وزارة الصحة
Ministry of Health

National Antimicrobial Guidelines

CENTRE FOR DISEASE CONTROL AND PREVENTION

Second Edition

Ministry of Health Message

The rise and spread of antimicrobial resistance (AMR) present a significant global challenge, posing substantial threats to health and economic stability. AMR negatively impacts patient outcomes, leading to increased rates of mortality and morbidity. A key contributor to this growing issue is the inappropriate use of antibiotics in both hospitals and community settings. Studies indicate that more than 50% of antimicrobial use is improper. Evidence underscores the importance of prudent antibiotic use—ensuring the appropriate selection, dosage, and duration of treatment—as a critical measure to curb resistance and improve patient outcomes.

This set of national antimicrobial guidelines aims to provide healthcare professionals in the Ministry of Health and other clinical settings with comprehensive recommendations for empirical and targeted antimicrobial therapies for a range of infectious conditions. These guidelines cover treatment protocols for both paediatric and adult patients, as well as guidance on antibiotic prophylaxis.

Healthcare providers are encouraged to collaborate with experts in antimicrobial stewardship, including infectious disease specialists, medical microbiologists, and clinical pharmacists, to ensure optimal use of antibiotics across healthcare settings. While broad-spectrum antibiotics are frequently prescribed empirically, therapy should be reassessed and tailored based on culture results and susceptibility data to ensure effective and responsible treatment.

This guideline has been developed by the National Antimicrobial Stewardship Subcommittee, under the National Health AMR Committee, with valuable contributions from national experts in infectious diseases, medical microbiology, and clinical pharmacy. Every effort has been made to ensure the accuracy and reliability of the content; however, physicians and prescribers must take responsibility for verifying the appropriate drug and dosage for each individual patient. The ultimate interpretation and application of these guidelines rest with the treating physician.

I am confident that the implementation of these guidelines will support the objectives and vision of antimicrobial stewardship and align with the country's national plans to combat antimicrobial resistance (AMR).

Ministry of Health

Disclaimer:

The recommendations expressed in these guidelines reflect the existing available evidence from the current literature and are subject to change over time. The recommendations described here are general and may not apply to a specific patient. Application of these guidelines to a particular situation remains the professional responsibility of the caring physician and/or the prescriber. For any feedback, kindly email at: ***dgdsc2014@gmail.com***

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Abbreviations

ABECB	Acute bacterial exacerbation of chronic bronchitis	DS	Double strength
AdjBW	Adjusted Body Weight	DSP	Diastolic blood pressure
AHA	American Heart Association	*E. faecium*	*Enterococcus faecium*
AIDS	Acquired Immunodefeciency Syndrome	EBV	Epstein-Barr Virus
ALL	Acute lymphoblastic leukaemia	ENT	Ear, nose and throat
AM-CL	Amoxicillin-clavulanate	ESBL	Extended spectrum beta-lactamases
AML	Acute myelogenous leukaemia	ESR	Erythrocyte sedimentation rate
AM-SB	Ampicillin-sulbactam	FAMCO	Family and community medicine
ART	Antiretroviral Therapy	FDA	Food and Drug Administration (USA)
Azithro	Azithromycin	FEVI	Forced expiratory volume in 1 second
B. abortus	*Brucella abortus*	FQ	Fluoroquinolone
B. cepacia	*Burkholderia cepacia*	G6PD	Glucose-6-phosphate dehydrogenase
B. henselae	*Bartonella henselae*	GAS	Group A Streptococcus
B. melitensis	*Brucella melitensis*	GI	Gastrointestinal
B. quintana	*Bartonella quintana*	GU	Genitourinary
B. suis	*Brucella suis*	GVHD	Graft-versus-host disease
BAL	Bronchalveolar Lavage	*H. influenzae*	*Haemophilus influenzae*
B-Lactam	Beta-lactam	HACEK	A group of Gram-negative bacteria that includes *Haemophilus spp.*
C. pneumoniae	*Chlamydophila pneumoniae*	HHV6	Human Herpes Virus 6
CA-MRSA	Community-associated methicillin-resistant *S. aureus*	hrs / hr	Hours / Hour
CAP	Community-acquired pneumonia	HSCT	Hematopoietic stem cell
CAPD	Continuous Ambulatory Peritoneal Dialysis	HSV	Herpes simplex virus
CBC	Complete blood count	ICU	Intensive care unit
CBT	Cord blood test	ID	Infectious disease
CML	Chronic myelogenous leukaemia	IM	Intramuscular
CNS	Central nervous system	INH	Isoniazid
CoNS	Coagulase-negative staphylococci	IV	Intravenous
CRBSI	Catheter-related bloodstream infection	IVDU	Intravenous drug user
CrCl	Creatinine clearance	IVIG	Intravenous immunoglobulin
CRE	Carbapenem-resistant Enterobacteriaceae	*K. pneumoniae*	*Klebsiella pneumonia*
CSF	Cerebrospinal fluid	*M. catarrhalis*	*Moraxella catarrhalis*
CT	Computed tomography	*M. pneumoniae*	*Mycoplasma pneumoniae*
CVP line	central venous pressure line	MDR	multi-drug-resistant
CXR	Chest X-ray	MDR-GNB	multi-drug-resistant Gram-negative bacilli
DRESS	Drug Reaction with Eosinophilia and systemic symptoms	MDRSP	multi-drug-resistant *Streptococcus pneumoniae*
DRSP	Drug-resistant *S. pneumoniae*	MDR-TB	Multi Drug Resistant -TB

MDS	Myelodysplastic syndrome	SBP	Systolic blood pressure
MIC	Minimum inhibitory concentration	*SCD*	*Sickle Cell Disease*
MRI	Magnetic resonance imaging	SJS	Steven Johnson Syndrome
MRSA	Methicillin-resistant *S. aureus*	Spp.	Species
MSSA	Methicillin-sensitive *S. aureus*	SS	Single strength
MTB	Mycobacterium Tuberculosis	*Staph*	*Staphylococcus*
N. farcinica	*Nocardia farcinica*	STIs	Sexual Transmitted Infections
NAAT	Nucleic Acid Amplification Test	*Strept*	*Streptococcus*
NG	Nasogastric	TB	Tuberculosis
NTD	Neglected Tropical diseases	TDM	Therapeutic drug monitoring
OD	Once daily	TEN	Toxic Epidermal Necrolysis
P. aeruginosa	*Pseudomonas aeruginosa*	TMP-SMX	Trimethoprim/sulfamethoxazole
PCR	Polymerase chain reaction	Tobra	Tobramycin
PD	Peritoneal dialysis	UTI	Urinary tract infection
Pen-G	Penicillin G	VISA	Vancomycin Intermediate Staphylococcus aureus
Pen-V	Penicillin V	VRE	Vancomycin-resistant Enterococci
PJP	*Pneumocystis jiroveci* pneumonia	VRSA	Vancomycin Resistant Staphylococcus aureus
PO	Per OS (by mouth)	VZV	Varicella zoster virus
PPI	Proton Pump Inhibitor	WBC	White blood cell
q day	Once a day	β-lactam	beta-lactam
q1 hrs	Every hour		
q4 hrs	Every 4 hours		
q6 hrs	Every 6 hours		
q8 hrs	Every 8 hours		
q12 hrs	Every 12 hours		
q24 hrs	Every 24 hours		
R	Resistant		
R/O	Rule out		
RFT	Renal function test		
RR	Respiratory rate		
RT	Radiation therapy		
rt	Right		
Rx	Treatment		
S. aureus	*Staphylococcus aureus*		
S. bovis	*Streptococcus bovis*		
S. milleri	*Streptococcus milleri*		
S. pneumoniae	*Streptococcus pneumoniae*		
SBP	Spontaneous bacterial peritonitis		

National Antimicrobial Prescribing Guideline

1. Introduction:

The emergence of antimicrobial resistance is becoming a major public health issue. Infections caused by multi-drug-resistant organisms are associated with increased morbidity, increased length of hospital stay and increased mortality.

An effective strategy to limit the effect of multi-drug resistance must be multifaceted and must include the education of patients and physicians about appropriate drug, dose and duration, establishment of national antimicrobial guidelines, use of effective infection-control practices to prevent transmission from infected to uninfected patients, surveillance of antimicrobial resistance and antimicrobial use, and improved use of immunization.

The combat of antimicrobial resistance is one of the important priorities of the Ministry of Health in Oman. Establishing a national antimicrobial policy and guidelines is one facet of many measures that will be undertaken to improve the prudent use of antibiotics and reduce antimicrobial resistance in the country.

Principles:

This guidance is based on the best available evidence, however professional judgment based on the patient clinical presentation should be used. Patients should be involved or informed on the decision of initiation of antibiotics.

Antimicrobial prescriptions in all health care facilities in Oman are expected to be according to the following principles and care bundle (fig.1):

1. Treat infections and not colonization. Prescribe antibiotics when there is evidence of a bacterial infection **and there is likely a clear clinical benefit. In severe infections initiate antibiotics as early as possible.**

2. Specify the indications, dose, and duration in all the antibiotic prescription.

3. Always send appropriate microbiological investigations prior to antimicrobial therapy. Antimicrobial therapy should be reviewed in 24-48 hrs upon the availability of microbiological investigations. De-escalation of empirical therapy should be adjusted to target the causative organism based on their susceptibility testing. **Think AWaRE**

4. When deciding on the most appropriate antibiotic to prescribe, the following factors should be considered:

-History of drug allergy and document the allergy type: minor (rash only) or major (anaphylaxis, angioedema).

-Recent cultures (review previous culture e.g. if the patient grew or colonized with multiple –resistant organism)

-Recent antibiotic therapy

-Potential drug interactions.

-Potential adverse effects.

-Some antibiotics are considered unsafe in pregnancy or young children.

-Dose adjustment may be required for renal or hepatic dysfunctions.

5. Consider removal of any foreign body/indwelling devices, drainage of pus or any surgical interventions to control the infection source.

6. For advice on appropriate investigations and management of infections, consult your local infection specialists (infectious disease physician, medical microbiologists and /or clinical pharmacist)

7. The Use of two agents with anaerobic activity to treat infections with potential anaerobic bacteria involvement:

7.1. Double anaerobic coverage is unnecessary and put the patient at risk of drug toxicity. No data or guidelines that support the use of double anaerobic coverage in clinical practice.

7.2. Example: the use of Piperacillin/tazobactam and metronidazole or Meropenem and metronidazole

7.3. Two clinical exceptions:

- Addition of metronidazole to another agent with anaerobic activity to treat Clostridium difficile

-clindamycin added to another agent with anaerobic activity when treating necrotizing fasciitis

8. The Use of "double coverage "for Gram negative bacteria:

8.1. Double coverage of suspected Gram negative infections serves the purpose of providing broad spectrum initial empiric coverage until susceptibility data are known

8.2. No evidence exists to support the superiority of combination therapy over monotherapy for Gram negative infections once susceptibilities are known.

8.3. Once culture identification and susceptibilities have been reported, de-escalation to a single agent is strongly recommended.

9. Avoid routine prescription of intravenous forms of highly bioavailable antimicrobials agents for patients who can reliably take and absorb oral medications.

Antibiotics such as Fluoroquinolone, trimethoprim-sulfamethoxazole, clindamycin, linezolid, metronidazole, and fluconazole have excellent bioavailability and only rarely need to be administered intravenously. Use of oral forms will reduce the need for IV access and their associated complications.

10. When selecting antibiotics therapy think Which antibiotic to prescribe? Is it an **Access** or **Watch** or **Reserve** antibiotic? See below for definition

AWaRe Classification

The **AWaRe** classification, developed by the World Health Organization (WHO), organizes antibiotics into three categories to guide stewardship efforts and improve access to appropriate treatments while controlling resistance.

1. **Access group**:
    - Includes first-line antibiotics for the most common and serious infections.
    - These antibiotics should be widely available, affordable, and of good quality.
    - Examples: Amoxicillin, cefazolin.
2. **Watch group**:
    - Includes antibiotics with higher resistance potential.
    - Should be prescribed sparingly to avoid resistance.
    - Examples: Ciprofloxacin, ceftriaxone.
3. **Reserve group**:
    - Antibiotics of last resort for treatment of multi-drug-resistant infections.
    - Reserved for specific cases to preserve their efficacy.
    - Examples: Colistin, linezolid.

In Oman, institutions should:

- use AWaRe to prioritize access and control measures for antibiotics.
- **Monitoring Prescriptions**: By categorizing antibiotics into these groups, AWaRe helps monitor and evaluate prescribing practices.
- **Promoting Rational Use**: Ensures that the most appropriate antibiotics are used for common infections and that high-risk antibiotics are preserved for critical situations.

The Aware classification has been integrated into the AlShifa laboratory information system and the pharmacy prescription page. This will facilitate to raise awareness among the HCW and also allow for better monitoring of prescriptions according to AwaRe classification.

Access, Watch and Reserve antibiotics in the 2023 WHO Model list of essential medicines

Access group		**Watch group**		**Reserve group**	
Amikacin	Clindamycin	Azithromycin	Levofloxacin	Cefiderocol	Plazomicin
Amoxicillin	Cloxacillin	Cefixime	Moxifloxacin	Ceftazidime/ avibactam	Polymyxin B
Amoxicillin/ Clavulanate	Flucloxacillin	Cefotaxime	Piperacillin/ Tazobactam	Colistin	
Ampicillin	Doxycycline	Ceftazidime	Vancomycin	Fosfomycin	
Ampicillin/ Sulbactam	Gentamicin	Ceftriaxone	Ertapenem	Linezolid	
Cefalexin	Metronidazole	Cefuroxime	Streptomycin	Meropenem*	
Cefazolin	Nitrofurantoin	Cefepime		Meropenem/ Vaborbactam	
	Penicillin	Ciprofloxacin			
	Trimethoprim/ Sulfamethoxazole	Clarithromycin			
		Erythromycin			

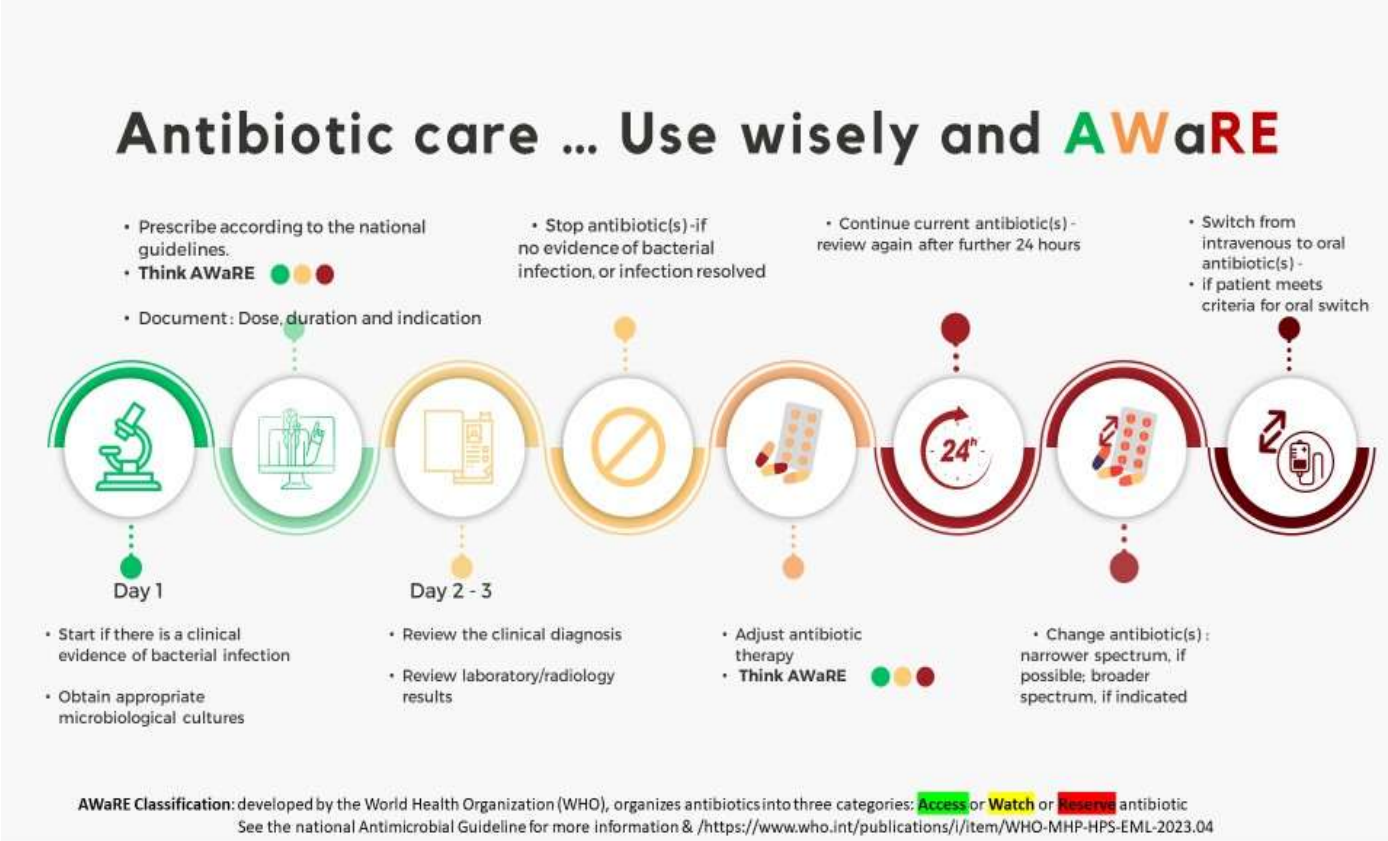

Fig.1 Antibiotic Care Bundel

4. Selected formulary antimicrobial and restriction status

GROUP I: Antibiotics for General use and Primary Health Care

This policy limits the general practitioner's (GP) choice of antibiotics to a few drugs only. With these drugs, he/she should be able to treat most community-acquired infections successfully. Some antibiotics in this group are restricted to Specialist in Family and community medicine (FAMCO) or other specialists (e.g. Dermatologist or ENT). However, some infections, such as pneumonia and otitis media caused by penicillin-resistant *Streptococcus pneumoniae* and *Moraxella catarrhalis* and ampicillin-resistant *Haemophilus influenzae* may not respond to treatment with any of the antibiotics available for the GP. Ideally, such infections are treated with ceftriaxone, co-amoxiclav or other ß-lactamase-resistant drugs. However, in order to rationalize antibiotic usage, it is not possible, to avail such drugs for general use. Nevertheless, doctors in general practice must be aware of the possibilities of infections by resistant organisms. They should, therefore refer all patients with pneumonia and children suffering from acute otitis media to the nearest specialist FOR further evaluation and management.

Antimicrobial	Comments
Benzylpenicillin (Penicillin G)	
Penicillin V	
*Procaine Pen*icillin	
Benzathine Benzyl Penicillin	
Amoxicillin	
Amoxicillin-Clavulanate	Restricted
Cloxacillin	
Cephalexin	
Cefuroxime	Restricted
Erythromycin	
Azithromycin	Restricted
Clarithromycin	Restricted
Trimethoprim-Sulphamethoxazole	Restricted
Doxycycline	
Ciprofloxacin	Restricted
Nalidixic Acid	
Nitrofurantoin	
Metronidazole	
Acyclovir	Restricted
Valacyclovir	Restricted
Nystatin	

Ketoconazole	Restricted
Fluconazole	Restricted
Itraconazole	Restricted
Terbinafine	Restricted
Albendazole	

**Restricted: this group are restricted to Specialist in Family and community medicine or other specialists (e.g Dermatologist or ENT).

Group II

These Antimicrobials are to be used by consultants (Exceptions are prescribers in ICU, ER, OR heam-oncology wards) in emergency and according to the prescribing criteria for a period of not exceeding more than three days until microbiological investigations are through. All antimicrobials need review and approval after 72 hrs in consultation with the infectious diseases/Medical microbiologist or the antimicrobial stewardship team

OR

In accordance with antibiotic susceptibility results i.e., if the microorganism is sensitive only to the antibiotics in this group.

OR

By the recommendation of the infectious disease or the medical microbiologist or the antimicrobial stewardship team in view of the prevalent antibiotic susceptibility pattern in the hospital concerned

Restricted Antibiotics	**Route**
Amikacin	**IV**
Meropenem	**IV**
Imipenem	**IV**
Piperacillin/Tazobactam	**IV**
Cefepime	**IV**
Ceftazidime	**IV**
Vancomycin	**IV**

Ertapenem	**IV**
linezolid	**IV & PO**
Tigecycline	**IV**
Moxifloxacin	**PO**
Streptomycin	**IV**
Colistin	**IV**
Fosfomycin	**PO**
Daptomycin	**IV**
Lipid-based Amphotericin (AmBisome)	**IV**
Anidulafungin	**IV**
Voriconazole	**IV & PO**
Caspofungin	**IV**
Ceftazidime-avibactam	**IV**
Aztreonam	**IV**

****Antibiotics not listed under group I or II should be prescribed or used for inpatients or outpatients with approval of a specialist and above, and in accordance to the prescribing indications outlined in this guideline.**

*****Please refer to Oman National Formulary for Ministry of Health Institutions 2023/ fourth edition**

5. PRESCRIBING CRITERIA FOR RESTRICTED ANTI-INFECTIVE AGENTS

Meropenem

1. Suspected or proven polymicrobial infection when combination therapy with other antibiotics or Piperacillin-tazobactam monotherapy is not desirable because:

-The organism is documented or likely resistant to all alternatives, risk of toxicity with aminoglycosides or clinical failure.

2. Infection involving an organism documented or likely resistant to all alternatives.

Vancomycin

1. Serious infections due to beta-lactam resistant Gram-positive organisms.

2. Infections due to Gram-positive organisms in patients with serious allergy to beta-lactam antibiotics.

3. Empiric treatment pending susceptibility for Staphylococcus aureus identified from a sterile site when there is a strong suspicion of MRSA e.g. In hospitalized patients, patients with known MRSA colonization.

4-Surgical prophylaxis in patients with life threatening allergy to beta-lactam antibiotics.

5-Prophylaxis for endocarditis if patients with life threatening beta-lactam allergy.

6-Empiric treatment of febrile neutropenic patients with suspected gram-positive infections (e.g., inflamed IV site)

7-C. difficle associated colitis unresponsive to Metronidazole. (Oral Vancomycin).

Piperacillin-Tazobactam

1-Suspected or proven polymicrobial infection when combination therapy with other antibiotics is not desirable because: organisms are documented or likely to be resistant to narrower spectrum antibiotics or risk of toxicity with aminoglycosides

2- Empiric therapy of febrile neutropenia + aminoglycoside

3-Suspected or proven nosocomial pneumonia where the organisms are documented or likely resistant to more narrow spectrum antibiotics.

Moxifloxacin

Moxifloxacin is a Quinolone antibiotic. It has activity against gram-positive cocci except gram-negative cocci (except N. gonorrhoeae due to high prevalence of resistance), gram-negative bacilli (including ESBL organisms, *Legionella* sp.), *Chlamydophilia* and *M. pneumoniae*, and activity against anaerobes except C. difficle.

Indications:

- Mild to moderate CAP, including multi-drug resistant *streptococcus pneumoniae*
- (MDRSP).
- Acute bacterial exacerbation of chronic bronchitis.
- Acute bacterial sinusitis.
- Uncomplicated skin and skin structure infections.
- Intra-abdominal infections.
- Bacterial conjunctivitis.

Acceptable off label use:

- Treatment of infections caused by *Legionella spp.*

Unacceptable uses:

- Avoid in use in community acquired pneumonia if suspecting TB.

Linezolid

- Treatment of Vancomycin-Resistant *Enterococcus faecium* infections
- Proven GISA (Glycopeptide Intermediate Staphylococcus Aureus)
  Infection
- One of the following infections that is Vancomycin-resistant or methicillin-resistant when Vancomycin (or another sensitive antimicrobial) is contraindicated, has failed or is not tolerated:
  I. Nosocomial pneumonia
  ii. Skin and skin structure infections including diabetic foot infections
  iii. Community-acquired necrotizing pneumonia
- Oral switch from IV glycopeptide where oral rifampicin & trimethoprim is not appropriate
- Poor IV access and glycopeptide is indicated

Tigecycline

1. Complicated poly microbial intra-abdominal infections.
2. Complicated skin and soft tissue infections

If the patients cannot receive other combination or the organism is resistant to other first line treatment.

Special note: -Not active against *Pseudomonas aeruginosa*.

Colistin -Treatment of multi-drug- resistant Gram-negative bacteria such as Acinetobacter baumannii, Pseudomonas aeruginosa and no other treatment options are available.

Ertapenem

Ertapenem is a carbapenem antibiotic. It has *in vitro* activity against many Gram-negative organisms including those that produce extended spectrum beta-lactamases (ESBL), but it does not have activity against *Pseudomonas spp*. *or Acinetobacter spp.* Its anaerobic and Gram-positive activity is similar to that of other carbapenems, except it does not have activity against *Enteroccocus spp*.

Indications:

1. Mild to moderate intraabdominal infections (biliary tract infections, diverticulitis, secondary peritonitis, /GI perforation).
2. Moderate diabetic foot infections without osteomyelitis
3. Moderate surgical site infections following contaminated procedures
4. Pelvic Inflammatory disease
5. Urinary tract infections due to ESBL producing organisms (not severe infections)

Ertapenem is not recommended for severe infections in which Pseudomonas spp. are suspected.

Daptomycin

Daptomycin is a lipopeptide antibiotic. It has activity against most strains of *Staphylococci & Streptococci* (including MRSA and VRE). It does NOT have activity against Gram negative organisms

Indications:

**All cases need to be discussed and approved by the infectious diseases and/or antimicrobial stewardship team

1. Bacteremia or endocarditis due to MRSA OR coagulase-negative staphylococci in a patient with serious allergy to Vancomycin.
2. Bacteremia or endocarditis due to MRSA in a patient failing vancomycin therapy as defined by:
   - Clinical decompensation after 3-4 days
   -Failure to clear blood culture after 7 days despite maintaining vancomycin level at 15-20 mcg/ml.
   -Vancomycin MIC is 2mcg/ml
3. Treatment of VRE infections

Daptomycin is NOT indicated for:

-Pneumonia as it is inactivated by the pulmonary surfactant

-Initial therapy of Gram-positive infections

-VRE colonization of the urine, drains, wounds or sputum.

Ceftaroline

- It is a fifth-generation cephalosporin.
- It is active against all staphylococci, including MSSA, MRSA, VISA, VRSA, MDR streptococcus pneumoniae, other streptococcus species, and Enterococcus faecalis.
- Gram-negative activity of Ceftaroline is limited mainly to Gram-negative respiratory tract pathogens, including b-lactamase-producing *Haemophilus influenzae, Moraxella catarrhalis, Neisseria gonorrhoeae and Enterobacterales* that do not produce ESBLs, inducible Amp-C b-lactamases or carbapenemases.
- It has been approved by the FDA for treatment of acute bacterial skin and skin structure infections and community-acquired pneumonia.
- Off- label uses are bloodstream infection, endovascular infection, bone and joint infections, and diabetic foot infection.

Note: it is not active against Enterococcus faecium, Pseudomonas aeruginosa, and Acinetobacter species.

Aztreonam

- It is the only monobactam antibiotic currently in clinical use.
- It is active against Enterobacteriaceae, including those producing metallo-beta-lactamase, as well as Pseudomonas aeruginosa, Neisseria species, and Haemophilus species.
- It has been approved by the FDA for treatment of bloodstream infection, urinary tract infections, lower respiratory tract infections, skin and skin-structure infections, intra-abdominal infections, and gynecologic Infections.
- Off-label uses of aztreonam are moderate to severe diabetic foot infection, intracranial abscess, meningitis, osteomyelitis, peritonitis.

Note: it is not active against Gram-positive bacteria or anaerobes.

Ceftazidime-avibactam

- It is a third-generation cephalosporin and beta lactamase inhibitor combination.
- It is active against Enterobacterales (including ESBL, Amp-C, OXA and KPC- producing strains) and P. aeruginosa.
- It has been approved by the FDA for the treatment of complicated intra-abdominal infections, used in combination with Metronidazole, complicated urinary tract infections, hospital-acquired pneumonia, and ventilator-associated pneumonia.

Note: it is not active against metallo-β-lactamases producing Enterobacteriaceae and anaerobes.

Fosfomycin

- It is a phosphonic acid derivative originally named phosphonomycin.
- It is available in both oral and intravenous forms, with each form serving distinct uses.
- It has a broad spectrum of antibacterial activity against most aerobic gram-positive and gram-negative bacteria usually isolated from patients with lower urinary tract infections including E. coli, Serratia species, *Klebsiella oxytoca* and *Klebsiella pneuomoniae*, Citrobacter species, Enterobacter species, Proteus species, S. aureus, S. saprophyticus, and Enterococcus species including VRE. It does not have activity against *Acinetobacter spp.*
- Oral form has been approved by the FDA for the treatment of acute uncomplicated cystitis.
- IV form has been approved by FDA for the treatment of bloodstream infection, bone and joint infection, endocarditis, intra-abdominal infection, meningitis, hospital-acquired or ventilator-associated pneumonia, skin and soft tissue infection, complicated urinary tract infection.

Indications:

1. Management of uncomplicated UTI in patients with history of antibiotic allergies and/or when no other oral therapy options are available.
2. Uncomplicated UTI due to VRE.
3. Salvage therapy of UTI due to multi drug resistant Gram-negative organism

*****Susceptibility to Fosfomycin should be confirmed prior to initiation of therapy**

Cefiderocol

- It is a novel siderophore cephalosporin.
- It is mainly active against gram-negative bacteria, particularly resistant strains such as carbapenem-producing Enterobacteriaceae including (KPC, NDM, VIM, IMP, and OXA-carbapenemases), Pseudomonas aeruginosa, Acinetobacter baumannii, and Stenotrophomonas maltophilia.
- It has been approved by FDA for the treatment of hospital-acquired and ventilator-associated pneumonia, and complicated urinary tract infection.

Paromomycin

- It is a wide-spectrum antibiotic belonging to the class of aminoglycosides.
- It is mainly effective against Leishmania, Entamoeba, and Cryptosporidium.
- It has been approved by FDA for the treatment of cutaneous leishmaniasis and intestinal amebiasis.
- Off-label uses of paromomycin are dientamoeba fragilis infection, refractory or resistant trichomoniasis, giardiasis, cryptosporidiosis-associated diarrhoea in patients with HIV

Antifungals

Liposomal amphotericin B:

Indications:
-Cryptococcal meningitis in HIV-infected patients: Treatment of cryptococcal meningitis in HIV-infected patients.

-Fungal infections, empiric therapy: Empiric treatment in febrile neutropenic patients with presumed fungal infection.

-Fungal infections, systemic therapy: Treatment of systemic infections caused by *Aspergillus* spp, *Candida* spp, and/or *Cryptococcus* spp in patient's refractory to conventional Amphotericin B deoxycholate therapy or when renal impairment or unacceptable toxicity precludes the use of the Deoxycholate formulation.

-Leishmaniasis (visceral): Treatment of visceral leishmaniasis.

Note: Lipid-based Amphotericin formulations (AmBisome) may be confused with conventional formulations (Deoxycholate [Amphocin, Fungizone]) or with other lipid-based amphotericin formulations (Amphotericin B lipid complex [Abelcet], Amphotericin Lipid-based and conventional formulations are **not** interchangeable and have different dosing recommendations. Overdoses have occurred when conventional formulations were dispensed inadvertently for lipid-based products.

Usual (Adult) dosage range: IV: 3 to 6 mg/kg/day.

Note: Premedication: For patients who experience non-anaphylactic immediate infusion-related reactions, pre medicate with the following drugs 30 to 60 minutes prior to drug administration: A nonsteroidal anti-inflammatory agent ± Diphenhydramine; **or** Acetaminophen with Diphenhydramine; **or** Hydrocortisone.

Caspofungin:

Indications:

-Treatment of invasive *Aspergillus* infections in patients who are refractory or intolerant of other therapies

- Treatment of candidemia and other *Candida* infections (intra-abdominal abscesses, peritonitis, pleural space)

-empirical treatment for presumed fungal infections in febrile neutropenic patients

Voriconazole

Oral voriconazole is approximately 96% bio-available. For this reason, it is recommended that oral voriconazole be used whenever possible.
Indications for using voriconazole:

- Primary treatment of pulmonary *Aspergillus*
- Primary treatment of amphotericin B and fluconazole resistant fungal infections (including Fusarium spp. and *Scedosporium apiospermum* - asexual form of *Pseudoallescheria boydii*)

- Treatment of invasive fungal infections in patients who are intolerant of, or refractory to, other antifungal therapy.

Posaconazole:

Restricted to ID consultant only.

Indications:

- Prophylaxis of invasive *Aspergillus* and *Candida* infections in patients who are at high risk of developing these infections due to being severely immunocompromised (e.g., hematopoietic stem cell transplant [HSCT] recipients with graft-versus-host disease [GVHD] or those with prolonged neutropenia secondary to chemotherapy for hematologic malignancies).

