offered TB preventative therapy once active TB is excluded.

See **Neonatal TB Prophylaxis** in Chapter 11: Paediatric Infections (Neonates, Infants and Children), and **Paediatric TB** in Chapter 11: Paediatric Infections (Neonates, Infants and Children)

Consider sending middle ear fluid for culture if poor response to empiric therapy.

Ear toileting involves dry mopping the ear with rolled tissue spears or similar, performed QID until the ear is dry. Perform prior to instilling eardrops.

Gentamicin eardrops are contraindicated in the setting of a perforated tympanic membrane due to risk of ototoxicity.

Duration:
Without perforation: Treat for 5-7 days
With perforation: Treat for 14 days

Pain alone is not sufficient for a diagnosis of otitis media. Most do not require antibiotics and recover with supportive therapy alone within 48 hours	*With perforation:* **Amoxicillin 500mg PO TID (child 50mg/kg PO BID)** PLUS **Ear toileting** PLUS **Ciprofloxacin 0.3% solution 5 drops BID (child only add if no response after 7 days of amoxicillin, give 2-5 drops QID).**
Acute mastoiditis Infection of the mastoid air cells of the temporal bone. In children mastoiditis is a rare complication of acute otitis media. In adults mastoiditis can be a complication of chronic suppurative otitis media or cholesteatoma. Symptoms include conductive hearing loss and tenderness, swelling, and pain behind the ear. Complications include subperiosteal, subcutaneous, intratemporal or intracranial collections, and facial nerve palsy. Consider CT and/or MRI to detect bone involvement or intracranial complications. Refer to **ENT.**	*Adult:* **Ceftriaxone 2g IV OD** PLUS **Cloxacillin 2g IV QID** *If no improvement and no culture results available, consider changing to:* **Meropenem 1g IV TID** *Child:* **Ceftriaxone 50mg/kg IV OD** *Adult and child: Change to oral antibiotics when appropriate (see duration), according to susceptibility results. If susceptibility results are not available use:* **Amoxicillin/Clavulanic acid 500/125mg (child 25/6.25 mg/kg) PO TID** *Alternative:* **Azithromycin 10mg/kg PO OD** OR **Cefuroxime 15mg/kg PO BID**
Acute diffuse otitis externa Often caused by skin breakdown in the external auditory canal following excessive water exposure. *Pseudomonas*	**Betamethasone 0.1%/Polymyxin 5000U/ Bacitracin 400U solution 3 drops to affected ear(s) TID** PLUS **Ear toileting (see comments)**

Aspiration and drainage of middle ear, or mastoidectomy may be required. Send operative samples for culture.

Duration:
Adult: Treat with IV antibiotics for 4 weeks then change to oral antibiotics to complete 6 weeks total treatment.
Child: Treat with IV antibiotic for at least 5 days then change to oral antibiotics when improving. Treat for a total of 12-15 days. Longer antibiotic treatment is required if there are intracranial complications.

Send swab for culture in patients with severe or recurrent otitis externa, and in patients who are immunocompromised.

The ear canal must be kept as dry as possible during treatment and for 2 weeks afterwards. Ear toileting involves dry mopping the ear with rolled tissue spears or similar, performed QID until the ear is dry. Perform prior to instilling eardrops.

aeruginosa and *Staphylococcus aureus* are common organisms. Topical therapy alone is sufficient in most cases of acute diffuse otitis externa.	*Alternative:* **Betamethasone 0.1%/Ciprofloxacin 0.3% solution 3 drops to affected ear(s) TID** PLUS **Ear toileting (see comments)** *For otitis externa with systemic symptoms, spread of inflammation to pinna, or folliculitis, to topical treatment ADD:* **Cloxacillin 500mg (child 12.5mg/kg) PO QID** PLUS **Ciprofloxacin 750mg (child 15mg/kg) PO BID**
Necrotising otitis externa A rare complication of acute diffuse otitis externa, involving spread of infection to cartilage and bone in the external ear canal and base of skull. Mostly occurs in elderly, immunocompromised, or diabetic patients. Infection is most commonly caused by *Pseudomonas aeruginosa.* Consider CT and/or MRI to detect bone involvement or intracranial complications.	**Meropenem 2g (child 40mg/kg) IV TID** *Alternative:* **Ciprofloxacin 400mg (child 10mg/kg) IV TID** OR **Ciprofloxacin 750mg (child 15mg/kg) PO BID** *Change to oral antibiotics when improving according to susceptibility results. If susceptibility results are not available use:* **Ciprofloxacin 750mg (child 20mg/kg) PO BID** *Alternative:* **Levofloxacin 750mg (child 10mg/kg) PO OD**
Acute sinusitis Often follows viral upper respiratory tract infections. Common causes of bacterial rhinosinusitis are *Streptococcus pneumoniae* and *Haemophilus influenzae.* Most do not require antibiotics and recover with supportive care alone within 10 days.	Avoid routine antibiotic use. *If antibiotics are indicated (see comments), use:* **Amoxicillin 500mg (child: 15mg/kg) PO TID** *Alternative:* **Phenoxymethylpenicillin 500mg (child 12.5mg/kg) PO QID** OR **Doxycycline 100mg BID** *If worsening symptoms after initial improvement seek ENT review and change to:* **Ceftriaxone 2g (child 50mg/kg) IV OD**

Duration:
Simple otitis externa: Treat for 5-7 days
Otitis externa with systemic symptoms, spread of inflammation to pinna, or folliculitis: Treat for 7-10 days

Consider the possibility of necrotising otitis externa in patients who fail to improve with above treatment.

Send swabs and tissue samples for culture prior to antibiotics. Send blood cultures if systemically unwell or immunocompromised. Consider biopsy if no pathogen is isolated from other cultures and patient fails to improve with empiric therapy.

Duration:
Change to oral antibiotics when clinically improving. Treat for a total of 6-8 weeks.

Refer to **ENT** and **Infectious Diseases** where available.

Consider antibiotics in patients with high fever for more than 3 days, or severe symptoms for more than 5 days, including purulent nasal discharge, sinus tenderness or maxillary toothache.

Patient with severe features or worsening symptoms after initial improvement may require ENT review and consideration of nasal endoscopy or surgical intervention.

Duration:
Treat for 7 days

Pharyngitis / Tonsilitis Acute pharyngitis is commonly caused by viruses, but it can also be caused by *Streptococcus pyogenes.* Distinguishing viral from bacterial pharyngitis on clinical findings alone has not proven to be accurate. In Timor-Leste, due to the high incidence of Rheumatic Heart Disease someone who presents with sore throat with pain or swelling or exudate, with or without associated fever of lymphadenopathy should be treated for presumed *Streptococcus pyogenes* pharyngitis.	**Benzathine Penicillin 1.2 million IU (900mg) (child <20kg 0.6 million IU (450mg)) IM** *Alternative:* **Phenoxymethylpenicillin 500mg (child 15mg/kg) PO BID** OR **Amoxicillin 500mg (child 25mg/kg) PO BID** OR **Azithromycin 500mg (child 12 mg/kg) PO OD**
Peritonsillar abscess (Quinsy) Presents with trismus, severe unilateral throat pain, high fever, change in voice. Most abscesses are polymicrobial; pathogens include *Streptococcus pyogenes,* and *Fusobacterium* spp. Monitor patients for signs of airway obstruction.	Adequate drainage is essential, usually requiring aspiration in hospital. **Benzylpenicillin 2 million IU (1.2g) (child 80 000 IU (50mg)/kg) IV, QID** *Alternative:* **Ampicillin 2g (child 50mg/kg) IV QID** OR **Clindamycin 600mg (child 15mg/kg) IV TID** *Change to oral antibiotics when improving according to susceptibility results. If susceptibility results are not available use:* **Phenoxymethylpenicillin 500mg (child 12.5mg/kg) PO BID** OR **Amoxicillin 500mg (child 15mg/kg) PO TID** OR **Clindamycin 450mg (child 10mg/kg) PO TID**

It is important to complete the antibiotic course even after recovery to prevent Rheumatic Heart Disease.

Duration:
Benzathine Penicillin: single dose only
Phenoxymethylpenicillin or Amoxicillin: Treat for 10 days
Azithromycin: Treat for 5 days

See **Rheumatic Fever secondary prophylaxis** in Chapter 1: Antibiotic Prophylaxis.

Send aspirated fluid for culture.

Duration:
Change to oral antibiotics 1-2 days after abscess drainage once patient improves. Treat for a total of 10 days.

Acute Epiglottitis / Supraglottitis This is a life-threatening infection caused by infection of the epiglottis and surrounding structures. Pathogens include *Haemophilus influenzae* and *Streptococcus pyogenes.* All patients require urgent hospitalisation, with intensive monitoring for airway obstruction. Refer all patients to **ENT** and/or **Anaesthetics** for airway management.	**Ceftriaxone 1g (child 50mg/kg) IV OD (if patient requires ICU use BID dosing)** *Alternative:* **Levofloxacin 750mg (child 10mg/kg) IV OD** *Change to oral antibiotics when improving according to susceptibility results. If susceptibility results are not available use:* **Amoxicillin/Clavulanic acid 500/125mg (child 25/6.25 mg/kg) PO TID** *Alternative:* **Levofloxacin 750mg (child 10mg/kg) PO OD**
Diphtheria Caused by toxin-producing Corynebacterium diphtheriae. Diphtheria can present as a respiratory or cutaneous disease with possible cardiac, neurological, or renal complications. The respiratory presentation can be rapidly fatal due to the risk of upper airway obstruction by a pseudomembrane. All patients require urgent hospitalisation, with close monitoring for airway obstruction. Refer all patients to **ENT**. Diphtheria antitoxin is the primary treatment however this is not currently available in Timor-Leste.	**Benzylpenicillin 2 million IU (1.2g) (child 50 000 IU (30mg)/kg) IV, QID** *Alternative:* **Ampicillin 2g (child 50mg/kg) IV QID** OR **Azithromycin 500mg (child 10mg/kg) IV OD** *Change to oral antibiotics when improving according to susceptibility results. If susceptibility results are not available use:* **Phenoxymethylpenicillin 500mg (child 12.5mg/kg) PO BID** OR **Amoxicillin 500mg (child 15mg/kg) PO TID** OR **Azithromycin 500mg (child 10mg/kg) PO OD**

Take blood cultures prior to antibiotics. If patient is septic give antibiotics within 1 hour of presentation.

In children minimize distress, unnecessary examination, and invasive procedures.

Duration:
Change to oral antibiotics when clinically improving. Treat for a total of 7-10 days

Swab membrane and material beneath membrane for culture. Transport swabs to laboratory as soon as possible and inform laboratory of suspected diagnosis.
In the absence of microbiological evidence, there should be a strong clinical suspicion of Diphtheria when a bluish-white or grey membrane forms in the throat or on the tonsils on the background of sore throat, low-grade fever, and cervical lymphadenopathy. The membrane typically bleeds on scraping.

An ECG can be useful to monitor toxin-induced myocarditis and its complications such as severe arrhythmias.

Duration:
Change to oral antibiotics when clinically improving.
Phenoxymethylpenicillin or Amoxicillin: Treat for total of 14 days.
Azithromycin: Treat for total of 5 days.

References

American Academy of Pediatrics. Tables of antibacterial drug dosages. In: Kimberlin D, Brady M, Jackson M, Long S, editors. Red Book 2018 Report of the Committee on Infections diseases. 31st ed. Itasca, IL; 2018

ARF/RHD technical working group. Timor-Leste guidelines for the prevention and management of acute rheumatic fever (ARF) and rheumatic heart disease (RHD). Timor-Leste: Ministerio da Saude; 2021

Brook I. Anaerobic bacteria in upper respiratory tract and head and neck infections: microbiology and treatment. Anaerobe 2012; 18(2):214-220. Doi: 10.1016/j.anaerobe.2011.12.014

Desrosiers M, Evans G, Keith P, Wright E, Kaplan A, Bouchard J, et al. Canadian clinical practice guidelines for acute and chronic rhinosinusitis. Allergy Asthma Clin Immunol 2011; 7(2). https://doi.org/10.1186/1710-1492-7-2

eTG complete. Ear, nose and throat infections. In: Therapeutic Guidelines [digital]. Melbourne: Therapeutic Guidelines Limited; 2019. http://www.tg.org.au

eTG complete. Respiratory Tract Infections: other than pneumonia. In: Therapeutic Guidelines [digital]. Melbourne: Therapeutic Guidelines Limited; 2019. http://www.tg.org.au

eTG complete. Respiratory Tract Infections: pneumonia. In: Therapeutic Guidelines [digital]. Melbourne: Therapeutic Guidelines Limited; 2019. http://www.tg.org.au

Gusmao dos Santos C, Francis J, Guterres J, Janson S, Lopes N, Marr I, et al. HNGV Antibiotic guidelines writing group. Antibiotic guidelines Hospital Nacional Guideo Valadares. Timor-Leste; 2016

Mathur S, Fuchs A, Bielicki J, Van Den Anker J, Sharland M. Antibiotic use for community-acquired pneumonia in neonates and children: WHO evidence review. Paediatr Int Child Health 2018; 38 (suppl 1):S66-75. Doi: 10.1080/20469047.2017.1409455.

Ministerio da Saude. Comprehensive TB guidelines for national tuberculosis control program. 5th ed. Dili: Ministerio da Saude, World Health Organisation; 2020

National institute for health and care excellence. Sinusitis (acute): antimicrobial prescribing, NICE guideline [NG79]. UK; 2017.

National institute for health and care excellence. Sore throat (acute): antimicrobial prescribing, NICE guideline [NG84]. UK; 2018.

Rosenfeld R, Schwartz S, Cannon C, Roland P, Simon G, Kumar K, et al. Clinical practice guideline: acute otitis externa. Otolaryngol Head Neck Surg 2014; 150(Suppl 1): S1-24. Doi: 10.1177/0194599813517083

Rubin J. Malignant (necrotizing) external otitis. In: Edwards M, Durand M, Bogorodskaya M, editors. UpToDate [internet]. Waltham (MA): UpToDate Inc; 2022.https://www.uptodate.com/contents/malignant-necrotizing-external-otitis?search=necrotizing%20otitis%20externa&source=search_result&selectedTitle=1~13&usage_type=default&display_rank=1

Schilder A, Chonmaitree T, Cripps A, Rosenfeld R, Casselbrant M, Haggard M, et al. Otitis media. Nat Rev Dis Primers 2016; 2 (1):16063. Doi: 10.1038/nrdp.2016.63

Thomas J, Berner R, Zahnert T, Dazert S. Acute Otitis Media – a structured approach. Dtsch Arztebl Int 2014; 111 (9):151-160. Doi: 10.3238/arztebl.2014.0151

Condition	Antimicrobial
Blepharitis Inflammation of the lid margins divided anatomically into anterior and posterior. Anterior refers to inflammation mainly centred around eyelashes and follicles, while posterior blepharitis involves the meibomian glands.	*Anterior:* Lid hygiene with daily warm compresses and gentle scrubbing *Posterior:* Lid hygiene (as above) initially If no improvement use: **Doxycycline 100 mg (child ≥8 years: 2mg/kg) PO OD**
External hordeolum (Stye) Abscess of small sebaceous gland associated with the eyelash. When infected it is generally staphylococcal infection. Most hordeola do not require any therapy aside from warm compresses. If the lesion does not reduce in size in 1-2 weeks refer to ophthalmology for consideration of incision and drainage.	Consider warm compresses BID. There is little evidence that treating with topical antibiotics improves outcome, only consider this in patients with frequent hordeola who do not achieve adequate improvement with warm compresses and removal of lid margin debris. *Adults:* **Tetracycline 1% ointment applied to the affected eye at night + Chloramphenicol 1% ointment or 0.5% eye drop solution QID.** *Child:* **Tetracycline 1% ointment applied to the affected eye TID-QID**
Internal Hordeolum (Meibomian abscess) Abscess of the meibomian gland usually caused by *Staphylococcus aureus.* Gland is often tender.	Consider warm compresses BID. If signs of cellulitis see **Pre-septal** and **Orbital Cellulitis** in Eye Infections chapter.
Endophthalmitis An inflammatory condition of the intraocular cavity	*Intravitreal:* **Vancomycin 2mg in 0.1ml**

	Comments and Duration of Therapy
	The exact aetiology is unclear, but infection be a complication of seborrhoeic dermatitis, or acne rosacea with secondary Staphylococcus or Streptococcus involvement *Duration:* Treat for 3-8 weeks
	Removal of the eyelash often aids resolution
	Topical antibiotics are not indicated. Incision and drainage is sometimes necessary for persistent or recurrent meibomian abscess
	Send vitreous samples for culture. Delayed treatment may result in loss of vision/loss of eye.

usually caused by infection. Presentation is usually acute with impaired vision, eyelid oedema, a congested eye, redness, and pain. May also occur as a serious complication of cataract surgery, following a penetrating eye injury, or as a result of metastatic bacterial infection. **Ophthalmology** review required. See Sepsis and Directed Therapy for Blood Stream Infections chapter	PLUS **Ceftazidime 2mg in 0.1ml** PLUS **Dexamethasone 0.01 mg in 0.1ml** *If delay in review by ophthalmology give:* **Ciprofloxacin 750mg (child 20mg/kg) PO BID** PLUS **Vancomycin IV, dose according to Vancomycin dosing section**
Bacterial Conjunctivitis Presents as irritated red eyes with purulent discharge stuck to the eyelid. Symptoms usually begin unilaterally. Many cases will spontaneously resolve within 5 -7 days. Conjunctivitis in the neonatal period requires urgent treatment. See **Neonatal Conjunctivitis or Gonococcal Ophthalmia Neonatorum** in Paediatric Infections (Neonates, Infants and Children) chapter.	Antibiotics are often not required. *If severe or not resolving, use:* **Chloramphenicol 1% ointment or 0.5% eyedrops 1 drop to the affected eye 1-2 hourly for the first 24 hours. Thereafter QID.** *Alternative:* **Tetracycline 1% ointment to the affected eye TID**
Trachoma A clinical diagnosis in the setting of chronic conjunctivitis. Caused by *Chlamydia trachomatis,* trachoma is the leading cause of preventable infectious blindness in the world.	**Azithromycin 1g (child >6months 20mg/kg) PO for 1 dose** *Alternative or if <6 months old:* **Tetracycline 1% ointment BID to both eyes for at least 6 weeks. Repeat after interval of 6 months for another 6 weeks if necessary.**

Do not use topical antibiotics if an open globe injury is suspected as preservatives are toxic to the endothelium /intraocular contents.

Endogenous endophthalmitis results from micro-organism seeding from a blood stream infection. If this is the diagnosis take two sets of blood cultures prior to antibiotics, and consider the possibility of endocarditis. Identify and treat the primary underlying infection with systemic antibiotics in addition to intravitreal antibiotics. If primary infection is unclear use ciprofloxacin and vancomycin.

Duration:
This depends on clinical response and source of infection. Seek ophthalmology advice.

Chloramphenicol can cause contact hypersensitivity reactions that can be severe.

If failing to respond to antibiotic therapy, significant pain, loss of vision or photophobia, refer immediately to ophthalmologist.

Duration:
Treat for a total of 7 days.

In areas where Trachoma is prevalent, regular face washing and treatment of all household contacts is recommended. It is not prevalent in Timor-Leste.

Pre-septal Cellulitis Soft tissue infection of the eyelids anterior to the orbital septum. Vision and ocular range of movement are normal.	*Mild:* **Cloxacillin 500mg (child 12.5mg/kg) PO** *Alternative:* **Cotrimoxazole 160/800 mg (child 4/20 mg/kg) PO BID** OR **Clindamycin 450 mg (child 10mg/kg) PO TID** *Moderate or Severe:* **Cloxacillin 2g (child 50mg/kg) IV QID** *Alternative:* **Cefazolin 2g (child 50mg/kg) IV TID** OR **Clindamycin 600mg (child 15mg/kg) IV TID**
Orbital Cellulitis Usually arises from infection of the paranasal sinuses or after orbital trauma. Clinical symptoms include reduced vision, limited or painful extraocular movement or proptosis. Urgent referral to **Ophthalmology** is required for possible drainage. Consider CT scan.	**Cloxacillin 2g (child: 50mg/kg up to 2g) IV QID** PLUS **Ceftriaxone 2g (child: 50mg/kg) IV OD** *Alternative:* If cloxacillin is not available replace this with: **Cefazolin 2g (child 50mg/kg) IV TID** OR **Clindamycin 600mg (child 15mg/kg) IV TID** *When improving, change to:* **Amoxicillin/Clavulanic acid 500/125mg (child 25/6.25 mg/kg) PO TID**
Corneal ulcer Symptoms include pain and worsening photophobia. A small white spot is often evident on the cornea. Refer to **Ophthalmology**. If dendritic appearance (branching pattern), see **Dendritic corneal ulceration** below.	**Chloramphenicol 1% ointment or 0.5% solution 1 drop to the affected eye Q1H initially** *Alternative:* **Ciprofloxacin 0.3% solution Q1H** Frequency should be decreased according to clinical response under supervision of an ophthalmologist.

Take blood cultures if systemically unwell.

Duration:
Change to oral antibiotics when improving, treat for a total of 7 days.

Take blood cultures if systemically unwell.

Pathogens include Staphylococcus aureus, Haemophilus spp., Streptococcus spp., and anaerobic bacteria. Infection can be caused by fungi in immunocompromised patients or those with diabetes. If this is suspected clinically, antifungal cover will be required.

Duration:
Treat for a total of 14 days.

Consider brain abscess if there is intracranial spread of infection seen on CT. See **Brain abscess and Subdural Empyema** in Chapter 4: Central Nervous System Infections.

Corneal scraping for culture of the specimen should be performed by ophthalmologist

Strict hourly dosing (including overnight) for the first 48 hours improves outcomes. Treatment may need to be supplemented with subconjunctival injection by an ophthalmologist if there is pus present in the anterior chamber.

Dendritic corneal ulceration caused by Herpes Simplex virus.	**Acyclovir 3% ointment to the affected eye five times daily**
Fungal Corneal Ulcer Suspect if history of trauma especially by wood or tree branches. Refer to Ophthalmology immediately	**Natamycin eye drops, 1 drop every 1-2 hours. Reduce to TDS / QID after 3-4 days.**
Non-perforating eye injuries	*If no evidence of infection:* Symptomatic treatment only, rinsing eyes with clean water. *If infected (sticky discharge):* **Chloramphenicol 1% ointment or 0.5% solution 1 drop into the affected eye 1-2 hourly for the first 24 hours. Thereafter QID.**
Perforating Eye Injuries / Open Globe Injuries Immediately refer to **Ophthalmology**	Apply eye shield. *Give:* **Ciprofloxacin 750mg (child 20mg/kg) PO BID**
Corneal abrasion without infection	**Chloramphenicol 1% ointment and/or 0.5% solution 1 drop into the affected eye QID.**

Fluorescein staining of the cornea facilitates a presumptive clinical diagnosis of dendritic ulcer. As this is a viral infection, antibiotics have no place in treatment of this condition.

Duration:
Treat for 14 days or until at least 3 days after complete resolution

See also **Encephalitis** in Chapter 4: Central Nervous System Infections, **Genital Herpes simplex virus** in Chapter 8: Genital Infections, **Neonatal Herpes simplex prophylaxis / treatment** in Chapter 11: Paediatric Infections (Neonates, Infants and Children), and **Herpes Simplex** in Chapter 13: Skin and Soft Tissue Infections

Corneal scraping with culture of the specimen should be performed by ophthalmologist

Duration:
Treat for 2-3 weeks until resolution of infection.

Duration:
Treat for 7 days.

Duration:
Treat for 5-7 days

For corneal abrasion / injury with evidence of infection treat as Corneal Ulcer. Infection is suggested by corneal opacification around the injury, redness, and discharge.

Duration:
Treat for 3 days.

Acute dacryocystitis Infection of nasolacrimal sac	**Cloxacillin 500mg (child 12.5mg/kg) PO QID** *Alternative:* **Cotrimoxazole 160/800 mg (child 4/20 mg/kg) PO BID** OR **Clindamycin 450 mg (10mg/kg) PO TID**
Chronic dacryocystitis Presents as a unilateral watery eye (occasionally bilateral) with conjunctivitis-like symptoms for months to years.	No need for antibiotics

References

American Academy of Ophthalmology. 2019-2020 Basic and clinical science course: Pediatric ophthalmology and strabismus. USA; American Academy of Ophthalmology; 2020

American Academy of Ophthalmology. 2019-2020 Basic and clinical science course: Oculofacial plastic and orbital surgery. USA; American Academy of Ophthalmology; 2020

American Academy of Ophthalmology. 2019-2020 Basic and clinical science course: External Ocular disease and cornea. USA; American Academy of Ophthalmology; 2020

Chaudhuri Z, Vanathi M. Postgraduate ophthalmology. New Delhi; Jaypee Brothers Medical Publishers; 2012

eTG complete. Eye infections. In: Therapeutic Guidelines [digital]. Melbourne: Therapeutic Guidelines Limited; 2019. http://www.tg.org.au

Swab discharge for culture.

Refer to Ophthalmology for dacryocystorhinostomy (DCR) surgery.

Duration:
Treat for 7 days

Refer to **Ophthalmology** for dacryocystorhinostomy (DCR) surgery

eTG complete. Pre-emptive treatment following a penetrating eye injury. In: Therapeutic Guidelines [digital]. Melbourne: Therapeutic Guidelines Limited; 2019. http://www.tg.org.au

Gusmao dos Santos C, Francis J, Guterres J, Janson S, Lopes N, Marr I, et al. HNGV Antibiotic guidelines writing group. Antibiotic guidelines Hospital Nacional Guideo Valadares. Timor-Leste; 2016

Kanski J, Bowling B. Clinical Ophthalmology: a systematic approach. 7th ed. Oxford: W B Saunders Co limited; 2011

Condition	Antimicrobial
Trichomoniasis *Trichomonas vaginalis* is a sexually transmitted protozoan that infects squamous epithelium of the urogenital tract. Women are infected more than men and present with a thin, yellow-green, frothy malodorous discharge, pruritis, burning, dysuria, pelvic pain, dysuria, or dyspareunia. In men infection is generally asymptomatic but may cause urethral discharge or dysuria. Trichomonas infection during pregnancy is associated premature delivery, early rupture of membranes, and low birth weight.	**Metronidazole 500mg PO BID (preferred in pregnancy)** *Alternative:* **Metronidazole 2g PO single dose** Treat sexual partners presumptively with single dose metronidazole. Avoid sexual activity for 7 days after treatment initiation.
Gonorrhoea *Neisseria gonorrhoeae* is a predominantly sexually transmitted infection. It presents as urethritis in men and cervicitis in women. It can also involve the throat (pharyngitis), rectum (proctitis) or cause conjunctivitis. Symptoms in women include dysuria, urinary frequency, and vaginal discharge.	**Ceftriaxone 500mg IV/IM single dose** PLUS **Azithromycin 1g PO single dose** *For disseminated gonococcal infection:* See **Septic Arthritis** in Bone and Joint Infections chapter, confirmed Neisseria gonorrhoeae *For neonatal prophylaxis and treatment:* See Chapter 11: **Paediatric Infections** (Neonates, Infants and Children).

Comments and Duration of Therapy
Perform microscopy on wet mount of vaginal discharge to examine for motile trichomonads. Measure pH: in trichomonas infection this may be >4.5. If diagnosis unable to be confirmed with bedside tests send bacterial swab for microscopy and culture, and send viral (dry) swab for multiplex PCR. Test all patients for other sexually transmitted infections including HIV and syphilis. *Duration:* **Metronidazole 2g:** Give single dose. **Metronidazole 500mg:** Treat for 7 days. Test for cure with PCR after 2 weeks of treatment completion.
Send first pass urine for PCR, swab vagina, male urethra, throat and/ or rectum (whichever is clinically indicated) with bacterial swab for culture, and swab with viral (dry) swab for PCR. If systemic infection suspected send blood culture. Complications include urethral and labial abscesses, inflammation of the epididymis and testis, acute salpingitis, pelvic peritonitis, pelvic abscess, ectopic pregnancy, infertility, severe conjunctivitis, and iritis. Test all patients for other sexually transmitted infections including HIV and syphilis.