Off-Label indications:
- Treatment of invasive Aspergillosis (refractory to or intolerant of conventional therapy)
- Mucormycosis
- Refractory or relapsed invasive fungal infections (salvage therapy)

Intravenous (IV) to Oral (PO) Antibiotics Conversion

This describes the practice of converting intravenous antimicrobials therapy to an effective alternative oral formulation. Several clinical trials have been conducted that demonstrate the efficacy and safety of IV to PO antimicrobials conversion, and several studies have also addressed the economic impact of this conversion.

Cost savings are achieved through lowering direct acquisition costs, eliminating the need for ancillary supplies, reducing pharmacy and nursing time, and shortening the length of hospital stay. IV to oral antimicrobials conversion also benefits the patient by eliminating adverse events associated with IV therapy, increasing patient comfort and mobility and increasing the possibility of earlier discharge.

Conversion to oral therapy also reduces the risk of adverse effects associated with intravascular lines like catheter-related blood stream infection (CRBSI) and thrombophlebitis.

Example of Antimicrobials That Can Be included in IV to PO Therapy Conversion and Bioavailability of Selected Antimicrobials Available in Both IV and PO Formulations- Refer to Table 1

Bioavailability of Selected Antibiotics Available in Both IV and PO Formulations
80% to 100%
Ciprofloxacin **Clindamycin** **Doxycycline** **Fluconazole** **Linezolid** **Metronidazole** **Moxifloxacin** **Trimethoprim-sulfamethoxazole** **Azithromycin (<50%: Although Azithromycin has a low bioavailability, it is well-distributed into tissues)**

Criteria used to determine Patients for IV to PO Therapy Conversion:

1. Intact and functioning gastrointestinal (GI) tract as evidenced by:
   - Patient is tolerating food, fluids or enteral feeds
   - Patient is receiving other oral medications
   - No nausea, emesis or diarrhea in the past 24 hrs

Criteria Indicating Absorption of Oral Medications May Be Compromised:
   - Nil by mouth (NPO) status (and no medications are being administered orally)
   - Nasogastric (NG) tube with continuous suction
   - Severe/persistent nausea or vomiting
   - Gastrointestinal transit time too short for absorption such as malabsorption syndromes, partial or total removal of the stomach, short bowel syndrome
   - Active upper gastrointestinal bleeding
   - High doses of vasopressor medications (typically in persistent hypotension despite high dose of vasopressor)
   - Difficulty swallowing or loss of consciousness and no NG access available
   - Documented ileus or gastrointestinal obstruction
   - Continuous tube feedings that cannot be interrupted and patient requires a medication known to bind to enteral nutrition formulas

2. Improving clinical status

-The patient should be clinically stable and deterioration should not be expected.

-Should be afebrile or have had a maximum temperature of less than 38oC in the previous 24 hrs.

-White blood cell (WBC) count should be trending downward. It is important to examine the patient's medication therapy for other medications that can cause an increase or sustained high WBC count such as steroids.

-It is also important to review the cultured pathogen (bacteria, fungus, etc.) and ensure that it is susceptible to the oral medication.

3. Does not meet any of the following **exclusion criteria**

- Endocarditis
- Central nervous system infections (e.g.; meningitis, brain abscess, etc.)
- Orbital cellulitis
- Osteomyelitis
- Endophthalmitis
- Melioidosis (at least 10 to 14 days of IV therapy)
- Abscesses
- Patients who are neutropenic are typically excluded from IV to PO therapy conversion.

Antimicrobials IV- PO conversion equivalent doses

Antimicrobials	Parenteral IV dose	PO equivalent dose	Comments
Azithromycin	500 mg IV daily	500 mg daily	With and without food for the tab Suspension: take 1hr before or 2 hrs after food
Cefuroxime	* 750 – 1500 mg IV q8hr	500 mg PO q12hr	
Ciprofloxacin *	400 MG IV q8hr 400 mg IV q12hr 400 mg IV q24hr	750 mg PO q12hr 500 mg PO q12 hr 500 mg PO q24 hr	Give 2 hrs before calcium, iron or dairy products □ Not for pts with continuous enteral feeding or jejunostomy tube □ stop tube feeding 2 hrs before and 2 hrs after administration**
Moxifloxacin	400 mg IV daily	400 mg PO daily	
Clindamycin	600 mg IV q8hr	300 mg PO q6hr Or 600 mg q8hr for severe skin infections With or without	With or without food
Doxycycline	100 mg IV q12hr	100 mg PO q12hr	Take 1 hour before or 2 hrs after meals
Linezolid	600 mg IV q12hr	600 mg PO q12hr	Avoid tyramine rich foods

Metronidazole *	500 mg IV q8 -12hr	500 mg PO q8 -12hr	
Fluconazole	IV dose daily	Same dose PO daily	* Not affected by food (1:1 conversion) (Patients with candidemia or Disseminated candidiasis, keep IV)

Note:
*Consider renal dosing for patients with renal impairment.
** Patients with feeding tubes: tubes should be flushed with water both before and after Medication administration.

Performance Measures:

The compliance with this guide and policy will be monitored by specific activities such as audit and feedback. Antimicrobials Bundle of care audit tool:

1. **Life-threatening conditions:**

1.1Median time from first clinical contact to the first dose of antibiotics for patients with suspected bacterial meningitis or for patients with suspected sepsis

2. Use of antimicrobial guidelines and clinical conditions

2.1: proportion of antibiotic prescriptions that are in accordance with guidelines.

3. Documentation

3.1 Rate of documentation of clinical indications (Reason) for prescribing antibiotics.

4. Use of Broad-spectrum antibiotics

4.1 proportion of patient prescriptions of broad-spectrum antibiotics for which a medical review is documented within 72 hrs from first prescription.

4.2 Proportion of patient prescription of **Access** or **Watch** or **Reserve** antibiotic

5. Surgical prophylaxis:

5.1 Proportion of patients for whom surgical prophylactic antibiotics were prescribed in accordance with guideline

5.2 Proportion of patients who are administered indicated prophylactic antibiotics within 30-60 mins before surgical procedure.

5.3 Proportion of patients whose prophylactic antibiotics were discontinued within 24 hrs after surgery or 48 hrs after cardiac surgery.

6. Increase the proportion of the use of Access group antibiotics by 10-20% annually to achieve 70% by 2030

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10. Oman National Formulary 2021

TABLE 1: GUIDELINES FOR TREATMENT OF RESPIRATORY INFECTIONS IN ADULTS

ANATOMIC SITE/ DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
RESPIRATORY SYSTEM				
Acute bronchitis	Usually, viral *M. pneumoniae* 5%, *C. pneumoniae* 5% Bordetella pertussis	**Supportive care** No antibiotics are indicated (Except in suspected or confirmed Pertussis, severe exacerbation of COPD).		If persistent cough > 2-3 weeks 1)Consider non infective causes 2)If persistent fever with abnormal vital signs, do chest x-ray (CXR), consider Pertussis and atypical bacterial PCR to rule out Mycoplasma/ C. Pneumoniae 3)Rule out M.TB infection
Pertussis (10-20 % of adults with cough > 14 days have Pertussis)	*B. pertussis*, *B.parapertussis* *B.bronchiseptica* *B.holmesii*	Azithromycin 500 mg day 1 then 250 mg q24 hr days for 4 days	Erythromycin 500 mg q6hr x 7-14 days **OR** Clarithromycin 500 mg (q12hr) X 7 days **OR** TMP-SMX (1 DS tab q12hr for 14 days) is an alternative if macrolides resistance is expected	Prophylaxis of household or close contacts is indicated as per treatment regimens

TABLE 1: GUIDELINES FOR TREATMENT OF RESPIRATORY INFECTIONS IN ADULTS

ANATOMIC SITE/ DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
RESPIRATORY SYSTEM				
Acute Bacterial Exacerbation of Chronic Bronchitis (ABECB) Role of antibiotics is debated. However recent evidence showed benefit in patients hospitalised with severe disease. **Risk factors for *Pseudomonas*:** Recent hospitalisation (within 3 months), frequent administration of antibiotics (≥4 courses in the past year), isolation of Pseudomonas in previous exacerbation, systemic steroids use, colonisation with *Pseudomonas* during stable disease, FEV1<50%.	Viruses causes 20–50%, *C. pneumoniae*, *M. pneumonia*, *H. influenzae*, *S. pneumoniae*, *M. catarrhalis*, Gram-negative enteric organisms	**Mild or moderate disease:** Either no antimicrobial or may be: Amoxicillin 500 mg PO 3 times daily (q8hr) **OR** Cotrimoxazole 1 DS tab twice daily q12hr **OR** Doxycycline100 mg q12hr, **OR** Cefuroxime 500 mg PO q12hr. **Severe disease:** **-no risk of *Pseudomonas*** Amoxicillin-clavulanate 875/125 **OR** Azithromycin (500mg PO Day 1 then 250 mg once daily for 4 days or 500 mg once daily for three days) **OR** Clarithromycin 500 mg q12hr **OR** Fluoroquinolone (FQ) with enhanced activity against pneumococci: levofloxacin 500 mg q24 hrs Limit duration of therapy to 5-7 days **-if Risk for *Pseudomonas***: IV FQ (levofloxacin 750 mg once daily) **OR** Piperacillin-Tazobactam 4.5 IV q6hr **OR** Cefepime 2g q8hr. Limit duration of therapy to 5-7 days		**Severe**: increased cough, dyspnea, sputum viscosity and volume, FEV1 <50%, >2 exacerbations in the last 12 months, Home O2, Coronary artery disease or heart failure, chronic steroid use, antibiotics in the last 3 months **Consider:** 1)CXR if febrile or has low O2 sat 2)inhaled bronchodilators 3) corticosteroids taper over 2 weeks 4) stop smoking 5) non-invasive positive pressure ventilation Ensure all patients are receiving appropriate immunisation including Influenza, COVID-19 and pneumococcal vaccination and others as appropriate. -Obtain sputum culture before initiation of antimicrobial therapy OR use a recent sputum culture to guide the therapy

TABLE 1: GUIDELINES FOR TREATMENT OF RESPIRATORY INFECTIONS IN ADULT

ANATOMIC SITE/ DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
RESPIRATORY SYSTEM				
Bronchiectasis	H. influenzae, P. aeruginosa, S. pneumoniae	Non hospitalised: no previous antibiotics or cultures: Amoxicillin 500 mg q 8hr **OR** Clarithromycin 500 mg q12hr for 10-14 days or Doxycycline 100 mg q12hr. -Hospitalised with positive previous cultures: modify accordingly, - Sever disease and chronic colonisation with H. influenzae: use higher dose of: Amoxicillin 1g q8hr **OR** Amoxicillin-clavulanate 875 mg q12hr **OR** Ciprofloxacin 750 mg q12hr **OR** Levofloxacin 750 q24hr		Obtain sputum culture before initiation of treatment or use recent cultures to guide therapy **Prevention:** consult respiratory/chest physician Consider immunisation as appropriate
Community-acquired pneumonia For management guide and prognosis prediction use: - Pneumonia Severity index (PSI) and /or -CURB65 criteria (C=confusion, U=urea >7.5 mmol/L, R=RR ≥30, B=SBP <90 or DBP ≤60, Age ≥65.) (ATS/IDSA guideline 2019 (Am J Respir Crit Care Med. 2019;200: e45) **NB**: clinical judgement should be used for all patients. -Obtain appropriate cultures -Start empirical influenza treatment during flu season and look for *S. aureus*				
CAP, Outpatient	Outpatient: S. pneumoniae, M. pneumoniae, H. influenzae, C. pneumoniae, Respiratory viruses	**Previously healthy and no use of antimicrobials within the previous 3 months:** Amoxicillin 1g q8hr **OR** Doxycycline 200 mg PO stat then 100 mg q12hr for 7 days.		
		Presence of comorbidities such as chronic heart, lung, liver or renal disease; DM; alcoholism; malignancies; asplenia; immunosuppressing conditions or drugs; or use of antimicrobials within the previous 3 months (in which case an alternative from a different class should be selected):		

TABLE 1: GUIDELINES FOR TREATMENT OF RESPIRATORY INFECTIONS IN ADULTS

ANATOMIC SITE/ DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
RESPIRATORY SYSTEM				
		***Combination therapy:** Amoxicillin/clavulanate 1g PO q12hr **OR** Cefuroxime 500 mg PO q12hr **PLUS** one of the following: Doxycycline 100mg q12hr PO **OR** Azithromycin (500 MG PO day 1 then 250 mg once daily for 4 days or 500 mg once daily for three days) **OR** Clarithromycin 500 mg q12hr. **Monotherapy** Levofloxacin 500 mg PO once daily Duration of Therapy is 5-7 days based on clinical response.		
CAP, In-patient (non-ICU Non severe)	*S. pneumoniae*, *M. pneumoniae*, *C. pneumoniae*, *H. influenzae*, *Legionella spp.*, Respiratory viruses	If no risk for MRSA **OR** *Pseudomonas*: Amoxicillin 500 mg PO q8hr if oral intake is possible **OR** IV Ampicillin 1-2 g IV q6hr **OR** Amoxicillin-clavulanate 1.2 IV gm q12hr **PLUS,** IV Azithromycin **OR** Clarithromycin If Allergic to Penicillin use: Levofloxacin 750 mg IV q24h Duration: 5-7 days based on clinical response Consider antiviral therapy according to the season and epidemiology.		Send appropriate sputum and blood cultures and urine for antigen detection of S. pneumoniae & L. pneumophila (as available) Nasopharyngeal swab for PCR detection of respiratory viruses (COVID-19, influenza, RSV and perhaps others

TABLE 1: GUIDELINES FOR TREATMENT OF RESPIRATORY INFECTIONS IN ADULTS

ANATOMIC SITE/ DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
RESPIRATORY SYSTEM				
CAP, In-patient (Severe/ ICU):	*S. pneumoniae*, *S. aureus*, *Legionella spp.*, Gram-negative bacilli *H. influenzae*	- Ceftriaxone 1-2 g Once daily **PLUS** either Macrolide **OR** a respiratory fluoroquinolone. - **OR** Cefotaxime 1-2 g q8hr **PLUS** either Macrolide **OR** a respiratory Fluoroquinolone (for Penicillin allergic patients, a respiratory Fluoroquinolone is recommended). **Special concerns** -If *Pseudomonas* is a consideration (see risk factors as above): Use Piperacillin-tazobactam 4.5 gm IV q 8hr **OR** Cefepime 2 gm q 8hr **PLUS** Levofloxacin (750 mg PO once daily) -If community-associated Methicillin-resistant *S. aureus* (CA-MRSA) is a consideration, add Vancomycin **OR** Linezolid		Send appropriate investigations as above Consult ID/Microbiology
Aspiration pneumonia +/-lung abscess	Anaerobes 34%, Gram-positive cocci 26%, *S. milleri* 16%, *K. pneumoniae* 25%, *Nocardia spp*.3%	Amoxicillin-clavulanate 1.2 IV gm q12hr **OR** Clindamycin 600 mg IV q8h Oral options Amoxicillin-clavulanate 1gm 12hr **OR** PO Clindamycin 300-450 mg PO q8hr **OR** Levofloxacin (750 PO mg once daily)	Ceftriaxone 1g IV q24h plus Metronidazole 500 mg IVq8hr **OR** Piperacillin-tazobactam 4.5 g IV q8hr	Duration of therapy Optimal duration is unknown if no lung abscess or empyema 7-10 is recommended Lung abscess: 4-6 weeks guided by clinical, radiological resolution and adequacy of drainage

TABLE 1: GUIDELINES FOR TREATMENT OF RESPIRATORY INFECTIONS IN ADULTS				
ANATOMIC SITE/ DIAGNOSIS	**ETIOLOGIES**	**SUGGESTED REGIMENS**		**COMMENTS**
		FIRST LINE	**SECOND LINE**	
RESPIRATORY SYSTEM				
Hospital acquired pneumonia or Ventilator associated pneumonia	As above **PLUS** multi-drug resistant MDR	Piperacillin-tazobactam 4.5 gm IV q8hr	Meropenem 1gm IV q8hr **OR** Levofloxacin 750 mg IV/PO once daily.	Add Vancomycin or Linezolid if risk of MRSA Therapy should be guided by cultures Consult ID/Microbiology
Empyema	S. pneumoniae. Group A Strept. S. aureus, H. influenzae, Coliforms, anaerobes	Clindamycin 600 mg IV q8hr **PLUS** Ceftriaxone 1gm IV q24h **OR** Cefepime IV 2gm q6hr	Ceftriaxone 1gm IVq24h **PLUS** Metronidazole (500 mg IV q6h or 1 g IV q12h) **OR** Piperacillin-tazobactam 4.5 gm IV q8hr	Diagnostic thoracentesis and chest tube for drainage Add Vancomycin or Linezolid if MRSA is suspected
Pneumonia with fever, night sweats and weight loss	To rule out pulmonary TB	Refer to national TB guidelines		
Cystic fibrosis, pulmonary exacerbation	*S. aureus* and *H. influenzae* early in disease *P. aeruginosa* later in disease *B. cepacia* Non-tuberculous mycobacteria is emerging important pathogen	-Tobramycin 5-7 mg/kg IV q 24 hr + Piperacillin/ tazobactam 4.5 gm IV q 8hr. -for Methicillin-sensitive *S. aureus* (MSSA) use Cloxacillin 1-2 gm IV q6hr. -For MRSA use Vancomycin 15-20 mg/kg IV q8-12 hr. -*For B. cepacia*: TMP-SMX 10mg/kg day of TMP component in 2-3 devided doses.	Tobramycin 5-7 mg/kg IV q 24 hr + Ceftazidime 2gm IV q8hr If P. aeruginosa resistant, then Ciprofloxacin **OR** Levofloxacin can be used if P. aeruginosa is susceptible.	Obtain cultures Consult ID/Chest Physician to streamline therapy. Ensure appropriate immunization is given

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TABLE 2: GUIDELINES FOR TREATMENT OF EAR, NOSE AND THROAT INFECTIONS

The microbial flora of the external canal is similar to the flora of skin elsewhere. There is predominance of *S. epidermidis, S. Aureus, Corynebacterium spp.*, and, to a lesser extent, anaerobic bacteria such as *P. acnes*. Pathogens responsible for infection of the middle ear (*S. pneumoniae*, *H. influenzae*, or *M. catarrhalis*) are uncommonly found in cultures of the external auditory canal when the tympanic membrane is intact).

ANATOMIC SITE/ DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Acute Otitis externa	*S. aureus, P. aeruginosa*	**Ear drops:** 1) Ciprofloxacin + (Dexamethasone or Hydrocortisone) q12hr x 7 days **OR** 2) Ofloxacin q24 hr x 7 days		
Chronic Otitis Externa	Usually due to seborrhoea	**Ear drops** Polymyxin B+ neomycin+ Hydrocortisone q12hr) + selenium sulphide shampoo		Ear drops may be started at primary health care. If no improvement with ear drops (pain) then refer the patient to ENT. Usually: cleaning and suctioning will be done by an ENT doctor. In addition: if this drop is available as cream or ointment then application will be done by ENT every 5-7 days
Otitis Externa Fungal	*Candida spp.*	Clotrimazole ear drops q12hr for 10–14 days then reassess	Fluconazole 200 mg PO one dose & then 100 mg **PO** once daily for 3–5 days	Oral therapy is given in refractory cases were no response to topical antifungals

TABLE 2: GUIDELINES FOR TREATMENT OF EAR, NOSE AND THROAT INFECTIONS

ANATOMIC SITE / DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Otitis Externa Malignant (necrotizing) **Risk groups:** Diabetes mellitus, AIDS, chemotherapy. Requires multidisciplinary approach	*P.aeruginosa* >95% *S. aureus* Others: Aspergillus *species*	**Immunocompetent:** Ciprofloxacin 750 mg PO q8–12 hr **Immunocompromised:** Ciprofloxacin 400 mg IV q8hr x 2 weeks. **PLUS** Ceftazidime 2gm IV q8hr **OR** Piperacillin-tazobactam 4.5gm IV q6 hr	Piperacillin-tazobactam 4.5 g IV q6hr **OR** Meropenem 1gm IV q8hr **OR** any other antipseudomonal B-lactam ± aminoglycoside	Consult an ENT specialist for staging and surgical intervention.ID consult R/O osteomyelitis by computed tomography (CT) or MRI scans. If bone is involved, then treat for 6– 8 weeks. Control of Diabetes/ comorbidity Local aural wick + Dexamethasone drops Local debridement if needed Hyperbaric Oxygen Therapy in selected cases with no improvement /HbA1C>10. In all stages the Rx to be reviewed at the end of Rx- To be extended/modified if disease is progressive or residual symptoms or activity still suspected on ESR/CRP/Gallium Scan or PET scan On Discharge: Oral Ciprofloxacin 750 mg q12hr x 3-4 weeks to complete 8 weeks total duration based on response.

TABLE 2: GUIDELINES FOR TREATMENT OF EAR, NOSE AND THROAT INFECTIONS

ANATOMIC SITE / DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Acute Otitis Media	Commonly caused by viral infection (70%) Bacterial: *S. pneumoniae* *H. influenzae* , *M. Cattarhalis,* rarely *S. aureus,* *S. pyogenes*	**Mild to moderate disease**: Amoxicillin PO 500 mg q12hr, **OR** 250 mg q8hr **Severe disease**: Amoxicillin-clavulanate 875/125 mg every 12 hrs All doses are adult doses	Cefuroxime 500 mg q12hr **OR** Clarithromycin 500 mg q12hr x 10 days **If no response within 48-72 hrs:** Ceftriaxone 1-2 gm IV once daily All doses are adult doses	Duration of treatment: <2 years: 10 days >2 years: 5–7 days Antibiotics to be modified by availability of cultures and susceptibility Consult ENT
Acute mastoiditis -Require in-patient therapy -Obtain cultures, then empiric therapy.	***First episode****:* *S. pneumoniae,* *H. influenzae, M. catarrhalis* **Secondary to chronic otitis media (COM)**: *S. aureus, P. aeruginosa,* *S. pneumoniae*	Ceftriaxone 2 gm IV once daily	Levofloxacin 750 mg IV once daily -if secondary to COM: Surgical debridement then [Vancomycin 15-20 mg/kg IV q8hr **PLUS** Piperacillin-tazobactam 4.5 gm IV q6hr] **OR** [Vancomycin 15-20 mg/kg IV q8hr + Ceftazidime 2gm IV q8hr **PLUS** Metronidazole 750 mg IV q8hr	CT or MRI for diagnosis. ENT consultation for surgical intervention and management of complications Duration: IV 7-10 days then shift to oral options to complete a 4-weeks course (could be longer in case of severe/complicated disease)
Chronic mastoiditis	Often polymicrobial (Gram-positive, Enterobacterales and *Pseudomonas*) Anaerobes	ENT consultation. Obtain cultures, treat for acute exacerbations or preoperatively		Diagnosis: CT or MRI

TABLE 2: GUIDELINES FOR TREATMENT OF EAR, NOSE AND THROAT INFECTIONS

ANATOMIC SITE / DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Idiopathic facial nerve palsy VII (cranial nerve) Bell's palsy	Herpes simplex virus (type1 & 2) most common Other: Varicella zoster (VZV), HHV-6, Lyme disease	Initiate treatment promptly after the onset of palsy with Prednisone: ● Dosage: 1 mg/kg orally, divided into twice-daily doses for 5 days. ● Tapering: Gradually reduce the dose to 5 mg twice daily over the following 5 days (total treatment duration: 10 days). **PLUS** Any one of the following: ● Acyclovir 1600-2400 mg PO daily (divided q4hr) x 10 days ● Valacyclovir 1000-1500 mg PO daily (divided q12hr or q8hr) x 7 days ● Famciclovir 750 mg PO daily x 7 days		It is crucial to exclude other causes of Bell's palsy like Lyme disease in endemic

TABLE 2: GUIDELINES FOR TREATMENT OF EAR, NOSE AND THROAT INFECTIONS

Acute Sinusitis: It is generally not possible to distinguish acute viral from bacterial rhinosinusitis in the first 10 days, based on history, examination or radiologic study. Since acute viral rhinosinusitis is expected to resolve within 10 days, and acute bacterial rhinosinusitis may also resolve spontaneously within the first 10 days, patients who present with fewer than 10 days of symptoms in general should be managed with supportive care. Exceptions would be patients who experience clinical worsening after initial improvement, patients with severe symptoms and clearly worsening clinical course, and immunocompromised patients.

ANATOMIC SITE / DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Acute Sinusitis	*S. pneumoniae*, *H. influenzae*, *M. catarrhalis*, *S. aureus*, Viral Anaerobes: *S. pyogenes*	Amoxicillin 500 mg PO q8 hr.	Amoxicillin-clavulanate (extended release) 1000/62.5 mg PO q12hr **OR** Amoxicillin-clavulanate 875/125 mg PO q12hr **OR** Doxycycline 100 mg PO q12 hr	Penicillin allergy: Alternative first line therapy, narrow spectrum antibiotics include: Trimethoprim-sulfamethoxazole **OR** Erythromycin **OR** Azithromycin **OR** Levofloxacin. Duration :5-7 days

TABLE 2: GUIDELINES FOR TREATMENT OF EAR, NOSE AND THROAT INFECTIONS

Chronic sinusitis: there is limited evidence that antibiotics, as a single therapy, are beneficial in the treatment of chronic sinusitis. Instead, a comprehensive approach to medical management, which includes antimicrobials combined with topical or systemic glucocorticoids, and sometimes other agents, is now encouraged.

ANATOMIC SITE/ DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Chronic sinusitis **Allergic** **Infective** **Dental** **Idiopathic**	Anaerobes: *Prevotella spp.,* *Streptococcus spp.,* *Fusobacterium spp.* Aerobes : *Streptococcus spp.* *S. aureus,* *M. catarrhalis* *H. influenzae,* *P. aeruginosa,* Enterobacterales *:*	If antibiotics needed: **Immunocompetent:** Amoxicillin-clavulanate 875 mg/125 mg PO q12hr **immunocompromised with concern of *P. aeruginosa*:** Levofloxacin 750 mg PO q24hr + Metronidazole 500mg PO q8hr	Cefuroxime 500 mg PO q12hr **PLUS** Clindamycin 300 mg PO q12hr **OR** Metronidazole 500 mg PO q8hr	ENT consultation Treatment should be continued for at 7-10 days guided by the clinical response
Pharyngitis / tonsillitis Avoid antibiotics as 90% resolve in 7 days without antibiotics	Commonly viral EBV (Infectious mononucleosis) *Streptococcus spp. (group A, C, G)* Other causes: Primary HIV *C. diphtheria,* *A. hemolyticum,* *M. pneumoniae,* *F. Necrophorum* (rare)	Penicillin V 500 mg PO q12hr or 250 mg PO q6hr x 10 days **OR** Amoxicillin 500 mg PO q8hr x 10 days If compliance is unlikely give Benzathine penicillin (IM) x 1.2 million unit once only	Clindamycin 300–450 mg PO q6–8hr x 5days **OR** Erythromycin 500 mg PO q6hr Duration of therapy: 10 days **OR** Cefuroxime 250 mg PO q12hr Duration of therapy: 5 days	If Penicillin allergic: Clindamycin **OR** Erythromycin

TABLE 2: GUIDELINES FOR TREATMENT OF EAR, NOSE AND THROAT INFECTIONS

ANATOMIC SITE/ DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Peritonsillar abscess	*F. necrophorum* *Strep group A, Strep Group C/G (9%)* *S. anginosus.*	Surgical drainage **PLUS** Metronidazole 500 mg IV/PO q6-8hr **PLUS** Ceftriaxone 2 gm IV q24hr	Piperacillin-tazobactam 3.375 gm IV q6hr Penicillin allergic: Clindamycin 600-900 mg IV q6-8 hr	
Epiglottitis (Supraglottis) **Risk of life-threatening airway obstruction**	*H, influenzae, S. pyogenes, S. pneumoniae, S. aureus (includes MRSA), viruses*	Ceftriaxone 2 gm IV q24hr **PLUS** Vancomycin 15-20 mg/kg q8-12hr	Levofloxacin 750 mg IV q24hr **PLUS** Clindamycin 600-900 mg IV q6-8hr	
Fungal Sinusitis **Rhino-orbital-cerebral mucormycosis**	**Infections mostly occur in immunocompromised patients:** Diabetes mellitus with acute ketoacidosis; neutropenia; deferoxamine rule out: Mucormycosis Infections may involve: Rhino-orbital-cerebral mucormycosis, Pulmonary, GI, cutaneous, renal, CNS, or disseminated disease. **Surgical intervention in the mainstay of treatment in addition to the antifungals.** Consider Hyperbaric Oxygen Therapy (HBOT) as an adjuvant therapy.			
	Rhizopus, *Mucor*, and *Rhizomucor*; *Cunninghamella*, *Lichtheimia*, *Saksenaea*, and *Apophysomyces*	Liposomal Amphotericin B 5-10 mg/kg IV q24hr **Step down:** Posaconazole (Delayed Release) tablet 300mg PO q12hr x 2 doses then 300 mg q24hr **OR** suspension 200 mg q6hr then 400 mg PO q12hr	Amphotericin B Lipid complex, 1 mg/kg IV q24hr Isavuconazonium sulphate 372 mg PO/IV q8hr x 6 doses and then 372 mg PO/IV q24hr	**Duration of therapy** based on response, guided by: 1) resolution of clinical signs and symptoms of infection 2) resolution or stabilization of radiographic abnormalities; and 3) resolution of underlying immunosuppression.

TABLE 3: GUIDELINES FOR TREATMENT OF EYE INFECTION

ANATOMIC SITE/ DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
External hordeolum	*Staphylococcus aureus*	Frequent hot compresses Topical antibiotic drops 3-4 times and antibiotic eye ointment at night	Referred to an ophthalmologist for incision and drainage if there is abscess	Frequent follow up in children, as they can develop quickly into cellulitis If there is concurrent preseptal cellulitis, oral antibiotics with Staphylococcal coverage are appropriate
Chalazion	Non-infective	Frequent hot compresses Topical antibiotic /Corticosteroid Ointment combination (may benefit)	Refer to an ophthalmologist for incision and curettage or direct Glucocorticoid injection	
Blepharitis	Aetiology unclear. Factors include *Staphylococcus*, seborrhoea, rosacea & dry eye.	Lid margin care with baby shampoo & warm compresses q24hr. Artificial tears if dry eye.	Erythromycin ointment. Tetracycline ointment. Fucithalmic eye drops for 5–7 days	If associated in chronic or refractory cases or rosacea, add Doxycycline 100 mg PO q12hr for 2 weeks. Consult ophthalmologist
Acute bacterial conjunctivitis	*S. epidermidis, S. aureus, S. pneumoniae, H. influenzae*.	Ofloxacin/ Moxifloxacin eye drops q4 hrs Tetracycline ointment at night	Gentamicin ointment for 5–7 days	Eye washes with warm water (saline). Add systemic antibiotics. If extraocular involvement, refer to ophthalmologist

TABLE 3: GUIDELINES FOR TREATMENT OF EYE INFECTION

ANATOMIC SITE / DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Viral conjunctivitis (pink eye)	Adenovirus	No treatment. If symptomatic, cold artificial tears may help. If membrane or pseudo membrane is present add mild steroid		Highly contagious. Onset of ocular pain and photophobia in an adult suggests associated keratitis
Viral keratoconjunctivitis	Herpes simplex virus (HSV), types 1 & 2	Trifluridine 1% ophthalmic solution, one drop q2h up to 9 drops/day until re-epithelialized, then 1 drop q4hr up to 5 x days not to exceed 21 days	-Acyclovir ointment (30 mg) Five times a day at approximately 4 hourly intervals. Treatment should be continued for 14 days or for 3 days after healing of corneal lesions. **OR** Ganciclovir 0.15% gel 5 times a day for 14 days	Consult ophthalmologist Oral antiviral agents can also be effective. Topical Antibiotics to prevent infection can be considered. Alternate mild steroid & Artificial tears can be added
Varicella zoster ophthalmicus	VZV	Valacyclovir 1 g PO q8h for 10 days	Acyclovir 800 mg PO 5 per day for 10 days	Consult ophthalmologist
Inclusion Chlamydial conjunctivitis	*C. trachomatis*	Azithromycin 1g once	Doxycycline 100 mg PO q 12 hr for 7 days	Consult ophthalmologist
Gonococcal conjunctivitis	*N. gonorrhoeae*	Ceftriaxone 1 gm IM/IV one dose **PLUS,** Azithromycin 1 gm PO once to cover for presumptive Chlamydial co-infection.		

TABLE 3: GUIDELINES FOR TREATMENT OF EYE INFECTION				
ANATOMIC SITE /DIAGNOSIS	**ETIOLOGIES**	**SUGGESTED REGIMENS**		**COMMENTS**
		FIRST LINE	**SECOND LINE**	
Trachoma	*C. trachomatis*	Azithromycin 1 gm PO single dose	Doxycycline 100 mg PO q12hr for 21 days. **OR** Tetracycline 250 mg PO q6hr for 14 days	Topical therapy is of marginal benefit
Fungal keratitis	*Aspergillus spp., fusarium spp., Candida spp.* and others	Natamycin 1 drop every 1–2 hrs for 3-4 days, then q3–4hr for 14-21 days depending on response **OR** -Voriconazole 1% eye solution hourly taper to 4 hourly for 2-weeks based on resolution.	Amphotericin B 1 drop every 1–2 hrs tapered based on clinical response.	Consult ophthalmologist, obtain appropriate cultures, practice good hygiene and cleaning
Bacterial keratitis	*S. aureus, S. pneumoniae, S. pyogenes, Haemophilus* *Pseudomonas aeruginosa* (contact lens wearer)	-Moxifloxacin ophthalmic 0.5% 1 drop q1hr for the first 48 hrs and then taper according to response. - Ciprofloxacin 0.3% ophthalmic drops	Fortified Gentamicin / Cefuroxime **OR** Vancomycin eye drops hourly with tapering according to clinical response	Consult Ophthalmologist, obtain appropriate cultures, practice good hygiene and cleaning Contact lens culture in CL induced ulcers
Orbital cellulitis	*S. pneumoniae, H. influenzae, M. catarrhalis, S. aureus*, anaerobes, *group A Strept.*, occasionally Gram-negative organisms.	Ceftriaxone 2 g IV q 24hr **PLUS** Metronidazole 500 mg IV q6–8hr Topical Erythromycin eye ointment.	If allergic to penicillin: Levofloxacin 750 mg IV q 24hr and Metronidazole 500 mg IV q6–8hr if MRSA: Vancomycin 15-20 mg/kg IV q8-12hr **OR** Linezolid 600 mg IV q12hrs	Image orbit (CT or MRI). Risk of cavernous sinus thrombosis. Need inpatient treatment in hospital under care of Ophthalmologist

TABLE 3: GUIDELINES FOR TREATMENT OF EYE INFECTION

ANATOMIC SITE /DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Necrotizing herpetic retinopathy (ARN/PORN)	Varicella zoster virus, HSV type 2	Acyclovir IV 10–12 mg/kg q8hr for 1–2 weeks till lesions are improving then Valacyclovir 1000 mg PO q8hr **OR** Acyclovir 800 Mg PO q8hr	Intravitreal Ganciclovir OR Intravitreal Foscarnet Adding corticosteroids for selected patients may be considered	Consult ophthalmologist and infectious disease physician It is import-ant to note that intravitreal Foscarnet or Ganciclovir should always be admin-istered in association with systemic antiviral agents.
	CMV (Rarely)	Ganciclovir/ Valganciclovir		
Postoperative endophthalmitis	**Intravitreal** Vancomycin 1 mg/0.1 ml **PLUS** Ceftazidime 2 mg/0.1 ml **OR** Amikacin 0.4 mg/0.1 ml Then topical third or fourth generation of Fluoroquinolones **PLUS** Oral Ciprofloxacin 750 mg q12hrs			Emergency / Immediate ophthalmic consultation The use of systemic antibiotics in the setting of exogenous endophthalmitis is controversial as most of the drugs given have poor intraocular penetration.
Traumatic endophthalmitis	–**Intravitreal** Ceftazidime 2 mg/0.1 ml **OR** Amikacin 0.4 mg/0.1 ml **PLUS** Vancomycin 1 mg/0.1 ml **OR** Clindamycin 1 mg/0.1 may be repeated every 48–72 hrs **PLUS** -**Topical fortified** Tobramycin q1h with fortified Cefazolin **OR** fortified Vancomycin. Plus -**Systemic antibiotic** Ciprofloxacin 400 mg IV q12hr and Clindamycin 600 mg IV q8hr.			Emergency / Immediate Ophthalmology consultation

TABLE 3: GUIDELINES FOR TREATMENT OF EYE INFECTION

ANATOMIC SITE /DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Endogenous Bacterial Endophthalmitis	*B. cereus* (especially in IV drug abuse), *Streptococci spp.* *N. meningitidis* *S. aureus* *H. influenzae*	**Intravitreal** Amikacin 0.4 mg/0.1 ml **OR** Ceftriaxone 2 mg/0.1 ml **PLUS** Vancomycin 1 mg/0.1 ml **OR** Clindamycin 1 mg/0.1 ml	Systemic antibiotic is recommended and should be given at least for 2 weeks depending on blood culture	Emergency / Immediate Ophthalmology consultation
Fungal endophthalmitis	*Candida sp.*, *Aspergillus sp.*	**Intravitreal** Amphotericin B 5 µg **OR** Voriconazole 100 µg **PLUS** **Systemic** Fluconazole 800 mg loading dose then 400 mg PO/IV q24hr. **OR** Voriconazole 400 mg q 12 hr for two doses then 200 mg PO/1V q 12hr		-Urgent ophthalmology consults -patients with candida endophthalmitis will benefit from systemic antifungals. Echinocandins are **NOT** recommended for the treatment of ocular candida infection.

TABLE 4: GUIDELINES FOR TREATMENT OF INFECTIVE ENDOCARDITIS AND RELATED INFECTIONS

ANATOMIC SITE / DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Infective endocarditis: native valve -**Empirical therapy** awaiting cultures-No IV illicit drugs, valvular or congenital heart disease but no modifying circumstances	*Viridans streptococci* 30–40%, Other *Strep.* 15–25%, *Enterococci* 5–18%, *staphylococci* 20–35% including CoNS	Ceftriaxone 2 gm IV once daily **PLUS** Vancomycin 15-20 mg /kg q8-12 hr to achieve trough level of 15–20 mcg/ml	Gentamicin 1 mg/kg IV q8hr **PLUS** Vancomycin 15-20 mg/kg IV q12hr, not to exceed 2g q24hr unless serum level monitored. Aim for Vancomycin target trough level 15–20 mcg/ml Consider Daptomycin if allergic to Vancomycin	Consult ID If the patient is not acutely ill and not in heart failure, we recommend waiting for blood culture results. If initial 3 sets of blood cultures are negative after 24–48 hrs, obtain 2–3 more blood cultures before empiric therapy started.
Infective endocarditis: Native valve -**Empirical therapy** IV illicit drug use +/- evidence right-sided endocarditis. After collecting blood culture, empiracl treatment should be individualized based on clinical stability.	*S. aureus* :70% (MSSA & MRSA)	Vancomycin 15-20 mg /kg q8-12 hr to achieve trough level of 15–20 mcg/ml - Add Gentamicin 3 mg/kg q 24 hr for Gram negative coverage if needed	Daptomycin 10 mg/kg IV q24hr, approved for right-sided endocarditis Daptomycin should be Combined with a Beta Lactams antibiotic or Fosfomycin or Rifampicin.	Consult ID

TABLE 4: GUIDELINES FOR TREATMENT OF INFECTIVE ENDOCARDITIS AND RELATED INFECTIONS

ANATOMIC SITE / DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Infective endocarditis : Native valve-culture positive viridians streptococci, *S. gallolyticus (S. bovis)* **with Penicillin G MIC <0.12 mcg/ml**	Viridans streptococci, *S. gallolyticus (S. bovis)*	Penicillin G12–18 million units/day IV divided q4hr for 4 weeks; **OR** Ceftriaxone 2g IV q24hr for 4 weeks. **OR** Ampicillin 2 gm IV q 4 hr is a reasonable alternative to penicillin if a penicillin shortage exists.	Penicillin G 12–18 million units/day IV divided q4hr for 2 weeks **PLUS** Gentamicin 1 mg/kg q8hr IV for 2 weeks **OR** Ceftriaxone 2g IV q24hr **PLUS** Gentamicin IV 1 mg/kg q8hr IV for 2 weeks	Consult ID Always ensure that MICs are provided by the microbiology lab. Target Gentamycin levels peak 3-4 mcg/ml, trough gent level <1 mcg/ml). If serious allergy to penicillin or Cephalosporin: use Vancomycin 15 mg/kg IV q12hr to 2 g/day max unless serum levels measured x 4 weeks
Infective endocarditis-Native valve-culture positive viridians streptococci, *S. gallolyticus (S. bovis)* **with Penicillin G MIC >0.12 to <0.5 mcg/ml**	Viridans streptococci, *S. gallolyticus (S. bovis)*	Penicillin G 24 million units/day IV divided q4hr for 4 weeks) **PLUS** (Gentamicin 1 mg/kg IV q8hr for 2 weeks) Note: low dose of Gentamicin **OR** Ampicillin 2g IV every 4 hr **PLUS** (Gentamicin 1 mg/kg IV q8hr for 2 weeks)	**If susceptible** to Ceftriaxone: Ceftriaxone 2gm IV q24hr for 4 weeks	Consult ID Vancomycin therapy is reasonable only for patients unable to tolerate penicillin or ceftriaxone therapy. Vancomycin 30 mg/kg IV q12hr (maximum 3g/day) unless serum levels measured for 4 weeks
For Viridans streptococci, *S. gallolyticus (S. bovis)* with Penicillin G MIC >0.5 and	Viridans streptococci, *S. gallolyticus (S. bovis)*, nutritionally variant streptococci	Penicillin G 24 million units/24hr IV, divided q4hr for 4 weeks **PLUS** Gentamicin 1 mg/kg IV q8hr for 2 weeks **OR** Ampicillin 12 gm/day IV, divided q4hr for 4 weeks **PLUS** Gentamicin (dose as above) for 2 weeks	Vancomycin 15-20 mg/kg IV q12hr for 4 weeks	Consult ID Vancomycin for Penicillin OR Cephalosporin allergic patients.

TABLE 4: GUIDELINES FOR TREATMENT OF INFECTIVE ENDOCARDITIS AND RELATED INFECTIONS

ANATOMIC SITE / DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Enterococci susceptible to Ampicillin /Penicillin G, Vancomycin, Gentamicin	*E. faecalis* *E. faecium*	Ceftriaxone 2gm IV q12hr **PLUS** Ampicillin 2g IV q4hr for 6 weeks	Ampicillin 2gm IV q4hr **OR** Penicillin G 18-30 million units per day IV divided in 6 doses **PLUS** Gentamicin 1mg/kg IV q8hr IV for 4-6 weeks	Consult ID
Enterococci: MIC Streptomycin >2000 mcg/ml; MIC Gentamicin >500–2000 mcg/ml; **no resistance to Penicillin**	*E. faecalis* *E. faecium* Enterococci, high-level Aminoglycoside resistance	Ampicillin 12 g/day IV divided q4hr **PLUS** Ceftriaxone 2 g IV q12hr for 6 weeks	Prolonged Penicillin G **OR** Ampicillin for 8–12 weeks	Consult ID If prolonged treatment fails consider surgical removal of the valve
Enterococci: Penicillin G MIC >16 mcg/ml; **no Gentamicin resistance**	Enterococci, intrinsic Penicillin G / Ampicillin resistance	Vancomycin 15 mg/kg IV q12hr (check levels if >2 g) for 6 weeks **PLUS,** Gentamicin 1 mg/kg q8hr for 2 weeks. See comment.		Consult ID Desired Vancomycin serum levels trough 10–15 mcg/ml. Gentamycin used for synergy; peak levels need not exceed 4 mcg/ml.

TABLE 4: GUIDELINES FOR TREATMENT OF INFECTIVE ENDOCARDITIS AND RELATED INFECTIONS

ANATOMIC SITE/ DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Enterococci: Penicillin/ Ampicillin resistance and high-level gentamicin resistance and vancomycin resistance, usually VRE ID consultation required	Enterococci, vancomycin-resistant, usually *E. faecium*	Daptomycin 10-12 mg /kg once daily for 8 weeks **PLUS,** one of the following -Ampicillin 12g IV q4hr for > 8 weeks **OR** Ertapenem 2g IV once daily **OR** Ceftaroline 600 mg IV q8hr **OR** Fosfomycin 3 gm IV q6hr		Quinupristin/Dalfopristin activity is limited to *E. faecium* and is usually bacteriostatic, therefore expect high relapse rate. Dose: 7.5 mg/kg IV (via central line) q8hr. Linezolid is active against most Enterococci, but bacteriostatic. Dose: 600 mg IV **OR** PO q12hr. Linezolid failed in patients with *E. faecalis* endocarditis. Daptomycin is bactericidal *in vitro*; clinical experience in CID 41:1134, 2005.
Native valve Staphylococcal endocarditis MSSA	*S. aureus*, methicillin-sensitive	Cloxacillin **OR** Flucloxacillin 2 g IV q4–6hr (Use q4h regimen if weight >85 kg) for 4–6 weeks	Cefazolin 2 g IV q8hr for 4–6 weeks	If Penicillin allergy: Vancomycin 15-20 mg/kg IV q12hr. Check level if >2 g/day for 4–6 weeks.
Native valve Staphylococcal endocarditis MRSA,	*S. aureus*, methicillin-resistant	Vancomycin 30–60 mg/kg per day divided into 2–3 doses to achieve target trough concentration 15–20 mcg/ml For 6 weeks	Daptomycin 8-10 mg/kg IV q 24hr **PLUS** Ceftaroline 600 mg IV q8hr	ID consultation required Note: Daptomycin is not Food and Drug Administration (FDA) approved for left sided endocarditis, can cause muscle toxicity. Need to monitor creatinine kinase regularly

TABLE 4: GUIDELINES FOR TREATMENT OF INFECTIVE ENDOCARDITIS AND RELATED INFECTIONS

ANATOMIC SITE/ DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Slow-growing fastidious Gram-negative bacilli in any valve	A group of Gram-negative bacteria that includes *Haemophilus spp.* (HACEK) group *Aggregatibacter aphrophilus and Aggregatibacter paraphrophilus Aggregatibacter actinomycetemcomitans Cardiobacterium hominis Eikenella corrodens Kingella kingae*	Ceftriaxone 2 gm IV q24hr for 4 weeks	If Penicillinase-negative: Ampicillin 2 gm q4hr for 4 weeks **OR** Ciprofloxacin 500 mg q12 hr orally **OR** 400 mg IV q 12 hr IV for 4 weeks Fluoroquinolone therapy **recommended only** for patients unable to tolerate cephalosporin and Ampicillin therapy	Consult ID
Bartonella species-any valve	*B. henselae, B. quintana*	Doxycycline 100 mg IV/PO q12hr for 4 weeks **PLUS** Gentamicin 1 mg/kg IV q 8 hr for 2 weeks.		Consult ID If Doxycycline is not tolerated, Azithromycin 500 mg PO/IV OD in combination with Gentamicin can be used If Gentamicin is not tolerated, Rifampicin 300 mg IV/PO q12hr for 14 days can be used in addition to doxy or Azithromycin

TABLE 4: GUIDELINES FOR TREATMENT OF INFECTIVE ENDOCARDITIS AND RELATED INFECTIONS

ANATOMIC SITE / DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Brucella	*Brucella spp.*	Doxycycline 100 mg IV/PO q 12hr **PLUS** Cotrimoxazole 960 mg PO q 12hr **PLUS** Rifampicin (300– 600 mg/24hr) for ≥3–6 months orally Consider addition of Gentamicin in consultation with ID		Consult ID Assess indication for surgery
Infective endocarditis: Prosthetic valve empiric therapy (culture pending): -Early (<2 months post- op) -Late (>2 months post-op)	**Early onset***:* *S. aureus*, *S. epidermidis*, Rarely, Enterobacteriaceae Diphtheroids, fungi **Late onset *:*** *S. epidermidis*, Viridans streptococci, Enterococci, *S. aureus*	Vancomycin 15–20 mg/kg IV q12hr **PLUS** Gentamicin 1 mg/kg IV q8hr **PLUS** Rifampicin 600 mg IV/PO q24hr **OR** Vancomycin **PLUS** Cefepime or Piperacillin-tazobactam		Surgical and ID consultations
Infective endocarditis: Prosthetic valve-positive blood culture:	*S. epidermidis*	Vancomycin 15–20 mg/kg IV q12hr **PLUS** Rifampicin 300 mg PO q8hr for 6 weeks **PLUS** Gentamicin 1 mg/kg IV q8hr for 2 weeks.		ID and surgical consultation required. Indications for surgery: severe heart failure, *S. aureus* infection, prosthetic dehiscence, resistant organism, emboli due to large vegetation. High mortality. Valve replacement plus antifungal therapy is recommended. ID consultation is required
	S. aureus	**Methicillin-sensitive** (MSSA): Cloxacillin 2g IV q4hr **OR** Cefazolin 2 gm IV q 8hr **PLUS,** Rifampicin 300 mg PO q8hr for 6weeks **PLUS** Gentamicin 1 mg/kg IV q8hr for 2 weeks. **Methicillin-resistant** (MRSA): Vancomycin 15-20 mg/kg IV q12hr **PLUS** Rifampicin 300 mg PO q8hr for 6weeks **PLUS** Gentamicin 1 mg/kg IV q8hr for 2 weeks.		

TABLE 4: GUIDELINES FOR TREATMENT OF INFECTIVE ENDOCARDITIS AND RELATED INFECTIONS

ANATOMIC SITE / DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
	Viridans Streptococci, Enterococci	See infective endocarditis, native valve, and positive culture.		
	Enterobacteriaceae **OR** *P. aeruginosa*	Aminoglycoside (Tobramycin if *P. aeruginosa*) + β-lactam (e.g., Piperacillin-tazobactam or Ceftazidime or Meropenem).		
	Candida, aspergillus	Caspofungin 150 mg /day **OR** Anidulafungin 200 mg/day **OR** Lipid-base amphotericin B 3–5 mg/kg/day **PLUS** Flucytosine 25 mg/kg PO q6hr		
Infective endocarditis-Q fever	*Coxiella burnetii*	Doxycycline 100 mg PO q12hr **PLUS** Hydroxychloroquine 200 mg q 8hr PO for at least 18 months. Pregnancy: Need long term TMP-SMX		ID consultation is required
Pacemaker/ defibrillator infections	*S. aureus* (40%), *S. epidermidis* (40%), Gram-negative bacilli (5%), and fungi (5%)	Device removal **PLUS** Vancomycin 15–20 mg/kg IV q8–12hr **PLUS** Rifampicin 300 mg PO q12hr.	Device removal **PLUS** Daptomycin 6–10 mg/kg IV q24hr **PLUS** Rifampicin 300 mg PO q12hr	ID consultation is required. Daptomycin is not FDA approved for this indication. Duration is 4–6 weeks after device removal
Ventricular assist device-related infection	*S. aureus*, *S. epidermidis*, Aerobic Gram-negative bacilli, *candida spp.*	After culture of blood, wounds, drive line, device pocket & maybe pump: Empiric Vancomycin 15–20 mg/kg IV q8–12hr **PLUS** Cefepime 2 gm IV q12 hr **PLUS** Fluconazole 800 mg IV q24hr.		ID consultation is required

TABLE 4: GUIDELINES FOR TREATMENT OF INFECTIVE ENDOCARDITIS AND RELATED INFECTIONS

ANATOMIC SITE / DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Pericarditis, purulent Empirical therapy	*S. aureus*, *S. pneumoniae*, Group A Streptococci, Gram-negative	Vancomycin 15–20 mg/kg IV q8–12hr **PLUS** Ceftriaxone 2gm IV q12 hr **OR** Vancomycin 15–20 mg/kg IV q8–12hr **PLUS** Cefepime 2 gm IV q 12 hr		ID consultation is required
Rheumatic fever prophylaxis		Benzathine pen G 1.2 million units IM once every 3–4 weeks **OR** Penicillin V 250 mg PO q12hr If Penicillin allergy is confirmed: Oral Azithromycin 250 mg OD		Duration: for 5 years after **acute rheumatic fever o**r until age 21, whichever is longer. If carditis present continue prophylaxis for 10 years

TABLE 5-A: PROPHYLAXIS OF INFECTIVE ENDOCARDITIS

ANTIMICROBIAL PROPHYLAXIS FOR THE PREVENTION OF BACTERIAL ENDOCARDITIS IN PATIENTS WITH UNDERLYING CARDIAC CONDITIONS

Antibiotic prophylaxis for dental procedures is now directed at individuals who are likely to suffer the most devastating consequences should they develop endocarditis. Prophylaxis to prevent endocarditis is no longer specified for gastrointestinal or GU procedures. The following is adapted from and reflects the new American Heart Association (AHA) recommendations (2007).

SELECTION OF PATIENTS FOR ENDOCARDITIS PROPHYLAXIS				
For patients with any of these high-risk cardiac conditions associated with endocarditis	**Patients undergoing dental procedures involving…**	**Patients undergoing invasive respiratory procedures involving…**	**Patients undergoing invasive procedures of the GI or GU tracts**	**Patients undergoing procedures involving infected skin and soft tissues**
Prosthetic heart valves Previous infective endocarditis Congenital heart disease with any of the following: Completely Repaired cardiac defect using prosthetic material (only for first 6 months), partially corrected but with residual defect near prosthetic material, uncorrected cyanotic congenital heart disease, surgically constructed shunts, and conduits, valvulopathy following heart transplant. transcatheter implanted aortic and pulmonary valvular prosthesis and in patients with left ventricular assist devices. transcatheter mitral and tricuspid valve repair	Any manipulation of gingival tissue, dental periapical regions or perforating the oral mucosa. Prophylaxis recommended (See Table 5-B. Antibiotic Prophylactic Regimens for Dental Procedures). Prophylaxis is not recommended for routine anaesthetic injections (unless through infected area), dental x-rays, shedding of primary teeth, adjustment of orthodontic appliances or placement of orthodontic brackets or removable appliances.	Incision of respiratory tract mucosa consider prophylaxis (See Table 5-B. Antibiotic Prophylactic Regimens for Dental Procedures) or for treatment of established infection. Prophylaxis recommended (see Table 5-B. Antibiotic Prophylactic Regimens for Dental Procedures) for oral flora, but include anti-staphylococcal coverage when *S. aureus* is of concern).	Prophylaxis is no longer recommended solely to prevent endocarditis, but the following approach is reasonable: for patients with Enterococcal UTIs, treat before elective GU procedures. Include Enterococcal* coverage in perioperative regimen for non-elective procedures + for patients with existing GU or GI infections or those who receive perioperative antibiotics to prevent surgical site infections or sepsis. It is reasonable to include agents with anti-Enterococcal activity in perioperative coverage. The ESC2023 upgraded their recommendation from class III to IIb. So, antibiotics prophylaxis may be considered for **high-risk patients**.	Include coverage against Staphylococci and Beta-haemolytic Staphylococci in treatment regimens.

*Agents with anti-enterococcal activity include penicillin, amoxicillin, piperacillin, vancomycin and others.
++ 2008 AHA/ACC focused update of guidelines on valvular heart disease use term “is reasonable” to reflect level of evidence (Circulation 118:887, 2008).

TABLE 5-B. DENTAL PROCEDURES ANTIBIOTIC PROPHYLACTIC REGIMENS FOR PATIENTS WITH UNDERLYING CARDIAC CONDITIONS

SITUATION	AGENT	REGIMEN-SINGLE DOSE 30–60 MINUTES BEFORE PROCEDURE ADULTS	CHILDREN
Oral	Amoxicillin	2 g	50 mg/kg
Unable to take oral medication	Ampicillin **OR**	2 g IM/IV*	50 mg/kg IM/ IV
	Cefazolin **OR** Ceftriaxone	1 g IM / IV	50 mg/kg IM/IV
Allergic to Penicillin or Ampicillin oral regimen	Cephalexin**†	2 g	50 mg/kg
	OR		
	Doxycycline	100 mg PO	≤ 45 kg, 2.2 mg/kg 30-60 > 45 kg, 100 mg 30-60
	OR		
	Azithromycin **OR** Clarithromycin	500 mg	15 mg/kg
Allergic to Penicillin or Ampicillin and unable to take oral medication	Cefazolin **OR** Ceftriaxone †	1 g IM/IV	50 mg/kg IM/IV

**Or other first or second-generation oral cephalosporin in equivalent adult or paediatric dosage.
†Cephalosporins should not be used in an individual with a history of anaphylaxis, angioedema or urticarial with penicillin or Ampicillin.

TABLE 6: GUIDELINES FOR TREATMENT OF CENTRAL NERVOUS SYSTEM INFECTIONS IN ADULTS

ANATOMIC SITE /DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Brain abscess (empirical treatment is guided by suspected source and underlying condition. While therapy should be adjusted based on culture results, anaerobic coverage should always continue even if none are grown	Primary (oral, otogenic, or sinus source) *S. milleri, Bacteroides,* Enterobacterales *S. aureus* Rare: *Nocardia, Listeria*	Ceftriaxone 2 g IV q12hr **PLUS** Metronidazole 500mg IV q6-8hr	Cefotaxime 2 g IV q4-6hr **PLUS** Metronidazole 500mg IV q6-8hr Vancomycin 15-20mg/kg/dose q8-12hr, adjust according to TDM to be used if MRSA is suspected	Consult ID & neurosurgeon at the time of diagnosis. Obtain appropriate cultures. Duration of therapy: Should be guided by clinical response and radiological findings
	Post-surgery or post-traumatic *S. aureus* Enterobacterales	Vancomycin 15-20mg/kg/dose q8-12hr, adjust according to TDM **PLUS** Ceftazidime 2gm IV q8hr **OR** Cefepime 2g IV q8hr.	Linezolid 600 mg q12hr IV or PO **PLUS** Ceftazidime 2gm IV q8hr **OR** Cefepime 2g IV q8hr.	Adjust Vancomycin according to renal function and trough level If ESBL, *Pseudomonas spp* or MDRO are suspected, consider using a Carbapenem. Metronidazole may be added if anaerobic infection is suspected.
	Nocardia (*N. asteroids, N. farcinica, N. brasiliensis)*	TMP-SMX 5mg/kg/dose (Trimethoprim component) q8-12hr **PLUS** Imipenem 5 00 mg IV q6hr	Linezolid 600 mg IV/PO q12hr **PLUS** Meropenem 2g IV q8hr	Consult ID May add amikacin if multi-organ involvement after consulting with ID.

TABLE 6: GUIDELINES FOR TREATMENT OF CENTRAL NERVOUS SYSTEM INFECTIONS IN ADULTS

ANATOMIC SITE /DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
HIV-infected (AIDS)	*Toxoplasma gondii* *Fungi, cryptococcosis*	Consult ID		
Central nervous system (CNS) shunt infections	CoNS, *S. aureus*, and other skin flora	Vancomycin 15-20 mg/kg/dose q8-12hr, adjust according to TDM **PLUS** Cefepime2gm IV q 8hr **OR** Ceftazidime 2g IV q8hr	Vancomycin 15-20 mg/kg/dose IV q8hr (not to exceed 2g per dose) (or Linezolid 600 mg q12hr IV/PO) **PLUS** Meropenem 2g IV q8hr Rifampicin as a combination therapy is recommended for treatment of Staphylococcal infections involving spinal or intracranial hardware.	Successful management includes shunt removal and IV antibiotic therapy. Consult neurosurgeon and ID Complete removal of infected CSF shunt, CSF drain, intrathecal infusion pump or other hardware and replacement with an EVD is recommended. The recommended timing of insertion of new CSF shunt devices varies according to the causative organism and response to treatment including CSF investigations.
	Candida	Liposomal Amphotericin (can be combined with 5-Flucytosine). Once patient is improving, Fluconazole can be used if the organism is susceptible		

TABLE 6: GUIDELINES FOR TREATMENT OF CENTRAL NERVOUS SYSTEM INFECTIONS IN ADULTS

ANATOMIC SITE /DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Encephalitis	Herpes simplex/ VZV,	Acyclovir 10 mg/kg IV q8hr		Consult ID Empiric therapy while waiting for (CSF), herpes viruses, PCR, culture results, etc. with dose adjustment for kidney function/ combination can be used in severe cases
	CMV / HHV6	Ganciclovir 5mg/kg IV q 12hr	Foscarnet 90 mg/kg IV q 12hr	
	Influenza	Oseltamivir		
	EBV / West Nile	No treatment, (symptomatic support)		
	HIV	ART		
	JC virus	Reduce immunosuppression		

TABLE 6: GUIDELINES FOR TREATMENT OF CENTRAL NERVOUS SYSTEM INFECTIONS IN ADULTS

ANATOMIC SITE /DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Epidural abscess	*S. aureus* and Gram-negative bacilli	Ceftriaxone 2g IV q12hr **PLUS** Metronidazole 7.5 mg/kg IV q6-8hr (Max.4g/day)	Vancomycin 15-20mg/kg/dose q8-12hr, adjust according to TDM **PLUS** Cefepime 2 g IV q8hr **PLUS** Metronidazole 7.5 mg/kg IV q6-8hr (Max.4g/day)	Consult ID & neurosurgeon for surgical drainage Use the alternative regimen if high risk of MRSA
Meningitis, acute bacterial Age <1 month	*S. agalactiae,* *E. coli* *L.monocytogenes* *Klebsiella* species	Ampicillin IV 300-400mg/kg/day divided q4-6hr (Max. 12g/day) **PLUS** Cefotaxime IV 225-300mg/kg/day divided q6-8hr (Maximum 2g/dose)	Ampicillin **PLUS** Aminoglycoside	See paediatric infection guide for dosage

TABLE 6: GUIDELINES FOR TREATMENT OF CENTRAL NERVOUS SYSTEM INFECTIONS IN ADULTS

ANATOMIC SITE / DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Meningitis, acute bacterial Age 1 month-50 years. **Empirical therapy**	*S. pneumoniae, N. meningitidis*, and *H. influenza* (rare).	**Adult dose**: Vancomycin 15-20mg/kg/dose q8-12hr, adjust according to TDM (not to exceed 2g per dose) **PLUS** Ceftriaxone 2g IV q12hr **PLUS,** Dexamethasone 0.15 mg/kg IV q6hr	**Adult dose**: Vancomycin 15-20mg/kg/dose q8-12hr, adjust according to TDM (not to exceed 2g per dose) **PLUS** Meropenem 2g IV q8hr **PLUS,** Dexamethasone 0.15 mg/kg IV q6hr	**See paediatric infection guide for dosage** Give Dexamethasone before the first dose of antibiotic for 2–4 days. Discontinue if CSF culture /PCR negative for *S. pneumoniae*
Meningitis, acute bacterial **Empirical therapy** Age: >50 years or alcoholism or other debilitating associated illnesses or impaired immunity.	*S. pneumoniae, N. meningitidtis, L. monocytogenes*, aerobic Gram-negative bacilli	Amoxicillin 2g IV q4h **PLUS** Vancomycin 15-20mg/kg/dose q8-12hr, adjust according to TDM (not to exceed 2g per dose) **PLUS** Ceftriaxone 2 g IV q12hr	Vancomycin 15-20mg/kg/dose q8-12hr, adjust according to TDM (not to exceed 2g per dose) **PLUS** Meropenem 2g IV q8hr	Give Dexamethasone before the first dose of antibiotic for 2–4 days. For patients with severe Penicillin allergy, TMP-SMX **PLUS** Vancomycin can be used pending culture results Discontinue if CSF culture /PCR negative for S. *pneumoniae*
Post-neurosurgery or penetrating head trauma	*S. pneumoniae* (if CSF leak) *H. influenzae*, staphylococci (MRSA, CoNS), Gram-negative	Vancomycin 15-20mg/kg/dose q8-12hr, adjust according to TDM **PLUS** Ceftazidime 2gm IV q 8hr **OR** Cefepime 2g IV q8hr	Vancomycin 15-20mg/kg/dose q8-12hr, adjust according to TDM **PLUS** Meropenem 2g IV q8hr	Give Dexamethasone before the first dose of antibiotic for 2–4 days Discontinue if CSF culture /PCR negative of *S. pneumoniae*

TABLE 6: GUIDELINES FOR TREATMENT OF CENTRAL NERVOUS SYSTEM INFECTIONS IN ADULTS

ANATOMIC SITE /DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Acute bacterial meningitis Specific therapy**:** Check culture and susceptibility report.	*S. pneumoniae*	Penicillin G 4 million unit IV q4hr (Provided that MIC is equal to or less than 0.06 mcg/ml) **OR** Ampicillin 2g IV q4hr	Ceftriaxone 2g IV q12hr (Provided that MIC is less than 1 mcg/ml)	Treat for 10-14 days Dexamethasone (0.15mg/kg q6hr) prior to first dose of antibiotics and continue for 4 days. If Ceftriaxone MIC is 1 or more, Vancomycin must be added.
	E. coli and other Enterobacterales	Ceftriaxone 2g IV q12hr **OR** Cefotaxime 2g IV q4-6hr	Cefepime 2g IV q8hr **OR** Meropenem 2g IV q8hr	Consult ID. **Treat for 21 days** Re-culture CSF after 4-5 days of therapy; If culture is still positive, may need adjunctive intrathecal or intraventricular antibiotic therapy.
	H. influenzae	Ceftriaxone 2g IV q12hr **OR** Cefotaxime 2 gm IV q 4-6hr For a minimum of 7 days.	Cefepime 2g IV q8hr **OR** Meropenem 2g IV q8hr	Dexamethasone 0.15 mg/kg IV q6hr; first dose is given 15-20 minutes prior to first antibiotic dose, and then continued for 4 days in microbiologically confirmed cases.