Symptoms in women include dysuria, urinary frequency, and vaginal discharge. Symptoms in men include urethral discharge, dysuria, and urinary frequency. Infected patients may also be asymptomatic. Disseminated infection presents as bacteraemia, pustular skin rash and/or acute infective arthritis.	Test and treat all patient's sexual partners for the preceding 60 days. Avoid sexual activity for 7 days after treatment initiation.
Chlamydia infection of urethra, endocervix or rectum. *Chlamydia trachomatis* is an intracellular bacterium which can cause two sexually transmitted diseases in adults depending on the serotype. In males Chlamydia presents with urethritis, or proctitis, and complications including epididymitis. In females, infection is often subclinical or non-specific. Complications include cervicitis, salpingitis and endometriosis. Chlamydia is major cause of female infertility worldwide.	**Azithromycin 1g PO single dose** *Alternative:* **Doxycycline 100mg BID** *If treating empirically, to cover the possibility of gonorrhoea infection ADD:* **Ceftriaxone 500mg IV/IM single dose** OR **Cefixime 400mg PO single dose** Test and treat all patient's sexual partners for the preceding 60 days. Avoid sexual activity for 7 days after treatment initiation.
Chlamydia - Lymphogranuloma venereum (LGV). This manifests as a transient painless genital ulcer followed by lymphadenopathy which ulcerates. Men who have sex with men will often present with symptoms of	**Doxycycline 100mg PO BID** Alternative: **Azithromycin 1g weekly** Test and treat all patient's sexual partners. Avoid sexual activity until 3 weeks after treatment initiation.

Duration:
Treat with single dose only of both antibiotics.

Test for cure 2-3 weeks after completing treatment.

Send first pass urine for PCR, swab vagina, male urethra, and/ or rectum (whichever is clinically indicated) with bacterial swab for culture, and swab with viral (dry) swab for PCR.

Test all patients for other sexually transmitted infections including HIV and syphilis.

Duration:
Azithromycin, Ceftriaxone, Cefixime: Give single dose
Doxycycline: Treat for 7 days

Test for cure 3 weeks after treatment initiation in patients who are pregnant, have PID, or have anorectal infection.

See **Neonatal Chlamydia prophylaxis** in Chapter 11: Paediatric Infections (Neonates, Infants and Children).

Swab ulcer, rectum, or aspirate (whichever is clinically indicated) with viral (dry) swab for PCR.

Test all patients for other sexually transmitted infections including HIV and syphilis.

Duration:
Treat for 21 days

proctitis. LGV infection can be complicated by anal strictures and fistulas.	
Chancroid A sexually transmitted ulcerative infection caused by *Haemophilus ducreyi*. This initially presents with painful vesicular papules, which rapidly developing into soft ulcers with undermined, ragged edges. Ulcers are haemorrhagic and sticky, and often secondarily infected. One to two weeks later, inguinal nodes become involved and a painful, matted, tethered 'bubo' occurs. A discharging sinus may develop and in time become a spreading ulcer. Lesions heal slowly and commonly relapse.	**Azithromycin 1g PO single dose** *Alternative:* **Ceftriaxone 500 mg IV/IM single dose** OR **Ciprofloxacin 500mg PO BID** OR **STI pack (Cefixime 400mg PO and Azithromycin 1g PO) single dose** Treat all patient's sexual partners in the 10 days preceding symptom onset regardless of symptoms. Avoid sexual activity until ulcer has healed.
Syphilis A sexually transmitted infection caused the spirochete *Treponema pallidum.* **Early syphilis (< 2 years)** **Primary:** Painless chancre. Sharply demarcated ulcer with indurated borders and clean base.	*Early syphilis:* **Benzathine penicillin 2.4 million IU (1.8g) IM single dose** *Alternative:* **Procaine benzylpenicillin 2.5 million IU (1.5g) IM OD for 10 days** OR (not preferred) **Doxycycline 100mg PO BID for 14 days**

Test for cure with PCR after 4 weeks of treatment completion in patients who remain symptomatic, pregnant patients, and patients treated with azithromycin.

Haemophilus ducreyi is fastidious and difficult to culture, if this diagnosis is suspected contact laboratory for advice on how to collect a specimen. Note that a negative culture does not exclude this infection.

Test all patients for other sexually transmitted infections including HIV and syphilis.

Duration:
Azithromycin, Ceftriaxone: Give single dose
Ciprofloxacin: Treat for 3 days

If no evidence of clinical improvement within one week of treatment, consider alternative diagnosis.

Confirming the diagnosis of syphilis requires a treponemal (TPPA, TPHA, EIA) AND a nontreponemal (RPR, VDRL) test. Treponemal tests are specific but remain positive lifelong regardless of treatment. Nontreponemal tests are not specific and can be falsely positive, but rise and fall with disease activity and can be used to monitor treatment response.

In primary syphilis treponemal tests may take 2 weeks, and nontreponemal tests 4 weeks to become reactive.

Secondary: Fever, systemic symptoms, lymphadenopathy, and non-pruritic rash (maculopapular, pustular, ulcerative, or mucosal lesions). CNS, GIT, ocular, renal, and musculoskeletal system involvement can also occur. Early latent: Asymptomatic. **Late syphilis (>2years)** Progression from untreated early syphilis. **Late latent:** Asymptomatic **Tertiary:** Cardiovascular syphilis. Neurosyphilis. Gummatous disease with granulomas of skin, bones, and viscera. Patients should have a lumbar puncture to investigate for neurosyphilis.	*Late latent syphilis: and non-neurological tertiary syphilis* **Benzathine penicillin 2.4 million IU (1.8g) IM weekly for 3 weeks.** *Alternative:* **Procaine benzylpenicillin 2.5 million IU (1.5g) IM OD for 15 days** OR (not preferred) D**oxycycline 100mg PO BID for 28 days** In primary syphilis test and treat all patient's sexual partners from the preceding 3 months, in secondary from the preceding 6 months, and in early latent syphilis from the preceding 12 months. In late syphilis screen and treat current sexual partners, and others according to sexual history.
Neurosyphilis Can occur at any stage of syphilis. In all patients with syphilis assess for cognitive dysfunction, motor or sensory loss, eye or auditory disturbances, cranial nerve palsies or symptoms or signs of meningitis. If present, treat as for Neurosyphilis.	**Benzylpenicillin 4 million IU (2.4g) IV Q4H** *Alternative (not preferred):* **Ceftriaxone 2g IV OD**
Syphilis in Pregnancy All pregnant women should be screened at first antenatal visit, during the 3rd trimester and at delivery. All pregnant women who are sexual contacts of patients with syphilis should be presumptively treated.	*Early and late syphilis:* **Benzathine penicillin 2.4 million IU (1.8g) IM weekly for 3 weeks.**

Following treatment, monitor response with a nontreponemal test at 3, 6 and 12 months, and in HIV patients at 18 and 24 months. Syphilis is considered treated if nontreponemal titre falls by at least fourfold. If this does not occur or titre increases, consider treatment failure or reinfection, and retreat. Also consider neurosyphilis as a cause for treatment failure.

In early and late syphilis if patient has CNS or eye involvement consider a lumbar puncture and treat as Neurosyphilis.

Test all patients for other sexually transmitted infections including HIV.

Duration:
Treat for 14 days

Repeat lumbar puncture 6 months after completing treatment. If persistent leukocytosis, retreat.

Repeat nontreponemal tests (RPR, VDRL) monthly following treatment for duration of pregnancy. Repeat treatment if titre is not falling by 6 weeks, or if sexual partner was not treated simultaneously.

All infants born to mothers with syphilis should be examined for evidence of congenital syphilis.

See **Neonatal Syphilis prophylaxis/ treatment** in Chapter 11: Paediatric Infections (Neonates, Infants and Children).

Genital Herpes simplex virus Genital herpes is the most common cause of ulcerative genital disease worldwide. Most infections are caused by HSV-2, but HSV-1 genital infection is becoming a more common. Lesions present as vesicles, pustules, and erythematous ulcers. Associated symptoms include pruritis, pain, dysuria, tender inguinal lymphadenopathy, and systemic symptoms (headache, fever, malaise, myalgia). Primary infection may be severe or asymptomatic.	*Primary infection:* **Acyclovir 400mg PO TID** *Recurrent infection:* **Acyclovir 800mg PO TID** *Suppressive therapy for recurrent infection in late pregnancy:* **Acyclovir 400mg PO TID** Avoid sexual activity during outbreaks and for 1 to 2 days after. Use condoms.
Genital warts Sexually transmitted infection caused by Human Papillomavirus (HPV). HPV infections are transmitted primarily through skin to skin, or skin to mucosa contact. Warts may be present on the vulva, vagina, penis, scrotum, urethral meatus, anus, and elsewhere on the perineum. The lesions may be well-defined papules, flat or filiform.	**Podophyllin 0.5% solution topically to each wart BID** (Contraindicated in pregnancy and breastfeeding mothers).

Antiviral therapy is not curative but shortens the duration of symptoms if given within 72 hours of symptom onset.

Test all patients for other sexually transmitted infections including HIV and syphilis. Genital HSV is an important risk factor for HIV acquisition and transmission.

Infants born to mothers with primary infection needed prophylactic therapy. See Neonatal Herpes Simplex Prophylaxis / Treatment in Paediatrics (Neonates, Infants and Children) chapter. If there are signs and symptoms of active infection delivery by cesarean section is indicated.

Duration:
Primary infection: Treat for 10 days
Recurrent infection: Treat for 2 days
Suppressive therapy for recurrent infection in late pregnancy: Start at 36 weeks. Continue until delivery.

See also **Encephalitis** in Chapter 4: Central Nervous System Infections, **Dendritic corneal ulceration caused by Herpes Simplex virus** in Chapter 7: Eye Infections, **Neonatal Herpes simplex prophylaxis / treatment** in Chapter 11: Paediatric Infections (Neonates, Infants and Children), and **Herpes Simplex** in Chapter 13: Skin and Soft Tissue Infections

Consider offering HPV vaccines to sexual partners if available. HPV vaccination protects against genital warts and HPV-associated cancers. HPV types that cause warts have not been associated with cancer.

Test all patients for other sexually transmitted infections including HIV and syphilis.

Duration:
Podophyllin: Apply for 3 days, cease for 4 days, then repeat this cycle weekly for 4-6 applications until warts disappear.

References

Ahronowitz I, Leslie K. Yeast Infection. In: Goldsmith L, Katz S, Gilchrest A, Paller A, Leffell D, Wolff K, editors. Fitzpatrick's Dermatology in General Medicine. 9th ed. New York: McGraw-Hill; 2019. 2952 – 2964

Cheng L, Wang Y, Du J. Human papillomavirus vaccines: an updated review. Vaccines 2020; 8 (3):391.https://doi.org/10.3390/vaccines8030391.

eTG complete. Genital and Sexually Transmitted Infections. In: Therapeutic Guidelines [digital]. Melbourne: Therapeutic Guidelines Limited; 2019. http://www.tg.org.au

Ghannoum M, Salem I, Christensen. Antifungals. In: Goldsmith L, Katz S, Gilchrest A, Paller A, Leffell D, Wolff K, editors. Fitzpatrick's Dermatology in

General Medicine. 9th ed. New York: McGraw-Hill; 2019. 3436 – 3450

Gusmao dos Santos C, Francis J, Guterres J, Janson S, Lopes N, Marr I, et al. HNGV Antibiotic guidelines writing group. Antibiotic guidelines Hospital Nacional Guideo Valadares. Timor-Leste; 2016

Hicks C, Clement M. Syphilis: Screening and diagnostic testing. On: Marrazzo J, Mitty J, editors. UpToDate [internet]. Waltham (MA): UpToDate Inc; 2021. https://www.uptodate.com/contents/syphilis-screening-and-diagnostic-testing?search=syphilis&source=search_result&selectedTitle=1~150&usage_type=default&display_rank=1#H219329901

Jeffrey I, Cohen. Herpes Simplex. In: Goldsmith L, Katz S, Gilchrest A, Paller A, Leffell D, Wolff K, editors. Fitzpatrick's Dermatology in General Medicine. 9th ed. New York: McGraw-Hill; 2019. 3021 – 3024

Lautenschlager S, Brockmeyer N. Chancroid. In: Goldsmith L, Katz S, Gilchrest A, Paller A, Leffell D, Wolff K, editors. Fitzpatrick's Dermatology in General Medicine. 9th ed. New York: McGraw-Hill; 2019. 3186 – 3192

Lautenschlager S, Brockmeyer N. Lymphogranuloma Venereum. In: Goldsmith L, Katz S, Gilchrest A, Paller A, Leffell D, Wolff K, editors. Fitzpatrick's Dermatology in General Medicine. 9th ed. New York: McGraw-Hill; 2019. 3193 – 3201

Perhimpunan Dokter Spesialis Kulit dan Kelamin Indonesia (PERDOSKI). Kandidiosis Vulvovaginalid (KVV). Dalam: Panduan Praktis klinis, bagi dokter specialis kulit dan kelamin di Indonesia. Jakarta; 2017. 365-367

Perhimpunan Dokter Spesialis Kulit dan Kelamin Indonesia (PERDOSKI). Vaginosis Bakterial. Dalam: Panduan Praktis klinis, bagi dokter specialis kulit dan kelamin di Indonesia. Jakarta; 2017. 379 - 380

Perhimpunan Dokter Spesialis Kulit dan Kelamin Indonesia (PERDOSKI). Tricomoniasis. Dalam: Panduan Praktis klinis, bagi dokter specialis kulit dan kelamin di Indonesia. Jakarta; 2017. 375 - 376

Perhimpunan Dokter Spesialis Kulit dan Kelamin Indonesia (PERDOSKI). Gonorrhoeae. Dalam: Panduan Praktis klinis, bagi dokter specialis kulit dan kelamin di Indonesia. Jakarta; 2017. 362 – 364

Perhimpunan Dokter Spesialis Kulit dan Kelamin Indonesia (PERDOSKI). Syphilis. Dalam: Panduan Praktis klinis, bagi dokter specialis kulit dan kelamin di Indonesia. Jakarta; 2017. 372 - 373

Perhimpunan Dokter Spesialis Kulit dan Kelamin Indonesia (PERDOSKI). Kutil Anogenital. Dalam: Panduan Praktis klinis, bagi dokter specialis kulit dan kelamin di Indonesia. Jakarta; 2017. 368 - 371

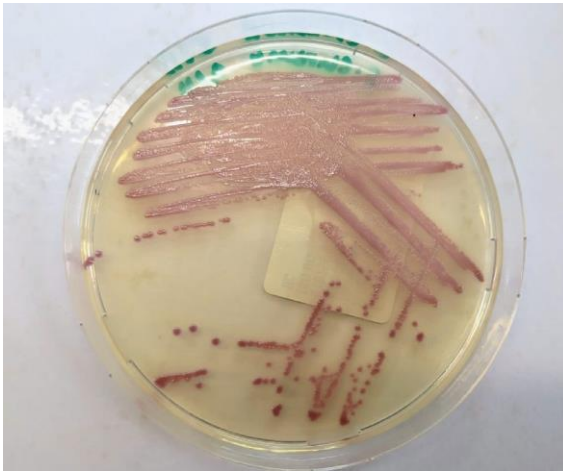
Sterling J. Human Papillomavirus Infections. In: Goldsmith L, Katz S, Gilchrest A, Paller A, Leffell D, Wolff K, editors. Fitzpatrick's Dermatology in General Medicine. 9th ed. New York: McGraw-Hill; 2019. 3095 - 3106

Strowd L, McGregor S, Pichardo R. Gonorrhoeae, Mycoplasma, and Vaginosis. In: Goldsmith L, Katz S, Gilchrest A, Paller A, Leffell D, Wolff K, editors. Fitzpatrick's Dermatology in General Medicine. 9th ed. New York: McGraw-Hill; 2019. 3207 – 3221

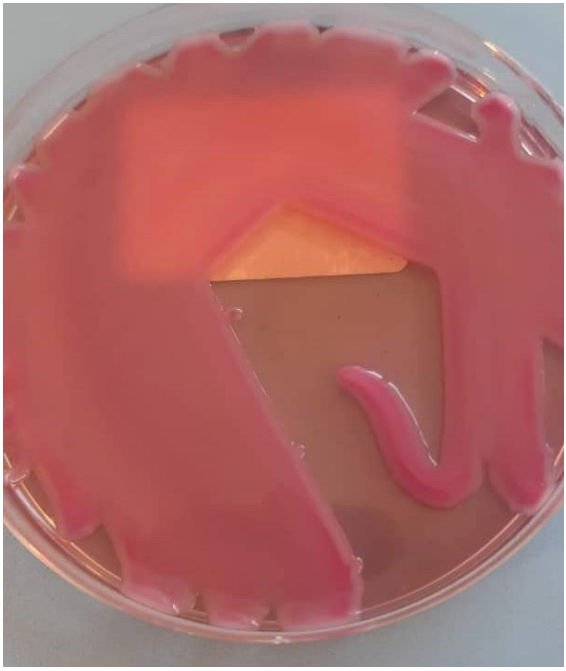
Tuddenham S, Zenilman, J. Syphilis. In: Goldsmith L, Katz S, Gilchrest A, Paller A, Leffell D, Wolff K, editors. Fitzpatrick's Dermatology in General Medicine. 9th ed. New York: McGraw-Hill; 2019. 3144 - 3172

Winer R, Koutsky L. Genital Human Papillomavirus Infection. In: Holmes K, Sparling P, Stamm W, Piot P, Wasserheit J, Corey L, et al. editors. Sexually Transmitted Disease. 4th ed. New York: McGraw- Hill; 2007. 489 – 508

Zeena Y, Nguyen Q, Sanber K, Tyring S. Antiviral Drug. In: Goldsmith L, Katz S, Gilchrest A, Paller A, Leffell D, Wolff K, editors. Fitzpatrick's Dermatology in General Medicine. 9th ed. New York: McGraw-Hill; 2019. 3493 - 3516



S. aureus on *S.aureus* chrome agar



Mucoid, Lactose Fermenter colony growth on MacConkey agar

Condition	Antimicrobial
Oral thrush (Candidiasis) A fungal infection of the buccal mucosa caused by Candida species. White plaques are seen on the tongue, cheeks, or roof of the mouth. Risk factors include immunosuppression such as HIV infection or diabetes, the use of inhaled steroids, concurrent antibiotics, or poor oral hygiene.	**Nystatin oral suspension 100,000U (1mL) PO QID** after food. Place under the tongue or in the buccal cavity then swallow.
Candida Oesophagitis Most commonly seen in the setting of immunosuppression. Test all patients for HIV.	*For asymptomatic patients who are not immunocompromised:* **Nystatin tablet 500,000U PO QID** OR **Nystatin oral suspension 100,000U (1mL) PO QID** *For symptomatic or immunocompromised patients:* **Fluconazole 200mg for first dose (child 6mg/kg), followed by 100mg daily (child 3mg/kg)**
Diarrhoeal diseases An increased frequency of liquid or semi liquid stools. Antibiotic therapy is ONLY indicated when bacterial infection is suspected, such as with high fever, tachycardia, leukocytosis, abdominal tenderness, severe abdominal pain, or blood in the stool. If this occurs, see **Severe Dysentery** below.	Most diarrhoeal disease does not require antibiotic therapy. The major concern with diarrhoea is a rapid loss of fluid and risk of dehydration. Oral and/or intravenous rehydration is usually all that is required.

Comments and Duration of Therapy
Duration: Treat for 7-14 days or until several days after symptoms have resolved. See **Candida Oesophagitis** in Chapter 9: Gastrointestinal infections, **Cutaneous Candidiasis** in Chapter 13: Skin and Soft Tissue Infection and **Vulvovaginal Candidiasis** in Chapter 17: Women's Health
Duration: For asymptomatic patients who are not immunocompromised: Treat for 10-14 days For symptomatic or immunocompromised patients: Treat for 14-21 days. For refractory infection: Extend treatment to 28 days See Oral thrush (Candidiasis) in Chapter 9: Gastrointestinal infections, Cutaneous Candidiasis in Chapter 13: Skin and Soft Tissue Infection, and Vulvovaginal Candidiasis in Chapter 17: Women's Health
In acute diarrhea send stool for rotavirus testing. Stool cultures should be reserved for grossly bloody stool, severe dehydration, signs of inflammatory disease, symptoms lasting more than 3-7 days, immunosuppression, and suspected nosocomial infections. Blood cultures should be obtained from infants <3 months of age, people of any age with signs of septicemia or when enteric fever is suspected, people with systemic manifestations of infection, and in people who are immunocompromised.

Severe dysentery Severe diarrhoea associated with blood and mucous. Commonly caused by Salmonella or Shigella species, or Entamoeba histolytica. Treatment is especially required in infants less than 12 months old because of the risk of bacteraemia and other systemic manifestations.	**Ceftriaxone 2g (child: 50mg/kg) IV OD** PLUS **Metronidazole 500mg (child: 10mg/kg) PO/ IV TID** *Change to oral antibiotics when improving according to susceptibility testing. If no susceptibilities available use:* **Co-trimoxazole 160/800mg (child: 4+20mg/kg) PO BID** PLUS **Metronidazole 500mg (child: 10mg/kg) PO TID** *Alternative:* **Ciprofloxacin 500mg (child: 10mg/kg) PO BID**
Intestinal Amoebiasis Invasion of the intestinal lining by Entamoeba histolytica trophozoites causes amoebic bloody diarrhoea or colitis. Severe colitis may be complicated by perforation.	**Metronidazole 500mg (child: 10mg/kg) PO TID**
Liver Abscess A collection of pus inside the liver. Symptoms and signs include fever, lethargy, right upper quadrant discomfort, anorexia, a large and tender liver, and pleural effusion. If not responding to antibiotics, or if abscess >5cm seek surgical opinion regarding drainage.	*Amoebic:* **Metronidazole 500mg (child: 10mg/kg) PO/ IV TID** *Bacterial:* **Ceftriaxone 2g (child: 50mg/kg) IV OD** PLUS **Metronidazole 500mg (child: 10mg/kg) PO/ IV TID** *Change to oral antibiotics after 2 weeks. If susceptibilities are not available use:* **Amoxicillin/Clavulanic acid 500/125mg (child 25/6.25 mg/kg) PO TID**

Send stool for microscopy (including ova, cysts and parasites), culture and susceptibility testing.

Rehydration and electrolyte replacement are the most important component of treatment.

Duration:
Treat for 3-5 days
If enteric fever is suspected or confirmed See **Typhoid (enteric fever)** in Chapter 9: Gastrointestinal Infections.
If intestinal amoebiasis is suspected see **Intestinal Amoebiasis** in Chapter 9: Gastrointestinal Infections.

Currently luminal amoebicides to eliminate cysts in the colon are not available on the Timor-Leste essential drugs list (e.g. Paromomycin, Diloxanide). The risk of relapse is increased without their use.

Duration:
Metronidazole: Treat for 7-10 days

Blood cultures should be collected in all patients with liver abscess, prior to antibiotics where possible. If abscess is drained, send pus for culture. Ultrasound or CT is required for diagnosis.

Duration:
Amoebic: Treat for 7-10 days
Bacterial: Change to oral antibiotics after 2 weeks if patient is well. Treat for a total of 6 weeks.

Currently luminal amoebicides to eliminate cysts in the colon (e.g. paromomycin) are not on the Timor-Leste essential drugs list. The risk of relapse is increased without their use.

Giardiasis Often characterised by yellow diarrhoea, excess gas, stomach or abdominal cramps, and/or nausea.	**Metronidazole 500mg (child: 10mg/kg) PO TID**
Strongyloidiasis Uncomplicated disease is frequently asymptomatic or may involve gastrointestinal symptoms include abdominal pain or diarrhoea. Pulmonary symptoms can occur during the pulmonary migration phase. Dermatological manifestations include urticarial rashes and Larva Currens.	*For immunocompetent patients:* **Albendazole 400mg (child ≤10kg 200mg) PO BID for 3 days. Repeat after 7 days** *Alternative (for adult or child >15kg):* **Ivermectin 200mcg/kg PO with fatty food for 1 dose. Repeat 7 days later.** *For immunocompromised patients with uncomplicated disease:* **Ivermectin (adult and child >15kg) 200mcg/kg PO with fatty food on days 1, 2, 15 and 16.** *For patients with disseminated Strongyloidiasis:* **Ivermectin (adult and child >15kg) 200mcg/kg PO with fatty food daily until symptoms resolve and stool or sputum microscopy demonstrates clearance of larvae.** *Followed by:* **Ivermectin on days 7 and 8 after completion of daily therapy.**
Antibiotic-associated diarrhoea Most antibiotic-associated diarrhoea is a side effect of the medication, while only a small proportion of antibiotic-associated diarrhoea is caused by *Clostridium difficile.*	Cease other antibiotics if possible. *If Clostridium difficile is confirmed or strongly suspected use:* **Metronidazole 500mg (child: 10mg/kg) PO BID** *For recurrent or refractory Clostridium difficile:* **Vancomycin 125mg (child 10mg/kg) PO, QID** (IV formulations of vancomycin can be given orally for this indication)

Duration:
Metronidazole: Treat for 5-7 days.

Diagnosis of Strongyloides depends on microscopic identification of larvae in the stool, or in sputum in disseminated infection. The diagnosis may be supported by the presence of eosinophilia in the blood.

Disseminated Strongyloidiasis occurs when patients with chronic Strongyloidiasis become immunosuppressed. This can be rapidly fatal. For patients with disseminated Strongyloidiasis reduce immunosuppression if possible.

Ivermectin should not be given to children <15kg and should not be used in pregnancy. Round up doses to the nearest 1.5mg.

Send stool for culture and specifically request Clostridium difficile testing.

Duration:
Treat Clostridium difficile infections for 10 days.

Typhoid (enteric fever)- proven or suspected Caused by ingestion of contaminated water or transmitted by poor hygiene practices during food handling. Typhoid may be suspected in the presence of fever >38 degrees for >3 days, and can be associated with a dry cough, bowel changes (constipation in adults, diarrhoea in children), headache, malaise, cough, or rash.	**Ceftriaxone 2g (child: 50mg/kg) IV OD** *Alternative:* **Azithromycin 1g (child 20mg/kg) PO OD** Step down to oral antibiotics when well according to susceptibilities. If susceptibility results are not available use: **Azithromycin 1g (child 20mg/kg) PO OD** OR **Ciprofloxacin 500mg (child 12.5mg/kg) PO BID**
Helminths: Hookworm, Roundworm, Whipworm	**Albendazole 400mg PO OD** *Alternative:* (In Pregnancy) **Pyrantel 250mg PO OD**
Helicobacter pylori Patients infected with H. pylori have a 10-20% lifetime risk of developing peptic ulcers and a 1-2% risk of developing stomach cancer.	*Optimum therapy if available:* **Omeprazole 20mg PO BI**D PLUS **Amoxicillin 1g PO BI**D PLUS **Clarithromycin 500mg PO BID** *Alternative:* **Omeprazole 20mg PO BID** PLUS **Amoxicillin 1gram PO BID** PLUS **Metronidazole 500mg PO BID**
Chronic Hepatitis B The indications for treatment include HBV DNA ≥ 2000 IU/ml, elevated ALT, and/or cirrhotic patients with detectable HBV DNA.	**Tenofovir dipovoxil fumarate (TDF) 300 mg PO OD**

Send blood cultures prior to antibiotics. Send stool culture.

Duration:
Change to oral antibiotics when improving. Treat for a total of 7-10 days.

Duration:
Adults and children > 2 years: Treat for 3 days. If heavy infection repeat after 7 days.
Children 1-2 years: Single dose only.

All patient with a duodenal ulcer, proven H. pylori peptic ulcers or with MALT should be treated.

Duration:
Treat for 10-14 days

Perform creatinine clearance at baseline.
Perform creatinine clearance, serum phosphate, urine glucose, and protein at least annually.