TABLE 6: GUIDELINES FOR TREATMENT OF CENTRAL NERVOUS SYSTEM INFECTIONS IN ADULTS

ANATOMIC SITE /DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
	N. meningitidis	Ceftriaxone 2g IV q12hr **OR** cefotaxime 2gm IV q 4-6 hr	If: Penicillin MIC <0.1 mcg/mL: Penicillin G 4 million units IV q4hr (24 million units per day **OR** AMP 2g IV q4hr	If Penicillin is used for treatment, Nasopharyngeal colonisation should be eradicated with Rifampicin or Ciprofloxacin to avoid transmission to others. Chemoprophylaxis should be offered **Note:** FQ-resistant isolates are encountered nationally
	L. monocytogenes	Ampicillin 2g IV q4hr for a minimum of 21 days +/- Gentamicin IV for 1-3 weeks.	TMP/SMX (Trimethoprim component 10 mg/kg IV q6-8hr (Max.4g/day) **OR** Meropenem 2g IV q8h	Addition of Gentamicin may be considered, although the Evidence of the combination is inconclusive
	S. agalactiae	Penicillin G: 4 million units IV q4h (24 million units per day **OR** Ampicillin: 2 g IV q4h **PLUS** Gentamicin 1 mg/kg IV q8hr (in case of severe infection)	Ceftriaxone 2g IV q12hr **OR** Cefotaxime 2gm IV q 4-6hr	considered discontinuation of Gentamicin once severe infection is controlled.

TABLE 6: GUIDELINES FOR TREATMENT OF CENTRAL NERVOUS SYSTEM INFECTIONS IN ADULTS

ANATOMIC SITE /DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Prophylaxis for H. influenzae type B (Hib) Household or close contact group defined as persons who reside with the patient or a non-resident who has spent 4 hours or more with the index patient for at least 5 of the 7 days preceding the day of hospitalization of the patient.		Rifampicin: -for individuals >1 month :20 mg/kg (not to exceed 600 mg) once daily x 4 days -for age <1 month: 10 mg/kg once daily x 4 days		**Household or Close Contacts:** Rifampicin chemoprophylaxis recommended for index patients (unless treated with Cefotaxime or Ceftriaxone) and all household contacts in households with members aged <4 years who are not fully vaccinated or members aged <18 years who are immunocompromised, regardless of their vaccination status. Childcare Contacts: Rifampicin chemoprophylaxis recommended in childcare settings when two or more cases of invasive Hib disease have occurred within 60 days and unimmunized or under immunized children attend the facility; when prophylaxis is indicated, it should be prescribed for all attendees, regardless of age or vaccine status, and for childcare providers.
Prophylaxis for *Neisseria meningitidis* exposure	Rifampicin: -10 mg/kg (max dose 600 mg) q12hr x 2 days (adult or child >1 month) -5 mg/kg q12hr x 2 dose children <1 month **OR** **Ceftriaxone** single IM dose of 250 mg (adult) or 125 mg (child age <15 years)			Increasing Ciprofloxacin resistance among invasive meningococcal strains, hence we no longer recommend it in Oman.

TABLE 6: GUIDELINES FOR TREATMENT OF CENTRAL NERVOUS SYSTEM INFECTIONS IN ADULTS

ANATOMIC SITE /DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Meningitis, TB*		Isoniazid 300 mg OD + Rifampicin 600 mg OD + Ethambutol 15–25 mg/kg/day + Pyrazinamide 15 to 30 mg/kg/day (maximum 2 g dose), x 2 months followed by Isoniazid (INH) and Rifampicin: for 7–10 months. **PLUS,** steroids as adjuvant therapy. See comments for dose.	Isoniazid 300 mg OD + Rifampicin: 600 mg OD + Streptomycin 1g IM q24hr + Pyrazinamide 15 to 30 mg/kg/day (maximum 2 g dose), x 2 months followed by Isoniazid and Rifampicin for 7–10 months	Dexamethasone 0.3 to 0.4 mg/kg/day for 2 weeks, then 0.2 mg/kg/day week 3, then 0.1 mg/kg/day week 4, then 4 mg per day and taper 1 mg off the daily dose each week; total duration approximately 8 weeks. Consulting with ID is advisable especially if MRD-TB is suspected or confirmed Refer to TB national manual
Neurocysticercosis Treatment depends on the extent of brain lesions and cysts	*Taenia solium*	Multiple lesions on MRI : Albendazole 400 mg PO q12hr **PLUS** Praziquantel 50 mg/kg/day **PLUS,** Dexamethasone 0.1 mg/kg/day + anti-seizure medications	If 1-2 cysts on MRI: Albendazole 400 mg PO q12hr **PLUS** Dexamethasone 0.1 mg/kg/day **PLUS** Anti-seizure medications	Viable cysts by MRI. Eye exam is needed for evidence of involvement. Duration of therapy depends on extent and severity of disease, please consult ID physician

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TABLE 7: GUIDELINES FOR TREATMENT OF BONE AND JOINT INFECTIONS IN ADULTS

ANATOMIC SITE/ DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
BONE: Osteomyelitis: Important: Essential to obtain specimens (blood, bone) before starting antibiotic treatment. Total duration of treatment differs from patient to patient but 4–6 weeks of antibiotic therapy is recommended as a minimum. Clinical, radiological and laboratory, ESR or CRP should be used to monitor response to therapy. Other modalities of treatment such as surgical debridement of necrotic bone and removal of hardware are frequently needed. In selected cases, hyperbaric Oxygen therapy may be recommended. Team management including surgeons, microbiologist/ID physicians and pharmacists increases the chance of successful treatment.				
Osteomyelitis empiric treatment	*S. aureus, Group A strep, Gm-neg. bacilli rare, Kingella kingae in children*	Cloxacillin IV 1-2 gm q6hr **OR** Cefazolin IV 2 gm q8hr	Vancomycin IV 15-20mg/kg/dose q8-12hr **OR** Clindamycin IV 600-900 mg q6hr	Collect bone and blood cultures before empiric therapy Duration of Therapy :4-6 weeks: Initial 1-2 weeks of IV course followed by PO switch.
Hematogenous (vertebral & non-vertebral)	*S. aureus* (MSSA)	Cloxacillin IV 2 g q4–6hr **OR** Cefazolin 2 gm IV q8hr.	Ceftriaxone IV 2 gm q 24hr **OR** Vancomycin IV 15-20 mg/kg/dose q12hr	Duration of therapy: 6 weeks, provided that epidural or paravertebral abscesses can be drained; consider longer course in those with extensive infection or abscess particularly if not amenable to drainage because of increased risk of treatment failure
	MRSA	Vancomycin IV 15-20 mg/kg/dose q12hr	Teicoplanin IV 6–12 mg/Kg q12hr for 3–5 doses) then 6–12 mg/kg q24hr **OR** Linezolid 600 mg PO/IV q12hr ± Rifampicin 300 mg PO q12hr **OR** Daptomycin 8-10 mg/kg q24hr IV ± Rifampicin	

TABLE 7: GUIDELINES FOR TREATMENT OF BONE AND JOINT INFECTIONS IN ADULTS

ANATOMIC SITE /DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
			300-450 mg PO/IV q12hr if MRSA is Clindamycin susceptible: Clindamycin 600-900 mg IV q8hr	Oral options or in case of allergy or toxicity issues provided in vitro susceptibility is known: Clindamycin, Trimethoprim-sulfamethoxazole, Fusidic acid or Linezolid
	Enterobacterales	Ceftriaxone IV 2 gm once daily **OR** Cefepime 2g IV q 8- 12 hr	Ciprofloxacin IV 400 mg q12hr or 750 mg PO q12hr **OR** Levofloxacin 750 mg PO/IV once daily	
With SCD	*Salmonella spp.*	Ceftriaxone IV 2 gm q24	Trimethoprim-sulfamethoxazole Oral dose: 1 to 2 double-strength tablets every 12 hr **OR** Levofloxacin 750 mg IV/PO q24hr **OR** Ciprofloxacin IV 400 mg q12hr	Ciprofloxacin resistance is increasing (Resistance rate 25-30% according to OMASS 2022-2023)

TABLE 7: GUIDELINES FOR TREATMENT OF BONE AND JOINT INFECTIONS IN ADULTS

ANATOMIC SITE/ DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Person Who Injects Drugs (PWID)/Intravenous drug user (IVDU)	*Pseudomonas*	Ceftazidime 2g IV Q8hr **OR** Piperacillin-tazobactam IV 4.5g q6hr	Ciprofloxacin IV 400 mg q12hr	Oral Ciprofloxacin dose is 750 mg q12hr
Contiguous without vasculopathy, e.g., trauma **Empiric therapy**	*Pseudomonas* (nail penetrating trauma to foot). Long bone post internal fixation*:* (MSSA, MRSA, Gram-negative or *Pseudomonas*)	Ceftazidime 2g IV q8hr **OR** Cefepime 2g IV q12hr **PLUS** Vancomycin IV 15-20 mg/kg/dose q12hr	Levofloxacin 750 mg PO once a day **OR** Linezolid **PLUS** ceftazidime	
Contiguous without vasculopathy, e.g., trauma **targeted therapy**	*S. aureus*	Cloxacillin IV 2g IVq4–6hr **PLUS** Rifampicin 600-900 mg PO daily	**If MRSA**: Vancomycin IV 15-20 mg/kg/dose q12hr **PLUS** Rifampicin 600-900 mg daily	
	Enterococcus	Ampicillin 1-2g IV q6hr	Vancomycin IV 15-20 mg/kg/dose q12hr	
	Enterobacterales	Ciprofloxacin 750 mg PO q12hr **OR** IV 400 q12hr	Ceftriaxone 1–2g q12hr	
	Pseudomonas	Ciprofloxacin 750 mg PO q12hr **OR** IV 400 q12hr	Piperacillin-tazobactam 4.5g IV q6hr	

TABLE 7: GUIDELINES FOR TREATMENT OF BONE AND JOINT INFECTIONS IN ADULTS

ANATOMIC SITE / DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
With orthopaedic implant	*S. aureus*	If MSSA Cloxacillin IV 2g q4–6 hr **PLUS** Rifampicin 300-450 mg PO q12hr	Cefazolin 2gm IV q 8hr **PLUS** Rifampicin 300-450 mg PO q12hr **OR** Vancomycin IV 15-20 mg/kg/dose q12hr PLUS Rifampicin 300-450 mg PO q12hr	
		If MRSA Vancomycin IV 15-20 mg/kg/dose q12hr **PLUS** Rifampicin 300-450 mg PO q12 hr	Linezolid 60 mg q12h IV/PO ± Rifampicin 300 mg PO/IV bid **OR** Daptomycin 8-10 mg/kg q24h IV ± Rifampicin 300-450 mg po/IV bid	
	Coagulase Negative *Staph.*	Vancomycin 15-20 mg/kg/dose q12hr **PLUS** Rifampicin 300-450 mg PO q12 hr	Teicoplanin 400–600 mg q12hr **PLUS** Rifampicin 300-450 mg PO q12 hr	
	Enterococci	Ampicillin 1-2g IV q6hr	Vancomycin IV 15-20 mg/kg/dose q12hr	
	Enterobacterales	Ciprofloxacin 750 mg PO q12hr or 400 q12h	Ceftriaxone 2g IV q12hr **OR** Cefepime 2g IV q12hr	
	Pseudomonas	Cefepime 2g IV q12hr	Piperacillin-Tazobactam 4.5g q8hr **OR** Ciprofloxacin 750 mg PO q12hr or IV 400 q12hr	
Contiguous with Vasculopathy e.g., DM	Polymicrobial [Gram positive cocci (to include	Only If acutely ill start antibiotics	Piperacillin-tazobactam IV 4.5gm q8hr	Consider a duration of a few days of antibiotics if all infected bone

Diagnosis of osteomyelitis: Culture bone biopsy (gold standard). Swab cultures are unreliable. Sampling by needle puncture inferior to biopsy Osteomyelitis likely if ulcer >2 cm2, positive probe to bone, ESR >70 & abnormal plain x-ray.	MRSA) (aerobic & anaerobic) and Gram neg. bacilli (aerobic & anaerobic)]	Amoxicillin – clavulanate 1.2g IV q8hr		resected or up to 3 weeks of antibiotic therapy after minor amputation for diabetes-related osteomyelitis of the foot and positive bone margin culture and 6 weeks for diabetes-related foot osteomyelitis without bone re-section or amputation.

TABLE 7: GUIDELINES FOR TREATMENT OF BONE AND JOINT INFECTIONS IN ADULTS

ANATOMIC SITE/ DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
	S. aureus	If MSSA Cloxacillin IV 2g q4–6 hr	Cefazolin 2 gm IV q8hr **OR** Vancomycin IV 15-20 mg/kg/dose q12hr	
		If MRSA Vancomycin IV 15-20 mg/kg/dose q12hr	Linezolid 60 mg q12h IV/PO	
	Any MDR organisms	According to identity and antibiotic susceptibility of the organism, please consult microbiologist /ID physician		
Septic arthritis	Before commencing empirical antibiotics, make sure to send Blood cultures and synovial fluid for: Gram stain, culture, WCC with differential, and assessment for crystals with a polarising microscope. Treatment requires both adequate drainage of infected fluids and appropriate antimicrobial therapy.			
Aetiology	*-Staphylococcus aureus* *-Streptococcal species* *-Neisseria gonorrhoeae* *- gram-negative bacilli generally occurs in older adults, in patients with underlying immunosuppression, or in injection drug users (IDU)* *-Brucellosis* *-Mycobacterial species* *-Fungal species (Candida species, sporotrichosis, Cryptococcus, blastomycosis)*			

TABLE 7: GUIDELINES FOR TREATMENT OF BONE AND JOINT INFECTIONS IN ADULTS

ANATOMIC SITE/ DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Septic Arthritis No risk of sexually transmitted infection	*S. aureus, streptococci, Gram-negative bacilli*	If **Gram positive cocci** Start: Cloxacillin or Cefazolin **-Gram negative organism and the patient is immunocompetent:** Start third generation Cephalosporin	**If Gram negative and the patient at risk of pseudomonas infection: start Ceftazidime or Cefepime** **In case patient is a** (neutropenia and bacteremia, have severe burns)	Surgical intervention and drainage are essential. Adjust regimen based on culture and susceptibility.

TABLE 7: GUIDELINES FOR TREATMENT OF BONE AND JOINT INFECTIONS IN ADULTS

ANATOMIC SITE/ DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
		- If Gram stain **is not showing any organism**: start third generation Cephalosporin. **If MRSA suspected**: start Vancomycin	are in a setting where the incidence of resistance to the chosen antibiotic class is high (eg, >10 to 15 percent) with dual anti pseudomonas: Cefepime or Ceftazidime or Meropenem **PLUS,** Aminoglycoside **OR** Fluoroquinolone	**Duration of** therapy is unknown but should be guided by culture and susceptibility and based on ID consultation.
Septic arthritis Acute monoarticular at risk for sexually-transmitted infections	*N. gonorrhoeae, S. aureus, streptococci, rarely aerobic Gram-neg. bacilli*	Ceftriaxone 1g IV q24hr or Cefotaxime 1g IV q8hr	Add Vancomycin if Gram stain showed Gram positive cocci in clusters. Cover for concomitant Chlamydial infection with Doxycycline or Azithromycin	Suspected gonococcal infections (GC): culture urethra, cervix, anal canal, throat, blood, joint fluid.
Bursitis	*Staphylococcus aureus* *Streptococci*	Flucloxacillin IV 1-2g q6hr **OR** Cefazolin 2g IV q8hr Oral switch: Flucloxacillin 500mg -1g q6hr	Clindamycin IV 600 mg -1.2g q 6 hrs Oral switch: Clindamycin 300 mg-450 mg q6hr	Aspirates should be done prior to the empirical antibiotics. Complete drainage is essential.

TABLE 7: GUIDELINES FOR TREATMENT OF BONE AND JOINT INFECTIONS IN ADULTS				
ANATOMIC SITE /DIAGNOSIS	**ETIOLOGIES**	**SUGGESTED REGIMENS**		**COMMENTS**
		FIRST LINE	**SECOND LINE**	
Prosthetic Joint infection	Empiric therapy is NOT recommended. Treat based on culture and sensitivity results. Obtain surgical and ID consultation to assess the need for debridement, interventions and prosthesis removal.			
Prosthetic Joint infection	*Staphylococcus epidermidis*, other coagulase-negative - staphylococci *Staphylococcus aureus* (MSSA or MRSA)	**MSSA:** Rifampicin 300 to 450 mg orally q12hr **PLUS** any of the following: -Flucloxacillin:2g IV q6hr **OR** -Cefazolin 2g IV every 8 hrs **OR** Ceftriaxone 2g IV q24 hrs **MRSA**: Rifampicin 300 to 450 mg orally q12hr **PLUS,** any of the following: -Vancomycin 15 to 20 mg/kg q8hr **OR** Teicoplanin 12 mg/kg IV q12hr for 3 to 5 doses, followed by 12 mg/kg q24hr	(Daptomycin 8-10 mg/kg IV q24hr **OR** Linezolid 600 mg PO/IV q12hr) **PLUS** Rifampicin 300 mg PO q12hr	Obtain appropriate cultures and adjust accordingly Consult ID
Prosthetic Joint infection .	-Streptococci -Enterococci	**Any one of the following:** -Aqueous crystalline penicillin G 20 to 24 million units IV	Vancomycin 20 mg/kg loading dose then 15 mg/kg/dose IV q12hr, not to exceed 2g per dose, initially	Obtain appropriate cultures and adjust accordingly Consult ID

TABLE 7: GUIDELINES FOR TREATMENT OF BONE AND JOINT INFECTIONS IN ADULTS				
ANATOMIC SITE/ DIAGNOSIS	**ETIOLOGIES**	**SUGGESTED REGIMENS**		**COMMENTS**
		FIRST LINE	**SECOND LINE**	
		in 6 equally divided doses -Ampicillin 12g IV in 6 equally divided doses. -Ceftriaxone 2g IV q24hr	Daptomycin 8-10 mg/kg IV q24hr **OR** Linezolid 600 mg PO/IV q12hr	
	Gram-negative enteric bacilli	Ceftriaxone 2g IV q24hr **OR** Cefepime 2g IV q12hr, based on susceptibility)	Ciprofloxacin 750 mg PO q12hr	Obtain appropriate cultures and adjust accordingly Consult ID
	Pseudomonas aeruginosa	Cefepime 2g IV q12 hr	Ciprofloxacin 750 mg PO q12hr	Obtain appropriate cultures and adjust accordingly Consult ID
	Cutibacterium (formerly *Propionibacterium*) *acnes)*	**Any of the following:** -Aqueous crystalline penicillin G 20 million units IV every 24 hours in 6 divided doses -Ceftriaxone 2g IV q24hr		Obtain appropriate cultures and adjust accordingly Consult ID
	Mycobacterium Tuberculosis	Refer to the National TB manual		
	Brucellosis	Refer to the systemic infections (table 12)		

TABLE 8: GUIDELINES FOR TREATMENT OF ABDOMINAL INFECTIONS IN ADULTS				
ANATOMIC SITE/ DIAGNOSIS	**ETIOLOGIES**	**SUGGESTED REGIMENS**		**COMMENTS**
		FIRST LINE	**SECOND LINE**	
Esophagitis	*Candida albicans*	Fluconazole 200-400 mg IV/PO q24hr for 14-21 days	Voriconazole 200 q12hr IV/PO for 14-21 days	For fluconazole-refractory infection, options include: Itraconazole solution, Voriconazole, Echinocandins, or Amphotericin.
	HSV (immunocompromised patient)	Valacyclovir 1g PO q12hr daily **OR** Acyclovir 400 mg PO five times a day for 14 to 21 days Famciclovir 500 mg PO q12hr x 7 days	IV acyclovir if oral is not tolerated	renally adjusted if necessary
Duodenal/ Gastric Ulcer	*Helicobacter pylori*	PPI + Amoxicillin 1g PO q12hr **PLUS** Clarithromycin PO 500 mg q12hr	PPI + Clarithromycin 500 mg PO q12hr Metronidazole 500 mg PO q8hr	Consult GI Duration: 14 days
Biliary infections (cholecystitis cholangitis, biliary sepsis, CBD obstruction)	*Enterobacterales Enterococci, anaerobes*	Piperacillin-tazobactam 4.5g IV q6hr **OR** Metronidazole 500 mg (PO or IV) q8hr **PLUS** Ceftriaxone 2g IV once daily	**Severe cases/high risk of ESBL**: Meropenem 1g IV q8hr **Penicillin allergic**: Metronidazole 500 mg PO/ IV q8hr **PLUS** Ciprofloxacin 400 mg IV q12hr or 500 mg PO q12hr **OR** Levofloxacin 750 mg IV/PO once daily	in cholecystitis, cholecystectomy can be done early (within 7 days) or can be delayed In patients with cholangitis, adequate biliary drainage is crucial.

TABLE 8: GUIDELINES FOR TREATMENT OF ABDOMINAL INFECTIONS IN ADULTS

ANATOMIC SITE/ DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Diverticulitis	Almost all infections are polymicrobial. (Most commonly *Enterobacterales, anaerobes, Streptococci,* and *enterococcus spp,* Occasionally *P. aeruginosa*)	**<u>Mild</u>** **Out- patient:** Amoxicillin-clavulanate 875/125 mg PO q8hr	Ciprofloxacin 500 mg PO q12hr **PLUS** Metronidazole 500 mg q8hr **OR** TMP-SMX- DS PO q12hr **PLUS** Metronidazole 500mg PO q8hr	Mild diverticulitis can be treated conservatively without antibiotics if uncomplicated (doesn't extend to the peritoneum) and the patient is immunocompetent and shows no signs of sepsis CT scan is important in assessing the need for drainage in complicated and severe disease. Duration depends on clinical response. If source control is achieved shorter duration of 5-7 days may be considered
		<u>Moderate to Severe infection</u> Piperacillin-tazobactam 4.5g IV q6hr **OR** Meropenem 1g IV q8hr	Ampicillin 2g IV q6hr **PLUS** Gentamicin **OR** Amikacin **PLUS** Metronidazole 500 mg PO/IV q8hr **OR** Tigecycline initial 100 mg IV infusion then 50 mg IV infusion q12hr	

TABLE 8: GUIDELINES FOR TREATMENT OF ABDOMINAL INFECTIONS IN ADULTS

Pancreatitis

Acute alcoholic pancreatitis without necrosis does not require antibiotic therapy or prophylaxis as studies have shown no advantage. Observe for abscess formation or necrosis which will require therapy.

ANATOMIC SITE/ DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Necrotizing pancreatitis with infected necrotic tissue **OR** Infected pseudocyst, **OR** pancreatic abscess	*Enterobacterales* Enterococci, *S.aureus* *Anaerobes*, *Candida (*not frequent*)*	Piperacillin-tazobactam 4.5g IV q8hr	Meropenem 1gIV q8hr **OR** Metronidazole 500 mg PO/ IV q8hr **PLUS** Ciprofloxacin 400 mg IV q12hr or 500 mg PO q12hr **OR** Levofloxacin 750 mg IV/PO once daily	Infected pancreatic necrosis can be confirmed by: 1-CT scan with gas 2-Percutaneous aspirate or surgical specimen with organism evident on Gram stain or culture Usually develops after the second week from onset of pancreatitis symptoms

TABLE 8: GUIDELINES FOR TREATMENT OF ABDOMINAL INFECTIONS IN ADULTS

ANATOMIC SITE/ DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Peritonitis Primary (spontaneous bacterial peritonitis (SBP)	Enterobacterales *S. pneumoniae*, Enterococci, Staph spp anaerobes	**Primary:** Ceftriaxone 2g IV q 24hr **OR** Cefotaxime 2g IV q8hr **If infection life threatening:** Piperacillin /tazobactam 4.5 gm IV q 6 hr	Meropenem 1gIV q8hr **OR** Metronidazole 500 mg PO/ IV q8hr **PLUS** Ciprofloxacin 400 mg IV q12hr or 500 mg PO q12hr **OR** Levofloxacin 750 mg IV/PO once daily	**Duration**: Uncomplicated 5–7 days. Complicated or positive culture: 10 days, may be longer if the patient is bacteremic or shows slow response.
Secondary Peritonitis secondary to GI perforation	Enterobacterales Enterococci, Anaerobe *P. aeruginosa*	**Mild to moderate:** Cefepime 2gm IV q 12hr **PLUS** Metronidazole 500 mg PO q 8hr	Metronidazole 500 mg PO/ IV q8hr **PLUS** Ciprofloxacin 400 mg IV q12hr or 500 mg PO q12hr **OR** Levofloxacin 750 mg IV/PO once daily	Empirical antifungal generally not indicated unless the patient has risk factors. Surgical source control is essential
		Severe (ICU): Piperacillin /tazobactam 4.5 gm IV q 6 hr **OR** Carbapenem	Ampicillin **PLUS** Ciprofloxacin **PLUS** Metronidazole **OR** AMP **PLUS** Aminoglycoside **PLUS** Metronidazole	

TABLE 8: GUIDELINES FOR TREATMENT OF ABDOMINAL INFECTIONS IN ADULTS				
ANATOMIC SITE/ DIAGNOSIS	**ETIOLOGIES**	**SUGGESTED REGIMENS**		**COMMENTS**
		FIRST LINE	**SECOND LINE**	
Prevention of SBP		TMP-SMX DS 1-tab PO 5 days per week	Ciprofloxacin 500 mg PO q24 hrs	**Consult hepatology/GI/ID prior to initiation of prophylaxis** 1-year risk of SBP in patients with ascites and cirrhosis as high as 29%. TMP-SMX reduce SBP bacteraemia from 27% to 3%
Chronic ambulatory peritoneal dialysis (CAPD) peritonitis	Most common: Gram-positive cocci: *s. aureus*, coagulase-negative, enterococci Less common: Gram-negative and yeast	Empirical treatment should target -Gram positive cocci, add Vancomycin -Gram negative: add Cefepime or Ceftazidime or Aminoglycoside Use intraperitoneal drug dosing unless the patient is bacteremic	Adjust according to microbiological results **Consult Nephrology/ID**	Most infections are caused by contamination of the catheter. Diagnosis of CAPD catheter infection if peritoneal dialysis fluid WBC >100/mm3 with >50% polymorphonuclear leukocytes + clinical signs and symptoms

TABLE 8: GUIDELINES FOR TREATMENT OF ABDOMINAL INFECTIONS IN ADULTS

ANATOMIC SITE/ DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Infectious diarrhoea	*Campylobacter jejuni/coli* (self-limited in normal host)	Azithromycin 1 gm PO stat without dysentery **OR** Azithromycin 500 PO q 24 hr for 3 days with or without dysentery	Ciprofloxacin 500 mg PO q12 hr for 3-5 days **OR** Clarithromycin 500 mg PO q12hr for 3 days **OR** Doxycycline 100 mg q12hr for 5 days	Campylobacter enteritis is a self-limited infection in most cases. Antimicrobials indicated in patients with prolonged/severe illness and in immunocompromised.
	Campylobacter foetus	Imipenem 500 mg IV q 6 hr **OR** Meropenem 1 gm IV q8hr	Ampicillin 100 mg/kg/day IV div q6hr **OR** Gentamicin 5 mg/kg IV q 24hr	Diarrhoea uncommon, causes more systemic disease in debilitated host
	Shiga toxin-producing *E. coli*	Avoid antibiotics		
	Salmonella spp. (non-typhi)	If can be treated as outpatient: Trimethoprim-sulfamethoxazole 960 PO q12hr for 10-14 days **OR** Ciprofloxacin 500 mg PO q12hr for 7-10 days (14 days if immunocompromised). If requires IV antibiotics: IV Ceftriaxone 2g q 24hr for 7 days (14 days if immunocompromised)	Azithromycin 500 mg PO q24hr for 7 days (14 days if immunocompromised)	Non-typhoidal *Salmonella* gastroenteritis is a self-limited infection. Antimicrobial therapy is generally not required and may prolong faecal shedding. Indications for antimicrobial therapy include: severe/systemic illness, age <1 year or >50 yrs, prosthesis, vascular graft, valvular heart disease, severe atherosclerosis, immunocompromised patients, hemoglobinopathies.
	Typhoid fever	refer to systemic infection guide table 12		

TABLE 8: GUIDELINES FOR TREATMENT OF ABDOMINAL INFECTIONS IN ADULTS				
ANATOMIC SITE/ DIAGNOSIS	**ETIOLOGIES**	**SUGGESTED REGIMENS**		**COMMENTS**
		FIRST LINE	**SECOND LINE**	
	Shigella	**Mild to moderate** Ciprofloxacin 500 mg q12hr for 3 days **If severe infection**: Ceftriaxone 1-2gm q24hr for 5 days	Azithromycin 500 mg q24hr for 3 days **OR** Trimethoprim-sulfamethoxazole DS tablet q12hr for five days	Shigellosis is a self-limited illness. Indications for antimicrobial therapy include: severe disease, immunocompromised and in outbreak setting Longer (7-10 days) duration for immuno-compromised patients.
	Vibrio cholera:	Doxycycline 300 mg PO single dose.	Azithromycin 1gm PO single dose **OR** Ciprofloxacin 1gm PO single dose **OR** Trimethoprim-sulfamethoxazole 960 mg PO q 12hr for 1-3 days (if susceptible)	Aggressive hydration is the most important part in treating cholera. Antimicrobial therapy is considered adjunctive.
	Y. enterocolitica Treatment recommended for: immunocompromised, bacteraemia, pseudoappendicitis syndrome	**-Mild to moderate no treatment recommended -Severe:** Doxycycline 100 mg q12hr **OR** Ceftriaxone 2g once daily **PLUS** Gentamicin 5 mg/kg per day once q24h)	Trimethoprim-sulfamethoxazole 960 mg q12 hrs **OR** Fluoroquinolone	No antimicrobial therapy is generally needed except in severe disease and septic patients Duration: 5 days
	Aeromonas/ plesiomonas	Ciprofloxacin 500 mg PO q12hr	Trimethoprim-sulfamethoxazole 960 mg PO q12hr	Duration: 3 days
	E. histolytica	Metronidazole 500–750 mg q8hr for 7-10 days followed by intraluminal agent paromomycin 500 mg q8hr for 7 days		

TABLE 8: GUIDELINES FOR TREATMENT OF ABDOMINAL INFECTIONS IN ADULTS

ANATOMIC SITE/ DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
	Giardia	Metronidazole 250 mg PO q8hr for 5 days **OR** Albendazole 400 PO q24hr with food for 5 days **OR** Tinidazole 2g PO single doses		
	Cryptosporidium	Nitazoxanide 500 mg PO q12hr x 3 days Alternative: Paromomycin 500 mg q6hr for 14-21 days		Diarrhoea is generally self-limited in immunocompetent patients, and does not require antimicrobial therapy If AIDS: ART and nitazoxanide for 14 days
	Cyclospora	Trimethoprim-Sulfamethoxazole 960 mg PO q12hr for 7–10 days		
C. difficile Infection (CDI)	**Initial episode, mild or moderate:** Initial episode, non-severe (WBC count < $15x10^9$ cells/L, serum creatinine < 1.5 times the baseline level, and body temperature <38.5°C)	Vancomycin 125 mg PO q6hr for 10-14 days	If oral Vancomycin is not available, Metronidazole PO 500 mg q8hr for 10-14 days	Discontinue offending antibiotics
	Initial episode, severe: Leucocytosis with a WBC count of 15,000 cells/ml or higher or a serum creatinine level greater than or equal to 1.5 times the premorbid level	Vancomycin, 500 mg q6hr by mouth for 10–14 days +/- Metronidazole 500 mg IV q8hr		Consult ID & GI

TABLE 8: GUIDELINES FOR TREATMENT OF ABDOMINAL INFECTIONS IN ADULTS

ANATOMIC SITE/ DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
	Initial episode, severe: Hypotension or shock, ileus, megacolon	Vancomycin, 500 mg 4 times per day PO or by nasogastric tube, **PLUS** Metronidazole 500 mg IV every 8 hrs If complete ileus, consider adding rectal instillation of Vancomycin as enema		Referral of severe cases to GI surgeons is recommended. Rectal installation of Vancomycin, consult GI, ID team and clinical pharmacy
	First recurrence	Same as for initial episode		
	second recurrence	Vancomycin 125 mg PO q6hr 10–14 days then start tapering. Tapered and/or pulsed Regimen.		Consult ID and GI physicians

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TABLE 9: GUIDELINES FOR TREATMENT OF SKIN AND SOFT TISSUE INFECTIONS				
ANATOMIC SITE/ DIAGNOSIS	**ETIOLOGIES**	**SUGGESTED REGIMENS**		**COMMENTS**
		FIRST LINE	**SECOND LINE**	
Bites: Remember tetanus prophylaxis				
Cat bite: complicated by infection in 80%. Patients should be cultured and treated empirically. Observe osteomyelitis.	*Pasteurella multocida* *S. aureus* *Capnocytophaga spp* *Bartonella hensale* *Anaerobes*	Amoxicillin-clavulanate 875/125 mg PO q12hr **OR** 500/125 mg PO q8hr	Cefuroxime 500 mg PO q12hr **OR** doxy 100 mg PO q12hr	*P. multocida* resistant to cloxacillin, cephalexin, clindamycin, many strains resistant to erythromycin. If the culture grew only *P. multocida*, can switch to penicillin
Dog bite: complicated by infection in 5%. Treat if bite is severe or with comorbidity (e.g. diabetes)	*Pasteurella canis*, *S. aureus*, *Bacteroides spp.*, *Fusobacterium*, *Capnocytophaga*	Amoxicillin-clavulanate 875/125 mg PO q12hr **OR** 500/125 PO q8hr	Clindamycin 300 mg PO q6hr **PLUS** Fluoroquinolone (adults) **OR** Clindamycin + TMP-SMX (children)	Consider anti-rabies prophylaxis (rabies immunoglobulin and vaccine) Refer to Anti Rabies prophylaxis page 189-190.
Human bite	*Streptococci* *S. aureus*, *Eikenella corrodens* Anaerobes	**Early (not infected**) Amoxicillin-clavulanate 875/125 mg PO q12hr for 5 days **Later: signs of infection** (usually in 3–24 hrs) Piperacillin-tazobactam 4.5g IV q8hr	**If pen allergy:** Clindamycin + (either Ciprofloxacin OR TMP-SMX)	Cleaning, irrigation and debridement most important for clenched fist injuries x-rays should be obtained. Bites inflicted by hospitalised patients, consider aerobic Gram-negative bacteria. *Eikenella* resistant to Clindamycin, Nafcillin/Oxacillin, Metronidazole, first generation Cephalosporin, and Erythromycin, susceptible to FQs, and TMP-SMX

TABLE 9: GUIDELINES FOR TREATMENT OF SKIN AND SOFT TISSUE INFECTIONS

ANATOMIC SITE/ DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Snake bite	*Enterobacterales, Pseudomonas, Staphylococcus, Clostridium spp.*	**Primary therapy is anti-venom** Piperacillin-tazobactam if the wound is infected.		Tetanus prophylaxis. Obtain culture. Antibiotic treatment indicated if there are signs of infections. Should be guided by a culture report.
Boils, furunculosis carbuncles **afebrile**	*S. aureus* both MSSA & MRSA- increase incidence of community-associated MRSA	Incision & drainage is indicated**.** If abscess <5 cm in diameter: culture abscess, hot packs, **NO drugs.** If abscess >5 cm in diameter: TMP/SMX 1 DS tab PO q12hr	Clindamycin PO 300–600 mg q6–8hr for 5–10 days	
Boils, subcutaneous abscesses, furunculosis, carbuncles (connecting abscesses) **febrile**	*S. aureus* both MSSA & MRSA- increase incidence of community-associated MRSA	Incision & drainage is the mainstay of treatment Outpatient: TMP/SMX 1 DS tab q12hr for 5–10 days	Clindamycin PO 300–600 mg q6–8hr In-patient: Obtain pus and blood cultures Vancomycin 15 mg/kg q12hr till culture results are available	Needle aspiration is inadequate. Consider imaging if not sure of the extent or the diagnosis. Therapy should be given before incision and drainage in patients with prosthetic heart valves or other conditions placing them at high risk for endocarditis

TABLE 9: GUIDELINES FOR TREATMENT OF SKIN AND SOFT TISSUE INFECTIONS

ANATOMIC SITE/ DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Recurrent boils, subcutaneous abscesses, furunculosis	MSSA, MRSA	Consult ID if decolonization is considered. Mupirocin 2% ointment to anterior nares twice a day for 7 days and daily Chlorhexidine 2% bath for 7 days. Decontamination of personal items such as towels, linen, etc.	Consult ID or microbiologist if oral antibiotics needed for decolonization	Adult patients should be evaluated for neutrophil disorder if recurrent abscesses started in early childhood
Impetigo	Group A *Strep.* (rare group B, C & G) *S. aureus* (MSSA, MRSA) cause bullous impetigo	No oral antibiotics unless severe, extensive, or bullous or in outbreak setting Few lesions, Streptococcus. impetigo: Topical Fusidic acid 2% for 5 days. Bullous impetigo: Topical Fusidic acid 2% or Mupirocin 2% q8hr (for MRSA) for 7 days. When oral antibiotic indicated: Cloxacillin 500 mg PO q6hr **OR** Cephalexin 250 mg PO q6hr for 5–7 days based on clinical response	For MRSA: Doxycycline, TMP-SMX, **OR** Clindamycin can be used	Reserve topical antibiotics for localized lesions: topical Fusidic acid 2% q8hr for 5 days can be used Do not use Mupirocin (Reserved for MRSA)

TABLE 9: GUIDELINES FOR TREATMENT OF SKIN AND SOFT TISSUE INFECTIONS

ANATOMIC SITE/ DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Burns Non-infected		Role of topical antibiotic is unclear	Silver sulfadiazine 1%	Anti-tetanus is indicated
Burns Wound sepsis	*S. pyogenes* *S. aureus*, *Enterobacter-spp.*, *P. aeruginosa*, *E. coli*, Fungi (rare), HSV (Rare)	Cefepime 2gm IV q8–12hr **OR** Piperacillin-tazobactam 4.5gm IVq8hr ± Vancomycin (**Consider adding Vancomycin if the patient is known or suspected of MRSA).**	Meropenem **PLUS** Vancomycin	Obtain blood and wound cultures before starting antibiotics if possible. Monitor serum levels of Vancomycin as serum half-life of most antibiotics is decreased in burns patients. Candida usually colonised wounds but rarely invades
Cellulitis, Erysipelas Extremities, non-diabetic	*Strept spp.* (group A, B, C, G) *S. aureus*	**Inpatient:** Cefazolin IV 1gm q8hr **OR** Cloxacillin 2gm IV q6hr When afebrile can step to oral therapy. **Outpatient:** Cephalexin 500 mg PO q6hr for 10 days	Amoxicillin-clavulanate **OR** Clindamycin **OR** Clarithromycin	Always elevate the affected extremity. Cultures should be obtained for patients on chemotherapy, neutropenia, animal bites or immuno- compromised or immersion injuries. Penicillin G 1–2 million units IV q6h if Streptococci
Facial, adult (erysipelas)	*Strept* (group A, B, C & G) *S. aureus* (MRSA), *S. pneumoniae* (rare)	Ceftriaxone 1g IV q24hr	Vancomycin 1 gm IV q12hr if MRSA suspected	Obtain blood cultures
Erysipelas and Diabetes mellitus	*Strept* (group A, B, C& G) *S. aureus*, *Enterobacterales* *Clostridia* (rare)	**Early mild:** TMP-SMX-DS 1–2 tabs PO q12hr **PLUS** Cephalexin PO 500 mg q6hr	**Severe:** Meropenem or Piperacillin-tazobactam **PLUS** Vancomycin **OR** Linezolid	Surgical consultation to rule out necrotizing fasciitis and for debridement to obtain cultures. If septic, consider x-rays to assess the presence of gas

TABLE 9: GUIDELINES FOR TREATMENT OF SKIN AND SOFT TISSUE INFECTIONS

ANATOMIC SITE/ DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Diabetic foot Mild: presence of purulence & >1 sign of inflammation and cellulitis (if present) <2 cm around the ulcer limited to skin and superficial subcutaneous tissue	*S. aureus*, Streptococci Group A, B	Cephalexin PO 500 mg q6hr **OR** Clindamycin 600 mg PO q8hr If IV needed: IV Clindamycin 600 mg q8hr **OR** IV Cefazolin 1gm q8hr	Amoxicillin/ clavulanate 875/125 mg PO q12hr	If MRSA risk or positive infection or colonization add Vancomycin **OR** Linezolid to regimens not containing Clindamycin or microbiology reports indicates Clindamycin resistance Antibiotics to be adjusted based on culture results. Routine surface swabs inadequate to determine main pathogen within the polymicrobial colonisation of diabetic foot ulcer, Ideally, early ulcer debridement and deep tissue samples are important before empiric antimicrobials
Diabetic foot: Moderate: same as mild PLUS >2 cm of cellulitis, lymphangitis streaking, spread beneath superficial fascia, deep tissue abscess, gangrene, involvement of muscle, tendon, joint or bone.	As above + coliforms +/- *Pseudomonas* +/- anaerobes	Ciprofloxacin (750 mg orally q12hr) **PLUS** Metronidazole (500 mg orally every 8 to 12 hours) **PLUS, either** Doxycycline (100 mg PO q12 hr) **OR** TMP-SMX (480mg-960mg PO q12 hrs)	Cefepime 2gm IV every 8 hrs **OR** Piperacillin-tazobactam 4.5g q8hr **OR** Ertapenem 1g IV q24hr	
Diabetic foot Severe**:** same as above in addition to systemic toxicity or metabolic instability	As above + anaerobes	Piperacillin-tazobactam 4.5Gm IV q6hr **PLUS** Vancomycin 15-20 mg/kg IV q12hr	Ciprofloxacin 400 mg IV q12hr **PLUS** IV Metronidazole 500gm q8hr **PLUS** IV Vancomycin 15-20 mg/kg IV q12hr **OR** Meropenem 1g q8hr **PLUS** Vancomycin	Diabetic foot Severe**:** same as above in addition to systemic toxicity or metabolic instability

TABLE 9: GUIDELINES FOR TREATMENT OF SKIN AND SOFT TISSUE INFECTIONS

ANATOMIC SITE/ DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Necrotizing fasciitis Empirical therapy	**Types** (1) Strep spp., Group A, C, G (2) Clostridia spp. (3) Polymicrobial, aerobic + anaerobic (if S. aureus + anaerobic strep = Meleney's synergistic gangrene); (4) MRSA; (5) V. vulnificus (6) Klebsiella spp (7) Aeromonas spp.	Meropenem 1g IV every 8 hr **OR** Ertapenem 1g IV every 24 hr **PLUS** Vancomycin 15 to 20 mg/kg IV q8 to 12 hr **OR** Daptomycin 4 to 6 mg/kg IV q 24hr **PLUS** Clindamycin 900 mg IV q8 hr	Piperacillin-tazobactam (adults: 3.375 gm IV q6hr or 4.5g every 8 hours add Vancomycin **OR** Daptomycin if MRSA is suspected. **PLUS** Clindamycin 900 mg IV every 8 hrs	All types require prompt surgical debridement. Diagnosis of necrotizing fasciitis requires incision & probing of the fascial plane. Need Gram stain/culture to determine if aetiology is Streptococcus, Clostridia, polymicrobial, or S. aureus.
Necrotizing fasciitis	Streptococcal (A, C, G)	Penicillin G 4-million-unit IV q4hr **PLUS** Clindamycin 900 mg IV q8hr **PLUS** **IVIG (Intravenous Immunoglobulin) not recommended except for group A strep infection: 0.5 gm/kg day 1, then 25 gm days 2 and 3 (CID 71:1772, 2020)**		**ID and surgical consultation and review.**

TABLE 9: GUIDELINES FOR TREATMENT OF SKIN AND SOFT TISSUE INFECTIONS

ANATOMIC SITE/ DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Necrotizing fasciitis	Polymicrobial	Meropenem or Piperacillin-tazobactam **PLUS** Vancomycin or Daptomycin		**Doses as above. Antibiotics can be adjusted based on culture results.**
Necrotizing fasciitis	*Clostridia spp.*	Penicillin G 2–4-million-unit IV q4hr **PLUS** Clindamycin 900 mg IV q8hr		
Staphylococcal scalded skin syndrome	Toxin-producing *S. aureus*	**MSSA:** Cloxacillin 2g IV q4hr for 5–7 days **MRSA**: Vancomycin 15 mg/kg IV q12hr		Toxin causes intra-epidermal split and positive Nikolsky sign. Biopsy can differentiate drug cause such as toxin epidermal necrolysis
Infected wound extremities post-trauma	Polymicrobial *S. aureus, Streptococcus spp.,* Coliforms, *Clostridium spp.,* Water exposure: *Pseudomonas spp., Aeromonas spp, Vibrio spp*	**Mild:** TMP/SMX 960mg PO q12hr **OR** Clindamycin **Febrile with sepsis:** Piperacillin-tazobactam **OR** Meropenem **PLUS** Vancomycin	Doxycycline PO 100 mg q12hr **OR** Amoxicillin-clavulanate PO **OR** Vancomycin PLUS (Ciprofloxacin **OR** Levofloxacin)	Debride the wound if necessary Culture is indicated Antibiotics to be adjusted based on susceptibility results Tetanus toxoid
Infected wound Postoperative, not involving intestinal or genital surgeries	*S. aureus, Strept. A, B, C, G*	**Mild:** TMP/SMX 1 tab PO q12hr **Severe:** Vancomycin 15--20 mg/kg q12hr	**Mild:** Clindamycin 300–450 mg PO q8hr **Severe:** Linezolid	Check Gram stain of exudate

TABLE 9: GUIDELINES FOR TREATMENT OF SKIN AND SOFT TISSUE INFECTIONS

ANATOMIC SITE/ DIAGNOSIS/	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Infected wound postoperative, involving intestinal or genital surgeries	S. aureus (MSSA, MRSA) Strep. spp *Coliforms*, anaerobes	**Mild: A**moxicillin-clavulanate 875/125 mg PO q12hr **OR** TMP/SMX 1–2-tab PO q12hr (if Gram-positives seen on Gram stain) **Severe:** Piperacillin-tazobactam 4.5g IV q8hr **PLUS** Vancomycin 15 mg/kg IV q12hr **OR** Meropenem **PLUS** Vancomycin 15-20 mg/kg IV q12hr	- Can substitute Linezolid **OR** **Daptomycin** for Vancomycin. -Can substitute Ciprofloxacin **OR** Levofloxacin for Beta-lactam antibiotics	Drain wounds and get cultures
Scabies		Permethrin 5% cream. Apply to the entire skin from chin down to toes. Leave it for 8-14 hrs. Repeat in 1-2 weeks.	Ivermectin Ivermectin is not recommended for pregnant or nursing, or children less than (15 kilograms).	Consult ID. Treat all household and sexual contacts. Decontaminate clothes.

TABLE 10: GUIDELINES FOR TREATMENT OF URINARY TRACT INFECTIONS AND SEXUALLY TRANSMITTED DISEASES IN ADULTS

ANATOMIC SITE/ DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Urinary Tract Infections				
Asymptomatic bacteriuria refers to isolation of bacteria (≥100,000 [105] colony-forming units [CFU]/mL in a voided clean-catch specimen) from an individual without symptoms of urinary tract infection (UTI).**Treatment is only indicated in case of pregnancy and patients undergoing invasive urological procedures.**				
Uncomplicated Cystitis	*E. coli, Klebsiella, Proteus, Staph. saprophyticus.*	Nitrofurantoin 100 mg PO q12hr x 5 days Nitrofurantoin is the first line due to better susceptibility among Uropathogens according to OMASS 2023.	Trimethoprim/ sulfamethoxazole 960 mg PO q12hr x 3 days **OR** Cephalexin 500 mg PO q6hr x 5-7 days **OR** Fosfomycin 3g PO single dose **OR** **if G6PD deficient** Amoxicillin-clavulanate 875/125 mg PO q12hr x 5- 7 days	- Routine urine culture is not recommended in cases with classic symptoms of acute uncomplicated cystitis. - Check G6PD deficiency status prior to prescribing. - Ciprofloxacin and other fluoroquinolones are no longer recommended as first line treatment due to increasing rate of resistance and potentially permanent and disabling rare adverse effects. - If Staphylococcus aureus is isolated in the urine, bacteraemia may be present. The patient must be assessed for other sources of infection.
Complicated Urinary tract infections	A complicated UTI, whether localized to the lower or upper tract, is associated with an underlying condition that increases the risk of failing therapy, including the following: ● Diabetes ● Pregnancy ● Symptoms for 7 or more days before seeking care ● Hospital-acquired infection ● Renal failure ● Urinary tract obstruction ● Presence of an indwelling urethral catheter, stent, nephrostomy tube or urinary diversion ● Recent urinary tract instrumentation			

TABLE 10: GUIDELINES FOR TREATMENT OF URINARY TRACT INFECTIONS AND SEXUALLY TRANSMITTED DISEASES IN ADULTS

ANATOMIC SITE/ DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
	• Functional or anatomic abnormality of the urinary tract • History of UTI in childhood • Renal transplantation • Immunosuppression Prior to empiric therapy: urine culture & sensitivity. If hypotensive: blood cultures. If obstructive uropathy is suspected, need imaging of urinary tract asap. Infection with a multi-drug resistant uropathogen is also considered complicated although there is no data to suggest that such infections are more likely to fail if an antimicrobial to which the infecting pathogen is susceptible is used.			
Complicated UTI	*E. coli* *Klebsiella* *Proteus* *S. saprophyticus* *Enterococci* *Pseudomonas aeruginosa* Candida	**Low risk for MDR Gram negative bacteria:** Ceftriaxone) 1g IV once daily **OR** Piperacillin-tazobactam 4.5 gm IV q6-8hr **OR** Gentamicin 5 mg/kg IV q 24 hr	**High risk for MDR Gram negative bacteria:** Meropenem 1gm IV every 8 hours infused over 3 hours	Consider imaging if persistent clinical symptoms/instability despite 24-48 hours of appropriate antimicrobial therapy Drug-resistant gram-positive organisms: Add Vancomycin (for MRSA) or Linezolid, Daptomycin (for VRE) to Ceftriaxone Adjust therapy according to culture and susceptibility results.
Complicated UTI	*Proven Carbapenem resistant Enterobacterales (CRE)*	Ceftazidime-avibactam 2.5 gm IV q8hr +/- Aztreonam 2gm IV q 6-8hr		Consult ID CRE Incidence per 1000 positive urine culture is 19.3/1000 (OMASS 2023)

TABLE 10: GUIDELINES FOR TREATMENT OF URINARY TRACT INFECTIONS AND SEXUALLY TRANSMITTED DISEASES IN ADULTS

ANATOMIC SITE/ DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Acute Pyelonephritis	*E. coli* *Klebsiella* *Proteus* *Enterococci* *Pseudomonas aeruginos*a	**If no risk of MDR** Ceftriaxone 1-2g q24hr for 7 to 10 days **OR** Gentamicin 5mg/kg IV q24hr. **If risk of MDR or critical diseases:** Meropenem 1g IV q8hr **OR** Piperacillin-tazobactam 4.5g IV q6hr	**If no risk of MDR** Ciprofloxacin 500mg PO, q12hr or 400 mg IV q12hr for 5-7 days **OR** Levofloxacin IV /PO 750 mg q24hr x 5-7 days **If risk of MDR or critical disease:** Ertapenem 1 gm IV q24hr **OR** Ceftazidime-avibactam 2.5g IV q8hr	Nitrofurantoin and Fosfomycin should not be used for pyelonephritis because of low renal tissue concentration. Tailor the empirical antibiotics to the urine/blood culture final susceptibility result.
Pregnancy Asymptomatic bacteriuria:	*E. coli (70%)* *Klebsiella spp.* *Enterobacter spp.* *Proteus spp.* *Group B Streptococcus*	Nitrofurantoin **(Avoid in 3rd trimester**) 100 mg PO q12hr x 5-7 days	Amoxicillin-clavulanate 500/125 mg PO q8hr x 3-7 days **OR** Cephalexin 500 mg PO q6hr x 3-7 days	Avoid Nitrofurantoin in 3rd trimester due to risk of haemolytic anaemia in the new born.

TABLE 10: GUIDELINES FOR TREATMENT OF URINARY TRACT INFECTIONS AND SEXUALLY TRANSMITTED DISEASES IN ADULTS

ANATOMIC SITE /DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Pregnancy cystitis	as above	Nitrofurantoin 100 mg PO q12hr for 7 days	Amoxicillin-Clavulanate 875/125 mg PO for 10–14 days **OR** Fosfomycin 3g PO single dose	**Contraindicated in pregnancy**: Ciprofloxacin, Tetracycline, **Avoid during 1st trimester:** Trimethoprim-sulfamethoxazole, Nitrofurantoin. **Avoid near term**: Trimethoprim-sulfamethoxazole. A follow up culture (test of cure) should be obtained a week after completion of therapy. Consult ID/micro if bacteriuria persists
Pregnancy Pyelonephritis	Same as for Cystitis	**Mild-moderate**: Ceftriaxone 1g IV q 24 hours **OR** Cefepime 1g IV q12hr **Severe:** Piperacillin-tazobactam 4.5gm IV q6hr	**Mild- Moderate:** Ampicillin 1-2 g IV q6hr **PLUS** Gentamicin 1.5 mg/kg q8hr **Severe**: Meropenem 1g IV q8hr **OR** -Ertapenem 1g IVq24hr	Switch to PO therapy after afebrile for 48 hrs. Duration is for 10-14 days

TABLE 10: GUIDELINES FOR TREATMENT OF URINARY TRACT INFECTIONS AND SEXUALLY TRANSMITTED DISEASES IN ADULTS

ANATOMIC SITE /DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Candidal UTI				
Asymptomatic, Candiduria		No treatment required except if undergoing urologic procedure, in the setting of neutropenia or in low-birth-weight neonates		If possible, remove the urinary catheter or stent
Symptomatic cystitis (or asymptomatic but undergoing urologic procedure or high risk for disseminated infection)		Fluconazole 400 mg (6mg/kg) PO q 24hr for 14 days Treatment should be started before and continued after the procedure.	Amphotericin B 0.3–0.6 mg/kg IV q 24hr (for Fluconazole resistant organisms) For 1–7 days.	Consult ID Bladder irrigation with amphotericin B is NOT recommended for cystitis or pyelonephritis
Candida Pyelonephritis		Fluconazole PO/IV 400 mg (6mg/kg) q 24 hr for 14 days	Amphotericin B 0.5-0.7 mg/kg IV q 24hr (for Fluconazole resistant organisms) for 1-7 days.	Lipid formulations of amphotericin B should not be used to treat urinary tract infections because they do not penetrate into the kidney or achieve adequate concentrations in the urine

TABLE 11: GUIDELINES FOR SEXUALLY TRANSMITTED DISEASES IN ADULTS

ANATOMIC SITE /DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Urethritis / cervicitis/ Proctitis	*Neisseria Gonorrhoea or Chlamydia trachomatis*	Ceftriaxone 500 mg IM stat **PLUS** Doxycycline 100mg PO q 12hr for one week.	Azithromycin 1g PO stat	- treatment is based on syndromic approach as NAAT testing is limited to few centres -50 %of patients with Urethritis / cervicitis/ Proctitis due to *Neisseria Gonorrhoea have concomitant Chlamydia trachomatis or vice versa.* -Treat partner
Urethritis / cervicitis Pregnancy		Ceftriaxone 500 mg IM stat if Chlamydia not excluded add Azithromycin 1g PO stat		Doxycycline is contraindicated in pregnancy
Recurrent or persistent urethral discharge in men treat based on NAAT results	*C. trachomatis* *Mycoplasma genitalium &* *Trichomonas vaginalis* *HSV can also be a cause*	-Consider resistant -Treat based on NAAT results		Repeat NAAT for: - *N. gonorrhoeae* -*C. trachomatis* Send urine-based NAAT test for: -M. genitalium -T. vaginalis Treat the partner
Genital Herpes	Herpes Simplex virus (HSV)	Acyclovir 400mg PO q8hr for 7-10 days or Valacyclovir 1g PO q12hr for 7-10 days		for recurrent genital herpes please refer to Table on treatment of viral infection guidelines

TABLE 11: GUIDELINES FOR SEXUALLY TRANSMITTED DISEASES IN ADULTS

ANATOMIC SITE /DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Vaginal candidiasis	Pseudohyphae & spores- Candida	Clotrimazole cream 1% plus Clotrimazole pessary 500mg	**Mild infection**: Fluconazole 150 mg PO stat **Severe infection or immunocompromised** infection: Fluconazole 150 mg PO q72 hr to be repeated as needed every 72 hrs for 2-3 days.	Microscopic Approach Fluconazole should be avoided during pregnancy
Bacterial Vaginosis	Clue cells- Bacterial vaginosis (BV)	Metronidazole 500 mg PO q12 hrs for 7 days	Clindamycin 100 mg vaginal suppositories at bedtime for three days **OR** Clindamycin 300 mg orally twice daily for 7 days	By Microscope
Trichomoniasis (TV)	Flagellated unicellular protozoa- Trichomonas	Metronidazole 500 mg PO q12hr x 7d for women **OR** 2 g PO x one dose for men		By Microscope
Pelvic Inflammatory Disease (PID)	*N. gonorrhoeae, chlamydia, Bacteroides, Enterobacterales, streptococci, especially S. agalactiae*	**Outpatient** Ceftriaxone 500 mg IM single dose **PLUS,** Doxycycline 100mg q 12hr for 14 days **PLUS,** Metronidazole 500 mg PO q12hr for 14 days **In-patient :** Ceftriaxone	Alternative to Doxycycline is Azithromycin either as: 500 mg q24hr for 1-2 days then 250 mg q24h for a 14-day course **OR** 1g once per week for 2 weeks	The optimal duration of therapy is unknown. A total of 14 days is acceptable

TABLE 11: GUIDELINES FOR SEXUALLY TRANSMITTED DISEASES IN ADULTS

ANATOMIC SITE /DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
		1g IV q24hr **PLUS** Doxycycline 100 mg PO/IV q12hr **PLUS** Metronidazole 500 mg PO/IV q12hr		
Lymphogranuloma venereum (LGV)	Chlamydia Trachomatis	Doxycycline 100mg q12hr for 21 days	Azithromycin 1G weekly x 21 days if patient or partner is pregnant	
Genital Warts	Human papillomaviruses (HPVs)	Podophyllotoxin Solution 5mg/ml	Apply twice daily to lesions for 3 consecutive days each week for 4weeks	
Syphilis	Screen with treponema-specific antibody or RPR/VDRL Test all patients with syphilis for HIV; test all HIV patients for latent syphilis. Indications for LP (CDC): neurologic symptoms, treatment failure, any eye or ear involvement, other evidence of active syphilis (aortitis, gumma, iritis). For penicillin allergy: either desensitise to penicillin or obtain infectious diseases consultation.			
Early syphilis: primary, secondary, or latent <1 yr	*Treponema Pallidum*	Benzathine penicillin G 2.4 IU IM ONE DOSE	Alternative agent in nonpregnant adults: -Doxycycline (100 mg PO q12hr for 14 days) (with no evidence of neurologic, ocular or otic syphilis) **OR** -In case of Penicillin allergy: Ceftriaxone 1g (IM or IV) daily for 10 to 14 days	Patients with neurologic, ocular, or otic manifestations of early syphilis require intravenous (IV) therapy **Jarisch-Herxheimer reaction** is an acute, self-limited, febrile reaction that usually occurs within the first 24 hours after the patient receives therapy for any spirochetal infection, including syphilis (10-35% of cases). It is seen most commonly after treatment of early syphilis.

TABLE 11: GUIDELINES FOR SEXUALLY TRANSMITTED DISEASES IN ADULTS

ANATOMIC SITE /DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Late Latent Syphilis	*Treponema Pallidum*	Benzathine penicillin G 2.4MU IM one injection each week for 3 weeks	For **nonpregnant** patients with late latent syphilis who are Penicillin allergic, Doxycycline (100 mg orally twice daily) can be administered for 28 days	Data are limited for this alternative therapy for late Latent syphilis, so patient needed to be followed closely during treatment
Treatment of neuro/ocular/otic syphilis (Obtain CSF examination)		Penicillin G (3 to 4 million units IV q4hr for 10 to 14 days	Ceftriaxone 2 g (IV or IM) q24hr for 14 days	Consult ID For penicillin allergy: either desensitize to Penicillin or obtain infectious diseases consultation.
Syphilis, Pregnancy	-Monthly quantitative VDRL or equivalent test. If 4-fold increase in titre re-treat. -Doxycycline and tetracycline contraindicated. -Erythromycin is not recommended because of the high risk of failure to cure fetus. -Parenteral (IM or IV) penicillin G is the only therapy with documented safety and efficacy for both mother and fetus during pregnancy. Pregnant women with a history of penicillin allergy should be referred to ID, desensitized and treated with penicillin.			
Primary/ secondary/early latent	*Treponema Pallidum*	Penicillin G benzathine (Bicillin L-A) 2.4 million units IM in a single dose (usually administered as 1.2 million units in each buttock)		
Late latent/tertiary/ unknown duration	*Treponema Pallidum*	Penicillin G benzathine (Bicillin L-A) 2.4 million units IM once weekly (usually administered as 1.2 million units in each buttock) for 3 weeks (7.2 million units' total dose)		

TABLE 11: GUIDELINES FOR SEXUALLY TRANSMITTED DISEASES IN ADULTS

ANATOMIC SITE/ DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Neurosyphilis (including ocular syphilis)		Aqueous crystalline penicillin G IV 18 to 24 million units per day, administered as 3 to 4 million units IV every 4 hours or as a continuous infusion over 24 hours for 10 to 14 days		
Post-exposure prophylaxis		Penicillin G benzathine (Bicillin L-A) 2.4 million units IM in a single dose (usually administered as 1.2 million units in each buttock)		

TABLE 12: GUIDELINES FOR TREATMENT OF SYSTEMIC INFECTIONS

ANATOMIC SITE /DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Important: Obtain careful epidemiologic history				
Brucellosis	*B. abortus* (cattle), *B. suis* (swine), *B. melitensis*, (goats), *B. canis* (dogs)	**No focal disease:** Doxycycline 100 mg PO q12hr for 6 weeks **PLUS** Gentamicin 5 mg/kg IV OD for the first 7 days	Doxycycline 100 mg PO q12hr **PLUS** Rifampicin 600–900 PO OD for 6 weeks	Consult ID
		Spondylitis, sacroiliitis: Gentamicin 5 mg/kg IV q 24hr for the first 7-14 days **PLUS** Doxycycline 100 mg PO q12hr PLUS Rifampicin 600-900 mg PO q24hr for minimum of 3 months	Cip 750 mg PO q12hr **PLUS** Rifampicin 600–900 mg PO q24hr both for a minimum of 3 months	
		Neuro-brucellosis : -Doxycycline 100 mg IV/PO q12hr **PLUS** Rifampicin 600-900 mg PO q24hr both for at least 12 weeks; the duration of therapy is often extended up to 4 to 6 months **PLUS** Ceftriaxone 2g IV q12hr (for the first 4 to 6 weeks) and until CSF parameters return to normal		
		Endocarditis: Surgery **PLUS** combination of (Doxycycline **PLUS** Rifampicin **PLUS** TMP-SMX for 6 weeks to 6 months) **PLUS** Gentamicin 5 mg/kg IV q24hr for 2–4 weeks		
		Pregnancy: <36 weeks gestation Rifampicin 600-900 mg PO q24hr **PLUS** TMP-SMX 960 mg PO q12hr for 4 weeks **<u>Pregnancy: >= 36 weeks gestation Rifampicin monotherapy until delivery</u>**	(TMP-SMX may cause kernicterus if given during the last week of pregnancy)	Consult ID Limited data on treatment of brucellosis in pregnancy

TABLE 12: GUIDELINES FOR TREATMENT OF SYSTEMIC INFECTIONS

ANATOMIC SITE/ DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Leptospirosis	*Leptospira*	**Mild illness:** Doxycycline 100 mg PO q12hr **OR** Amoxicillin 500 mg PO q8hr for 7 days **Severe illness:** Penicillin G 1.5 million U IV q6hr **OR** Ceftriaxone 2 gm IV q24hr For 7 days	**Mild illness** Azithromycin 500 mg PO q24hr for 3 days **Severe illness:** Doxycycline 100 mg IV q12hr for 7 days	Send serology and Blood, urine or CSF for leptospira PCR. urine of domestic livestock, dogs and small rodents
Typhoid and Paratyphoid fever	*Salmonella* Typhi *Salmonella* Paratyphi A, B, C	Ceftriaxone 2g IV q24hr for 7–14 days (for uncomplicated infection)	Ciprofloxacin 500 mg PO q12hr **OR** 400 mg IV q12hr for 7–14 days **OR** Azithromycin 1g PO for one dose, then 500 mg q24hr for 5–7 days	Susceptibility test results are essential to guide therapy as resistance to Ciprofloxacin is increasing. In cases with a history of travel to countries with high prevalence of multi-drug resistant strains e.g XDR (such as Pakistan), consider treating with Azithromycin for uncomplicated infection and Meropenem for complicated or severe infection. Dexamethasone is used in severe infections, first dose should be prior to antibiotics 3 mg/kg IV, then 1 mg /kg IV q6hr x 8 doses for 48 hrs.