Test all patients for HIV.
Patients with concurrent HIV should be treated with an anti-retroviral regime with activity against HBV.

Spontaneous bacterial peritonitis (SBP) Usually a complication of large volume ascites in patients with cirrhosis. Most common pathogens are gram negative organisms including E. coli and Klebsiella spp. In children Streptococcus pneumoniae is the most common cause. Suspect in patients with ascites whose clinical status deteriorates. SBP is diagnosed when total ascitic white cell count is ≥ 500 cells/µL, or neutrophil count is ≥ 250 cells/µL.	**Ceftriaxone 2g (child 50mg/kg) IV OD** *Alternative:* **Ciprofloxacin 500mg (child 10mg/kg) PO BID**

References

Clinical practice guidelines panel, European Association for the Study of the Liver. EASL 2017 Clinical practice guidelines on the management of hepatitis B virus infection. J Hepatol 2017; 67:370-398

eTG complete. Acute Infectious Diarrhoea. In: Therapeutic Guidelines [digital]. Melbourne: Therapeutic Guidelines Limited; 2019. http://www.tg.org.au

eTG complete. Gastrointestinal helminths (worms). In: Therapeutic Guidelines [digital]. Melbourne: Therapeutic Guidelines Limited; 2019. http://www.tg.org.au

eTG complete. Liver Abscess. In: Therapeutic Guidelines [digital]. Melbourne: Therapeutic Guidelines Limited; 2019. http://www.tg.org.au

eTG complete. Oesophageal candidiasis. In: Therapeutic Guidelines [digital]. Melbourne: Therapeutic Guidelines Limited; 2019. http://www.tg.org.au

Take blood cultures. Perform ascitic tap and send fluid for chemistry, cell count and culture (fluid for culture should be injected into blood culture bottles to increase yield). Request AFB and GeneXpert if TB peritonitis is suspected.

Change antibiotics according to culture and susceptibility results.

Duration:
If there is rapid clinical improvement stop antibiotics after 5 days.

See **Cirrhosis, antibiotic prophylaxis** in Chapter 1: Antibiotic prophylaxis for prophylaxis following first episode of SBP in patients with cirrhosis.

Gusmao dos Santos C, Francis J, Guterres J, Janson S, Lopes N, Marr I, et al. HNGV Antibiotic guidelines writing group. Antibiotic guidelines Hospital Nacional Guideo Valadares. Timor-Leste; 2016

Pappas P, Kauffman C, Andes D, Clancy C, Marr K, Ostrosky-Zeichner L, et al. Clinical Practice Guidelines for the management of candidiasis: 2016 update by the Infectious Diseases Society of America. Clin Infect Dis 2016; 62(4):e1-e50. https://doi.org/10.1093/cid/civ933

Shah S, Iyer P, Moss S. AGA Clinical practice update on the management of refractory Helicobacter pylori infection: expert review. Gastroenterology 2021; 160(5):1831-1841. Doi: 10.1053/j.gastro.2020.11.059

Terrault N, Lok A, McMahon B, Chang K-M, Hwang J, Jonas M et al. Update on prevention, diagnosis, and treatment of chronic hepatitis B: AASLD 2018 hepatitis B guidance. Hepatology 2018; 67 (4):1560-1599

Condition	Antimicrobial
Haemodialysis Line infection / Central Line infection Patients who present with clinical sepsis in the presence of a hemodialysis line or a central line.	**Vancomycin 25-30mg/kg IV loading dose** For patients on haemodialysis give further doses after haemodialysis (usually 3 times a week). For subsequent dosing in all patients see Vancomycin dosing section. PLUS **Gentamicin 4-5mg/kg IV OD** Single dose only for dialysis patients. If patient is in **septic shock** replace Gentamicin with: **Amikacin 28mg/kg IV as a first dose in patients with creatinine clearance >60ml/minute. Use 16-20mg/kg if creatinine clearance <60ml/minute.** Single dose only for dialysis patients. For subsequent doses see **Aminoglycoside dosing** section. **Child 15mg/kg IV OD.** If amikacin is not available and patient is likely to have normal renal function give above regime but increase Gentamicin to 7mg/kg IV for first dose. *Alternative:* If vancomycin is not available use: **Cloxacillin 2g IV QID**

References

Allon M, Sexton D, Tunnelled hemodialysis catheter-related bloodstream infection (CRBSI): management and prevention. In: Berns J, Lam A, editors. UpToDate [internet]. Waltham (MA): UpToDate Inc; 2020.

eTG complete. Bloodstream infections associated with an intravascular device. In: Therapeutic Guidelines [digital]. Melbourne: Therapeutic Guidelines Limited; 2019. http://www.tg.org.au

Comments and Duration of Therapy

Take blood cultures from line and peripherally before antibiotics. If line is removed send tip for culture.

Change antibiotics according to culture and susceptibility results.

Where possible remove line.

Duration:
If there is rapid clinical improvement after removal of line treat for 5-7 days.

Infections with *Staphylococcus aureus* and *Candida* spp. require longer durations see *Staphylococcus aureus* bacteraemia in Chapter 12: Sepsis and Directed Therapy for Blood Stream Infections, and Candidaemia in Chapter 12: Sepsis and Directed Therapy for Blood Stream Infections.

Gusmao dos Santos C, Francis J, Guterres J, Janson S, Lopes N, Marr I, et al. HNGV Antibiotic guidelines writing group. Antibiotic guidelines Hospital Nacional Guideo Valadares. Timor-Leste; 2016

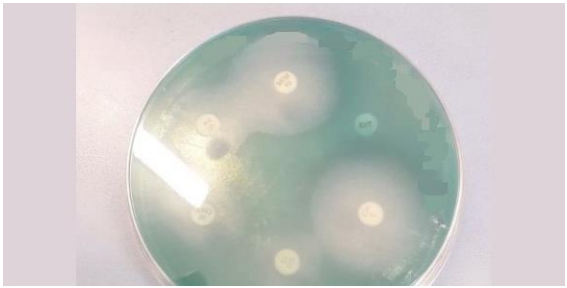
Chapter 11. **Paediatrics** (Neonates, Infants and Children)

Treatment for infections in children are included throughout the guideline. See relevant sections.

Antibiotic dosing principles in Paediatrics

- Children >12 years old may receive adult doses
- Take special care in neonates as dosages and intervals may differ from older children
- The dose must not exceed the maximum adult dose unless specified.
- All intravenous infusions should be given carefully according to Injectable Guidelines to avoid thrombophlebitis.

Condition	Antimicrobial
Well baby with obstetric risk factors for infection Early infections present in the first 3 days after birth and are often associated with obstetric risk factors for infection. Symptoms of neonatal sepsis may be non-specific, and onset may be gradual. Antibiotics are given empirically to babies born to mothers with obstetric risk factors for infection to prevent complications of early onset neonatal sepsis.	**Ampicillin 50mg/kg IV BID** PLUS **Gentamicin 5mg/kg IV OD** (<2kg 48 hourly)
Early and late onset neonatal sepsis This may present with fever without focus, or more obvious signs of septicaemia. The antibiotics suggested are	*Early onset sepsis (postnatal age ≤7 days):* **Ampicillin 50mg/kg IV BID** PLUS **Amikacin 15mg/kg IV OD** *Late onset sepsis (postnatal age >7 days):* **Ampicillin 50mg/kg IV TID**



Disc diffusion antibiotic testing (Disc AST) on *Pseudomonas aeruginosa* shows distinct green colony on MHA

Comments and Duration of Therapy

Obstetric risk factors for early onset neonatal sepsis include:

- Home birth
- Rupture of membranes >18 hours
- Offensive liquor
- Preterm delivery
- Maternal fever or sepsis
- Maternal history of a previous neonatal death from sepsis.

Duration:
Treat for 2 to 5 days

Take blood cultures prior to antibiotics. Send urine, CSF, and pus for culture if clinically indicated.

Administer antibiotics within one hour of presentation.

See Neonatal Sepsis Standard Operating Procedure guideline, for further guidance on investigation and management.

appropriate for these presentations as well as for pneumonia or urinary tract infection in the neonatal period. The most common infecting organisms include *Escherichia coli, Klebsiella pneumoniae, Haemophilus influenzae, Streptococcus aureus*, Group B *Streptococcus* and *rarely. Listeria monocytogenes.*	PLUS **Amikacin 15mg/kg IV OD** For premature neonates see Neonatal dosing section (Appendix H) *Alternative:* If amikacin is not available replace this in above regimes with: **Gentamicin 5mg/kg IV OD** (<2kg 48 hourly) OR **Cefotaxime 50mg/kg IV TID** OR **Ceftriaxone 50mg/kg IV BID** (if cefotaxime not available) *If there is no improvement, especially in hospital acquired infection, and there are no microbiology results to direct treatment, ensure blood cultures are taken and consider changing to:* **Meropenem 40mg/kg IV TID** PLUS **Vancomycin 15mg/kg IV TID**
Neonatal sepsis with possible *Staphylococcus aureus* infection Suspect *Staphylococcus aureus* in the setting of: » Fever and skin pustules » Skin abscess » Omphalitis » Pneumonia with pneumatocoele or empyema » Hospital-acquired late onset infection	**Cloxacillin 50mg/kg IV BID in first week of life, TID after first week of life, QID >21 days.** PLUS **Amikacin 15mg/kg IV BID** For premature neonates see Neonatal dosing section (Appendix H) *Alternative:* If amikacin is not available replace this in above regimes with: **Gentamicin 5mg/kg IV OD (<2kg 48 hourly**) OR **Cefotaxime 50mg/kg IV TID in first week of life, QID after first week of life.** OR **Ceftriaxone 50mg/kg IV BID** (if cefotaxime not available)

Duration:
Change antibiotics according to microbiology results. Treat for 7-10 days

Take blood cultures prior to antibiotics. Administer antibiotics within one hour of presentation.

Abscesses may require incision and drainage. Send pus and wound swabs for culture. Umbilical cord should be cleaned with antiseptic solution and allowed to dry. With omphalitis, consider neonatal Tetanus.

Duration:
Change antibiotics according to microbiology results. Treat for 7-10 days

	If there is no improvement, especially in hospital acquired infection, and there are no microbiology results to direct treatment, ensure blood cultures are taken and consider changing to: **Meropenem 40mg/kg IV TID** PLUS **Vancomycin 15mg/kg IV BID in in first week of life, TID after first week of life.**
Neonatal Meningitis Meningitis in the neonatal period is most commonly caused by Group B *Streptococcus, Listeria monocytogenes,* and Gram-negative organisms.	**Ampicillin 100mg/kg IV BID in in first week of life, TID after first week of life.** PLUS **Cefotaxime 50mg/kg IV TID in first week of life, QID after first week of life** PLUS **Amikacin 15mg/kg IV OD for 72 hours.** For premature neonates see **Neonatal dosing** section *Alternative:* If amikacin is not available replace this in above regimes with: **Gentamicin 5mg/kg IV OD (<2kg 48 hourly)** If cefotaxime is not available replace this in above regime with: **Ceftriaxone 50mg/kg IV BID** *In neonates who have been hospitalized since birth and develop meningitis after 7 days replace Ampicillin in the above regime with:* **Vancomycin 15mg/kg IV TID** *If there is no improvement, especially in hospital acquired infection, and there are no microbiology results to direct treatment, ensure blood cultures are taken and consider changing to:* **Meropenem 40mg/kg IV TID** PLUS **Vancomycin 15mg/kg IV BID in in first week of life, TID after first week of life.**

Send blood cultures prior to antibiotics. Send CSF for protein, glucose, cell count, culture and susceptibilities and PCR.

Duration:
Change antibiotics according to microbiology results. Treat for at least a minimum total of 10 days up to 21 days in severe cases, especially in Gram-negative meningitis.

Necrotising Enterocolitis This infection is common in extremely premature babies, and presents with distended abdomen, feed intolerance, fever, abnormal white cell count and thrombocytopaenia. It is associated with high rates of mortality. Antibiotics target enteric organisms including Gram-positive, Gram-negative, and anaerobic pathogens.	**Ampicillin 50mg/kg IV BID in in first week of life, TID after first week of life.** PLUS **Amikacin 15mg/kg IV OD** PLUS **Metronidazole 7.5mg/kg IV TID (<2kg BID)** For premature neonates see **Neonatal dosing** section *If there is no improvement, and there are no microbiology results to direct treatment, ensure blood cultures are taken and consider changing to:* **Meropenem 40mg/kg IV TID** PLUS **Vancomycin 15mg/kg IV BID in in first week of life, TID after first week of life.**
Skin pustules (without systemic symptoms) in neonate Skin infections in neonates are usually caused by *Staphylococcus aureus.* If fever or other systemic symptoms are present, the infant should be treated with high-dose intravenous antibiotics to cover for the possibility of sepsis.	**Cloxacillin 25mg/kg PO/IV BID in first week of life, TID after first week of life.**
Neonatal Malaria See **Timor-Leste National Malaria Guidelines.**	**Artesunate 3mg/kg IV/IM doses at 0, 12 and 24 hours then once daily** *Alternative:* **Quinine 20mg/kg in 10ml/kg of IV fluid infused of 4 hours. Then 8 hours after initial dose give 10mg/kg in IV fluid over 2 hours, and repeat TDS for total of 7 days.**

Send blood cultures prior to antibiotics.

Duration:
Treat for 7-10 days

Wash skin with soap and water, dry and clean with antiseptic solution. Rupture and drainage of pustules is not usually required.

Duration:
Treat for 5-7 days.

Neonatal Gonorrhoea prophylaxis If the mother is successfully treated prior to delivery, no prophylaxis is required for the neonate. If the mother has not been treated, the risk of vertical transmission is 30-40%. A single dose of ceftriaxone provides effective prophylaxis for the neonate.	**Ceftriaxone 50mg/kg IV/IM single dose.**
Neonatal Chlamydia prophylaxis If a mother has active Chlamydia infection that has not been treated, the risk of the neonate developing Chlamydia conjunctivitis is 20-50% and the risk of Chlamydia pneumonia is 5-10%.	Prophylactic antibiotics are not effective at preventing Chlamydia conjunctivitis or pneumonia in neonates.
Neonatal Conjunctivitis or Gonococcal Ophthalmia Neonatorum Conjunctivitis may be associated with a blocked tear duct, or bacterial colonization with oropharyngeal flora. Congenitally acquired infections including Gonorrhoea and Chlamydia can also cause severe, sight threatening conjunctivitis. Gonococcal conjunctivitis usually presents in the first two weeks of life with sudden, severe, grossly purulent conjunctivitis.	Irrigate the eye with saline several times a day until purulence subsides. **Ceftriaxone 50mg/kg IV/IM single dose** PLUS **Azithromycin 20mg/kg PO OD** *If there is evidence of disseminated Gonococcal disease:* **Cefotaxime 50mg/kg IV TID in first week of life, QID after first week of life** OR **Ceftriaxone 50mg/kg IV OD**

For all cases also treat mother and sexual partner. See Gonorrhoea in Chapter 8: Genital Infections.

Monitor for active infection and if this occurs see Neonatal Conjunctivitis or Gonococcal Ophthalmia Neonatorum in Chapter 11: Paediatric Infections (Neonates, Infants and Children).

For all cases also treat mother and sexual partner. See **Chlamydia infection of urethra, endocervix or rectum** in Chapter 8: Genital Infections.

Families should be advised to monitor baby for signs of conjunctivitis or pneumonia and present early for treatment.

Send bacterial swab for culture. Send viral (dry) swab for PCR. If disseminated disease is suspected (see below) send blood cultures, CSF and synovial fluid where clinically indicated.

Exclude disseminated gonococcal infection by careful physical examination. Disseminated disease may present as sepsis, arthritis, meningitis, or skin abscesses.

Neonatal gonococcal infection is preventable with prophylactic antibiotics for babies born to mothers with known gonococcal infection (see above).

The infant's mother and her partner should be tested and treated for Gonorrhoea, see **Gonorrhoea** in Chapter 8: Genital Infections.

Duration:
Azithromycin: Treat for 3 days
Disseminated Gonococcal disease: Treat for 10 days

It can rapidly lead to perforation of the globe and blindness. Topical antibiotics alone are insufficient. Urgent review by **Ophthalmology** is required.	
Neonatal oral candidiasis (thrush) prophylaxis	Indicated if any of the following: » < 32 weeks CGA » Receiving antibiotics for > 7 days » On CPAP **Nystatin 100 000 IU/ml PO 1ml TID**
Neonatal oral candidiasis (thrush) treatment	**Nystatin 100 000 IU/ml PO 1ml QID** *Treat mother's breast with:* **Miconazole 2% cream topically BID** OR **Gentian violet topically BID**
Neonatal Syphilis prophylaxis / treatment Babies born to mothers with Syphilis should be assessed for clinical evidence of congenital Syphilis. The risk of transmission from mothers with early Syphilis is 40-90%, in late Syphilis it is <10%. Symptoms or signs may include growth restriction, respiratory distress, rash (palms / soles), mucosal lesions, anaemia, jaundice, hepatosplenomegaly, nasal discharge, bony tenderness or periostitis on x-ray. See also **Syphilis in Pregnancy** in Genital Infections chapter.	*Asymptomatic babies born to mothers with syphilis (even if treated during pregnancy):* **Benzathine Penicillin 50 000 IU (37.5mg)/kg IM single dose** *Babies with probable congenital syphilis (positive examination findings or other investigations, and/or nontreponemal test ≥ four times maternal titre):* **Benzylpenicillin 100 000 IU (60mg)/kg IV/IM BID** Consider treating as probable congenital syphilis, babies with normal physical examination and nontreponemal test < four times maternal titre, whose mothers were not treated, were inadequately treated, or have evidence of reinfection or relapse.

Duration:
Continue until tolerating full enteral feeds, and antibiotics ceased for 48 hours.

Duration:
Neonate: Treat for 7-10 days
Mother: Continue until 2 weeks after symptom resolution.

See **Oral thrush (Candidiasis)** in Chapter 9: Gastrointestinal infections, **Candida Oesophagitis** in Chapter 9: Gastrointestinal infections, **Cutaneous Candidiasis** in Chapter 13: Skin and Soft Tissue Infection and **Vulvovaginal Candidiasis** in Chapter 17: Women's Health

Send serum for nontreponemal testing (VDRL, RPR). If baby's nontreponemal titre is four times the maternal titre congenital syphilis is highly likely. Consider LP in all babies with possible congenital syphilis.

For all cases also treat the mother and sexual partner and notify the case to Ministry of Health. See **Syphilis** in Chapter 8: Genital Infections, and **Syphilis in Pregnancy** in Chapter 8: Genital Infections.

Duration:
Babies with probable congenital syphilis (including CNS disease): Treat for 14 days.

Repeat nontreponemal testing in all infants born to mothers with syphilis every 2-3 months until this become nonreactive or titre has decreased fourfold. If this fails to decline or increases after 6-12 months, perform LP and repeat 14-day treatment course.

Neonatal HIV Prophylaxis If measures are not put in place to prevent mother-to-child transmission of HIV, the risk of transmission from an infected mother to the baby is approximately 40%. It is possible to reduce this risk by using antiretroviral therapy (ART) during the antenatal period to control viral replication in the mother. All pregnant women who have HIV should be commenced on ART immediately, and all exposed infants should also be treated with ART as soon as possible. Ideally within 6 hours of birth. Refer to local **HIV team** and **Infectious Diseases** where available. See **Timor-Leste Comprehensive ART Guidelines.**	*Low risk babies (see comments):* **Zidovudine PO BID** **≥ 35 weeks gestation: 4mg/kg PO BID for 4 weeks** **30-34 weeks gestation: 2mg/kg PO BID for 2 weeks, then TID for 2 weeks** **<30 weeks gestation: 2mg/kg PO BID for 4 weeks** *If unable to tolerate PO, give IV zidovudine:* **Term neonate: 1.5mg/kg IV QID** **Premature: 1.5mg/kg IV BID** *High risk babies (see comments):* **Zidovudine (dose as above) for 4 weeks** PLUS **Lamivudine 2mg/kg PO BID for 4 weeks** PLUS **Nevirapine 2mg/kg PO OD for 1 week, then 4mg/kg for 1 week then stop** (if mother was taking nevirapine for at least 3 days prior to birth use 4mg/kg for 2 weeks) PLUS **Cotrimoxazole 5+25mg/kg PO OD from 6 weeks of age, until confirmed HIV negative.**
Neonatal TB Prophylaxis Risk of transmission is reduced once a pregnant woman has been on treatment for >2 weeks. Congenital and perinatal TB transmission occur rarely, but the associated mortality when transmission does occur is high (~50%).	**Isoniazid 10mg** (range 7-15mg, max 300mg) **PO OD for 6 months** *Alternative:* **Rifampicin 15mg** (range 10-20mg, max 600mg) **PO OD** PLUS **Isoniazid 10mg/kg** (range 7-15mg, max 300mg) *After treatment completion give:* **BCG vaccination**

All babies at risk of mother-to-child transmission of HIV should be tested using HIV proviral DNA or HIV RNA PCR at 1 and 6 weeks, and 3 months. HIV antibody testing should be performed at 18 months. Refer to the National ART Guidelines if HIV infection is confirmed.

Babies are low risk if:

- Mother is on ART and viral load <50 copies/ml within 4 weeks of delivery

AND

- Mother did not acquire HIV during pregnancy

Babies are high risk if:

- Mother received ART but viral load >50 copies/ml within 4 weeks of delivery
- Mother acquired HIV during pregnancy
- Mother did not receive ART during pregnancy
- Mother only received intrapartum ART

Exclusive breastfeeding until the baby is 6 months should be encouraged. Mixed breast and formula feeding increases the risk of transmission of HIV considerably.

See **HIV infection** in Chapter 14: Special Infections

Neonates born to mothers with confirmed TB whose treatment was started <2 weeks prior should be examined carefully to exclude TB disease. Asymptomatic babies should not receive the BCG vaccine until they have completed preventative therapy.

If tuberculosis is confirmed see **Timor-Leste Comprehensive TB Guidelines for National Tuberculosis Control Program**

During the course of treatment, adjust drug doses for weight gain in the infant.

Duration:
Isoniazid monotherapy: Treat for 6 months
Rifampicin + isoniazid: Treat for 3 months

See **Paediatric TB** in Chapter 11: Paediatric Infections (Neonates, Infants and Children),and **Tuberculosis (TB)** in Chapter 6: ENT / Respiratory Tract infections

Neonatal Herpes Simplex Virus Prophylaxis / Treatment Asymptomatic babies born to mothers with a first episode of genital herpes around the time of delivery have a high risk (~30%) of neonatal herpes disease. Those that are infected have a high risk (~30%) of severe, disseminated or CNS disease. Prophylaxis is indicated for these babies.	*For asymptomatic babies and initial treatment for symptomatic babies:* **Acyclovir 20mg/kg IV TID** *Alternative (not preferred):* **Acyclovir 20mg/kg PO 5 times a day** *Suppression for symptomatic babies after completing initial treatment:* **Acyclovir 20mg/kg PO TID**
Neonatal Varicella Zoster Virus Prophylaxis / Treatment The highest risk of neonatal chickenpox occurs when babies are born to mothers who have their first episode of chickenpox from 7 days before to 28 days after delivery. Horizontal transmission can also occur from other household members to a baby born to a mother with no prior history of chickenpox.	*Asymptomatic babies born to mothers with recent chickenpox (7 days before - 28 days after delivery) use:* **Varicella Zoster Immunoglobulin** (if available) *Symptomatic neonates:* **Acyclovir 20mg/kg IV TID** *Alternative (not preferred):* **Acyclovir 20mg/kg PO 5 times a day**
Hepatitis B in Neonates Hepatitis B transmission from mother to child is common in untreated mothers with e-antigen positive chronic hepatitis B, in the absence of vaccination (up to 90%). Birth dose Hepatitis B vaccination prevents approximately 75% of transmission, while the	**Hepatitis B vaccine IM as soon as possible after birth preferably within 12 hours of delivery** AND **Hepatitis B Immunoglobulin (HBIG) 0.5ml IM (if available)** *Followed by:* **Refer to the Childhood Immunisation Schedule to perform a full Hepatitis B vaccination regimen**

Perform lumbar puncture and request HSV PCR (Biofire multiplex) where available. Repeat lumbar puncture at 2-3 weeks in CNS disease to check for cure.

Duration:
Asymptomatic: Treat for 10 days
Initial treatment skin, eye, and mouth disease: Treat for 14 days.
Initial treatment disseminated or CNS disease: Treat for at least 21 days. Continue for longer if CSF HSV PCR remains positive.
Suppression: Continue for 6 months.

See also **Encephalitis** in Chapter 4: Central Nervous System Infections, **Dendritic corneal ulceration caused by Herpes Simplex virus** in Chapter 7: Eye Infections, **Genital Herpes simplex virus** in Chapter 8: Genital Infections, and **Herpes Simplex** in Chapter 13: Skin and Soft Tissue Infections

Neonatal chickenpox is life-threatening, with estimated case fatality rates of up to 30%. Features may include fever, vesicular rash, pneumonia, meningoencephalitis, or hepatitis.

Isolate from other babies and use contact precautions.

Duration:
Symptomatic neonates: Treat for 10 days

See **Herpes Zoster / Shingles** in Chapter 13: Skin and Soft Tissue Infection, and **Varicella infection (chickenpox)** in Chapter 14: Special Infections

If access to the Hepatitis B vaccine becomes limited in Timor-Leste, babies born to mothers with Hepatitis B should be prioritized for administration of the hepatitis B vaccine.

See **Chronic Hepatitis B** in Chapter 9: Gastrointestinal Infections

addition of Hepatitis B immunoglobulin may improve protection against transmission to approximately 90%. Mothers with hepatitis B should be encouraged to breastfeed.	Babies with low birth weight (<2kg) do not respond as well to the vaccine. Consider a booster Hepatitis B vaccine at 12 months on top of the usual regimen.
Childhood Malnutrition In severe acute malnutrition, the usual signs of bacterial infection such as fever are often absent. Multiple infections are common. If specific infections are identified treat for these, otherwise, in all children with severe acute malnutrition, give the following antibiotics empirically.	*Severe acute malnutrition in children with no signs of infection and who do not appear unwell:* **Amoxicillin 40-45mg/kg PO BID** *Alternative:* **Cotrimoxazole 4/20 mg/kg PO BID** *Severe acute complicated malnutrition with oedema or looking unwell:* **Ampicillin 50mg/kg IV/IM QID** PLUS **Gentamicin 7.5mg/kg IV OD** *Severe acute malnutrition with signs of severe infection or meningitis:* **Ceftriaxone 50mg/kg IV BID** *If refractory diarrhoea ADD:* **Metronidazole 12.5mg/kg IV BID**
Pertussis in Children Consider pertussis if the child has a whooping-type cough, persistent cough, post-cough vomiting, or apnoeic or cyanotic episodes. Fever is uncommon.	*Infants < 6 months:* **Azithromycin 10 mg/kg PO OD** *Infants ≥ 6 months and children:* **Azithromycin 10mg/kg single dose on day 1; then 5mg/kg PO OD** *Alternative:* **Co-trimoxazole child 4/20 mg/kg PO BID for infants and children > 1 month** OR **Clarithromycin 7.5mg/kg PO BID**

Send blood cultures.
Consider treating as Sepsis if child is lethargic, hypothermic or hypoglycaemic.

Duration:
SAM in children with no signs of infection and not unwell: Treat for 7 days
SAM with oedema or looking unwell: Step down to orals once improving. Treat for a total of 7 days.
SAM with signs of severe infection or meningitis: Treat according to suspected source of infection. If this is not obvious treat for 7 days.

There is no conclusive evidence that antibiotics alter the course of disease, but treatment of Pertussis minimises the transmission to susceptible contacts. Patients should avoid contact with others, especially young children and infants, until at least 5 days of antibiotic therapy have been taken.

Duration:
Azithromycin: Treat for 5 days.
Co-trimoxazole, Clarithromycin: Treat for 7 days

See **Community acquired pneumonia (CAP) in children** in Chapter 6: ENT / Respiratory Tract infections

Paediatric TB

Suspect TB if any two of the following:

- Recent TB contact
- Cough > 2 weeks
- Fever >2 weeks
- Failure to thrive
- Fatigue / reduced playfulness >2 weeks
- Lymphadenopathy (>1cm) >2 weeks
- Profuse night sweats

See **Timor-Leste Comprehensive TB Guidelines for National Tuberculosis Control Program**

See also **Tuberculosis (TB)** section in ENT / Respiratory chapter.

References

American Academy of Pediatrics. Evaluation and treatment of infants with possible, probable, or confirmed congenital syphilis. In: Kimberlin D, Brady M, Jackson M, Long S, editors. Red Book 2018 Report of the Committee on Infections diseases. 31st ed. Itasca, IL; 2018

American Academy of Pediatrics. Hepatitis B. In: Kimberlin D, Barnett E, Lynfield R, Sawyer M, editors. Red Book 2021-2024 Report of the Committee on Infections diseases. 32nd ed. Itasca, IL; 2021

American Academy of Pediatrics. Pertussis (whooping cough). In: Kimberlin D, Barnett E, Lynfield R, Sawyer M, editors. Red Book 2021-2024 Report of the Committee on Infections diseases. 32nd ed. Itasca, IL; 2021

American Academy of Pediatrics. Tables of antibacterial drugs for neonates (≤28 postnatal days of age). In: Kimberlin D, Brady M, Jackson M, Long S, editors. Red Book 2018 Report of the Committee on Infections diseases. 31st ed. Itasca, IL; 2018

Examine for signs of extra-pulmonary TB:

- Pleural effusion
- Enlarged non-tender lymph nodes, mainly cervical.
- Signs of meningitis
- Abdominal swelling with or without palpable masses
- Progressive swelling or deformity in the bone or a joint, including the spine

Send sputum, gastric aspirate, pus, lymph node, joint aspirate, CSF for GeneXpert PCR, AFB and culture. Consider performing blood culture (request prolonged incubation in Bactec) if disseminated TB is suspected or there is significant immunocompromise.

Test all patients for HIV.
See **Neontal TB prophylaxis** in Chapter 11: Paediatric Infections (Neonates, Infants and Children),and **Tuberculosis (TB)** in Chapter 6: ENT / Respiratory Tract infections

American Academy of Pediatrics. Zidovudine regimen for decreasing the risk of mother-to-child transmission (MTCT) of HIV. In: Kimberlin D, Brady M, Jackson M, Long S, editors. Red Book 2018 Report of the Committee on Infections diseases. 31st ed. Itasca, IL; 2018

Brook I. Microbiology and management of neonatal necrotizing enterocolitis. Am J Perinatol 2008; 25(2):111-118. doi: 10.1055/s-2008-1040346

eTG complete. HIV infection in pregnancy. In: Therapeutic Guidelines [digital]. Melbourne: Therapeutic Guidelines Limited; 2019. http://www.tg.org.au
eTG complete. Neonatal herpes simplex infection. In: Therapeutic Guidelines [digital]. Melbourne: Therapeutic Guidelines Limited; 2019. http://www.tg.org.au

Flynn P, Abrams E, Fowler M. Prevention of mother-to-child HIV transmission in resource-limited settings. In: Mofenson L, Bogorodskaya M, editors. UpToDate [internet]. Waltham (MA): UpToDate Inc; 2021. https://

www.uptodate.com/contents/prevention-of-mother-to-child-hiv-transmission-in-resource-limited-settings?search=neonatal%20transmission%20HIV&source=search_result&selectedTitle=1~150&usage_type=default&display_rank=1#H472064793

Gusmao dos Santos C, Francis J, Guterres J, Janson S, Lopes N, Marr I, et al. HNGV Antibiotic guidelines writing group. Antibiotic guidelines Hospital Nacional Guideo Valadares. Timor-Leste; 2016

Jones K, Thitiri J, Ngari M, Berkley J. Childhood malnutrition: toward an understanding of infections, inflammation, and antimicrobials. Food Nutr Bull 2014;35 (2 Suppl):S64-70. doi: 10.1177/15648265140352S110

Lazzerini M, Tickell D. Antibiotics in severely malnourished children: systematic review of efficacy, safety and pharmacokinetics. Bull World Health Organ 2011; 89:593-606. doi:10.2471/BLT.10.084715

Ministerio da Saude Timor-Leste. In-patient management of children with severe acute malnutrition protocol for Timor-Leste. Dili: Ministerio da Saude, World Health Organisation; 2019.

Ministerio da Saude. Comprehensive TB guidelines for national tuberculosis control program. 5th ed. Dili: Ministerio da Saude, World Health Organisation; 2020

National HIV/AIDS programme Timor-Leste. Guidelines for antiretroviral therapy and management of opportunistic infections for children, adolescents and adults living with HIV. Timor-Leste: Ministerio da Saude; 2021

Palasanthiran P, Starr M, Jones C, Giles M, editors. Management of perinatal infections. Sydney: Australasian Society for Infectious Diseases; 2014

Smith M, Boutzoukas A, Autmizguine J, Hudak M, Zinkhan E, Bloom B, et al. Antibiotic safety and effectiveness in premature infants with complicated intraabdominal infections. Pediatr Infect Dis J 2021; 40(6):550-555. doi: 10.1097/INF.0000000000003034

Solomkin J, Mazuski J, Bradley J, Rodvold K, Goldstein E, Baron E, et al. Diagnosis and management of complicated intra-abdominal infection in adults and children: guidelines by the Surgical infection Society and Infectious Disease Society of America. Clin Infect Dis 2010; 50(2):133-164. doi: 10.1086/649554

Standing J, Ongas M, Ogwang C, Kagwanja N, Murunga S, Mwaringa S, et al. Dosing of ceftriaxone and metronidazole for children with severe acute malnutrition. Clin Pharmacol Ther 2018; 104(6):1165-1174. doi: 10.1002/cpt.1078. Epub 2018 Apr 19.

Tiwari T, Murphy T, Moran J. Recommended antimicrobial agents for the treatment and postexposure prophylaxis of pertussis: 2005 CDC Guidelines. MMWR 2005; 54 (RR14):1-16

Wodi A, Ault K, Hunter P, McNally V, Szilagyi P, Bernstein H. Advisory committee on immunization practices recommended immunization schedule for children and adolescents aged 18 years of younger – United States, 2021. MMWR 2021; 70(6):189-192. doi: 10.15585/mmwr.mm7006a1

Workowski K, Bolan G. Sexually transmitted diseases treatment guidelines, 2015. MMWR 2015; 64(RR3):1-137

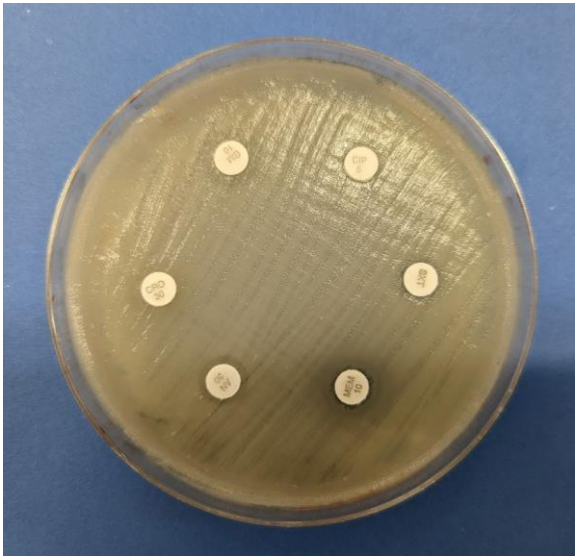
World Health Organization. Hepatitis B vaccines: WHO position paper, July 2017 Recommendations. Vaccine 2019; 37(2):223-225. doi: 10.1016/j.vaccine.2017.07.046.

Chapter 12. **Sepsis and Directed Therapy for Blood Stream Infection**

Development of sepsis begins with infection (tissue invasion), which can then progress to bacteraemia (blood stream involvement) and lead on to severe sepsis (infection with single organ dysfunction). Patients with severe sepsis may develop septic shock (with hypotension not responsive to fluids), and/or multi-organ dysfunction syndrome (MODS) with dysfunction of 2 or more organs. Symptoms and signs of sepsis may or may not include signs specific to a source such as cough or dysuria.

Sepsis should be considered in a child with fever who is severely ill and is likely to have infection. It is usually associated with tachycardia, tachypnoea, raised white cell count and organ dysfunction. Hypotension is a late sign of septic shock in children. Warning signs in adults include arterial hypotension (<90mmHg systolic), fever >38ºC, tachycardia, tachypnoea and altered mental status. Importantly many of these signs indicate decreased organ perfusion and can be improved with careful and early fluid resuscitation, appropriate antibiotic treatment, and repeated re-assessment (at least half-hourly). Rapid treatment of sepsis saves lives.

Common causative organisms include: *Streptococcus pneumoniae, Staphylococcus aureus, Streptococcus pyogenes, Haemophilus influenzae,* and *Neisseria meningitidis.* Enteric Gram-negative organisms such as *Escherichia coli, Klebsiella pneumoniae* and *Salmonella* spp. are more common in children with underlying malnutrition.



Disc diffusion antibiotic testing (Disc AST) shows resistant to all gram negative antibiotics tested

Condition	Antimicrobial
Sepsis without focus **Take blood cultures then administer antibiotics within 1 hour.** Continue repeated assessment and investigation for site of infection. Refer to relevant section once a focus is found and direct antibiotics accordingly.	*Immunocompetent and low risk for multidrug resistant organisms (MDR):* **Ceftriaxone 2g (child 50mg/kg) IV OD** PLUS **Gentamicin 4-5mg/kg (child 7.5mg/kg) IV OD** PLUS **Cloxacillin 2g (child 50mg/kg) IV QID** *High risk for MDR or significant immunocompromise:* **Ceftriaxone 2g (child 50mg/kg) IV OD** PLUS **Amikacin 28mg/kg IV OD as a first dose in patients with creatinine clearance >60ml/minute. Use 16-20mg/kg if creatinine clearance <60ml/minute.** For subsequent doses see **Aminoglycoside dosing** section. **Child 15mg/kg IV OD.**
	If amikacin is not available and patient is likely to have normal renal function give Gentamicin 7mg/kg IV for first dose. If patient is likely to have abnormal renal function give Gentamicin 4-5mg/kg IV OD. PLUS **Vancomycin 25-30mg/kg loading dose, then dose according to Vancomycin dosing section.** Do not continue gentamicin or amikacin beyond 72 hours.
Septic Shock A subset of sepsis associated with circulatory, cellular, and metabolic abnormalities. This presents as hypotension which is refractory to IV fluid	*Community acquired:* **Ceftriaxone 2g IV (child 50mg/kg) IV OD** PLUS **Amikacin 28mg/kg IV OD as a first dose in patients with creatinine clearance >60ml/minute. Use 16-20mg/kg** if creatinine clearance

Comments and Duration of Therapy

Consider patients high risk for MDR if any of the following:

- Recent antibiotic use
- Recent admission to hospital
- Known MDR colonization

If using gentamicin, amikacin or vancomycin for sepsis, daily monitoring of creatinine clearance is particularly important (refer to Cockcroft-Gault calculation).

Typhoid (enteric fever) may present as fever with few focal features. If Typhoid is suspected see **Typhoid (enteric fever)- proven or suspected** in Chapter 9: Gastrointestinal Infections, for stepdown antibiotic therapy.

Take blood cultures then administer antibiotics within 1 hour.

Continue investigation for site of infection. Refer to relevant section once a focus is found and direct antibiotics accordingly.

replacement, requiring vasopressor therapy to maintain MAP > 65 mmHg, and associated with tissue hypoperfusion (lactate > 2 mmol / L), in the absence of hypovolaemia. **Diagnosis septic shock in patients with mean arterial pressure (MAP) < 65mmHg after adequate IV fluid replacement, or who are on vasopressors. Early administration of antibiotics is associated with improved outcomes. Patients should receive antibiotics within 1 hour of presenting with septic shock.** Refer to **ICU.**	<60ml/minute. For subsequent doses see **Aminoglycoside dosing** section. **Child 15mg/kg IV OD.** If amikacin is not available and patient is likely to have normal renal function give Gentamicin 7mg/kg IV for first dose. If patient is likely to have abnormal renal function give Gentamicin 4-5mg/kg IV OD. PLUS **Vancomycin 25-30mg/kg loading dose, then dose according to Vancomycin dosing section.** If not improving after 48 hours and no culture results available, change to antibiotics for Hospital Acquired Septic Shock. For dosing frequency see **Aminoglycoside dosing** section. *Do not continue gentamicin or amikacin beyond 72 hours.* *Hospital acquired:* **Meropenem 1g (child 40mg/kg) IV TID** PLUS **Vancomycin 25-30mg/kg loading dose, then dose according to Vancomycin dosing section.**
Gram-negative bacteraemia	Treat according to susceptibilities. If site of infection is identified refer to relevant section of guideline.
***Staphylococcus aureus* bacteraemia** *General considerations* » Where possible remove source of bacteraemia	*For Methicillin-sensitive Staphylococcus aureus (MSSA):* **Cloxacillin 2g QID (child 50mg/kg up to 2g) (for septic shock use Q4H dosing)**

Duration:
If site of infection remains unknown, treatment response is rapid, patient is not immunocompromised, and there is no deep-seated or uncontrolled site of infection, 5-7 days of total antibiotic treatment is adequate.

For Burkholderia pseudomallei bacteraemia see Melioidosis in Chapter 14: Special Infections.

Treat as complicated if any of the following are present:

- Positive blood culture >48 hours after starting appropriate antibiotics
- Fever 72 hours after starting appropriate antibiotics
- Abnormal cardiac valves
- No source of infection identified
- Source of infection identified but not addressed

(e.g. canula, abscess, necrotic bone). » Evaluate clinically for metastatic foci of infection (e.g. endocarditis, septic arthritis, osteomyelitis, abscesses). » Repeat one set of blood cultures every 48 hours until negative. » Perform a transthoracic echo on all patients.	*For Methicillin-resistant Staphylococcus aureus (MRSA):* **Vancomycin IV, dose according to Vancomycin section** Monitor creatinine every 2-3 days while patient is on vancomycin.
Candidaemia *General considerations* » Where possible remove source of candidaemia (e.g. intravenous line, catheter) » Evaluate clinically for metastatic foci of infection » Repeat one set of blood cultures every 48 hours until negative » Perform a transthoracic echo » Perform fundoscopic examination to evaluate for endophthalmitis	**Fluconazole 800mg (child 12mg/kg up to 800mg) IV for the first dose, followed by 400mg (child 6mg/kg up to 400mg) IV OD.** When clinically improved change to: **Fluconazole 400mg (child 6mg/kg) PO OD** ***Candida* species other than *C. albicans* may need higher doses.**

References

eTG complete. Sepsis and bacteraemia. In: Therapeutic Guidelines [digital]. Melbourne: Therapeutic Guidelines Limited; 2019. http://www.tg.org.au

Evans L, Rhodes A, Alhazzani W, Antonelli M, Coopersmith C, French C, et al. Surviving Sepsis Campaign Guidelines 2021. Intensive Care Med 2021; 47(11):1181-1247. doi: 10.1007/s00134-021-06506-y

» Evidence of metastatic foci of infection
» Intravascular prosthetic material

Duration:
Uncomplicated bacteraemia: Treat for 2 weeks IV.
Complicated bacteraemia: Treat for at least 4 weeks IV. Extend treatment to 6 weeks if response to antibiotics is slow.

Metastatic complications of candidaemia include:
» Endocarditis
» Endophthalmitis
» Abscesses

Duration:
No metastatic complications: Treat for 2 weeks
Metastatic complications present: Treat for 4-6 weeks

Gavelli F, Castello L, Avanzi G. Management of sepsis and septic shock in the emergency department. Intern Emerg Med 2021; 16(6):1649-1661. doi: 10.1007/s11739-021-02735-7

Gusmao dos Santos C, Francis J, Guterres J, Janson S, Lopes N, Marr I, et al. HNGV Antibiotic guidelines writing group. Antibiotic guidelines Hospital Nacional Guideo Valadares. Timor-Leste; 2016

Condition	Antimicrobial
Impetigo Impetigo is a superficial bacterial skin infection most often caused by *Streptococcus pyogenes* or *Staphylococcus aureus*. Lesions may sometimes be bullous or have a "honey crust".	All impetigo should be treated with soap and water and antiseptic solution topically TID to soften crusts. *For moderate to severe disease:* **Cloxacillin 500mg (child 15mg/kg) PO QID** *Alternative:* **Co-trimoxazole 160 / 800mg (child 4/20 mg/kg) PO BID** OR **Benzathine penicillin 1.2 million IU (900mg) (child <20kg 0.6 million IU (450 mg)) IM, 1 dose (do not use for bullous impetigo)**
Folliculitis, Boils, Carbuncles and Skin Abscesses Folliculitis is the infection of a hair follicle with purulent inflammatory exudate. A boil (or furuncle) is a simple subcutaneous abscess. Carbuncles are deeper and wider lesions with interconnecting tracts from neighbouring hair follicles. The main pathogens are *Staphylococcus aureus* and *Streptococcus pyogenes.*	For abscesses < 5cm antibiotics are not always necessary. *After adequate incision and drainage, if persistent cellulitis, give:* **Cloxacillin 500mg (child 15mg/kg) PO QID** *Alternative:* **Cotrimoxazole 160/800 mg (child 4/20 mg/kg) PO BID** OR **Clindamycin 450 mg (child 10mg/kg) PO TID** If patient is systemically unwell treat as per **Cellulitis.**

	Comments and Duration of Therapy
	Swab exudate for culture if moderate-severe infection, or if patient is not improving on first line therapy. *Nonbullous* impetigo arises on the face especially around the nares, or the extremities. It starts as erythematous papules which become vesicles, and then pustules that rupture and lead to honey-coloured crusted lesions on an erythematous base. *Bullous* impetigo is characterized by the progression of vesicles to flaccid bullae which rupture easily, then become crusted. It is usually caused by *Staphylococcus aureus*. Adults with bullous impetigo should be tested for HIV. *Duration:* Treat for 5 days
	Incision and drainage is key to the treatment of boils and carbuncles. Send pus for culture and if systemically unwell send blood cultures. *Duration:* If patient is systemically well treat for 5-7 days See ***Staphylococcus aureus* bacteraemia** in Chapter 12: Sepsis and Directed Therapy for Blood Stream Infections if this is present.

Cellulitis Cellulitis is a common infection of the deep dermis and subcutaneous tissue most often caused by Streptococcus pyogenes and Staphylococcus aureus. It presents as erythema, swelling, warmth, and pain, and may be purulent with associated pustules or abscesses. Water exposure increases the risk of certain organisms such as ***Aeromonas*** (fresh/brackish water) or *Vibrio* (salt water). In patients with **septic shock** treat as **Necrotising Soft Tissue Infection.** In patients with cellulitis involving or surrounding an eye, see **Orbital** and **Pre-Orbital Cellulitis** in Eye Infections chapter.	*Mild infection:* **Cloxacillin 500mg (child 15mg/kg) PO QID** *Alternative:* **Cotrimoxazole 160/800 mg (child 4/20 mg/kg) PO BID** OR **Clindamycin 450 mg (10mg/kg) PO TID** *Moderate to severe infection:* **Cloxacillin 2g (child: 50mg/kg) IV QID** *Alternative:* **Cefazolin 2g (child 50mg/kg) IV TID** OR **Clindamycin 600mg (child 15mg/kg) IV TID** OR **Vancomycin IV, dose according to Vancomycin dosing section** *If there is water exposure, ADD:* **Ciprofloxacin 500mg (child 10mg/kg) PO BID**
Bite wounds Bite wound infections are caused by bacteria associated with human skin *(Staphylococcus aureus),* and animal oral flora *(Pasteurella* spp., *Capnocytophaga canimorsus, Streptococcus* spp., anaerobic bacteria). Marine bite infections are associated with *Aeromonas* spp., *Shewanella putrefaciens, and Vibrio* spp.	Consider tetanus prophylaxis for all bite wounds. See **Tetanus Prophylaxis** in Antibiotic Prophylaxis chapter. *For Human (clenched fist) / Cat / Dog bites:* *Prophylaxis for high risk wounds, or mild infection:* **Amoxicillin/Clavulanic acid 500/125mg (child 25/6.25 mg/kg) PO TID**

If there are abscesses, incision and drainage is important, if there are signs of necrotizing fasciitis treat for this. Consider MRSA if cellulitis is purulent. Send blood cultures if systemically unwell, send swab of pus for culture if this is present.

Predisposing factors for cellulitis such as tinea infection of the feet, lymphoedema and fissured dermatitis if present should be treated to prevent recurrence.

Rest and elevation of the affected area improves clinical response.

Duration:
Mild infection: Treat for 5-7 days
Moderate to severe infection: Change to oral antibiotics when clinically improving. Treat for a total of 7-10 days.

See ***Staphylococcus aureus* bacteraemia** in Chapter 12: Sepsis and Directed Therapy for Blood Stream Infections if this is present.

If there is evidence of infection, swab wound for culture. If systemically unwell, perform blood cultures. If wound is debrided send tissue for culture.

Bite wounds are high risk for infection if any of the following are present:

- Delayed presentation for debridement (>8hours)
- Puncture wound that cannot be adequately debrided
- Wound on hands, feet, or face
- Wound involving bones, joints, or tendons
- Immunocompromised patient
- Cat bite wound

Antibiotics are required for infected bites. For bites that are not infected, antibiotics are required if the wound is high risk. If patient is in **septic shock** treat as **Necrotising Soft Tissue Infection.** See **Necrotising Soft Tissue Infection** (Necrotising fasciitis, myonecrosis, **gas gangrene, Fournier's gangrene)** in Chapter 13: Skin and Soft Tissue Infections	*Alternative:* **Doxycycline 100 mg (child ≥8 years: 2mg/kg) PO OD** PLUS **Metronidazole 500mg (child 12.5mg/kg) PO BID** OR **Cotrimoxazole 160/800 mg (child 4/20 mg/kg) PO BID** PLUS **Metronidazole 500mg (child 12.5mg/kg) PO BID** *Moderate to severe infection:* **Ceftriaxone 2g (child 25mg/kg) IV OD** PLUS **Metronidazole 500mg (child 12.5mg/kg) IV/PO BID** *For marine bites and water contaminated wounds:* *Prophylaxis for high risk wounds, or mild infection:* **Cloxacillin 500mg (child 15mg/kg) PO QID** PLUS **Ciprofloxacin 500mg (child 12.5mg/kg) BID** Moderate to severe infection: **Cloxacillin 2g (child: 50mg/kg) IV QID** PLUS **Ciprofloxacin 400mg (child 10mg/kg) IV TID**
Traumatic Wound Prophylaxis and Infection Antibiotic prophylaxis is not routinely required for traumatic wounds but may be	Consider tetanus prophylaxis for all wounds. See **Tetanus Prophylaxis** in Antibiotic Prophylaxis chapter. Thorough debridement and cleaning is essential.

Duration:

Prophylaxis or mild infection: If no signs of infection treat for 3 days. If signs of infection treat for 5-7 days depending on clinical response.

Moderate to severe infection: Change to oral antibiotics when clinically improving. Treat for a total of 10-14 days.

If there is evidence of infection, swab wound for culture. If there are systemic features of infection, send blood cultures.

Duration:

Prophylaxis of heavily contaminated wounds that do not require surgery: Treat for 24 - 72 hours.

considered in wounds that require surgical management, or which are heavily contaminated. See **Prophylaxis for Open Fractures** in Bone and Joint Infections if this is present. If patient is in **septic shock** treat as **Necrotising Soft Tissue Infection**. See **Necrotising Soft Tissue Infection (Necrotising fasciitis, myonecrosis, gas gangrene, Fournier's gangrene)** in Chapter 13: Skin and Soft Tissue Infections	*For prophylaxis of heavily contaminated wounds that do not require surgery, and for mild infection use:* **Cloxacillin 500mg (child 15mg/kg) PO QID.** *Alternative:* **Cotrimoxazole 160/800 mg (child 4/20 mg/kg) PO BID** OR **Clindamycin 450 mg (child 10mg/kg) PO TID** *For prophylaxis of wounds that require surgery, and for moderate to severe infection use:* **Cefazolin 2g (child 50mg/kg) IV TID** *Alternative:* **Cloxacillin 2g (child 50mg/kg) IV QID** OR **Clindamycin 600mg (child 15mg/kg) IV TID** OR **Vancomycin IV, dose according to Vancomycin dosing section** *If wound is heavily contaminated or penetrating to hollow viscous ADD:* **Metronidazole 500mg (child 12.5mg/kg) IV/PO BID**
Surgical Site Infection This refers to a post-operative patient who has developed infection at the operation site either in the ward or after discharge home. The most common pathogens are *Staphylococcus aureus* and other *Staphylococcal* spp., *Streptococcal* spp., and *Enterococcus*. If patient is in **septic shock** treat as **Necrotising Soft Tissue Infection.**	**Cloxacillin 2g (child 50mg/kg) IV QID** *Alternative:* **Cefazolin 2g (child 50mg/kg) IV TID** OR **Clindamycin 600mg (child 15mg/kg) IV TID** *If gram negative infection is suspected (e.g. grossly contaminated wound that communicates with gastrointestinal or urinary tract) consider ADDING:* **Gentamicin 4-5mg/kg (child <10 years old 7.5mg/kg) IV OD** See **Aminoglycoside dosing** section.

Prophylaxis of wounds that require surgery: Stop antibiotics ≤ 24 hours after wound closure. Stop antibiotics at 72 hours if wound closure is not achieved earlier.
Mild infection: Treat for 5-7 days depending on clinical response.
Moderate to severe infection: Change to oral antibiotics when clinically improving. Treat for a total of 10-14 days.

Swab wound for culture. If systemic features of infection, send blood cultures.

Debride wound if necrotic tissue or deep collection is present. Send tissue for culture.

Duration:
Change to oral antibiotics when clinically well. Treat for 7-14 days depending on the severity of infection.

Diabetic foot infection Diabetic foot infections may involve skin and soft tissue or extend deeper to underlying muscle and bone. These infections are often mixed, involving aerobes and anaerobes, Gram-positive and Gram-negative organisms., however *Staphylococcus aureus* and streptococci are the most common cause of acute diabetic foot infections in patients who have not received recent antibiotics. If patient is in **septic shock** treat as **Necrotising Soft Tissue Infection.**	Always obtain surgical opinion for the possibility of debridement. *Mild:* **Amoxicillin/Clavulanic acid 500/125mg PO TID** *Alternative:* **Cloxacillin 500mg PO QID** PLUS **Metronidazole 500mg PO BID** OR **Co-trimoxazole 160/800mg BID** PLUS **Metronidazole 500mg PO BID** *Moderate-Severe:* **Cloxacillin 2g IV QID** PLUS **Ciprofloxacin 500mg PO BID (or 400mg IV TID)** PLUS **Metronidazole 500mg PO/IV BID** *Alternative:* **Clindamycin 600mg IV TID** PLUS **Ciprofloxacin 500mg PO BID (or 400gm IV TID)**
Necrotising Soft Tissue Infection (Necrotising fasciitis, myonecrosis, gas gangrene, Fournier's gangrene) Clinical features that suggest a necrotising infection of the skin and deeper tissues include: severe constant pain, bullae, skin necrosis or discolouration, wooden hard	**Meropenem 1g (child 20mg/kg) IV TID** PLUS **Vancomycin 25-30mg/kg loading dose IV, then dose according to Vancomycin dosing section** PLUS **Clindamycin 600mg (child 15mg/kg) IV / PO TID** *Alternative:* Replace meropenem in the above regime with: **Piperacillin/Tazobactam 4/0.5g (child 100/12.5 mg/kg) IV QID**

Tissue culture obtained by biopsy or aspiration may help guide antibiotic therapy. Superficial wound swab cultures need to be interpreted in the clinical context, as organisms isolated may be colonizing rather than infecting the wound. Take blood cultures if systemically unwell.