TABLE 12: GUIDELINES FOR TREATMENT OF SYSTEMIC INFECTIONS

ANATOMIC SITE/ DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Salmonella bacteraemia (non-typhoidal) Screen for HIV infection	*Salmonella enteritidis* or other serotypes from animal sources	Ceftriaxone 2 g IV q24hr	Ciprofloxacin 400 mg IV q12hr **OR** Levofloxacin 750 PO q24hr - Do not use quinolones until susceptibility is determined.	Rule out endovascular infection, osteomyelitis in sickle cell disease patients. **Treatment duration** -for 14 days (immunocompetent) if no extra-intestinal infection -for ≥6 weeks if extra-intestinal infection e.g mycotic aneurysm, endocarditis, or immunosuppressed patient. -Consider treating with Meropenem if XDR Salmonella is suspected. -Azithromycin 1 gm for the first few days then, 500 mg PO q24hr for 5–7 days is another alternative treatment.

TABLE 12: GUIDELINES FOR TREATMENT OF SYSTEMIC INFECTIONS

ANATOMIC SITE/ DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Q Fever, **acute**	*C. burnetii*	Doxycycline 100 mg PO q12hr for 2 weeks	Fluoroquinolone (e.g. Moxifloxacin 400 mg PO q24hr for 2-3 weeks).	h/o animal contact Consult ID
Q fever, **chronic**	*C.burnetii*	**Endocarditis / infected graft or aneurysm:** Doxycycline 100 mg IV/PO 12 hrs **PLUS** Hydroxychloroquine 200 mg PO q8hr for at least 18 months. **Infected bone, joint, liver**: same as above until fall in antibody titre.		Consult ID Diagnosis: IFA > 800 phase 1 IgG plus evidence of endocarditis or vasculopathy or signs of chronic Q fever or positive Coxiella burnetii PCR of blood or tissue. Possible chronic Q fever = IFA > 800 phase 1 IgG.
Sepsis (suggested empiric therapy assumes patient is bacteremic) Not neutropenic No clear source Life-threatening Refer to specific sections of this guide for the empiric recommendation therapy for specific source of infection	Aerobic Gram-negative *S. aureus*, streptococci	Piperacillin/ tazobactam 4.5g IV q6hr **PLUS** Vancomycin 15-20 mg/kg IV q 8-12 hrs Stop Vancomycin if no resistant organisms are isolated after 48 hours from cultures	Meropenem 1-2 g q8hr Vancomycin **OR** Cefepime 2g q8hr **PLUS** Vancomycin 15-20 mg/kg IV q 8-12 hrs. If high prevalence of MDR Gram-negative (such as Carbapenem-resistant Enterobacterales [CRE] or MDR-GNB) consider adding IV Colistin or newer agents e.g. Ceftazidime-avibactam	Obtain appropriate cultures prior to antimicrobial therapy Check the patient old cultures and their antibiograms Could substitute Linezolid for vanco, however Linezolid is bacteriostatic against *S. aureus.* Stop Vancomycin and Colistin if no resistant organisms are isolated from cultures Consider adding anti-fungal agent if suspected fungal infection

TABLE 12: GUIDELINES FOR TREATMENT OF SYSTEMIC INFECTIONS

ANATOMIC SITE/ DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Septic Shock syndrome	See specific syndromes Proven therapies: replete intravascular volume with IV saline, goal is CVP >8 cm within 6 hrs of admission Attempt to correct the source of bacteraemia. Obtain cultures then start appropriate antibiotics, time of first dose is crucial Appropriate pressors if still hypotensive and elevated lactate	Piperacillin/ tazobactam 4.5 gm IV q6hr **PLUS** Vancomycin 15-20 mg/kg IV q 8-12 hrs	Meropenem + Vancomycin If high prevalence of MDR Gram-negative (such as CRE or MDR-GNB), consider adding IV Colistin or newer agents e.g Ceftazidime-avibactam	Hydrocortisone in stress dose 100 mg IV q8h if BP persistent after fluids and one pressor. Benefit in patients with severe sepsis (systolic pressure <90 mmHg)
Toxic shock syndrome due to Paeniclostridium sordellii present as shock, capillary leak, haemoconcentration, very high WBCs, afebrile	*Paeniclostridium sordellii (formerly Clostridium sordellii*)	See above shock syndrome Penicillin G 18–20 million units/day divided q4-6hr **PLUS** Clindamycin 900 mg IV q8hr	Organism is usually sensitive to Cephalosporins, Carbapenems and Tetracycline	Toxic shock syndrome due to Paeniclostridium sordellii present as shock, capillary leak, haemoconcentration, very high WBCs, afebrile
Staphylococcal toxic shock syndrome-	*S. aureus* (toxic shock-toxin mediated)	Cloxacillin 2g IV q4hr for 10-14 days if no focus identified **PLUS** Clindamycin.	If MRSA suspected/ confirmed: Vancomycin 15-20 mg/kg IV q 8-12 hrs **PLUS** Clindamycin	IVIG 1 gm per kg on day 1 then 0.5 gm per kg days 2 & 3 for patients unresponsive to fluids and vasopressors.

TABLE 12: GUIDELINES FOR TREATMENT OF SYSTEMIC INFECTIONS

ANATOMIC SITE/ DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
		900 mg IV q8hr until patient is stable for 48-72 hrs	900 mg IV q8hr **PLUS** IVIG	
Streptococcal toxic shock syndrome	Group A, C, G streptococci Group B streptococcus can cause Toxic Shock-like syndrome	Penicillin G 4 million units q4hr **PLUS,** Clindamycin 900 mg IV q8hr If Clindamycin susceptible, continue Clindamycin for 5-7 days while continuing Penicillin, if Clindamycin resistant, can use Linezolid 600 mg IV q12hr	Ceftriaxone 2gm IV q24hr **PLUS** Clindamycin 900 mg IV q8hr	IVIG associated with reduction in sepsis related organ failure IVIG dose 1 gm per kg on day 1 then 0.5 gm per kg on days 2 & 3. Consider household contacts prophylaxis for GAS Duration: individualise, but minimum of 14 days if associated bacteremia
Febrile neutropenia	Fever as a single oral temperature of ≥38.3°C or a temperature of ≥38.0°C sustained over a one-hour period in neutropenic patients ((ANC) <1500 or 1000 cells/μL)			
Febrile neutropenia Low risk (ANC >100, normal CXR, normal liver function tests and creatinine, no clinical IV site/tunnel infection, Temperature <39, no abdominal pain, no comorbidities. Neutropenia <7 days)	Aerobic Gram-negative bacilli, aerobic gram-positive cocci	Ciprofloxacin 750 mg PO q12hr **PLUS** Amoxicillin-clavulanate 500/125 mg PO q8hr	Moxifloxacin 400 mg PO q24hr	**Duration**: continue until patient is afebrile and ANC>500 cells Obtain appropriate cultures and radiological investigations to identify the focus of infection. Adjust antibiotics according to susceptibility profiles

TABLE 12: GUIDELINES FOR TREATMENT OF SYSTEMIC INFECTIONS

ANATOMIC SITE /DIAGNOSIS	ETIOLOGIES	SUGGESTED REGIMENS		COMMENTS
		FIRST LINE	SECOND LINE	
Febrile neutropenia **High Risk:** Clinically stable (anticipate >7 days, profound neutropenia & active comorbidities Renal and liver impairment, pneumonia, mucositis). Initial fever Same as above	Aerobic Gram-negative bacilli, *aerobic gram-positive cocci* *Pseudomonas* *Fungi (candida)* *Viral (HSV, VZV, Respiratory viruses)*	Monotherapy with: Piperacillin-tazobactam 4.5g IV q 6hr. Consider Vancomycin if indicated (see comments)	-Cefepime **OR** Piperacillin/tazobactam **PLUS,** Aminoglycoside **OR** -Cefepime **PLUS** Ciprofloxacin). Consider Vancomycin if indicated (see comments)	Consider adding **Vancomycin** if: history of MRSA infection OR colonization OR suspected CRBSI, skin and soft tissue infection or pneumonia or mucositis or positive blood culture with Gram-positive organisms. -If suspected ESBL consider Meropenem
Febrile neutropenia Persistent fever or new fever after 4–7 days in clinically stable patient without established bacterial infection	*Candida spp.*, *Aspergillus*, VRE Gram-negative bacilli	Continue antibiotics as above and add antifungal coverage: -if receiving Fluconazole as prophylaxis or no fungal prophylaxis, start Voriconazole or Caspofungin -if receiving Voriconazole or Posaconazole as prophylaxis then start Amphotericin B liposomal.		Prior to antifungal: obtain cultures, biopsy suspected skin lesions, CT chest/abdomen/sinuses, galactomannan assay, consult ID
Febrile neutropenia Clinically unstable patient despite appropriate antibiotic and antifungal coverage		Meropenem **PLUS** Vancomycin **PLUS** Aminoglycoside **PLUS** Antifungal		Obtain cultures and radiological workup. Consult ID

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TABLE 13: GUIDELINES FOR TREATMENT OF COMMON VIRAL INFECTIONS			
ANATOMIC SITE /DIAGNOSIS	**FIRST LINE**	**SECOND LINE**	**COMMENTS**
Varicella-zoster virus (VZV) (Chickenpox)	Valacyclovir 1g q8hr PO For 7 days	Acyclovir 20 mg/kg PO q6hr **OR** Acyclovir 10 mg/kg IV q8hr for 5 days	Treatment best started within 24 hrs from onset of rash **The following situations should be treated anytime**: adults, Immunocompromised, patients on steroid, pregnancy, chronic skin or lung disease, **Hospitalisation and IV Rx should be offered for the following patients with**: -respiratory symptoms -CNS complication - Haemorrhagic rash -Sever disease -Immunocompromised
Varicella-zoster virus (VZV), Post exposure	**In post-exposure scenarios** is typically administered as varicella-zoster immune globulin (VZIG). **Target individuals**: -Immunocompromised patients of any age who lack evidence of immunity to VZV -Pregnant women who lack evidence of immunity to VZV -Newborns of mothers who develop varicella five days before to two days after delivery. -Hospitalised premature infants born at ≥28 weeks of gestation whose mothers do not have evidence of immunity, -Hospitalised premature infants born at <28 weeks of gestation or who weigh ≤1000 g at birth, regardless of maternal evidence of immunity to varicella **Timing**: should be given as soon as possible and within 10 days of exposure **Dosing** of VZV IVIG based on weight: <2 kg – 62.5 international units -2.1 to 10 kg – 125 international units 10.1 to 20 kg – 250 international units 20.1 to 30 kg – 375 international units 30.1 to 40 kg – 500 international units ≥40 kg – 625 international units **B) Anti-viral prophylaxis: Please refer to ID**		

TABLE 13: GUIDELINES FOR TREATMENT OF COMMON VIRAL INFECTIONS

ANATOMIC SITE /DIAGNOSIS	FIRST LINE	SECOND LINE	COMMENTS
Shingles	Valacyclovir 1g PO q8hr for 7 days	Mild-Moderate: Acyclovir 800 mg PO 5 x a day continue for 2 days after lesions are crusted Severe infections (patients with ocular, neurological and disseminated (> one dermatome) Acyclovir IV 10 mg/kg q8hr for 7-14 days	for severe and pregnant patients Consult ID Adjust the dosage for renal failure
Oral HSV (first episode) Oral HSV (recurrent) Rx is only indicated for severe recurrence that happens occasionally especially if there is a prodrome	Valacyclovir 1g PO q12hr Valacyclovir 2 g PO q12hr for one day)	Acyclovir: 400 mg PO q8hr or 200 mg five times daily (For smaller children 15mg/kg 5 times/day) **OR** Famciclovir: 250 mg PO q8hr or 500 mg PO q12hr Acyclovir 400 mg PO q8hr for five days **OR** Famciclovir 750 mg PO q12hr for one day **OR** 1500 mg as a single dose)	Duration of treatment for 7-10 days, best within 72 hr but also beneficial within the first week of onset to improve course of infection

TABLE 13: GUIDELINES FOR TREATMENT OF COMMON VIRAL INFECTIONS

ANATOMIC SITE /DIAGNOSIS	FIRST LINE	SECOND LINE	COMMENTS
Genital herpes simplex infection (first episode)	Valacyclovir 1g PO q12hr **OR** Acyclovir PO 400 mg q8hr **OR** Famciclovir PO 250 mg q8hr	Acyclovir IV (5 mg/kg every 8 hrs) for complicated cases with CNS or disseminated infection	Treatment should be started as soon as possible. duration 7-10 days **Pregnancy**: -Consult ID to assess the need for suppressive therapy and guide on the mode of delivery. -Primary HSV: increased risk of dissemination, including severe hepatitis, Risk greatest in 3rd trimester
Recurrent genital herpes simplex infection	Valacyclovir 1g PO q12hr for 5 days **OR** Acyclovir 800 mg PO q8hr a day for 2 days, alternatively 200 mg PO 5 times a day for 5 days, alternatively 400 mg PO q8hr a day for 3–5 days.	Famciclovir:125 mg q12hr for 5 days, alternatively 1g q12hr for 1 day	Consult ID for the mode of delivery and the need for suppressive (longer term) therapy (can be considered for frequent recurrences with severe infection)
Influenza	-Annual influenza vaccination is essential for all those at risk of influenza infection. -Antiviral drugs are not a substitute for vaccination, which remain the most effective way of preventing illness from influenza. This is particularly important in pregnant women. -Testing for influenza, RSV and SARS-CoV-2 are essential and according to our national respiratory infection surveillance protocol (NARI). PCR tests are preferred -Empiric therapy should be started for all patients who are hospitalised, have severe or progressive influenza or are at higher risk of complications due to age or underlying medical conditions. -Check for concomitant bacterial pneumonia. -No antibiotic therapy or prophylaxis is indicated for uncomplicated influenza infection. -Empiric treatment for bacterial co-infection is recommended in influenza patients who: Present with respiratory failure or hemodynamic instability. Fail to improve or worsen after 3–5 days of antiviral therapy and supportive care		

TABLE 13: GUIDELINES FOR TREATMENT OF COMMON VIRAL INFECTIONS

ANATOMIC SITE /DIAGNOSIS	FIRST LINE	SECOND LINE	COMMENTS
Influenza Treatment	Oseltamivir 75 mg PO q12hr for 5 days		Give for 10 days if immunocompromised For children and people with body weight <40 Kg, the dose should be adjusted to weight
Influenza (prophylaxis)	Oseltamivir 75 mg PO q24hr for 10 days		This is only given to high-risk groups after close contact with influenza cases in the setting where influenza vaccination is contraindicated or not administered yet. This is not substitute for flu vaccination

TABLE 14 A: GUIDELINES FOR EMPERIC TREATMENT OF PEDIATRIC INFECTIONS

Access, Watch and Reserve antibiotics definitions

Access antibiotics are antibiotics with a narrow spectrum of activity, generally with less side-effects, a lower potential for the selection of antimicrobial resistance and of lower cost. They are recommended for the empiric treatment of most common infections and should be widely available.

Watch antibiotics generally have a higher potential for the selection of antimicrobial resistance and are more commonly used in sicker patients in the hospital facility setting. Their use should be carefully monitored to avoid overuse.

Reserve antibiotics are last-resort antibiotics that should only be used to treat severe infections caused by multi-drug-resistant pathogens.

Access, Watch and Reserve antibiotics in the 2021 WHO Model list of essential medicines and WHO Model list of essential medicines for children

Access group		Watch group		Reserve group	
Amikacin Amoxicillin Amoxicillin/ Clavulanate Ampicillin Ampicillin/ Sulbactam Cefalexin Cefazolin	Clindamycin Cloxacillin Doxycycline Gentamicin Metronidazole Nitrofurantoin Penicillin Trimethoprim/ Sulfamethoxazole	Azithromycin Cefixime Cefotaxime Ceftazidime Ceftriaxone Cefuroxime Ciprofloxacin Clarithromycin Erythromycin	Piperacillin/ Tazobactam Vancomycin	Cefiderocol Ceftazidime/ avibactam Colistin Fosfomycin Linezolid Meropenem* Meropenem/ Vaborbactam	Plazomicin Polymyxin B

*For our local needs in Oman, within the pediatric context, we have opted to list meropenem as a reserve group antibiotic.

NEONATAL INFECTIONS (for babies admitted in the neonatal units)			
SYSTEM/ DIAGNOSIS	**SUSPECTED PATHOGENS**	**INITIAL THERAPY**	**ALTERNATIVE THERAPY/ COMMENTS**
Early Onset Sepsis (first week of life)	*Group B streptococci, Listeria, E. coli*	Ampicillin **AND** Gentamicin	Consider addition of Cefotaxime if there is evidence or high suspicion for meningitis. See meningitis below. Consult ID for meningitis or refractory septic shock. **Caution:** early and prolonged antibiotic use in neonates has been associated with increased risk of necrotizing enterocolitis.
Late Onset Sepsis (after first week of life)	*Staphylococcus, Group B streptococci, Listeria, E. coli, other gram negatives*	*Hemodynamically stable:* Cloxacillin **AND** Gentamicin **OR** Amikacin *If central line is present*: Vancomycin **AND** Amikacin	For septic shock or meningitis, use Ceftazidime instead of Cloxacillin, continue aminoglycoside, consider ID consult (Meropenem needed in more critical cases). Piperacillin/ Tazobactam is an option when meningitis is unlikely. Consider local susceptibility patterns. Monitor renal function carefully with Vancomycin, Gentamicin, Amikacin.
Meningitis	*Group B streptococci, Listeria, E. coli* *For Meningoencephalitis, focal seizures, skin or mucosal lesions in baby or mother: suspect HSV*	Cefotaxime with **OR** without Gentamicin **OR** Amikacin *Listeria suspected:* Add Ampicillin *HSV suspected:* Add Acyclovir	Consult ID for meningitis. Addition of Gentamicin may have beneficial synergistic effect against some bacterial organisms (GBS). **For Gram Negative Meningitis**: use Meropenem **AND** Amikacin while awaiting culture results
Necrotizing Enterocolitis	*Enteric gram negatives, anaerobes, enterococcus*	Ampicillin **AND** Metronidazole **AND** Gentamicin	Consider ID consult for refractory cases.
Color Code: Access Group Antibiotic, Watch Group Antibiotic, Reserve Group Antibiotic			

NEONATAL INFECTIONS, continued (for babies admitted in the neonatal units)			
SYSTEM/ DIAGNOSIS	**SUSPECTED PATHOGENS**	**INITIAL THERAPY**	**ALTERNATIVE THERAPY/ COMMENTS**
Candida sepsis	*Candida species*	Amphotericin B (first line) **OR** Fluconazole (acceptable alternative if not previously on prophylaxis)	Consult ID for Candida sepsis. Conventional Amphotericin B deoxycholate is the preferred formulation for neonates (better renal penetration). Liposomal Amphotericin B is an acceptable alternative, if no renal involvement. Note difference in dosing. Coordinate with pharmacy for dosing and to avoid safety incidents.
Ophthalmia neonatorum (conjunctivitis)	*Neisseria gonorrhoeae, Chlamydia trachomatis, Staphylococcus aureus, Haemophilus influenzae* *Viral causes: HSV*	*N. gonorrhoae*: Cefotaxime 100mg/kg IV or IM single dose *C. trachomatis*: Erythromycin (12.5mg/kg/dose every 6 hours orally for 14 days) **OR** Azithromycin (20mg/kg/dose once daily orally for 3 days)	Send testing for *N. gonorrhoeae* and *C. trachomatis* (swab for NAAT), send swab for bacterial culture (pus swab). If HSV suspected, send testing (PCR from swabs, blood, CSF), and start IV Acyclovir.
Color Code: Access Group Antibiotic, Watch Group Antibiotic, Reserve Group Antibiotic			

COMMON PEDIATRIC INFECTIONS Lower Respiratory Tract			
SYSTEM/ DIAGNOSIS	**SUSPECTED PATHOGENS**	**INITIAL THERAPY**	**ALTERNATIVE THERAPY/ COMMENTS**
Bronchiolitis (<2 years of age)	*Respiratory Syncytial Virus, Rhinovirus, Parainfluenza virus, human Metapneumovirus*	No antibiotics or antivirals are indicated for the vast majority of cases.	Secondary bacterial infection is uncommon and should only be considered in select cases (worsening symptoms after 4-5 days, high grade fevers with elevated inflammatory markers, lobar infiltrate). Influenza virus is less commonly associated with bronchiolitis, empiric Oseltamivir is not indicated.
Community Acquired Pneumonia (>2 months of age)	*Respiratory viruses. Streptococcus pneumoniae, Haemophilus influenza, Staphylococcus aureus, Mycoplasma pneumoniae.*	*Most cases:* High dose Amoxicillin **OR** IV Ampicillin *Requires High Dependency, HFNC or NIV, or Aspiration Pneumonia:* IV Amoxicillin/ Clavulonate *Septic Shock or Requires Mechanical Ventilation:* Vancomycin **AND** Ceftriaxone	*For patients with a simple pleural effusion*: use Ceftriaxone *For patients with loculated empyema or necrotizing pneumonia*: use Clindamycin and Ceftriaxone. Consult ID and surgery. During high community transmission of Influenza virus, consider adding empiric Oseltamivir. Send RVP/PCR test. Consider adding Azithromycin for school-aged children with findings of atypical pneumonia (prolonged symptoms, bilateral chest findings, extrapulmonary manifestations).
Hospital Acquired and Healthcare Associated Pneumonia (>2 months of age)	*Streptococcus pneumoniae, Haemophilus influenza, Staphylococcus aureus, Pseudomonas aeruginosa*	Mild and low risk for *Pseudomonas*: IV Amoxicillin/ Clavulonate Moderate/Severe, Intubated/ Tracheostomized/ Immunocompromised: IV Piperacillin/ Tazobactam	For septic patients, patients with central lines, and patients with previous MRSA colonization/infection: add Vancomycin Risk factors for *Pseudomonas aeruginosa* include: mechanical ventilation, immunodeficiency, tracheostomy, bronchiectasis, previous colonization/infection with *Pseudomonas*.
Color Code: Access Group Antibiotic, Watch Group Antibiotic, Reserve Group Antibiotic			

COMMON PEDIATRIC INFECTIONS ENT and Upper Respiratory Tract			
SYSTEM/ DIAGNOSIS	**SUSPECTED PATHOGENS**	**INITIAL THERAPY**	**ALTERNATIVE THERAPY/ COMMENTS**
Pharyngitis/ Tonsillitis (streptococcal)	*Streptococcus pyogenes (GAS)*	Amoxicillin 25mg/kg/dose every 12 hours *Penicillin allergy:* Clindamycin **OR** Azithromycin	Most cases of pharyngitis are viral. GAS infection should be confirmed by the rapid antigen test, NAAT, or culture, to prevent overuse of antibiotics.
Acute Otitis Media (AOM)	*Streptococcus pneumoniae, Haemophilus influenzae, Moraxella catarrhalis*	Amoxicillin (5-10 days) Mild, non-IgE Penicillin allergy*:* Cephalexin IgE-mediated or severe Penicillin allergy: Clindamycin (5-10 days) **OR** Azithromycin (3-5 days)	**Consider 48 hr observation** before starting antibiotics for non-severe cases in children >2 years. Amoxicillin dose: 30-45mg/kg/dose every 12 hrs (high dose preferred for AOM) Use Amoxicillin/Clavulonate for patients not responding to Amoxicillin, or experiencing recurrence after recent treatment with Amoxicillin.
Acute Sinusitis	*Streptococcus pneumoniae, Haemophilus influenzae, Moraxella catarrhalis*	Amoxicillin 15-30mg/kg/dose every 8 hours (10 days) **OR** Amoxicillin/ Clavulonate (10 days)	For standard dose formulation of Amoxicillin/Clavulonate (7:1) give 15-25mg/kg/dose every 12 hours For extra strength formulation (high dose) of Amoxicillin/Clavulonate (14:1) give 45mg/kg/dose every 12 hours
Dental Abscess	*Streptococcus pyogenes (GAS), mixed oral flora*	Amoxicillin/ Clavulonate	Alternative: Clindamycin Tooth extraction is often necessary.
Retropharyngeal abscess	*Streptococcus pyogenes (GAS), mixed oral flora*	IV Amoxicillin/ Clavulonate **OR** IV Clindamycin **AND** Ceftriaxone	Consult ID team. Consider early surgical management by ENT. Send pus for culture.
Color Code: Access Group Antibiotic, Watch Group Antibiotic, Reserve Group Antibiotic			

COMMON PEDIATRIC INFECTIONS Eyes			
SYSTEM/ DIAGNOSIS	**SUSPECTED PATHOGENS**	**INITIAL THERAPY**	**ALTERNATIVE THERAPY/ COMMENTS**
Conjunctivitis (>3 months of age)	*Often is viral or allergic. Bacterial causes: Staphylococcus aureus, Haemophilus influenzae, Streptococcus pneumoniae*	*Viral*: topical antihistamine, supportive *Purulent/Bacterial*: Topical Ofloxacin **OR** Ciprofloxacin ophthalmic drops for 5 to 7 days	Consult Ophthalmology if red flags are present: - Reduced visual acquity - Headache and nausea - Photophobia - Foreign body sensation - Ciliary flush, corneal opacity - Fixed pupil - Profuse purulent discharge
Periorbital (Preseptal) Cellulitis	Skin origin : *Staphylococcus aureus, Streptococcus pyogenese* *Sinus origin: respiratory flora*	IV Cefazolin **OR** Cloxacillin If MRSA suspected: Clindamycin	If originating from sinusitis: IV Amoxicillin/Clavulonate Transition to oral therapy recommended in mild cases with significant improvement.
Orbital Cellulitis	*Streptococcus pneumoniae, Streptococcus pyogenes, Haemophilus influenzae, Staphylococcus aureus, Anaerobes*	IV Ceftriaxone **AND** IV Clindamycin	Consider CT to assess the need for surgical intervention. Consider ID, ENT and ophthalmology consultations.
Color Code: Access Group Antibiotic, Watch Group Antibiotic, Reserve Group Antibiotic			

COMMON PEDIATRIC INFECTIONS Urinary Tract Infections			
SYSTEM/ DIAGNOSIS	**SUSPECTED PATHOGENS**	**INITIAL THERAPY**	**ALTERNATIVE THERAPY/ COMMENTS**
Urinary Tract Infection (>3 months of age) **Uncomplicated**	*E. coli*	Oral Amoxicillin/ Clavulonate Oral Trimethoprim/ Sulfamethoxazole Afebrile cystitis: consider Nitrofurantoin Duration for febrile UTI in otherwise healthy children: 7-10 days. Duration for afebrile UTI (cystitis): 3-5 days.	Always obtain appropriate urine specimen for culture prior to initiating antibiotics (catheter specimen for infants <2 years of age, clean-catch specimen for toilet trained children >2 years). Bag specimens are only suitable for urinalysis, never send for culture. Diagnosis of UTI requires evidence of pyuria and significant bacterial growth with compatible symptoms. Obtain renal ultrasound for first-time UTI in infants <2 years of age. Nitrofurantoin is contraindicated in patients with G6PD deficiency.
Urinary Tract Infection (>3 months of age) **Complicated by: urosepsis or immunodeficiency or failure of outpatient therapy**	*E. coli, Enterococcus, other enteric gram negatives*	IV Ampicillin **AND** Gentamicin **OR** IV Ceftriaxone AND Gentamicin	Always obtain appropriate urine specimen for culture prior to initiating antibiotics (catheter specimen for infants <2 years of age, clean-catch specimen for toilet-trained children >2 years). Bag specimens are only suitable for urinalysis, never send for culture. Review results of prior cultures. Consult ID for multi-drug resistant organisms. For patients with septic shock, hemodynamic instability, inotropic support requirement, use Piperacillin/Tazobactam or Meropenem with Amikacin.
Color Code: Access Group Antibiotic, Watch Group Antibiotic, Reserve Group Antibiotic			

COMMON PEDIATRIC INFECTIONS Sepsis			
SYSTEM/ DIAGNOSIS	**SUSPECTED PATHOGENS**	**INITIAL THERAPY**	**ALTERNATIVE THERAPY/ COMMENTS**
Sepsis (>3 months of age) **Community Acquired**	*Streptococcus pneumoniae, Streptococcus pyogenese, Staphylococcus aureus, Haemophilus influenzae, enteric gram negatives*	IV Vancomycin **AND** Ceftriaxone **AND** (if signs of shock) Gentamicin (7.5mg/kg STAT dose)	Addition of Gentamicin STAT dose is especially important for patients with signs of shock, as it significantly improves coverage for enteric gram negative organisms. The decision to continue Gentamicin for subsequent doses depends on clinical status, renal function, and culture results. Monitor renal function carefully.
Sepsis (>3 months of age) **Hospital Acquired or Related** **Children with central venous access device**	*Streptococcus pneumoniae, Streptococcus pyogenese, Staphylococcus aureus, Haemophilus influenzae, enteric gram negatives, Pseudomonas aeruginosa*	IV Vancomycin **AND** Piperacillin/ Tazobactam **AND** (if signs of shock) Amikacin (15mg/kg STAT dose)	Review previous microbiology results to guide optimal antibiotic choices. Consult ID immediately for patients with history of multi-drug resistant (MDR) organisms, and patients requiring PICU care. The decision to continue Gentamicin for subsequent doses depends on clinical status, renal function, and culture results. Monitor renal function carefully.
Fever and Neutropenia (>3 months of age) (absolute neutrophil count <0.5x10^9/L or <1x10^9/L with predicted decline over the next 48 hours)	*Pseudomonas aeruginosa, Viridans streptococci, Streptococcus pneumoniae, Streptococcus pyogenese, Staphylococcus aureus, Haemophilus influenzae, enteric gram negatives*	*Stable patient:* IV Piperacillin/ Tazobactam *Central venous access device, recent Cytarabine, previous MRSA:* add IV Vancomycin *Septic patient, signs of shock:* Add IV Amikacin	Upgrading Piperacillin/Tazobactam to Meropenem is restricted to patients who require inotropic support or who have proven ESBL infection. Consult ID immediately for patients with history of multi-drug resistant (MDR) organisms, and patients requiring PICU care.
Color Code: Access Group Antibiotic, Watch Group Antibiotic, Reserve Group Antibiotic			

COMMON PEDIATRIC INFECTIONS Central Nervous System			
SYSTEM/ DIAGNOSIS	**SUSPECTED PATHOGENS**	**INITIAL THERAPY**	**ALTERNATIVE THERAPY/ COMMENTS**
Meningitis (>3 months of age)	*Enteroviruses, other respiratory viruses. Streptococcus pneumoniae, Haemophilus influenzae, Neisseria meningitides.*	IV Ceftriaxone with **OR** without IV Vancomycin	Consult with ID team immediately (<1 hr) regarding need for steroids and other management choices.
Encephalitis or Meningoencephalitis (>3 months of age)	*In addition to meningitis pathogens, Mycoplasma pneumoniae, Influenza viruses, Dengue viruses, Herpes Simplex virus (HSV), Malaria.*	IV Ceftriaxone **AND** IV Acyclovir with **OR** without IV Vancomycin	Consult ID and neurology teams immediately. Consider autoimmune etiologies as well. During high community transmission of Influenza virus, consider adding empiric Oseltamivir. Send RVP/PCR test.
Brain Abscess	*Mixed respiratory tract flora*	IV Ceftriaxone **AND** IV Vancomycin **AND** IV Metronidazole	Consult ID and Neurosurgery. Consider Cefepime or Ceftazidime in patients at risk for *Pseudomonas*. Consider Meropenem in patients at risk for resistant gram negative organisms.
Cerebrospinal Fluid Shunt Infection	*Coagulase-negative staphylococcus, Cutibacterium acnes, Staphylococcus aureus, Pseudomonas aeruginosa, enteric gram negatives.*	IV Vancomycin **AND** IV Cefepime **OR** IV Ceftazidime	Obtain CSF culture for all patients, preferably before antibiotic administration. Shunt removal/externalization is recommended. Consult ID and neurosurgery. Consider Meropenem in patients at risk for resistant gram negative organisms (e.g. ESBL).
Color Code: Access Group Antibiotic, Watch Group Antibiotic, Reserve Group Antibiotic			

COMMON PEDIATRIC INFECTIONS Skin and Soft Tissue			
SYSTEM/ DIAGNOSIS	**SUSPECTED PATHOGENS**	**INITIAL THERAPY**	**ALTERNATIVE THERAPY/ COMMENTS**
Cellulitis Outpatient therapy	*Staphylococcus aureus, Streptococcus pyogenes*	Oral Flucloxacillin 25mg/kg/dose every 6 hours	Alternative: oral Cephalexin 25mg/kg/dose every 6 hours Duration: typically 5-7 days for uncomplicated cases.
Cellulitis Inpatient therapy	*Staphylococcus aureus, Streptococcus pyogenes*	IV Cefazolin 33mg/kg/dose every 8 hours **OR** IV Cloxacillin 50mg/kg/dose every 6 hours	Indications for admission include: signs of systemic inflammation, rapid progression, underlying medical conditions, inability to tolerate oral medication. If at risk for MRSA (previous infection/colonization, recent hospitalization): use IV Clindamycin
Impetigo	*Staphylococcus aureus, Streptococcus pyogenes*	*Mild and localized*: topical Mupiricin *Extensive*: oral Flucloxacillin or Cephalexin	If MRSA suspected: use Clindamycin
Infected bite wound	*Pasteurella multocida, Eikenella corrodens, Streptococci, Staphylococci, Anaerobes*	Amoxicillin/ Clavulonate (oral for mild cases, IV for patients requiring hospitalization)	Alternative for hospitalized patients (penicillin allergy, sepsis): IV Ceftriaxone AND Metronidazole. If MRSA suspected: add Vancomycin OR Clindamycin.
Necrotizing fasciitis	*Streptococcus pyogenes, Staphylococcus aureus, Pseudomonas, Vibrio spp, Aeromonas spp, anaerobes*	IV Ceftazidime **OR** Piperacillin/ Tazobactam **AND** IV Clindamycin **AND** IV Vancomycin	This is a life-threatening surgical emergency, and **immediate surgical intervention** is warranted without delay. Consult surgical services and ID immediately.
Acute Cervical Lymphadenitis	*Streptococci, anaerobes, Staphylococcus aureus*	IV Amoxicillin/ Clavulonate **OR** Cefazolin If MRSA suspected: use Clindamycin	Alternative: IV Cloxacillin Consider trial of oral therapy for mild cases. Ultrasound and ENT consultation to look for drainable collection.
Color Code: Access Group Antibiotic, Watch Group Antibiotic, Reserve Group Antibiotic			

COMMON PEDIATRIC INFECTIONS Bone and Joint			
SYSTEM/ DIAGNOSIS	**SUSPECTED PATHOGENS**	**INITIAL THERAPY**	**ALTERNATIVE THERAPY/ COMMENTS**
Acute Hematogenous Osteomyelitis (>3 months of age) In children without Sickle Cell Disease (SCD). (for children with SCD, see the pediatric SCD table)	*Staphylococcus aureus, Streptococcus pyogenes, Kingella kingae*	IV Cefazolin 50mg/kg/dose every 8 hours, monotherapy Cefazolin provides good coverage for 80-90% of cases. Consider adding IV Clindamycin (13mg/kg/dose every 8 hours) for disseminated or severe cases, or if MRSA is suspected. Add IV Vancomycin in cases of septic shock or MRSA bacteremia.	Alternative for children >5 years of age: IV Cloxacillin Consult orthopedics and ID for all cases. Send blood culture before initiation of antibiotics. MRI is recommended. Urgent early surgical intervention is recommended when abscess or collection is present. CRP measurement is recommended to help with diagnosis and monitor response to treatment. For patients with good response to treatment, and good adherence and follow-up, transition to oral therapy (e.g. Cephalexin 33-50mg/kg/dose every 8 hours) is recommended in coordination with ID. Discussing treatment duration with ID is advised for all cases.
Acute Bacterial Arthritis (Septic Arthritis) (>3 months of age)	*Staphylococcus aureus, Streptococcus pyogenes, Kingella kingae, Streptococcus pneumoniae, Haemophilus influenzae B*	IV Cefazolin 50mg/kg/dose every 8 hours Cefazolin provides good coverage for 80-90% of cases. Consider adding IV Clindamycin (13mg/kg/dose every 8 hours) for disseminated or severe cases, or if MRSA is suspected. Use IV Ceftriaxone if *Haemophilus influenzae B* is suspected (e.g. unvaccinated child).	Consult orthopedics and ID for all cases. Send blood culture before initiation of antibiotics. Up to 50% of cases are associated with osteomyelitis, MRI should be considered in most cases to rule out osteomyelitis. Synovial fluid culture is recommended for all cases. Yield of synovial fluid specimens can be increased by inoculation into a blood culture bottle, and by targeted PCR tests. Transition to oral antibiotics is recommended for patients with early and sustained response to treatment, and good adherence and follow-up. Treatment duration is typically 2-4 weeks.
Color Code: Access Group Antibiotic, Watch Group Antibiotic, Reserve Group Antibiotic			

COMMON PEDIATRIC INFECTIONS Gastrointestinal			
SYSTEM/ DIAGNOSIS	**SUSPECTED PATHOGENS**	**INITIAL THERAPY**	**ALTERNATIVE THERAPY/ COMMENTS**
Acute Gastroenteritis	*Rotavirus, norovirus, adenovirus, sapovirus, astrovirus.*	Hydration, supportive care. Antibiotics not recommended.	Do NOT prescribe antimotility agents (such as loperamide) in children (potential severe side effects such as toxic megacolon).
Acute Dysentery (bloody diarrhea)	*Salmonella spp, Shigella spp., Campylobacter jejuni, verotoxin-producing E. coli (including 0157:H7), Yersinia enterocolitica,* Toxin-producing *C. difficile, E. histolytica*	Empiric antibiotics generally not recommended (risk of toxin release). Antibiotic treatment is based on positive microbiology results.	Send for stool culture and parasitology. Molecular (PCR) testing may help return faster results. Consider *C. diff* testing in at risk children >2 years of age (testing for *C. diff* not recommended before 2 years of age). Consider empiric Azithromycin or Ciprofloxacin, with caution, in select patients who are severely ill or appear toxic.
Salmonella Gastrointestinal Infection	*Nontyphoidal Salmonella species.*	Antibiotics not recommended for most cases (self-limited, mild to moderate disease). If indicated, use oral Azithromycin for uncomplicated disease.	Indications for antibiotic treatment: severe illness, age <3 months, immunocompromised, sickle cell disease, bacteremia or invasive disease. For invasive disease (e.g., bacteremia, osteomyelitis), use IV Ceftriaxone initially. Alternatives include Ciprofloxacin and Co-trimoxazole.
Acute Surgical Abdomen (including perforated appendicitis)	*Enteric gram negatives, anaerobes, enterococcus*	IV Ampicillin **AND** IV Metronidazole **AND** IV Gentamicin	Alternative: IV Piperacillin/Tazobactam
Color Code: Access Group Antibiotic, Watch Group Antibiotic, Reserve Group Antibiotic			

COMMON PEDIATRIC INFECTIONS Sickle Cell Disease			
SYSTEM/ DIAGNOSIS	**SUSPECTED PATHOGENS**	**INITIAL THERAPY**	**ALTERNATIVE THERAPY/ COMMENTS**
SCD with Fever Low risk: - Not septic appearing - Not surgically splenectomised - Not suspected to have meningitis, osteomyelitis or acute chest syndrome	*Respiratory viruses, other viruses. Streptococcus pneumoniae, Salmonella species.*	IV Ampicillin (50mg/kg/dose every 6 hrs) *During high community transmission of Influenza virus*: consider adding empiric Oseltamivir. Send RVP/PCR test.	Always send a blood culture prior to initiating antibiotics. Consider other targeted microbiologic investigations in accordance with symptoms (e.g. respiratory virology, stool culture). Consider upgrading to IV Ceftriaxone if worsening or not improving after 48 hours
SCD with Fever High Risk: Septic appearing, or h/o surgical splenectomy, or suspicion of meningitis, osteomyelitis, or acute chest syndrome.	*Respiratory viruses. Streptococcus pneumoniae, Salmonella species, Staphylococcus aureus, Haemophilus influenzae.*	IV Ceftriaxone *If showing signs of septic shock:* add IV Vancomycin **AND** STAT dose of IV Gentamicin	*If showing signs of meningitis:* use IV Ceftriaxone with OR without IV Vancomycin If allergic to Ceftriaxone, use Ciprofloxacin instead.
SCD with Pneumonia or Acute Chest Syndrome	*Respiratory viruses. Streptococcus pneumoniae, Mycoplasma pneumoniae, S. aureus, H. influenzae*	IV Ceftriaxone *Presence of empyema, or requiring NIV or Mechanical Ventilation:* add IV Clindamycin	Consider adding Azithromycin for school age children while awaiting *Mycoplasma* PCR results. During high community transmission of Influenza virus, consider adding empiric Oseltamivir. Send RVP/PCR test.
SCD with Osteomyelitis	*Salmonella species, Staphylococcus aureus,*	IV Ceftriaxone (50mg/kg/dose every 12 hours)	Obtain MRI. Consult ID and orthopedics. Consider adding IV Clindamycin if no improvement after 48-72 hours, consider need for surgical debridement.
Color Code: Access Group Antibiotic, Watch Group Antibiotic, Reserve Group Antibiotic			

TABLE 14-B: PEDIATRIC ANTIMICROBIAL DOSAGE GUIDE (*for infants, children and adolescents. Doses for neonates ≤28 days of life often differ, and are not covered in this table. The doses in the table are for patients with normal renal and hepatic function.*)

ANTIMICROBIAL	RECOMMENDED DOSAGE
	PENICILLINS
Amoxicillin	Standard dose regimen: 40-45 mg/kg/**day** orally divided every 8hrs; max dose 500mg/dose High dose regimen 80-90 mg/kg/**day** orally divided every 8-12 hr; max **daily** dose 4000mg/day
Amoxicillin-Clavulanate	*Immediate-release formulations*: Infants, Children, and Adolescents: **4:1 formulation**: Oral: 20 to 40 mg amoxicillin/kg/day in divided doses every 8 hours; maximum daily dose: 1,500 mg/**day** **7:1 formulation**: Oral: 25 to 45 mg amoxicillin/kg/day in divided doses every 12 hours; maximum daily dose: 1,750 mg/**day** **14:1 formulation**: Oral: 90 mg amoxicillin/kg/day in divided doses every 12 hours; maximum daily dose: 4,000 mg/**day**
Ampicillin	**IM, IV:** 50 to 200 mg/kg/**day** divided every 6 hours; maximum daily dose: 8 **g**/**day**; higher doses (300 to 400 mg/kg/**day** divided every 4 to 6 hours; maximum daily dose: 12 **g**/**day**) are recommended for some infections (e.g., meningitis).
Penicillin V	25-50 mg/kg/**day** orally divided every 6 hrs or every 12 hrs; maximum **daily** dose 2000 mg/day
Penicillin G	100,000-300,000 units/kg/day IV divided every 4-6 hrs; Maximum daily dose 24 million units/day. 250,000 – 400,000 units/kg/day IV divided every 4-6 hrs for severe infections

ANTIMICROBIAL	RECOMMENDED DOSAGE
PENICILLINS	
Cloxacillin	**Oral**: **Children ≤20 kg:** 25 to 50 mg/kg/day in divided doses every 6 hours. For osteomyelitis, use 100 mg/kg/**day** in divided doses every 6 hours. **Children and Adolescents >20 kg**: Refer to adult dosing. **IM, IV:** **Children ≤20 kg:** 25 to 50 mg/kg/day in divided doses every 6 hours. For septicaemia or osteomyelitis, use 200 mg/kg/**day** in divided doses every 4 to 6 hours **Children and Adolescents >20 kg**: Refer to adult dosing
Piperacillin-Tazobactam	All doses based on piperacillin component: **Infants ≤6 months:** IV: 240 to 300 mg piperacillin/kg/**day** in divided doses every 6 to 8 hours; maximum **daily** dose: 16 **g/day**. **Infants >6 months, Children, and Adolescents:** IV: 240 to 300 mg piperacillin/kg/**day** in divided doses every 6 to 8 hours; maximum **daily** dose: 16 g/**day** **Cystic fibrosis IV:** 450 mg piperacillin/kg/**day** divided every 4 to 6 hours or 600 mg piperacillin/kg/**day** divided every 4 hours has usual maximum **daily** dose: 18 to 24 g piperacillin/**day**
CARBAPENEMS	
Meropenem	**General dosing, susceptible infection (non-CNS)**: **Infants, Children, and Adolescents: IV:** 20 mg/kg/**dose** every 8 hours; maximum dose: 1,000 mg/**dose** **Meningitis or septic shock:** 40 mg/kg/**dose** IV every 8 hours; maximum dose: 2000 mg/**dose**
Cephalosporins	
Cephalexin	**Mild to moderate infection:** Oral: 25 to 50 mg/kg/**day** divided every 6 to 12 hours; maximum **daily** dose: 2,000 mg/**day**.

ANTIMICROBIAL	RECOMMENDED DOSAGE
Cephalosporins	
	Osteoarticular or severe infection: Oral: 100 to 150 mg/kg/**day** divided every 6 to 8 hours; maximum daily dose: 4,000 mg/**day**
Cefazolin	**IM, IV:** 25 to 100 mg/kg/**day** divided every 8 hours; usual maximum dose: 2,000 mg/**dose**. **For osteoarticular or serious infections**: 150 mg/kg/**day** divided every 6 to 8 hours, not to exceed 12 g/**day.**
Cefuroxime	20-30 mg/kg/**day** orally divided every 12hrs IV, IM: 100-150 mg/kg/**day** in divided doses every 8 hrs; max **daily** dose 6000mg/**day**
Cefixime	8mg/kg/**day** orally divided every 12-24hrs maximum **daily** dose; 400mg/**day**
Cefotaxime	**IV, IM:** 150 to 180 mg/kg/**day** in divided doses every 4 to 8 hours; maximum dose: 2,000 mg/**dose**; higher daily doses up to 300 mg/kg/**day** are recommended for some indications (eg, meningitis)
Ceftriaxone	50-100 mg/kg/**day** IV divided every 12-24 hrs
Ceftazidime	**Non-Pseudomonas spp. infections:** 90 to 150 mg/kg/**day** divided every 8 hours; maximum daily dose: 6 g/**day**. **Pseudomonas spp. infections:** Mild to moderate infections: 90 to 150 mg/kg/**day** divided every 8 hours; maximum daily dose: 6 g/**day**. **Severe infections:** 200 to 300 mg/kg/**day** divided every 8 hours; maximum daily dose: 12 g/**day**
Cefepime	**Non-*Pseudomonas* spp. infections:** IM, IV: 50 mg/kg/**dose** every 12 hours; maximum dose: 2,000 mg/**dose** ***Pseudomonas* spp. infections (suspected or proven):** IM, IV: 50 mg/kg/**dose** every 8 hours; maximum dose: 2,000 mg/**dose**
Aminoglycosides	
Amikacin	IV: 15-30 mg/kg/**dose** every 24 hrs. *Monitoring of serum concentrations recommended*.

ANTIMICROBIAL	RECOMMENDED DOSAGE
Aminoglycosides	
Gentamicin	IV: 5 to 7.5 mg/kg/**dose** every 24 hrs *Monitoring of serum concentrations recommended*.
Tobramycin	IV: 5 to 7.5 mg/kg/**dose** every 24 hours *Monitoring of serum concentrations recommended*.
Macrolides	
Erythromycin	Oral: Base, ethylsuccinate, stearate: 40 to 50 mg/kg/**day** divided every 6 to 8 hours; maximum **daily** dose: 4,000 mg/**day**; IV: Lactobionate: 15 to 20 mg/kg/**day** divided every 6 hours; maximum **daily** dose: 4,000 mg/**day**
Azithromycin	Oral: 5 to 12 mg/kg/**dose**; typically administered as 10 to 12 mg/kg/**dose** on day 1 (usual maximum dose: 500 mg/dose) followed by 5 to 6 mg/kg once daily (usual maximum dose: 250 mg/dose) for remainder of treatment duration. IV: 10 mg/kg once daily; maximum dose: 500 mg/**dose**
Clarithromycin	15-30mg/kg/**day** orally divided every 12hrs
Others	
Clindamycin	IM, IV: 20 to 40 mg/kg/**day** divided every 6 to 8 hours; maximum daily dose: 2,700 mg/**day.** Oral: 10 to 25 mg/kg/**day** divided every 8 hours; higher doses of 30 to 40 mg/kg/**day** divided every 6 to 8 hours recommended for some infections (e.g. severe, osteoarticular); maximum daily dose: 1,800 mg/**day**
Metronidazole	Oral: 15 to 50 mg/kg/**day** in divided doses every 8 hours; maximum **daily** dose: 2,250 mg/**day**. IV: 22.5 to 40 mg/kg/**day** in divided doses every 6 or 8 hours; maximum **daily** dose: 4,000 mg/**day**. ***C. difficile*:** **Non severe infection, initial or first recurrence:**

ANTIMICROBIAL	RECOMMENDED DOSAGE
Others	
	Oral: 7.5 mg/kg/**dose** every 6 to 8 hours for 10 days; maximum dose: 500 mg/**dose**. **Severe/fulminant infection, initial:** IV: 10 mg/kg/**dose** every 8 hours for 10 days; maximum dose: 500 mg/**dose** ***H. pylori***: oral :10-15 mg/kg/**dose** twice daily for 14 days
Co-trimoxazole (TMP/SMX, trimethoprim/sulfamethoxazole)	**Calculate dose based on TRIMETHOPRIM (TMP) component.** **UTI treatment**: Oral: Infants ≥2 months, Children, and Adolescents: 6 to 12 mg TMP/kg/**day** in divided doses every 12 hours; maximum dose: 160 mg/**dose**. IV: Infants ≥2 months, Children, and Adolescents: 8 to 10 mg TMP/kg/**day** in divided doses every 6 to 12 hours. ***UTI Prophylaxis:*** Infants ≥2 months, Children, and Adolescents: Oral: 2 to 3 mg TMP/kg/**dose** once daily
Doxycycline	**General dosing:** Children and Adolescents: Oral, IV: 2.2 mg/kg/**dose** every 12 hours; maximum dose: 100 mg/**dose**
Nitrofurantoin	**UTI treatment:** 5-7mg/kg/**day** orally divided every 6 hrs **UTI prophylaxis:** 1-2 mg/kg/**day** orally at bedtime
Vancomycin	40-60mg/kg/**day** IV divided every 6 to 8hrs *Monitoring of serum concentrations recommended.*
Linezolid	<12years old: IV, oral 10mg/kg/**dose** every 8hrs; max dose: 600 mg/**dose** ≥12years old: IV, oral 600 mg/**dose** OR 10 mg/kg/**dose** every 12hrs; max dose: 600 mg/**dose**

ANTIMICROBIAL	RECOMMENDED DOSAGE
Antivirals	
Acyclovir	**Herpes simplex virus encephalitis, treatment:** Infants and Children 3 months to <12 years: IV: 10 to 15 mg/kg/**dose** every 8 hours. **Note:** higher doses (20 mg/kg) are used under 3 months of age, but not routinely recommended beyond 3 months of age due to risk of nephrotoxicity and neurotoxicity. Children ≥12 years and Adolescents: IV: 10 mg/kg/**dose** every 8 hours for 14 to 21 days. **Herpes simplex virus, mucocutaneous infection:** ***Immunocompetent host:*** **Infants, Children, and Adolescents:** **Treatment (if indicated):** IV: 5 mg/kg/**dose** every 8 hours. Oral: 20 mg/kg/**dose** 4 times daily for 5 to 7 days; maximum dose: 800 mg/**dose** **Herpes zoster (shingles), treatment:** ***Immunocompetent host:*** **Ambulatory therapy:** Children ≥12 years and Adolescents: Oral: 800 mg/**dose** every 4 hours (5 doses per day) for 5 to 7 days. **Hospitalized patient:** Infants and Children <2 years: IV: 10 mg/kg/**dose** every 8 hours for 7 to 10 days. Children ≥2 years and Adolescents: IV: 500 mg/**m²**/**dose** every 8 hours for 7 to 10 days; some experts recommend 10 mg/kg/**dose** every 8 hours **Varicella (chickenpox), treatment (if indicated):** Begin treatment within the first 24 hours of rash onset: ***Immunocompetent host:*** **Ambulatory therapy:** Oral: Infants, Children, and Adolescents: 20 mg/kg/**dose** 4 times daily for 5 days; maximum **daily** dose: 3,200 mg/**day**. **Hospitalized patient**: IV: Infants, Children, and Adolescents: 10 mg/kg/**dose or** 500 mg/**m²**/**dose** every 8 hours for 7 to 14 days; some experts recommend 15 to 20 mg/kg/**dose** for severe disseminated or CNS infection
Oseltamivir	**Treatment of Influenza A&B** neonate: 3mg/kg/**dose** oral q12hr x 5 days 1 month- 1yr: 3mg/kg/**dose** oral q12hr x 5 days

ANTIMICROBIAL	RECOMMENDED DOSAGE
Antifungals	
	>1 year of age: 10-15kg: 30 mg/**dose** oral q12h for 5 days 16-23 kg: 45 mg/**dose** oral q12h for 5 days 24-40 kg: 60 mg/**dose** oral q12h for 5 days >40 kg: 75mg/**dose** oral q12h for 5 days (a longer duration can be considered in severely ill patients, e.g. encephalitis) **Prophylaxis after exposure to Influenza A&B** neonate: 3mg/kg once daily for 7 days 1 month- 1yr: 3mg/kg oral once daily for 7 days >1 year of age: 10-15kg: 30 mg oral daily for 7 days 16-23 kg: 45 mg oral daily for 7 days 24-40 kg: 60 mg oral daily for 7 days >40 kg: 75 mg oral daily for 7 days
Amphotericin B deoxycholate (conventional)	0.5-1 mg/kg/**day** IV once daily max **daily** dose 1.5mg/kg/**day**
Amphotericin B Lipid Complexed (ABLC, Abelcet)	5 mg/kg IV once daily
Amphotericin B Liposomal (AmBisome)	3-5 mg/kg IV once daily
Caspofungin	**Children 1–17 years** Loading dose 70 mg/m^2 once daily (max. per dose 70 mg) for 1 day, then maintenance 50 mg/m^2 once daily (max. per dose 70 mg); increased if necessary to 70 mg/m^2 once daily (max. per dose 70 mg), dose may be increased if lower dose tolerated but inadequate response.
Fluconazole	3-12 mg/kg/**day** IV/oral once daily
Itraconazole	**Infants, Children, and Adolescents:** Oral: 5 mg/kg/**dose** every 12 hours; maximum dose: 100 mg/**dose**; higher maximum doses may be appropriate for some indications
Nystatin	400,000 to 600,000 units 4 times daily

ANTIMICROBIAL	RECOMMENDED DOSAGE
Antifungals	
Voriconazole	**Infants and Children <12 years:** **Loading dose: IV:** 9 mg/kg/**dose** every 12 hours for 2 doses. **Maintenance:** **IV:** 8 mg/kg/**dose** every 12 hours. **Oral:** 9 mg/kg/**dose** every 12 hours; maximum dose: 350 mg/**dose**. **Children ≥12 years and Adolescents ≤14 years**: **IV:** **<50 kg:** Loading dose: 9 mg/kg/dose every 12 hours for 2 doses, followed by maintenance dose of 8 mg/kg/**dose** every 12 hours. **≥50 kg:** Loading dose: 6 mg/kg/**dose** every 12 hours for 2 doses, followed by maintenance dose of 4 mg/kg/**dose** every 12 hours. **Oral: Maintenance doses:** **<50 kg:** 9 mg/kg/**dose** every 12 hours; maximum dose: 350 mg/dose. **≥50 kg:** 200 mg every 12 hours. *Monitoring of serum concentrations recommended*.

References:

UpToDate Inc. (2024). Lexi-Drugs, UpToDate Lexidrug. Available at: https://online.lexi.com (Accessed: 26 November 2024)

Joint Formulary Committee (2024), *British National Formulary for Children*. Available at: https://www-medicinescomplete-com.apollo.worc.ac.uk (Accessed: 26 November 2024).

TABLE 15: GUIDELINES FOR THERAPEUTIC DRUG MONITORING (TDM):

CLINICAL GUIDE FOR ADULTS

Therapeutic drug monitoring is required for patients on aminoglycoside (e.g. gentamicin, amikacin) and glycopeptides (e.g. vancomycin). Serum concentration monitoring aims to avoid both excessive and sub-therapeutic concentration thereby preventing toxicity and ensuring efficacy.

DRUG	CONVENTIONAL DOSING	HIGH-DOSE EXTENDED INTERVAL DOSING	REMARKS
GENTAMICIN	• Gram-negative infections (serum levels): • Peak: 5-10 µg/mL (measure 30 min after 3rd dose is infused) • **Trough**: 1-2 µg/mL (measure 30 min before 4th dose, unless renal toxicity/dysfunction is suspected) • Non-CNS gram-positive infections (serum Levels): • **Peak**: 3-4 µg/mL (measure 30 min after 3rd dose is infused) • **Trough**: <1 µg/mL (measure 30 min before 4th dose, unless renal toxicity/dysfunction is suspected)	**- Initial Monitoring:** Measure random serum level between 8-12 hours after the dose. Use **Hartford Nomogram** to determine dosage interval by plotting level on graph. **Target Trough:** < 1 µg/mL (ideally 0) **- Follow-up Trough Level Monitoring:** For patients of acute renal function changes, early serum trough level (6 hours prior to next dose) should be considered (ideally 0 µg/mL) to ensure drug free windows to avoid accumulation in proximal tubules.	• **Dose calculation based on weight:** ○ Underweight patients: calculate the dose based on Total Body weight (TBW) ○ Non-obese patients: calculate the dose based on TBW or Ideal Body Weight (IBW) ○ Obese patients: calculate the dose based on Adjusted Body Weight (ABW) • When high-dose extended- Interval IV therapy is continued for more than 5 days, monitor levels once or twice weekly. • Concurrent use of penicillin/aminoglycosides therapy in patients with renal dysfunction may require separation of doses
AMIKACIN	• **Peak:** 15-30 µg/mL (measure 30 min after 3rd dose is infused). Use upper-level ranges for life threatening infections. • **Trough**: 5-10 µg/mL (measure 30 min before 4th dose, unless renal toxicity/dysfunction is suspected)	○ **Initial Monitoring:** Measure random serum level between 8-12 hours after the dose. Divide the level by 2 and use **Hartford Nomogram** to determine dosage interval by plotting level on graph. **Target Trough:** <1 µg/mL (ideally 0) • **Peak:** 56-64 µg/ml. May be measured approximately 4 hours after dose to account for distribution phase.	

DRUG	CONVENTIONAL DOSING	HIGH-DOSE EXTENDED INTERVAL DOSING	REMARKS
VANCOMYCIN	• **Intermittent Infusion Parameters/Goals:** • **Target AUC/MIC:** 400- 600 µg/mL.hr using dose, dosing interval, Cmax, Cmin, infusion time, time difference between infusion starts and times for collecting samples for measuring C_{max} & C_{min}. ▪ **C_{max}** - post-distributional peak serum concentration is determined 1 hour after infusion is completed by collecting sample. ▪ **C_{min}** - Trough serum concentration is measured drawn 30 minutes before next dose by collecting sample. ▪ Use AUC/MIC Sanford online calculator to adjust dose as dose is proportional to AUC/MIC. ▪ Timing for AUC measurement: measure C_{min} before 3rd dose and C_{max} before 4th dose. • **Continuous infusion parameters/Goals:** • **Target AUC/MIC:** 400- 600 µg/mL.hr (where MIC value is 1). • **Timing of serum sample:** 10-12 hour after the 3rd dose. ▪ **AUC** = 24 x Steady State Concentration (µg/mL.hr)**.**	• **Steady state levels of Continuous infusion:** • **AUC** = 24 x Steady State Concentration**.** • **Timing of serum sample:** 10-12 hours after the start of infusion. ▪ Hemodynamically stable patient: draw random levels once weekly Hemodynamically unstable patient: frequent or daily.	• Not needed in short course (<3 days) or lower intensity dosing for uncomplicated infection in non-obese patient with normal renal function. AUC/MIC based monitoring is preferred over trough level monitoring either in continuous infusion or intermittent infusion methods.

DRUG	CONVENTIONAL DOSING	HIGH-DOSE EXTENDED INTERVAL DOSING	REMARKS
	▪ Hemodynamically stable patient: draw trough and peak once weekly when steady state plateau concentration is achieved (AUC/MIC is within range). Hemodynamically unstable patient: frequent or daily		

Please consider the following:

- These are guidelines only; if you need more advice on the appropriateness of the sampling time, and the interpretation of the levels, contact the clinical pharmacist.
- TDM results must be interpreted in conjunction with the clinical status of the patient.
- Always use actual body weight for dose calculations.
- Recording the **sampling time** (e.g. sample was taken at 6.30 am) is **a MUST** in order to interpret the results and modify the dose accordingly.

Tips assist in interpreting TDM results

- Was the sample taken at steady state?
- Was the sample taken at the right time?
- Was the drug administered at the right time?
- Was the sample taken is peak or trough?
- Are there any interacting drugs/foods?
- Drug compliance?
- Is the result what you would expect?
- If any of the following clinical conditions is present:

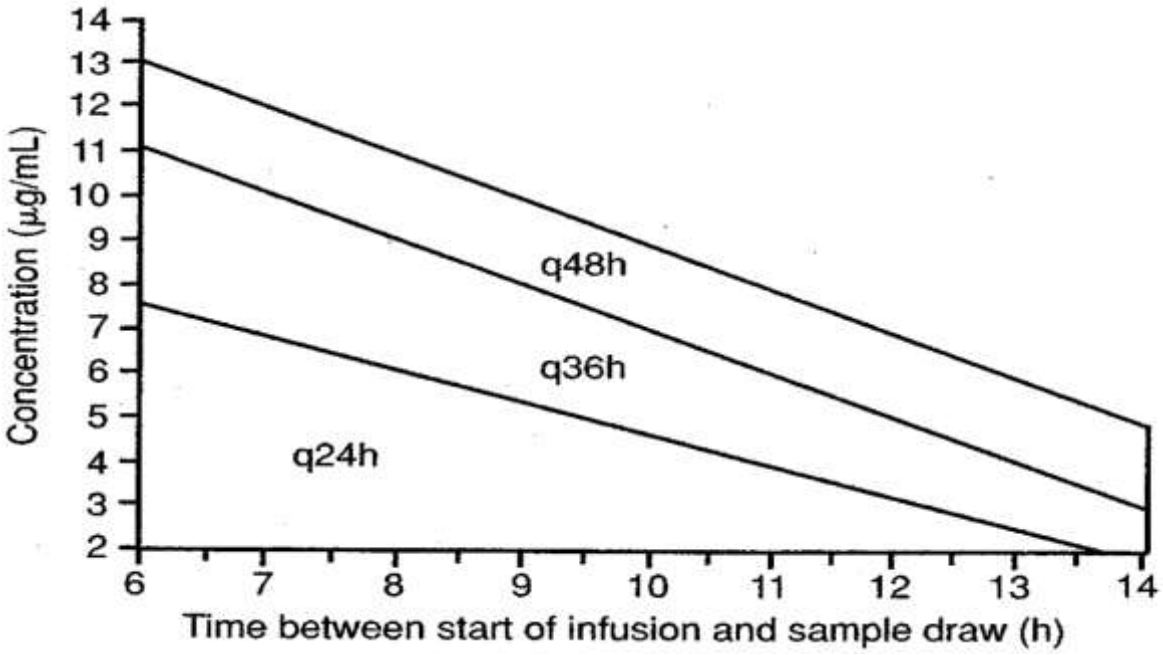
Ascites, burns, CHF, Gram-negative sepsis, hepatic/renal failure, neonate.

References:

- Surrey and Sussex Healthcare NHS trust. Therapeutic Drug Monitoring (TDM). Gentamicin prescribing guidelines – updated 27th Mar 2014, AL.
- BNF, 2010.
- Rybak M, Lomaestro B, Rotschafer JC, Moellering R Jr, Craig W, Billeter M, *et al*. Therapeutic monitoring of vancomycin in adult patients: a consensus review of the American Society of Health-System Pharmacists, the Infectious Diseases Society of America, and the Society of Infectious Diseases Pharmacists. Am J Health Syst Pharm 2009; 66:82–98.
- Pharmacy Bulletin. SQUH. Vol.4, No 1.
- Therapeutics: A Handbook for prescribers. NHS Greater Glasgow and Clyde, UK. August 2010.
- Stanford Health Care Aminoglycoside Dosing Calculation, 2021

HARTFORD HOSPITAL ONCE DAILY GENTAMICIN NOMOGRAM

FIG 2



16-GUIDELINES FOR SURGICAL ANTIMICROBIAL PROPHYLAXIS

Rationale

Antibiotics are administered prior to surgical procedures to prevent surgical site infections.

Aims

1. To provide antimicrobial recommendations for surgical prophylaxis in adults and children undergoing surgical procedures taking into consideration the type of surgery, most common organisms involved, international guidelines, expert opinion and cost.
2. To optimize antimicrobial use and patient outcome in prevention of surgical site infections in a rational way to prevent the emergence of resistance among bacteria.