Diabetic foot infections are often worse than they appear. Complications which need to be considered include osteomyelitis, and necrotising soft tissue infection. Proper wound care and dressings are as important as antibiotics.

Duration:
Mild infection: Treat for 5-7 days
Moderate to severe infection: If there is no osteomyelitis change to oral antibiotics when clinically improving and treat for a total of 10-14 days.
If infected limb is amputated with clear margins, stop antibiotics 2-5 days following surgery.

See **Acute Osteomyelitis** in Chapter 2: Bone and Joint Infections, and Chronic Osteomyelitis in Chapter 2: Bone and Joint Infections for treatment duration if this is present.

Send blood cultures prior to antibiotics. Send tissue specimens from operative theatre for culture.

Change to directed antibiotics as soon as culture results are available.

Clindamycin is included in the empiric regime for its theoretic anti-toxin effects. It should be continued in addition to a beta-lactam if *Streptococcus pyogenes*, *Staphylococcus aureus*, or *Clostridium spp*. are found to be the causative organisms.

subcutaneous tissue, gas in the soft tissue, oedema beyond the margin of erythema, rapid spread, systemic toxicity plus fever, delirium, renal failure and a high white cell count. Consider this diagnosis in any patients who are critically unwell with skin and soft tissue infection. **Give antibiotics within 1 hour of presentation. Urgent surgical debridement is essential.**	OR Replace meropenem in the above regime with: **Amikacin 28mg/kg IV OD as a first dose in patients with creatinine clearance >60ml/minute. Use 16-20mg/kg** if creatinine clearance <60ml/minute. For subsequent doses see **Aminoglycoside dosing** section. **Child 15mg/kg IV OD.** Replace vancomycin in the above regime with: **Cloxacillin 2g (child: 50mg/kg) IV QID** *If the wound has been immersed in water ADD:* **Ciprofloxacin 400mg (child 10mg/kg) IV TID** OR **Ciprofloxacin 500mg (child 12.5mg/kg) PO BID** to three drug regime above.
***Streptococcus pyogenes* Necrotising Soft Tissue Infection**	**Benzylpenicillin 4 million IU (2.4g) (child 80 000 IU (50mg)/kg) IV Q4H** PLUS **Clindamycin 600mg (child 15mg/kg) IV TID / PO** *Alternative:* **Ampicillin 2g (child 50mg/kg) IV Q4H** PLUS **Clindamycin 600mg (child 15mg/kg) IV TID / PO** *When oral therapy is appropriate change to:* **Amoxicillin 1g (child 25mg/kg) PO TID**
***Clostridium* spp. Necrotising Soft Tissue Infection (Gas gangrene)**	**Benzylpenicillin 4 million IU (2.4g) (child 80 000 IU (50mg)/kg) IV Q4H** PLUS **Clindamycin 600mg (child 15mg/kg) IV TID / PO** *Alternative:* **Ampicillin 2g (child 50mg/kg) IV Q4H** PLUS **Clindamycin 600mg (child 15mg/kg) IV TID / PO**

Duration:
Change to oral antibiotics when further debridement is no longer necessary, there has been clinical improvement, AND patient has been afebrile for 48 to 72 hours. At this point if patient is still on clindamycin, stop this. Continue oral antibiotics until infection has resolved but not necessarily until the wound has healed.

See ***Staphylococcus aureus* bacteraemia** in Chapter 12: Sepsis and Directed Therapy for Blood Stream Infections if this is present.

Duration:
Change to oral antibiotics when further debridement is no longer necessary, there has been clinical improvement, AND patient has been afebrile for 48 to 72 hours. At this point stop clindamycin. Continue oral antibiotics until infection has resolved but not necessarily until the wound has healed.

Duration:
Change to oral antibiotics when further debridement is no longer necessary, there has been clinical improvement, AND patient has been afebrile for 48 to 72 hours. Continue oral antibiotics until infection has resolved but not necessarily until the wound has healed

MRSA Necrotising Soft Tissue Infection See ***Staphylococcus aureus* bacteraemia** in Chapter 12: Sepsis and Directed Therapy for Blood Stream Infections if this is present.	**Vancomycin 25-30mg/kg loading dose, then dose according to Vancomycin dosing section** PLUS **Clindamycin 600mg (child 15mg/kg) IV TID / PO**
Burns Antibiotic prophylaxis is not indicated for patients with burns that do not require immediate debridement surgery. For patients who require debridement use routine surgical prophylaxis (see **Surgical Prophylaxis** in Antibiotic Prophylaxis chapter). There is no evidence to support the use of systemic prophylactic antibiotics after debridement. Monitor patients closely for evidence of infection and treat if this occurs.	Consider tetanus prophylaxis for all burns. See **Tetanus Prophylaxis** in Antibiotic Prophylaxis chapter. *Minor:* Sterilised gauze dressing impregnated with white soft paraffin *Moderate to severe with signs of infection:* Silver Sulfadiazine 1% cream (this cream does not penetrate eschar) Give systemic antibiotics if signs of surrounding cellulitis. See Cellulitis in Skin and Soft Tissue Infections chapter.
Mastitis Acute mastitis is usually associated with lactation and is frequently due to *Staphylococcus aureus*.	*Mild:* **Cloxacillin 500mg (child: 15mg/kg) PO QID** *Alternative:* **Cotrimoxazole 160/800 mg (child 4/20 mg/kg) PO BID** OR **Clindamycin 450 mg (10mg/kg) PO TID** *Moderate to severe:* **Cloxacillin 2g (child: 50mg/kg) IV QID** *Alternative:* **Cefazolin 2g (child 50mg/kg) IV TID** OR **Clindamycin 600mg (child 15mg/kg) IV TID**

Duration:
Change to oral antibiotics when further debridement is no longer necessary, there has been clinical improvement, AND patient has been afebrile for 48 to 72 hours. At this point stop clindamycin. Continue oral antibiotics until infection has resolved but not necessarily until the wound has healed.

For all burn cases, proper debridement and/ or escharotomy is paramount.

Superficial wound swab cultures can be helpful to direct therapy when infection is present, however they should be interpreted in the clinical context, as organisms isolated may be colonizing rather than infecting the wound. Send blood cultures if systemically unwell. Send tissue cultures from debridement if infection is present.

Take blood cultures if systemically unwell. Send wound swab, pus or operative specimens for culture if available.
Change antibiotics according to susceptibility results.

Duration:
Mild infection: Treat for 5-7 days
Moderate to severe infection: Step down to oral antibiotics when improving. Treat for a total of 7-10 days.

See ***Staphylococcus aureus* bacteraemia** in Chapter 12: Sepsis and Directed Therapy for Blood Stream Infections if this is present.

Herpes Simplex Common in children and adults. Primary episode generally occurs in childhood and may be associated with fever and lymphadenopathy. Lesions are usually preceded by pain, burning, or tingling for several hours to days. The lesions begin as macules and rapidly become papular, with vesicles appearing within 48 hours and scabs within 3-4 days.	*Mild:* Symptomatic management only *Moderate-Severe:* **Acyclovir 400mg (child 10mg/kg) PO 5 times a day** *Long-term suppression:* **Acyclovir 400mg (child 10mg/kg) PO BID**
Eczema Herpeticum Widespread Herpes skin infection complicating active or recently healed atopic dermatitis. Presents with an acute eruption of vesicles or multiple crusted erosions in an area of dermatitis. May be associated with fever, lymphadenopathy, and malaise.	**Acyclovir 400mg (child 10mg/kg) PO 5 times a day** If secondary bacterial infection is present treat as **Cellulitis.**
Herpes Zoster / Shingles Caused by reactivation of Varicella Zoster virus (chicken pox virus). Characterised by unilateral dermatomal pain, with a vesicular rash on an erythematous base in a dermatomal distribution. More common in older adults and immunocompromised patients. May be complicated by post-herpetic neuralgia. Management of this complication is more likely to be successful if analgesia is commenced early.	*If treatment is indicated (see comments) use:* **Acyclovir 800mg (child 20mg/kg) PO 5 times a day** *For immunocompromised patients with disseminated diseases:* **Acyclovir 10mg/kg (child < 5 years 20mg/kg, 5-12 years 15mg/kg, >12 years use adult dosing) IV TID** If secondary bacterial infection is present treat as Cellulitis. *For post-herpetic neuralgia consider:* **Amitriptyline 25 – 50mg nocte**

Treatment is effective if initiated within 48 hours of a lesion appearing. Long-term suppression may be considered in patients with frequent disabling recurrences, erythema multiforme, or in immunocompromised patients

Duration:
Moderate to severe: Treat for 7 days
Long-term suppression: Treat for up to 6 months

See also **Encephalitis** in Chapter 4: Central Nervous System Infections, **Dendritic corneal ulceration caused by Herpes Simplex virus** in Chapter 7: Eye Infections, **Genital Herpes simplex virus** in Chapter 8: Genital Infections, and **Neonatal Herpes simplex** in Chapter 11: Paediatric Infections (Neonates, Infants and Children)

Duration:
Treat for 7-10 days. Extend duration if lesions have not healed or crusted by day 10.

See **Herpes Simplex** in Chapter 13: Skin and Soft Tissue Infection

Treatment is indicated for adults and adolescents who present within 72 hours of rash onset, and for all immunocompromised patients regardless of duration of rash. Most children with herpes zoster don't require treatment. Treat if immunocompromised, or if severe or rapidly progressing.

Test for HIV in disseminated disease.

Duration:
Treat for 7 days
Immunocompromised patients with disseminated diseases: Change to oral therapy when clinically improving. Treat for total of 10-14 days.

See **Neonatal Varicella Zoster Virus Prophylaxis / Treatment** in Chapter 11: Paediatric Infections (Neonates, Infants and Children)

See **Neonatal Varicella Zoster Virus Prophylaxis / Treatment** in Chapter 11: Paediatric Infections (Neonatesm Infants and Children), and, Varicella infection (chickenpox) in Chapter 14: Special Infections

Tinea Caused by dermatophytes. The typical rash is annular, itchy, and scaly with a definite edge and central clearing. **Tinea capitis** Dermatophyte infection of hair and scalp. **Tinea corporis** Dermatophyte infection of skin excluding palms, soles, groin, and face. **Tinea cruris** Dermatophyte infection of inguinal area and crural fold. **Tinea pedis** Dermatophyte infection of feet. **Tinea manuum** Dermatophyte infection of hand.	**Miconazole 2% cream BID** *Alternative:* **Ketoconazole shampoo 2% OD to twice a week** OR **Ketoconazole gel 2% topical OD** OR **Clotrimazole 1% cream topical BID** OR **Terbinafine 1% cream BID** *If oral therapy is indicated (see comments) use:* **Fluconazole 150mg - 200mg PO weekly**
Cutaneous Candidiasis Presents as patches of moist confluent erythematous macules with overlying curd-like material. Usually occurs on mucosal surfaces or in skin folds (e.g. under breasts, in inguinal fold). Most commonly occurs in patients with predisposing factors such as therapy with broad-spectrum antibiotics, or diabetes.	**Clotrimazole 1% cream topical BID** *Alternative:* **Miconazole 2% cream topical BID** OR **Nystatin 100 000 units cream topical BID** A mild steroid cream can be added to the anti-fungal cream if required to relieve itching.
Pityriasis versicolour Caused by *Malassezia* yeasts. Most commonly seen in adolescents and young adults. Presents with patches of	

If diagnosis is uncertain perform fungal skin scraping and send to laboratory for microscopy and culture, prior to antifungal treatment.

Oral therapy is indicated if the following

- Widespread or established infection
- Failure of topical therapy
- Rapid recurrence after topical therapy

In tinea pedis keep feet dry, particularly between toes, and dry footwear in the sun.

Duration:
Topical therapy: Treat for 2-6 weeks
Oral therapy: Treat for 6 weeks. Monitor liver function weekly.

Consider performing potassium hydroxide (KOH) bedside test. If diagnosis remains unclear, swab area for culture.

Duration:
Continue until 2 weeks after symptom resolution.

See also **Vulvovaginal candidiasis, Oral thrush (Candidiasis), Candida oesophagitis,** and **Candidaemia**
See **Oral thrush (Candidiasis)** in Chapter 9: Gastrointestinal infections, **Candida Oesophagitis** in Chapter 9: Gastrointestinal infections, and **Vulvovaginal Candidiasis** in Chapter 17: Women's Health

Consider performing potassium hydroxide (KOH) bedside test. If diagnosis remains uncertain perform fungal skin scraping and send to laboratory for microscopy and culture, prior to antifungal treatment.

While the condition does not leave scars, pigmentary changes may take several months to return to normal.

hypopigmentation or hyperpigmentation, with fine scale. Usually on the neck, chest, back, and upper arms. Rash is usually asymptomatic.	
Head lice (Pediculosis capitis) These are crawling insects that live on the scalp and lay eggs on hair. Bites may produce erythematous macules, papules, excoriations, and scaling, with accompanying with pruritus.	40% of cases can be cured by wet combing alone. If insecticide is required use: **Permethrin 1 % cream topically to damp hair and scalp. Leave for 20 minutes before washing out.**
Body lice (Pediculosis corporis) Caused by *Pediculus humanus humanus*, lice that live in clothing. Patients complain of pruritus, and present with excoriations, often linier, primarily on the neck, shoulders, back, and wrist. In chronic cases patients may have hyperpigmentation macules.	**Permethrin 1 % cream topically to body. Leave on for 20 minutes before washing off** *Alternative:* **Ivermectin 200mcg/kg single dose** (not in children <15kg or pregnant women)
Pubic lice (Pediculosis pubis) Caused by *Phthirus* pubis, lice that live in pubic, axillary, beard, and other body hair. The main symptom is itch. Eggs are visible on hairs. Examine all hair-baring surfaces.	**Permethrin 1% cream topically to hair. Leave for 20 minutes before washing out.** *Alternative:* **Ivermectin 200mcg/kg single dose** (not in children or pregnant women) Shaving hair may be helpful.

Duration:
Shampoo: Single application may be adequate
Cream: Treat for 1-3 weeks

Wash pillowcases, combs, and brushes in hot water. Family and close physical contacts should be examined.

Duration:
Repeat application 7 days after first treatment.

Clothing and bedding should be discarded or washed in hot water and sealed in closed plastic bags for 30 days.

Pediculus humanus humanus can be a vector for typhus and trench fever (Bartonella quintana)

Duration:
Repeat application or dose 7 days after first treatment.

Pediculosis pubis commonly transmitted by sexual or close contact, examine contacts.

Duration:
Repeat application or dose 7 days after first treatment.

Scabies (non-crusted) Scabies caused by the mite *Sarcoptes scabei var. Hominis,* a human pathogen that is spread by close physical contact. An allergic reaction to the mite causes inflammation and itch particularly at night. Excoriations appear in the interdigital webs, sides of fingers, wrists, lateral palms, elbows, axillae, scrotum, penis, labia and areola mammae in women. Scaly burrows in the finger web spaces as pathognomonic. In infants, elderly, and immunocompromised individuals, all skin surface are susceptible.	**Permethrin 5% cream topically to dry skin from the neck down (including hands, under nails, and genitals). Leave on for 8-14 hours. Reapply to hands if they are washed.** *Alternative:* **Ivermectin 200mcg/kg single dose** (not in children <15kg or pregnant women) OR **Benzyl benzoate 25% emulsion** (apply as per Permethrin)
Crusted Scabies / Norwegian Scabies In crusted scabies the mite population on the patients is very high due to inadequate host immune response. It occurs in immunocompromised patients and presents as hyperkeratotic plaques. There may be associated thickening and dystrophy of the toenails and fingernails. Refer to **Dermatology** and **Infectious Diseases** if available	**Ivermectin 200mcg/kg PO OD** (not in children <15kg or pregnant women) PLUS *Topical scabicide:* **Permethrin 5% cream topically to dry skin from the neck down (including hands, under nails, and genitals). Leave on for 24 hours. Reapply to hands if they are washed.** *Alternative:* **Benzyl benzoate 25% emulsion (apply as per Permethrin).**

Send skin scraping from multiple sites for microscopy if diagnosis unclear, however due to the low mite burden in scabies this may be falsely negative.

All family members, and close contact should be treated simultaneously

Treated individuals should wear clean clothing, and all clothing, pillows, towels, and bedding used during the previous week should be washed in hot water and dried at high heat.

Itch may initially worsen with treatment and may take 3 weeks to resolve after treatment completion.

Duration:
Repeat application or dose 7 days after first treatment.

Send skin scraping from multiple sites for microscopy to confirm diagnosis. This will usually be positive in crusted scabies due to the high mite burden.

Test for HIV.

Duration:
Apply scabicide every second day for the first week, then apply twice weekly until cured.
Mild: Give ivermectin on days 1 and 8
Moderate: Give ivermectin on days 1, 2 and 8
Severe: Give ivermectin on days 1, 2, 8, 9 and 15

	PLUS *To topical scabicide ADD Keratolytic:* **Salicylic acid 5-10% in sorbolene cream after washing on alternate days when scabicide is not used.** *Alternative:* **Whitfield's solution (3% salicylic acid and 6% benzoic acid in lanolin base) on alternate days.**
Cutaneous Larva Migrans Caused by animal hookworm. Presents with erythematous intensely pruritic, serpiginous tracks due to migrating larvae. Progress a few centimeters per day. Commonly involves feet, legs, and buttocks.	**Albendazole 400mg (child 10 kg or less: 200 mg) PO OD** *Alternative:* **Ivermectin 200mcg/kg PO OD** (not in children <15kg or pregnant women)
Yaws Yaws is a skin infection caused by *Treponemal pallidum* subspecies *pertenue* which is transmitted by skin to skin contact. Mostly causes self-limiting primary infection with papules that enlarge into wart-like lesions with superficial erosion that heal spontaneously within 6 months. Weeks to months later a generalised eruption of similar skin lesions occurs via haematogenous or lymphatic spread, and multiple relapses occur in the first 5 years. Typically lesions are painless, raised, and reddish brown with a yellow crust.	**Benzathine penicillin 1.2 million** (900mg) (child <20kg 0.6 million IU (450mg)) IM single dose *Alternative:* **Azithromycin 30mg/kg** (maximum dose 2g) **PO single dose**

Diagnosis is based on clinical history and examination. Patients typically have a history of exposure to contaminated sand or soil.

Duration:
Albendazole: Treat for 3 days
Ivermectin: Treat for 1-2 days

Syphilis serology can be used to assist in the diagnosis of yaws. These tests cannot distinguish between infection with the organisms which cause syphilis or yaws. See **Syphilis** in Chapter 8: Genital Infections for serology interpretation.

Repeat nontreponemal tests at 6 and 12 months following therapy. A fourfold decrease in titre should occur within 12 months of successful treatment.

Yaws can be complicated by periostitis or paranasal maxillary erosions.

Yaws is not known to cause congenital infection.

References

Ahronowitz I, Leslie K. Yeast Infection, In: Goldsmith L, Katz S, Gilchrest A, Paller A, Leffell D, Wolff K, editors. Fitzpatrick's Dermatology in General Medicine. 9th ed. New York: McGraw-Hill; 2019. 2952 – 2964

Bravo F, Talhari C, Ezzedine K. Endemic (Nonvenereal) Treponematoses. In: Goldsmith L, Katz S, Gilchrest A, Paller A, Leffell D, Wolff K, editors. Fitzpatrick's Dermatology in General Medicine. 9th ed. New York: McGraw-Hill; 2019. 3172 - 3185

Chance A, Kroshinksy D. Necrotizing Faciitis, Necrotizing Cellulitis, and Myonecrosis. In: Goldsmith L, Katz S, Gilchrest A, Paller A, Leffell D, Wolff K, editors. Fitzpatrick's Dermatology in General Medicine. 9th ed. New York: McGraw-Hill; 2019. 2770 – 81

Condon S, Isada C, Tomecki K. Systemic and Topical Antibiotics. In: Goldsmith L, Katz S, Gilchrest A, Paller A, Leffell D, Wolff K, editors. Fitzpatrick's Dermatology in General Medicine. 9th ed. New York: McGraw-Hill; 2019. 3407 – 3422

eTG complete. Insects and mites: bites and infestations. In: Therapeutic Guidelines [digital]. Melbourne: Therapeutic Guidelines Limited; 2019. http://www.tg.org.au

eTG complete. Skin and soft tissue infections. In: Therapeutic Guidelines [digital]. Melbourne: Therapeutic Guidelines Limited; 2019. http://www.tg.org.au

eTG complete. Traumatic wound infections. In: Therapeutic Guidelines [digital]. Melbourne: Therapeutic Guidelines Limited; 2019. http://www.tg.org.au

Ghannoum M, Salem I, Christensen. Antifungal. In: Goldsmith L, Katz S, Gilchrest A, Paller A, Leffell D, Wolff K, editors. Fitzpatrick's Dermatology in General Medicine. 9th ed. New York: McGraw-Hill; 2019. 3436 - 3450

Gusmao dos Santos C, Francis J, Guterres J, Janson S, Lopes N, Marr I, et al. HNGV Antibiotic guidelines writing group. Antibiotic guidelines Hospital Nacional Guideo Valadares. Timor-Leste; 2016

Iuh K, Key J. Helminthic Infection. In: Goldsmith L, Katz S, Gilchrest A, Paller A, Leffell D, Wolff K, editors. Fitzpatrick's Dermatology in General Medicine. 9th ed. New York: McGraw-Hill; 2019. 3251 - 3273

Jeffrey I, Cohen. Herpes Simplex. In: Goldsmith L, Katz S, Gilchrest A, Paller A, Leffell D, Wolff K, editors. Fitzpatrick's Dermatology in General Medicine. 9th ed. New York: McGraw-Hill; 2019. 3021 – 3024

Kenneth E, Schmader, Michael E, Oxman. Varicella and herpes zoster. In: Goldsmith L, Katz S, Gilchrest A, Paller A, Leffell D, Wolff K, editors. Fitzpatrick's Dermatology in General Medicine. 9th ed. New York: McGraw-Hill; 2019. 3035 – 3064

Kwatra S, Loss M. Other Topical Medication. In: Goldsmith L, Katz S, Gilchrest A, Paller A, Leffell D, Wolff K, editors. Fitzpatrick's Dermatology in General Medicine. 9th ed. New York: McGraw-Hill; 2019. 3610 - 3622

Lauren N, Craddock, Stefan M. Superficial Fungal Infection. In: Goldsmith L, Katz S, Gilchrest A, Paller A, Leffell D, Wolff K, editors. Fitzpatrick's Dermatology in General Medicine. 9th ed. New York: McGraw-Hill; 2019. 2924 – 2951
Miller L. Superficial Cutaneous Infection and Pyodermas. In: Goldsmith L, Katz S, Gilchrest A, Paller A, Leffell D, Wolff K, editors. Fitzpatrick's Dermatology in General Medicine. 9th ed. New York: McGraw-Hill; 2019. 2718 – 2745

Ministry of Health Malaysia. National antimicrobial guideline 2019. 3rd ed. Malaysia: Ministry of Health; 2019

Mitja O, Mabey D. Yaws, bejel, and pinta. In: Ryan E, Rosen T, Baron E, Ofori A, editors. UpToDate [internet]. Waltham (MA): UpToDate Inc; 2022.

https://www.uptodate.com/contents/yaws-bejel-and-pinta?search=yaws&-source=search_result&selectedTitle=1~11&usage_type=default&display_rank=1#H2054732244

Ortiz-Lazo E, Arriagada-Egnen C, Poehls C, Concha-Rogazy M. An update on the treatment and management of cellulitis. Actas Dermosifiliogr (Engl Ed) 2019; 110(2):124-130. Doi: 10.1016/j.ad.2018.07.010

Pearson R, Margolis D. Cellulitis and Erysipelas. In: Goldsmith L, Katz S, Gilchrest A, Paller A, Leffell D, Wolff K, editors. Fitzpatrick's Dermatology in General Medicine. 9th ed. New York: McGraw-Hill; 2019. 2746 – 56

Perhimpunan Dokter Spesialis Kulit dan Kelamin Indonesia (PERDOSKI). Pioderma. Dalam: Panduan Praktis klinis, bagi dokter specialis kulit dan kelamin di Indonesia. Jakarta; 2017. 121 – 125

Perhimpunan Dokter Spesialis Kulit dan Kelamin Indonesia (PERDOSKI). Varicella. Dalam: Panduan Praktis klinis, bagi dokter specialis kulit dan kelamin di Indonesia. Jakarta; 2017. 147 – 150

Perhimpunan Dokter Spesialis Kulit dan Kelamin Indonesia (PERDOSKI). Herpes Zoster. Dalam: Panduan Praktis klinis, bagi dokter specialis kulit dan kelamin di Indonesia. Jakarta; 2017. 61 – 66

Urbina T, Razazi K, Ourghanlian C, Woerther P-L, Chosidow O, Lepeule R, et al. Antibiotics in necrotizing soft tissue infections. Antibiotics (Basel)- 2021; 10(9):1104. doi: 10.3390/antibiotics10091104

Wheat C, Burkhart C, Burkhart C, Cohen B. Scabies, Other Mites, and Pediculosis. In: Goldsmith L, Katz S, Gilchrest A, Paller A, Leffell D, Wolff K, editors. Fitzpatrick's Dermatology in General Medicine. 9th ed. New York: McGraw-Hill; 2019. 3274 – 3305

Zeena Y, Nguyen Q, Sanber K, Tyring S. Antiviral Drug. In: Goldsmith L, Katz S, Gilchrest A, Paller A, Leffell D, Wolff K, editors. Fitzpatrick's Dermatology in General Medicine. 9th ed. New York: McGraw-Hill; 2019. 3493 - 3516

Filamentous Fungus growth on SDA agar

Condition	Antimicrobial
Scrub typhus and other rickettsial infections Suspect in patients with headache, fevers, elevated transaminases, thrombocytopaenia and leukocytosis. Examine for eschar, painful lymphadenopathy, and rash.	**Doxycycline 100mg (child 2mg/kg) PO BID** *Alternative:* **Azithromycin 500mg (child 10mg/kg) on day 1, then 250mg (child 5 mg/kg) for a further 4 days**
Malaria Caused by Plasmodium parasites and spread by the female Anopheles mosquito. Usually presents as a febrile illness and can range from a mild illness to severe disease with cerebral involvement or multiorgan failure. Treat as severe malaria if any of the following features: » Altered consciousness » Vomiting » Renal failure or oliguria » Respiratory distress » Severe anaemia » Hypoglycaemia » High parasite count >2% RBCs » Acidosis	*Mild to Moderate:* **Artemether/Lumefantrine (Coartem) 20/120mg PO** 5-14kg: 1 tablet per dose 15-24kg: 2 tablets per dose 25-34kg: 3 tablets per dose >34kg: 4 tablets per dose Give at 0, 8, 24, 36, 48 and 60 hours for a total of 6 doses *Severe:* **Artesunate 2.4mg/kg IV/IM** 12 hourly for 3 doses then 24 hourly for 2 more doses. *Alternative:* **Quinine 20mg/kg** in IV fluid infused over 4hrs. Then 8 hours after initial dose was started give 10mg/kg Quinine in IV fluid over 2hrs and repeat 8 hourly for a total of 7 days antibiotic therapy.

	Comments and Duration of Therapy
	Duration: Treat with doxycycline for 7 days
	Send blood for antigen testing, PCR, and thick and thin films to confirm diagnosis. Refer to the **Timor-Leste Malaria Guidelines** for further advice. See **Neonatal Malaria** in Chapter 11: Paediatric Infections (Neonates, Infants and Children)

Tetanus *Clostridium tetani* inoculation of a dirty wound causes disease by toxin production. After infection of a wound the incubation period of Tetanus is usually around 1 week but ranges from 1 day to 2 months. Many patients may not remember the wound, so this should not put clinicians off the diagnosis. Generalised tetanospasm is the most common presentation; symptoms usually begin with trismus and progresses to involve the rest of the muscles of the body. Disease may take weeks to resolve.	Clean and debride all contaminated wounds early and thoroughly. *To halt further production of toxin use antibiotics to treat C. tetani:* **Metronidazole 500mg (child 12.5mg/kg) IV/ PO BID** *Alternative:* **Benzylpenicillin 3 million IU (1.8g) (child 80 000 IU (50mg)/kg) IV QID** OR **Ampicillin 2g (child 50mg/kg) IV Q4H** *To neutralise toxin already in circulation use:* **Human antitoxin 500-3000U IM if available** *To reduce muscle spasm and distress:* **Diazepam 5-20 mg PO/IV TID (doses up to 20mg Q2H may be required) (neonates 2 mg IV TID).** At high doses (80 mg/24h) monitor for respiratory suppression *To reduce autonomic dysfunction and muscle spasm:* **Magnesium sulphate 5g (child 75mg/kg) IV loading dose, then 2-3g/hr IV infusion until spasm controlled.** Monitor patellar reflexes and if areflexia occurs decrease dose.
Varicella infection (chickenpox) Caused by primary infection with the Varicella Zoster virus. Most commonly contracted in childhood but can occur in adulthood when it is more likely to cause severe disease. Usually presents with a pruritic, vesicular rash which later crusts. Most patients do not require treatment.	Treat all patients with severe disease, complicated disease (e.g. pneumonitis, encephalitis, or hepatitis) or who are immunocompromised. Treat pregnant women if they present within 72 hours of rash onset. **Acyclovir 800 mg (child: 20 mg/kg) PO 5 times daily**

All patients will need vaccination against Tetanus. Tetanus infection does NOT confer immunity.

Nurse patients in a calm, dim, quiet environment (movement, wind, bright lights, or emotional distress can all trigger spasms).

The anxiolytic activity of Diazepam is useful in this very distressing disease, but its antispasmodic activity is even more important.

Only use Magnesium sulphate IV and Diazepam IV in a controlled hospital environment with access to respiratory support if required.

Duration:
Treat with antibiotics for 7-10 days.

See **Tetanus prophylaxis** in Chapter 1: Antibiotic Prophylaxis

Patient should stay away from anyone immunocompromised or pregnant while they are infectious.

Duration:
Treat for 7-14 days

See **Neonatal Varicella Zoster Virus Prophylaxis / Treatmen**t in Chapter 11: Paediatric Infections (Neonatesm Infants and Children), and Herpes Zoster in Chapter 13: Skin and Soft Tissue Infection

HIV Infection ART is recommended for all patients with HIV. In patients with newly diagnosed HIV exclude other infections before commencing ART to reduce the risk of immune reconstitution inflammatory syndrome (IRIS). For patients without opportunistic infections start ART as soon as possible. IRIS is an inflammatory reaction to latent or subclinical infection with organisms such as Mycobacterium avium complex, TB, or Cryptococcus. IRIS can occur after starting ART especially when CD4 count < 100 cells / microlitre. See **Timor-Leste Comprehensive ART Guidelines.** **Refer all patients to HIV team.** Seek **Infectious Diseases** review where available.	Consider prophylaxis for the following opportunistic infections: » Pneumocystis jirovecii if CD4 <200 cells/microlitre, OR CD4 cell percentage <14% (See ***Pneumocystis jirovecii* prophylaxis** in Chapter 1: Antibiotic Prophylaxis) » Toxoplasmosis if CD4 <100 cells/microlitre (See **Toxoplasmosis prophylaxis** in Chapter 1: Antibiotic Prophylaxis) » Mycobacterium avium complex if CD4 <50 cells/microlitre (See ***Mycobacterium avium* complex (MAC) prophylaxis** in Chapter 1: Antibiotic Prophylaxis) Investigate for active TB in all patients with HIV. Consider treatment for latent TB if there is no evidence of active disease. If CXR and sputum testing are unavailable begin latent TB treatment in patients who DO NOT have fever, night sweats, weight loss, or cough of >2 weeks' duration. See **Timor-Leste Comprehensive TB Guidelines for National Tuberculosis Control Program** In most patients with HIV and active TB, start ART within 2 weeks of commencement of TB treatment. In patients with HIV and TB meningitis delay ART for 8 weeks after commencement of TB treatment.
Pneumocystis jirovecii (PJP) Pneumocystis jirovecii usually causes pneumonia in immunocompromised patients. Suspect PJP in immunocompromised patients with fever, dry cough, dyspnoea and hypoxia progressing over days	**Co-trimoxazole 5+25mg/kg (adult and child > 1 month) up to 480mg+2400mg, PO TID** *In high severity PJP ADD:* **Prednisone 40mg (child 1mg/kg) PO BID for 5 days** *Followed by:* **Prednisone 40mg (child 1mg/kg) OD for 5 days**

Perform the following prior to commencing ART if available:

- CD4 count
- HIV viral load
- HIV pro-viral DNA (in children under 2 years)
- CBC, chemistry, creatinine, liver function
- Pregnancy test in women of reproductive age
- Fasting glucose and lipids
- Urine analysis
- Syphilis serology and STI screen
- HBV and HCV serology
- CXR
- Sputum for TB GeneXpert X3 in patients with consistent symptoms or CXR changes
- Serum cryptococcus antigen in patients with CD4 < 200 cells/microlitre

If patient is symptomatic, consider the following where available:

- Blood culture for MAC (request prolonged incubation in BACTEC) in patients with CD4 <50 cells/microlitre
- CT brain and lumbar puncture
- Other investigations according to symptoms

Screen all patient with HIV for other STIs including syphilis. See Chapter 8: Genital Infection.

See **Cryptococcal Meningitis** in Chapter 4: **Central Nervous System Infections, Tuberculosis (TB)** in Chapter 6: ENT / Respiratory Tract Infections, **Candida Oesophagitis** in Chapter 9: Gastrointestinal Infections, **Neonatal HIV prophylaxis** in Chapter 11: Paediatric Infections (Neonates, Infants and Children), ***Pneumocystis jirovecii (PJP)*** in Chapter 14: Special Infections, ***Toxoplasma gondii*** in Chapter 14: Special Infections, ***Mycobacterium avium complex (MAC)*** in Chapter 14: Special Infections

PJP is considered high severity if either of the following are present:

- Arterial partial pressure of O2 (PaO2) < 70mmHg on room air
- O2 saturation <94% on room air

For patients with HIV and PJP who have no other opportunistic infections start ART within 2 weeks of diagnosis.

to weeks, who fail to respond to empiric treatment for CAP. Note that CXR may be normal in 50% of cases. See **Timor-Leste Comprehensive ART Guidelines.**	*Followed by:* **Prednisone 20mg (child 0.5mg/kg) OD for 11 days** *Followed by:* **Prednisone wean to cessation.**
Toxoplasma gondii Toxoplasmosis encephalitis presents as multiple ring-enhancing lesions in immunocompromised patients. It is the most common CNS infection in patients with advanced HIV who are not receiving prophylaxis. Seek **Infectious Diseases** review where available.	**Co-trimoxazole 5+25 mg/kg up to 480 + 2400mg, PO BID for 6 weeks.** *Followed by:* **Co-trimoxazole 160 / 800mg PO BID** Consider corticosteroids if there is mass effect or oedema relating to brain lesions.
***Mycobacterium avium* complex (MAC)** MAC infection causes lymphadenitis, pulmonary disease and disseminated infection. Immunocompetent patients who grow MAC from sputum culture do not all need to be treated and must be consid	**Azithromycin 500mg PO OD** (Alternative: **Clarithromycin 500mg PO BID**) PLUS **Ethambutol 15mg/kg PO OD** *In patients with high mycobacterial burden, very low CD4 counts, or whose viral load does not become suppressed with ART ADD:*

Duration:
Treat for 21 days. After this change to PJP prophylaxis. See Pneumocystis jirovecii (PJP) Prophylaxis in Chapter 1: Antibiotic Prophylaxis.

Suspect toxoplasmosis encephalitis in patients with HIV if ALL of the following are present:

- CD4 <100 cells / microlitre
- Not on prophylaxis
- Headache and / or other neurological symptoms
- Brain imaging demonstrating multiple ring-enhancing lesions

Consider alternative diagnosis if there is no clinical or radiological improvement within 10-14 days of commencing treatment.

For patients with HIV and toxoplasmosis who have no other opportunistic infections start ART within 2 weeks of diagnosis. Monitor for symptoms and signs of IRIS.

Duration:
Continue until CD4 > 200 cells/microlitre for at least 6 months.

See **Prophylaxis of Toxoplasma gondii in patients with HIV** in Chapter 1: Antibiotic Prophylaxis.

Perform blood cultures in patients with suspected disseminated disease and request prolonged incubation in BACTEC (cultures are usually positive after 7-10 days). In pulmonary disease send sputum for culture, however note that a positive culture may represent colonization rather than infection. In lymphadenitis send lymph node tissue or aspirate for culture.

For patients with HIV and MAC who have no other opportunistic infections start ART within 2 weeks of diagnosis.

ered on a case by case basis. Disseminated MAC infection most commonly occurs in immunocompromised patients. Clinical features of this include fever, night sweats, weight loss, fatigue, diarrhoea, abdominal pain, hepatomegaly, splenomegaly, and lymphadenopathy. Seek **Infectious Diseases** review where available.	**Rifampicin 600mg PO OD (OR 300mg PO BID)** AND / OR **Levofloxacin 500mg PO OD**
Melioidosis This is caused by the bacteria Burkholderia pseudomallei. Disease occurs via inhalation and percutaneous inoculation. Patients can present with pneumonia which sometimes mimics TB, sepsis with abscesses in multiple organs, or cutaneous ulcers. Risk factors include diabetes, hazardous alcohol use, renal disease and chronic lung disease, and other forms of immunosuppression. Seek **Infectious Diseases** review where available.	*Intensive therapy:* **Meropenem 1g (child 25mg/kg) IV TID** (If there is neurological involvement use 2g (child 50mg/kg) IV TID) PLUS *In neurological disease, osteomyelitis, septic arthritis, genitourinary infection, and skin and soft tissue infection ADD:* **Co-trimoxazole** (see below for dose) *Eradication therapy:* **Co-trimoxazole 40-60kg 240 / 1200mg, >60kg 320 / 1600mg, child 6/30mg/kg, PO BID** PLUS **Folic acid 5mg (child 0.1 mg/kg) PO OD**

Duration:
Continue for at least 12 months. After this treatment may be stopped if CD4 >100 cells/microlitre for > 6 months

See ***Mycobacterium avium* Complex (MAC) prophylaxis** in Patients with HIV in Chapter 1: Antibiotic Prophylaxis.

Send blood, urine, sputum, pus and/or wound swab for culture. All patients should have a CXR, and CT or ultrasound of their abdomen and pelvis to detect any abscesses.

Duration:
Skin abscess, bacteraemia without focus: Intensive 2 weeks, Eradication 3 months
Pneumonia: Intensive 3-4 weeks, Eradication 3 months
Deep collection, septic arthritis: Intensive 4 weeks from most recent drainage, Eradication 3 months
Osteomyelitis: Intensive 6 weeks, Eradication 6 months
CNS infection, mycotic aneurysms: Intensive 8 weeks, Eradication 6 months

Monitor electrolytes and creatinine regularly while on co-trimoxazole.

References

Currie B. Melioidosis TEHS Guideline. Darwin: Top End Health Service; 2020

eTG complete. Chickenpox. In: Therapeutic Guidelines [digital]. Melbourne: Therapeutic Guidelines Limited; 2019. http://www.tg.org.au

eTG complete. Human Immunodeficiency Virus. In: Therapeutic Guidelines [digital]. Melbourne: Therapeutic Guidelines Limited; 2019. http://www.tg.org.au

eTG complete. Melioidosis. In: Therapeutic Guidelines [digital]. Melbourne: Therapeutic Guidelines Limited; 2019. http://www.tg.org.au

eTG complete. Rickettsial infections. In: Therapeutic Guidelines [digital]. Melbourne: Therapeutic Guidelines Limited; 2019. http://www.tg.org.au

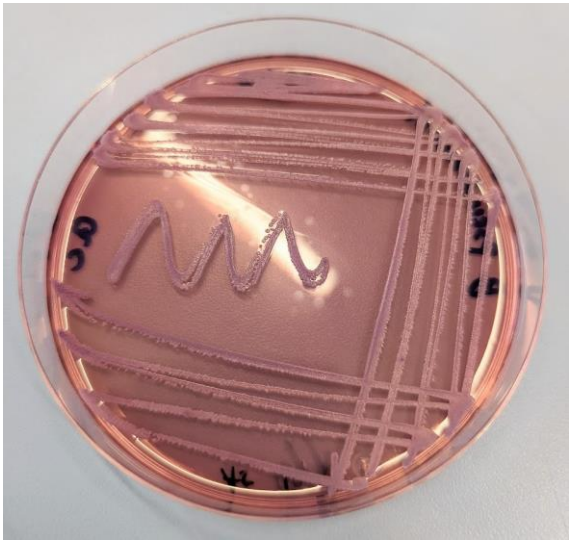
European AIDS Clinical Society. Guidelines: Version 10.0: November 2019. Brussels: EACS; 2019

Gusmao dos Santos C, Francis J, Guterres J, Janson S, Lopes N, Marr I, et al. HNGV Antibiotic guidelines writing group. Antibiotic guidelines Hospital Nacional Guideo Valadares. Timor-Leste; 2016

National HIV/AIDS programme Timor-Leste. Guidelines for antiretroviral therapy and management of opportunistic infections for children, adolescents and adults living with HIV. Timor-Leste: Ministerio da Saude; 2021

Panel on Opportunistic Infections in Adults and Adolescents with HIV. Guidelines for the prevention and treatment of opportunistic infections in adults and adolescents with HIV: recommendations from the Centers for Disease Control and Prevention, the National Institutes of Health, the HIV Medicine Association for the Infectious Diseases Society of America. USA: NIH; 2020

Thwaites L. Tetanus. In: Sexton D, Mitty J, editors. UpToDate [internet]. Waltham (MA): UpToDate Inc; 2021. https://www.uptodate.com/contents/tetanus?search=tetanus%20treatment&source=search_result&selectedTitle=1~150&usage_type=default&display_rank=1



Wrinkle purple colony of *Burkolderia pseudomalei* on Ashdown media

Condition	Antimicrobial
Appendicitis, Perforated Bowel, Severe Diverticulitis, Peritonitis, Intraperitoneal Abscess Patients who are unstable or septic require emergency surgery. Evidence does not support the use of antibiotics alone to treat unperforated appendicitis. Refer all patients to **Surgical Team**	**Ampicillin 2g (child 50mg/kg) IV QID** PLUS **Gentamicin 4-5mg/kg (child <10 years old 7.5mg/kg) IV OD** PLUS **Metronidazole 500mg (child 12.5mg/kg) IV BID** *If patient is in septic shock replace gentamicin with:* **Amikacin 28mg/kg IV OD as a first dose in patients with creatinine clearance >60ml/minute. Use 16-20mg/kg if creatinine clearance <60ml/minute.** For subsequent doses see **Aminoglycoside dosing** section. **Child 15mg/kg IV OD.** If amikacin is not available and patient is likely to have normal renal function give above regime but increase Gentamicin to 7mg/kg IV for first dose. *If still requiring IV therapy after 48 hours change to:* **Ceftriaxone 2g (child 50mg/kg) IV OD** PLUS **Metronidazole 500mg (child 12.5mg/kg) IV BID** *When clinically well change to oral antibiotics. If susceptibilities are unavailable use:* **Amoxicillin/Clavulanic acid 500/125mg (child 25/6.25 mg/kg) PO TID** OR **Cotrimoxazole 160/800mg (child 4/20 mg/kg) PO BID** PLUS **Metronidazole 500mg (child 12.5mg/kg) PO BID**

Comments and Duration of Therapy

Take blood cultures prior to antibiotics. Send tissue culture from operating theatre.

If patient is septic give antibiotics within 1 hour of presentation.

Duration:

Uncomplicated appendicitis: Stop antibiotics immediately after appendicectomy.

Complicated appendicitis (perforation, abscess), peritonitis, perforated bowel: Change to oral antibiotics when patient is improving. Treat for a total of 5 days after surgical control of infection.

Undrained residual intra-abdominal collection or abscesses: Continue antibiotics for 4-6 weeks

See **Gastrointestinal and Biliary Tree surgery prophylaxis** in Chapter 1: Antibiotic Prophylaxis

Cholecystitis, Cholangitis

In cholecystitis, cholecystectomy should be considered early in initial presentation. Severe suppurative cholangitis requires biliary decompression within 24 hours.

Refer all patients to **Surgical Team**

Ampicillin 2g (child: 50mg/kg) IV QID
PLUS
Gentamicin 4-5mg/kg (child <10 years old: 7.5mg/kg) IV OD

If patient is in septic shock replace gentamicin with:
Amikacin 28mg/kg IV OD as a first dose in patients with creatinine clearance >60ml/minute. Use 16-20mg/kg if creatinine clearance <60ml/minute. For subsequent doses see **Aminoglycoside dosing** section.
Child 15mg/kg IV OD.
If amikacin is not available and patient is likely to have normal renal function give above regime but increase Gentamicin to 7mg/kg IV for first dose.

If there is cholangitis with chronic biliary obstruction or acalculous cholecystitis ADD:
Metronidazole 500mg (child 12.5mg/kg) IV BID

If still requiring IV therapy after 48 hours, change ampicillin + gentamicin to:
Ceftriaxone 2g (child 50mg/kg) IV OD.

When clinically well change to oral antibiotics. If susceptibilities are unavailable use:
Amoxicillin/Clavulanic acid 500/125mg (child 25/6.25 mg/kg) PO TID
OR
Cotrimoxazole 160/800mg (child 4/20 mg/kg) PO BID
PLUS, if chronic biliary obstruction or acalculous cholecystitis
Metronidazole 500mg (child 12.5mg/kg) PO BID

References

eTG complete. Intra-abdominal Infections. In: Therapeutic Guidelines [digital]. Melbourne: Therapeutic Guidelines Limited; 2019. http://www.tg.org.au

Gusmao dos Santos C, Francis J, Guterres J, Janson S, Lopes N, Marr I, et al. HNGV Antibiotic guidelines writing group. Antibiotic guidelines Hospital Nacional Guideo Valadares. Timor-Leste; 2016

Take blood cultures prior to antibiotics. Send tissue culture from operating theatre.

If patient is septic give antibiotics within 1 hour of presentation.

Duration:
Cholangitis with biliary drainage: Stop antibiotics 5 days after drainage.
Cholangitis without biliary drainage: Treat for 7-10 days.
Calculus cholecystitis with cholecystectomy: Stop antibiotics immediately after cholecystectomy.
Acalculous cholecystitis with cholecystectomy: Treat for 5 days after cholecystectomy
Cholecystitis without cholecystectomy: Treat for 7-10 days

See **Gastrointestinal and Biliary Tree surgery prophylaxis** in Chapter 1: Antibiotic Prophylaxis

API bacterial identification test

Condition	Antimicrobial
Asymptomatic Bacteriuria Actively multiplying bacteria within the urinary tract of asymptomatic patients. **This should only be treated in pregnant women** as it is associated with a 20-30% risk of developing pyelonephritis in later pregnancy.	Antibiotics are not recommended for most patients with asymptomatic bacteriuria. *During pregnancy, while waiting for urine culture and susceptibility results use:* **Nitrofurantoin 100mg PO QID** *Alternative:* **Amoxicillin 500mg PO TID** OR **Cotrimoxazole 160/800mg BID** (avoid in first and third trimester if alternative available) If empiric treatment fails repeat urine culture.
Cystitis Symptoms may include dysuria, urinary frequency or haematuria. Fever or renal angle tenderness represents upper urinary tract infection, see **Pyelonephritis** below. In symptomatic infants <12 months old, have a low threshold for treating as for Pyelonephritis.	**Cotrimoxazole 160/800 mg (child 4/20 mg/kg) PO BID** (avoid in first and third trimester of pregnancy if alternative available). *Alternative:* **Amoxicillin/Clavulanic acid 500/125mg (child 25/6.25 mg/kg) PO TID** Change antibiotic therapy based on results of cultures and susceptibility testing. High fluid intake and complete bladder emptying may aid resolution of UTI.
Pyelonephritis, Complicated Urinary Tract Infection Pyelonephritis usually presents with fever, dysuria, and unilateral renal angle tenderness. In young children the symptoms and signs may be	*Mild to Moderate:* **Cotrimoxazole 160/800 mg** (child 4/20 mg/kg) PO BID (avoid in first and third trimester of pregnancy if alternative available). *Alternative:* **Amoxicillin/Clavulanic acid 500/125mg (child 25/6.25 mg/kg) PO TID**

Comments and Duration of Therapy
Screening for bacteriuria is recommended at the first prenatal visit. Take urine culture and where possible treat according to the results of this. If urine culture is unavailable perform urinary dipstick. Repeat urine culture 1-2 weeks after completion of antibiotics. *Duration:* Treat for 5-7 days.
Take urine culture. This is particularly important in patients with recurrent UTIs, recent antibiotic use, or in patients who have failed empiric treatment. Men should be examined for evidence of prostatitis. If patient has a catheter it is important to remove or exchange this. *Duration:* **Women and children > 12 months:** Treat for 3-5 days **Men:** Treat for 7 days **Children < 12 months:** Treat for 5 days.
Take urine culture. If systemically unwell perform blood cultures prior to antibiotics. If patient is septic give antibiotics within 1 hour of presentation. Consider imaging renal tract to define or exclude underlying anatomical or functional abnormality. For children <12 months old with pyelonephritis, there should be a low threshold for treating initially with intravenous antibiotics, due to an increased risk of secondary bacteraemia.

more non-specific, with fever, vomiting and poor feeding common in infants <12 months. Complicated urinary tract infection is a urinary tract infection in the presence of: » Obstruction » Immunosuppression » Renal stones » Anatomical urinary tract abnormality	*Severe:* **Cefazolin 2g (child 50mg/kg) IV TID** PLUS **Gentamicin 4-5mg/kg (child <10 years old 7.5mg/kg) IV OD** *Alternative:* **Ceftriaxone 2g (child 50mg/kg) IV OD** OR If cefazolin is not available replace this in the above regime with: **Ampicillin 2g (child 50mg/kg) IV QID** *If patient is in **septic shock** replace gentamicin with:* **Amikacin 28mg/kg IV OD as a first dose in patients with creatinine clearance >60ml/minute. Use 16-20mg/kg if creatinine clearance <60ml/minute.** For subsequent doses see Aminoglycoside dosing section. **Child 15mg/kg IV OD.** If amikacin is not available and patient is likely to have normal renal function give above regime but increase Gentamicin to 7mg/kg IV for first dose. If still requiring IV therapy after 48 hours, change ampicillin + gentamicin to: **Ceftriaxone 2g (child 50mg/kg) IV OD.**
Epididymo-orchitis Infection of the epididymis and/or testes. Presents with pyuria, scrotal pain and oedema, and swelling. Treatment depends on whether infection is sexually acquired or non-sexually acquired.	*Non-Sexually Acquired (>35 years):* *Mild-Moderate:* **Cotrimoxazole 160/800 mg (child 4/20 mg/kg) PO BID** OR **Ciprofloxacin 500mg PO BID** *Severe:* **Ampicillin 2g (child: 50mg/kg) IV QID**

Duration:
Change to oral antibiotics when improving. Treat for a total of 10-14 days.

See **Urological procedure prophylaxis** in Chapter 1: Antibiotic Prophylaxis

In all patients take a urine culture. For sexually active men perform an STI screen; first pass urine for gonorrhoea and chlamydia PCR, swab urethra and/or rectum with bacterial swab for culture, and with dry or viral swab for PCR.

Duration:
Non-Sexually Acquired: Change to oral antibiotics when well. Treat for total of 14 days.

Neisseria gonorrhoeae and *Chlamydia trachomatis* are the most common causative organisms in men under 35 years old. Age cut-offs are suggestions only to help guide treatment where microbiology results are not available.	PLUS **Gentamicin 4-5mg/kg (child <10 years old: 7.5mg/kg) IV OD** *If still requiring IV therapy after 48 hours, change ampicillin + gentamicin to:* **Ceftriaxone 2g (child 50mg/kg) IV OD.** *Sexually Acquired (<35 years):* **STI Pack.** See Genital Infections chapter.
Chronic Bacterial Prostatitis Persistent infection of the prostate, usually with Gram-negative organisms. Presentation may include low-grade fever, urgency, or perineal discomfort. Most cases of what is thought to be 'chronic' prostatitis, characterised by chronic pelvic pain, are not due to infection and repeated courses of antibiotic treatment should be avoided. Chronic bacterial prostatitis is rare.	**Ciprofloxacin 500mg PO BID** Antibiotics should be guided by culture results however fluroquinolones and co-trimoxazole are preferred agents due to good prostate penetration.

References

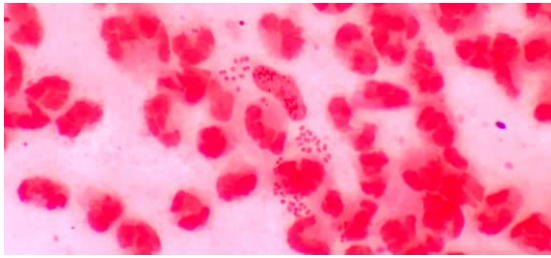
Cunningham F, Leveno K, Bloom S, Dashe J, Hoffman B, Casey B, et al. editors. Williams Obstetrics. 25th ed. New York: McGraw-Hill; 2018

eTG complete. Urinary Tract Infections. In: Therapeutic Guidelines [digital]. Melbourne: Therapeutic Guidelines Limited; 2019. http://www.tg.org.au

Gusmao dos Santos C, Francis J, Guterres J, Janson S, Lopes N, Marr I, et al. HNGV Antibiotic guidelines writing group. Antibiotic guidelines Hospital Nacional Guideo Valadares. Timor-Leste; 2016

Take urine culture in all patients. Consider performing prostate massage immediately prior to urine collection to improve sensitivity of culture.

Duration:
Treat for 4 weeks.



Gram negative diplococci intracellular bacteria on direct gram stain

Condition	Antimicrobial
Pelvic Inflammatory Disease (PID) PID is an infection of the upper genital tract in women. It includes endometritis, salpingitis, tubo-ovarian abscess, and pelvic peritonitis. It is usually polymicrobial and can be caused by a range of sexually and non-sexually transmitted organisms. If patient is septic give antibiotics within 1 hour or presentation.	*For patients in whom oral therapy is appropriate (see comments) use:* **Amoxicillin 500mg PO TID** PLUS **Metronidazole 500mg PO BID** PLUS **STI pack (Cefixime 400mg PO and Azithromycin 1g PO) single dose** *For patients in whom IV therapy is indicated (see comments) use:* **Ceftriaxone 2g IV OD** PLUS **Metronidazole 500mg IV BID** PLUS **Azithromycin 1g PO single dose (if septic use 500mg IV OD**) If patient is in **septic shock** ADD: **Amikacin 28mg/kg IV OD as a first dose in patients with creatinine clearance >60ml/minute. Use 16-20mg/kg if creatinine clearance <60ml/minute.** For subsequent doses see **Aminoglycoside dosing** section. If amikacin is not available and patient is likely to have normal renal function give Gentamicin 7mg/kg IV single dose. If renal function is likely to be abnormal give Gentamicin 4-5mg/kg. *Change to oral antibiotics when improving according to susceptibility results. If susceptibility results are not available use:* **Amoxicillin 500mg PO TID** PLUS **Metronidazole 500mg PO BID**

Comments and Duration of Therapy

Send first pass urine for PCR, swab vagina with bacterial swab for culture, and with viral (dry) swab for PCR. If systemically unwell send blood cultures prior to antibiotics.

Patients with any of the following should receive IV therapy:

- Pregnancy
- Inability to tolerate oral therapy
- Severe pain
- Fever ≥ 38 degrees
- Systemic features
- Sepsis
- Suspicion of tubo-ovarian abscess

Duration:
If using IV therapy change to oral antibiotics when clinically improving. Use single doses only of azithromycin and cefixime. Treat for total of 14 days.

If a sexually transmitted pathogen is detected, see Chapter 8: Genital Infections.

Post-partum endometritis This is an infection of the endometrium following pregnancy, it may extend into the myometrium, parametrium and progress beyond the uterus. It is usually polymicrobial. Patients typically present with fever, pelvic pain, and uterine tenderness, most often in the first week post-partum. Rarely *Clostridium, Streptococcus pyogenes* and *Staphylococcus aureus* can lead to endometritis with toxic shock syndrome and/or necrotising soft tissue infection. Endometritis occurring more than a week post-partum suggests *Chlamydia trachomatis* infection.	*Mild:* **Amoxicillin/Clavulanic acid 500/125mg PO TID** *Alternative:* **Co-trimoxazole 160 / 800mg PO BID** PLUS **Metronidazole 500mg PO BID** *Severe:* **Ampicillin 2g IV QID** PLUS **Gentamicin 4-5mg/kg IV OD** PLUS **Metronidazole 500mg IV BID** If patient is in **septic shock** replace Gentamicin with: **Amikacin 28mg/kg IV OD as a first dose in patients with creatinine clearance >60ml/minute. Use 16-20mg/kg if creatinine clearance <60ml/minute.** For subsequent doses see **Aminoglycoside dosing** section. If amikacin is not available and patient is likely to have normal renal function give above regime but increase Gentamicin to 7mg/kg IV for first dose. *Do not continue gentamicin or amikacin beyond 72 hours.*
Intra-amniotic infection / chorioamnionitis Infection involving the amniotic fluid, placenta, foetus, foetal membranes or decidua. Most infections are polymicrobial. Patients present with fever, uterine tenderness, and purulent amniotic fluid.	**Ampicillin 2g IV QID** PLUS **Gentamicin 4-5mg/kg** *If patient is in septic shock replace Gentamicin with:* **Amikacin 28mg/kg IV OD as a first dose in patients with creatinine clearance >60ml/minute. Use 16-20mg/kg if creatinine clearance <60ml/minute.** For subsequent doses see **Aminoglycoside dosing** section.

If patient is septic give antibiotics within 1 hour or presentation.

Send blood cultures if systemically unwell. Send first pass urine for PCR, swab vagina with bacterial swab for culture, and with viral (dry) swab for PCR.

Duration:
Mild: Treat for 7 days
Severe: Continue IV antibiotics until afebrile for 24-48 hours and clinically improved, then stop.

If a sexually transmitted pathogen is detected, see Chapter 8: Genital Infections.

If patient is septic give antibiotics within 1 hour of presentation.

Send blood cultures if septic. Consider sending amniotic fluid for microscopy and culture.

Duration:
After vaginal delivery unless patient is septic stop antibiotics. After caesarian section give one further dose of each antibiotic then stop.

If patient develops fevers post-delivery treat as post-partum endometritis.

	If amikacin is not available and patient is likely to have normal renal function give above regime but increase Gentamicin to 7mg/kg IV for first dose *Do not continue gentamicin or amikacin beyond 72 hours.* *If patient has caesarian use usual prophylaxis in addition to antibiotics for chorioamnionitis. After caesarian delivery and cord clamping ADD:* **Metronidazole 500mg IV single dose**
Septic abortion	Treat as **Post-partum endometritis**
Bartholin's abscess Bartholin glands are deep to the posterior aspect of the labia majora, and usually produce mucous for vaginal and vulval lubrication. Blockage of these ducts causes cysts which can sometimes become secondarily infected resulting in an abscess. Pathogens include *Staphylococcus aureus, Streptococcal* spp., and E. coli.	Unless there is significant erythema following drainage, antibiotics are not required. *If infection persists following drainage use*: **Amoxicillin/Clavulanic acid 500/125mg (child 25/6.25 mg/kg) PO TID** *Alternative:* **Cotrimoxazole 160/800 mg (child 4/20 mg/kg) PO BID**
Vulvovaginal candidiasis Commonly presents with vaginal or vulval pruritus or burning. The mucosa may have a white discharge with plaques on an erythematous base. Discharge is generally not malodorous. Incidence of vulvovaginal candidiasis increases during pregnancy, particularly in the third trimester.	**Clotrimazole pessary 500mg PV single dose** *Alternative:* **Clotrimazole 1% cream PV OD** OR **Nystatin 100 000 units PV OD** *If topical therapy is not tolerated and patient is not pregnant use:* **Fluconazole 150mg PO single dose**

The mainstay of treatment is surgical drainage. If recurrent or complicated infection send pus for culture.

Duration:
Treat for 7 days

Perform microscopy on wet mount of vaginal discharge and measure pH. In candidiasis vaginal pH is typically normal (4-4.5).

If there is any doubt regarding the diagnosis, or if patient has recurrent or resistant symptoms, take a swab of the affected area for microscopy and culture, prior to antifungal therapy.

Treatment failure is most commonly due to misdiagnosis.

Duration:
Clotrimazole pessary: Give single dose
Clotrimazole 1% cream: Treat for 6 nights.

Candida can occasionally cause balanitis, especially in diabetic patients, and in partners of women with recurrent vaginal candidiasis.	
Bacterial vaginosis (BV) Lactobacilli are a major component of normal vaginal flora and produce hydrogen to maintain an acidic pH, limiting anaerobe growth. BV is a process that reflects a change in typical vaginal microbiota. Women may present with a grey or off-white, fishy-smelling discharge. Pruritis or burning are generally absent. On physical examination a milky, homogenous coating may be seen adherent to the vaginal wall. Male partners of women with bacterial vaginosis may be colonized with organisms associated with BV (e.g. *Gardnerella vaginalis*), however they are generally asymptomatic.	**Metronidazole 2g PO single dose** *Alternative:* **Metronidazole 500mg PO BI**D OR **Clindamycin (preferred in pregnancy) 300mg** PO BID Treatment of male sexual partners is not currently recommended.
Gynaecological surgery (hysterectomy, gynaecological-oncology procedures, pelvic organ prolapse) prophylaxis	**Cefazolin 2g IV** PLUS **Metronidazole 500mg IV** *Alternative:* **Clindamycin 600mg + Gentamicin 2mg/kg** OR **Cloxacillin 2g + Gentamicin 2mg/kg + Metronidazole 500mg**

Nystatin: Treat for 14 nights.
Fluconazole: Give single dose.

See **Oral thrush (Candidiasis)** in Chapter 9: Gastrointestinal infections, **Neonatal oral candidiasis (thrush)** in Chapter 11: Paediatric Infections (Neonates, Infants and Children), and **Cutaneous Candidiasis** in Chapter 13: Skin and Soft Tissue Infection

Perform microscopy on wet mount of vaginal discharge to look for clue cells. Measure pH: in BV this is >4.5. Perform whiff-amine test; this is positive if a fishy odor is produced upon adding 10% KOH to vaginal discharge.

Send vaginal swab to laboratory for microscopy; culture is unnecessary in BV.

BV is a risk factor for preterm delivery, HIV acquisition and transmission, and other STI acquisition. It is associated with pelvic inflammatory disease. Test all women with BV for other sexually transmitted infections including HIV and syphilis. See Chapter 8: Genital Infections

Duration:
Metronidazole 2g: Give single dose
Metronidazole 500mg and Clindamycin: Treat for 7 days

Duration:
Stop antibiotics after procedure. Do not continue prophylaxis beyond 24 hours.
If infection is present see **Pelvic Inflammatory Disease (PID)** in Chapter 17: Women's Health, and **Post-partum Endometritis** in Chapter 17: Women's Health.
If surgical wound infection is present, see **Surgical Site Infection** in Chapter 13: Skin and Soft Tissue Infections.

Caesarean Delivery Prophylaxis	**Cefazolin 2 g IV** *Alternative:* **Cloxacillin 2g IV** OR **Clindamycin 600mg IV** OR **Vancomycin 15mg/kg**
Anal sphincter laceration prophylaxis	*Initial treatment:* **Cefazolin 2g IV** PLUS **Metronidazole 500mg IV** *Alternative:* **Clindamycin 600mg IV** *Followed by:* **Amoxicillin/Clavulanic acid 500/125mg PO TID** *Alternative:* **Co-trimoxazole 800/160mg PO BID** PLUS **Metronidazole 500mg PO BID**
Neonatal Group B Streptococcus infection prophylaxis Prophylaxis is indicated if any of the following: » Prior invasive group B streptococcal disease in neonate » Known group B colonisation in current pregnancy » Intrapartum fever (≥38C) » Preterm onset of labour (<37 weeks gestation) » Prolonged rupture of membranes (≥18hours)	**Cefazolin 2g TID IV** *Alternative:* **Ampicillin 2g QID IV** OR **Benzylpenicillin 5 million IU (3g) IV for one dose, followed by 3 million IU (1.8g) Q4H IV until delivery** OR **Clindamycin 600mg TID IV**

Duration:
Stop antibiotics after procedure. Do not continue prophylaxis beyond 24 hours.

If surgical wound infection is present, see **Surgical Site Infection** in Chapter 13: Skin and Soft Tissue Infections.

Duration:
Give single dose of initial IV treatment, then 5 days of oral antibiotics.

Consider screening for Group B Streptococcal colonization with vaginal swab 3-5 weeks prior to expected delivery.

Duration:
Begin 4 hours prior to expected delivery and stop at time of delivery.

Premature rupture of membranes (PROM) The diagnosis is made by obtaining a history of leaking vaginal fluid, pooling on speculum examination, and positive nitrazine and fern tests, prior to onset of labour.	Only give antibiotics if gestation is <34 weeks. **Azithromycin 1g IV / PO once only** PLUS **Ampicillin 2g QID for 48 hours** Followed by: **Amoxicillin 500mg TID PO**
Normal vaginal delivery	There is no need for antibiotic prophylaxis for normal vaginal delivery if patient has no risk factors for neonatal Group B Streptococcal infection. There is no need for antibiotic prophylaxis following childbirth except in the case of anal sphincter laceration.
Sexual Assault In addition to attention to physical injuries, exposure to sexually transmitted infections (STIs) must be considered. Antimicrobial treatment for potential gonorrhoea, chlamydia, bacterial vaginosis, and trichomoniasis should be considered.	Give prophylactic antibiotics if STI testing cannot be performed, or patient is unlikely to return for treatment. **Ceftriaxone 500mg IM single dose** PLUS **Azithromycin 1g PO single dose** PLUS **Metronidazole 2g single dose**

Prolonged PROM has been associated with increased risk of chorioamnionitis, abruption, and cord prolapse, however maintaining the pregnancy to gain further foetal maturity may be beneficial.

34 weeks or more: Plan delivery. Labour induction unless contraindication, GBS prophylaxis, single corticosteroid course may be considered up to 36 weeks.

32-33 complete weeks: Expectant management. GBS prophylaxis, single corticosteroid course, antimicrobial to prolong latency

24-31 complete weeks: Expectant management. GBS prophylaxis, single corticosteroid course, antimicrobial to prolong latency, consider tocolytics, $MgSO_4$ for neuroprotection may be considered

Duration:
Stop antibiotics after 7 days or delivery whichever is sooner.

If testing is available offer screening for STIs:

- Urine for *Chlamydia* and Gonorrhoea PCR
- Vaginal, throat and/or rectal bacterial and viral (dry) swabs for culture and PCR
- HIV, HBV, and Syphilis serology

See Chapter 8: Genital Infections

If unvaccinated for hepatitis B and HBsAg negative (or unable to test) give first dose HBV vaccine, then repeat at 1-2, and 4-6 months.

Consider anti-retroviral prophylaxis if high risk for HIV.

References

Baker C. Prevention of early-onset group B streptococcal disease in neonates. In: Berghella V, Sexton D, Barss V, editors. UpToDate [internet]. Waltham (MA): UpToDate Inc; 2022. https://www.uptodate.com/contents/prevention-of-early-onset-group-b-streptococcal-disease-in-neonates?search=group%20b%20strep%20in%20pregnancy&source=search_result&selectedTitle=2~150&usage_type=default&display_rank=2#H`3

Cunningham F, Leveno K, Bloom S, Dashe J, Hoffman B, Casey B, et al. editors. Williams Obstetrics. 25th ed. New York: McGraw-Hill; 2018

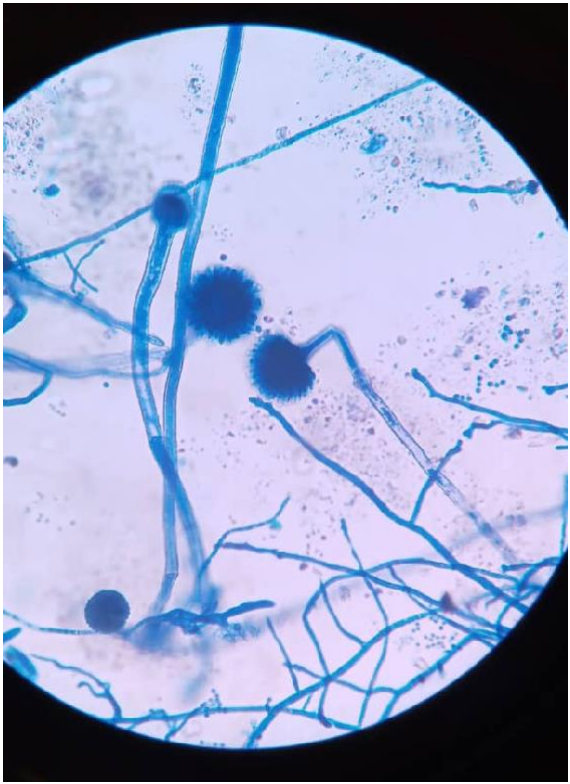
Duff P. Preterm prelabour rupture of membranes: management and outcome. In: Lockwood C, Barss V, editors. UpToDate [internet]. Waltham (MA): UpToDate Inc; 2021. https://www.uptodate.com/contents/preterm-prelabor-rupture-of-membranes-management-and-outcome?search=premature%20rupture%20of%20membranes%20treatment&source=search_result&selectedTitle=1~150&usage_type=default&display_rank=1#H1683472693

eTG complete. Genital and Sexually Transmitted Infections. In: Therapeutic Guidelines [digital]. Melbourne: Therapeutic Guidelines Limited; 2019. http://www.tg.org.au

eTG complete. Perinatal infections. In: Therapeutic Guidelines [digital]. Melbourne: Therapeutic Guidelines Limited; 2019. http://www.tg.org.au

Gusmao dos Santos C, Francis J, Guterres J, Janson S, Lopes N, Marr I, et al. HNGV Antibiotic guidelines writing group. Antibiotic guidelines Hospital Nacional Guideo Valadares. Timor-Leste; 2016

Knight M, Chiocchia V, Partlett C, Rivero-Arias O, Hua X< Hinshaw K et al. Prophylactic antibiotics in the prevention of infection after operative vaginal delivery (ANODE): a multicentre randomised controlled trial. Lancet 2019; 393 (10189): 2395-2403. DOI: https://doi.org/10.1016/S0140-6736(19)30773-1



Aspergillus species on Microscope

APPENDICES

A) Overview of Common Antibiotics

B-LACTAMS

Penicillins, cephalosporins, monobactams and carbapenems have a β-lactam ring in their molecular structure. These bactericidal antibiotics act primarily on the bacterial cell wall. Although some bacteria produce β-lactamases and therefore have developed resistance, these drugs on the whole remain useful in treating many different types of infections.

Penicillins

Penicillin is active against Streptococci spp., Neisseria, Spirochaetes, some anaerobes including Clostridia and a few other organisms. Most Staphylococcus aureus isolates are intrinsically resistant to penicillin and there is growing resistance to cloxacillin. The prevalence of penicillinase-producing Neisseria gonorrhoeae is on the increase. There are reports of decreased susceptibility of pneumococci and streptococci to penicillin from other parts of the world. The only serious disadvantage of penicillins is the potential for hypersensitivity reaction.

A. Penicillins

1. Benzylpenicillin (also known as crystalline penicillin or penicillin G)
   - » For intravenous (IV) use and needs to be given frequently (4-6 hourly).
2. Procaine Penicillin
   - » Intramuscular (IM) preparation with a longer duration of action. Needs to be administered less frequently i.e. daily.
3. Benzathine Penicillin
   - » Intramuscular preparation, providing low levels of penicillin in the circulation for 3-4 weeks.
4. Phenoxymethyl Penicillin (also known as penicillin V)
   - » An oral preparation, intrinsically less active than Benzylpenicillin.

Penicillin is the drug of choice for the treatment of the following infections:

- Streptococcal infections e.g. tonsillopharyngitis
- Infections due to *Streptococcus pneumoniae*
- Meningococcal infections e.g. meningitis, septicaemia
- Syphilis
- Clostridial infections, Diphtheria
- Leptospirosis

B. Aminopenicillins

Ampicillin and amoxicillin are destroyed by staphylococcal β-lactamases but have a slightly broader spectrum than penicillins because of their activity against some Gram-negative bacilli such as *E. coli, Salmonella* spp. and *Shigella* spp. They also have better activity against H. influenzae and enterococci compared with penicillin.

Although previously sensitive, resistance to these drugs among *E. coli* is now widespread. Many strains of *H. influenzae* also produce β-lactamases, which can destroy these drugs.

Amoxicillin is better absorbed than ampicillin and has a longer half-life and hence is preferred for oral therapy. These drugs are used in the empirical treatment of respiratory infections and in the treatment of susceptible urinary tract infections. They may also be used for typhoid fever.

C. Anti–Staphylococcal Penicillins

These are narrow spectrum penicillins, resistant to Staphylococcal β-lactamases. Methicillin, oxacillin, and cloxacillins fall into this category. Of these, only cloxacillin, flucloxacillin and dicloxacillin are clinically useful and are to be used only for proven or suspected staphylococcal infections.

Cloxacillin, suitable for oral administration, can cause cholestatic jaundice in some patients.

Some Staphylococci have developed resistance to this group, by mechanisms other than β-lactamase. These methicillin-resistant *Staphylococcus aureus* (MRSA) will be resistant to all other β-lactams (i.e. all penicillin, cephalosporins, monobactams and carbapenems).

D. Anti–Pseudomonal Penicillins

These are newer penicillins with a high grade of activity against Gram-negative bacteria including pseudomonas, e.g. piperacillin, ticarcillin

E. β-lactam and β-lactamase inhibitor combinations

Examples of β lactamase inhibitors include clavulanic acid and sulbactam.

Amoxicillin can be combined with clavulanic acid, which itself has minimal antibacterial activity but inhibits β-lactamase effectively so that amoxicillin can still be used against β-lactamase-producing bacteria. Amoxicillin/clavulanic acid combination can cause cholestasis. Combinations utilising sulbactam are more expensive and so should be used only while treating infections with known β-lactamase producers.

Note: Hypersensitivity to any penicillin implies the potential for hypersensitivity to all penicillins. See Beta-lactam Allergy below.

Cephalosporins

The cephalosporins have been traditionally divided into "generations" based on their spectrum of activity. In general, cephalosporins are less prone to hypersensitivity reactions, are more stable to staphylococcal penicillinases and have a broader spectrum than penicillins. However, they have very little action against enterococci. None of the cephalosporins available in Timor-Leste have action against MRSA. Cephalosporins also have been shown to select out MRSA, vancomycin-resistant enterococci, and ceftriaxone-resistant Gram-negative bacilli. Therefore, indications for their use should be limited.

A. First generation cephalosporins include cephalexin (oral), cephalothin and cephazolin (parenteral). The spectrum of activity is similar for each, being effective against penicillinase-producing Staphylococci and other Gram-positive cocci (except MRSA and enterococci) and a few Gram-negative enteric bacilli. There is no special advantage for any one first generation cephalosporins over another. They are not usually the first choice for any infection, although are the first choice for most surgical prophylaxis. They may be used in some patients with penicillin hypersensitivity, see Beta-lactam Allergy below.
B. Second generation cephalosporins include (among others) cefuroxime and cefaclor (oral). These are more stable to some Gram-negative β-lactamases. Their activity against Gram-positive organisms is similar to, or less than, that of the first generation cephalosporins and they have varying degrees of activity against anaerobes. These drugs have a limited role in therapy and are more expensive than the first generation cephalosporins.
C. The major activity of the third generation cephalosporins (e.g. ceftriaxone, ceftazidime, cefotaxime) is against Gram-negative bacilli. They have some activity against Gram-positive cocci and their activity against anaerobes varies. A major advantage of these agents is their ability to reach the central nervous system. Ceftazidime has the additional benefit of specific anti-pseudomonal activity. Ceftriaxone and cefotaxime are useful in hospital-acquired and any other Gram-negative septicaemia and meningitis.

Monobactams (e.g. Aztreonam) and Carbapenems (e.g. Meropenem)

A. Aztreonam is active against Gram-negative bacteria including pseudomonas and β-lactamase-producing Enterobacteriaceae.
B. Carbapenems have a much broader spectrum, including Gram-positive, Gram-negative and some anaerobic bacteria. They are the agents of choice for ESBL (extended spectrum β-lactamase-producing organisms).

Aminoglycosides

This group of antibiotics (including gentamicin, tobramycin, amikacin, and streptomycin) act by inhibiting protein synthesis in bacteria. They have good activity against aerobic Gram-negative bacilli, including Brucella. When given together with penicillins, they have good activity against Enterococci. Streptomycin in combination is also useful against mycobacteria. Aminoglycosides are not absorbed when given orally and should be administered parenterally for systemic effects. Aminoglycosides are ototoxic and nephrotoxic. The therapeutic index is low and blood levels need to be monitored if used for either directed or empirical therapy for longer than 3 days (see Aminoglycoside dosing below). Despite this disadvantage, they are used widely for their action on Gram-negative bacilli. Gentamicin is the least expensive and is the aminoglycoside of choice for empirical treatment of Gram-negative infection including nosocomial infections. Due to high gentamicin resistance levels in Timor-Leste amikacin is the preferred aminoglycoside in septic shock.

The primary indication for aminoglycosides is as short-term empirical therapy pending the outcome of investigations. Their value as empirical drugs relates to their rapid bactericidal activity and the comparatively low levels of resistance in many community and healthcare-associated Gram-negative pathogens. When used empirically, no further doses should be given beyond 72 hours and if ongoing empirical IV therapy is required (i.e. an organism is not grown) therapy should be changed to an alternative, less toxic drug such as ceftriaxone.

Aminoglycosides are indicated for directed therapy in only a few circumstances. These include, but are not restricted to:

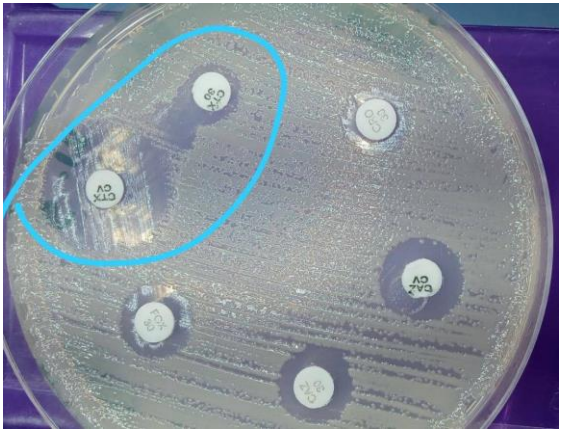
- Infections when resistance to other safer antimicrobials has been shown
- Low doses as synergistic treatment for streptococcal and enterococcal endocarditis.

Monitoring plasma concentrations of aminoglycosides is recommended in these patients and should commence on the first dose of directed therapy. See Aminoglycoside dosing below.

Fluoroquinolones

These antibiotics (e.g. ciprofloxacin, norfloxacin, levofloxacin) act by inhibiting DNA synthesis within bacteria. Their greatest activity is against aerobic Gram-negative bacilli including *Pseudomonas* spp., *Haemophilus* spp., and Gram-negative cocci such as Moraxella and Neisseria spp. Adverse effects include gastrointestinal side effects, hepatotoxicity, CNS toxicity, prolongation of the QT interval, tendonitis, and tendon rupture. Resistance occurs rapidly, so use should be restricted to where there is no alternative.

Gusmao dos Santos C, Francis J, Guterres J, Janson S, Lopes N, Marr I, et al. HNGV Antibiotic guidelines writing group. Antibiotic guidelines Hospital Nacional Guideo Valadares. Timor-Leste; 2016



ESBL confirmation double disc synergy test

B) Antibiotic Spectra of Activity

The Sanford Guide to Antimicrobial Therapy. Dallas Texas: Antimicrobial Therapy Inc.; 2022

Gram Negative Bacilli				G Neg Diplococci	Anaerobes
GIT, biliary tract, urinary tract, neonatal sepsis, hospital-acquired pneumonia, ventilator-acquired pneumonia			Water, burns, hospital acquired infection	Meningitis, septicaemia, asplenia	Oropharynx, teeth, GIT, vagina, abscess
Coliforms (E. coli, K. pneumoniae)	ESBL	ESCAPPM	Pseudomonas	Neisseria Meningitidis	
				Penicillin	
				Penicillin	
					Metronidazole
					Amoxicillin/ Clavulanic acid
					Clindamycin
					Van.
				Cefu.	
iaxone				Ceftriaxone	
Trimethoprim		Trimeth.			
	Co-trimoxazole				
Aminoglycoside: Gentamicin / Amikacin					
Carbapenems: Meropenem					
Ciprofloxacin		Ciprofloxacin			
Levofloxacin		Levofloxacin			
					Doxycycline

C) Antibiotics During Pregnancy and Breastfeeding

Antibiotic use during breastfeeding

There are two important issues to consider when prescribing drugs such as antibiotics during breastfeeding; firstly the likely exposure of the drug to the infant and secondly the likely effect the drug may have on milk supply. A risk benefit analysis is warranted. Simple advice can be given such as to feed the infant just before the next dose or alternatively to take the medication just after breastfeeding thus avoiding likely peak milk concentrations.

Antibiotic use during pregnancy

The nature of adverse effects of drug use during pregnancy depends upon the time of exposure. Teratogenicity is a major risk with drug exposure during the 1st trimester, while in the 2nd and 3rd trimesters foetal growth and functional development may be affected.

Category A
Drugs which have been taken by a large number of pregnant women without any proven increase in the frequency of malformations or other direct or indirect harmful effects on the foetus having been observed.

Category B1
Drugs which have only been taken by a limited number of pregnant women without an increase in the frequency of malformations or other direct or indirect harmful effects on the foetus having been observed. Studies in animals have not shown evidence of an increased risk of foetal harm.

Category B2
Drugs which have only been taken by a limited number of pregnant women without an increase in the frequency of malformations or other direct or indirect harmful effects on the foetus having been observed. Studies in animals are inadequate or may be lacking, but available data show no evidence of increased risk of foetal harm.

Category B3

Drugs which have only been taken by a limited number of pregnant women without an increase in the frequency of malformations or other direct or indirect harmful effects on the foetus having been observed. Studies in animals have shown evidence of an increased occurrence of foetal harm, the significance of which is considered uncertain in humans.

Category C

Drugs which, owing to their pharmacological effects, have caused or may be suspected of causing harmful effects on the human foetus or neonate without causing malformations. These effects may be reversible.

Category D

Drugs which have caused, are suspected to have caused, or may be expected to cause, an increased incidence of human foetal malformations or irreversible damage. These drugs may also have adverse pharmacological effects.

Category X

Drugs which have such a high risk of causing permanent damage to the foetus that they should not be used in pregnancy or when there is a possibility of pregnancy.

Antimicrobial	Breastfeeding	Pregnancy Class
Acyclovir	Safe to use	B3
Albendazole	Safe to use	D Teratogenic in several animal species. Human data unavailable.
Amikacin	Safe to use	D Foetal ototoxicity and nephrotoxicity have been reported with use of aminoglycosides, reserve for severe or life-threatening infections.
Amoxicillin	Safe to use. May cause diarrhoea, vomiting, candidiasis in infant.	A
Amoxicillin/ Clavulanic acid	Safe to use. May cause diarrhoea, vomiting, candidiasis in infant.	B1
Amoxicillin	Safe to use. May cause diarrhoea, vomiting, candidiasis in infant.	A
Artemether / Lumefantrine	Safe to use in mothers of infants >5kg. Seek specialist advice in mothers of infants <5kg.	D Suspected to cause serious birth defects when administered during the first trimester.

Antimicrobial	Breastfeeding	Pregnancy Class
Azithromycin	Safe to use. May cause diarrhoea, vomiting, candidiasis in infant. Unconfirmed epidemiologic evidence of increased infantile hypertrophic pyloric stenosis risk in infants during first 2 weeks of breastfeeding, with maternal use of macrolides.	B1
Cefazolin	Safe to use. May cause diarrhoea, vomiting, candidiasis in infant.	B1
Ceftriaxone	Safe to use. May cause diarrhoea, vomiting, candidiasis in infant.	B1
Cefuroxime	Safe to use. May cause diarrhoea, vomiting, candidiasis in infant.	B1
Chloramphenicol	Use alternative antibiotic where possible. If chloramphenicol must be used, monitor infant for adverse events (GI disturbance, adequacy of nursing, cytopaenias).	A Ensure chloramphenicol is not circulating at the time of delivery.
Ciprofloxacin	Safe to use. May cause diarrhoea, vomiting, candidiasis in infant. Avoid breastfeeding 3-4 hours after dose to decrease infant exposure.	B3

Antimicrobial	Breastfeeding	Pregnancy Class
Clarithromycin	Safe to use. May cause diarrhoea, vomiting, candidiasis in infant. Unconfirmed epidemiologic evidence of increased infantile hypertrophic pyloric stenosis risk in infants during first 2 weeks of breastfeeding, with maternal use of macrolides.	B3
Clindamycin	Safe to use. May cause diarrhoea, vomiting, candidiasis in infant. Unconfirmed epidemiologic evidence of increased infantile hypertrophic pyloric stenosis risk in infants during first 2 weeks of breastfeeding, with maternal use of macrolides.	A
Cloxacillin	Safe to use however if an alternative is available, use this to reduce risk of GI side effects in infant.	A
Co-trimoxazole	Safe to use in mothers of full-term, healthy infants. Use alternative antimicrobial in mothers of jaundiced, unwell, stressed, or premature infants to reduce the risk of haemolysis. Avoid in mothers of G6PD deficient infants.	C Sulphonamides may cause jaundice and haemolytic anaemia in the newborn.
Doxycycline	Possible risk of dental enamel staining or bone deposition of tetracycline. Avoid prolonged (>21 days) or repeat courses during nursing.	D Safe to use during the first 18 weeks of pregnancy. Use after this period causes tooth discolouration in infant.

Antimicrobial	Breastfeeding	Pregnancy Class
Erythro-mycin	Safe to use. May cause diar-rhoea, candidiasis in infant. Unconfirmed epidemiologic evidence of increased infantile hypertrophic pyloric stenosis risk in infants during first 2 weeks of breastfeeding, with maternal use of macrolides.	A
Ethambutol	Safe to use.	A
Fluconazole	Safe to use.	D Reports of spon-taneous abortion and congenital abnormalities in infants of mother treated with sin-gle or repeated doses of fluco-nazole in the first trimester.
Gentamicin	Safe to use.	D Foetal ototoxicity and nephrotox-icity have been reported with use of aminogly-cosides, reserve for severe or life-threatening infections.
Isoniazid	Safe to use. Monitor infant for rare adverse effects such as jaundice.	A
Ivermectin	Safe to use.	B3

Antimicrobial	Breastfeeding	Pregnancy Class
Levofloxacin	Safe to use. May cause diarrhoea, vomiting, candidiasis in infant. Avoid breastfeeding 4-6 hours after dose to decrease infant exposure.	C
Meropenem	Safe to use. May cause diarrhoea, candidiasis in infant.	B2
Metronidazole	Metronidazole and its active metabolite are present in detectable levels in breast milk. Consider alternative antibiotic if available or use lower doses of metronidazole if two options are given in guideline. If metronidazole is given as a single 2g dose, consider withholding breastfeeding for 12-24 hours after dose.	B2
Penicillin	Safe to use. May cause diarrhoea, vomiting, candidiasis in infant.	A
Pyrazinamide	Safe to use. Monitor infant for rare adverse effects such as jaundice, hepatitis, arthralgia.	B2
Quinine	Safe to use, except in mothers of infants with G6PD deficiency.	D In toxic doses quinine causes foetal damage including deafness. Its ability to induce uterine contractions increases risk of miscarriage.

Antimicrobial	Breastfeeding	Pregnancy Class
Rifampicin	Safe to use.	C Bleeding has been reported in newborn infants and in mothers after use of rifampicin during late pregnancy. If rifampicin is used in late pregnancy vitamin K should be given to the mother and newborn infant.
Tenofovir (TDF)	Safe to use.	B3
Vancomycin	Safe to use.	B2

Drugs and Lactation Database (LactMed) [internet]. Bethesda (MD): National Library of Medicine (US); 2006. https://www.ncbi.nlm.nih.gov/books/NBK501922/

Gusmao dos Santos C, Francis J, Guterres J, Janson S, Lopes N, Marr I, et al. HNGV Antibiotic guidelines writing group. Antibiotic guidelines Hospital Nacional Guideo Valadares. Timor-Leste; 2016

Therapeutic Goods Administration. Prescribing medicines in pregnancy database [internet]. Canberra: TGA; https://www.tga.gov.au/prescribing-medicines-pregnancy-database

D) Aminoglycoside dosing

These guidelines recommend once daily dosing for all indications except endocarditis and some neonatal infections. The required dose depends on lean body weight and renal clearance. The first dose should be given irrespective of renal function.

For initial dosing refer to relevant section of the guidelines. Repeat dosing depends on creatinine clearance (see Creatinine-Clearance calculation below). All regimes below will provide gram negative cover for 72 hours. If empiric gram-negative cover is required beyond 72 hours switch to an alternative antibiotic such as ceftriaxone.

It is essential to obtain creatinine results within 24 hours of starting gentamicin or amikacin. If this is not possible treat patients as for normal renal function, unless they have chronic renal impairment, or a strong suspicion of chronic renal impairment (such as diabetes with complications), in which case treat as for moderate renal impairment.

Plasma concentration monitoring (gentamicin levels) is essential if therapy is expected to continue beyond 72 hours (e.g. treatment for endocarditis). Measure plasma concentration 2-3 times per week, or more frequently if kidney function is changing rapidly or substantially. To measure plasma gentamicin concentration, take blood immediately prior to gentamicin dose to obtain trough level. This should be detectable but less than 0.5-1mg/L; adjust dose frequency to maintain level in this range. Monitor for vestibular and ototoxicity, and monitor renal function.

In **sepsis** for adults with an estimated creatinine clearance of >60ml/minute use an initial high dose of Gentamicin 7mg/kg, or Amikacin 28mg/kg. After this change to Gentamicin 4-5mg/kg, or Amikacin 16-20mg/kg. In patients with an estimated creatinine clearance <60ml/minute use an initial dose of Gentamicin 4-5mg/kg, or Amikacin16-20mg/kg.

Gentamicin and Amikacin dosing intervals in renal impairment

Estimated Creatinine Clearance	Dosing Interval	Maximum number of doses
>60ml/ minute	24 hourly	3 (0, 24, 48 hours)
40-60ml/ minute	36 hourly	2 (0, 36 hours)
30-40ml/ minute	48 hourly	2 (0, 48 hours)
<30ml/ minute	Single dose only	1 (0 hours)

E) Vancomycin dosing

The following applies to intravenous vancomycin only.
BID vancomycin dosing is recommended for all patients with normal renal function. Consider a loading dose of 25-30mg/kg in critically unwell adults.

Plasma concentration monitoring (vancomycin levels) should be performed in all patients treated with vancomycin for longer than 48 hours, where possible. For adults with creatine clearance >60ml/minute take blood immediately prior to the 4th vancomycin dose to obtain a trough level. For adults with impaired kidney function take blood immediately prior to the vancomycin dose given 48 hours after the first dose. For patients with creatinine clearance >20ml/minute it is not necessary to wait for the vancomycin level before giving the 48-hour dose. Monitor levels at least weekly in stable patients, and more frequently during dose optimization and if renal function changes. Monitor creatinine 2-3 times a week. For most conditions the target level is 15-20mg/L. When treating CNS infections, a trough of up to 25mg/L may be required. If the vancomycin plasma concentration is outside the target range once steady state has been reached (after 4 doses), adjust the dose. Dosage

adjustments should be made in a linear manner; for example in a patient receiving 1g BID, if the level is two-thirds of the target concentration (e.g. 10), then the dose is two-thirds of what it should be, and the dose should be increased by 50%, to 1.5g BID.

In **dialysis** patients vancomycin should be given in the last 100 minutes of dialysis or after dialysis ends. If vancomycin is given during dialysis give 30-35mg/kg loading dose, and 7.5-15mg/kg subsequent doses (give higher end of range if using a dialyzer with high permeability). If vancomycin is given after dialysis give 25mg/kg loading dose, and 7.5-10mg/kg subsequent doses (give higher end of range if using a dialyzer with high permeability). If vancomycin levels are available blood should be taken immediately prior to haemodialysis. If the level is <15mg/L give dose, if the level is >15mg/L do not give dose but repeat level prior to next haemodialysis session.

To reduce the risk of **red-man syndrome**, doses should be infused at a rate ≤ 10mg/minute, and the total infusion time should not be less than 1 hour. If red-man syndrome occurs, the infusion should be given more slowly.

Vancomycin dosing for adults and children ≥ 12 years

Creatinine clearance	Dose for weight <40kg	Dose for weight 40-49kg	Dose for weight 50-64kg	Dose for weight >65kg
>60ml/ minute	15-20mg/ kg BID	750mg BID	1g BID	1.5g BID
20-60 ml/ minute	15-20mg/ kg OD	750mg OD	1g OD	1.5g OD
<20ml/ minute	15-20mg/kg 48 hourly	750mg 48 hourly	1g 48 hourly	1.5g 48 hourly

Vancomycin dosing for children <12 years

Age	Dose
Neonate <36 weeks post conception	15mg/kg BID maximum. See Appendix H
Term neonates week 1 of life	15mg/kg BID
Term neonates weeks 2-4 of life	15mg/kg TID
Infants >1 month and children <12 years	15mg/kg (max 750mg) QID

Seek specialist advice for children <12 with impaired renal function.

eTG complete. Principles of vancomycin use. In: Therapeutic Guidelines [digital]. Melbourne: Therapeutic Guidelines Limited; 2019. http://www.tg.org.au

Hallam C, Whitbourn D. Trust Guideline for the use of parenteral vancomycin in adults. Britain: NHS Foundation Trust; 2021

Rybak M, Le J, Lodise T, Levine D, Bradyley J,Liu C et al. Therapeutic monitoring of vancomycin for serious methicillin-resistant Staphylococcus aureus infections: a revised consensus guideline and review by the American Society of Health-System Pharmacists, the Infectious Diseases Society of America, the Pediatric Infectious Diseases Society, and the Society of Infectious Diseases Pharmacists. Am J Health-Syst Pharm 2020; 77: 835-864. DOI 10.1093/ajhp/zxaa036

F) Creatinine Clearance Calculation (Cockcroft-Gault calculation)

Adult males: $\frac{(140 - \text{age}) \times \text{ideal weight (kg)}}{0.814 \times \text{serum creatinine (micromole/L)}}$

Adult females: Multiply above equation by 0.85

G) Renal Dose Adjustment of Common Antimicrobials in Adult

Antimicrobial	eGFR > 90 (normal)	eGFR 51-90	eGFR
Acyclovir IV	10mg/kg TID	No adjustment	BID
Albendazole	400mg OD	No adjustment	No adjustm
Amikacin	See **Aminoglycoside dosing**		
Amoxicillin	500mg-1g PO TID	TID	TID
Amoxicillin/Clavulanic acid	500mg/125mg BID	No adjustment	No adjustm
Ampicillin	1-2g IV QID	QID	TID
Artemether / Lumefantrine	See Malaria	No adjustment	No adjustm
(monitor potassium)	No adjustment (monitor potassium)		
Artesunate	See **Malaria**	No adjustment	No adjustm
Azithromycin	500mg OD	No adjustment	No adjustm
Cefazolin	1-2g IV TID	No adjustment	25-50% of
Ceftriaxone	1-2g OD-BID	No adjustment	No adjustm
Cefuroxime	500mg BID	No adjustment	No adjustm
Ciprofloxacin IV	400mg BID	No adjustment for	No adjustm
Ciprofloxacin PO	500-750mg BID	No adjustment	500mg BID
Clarithromycin	500mg BID	No adjustment	No adjustm
Clindamycin	300-600mg TID	No adjustment	No adjustm

31-50	eGFR 10-30	eGFR <10	Haemodialysis
	OD	5mg/kg OD	5mg/kg OD
ent	No adjustment	No adjustment	No adjustment (dose after dialysis)
	TID	BID	BID
ent	No adjustment	No adjustment	No adjustment
	BID	BID	BID
ent	No adjustment	No adjustment	
ent	No adjustment	No adjustment	No adjustment
ent	No adjustment	No adjustment	No adjustment
dose BID	25-50% of dose OD	25% of dose OD	25% of dose OD after dialysis OR 100% of dose on dialysis days only after dialysis
ent	No adjustment	No adjustment	No adjustment
ent	No adjustment	OD	OD after dialysis
ent	50% of dose BID or 100% OD	OD	OD after dialysis
	250mg BID or 500mg OD	500mg OD	500mg OD after dialysis
ent	50% of dose BID	50% of dose BID	50% of dose BID
ent	No adjustment	No adjustment	No adjustment

Antimicrobial	eGFR > 90 (normal)	eGFR 51-90	eGFR
Cloxacillin IV	1-2g QID-Q4H	No adjustment	No adjustm
Cloxacillin PO	500mg-1g QID	No adjustment	No adjustm
Co-trimoxazole	160/800mg OD –480mg/2400mg TID	No adjustment	No adjustm
Doxycycline	100mg OD-BID	No adjustment	No adjustm
Erythromycin	250mg BID	No adjustment	No adjustm
Ethambutol	15mg/kg	No adjustment	No adjustm
Fluconazole	200mg-1200mg OD	No adjustment	50-100% o
Gentamicin	See **Aminoglyco-side dosing**		
Isoniazid	5mg/kg OD	No adjustment	No adjustm
Ivermectin	200mcg/kg	No adjustment	No adjustm
Levofloxacin	250-500mg OD	No adjustment	500mg for then 250m
Meropenem	1-2g TID	No adjustment	BID-TID
Metronidazole	500-750mg BID-TID	No adjustment	No adjustm
Penicillin:			
Benzylpenicillin	1.2g-2.4g QID-Q4H	No adjustment	75% of dos mal dosing
Penicillin:			
Phenoxymethylpen-icillin	500mg BID	No adjustment	No adjustm

31-50	eGFR 10-30	eGFR <10	Haemodialysis
ent	No adjustment	50% of dose TID to QID	50% of dose TID to QID
ent	No adjustment	TID	TID
ent	5/25 mg/kg at normal dosing interval for 2 days, then 5/25 mg/kg BID.	5/25mg/kg BID-OD	5/25mg/kg BID-OD after dialysis.
ent	No adjustment	No adjustment	No adjustment
ent	No adjustment	50-75% dose	50-75% dose
ent	Avoid. If essential use 7.5-10mg/kg OD	Avoid. If essential use 15mg/kg 48 hourly	Avoid. If essential use 15mg/kg on dialysis days after dialysis
dose	25-50% of dose OD	25-50% of dose OD	25-50% of dose OD after dialysis
ent	No adjustment	No adjustment	No adjustment
ent	No adjustment	No adjustment	No adjustment
one dose g OD	500mg for one dose then 250mg OD	500mg for one dose then 48-hourly	500mg for one dose then 48-hourly
	50% of dose BID	50-100% of dose OD	50-100% of dose OD after dialysis
ent	No adjustment	No adjustment	No adjustment
e at nor- interval	75% of dose at normal dosing interval	25-50% of dose at normal dosing interval	25-50% of dose at normal dosing interval
ent	No adjustment	No adjustment	No adjustment

Antimicrobial	eGFR > 90 (normal)	eGFR 51-90	eGFR
Penicillin:			
Benzathine benzyl-penicillin	900mg	No adjustment	No adjustm
Pyrazinamide	25mg/kg	No adjustment	No adjustm
Quinine	See **Malaria**	No adjustment	No adjustm
Rifampicin	300-600mg OD-BID	No adjustment	No adjustm
Tenofovir (TDF)	300mg OD	No adjustment	48-hourly
Vancomycin	See **Vancomycin dosing**		

eTG complete. Renal impairment and antimicrobial dosing. In: Therapeutic Guidelines [digital]. Melbourne: Therapeutic Guidelines Limited; 2019. http://www.tg.org.au

BD Maldi-ToF machine for bacterial identification

31-50	eGFR 10-30	eGFR <10	Haemodialysis
ent	No adjustment	No adjustment	No adjustment
ent	No adjustment	50-100% dose OD	25-30mg/kg on dialysis days only
ent	No adjustment	No adjustment	No adjustment
ent	No adjustment	50-100% of dose OD	50-100% of dose OD
	72-96-hourly	Weekly	Weekly after dialysis

BD Phoenix MIC (Minimum inhibitory concentration) sensitivity testing cartridges

H) Neonatal Antimicrobial Dosing

<table>
<tr><th>Antimicrobial</th><th colspan="4">Dosing</th></tr>
<tr><td>Acyclovir</td><td colspan="4">20mg/kg/dose IV TID
Consider BID dosing in infants < 30 weeks CGA where HSV not confirmed</td></tr>
<tr><td rowspan="6">Amikacin</td><td>CGA</td><td>Postnatal age</td><td>Dose</td><td>Interval</td></tr>
<tr><td>< 30 weeks</td><td>0-14 days</td><td>15mg/kg</td><td>48 hourly</td></tr>
<tr><td></td><td>>14 days</td><td>15mg/kg</td><td>OD</td></tr>
<tr><td>30-34 weeks</td><td>0-14 days</td><td>15mg/kg</td><td>36 hourly</td></tr>
<tr><td></td><td>>14 days</td><td>15mg/kg</td><td>OD</td></tr>
<tr><td>>35 weeks</td><td>All</td><td>15mg/kg</td><td>OD</td></tr>
<tr><td rowspan="7">Ampicillin</td><td colspan="4">Standard infections: 50mg/kg/dose
Meningitis: 100mg/kg/dose</td></tr>
<tr><td colspan="2">CGA</td><td>Postnatal age</td><td>Interval</td></tr>
<tr><td colspan="2"><30 weeks</td><td>0-28 days</td><td>BID</td></tr>
<tr><td colspan="2"><30 weeks</td><td>>29 days</td><td>TID</td></tr>
<tr><td colspan="2">30-37 weeks</td><td>0-14 days</td><td>BID</td></tr>
<tr><td colspan="2">30-37 weeks</td><td>>15 days</td><td>TID</td></tr>
<tr><td colspan="2">>37 weeks</td><td>0-7 days</td><td>BID</td></tr>
<tr><td colspan="2">>37 weeks</td><td>≥8 days</td><td>TID</td></tr>
<tr><td>Azithromycin</td><td colspan="4">Chlamydia pneumonia or conjunctivitis:
20mg/kg/dose PO OD

Pertussis:
10mg/kg/dose PO OD</td></tr>
</table>

Antimicrobial	Dosing		
Cefotaxime	50 mg/kg/dose		
	CGA	Postnatal age	Interval
	<30 weeks	0-28 days	BID
	<30 weeks	>29 days	TID
	30-37 weeks	0-14 days	BID
	30-37 weeks	>15 days	TID
	>37 weeks	0-7 days	TID
	>37 weeks	>8 days	QID
Ceftriaxone	Standard infections: 50mg/kg/dose IV OD Meningitis: 50mg/kg/dose IV BID Note use of ceftriaxone in neonates can be associated with increased biliary sludge. Use cefotaxime in neonates if available		
Cloxacillin	IV: 50mg/kg/dose		
	Postnatal age	**Interval**	
	0-7 days	BID	
	8-20 days	TID	
	>21 days	QID	
	Oral: 25mg/kg/dose		
	Postnatal age	**Interval**	
	0-7 days	BID	
	8-20 days	TID	
	>21 days	QID	

<table>
<tr><th>Antimicrobial</th><th colspan="4">Dosing</th></tr>
<tr><td>Fluconazole</td><td colspan="4">Treatment:
Loading dose: 25mg/kg stat
Maintenance dose: 12mg/kg daily (starting 24 hours after loading dose)

Prophylaxis:
6mg/kg twice a week

Intravenous and oral dosing are the same</td></tr>
<tr><td rowspan="5">Gentamicin</td><td colspan="4">5mg/kg/dose IV</td></tr>
<tr><td colspan="2">CGA</td><td colspan="2">Interval</td></tr>
<tr><td colspan="2"><30 weeks</td><td colspan="2">48 hourly</td></tr>
<tr><td colspan="2">30-35 weeks</td><td colspan="2">36 hourly</td></tr>
<tr><td colspan="2">>36 weeks</td><td colspan="2">OD</td></tr>
<tr><td colspan="4">If gentamicin levels available, check level before the 3rd dose</td></tr>
<tr><td rowspan="5">Meropenem</td><td colspan="4">Meningitis or Pseudomonas sepsis:
40mg/kg IV TID

All other infections:</td></tr>
<tr><td>GA at birth</td><td>Postnatal age</td><td>Dose</td><td>Interval</td></tr>
<tr><td><32 weeks</td><td>0-13 days</td><td>20mg/kg</td><td>BID</td></tr>
<tr><td><32 weeks</td><td>>14 days</td><td>20mg/kg</td><td>TID</td></tr>
<tr><td>>32 weeks</td><td>0-13 days</td><td>20mg/kg</td><td>TID</td></tr>
<tr><td>>32 weeks</td><td>>14 days</td><td>30mg/kg</td><td>TID</td></tr>
<tr><td>Metronidazole</td><td colspan="4">Loading dose for all: 15mg/kg
Maintenance dose for all: 7.5mg/kg
IV and PO doses are the same</td></tr>
</table>

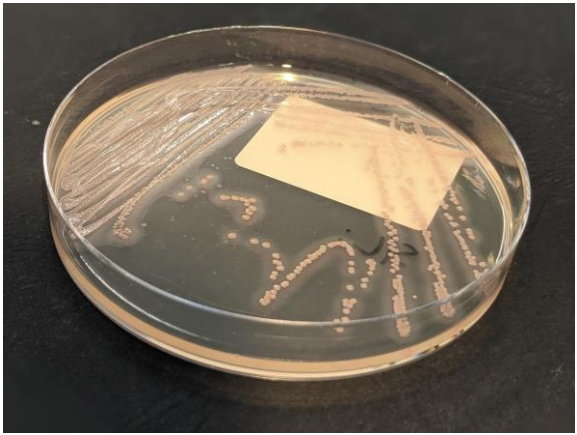
Antimicrobial	Dosing		
	CGA	**Maintenance dose to commence**	**Interval**
	<27 weeks	24 hours after loading	OD
	27-34 weeks	12 hours after loading	BID
	34-41 weeks	8 hours after loading	TID
	>41 weeks	6 hours after loading	QID
Vancomycin	15 mg/kg/dose		
	CGA	**Postnatal age**	**Interval**
	<30 weeks	0-2 days	18 hourly
	<30 weeks	>3 days	BID
	30-37 weeks	0-14 days	BID
	30-37 weeks	>15 days	TID
	>37 weeks	0-7 days	BID
	>37 weeks	>8 days	TID
	If vancomycin levels available, check level prior to the 3rd dose. Check level prior to the 2nd dose if: - <29 weeks gestation - Renal impairment		
Zidovudine	Oral: Start within 4 hours of birth		
	Gestation at birth	**Dose**	**Interval**
	<30 weeks	2 mg/kg	BID
	30-34 weeks	2 mg/kg	BID for 2 weeks, then TID
	>34 weeks	4 mg/kg	BID

eTG complete. Therapeutic Guidelines [digital]. Melbourne: Therapeutic Guidelines Limited; 2019. http://www.tg.org.au

McMullan B, Andresen D, Blyth C, Avent M, Bowen A, Britton P, et al. Antibiotic duration and timing of the switch from intravenous to oral route for bacterial infections in children: systematic review and guidelines. Lancet Infect Dis 2016; 16(8):e139-152. doi: 10.1016/S1473-3099(16)30024-X

Royal Hospital for Women. Australasian Neonatal Medicine Formulary [internet]. Sydney: SESLHD; https://www.seslhd.health.nsw.gov.au/royal-hospital-for-women/australasian-neonatal-medicines-formulary-anmf

The Sanford Guide to Antimicrobial Therapy. Dallas Texas: Antimicrobial Therapy Inc.; 2022



S. aureus on S.aureus chrome agar

Blood culture bottles and stack of culture plates

I) Beta-lactam allergy

Clinical history is vital in determining a beta-lactam allergy. It is important to ascertain the timing of the reaction, as allergies may wane and patients with childhood allergies will often tolerate the drug as an adult. It is also important to ascertain the type of drug reaction the patient experienced, immediate versus delayed hypersensitivity, side effect versus true allergy. Something to consider is that childhood rashes are commonly caused by viruses, or drug-virus interactions.

History	Recommendation	Comments
Penicillin allergy Allergy to phenoxymethylpenicillin, benzylpenicillin, benzathine penicillin, amoxicillin, amoxicillin/clavulanic acid, ampicillin, cloxacillin.	Penicillins: **Avoid** Cephalosporins: Cross reactivity 1-2% If mild allergy (e.g. rash, urticaria): **Safe to give with some exceptions (see comments).** If severe allergy (e.g. anaphylaxis, Stevens-Johnson, Toxic epidermal necrolysis): **Avoid (see comments).** *Meropenem:* Cross reactivity <1% If mild allergy (e.g. rash, urticaria): **Safe to give.** If severe allergy: **Consider (see comments).**	Do not give cefaclor or cephalexin to patients with allergies to ampicillin or amoxicillin, as these antibiotics share a side chain and have high rates of allergy cross-reactivity. In patients with immediate severe penicillin hypersensitivity (e.g. anaphylaxis) cephalosporins and meropenem can be considered in critical situations (e.g. sepsis, meningitis), after a risk-benefit analysis.

History	Recommendation	Comments
Cephalosporin allergy Allergy to cefazolin, ceftriaxone, cefuroxime, cefixime.	*Penicillins:* Cross reactivity 1-2% If mild allergy (e.g. rash, urticaria): **Safe to give with some exceptions (see comments in Penicillin allergy).** If severe allergy (e.g. anaphylaxis, Stevens-Johnson, Toxic epidermal necrolysis): **Avoid (see comments in Penicillin allergy).** *Cephalosporins:* **Avoid with some exceptions (see comments).** *Meropenem:* Cross reactivity <1% If mild allergy (e.g. rash, urticaria): **Safe to give.** If severe allergy: **Consider (see comments in Penicillin allergy).**	Cefazolin does not share side chains with any other available penicillins or cephalosporins, and so the risk of allergy cross-reactivity with this antibiotic is low. Cefazolin may be considered in patients with allergies to other cephalosporin or penicillins, and other cephalosporins or penicillins may be considered in patients who are allergic to cefazolin, after a risk-benefit analysis

J) Childhood Immunisation Schedule

Vaccine	Age of Administration
BCG, HepB, OPV 0	At birth or as soon as possible after birth. OPV 0 should only be given within 2 weeks of birth. BCG may be given until 12 months.
OPV 1, DTP-HepB-Hib 1, Rotavirus 1	6 weeks
OPV 2, DTP-HepB-Hib 2, Rotavirus 2	10 weeks (or 4 weeks after OPV 1, DTP-HepB-Hib 1, Rotavirus 1)
OPV 3, DTP-HepB-Hib 3, IPV 3, Rotavirus 3	14 weeks (or 4 weeks after OPV 2, DTP-HepB-Hib 2, Rotavirus 2)
MR 1	9 months
OPV 4, DTP-HepB-Hib, MR2	18 months
DT	6 years or school entry

Printed by

World Health
Organization
Timor-Leste