Antimicrobial surgical prophylaxis is generally indicated for the following type of surgery:

1. Clean wounds are uninfected operative wounds in which no inflammation is encountered and the wound is closed primarily. By definition, a viscus (respiratory, alimentary, genital or urinary tract) is not entered during a clean procedure.
2. Clean-contaminated wounds are operative wounds in which a viscus is entered under controlled conditions and without unusual contamination.

Antimicrobial prophylaxis is not indicated for an operation classified as dirty or contaminated **as treatment is rather required.**

General considerations

When prescribing an antimicrobial surgical prophylaxis, the following points should be considered:

1. Selection of an appropriate agent for specific patients, should take into account not only comparative efficacy but also adverse-effect profiles and patient drug allergies.
2. For most procedures, cefazolin 1 g or cefuroxime should be the agent of choice because of their relatively long duration of action, their effectiveness against the organisms most encountered in surgery and their relatively low cost.
3. Clindamycin or vancomycin should be used in penicillin-allergic patients.
4. Clindamycin may be preferable for patients not at risk for infections due to resistant Gram-positive organisms secondary to its narrower spectrum and a more rapid infusion time.
5. Routine vancomycin use is discouraged.
6. Modification of a surgical prophylaxis regimen may be necessary in patients with pre-existing infections prior to surgery, significant length of hospital stay prior to surgery and previous positive cultures/colonisation. Consult the infectious diseases unit for specific recommendations. Targeted antibiotic prophylaxis based on previous colonisation, for example by multi-drug resistant organisms may be considered on a case-by-case basis.
7. The recommendations in this guideline are provided for adult and paediatric (1–12 years) patients. They do not specifically address infants.
8. Decolonization therapy for MRSA is recommended prior to surgery and antibiotic prophylaxis should include cover for MRSA. Please refer to infection prevention protocol for decolonization.
9. Hospital-based guidelines should be developed in accordance with surgical site surveillance, the most frequently isolated pathogens implicated and their local antibiogram.

Timing

1. Administration of antibiotics for surgical prophylaxis should be as near to the incision time as possible. Infusion of antibiotics for surgical prophylaxis should begin within 1 hour prior to skin incision (i.e. at induction of anaesthesia in case of general anaesthesia).
2. Vancomycin may begin within 2 hours prior to incision due to the longer infusion time and to ensure adequate tissue levels at the time of incision.
3. All antibiotic infusions should be completed prior to incision.

Duration

- The optimal duration of perioperative prophylaxis is unknown. It is unlikely that further benefit is attained by the administration of additional doses beyond wound closure and postoperative prophylaxis is not recommended. Therefore, with few exceptions (see table 2), post operative prophylaxis is not recommended for most surgical cases.
- Single prophylactic doses +/- additional intraoperative doses in prolonged procedures are strongly recommended. If prophylaxis is extended beyond the operative period, antibiotics should be discontinued within 24 hours unless otherwise specified.
- Additional intraoperative doses are strongly recommended in prolonged procedures at intervals approximately 2 times the half-life of the drug. This roughly corresponds with redosing antimicrobials at a frequency of one interval shorter than usual (**see Table 1**). Additional intraoperative doses may not be warranted in patients for whom the half-life of the antimicrobial is prolonged, such as those patients with renal insufficiency.
- The continuation of prophylaxis until all catheters and drains have been removed is not appropriate and not recommended.

Responsibility for application

The attending surgeon should ensure that the appropriate dose, timing, and duration are followed.

Table-1 Recommended redosing intervals at which a supplemental dose is required if surgery is prolonged.

ANTIBIOTICS	ADULT DOSE(IV)	PAEDIATRIC DOSE (IV)	HALF-LIFE (Hour)	RECOMMENDED REDOSING INTERVAL (FROM INITIATION OF THE FIRST PREOPERATIVE DOSE) (Hour)
Cefazolin	2gm (3 gm for patients weighing >120 kg)	30 mg/kg	1.2–2.2	4
Cefuroxime	1.5 gm	50 mg/kg	1–2	4
Clindamycin	900 mg	10 mg /kg	2–4	6
Vancomycin	15 mg/kg	15 mg/kg/dose	6.0	6–12
Gentamicin	1.5 mg/kg	2.5 mg/kg	2.0	NA
Metronidazole	500 mg	15 mg/kg	8.0	8

TABLE 16: SURGICAL PROCEDURES AND THE RECOMMENDED DRUGS

SURGICAL PROCEDURE	LIKELY PATHOGEN	SUGGESTED REGIMENS	
		FIRST LINE	SECOND LINE
Cardiac: -Median sternotomy -pacemaker & implant -prosthetic valve -coronary artery bypass	Coagulase-negative *Staphylococcus*, *S. aureus*, enteric Gram-negative bacilli	Adult: Cefazolin 2g IV pre-op dose (then q8hr x 24 hrs post-op) Paediatric: Cefazolin 30 mg/kg/dose IV pre-op and q8hr x 24 hrs post-op.	Adult: Cefuroxime 1.5 g pre-op Paediatric: Cefuroxime 50 mg/kg pre-op Adult: Vancomycin 1 g pre-op and continued q12hr x 1 days Paediatric: Vancomycin 15 mg/kg/dose IV pre-op and continued q12hr 1 days (Consider use of intranasal mupirocin evening before, day of surgery & q12hr for 5 days, post-op in patients who are colonized with MRSA preoperatively)
-Thoracic non-cardiac -lung resections -Thoracoscopy -Thoracotomy	*S. aureus*, coagulase-negative *Staphylococcus*, Enteric Gram-negative bacilli	Adult: Cefazolin 2gm IV pre-op Paediatric: Cefazolin 30 mg/kg/dose IV pre-op	Adult: Vancomycin 1 g IV pre-op **OR** Clindamycin 900 mg IV pre-op Paediatric: Vancomycin 15 mg/kg/dose IV pre-op OR Clindamycin 10 mg/kg IV pre-op
Breast: -Reduction mammoplasty -Mammoplasty -Lumpectomy - Prophylactic mastectomy		None	
Breast cancer procedures (eg, axillary node dissection, mastectomy for known breast cancer)	*Staphylococcus aureus, Staphylococcus epidermidis, streptococci*	Adult dose: Cefazolin 2gm IV pre-op	Adult: Vancomycin 1 gm IV pre-op **OR** Clindamycin 900 mg IV pre-op
Vascular: -Arterial surgery abdominal aorta -Any vascular procedure that inserts prosthesis, or foreign body -Procedures on the leg that involve a groin incision	*S. aureus*, Coagulase-negative *Staphylococcus*, Enteric Gram-negative bacilli	Adult: Cefazolin 2 gm IV pre-op and q8hr x 1 days Paediatric: Cefazolin 30 mg/kg/dose IV pre-op (Intranasal Mupirocin as per cardiac surgery)	Adult: Vancomycin 1 IV g q12hr x 1 d **OR** Clindamycin 900 mg IV pre-op Paediatric: Vancomycin 15 mg/kg/dose IV continued q12hr x1d **OR** Clindamycin 10 mg /kg IV pre-op

TABLE 16: SURGICAL PROCEDURES AND THE RECOMMENDED DRUGS

SURGICAL PROCEDURE	LIKELY PATHOGEN	SUGGESTED REGIMENS	
		FIRST LINE	SECOND LINE
-Lower extremity amputation for ischemia Prophylaxis is not indicated for carotid endarterectomy or brachial artery repair without prosthetic material			
Neurosurgery: -Craniotomy -Skull fracture -CSF leak -Penetrating trauma -Spine -CSF shunt	*S. aureus*, Coagulase-negative *Staphylococcus*	Adult: Cefazolin 2gm IV pre-op Paediatrics: Cefazolin 30 mg/kg pre-op	Adult: -Vancomycin 1gm IV pre-op **OR** Clindamycin 900 mg IV is alternative for Vancomycin-allergic or beta-lactam allergic pt Paediatrics: Vancomycin 15 mg/kg pre-op
Orthopaedic -Hip arthroplasty -Hip fracture repair -Implantation of internal fixation devices (e.g. nails, screws, plates, wires) -Total joints replacement -Spinal fusion -Spinal procedures with and without instrumentation	*S. aureus*, Coagulase-negative *Staphylococcus*	Adult: Cefazolin 2g IV pre-op (for 24 hrs post-op) Paediatric: Cefazolin 30 mg/kg/IV pre-op **PLUS** q8hr for 2 doses post-op In patients colonized with MRSA and not decolonized: consider use of intranasal Mupirocin 2% ointment evening before, day of surgery & q12hr for 5 days post op.	Adult: Vancomycin 1g IV q12hr for 1 day Paediatric: Vancomycin 15 mg/kg pre-op **PLUS** q12hr x 2 doses post-op
Ophthalmic	*S. aureus*, *Staphylococcus epidemidis.* *Streptococci*, Enteric, Gram-negative bacilli, *Pseudomonas spp.*	**Topical:** Gentamicin, **OR** Tobramycin **OR** Ciprofloxacin, Ofloxacin **OR** Gramicidin-polymyxin Gram B ophthalmic multiple drops topically over 2–24 hrs	Addition of Cefazolin 100 mg by subconjunctival injection **OR** intracameral Cefazolin 1–2.5 mg **OR** Cefuroxime 1 mg at the end of the procedure is optional

TABLE 16: SURGICAL PROCEDURES AND THE RECOMMENDED DRUGS

SURGICAL PROCEDURE	LIKELY PATHOGEN	SUGGESTED REGIMENS	
		FIRST LINE	SECOND LINE
Head/neck: -Incision through oral, sinus or pharyngeal mucosa -Major neck dissection -Parotid surgery **Note that prophylaxis is not recommended for** tonsillectomy or functional endoscopic sinus procedure or tympanostomy tube insertion	*S. aureus*, Streptococci, oral Anaerobes, enteric Gram-negative bacilli	Adult: Cefazolin 2g IV **PLUS** Metronidazole 500 mg IV pre-op Paediatric: Cefazolin 30 mg/kg/dose IV pre-op IV single dose **PLUS** IV Metronidazole 15 mg/kg pre-op	Adult: Clindamycin 600 mg IV pre-op Paediatric: Clindamycin 10 mg/kg/dose IV *Addition of Gentamicin to Clindamycin is recommended if Gram-negative contamination of procedure is likely
Gastrointestinal oesophageal, gastroduodenal (high risk only: morbid obesity, oesophageal obstruction, decreased gastric acidity or motility	Enteric Gram-negative bacilli, Gram-positive cocci	Adult: Cefazolin 1–2g IV pre-op Paediatric: Cefazolin 30 mg/kg/dose IV pre-op single dose	Adult: Gentamicin 1.5 mg/Kg/ IV plus Clindamycin 900 mg IV pre-op Paediatric: Gentamicin 2.5 mg/kg/dose **PLUS** Clindamycin 10 mg/kg/dose IV pre-op
Biliary tract: In high-risk patients: -Age over 70 yrs -Common duct stones -Obstructive jaundice -Acute cholecystitis -Non-functioning gallbladder -ERCP	Enteric Gram-negative bacilli, *Clostridia*, *Enterococcus*	Adult: Cefazolin 1–2g IV pre-op x 1 dose Paediatric: Cefazolin 30 mg/kg/dose IV pre-op single dose	Adult: Gentamicin 1.5 mg/kg IV plus Clindamycin 900 mg IV pre-op x 1 dose Paediatric: Gentamicin 2.5 mg/kg/dose **PLUS** Clindamycin 10 mg/kg/dose IV pre-op
Inguinal hernia complicated or recurrent, mesh placement	Gram-positive cocci, Gram-negative bacilli	Adult: Cefazolin 2gm IV pre-op x 1 dose Paediatric: Cefazolin 30 mg/kg pre-op x 1 dose	Adult: Gentamicin 1.5 mg/kg/IV **PLUS** Clindamycin 900 mg IV pre-op x 1 dose Paediatric: Gentamicin 2.5 mg/kg/dose IV **PLUS** Clindamycin 10 mg/kg dose IV pre-op
Appendectomy, **Non-perforated** If perforated treat as secondary peritonitis	Enteric Gram-negative bacilli, anaerobes, Enterococci	Adult: Cefazolin 2gm IV **PLUS** Metronidazole 500 mg IV pre-op single dose Paediatric: Cefazolin 30 mg/kg pre-op **PLUS** Metronidazole 15 mg/kg/dose IV pre-op single dose	Adult: Gentamicin 1.5 mg/kg IV **PLUS** Clindamycin 900 mg IV pre-op Paediatric: Gentamicin 2.5 mg/kg/dose IV **PLUS** Clindamycin 10 mg/kg/dose/IV pre-op

TABLE 16: SURGICAL PROCEDURES AND THE RECOMMENDED DRUGS

SURGICAL PROCEDURE	LIKELY PATHOGEN	SUGGESTED REGIMENS	
		FIRST LINE	SECOND LINE
Colorectal: -Whipple procedure -Pancreatectomy -Small bowel	Enteric Gram-negative bacilli, anaerobes, Enterococci	Adult: Cefazolin 2g IV **PLUS** Metronidazole 500 mg IV pre-op single dose Paediatric: Cefazolin 30 mg/kg/IV pre-op **PLUS** Metronidazole 15 mg/kg/dose IV pre-op single dose	Adult: Gentamicin 1.5 mg/kg/IV **PLUS** Clindamycin 900 mg IV Pre-op Paediatric: Gentamicin 2.5 mg/kg/dose IV **PLUS** Clindamycin 10 mg/kg dose IV pre-op
Gynaecologic vaginal, abdominal, or laparoscopic hysterectomy Oncology procedures	Enteric Gram-negative anaerobes, group B *Strept.*, *Enterococcus*	Adult: Cefazolin 2g pre-op 2gm pre-op **PLUS** Metronidazole 500 mg IV pre-op single dose	Adult: Gentamicin 1.5 mg/kg IV **PLUS** Clindamycin 600 mg IV pre-op
Caesarean Section	Enteric Gram-negative anaerobes, group B *Strept.*, *Enterococcus*	Adult: Cefazolin 2gm IV pre-op	Adult: Gentamicin 1.5mg/kg IV **PLUS** Clindamycin 600 mg IV both as pre-op
Surgical abortion		1st trimester: Doxycycline 100 mg 1 hr before procedure + 200 mg post-procedure.	
Urology: -Genitourinary preoperative catheter -Transrectal prostate-biopsy -Placement of prosthetic material (Patients with preoperative bacteria should be treated to sterilize the urine before surgery or receive antibiotic active against the bacteria	Enteric Gram-negative bacilli, Enterococci	Adult: Ciprofloxacin .500 mg PO 2 hrs pre-op **OR** 400 mg IV pre-op 1–2 hrs pre-op Paediatric: Trimethoprim-sulfamethoxazole 6 mg/kg 2 hrs pre-op PO **OR** Cefazolin 30 mg/kg IV pre-op	Gentamicin 1.5 mg/kg IV pre-op +/- Clindamycin 600 mg IV pre-op

TABLE 16: SURGICAL PROCEDURES AND THE RECOMMENDED DRUGS

SURGICAL PROCEDURE	LIKELY PATHOGEN	SUGGESTED REGIMENS	
		FIRST LINE	SECOND LINE
pre-op and continued until catheter removal or for 10 days)		**OR**, Gentamicin 1.5 mg kg x 1 dose	
TURP, TURBT -Ureteroscopy -Rigid cystoscopy -Visual Internal urethrotomy -Lithotripsy -Nephrectomy -Pyeloplasty -Adrenalectomy	Enteric Gram-negative bacilli, Enterococci	Cefazolin 2gm pre-op	Ciprofloxacin 500 mg PO **OR** 400 mg IV Pre-op **OR** Gentamicin 1.5 mg/kg IV pre-op
Cystoscopy alone		**High-risk only**: Ciprofloxacin Adult dose: 500 mg PO **OR** 400 mg IV	Adult dose: Trimethoprim-sulfamethoxazole: One DS (160/800 mg) PO **OR** Gentamicin (5 mg/kg IV)
Open or laparoscopic surgery		Adult dose: Cefazolin 2gm IV pre-op	
Ileal conduit	*Enterobacteriaceae*, anaerobes	Adult: Cefazolin 2 gm IV pre-op **PLUS** Metronidazole 500 mg IV pre-op	Adult: Clindamycin 900 mg IV pre-op **PLUS** Gentamicin 1.5 mg/kg IV pre-op
Renal transplantation	*S. aureus*, coagulase-negative *Staph*, *Streptococci*, *Enterobacteriaceae*	Adult: Cefazolin 2gm IV pre-op Paediatric: Cefazolin 30 mg/kg IV pre-op	Adult: Clindamycin 900 mg IV pre-op **PLUS** Ciprofloxacin 400 mg IV pre-op Paediatrics: Clindamycin 10 mg/kg IV **PLUS** Gentamicin 2 mg/kg IV pre-op
Plastic surgery ● Reconstructive surgery, clean with risk factors or clean with contaminated ● Tissue expander insertion/ implants/ all flaps+	Staphylococcus aureus, streptococci	Adult dose: Cefazolin 2g IV pre-op	Adult: Clindamycin 600 mg IV pre-op Pediatric: Clindamycin 10 mg/kg IV pre-op

TABLE 16: SURGICAL PROCEDURES AND THE RECOMMENDED DRUGS

SURGICAL PROCEDURE	LIKELY PATHOGEN	SUGGESTED REGIMENS	
		FIRST LINE	SECOND LINE
Transplantation:			
Renal transplantation	*Staphylococcus aureus, Streptococci*, enteric Enterobacterales	Adult dose: Cefazolin 2g IV (Adjust according to renal function)	Adult: Clindamycin 600 mg IV pre-op **PLUS** Ciprofloxacin 400 mg IV pre-op Paediatrics: Clindamycin 10 mg/kg IV pre-op **PLUS** Gentamicin 2 mg/kg IV pre-op
Liver transplantation	*Staphylococcus aureus, Enterobacteriaceae, Enterococcus*	Adult dose: Piperacillin-tazobactam 3.375 g IV pre-op **PLUS** q6hr x 48 hrs post op	Adult: Clindamycin 600 mg IV pre-op **PLUS** Ciprofloxacin 400 mg IV pre-op Paediatrics: Clindamycin 10 mg/kg IV pre-op **PLUS** Gentamicin 2 mg/kg IV pre-op
Radiological procedure			
Biliary/ GI procedures including radio ablation or splenic embolization	Staphylococcus aureus, S. epidermidis, streptococci Gram negative bacili	Adult dose : Cefazolin 2gm IV **PLUS** Metronidazole 500mg IV	Clindamycin 600 mg IV pre-op Gentamicin 1.5 gm IV pre-op
Urological procedures (no ablation)		Adult dose: Cefazolin 2g IV	Clindamycin 600 mg IV pre-op
Implantable venous access port		Adult dose: Cefazolin 2g IV	Clindamycin 600 mg IV pre-op
Lymphangiogram, vascular malformation ablation, fibroid treatment		Adult dose: Cefazolin 2g IV	Clindamycin 600 mg IV pre-op
chemoembolization: fibroid, uterine embolization Percutaneous liver//renal/ lung ablation Vascular malformation embolization		None	

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TABLE 17: ANTIMICROBIAL IN PREGNANCY AND LACTATION

PREGNANCY & BREASTFEEDING- SAFE USE OF ANTI-INFECTIVE AGENTS

- In 2015 the FDA replaced the former pregnancy risk letter categories (A, B, C, D, X). The new labelling system **(The Pregnancy and Lactation Labelling Final Rule (PLLR)** allows better patient-specific counselling and informed decision making for pregnant women seeking medication therapies The PLLR also requires the label to be updated when information becomes outdated. Refer to product literature for newly approved or non -approved antimicrobials not listed in the guideline.

Antibacterial agents			
Name of the Agent	**Pregnancy**	**Breastfeeding**	**Former FDA Pregnancy category**
Aminoglycosides			
Amikacin Gentamycin Tobramycin Streptomycin	○ Avoid unless potential benefit outweighs risk. ○ Risk of auditory or vestibular nerve damage in the infant when used in pregnancy ○ When used by inhalation: avoid, no information available. ○ The risk is greatest with streptomycin. ○ The risk is probably very small with gentamicin and tobramycin, but their use should be avoided unless essential. ○ Consider monitoring TDM	Safe during breastfeeding	Category D
Penicillins			
Ampicillin Cloxacillin Penicillin G Amoxicillin-Clavulanic acid Piperacillin/Tazobactam	• Safe during pregnancy • Amoxicillin-Clavulanic acid should be avoided Due to risk of preterm delivery that increased risk of neonatal necrotizing enterocolitis.	Safe during breastfeeding Concentration of milk is low, Monitor infant GI toxicity	• FDA Category 1 • insufficient human data, evidence of fetotoxicity in animals. Other Penicillins: No evidence of toxicity in humans or animals.

Name of the Agent	Pregnancy	Breastfeeding	FDA Pregnancy category
Cephalosporins			
Cefazolin Ceftazidime Ceftriaxone Cefuroxime Cephalexin Cefepime Ceftazidim/Avibactam	- Safe during pregnancy - Ceftriaxone should be used with caution at term due to potential risk of kernicterus in neonates.	Safe during breastfeeding Concentration of milk is low, Monitor infant GI toxicity	• Category 1 • No evidence of toxicity in humans or animals.
Carbapenems			
Ertapenem (Not approved) Meropenem	Use only if potential benefit outweighs risk	Probably safe with monitoring but no data available (Sanford guideline)	Category 1 Human insufficient data to establish risk, animals no evidence of toxicity
Monobactam			
Azetronem (Not approved)	Should be restricted to severe Penicillin allergy for whom beta-lactam therapy is contraindicated and in MDROs.	• Safe during breastfeeding. • Concentration of milk is low, Monitor infant for GI toxicity.	Category D

Name of the Agent	Pregnancy	Breastfeeding	FDA Pregnancy category
Macrolides			
Azithromycin	Safe during pregnancy	Safe during breastfeeding	Category B
Clarithromycin			Category C
Erythromycin			Category B
Quinolones			
Ciprofloxacin Levofloxacin moxifloxacin	Use only if potential benefit outweighs risk Avoid in G6PD deficiency patients.	• Safe during breastfeeding • Avoid breast feeding an infant with G6PD deficiency. • Avoid with Moxifloxacin	Category C
Sulfonamides			
Co-trimoxazole (trimethoprim + sulfamethoxazole)	• Avoid during 1st trimester as it can cause cardiovascular effects, malformation in fetus & Neural tube defects (NTDs); add folic acid to minimize its risk. • Small risk of kernicterus in jaundiced infants and haemolysis in G6PD-deficient infants	• Safe during breastfeeding in healthy and full-term infants • Use with caution in premature infants or neonates with hyperbilirubinemia • Avoided in infants with G6PD deficiency.	Category C

Name of the Agent	Pregnancy	Breastfeeding	FDA Pregnancy category
Tetracyclines			
Doxycycline Minocycline Tetracycline	<u>For all Tetracyclines:</u> • Should **not** be given to pregnant women; effects on skeletal development have been documented in the 1st trimester in *animal* studies. • In 2nd or 3rd trimester may cause discoloration of the child's teeth & maternal hepatotoxicity was reported with large parenteral doses. <u>For Doxycycline:</u> Public Health England (PHE) advises avoid—when travel to malarious areas is unavoidable and other regimens are unsuitable, Doxycycline can be used for malaria prophylaxis if the entire course can be completed before 15 weeks' gestation.	• Short term therapy (≤ 3 weeks) during breastfeeding is safe. • Prolonged treatment courses during nursing should be avoided • Black discoloration of breast milk has been reported with Minocycline. •	Minocycline & Tetracycline: Category D -Doxycycline: Avoid in 2nd & 3rd trimester due to risk of permanent teeth discoloration or inhibition of bone growth. No evidence of substantial of teratogenic risk if used in 1st trimester but insufficient data to conclude no risk

Name of the Agent	Pregnancy	Breastfeeding	FDA Pregnancy category
Miscellaneous Antibacterial Agents			
Clindamycin	Safe during pregnancy	Avoid use, if possible, otherwise monitor infant for GI toxicity.	-Humans no evidence of toxicity in 2nd or 3rd trimester use. -Insufficient data with 1st trimester use. No evidence of toxicity in animals.
Daptomycin (Not approved)	Avoid during 1st trimester Use only if potential benefit outweighs risk.	Safe during breastfeeding	Category B
Linezolid	Use only if potential benefit outweighs risk. An alternate agent would be preferred.	Probably safe with monitoring GI toxicity	No evidence of toxicity in humans: Embryo-fetal lethality in animals.
Nitrofurantoin	• Safe during pregnancy Avoid- g6PD deficiency cases. • An alternate agent should be used after 37 weeks of gestation	Avoid in infant <8 days of age or if G6PD-deficient (any age)	Contraindicated at term (38-42) weeks gestation during labour & delivery or when the onset of labour is imminent.
Rifampicin	• Pre-natal exposure to Rifampicin has been related to haemorrhagic disease to new born. • Prophylactic administration of vitamin K is recommended to prevent this complication.	• Safe during breastfeeding • Monitor infant for toxicity. Breast milk may be stained with yellow or orange, red or brown colour.	Category 1 Humans: No well controlled studies, does not appear to be teratogenic. Animals: teratogenic in rodents, embryotoxic in rabbits.

Name of the Agent	Pregnancy	Breastfeeding	FDA Pregnancy category
Miscellaneous Antibacterial Agents			
Tigecycline	Should be avoided after 15 weeks of gestation. Use an alternative agent with known safety profile is recommended.	• Concentration of milk is low, poor absorption of drug expected (calcium in milk). • Short term use is safe; monitor infant for GI toxicity.	Category 1 • Humans: possible fetus toxicity. • Animals: fetal toxicity.
Vancomycin	• Avoid unless potential benefit outweighs risk. • Consider monitoring TDM	Safe during breastfeeding	Category C
Colistin	• Limited data on increased risk of PTB, low birth weight or congenital abnormalities. • In animals: polymyxin B demonstrated toxic effects to the embryo in a dose-dependent manner. • Due to the limited use in pregnant women and high potential for adverse events, strong caution is advised prior to use.	Probably safe with monitoring, data limited.	Category C

Name of the Agent	Pregnancy	Breastfeeding	FDA Pregnancy category
ANTIFUNGAL AGENTS			
Amphotericin B	Not known to be harmful but manufacturers advise avoid unless potential benefit outweighs risk.	Probably safe with monitoring, no data.	Category B
Caspofungin	Not safe during pregnancy Should be used only when benefit outweighs risk unknown risk to the fetus (should be avoided in 1st trimester, whenever possible)	Probably safe, concentration in milk is low; ADR not expected.	Category 1 • Insufficient human data. • Animal data suggest potential for fetal harm.
Fluconazole	Not safe during pregnancy. Should be used only when benefit outweighs unknown risk to the fetus.	Safe during Breastfeeding	Category 1 -Avoid, if possible, especially high doses (6-12 mg/kg/day) for a prolonged period during 1st trimester -The risk of miscarriage or congenital abnormalities with low doses (e.g., 150 mg x1) is unclear; CDC recommends topical azoles for Vulvovaginal candidiasis.
Itraconazole	Not safe during pregnancy. Should be used only when benefit outweighs; unknown risk to the fetus	Limited data available; avoid if possible.	Category 1 No human data. Fetal harm in animals.

Name of the Agent	Pregnancy	Breastfeeding	FDA Pregnancy category
ANTIFUNGAL AGENTS			
Pentamidine isetionate	Not safe during pregnancy.	Not safe during Breastfeeding	Category 1 -Data on pregnant women are limited. -Use only if the potential benefit justifies the potential risk to the fetus. WHO: May be administered to humans after the first trimester
Posaconazole	Not safe during pregnancy. Should be used only when benefit outweighs the unknown risk to the fetus.	Not safe during Breastfeeding	Category 1 May cause fetal harm, based on animal data. Human data insufficient.
Voriconazole	Not safe during pregnancy Should be avoided in 1st trimester unless other treatments have failed and the benefit outweighs the unknown risk to the fetus	Not safe during Breastfeeding	Category 1 Can cause fetal harm. No data on voriconazole use in pregnancy are available. Advise use of effective contraception during treatment. Evidence of embryo mortality, fetotoxicity, and teratogenicity in animals exist.
ANTIVIRAL AGENTS			
Acyclovir	Safe during pregnancy	Safe during Breastfeeding (Need monitoring)	Category B

Name of the Agent	Pregnancy	Breastfeeding	FDA Pregnancy category
ANTIVIRAL AGENTS			
Valacyclovir			Category 1 Humans: no known drug-associated risk of major birth defects. Animals: no evidence of toxicity.
Famciclovir	Avoid unless potential benefit outweighs risk	Not safe during Breastfeeding	Category 1 No evidence of toxicity in humans or animals
Foscarnet sodium (Not approved)	Avoid unless potential benefit outweighs risk in 2nd and 3nd trimester	Not safe during Breastfeeding	Category C
Ganciclovir	Avoid unless potential benefit outweighs risk-teratogenic risk, ensure effective contraception	Not safe during Breastfeeding	Category C
Valganciclovir		Not safe during Breastfeeding	Category 1 No human data. Embryo-fetal toxicity in animal.
Oseltamivir	Avoid unless potential benefit outweighs risk (e.g., during a pandemic)	safe during Breastfeeding	Category 1 limited human data suggest no embryo-fetal toxicity. No evidence of toxicity in animals.
ANTIMALARIAL AGENTS			
Chloroquine phosphate	Use if benefit overweight risk	safe during Breastfeeding	Category C
Primaquine phosphate	Risk of neonatal haemolysis and methemoglobinemia in 3rd trimester	Probably safe, monitor infant for toxicity	Category 1 Avoid in pregnancy (risk of haemolysis if fetus G6PD-deficiency)
Quinine sulfate	High doses are teratogenic in 1st trimester, but in malaria benefit of treatment outweighs risk	Safe during Breastfeeding	Category 1 Use only if other effective antimalarials are unavailable

Name of the Agent	Pregnancy	Breastfeeding	FDA Pregnancy category
ANTIMALARIAL AGENTS			
Artemether with lumefantrine	Safe during pregnancy, recommended by WHO and CDC in all trimesters	Avoid breast feeding for at least 1-week after last dose	Category 1 Recommended by WHO and CDC in all trimesters. No increase in major birth defects, miscarriage, or adverse maternal or fetal outcomes.

Appendix A- Dose adjustment in Pregnancy- General Considerations.

There are some physiological changes that may occur in pregnancy may affect the pharmacokinetics of drugs taken during the gestational period and post-partum. Depending on the clinical significance of these changes, adjustment of the doses and /or dosing interval may warrant consideration. Below are some examples of altered drug distribution and elimination in pregnancy.

- Increased maternal plasma volume may increase the volume of distribution of the same drug, which may require a dose increase.
- Decreased plasma protein concentration, specifically albumin, may increase the free fraction of highly protein bound drugs, which may require a dose reduction.
- Increased renal blood flow and glomerular filtration rate may increase the elimination of drugs that are excreted primarily in the urine. This may require use of an increased dose and /or a shorter dosing interval.
- Alteration in the activity of hepatic drug metabolizing enzymes may require dosage adjustment as follows:
  - Decreased activity (e.g., CYP1A2 and CYP2C19). For drugs that are dependent on these enzymes for elimination, a dose reduction may be required. For drugs that require these enzymes for conversion to their active form, a dose increase may be appropriate.
  - Increased activity (e.g., CYP3A, CYP2D6 and CYP2CP). For drugs that are dependent on these enzymes for elimination, a dose increase may be required. For drug that require these enzymes for conversion to their active form, a dose reduction may be required.

- Consider therapeutic drug monitoring (TDM) for some agents such as Vancomycin, Gentamicin … etc in order to achieve therapeutic level and avoid toxicity.
- Refer to product literature for newly approved or non- approved antimicrobials not listed in the guideline.

Appendix-B -Pregnancy Category chart	
Pregnancy category A	Adequate research has been done with the conclusion that drugs in this category are not likely to cause any harm to the foetus in the first trimester as well as later in pregnancy.
Pregnancy Category B	Studies carried out on animals have shown no adverse effects on the foetus; however, there is a lack of controlled studies on human pregnancy.
Pregnancy category C	Animal studies have shown evidence of harmful effects on the foetus; however, no controlled study has been done on a human pregnancy. The medicines may be prescribed in cases where the potential benefits outweigh the possible adverse effects.
Pregnancy category D	Studies done on human pregnancy have shown positive risks to the foetus. However, doctors might prescribe them in certain cases where the potential benefits outweigh the risks.
Pregnancy category X	Both human and animal studies have shown positive risks to the foetus, with the adverse effects extending to serious birth defects, miscarriage and fetal death. The possible risks of using these medicines outweigh any potential benefits.

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PENICILLIN ALLERGY

Adverse drug reactions (ADR) are defined as any noxious, unintended, undesired effect of a drug that occurs at doses used for prevention, diagnosis, or treatment.

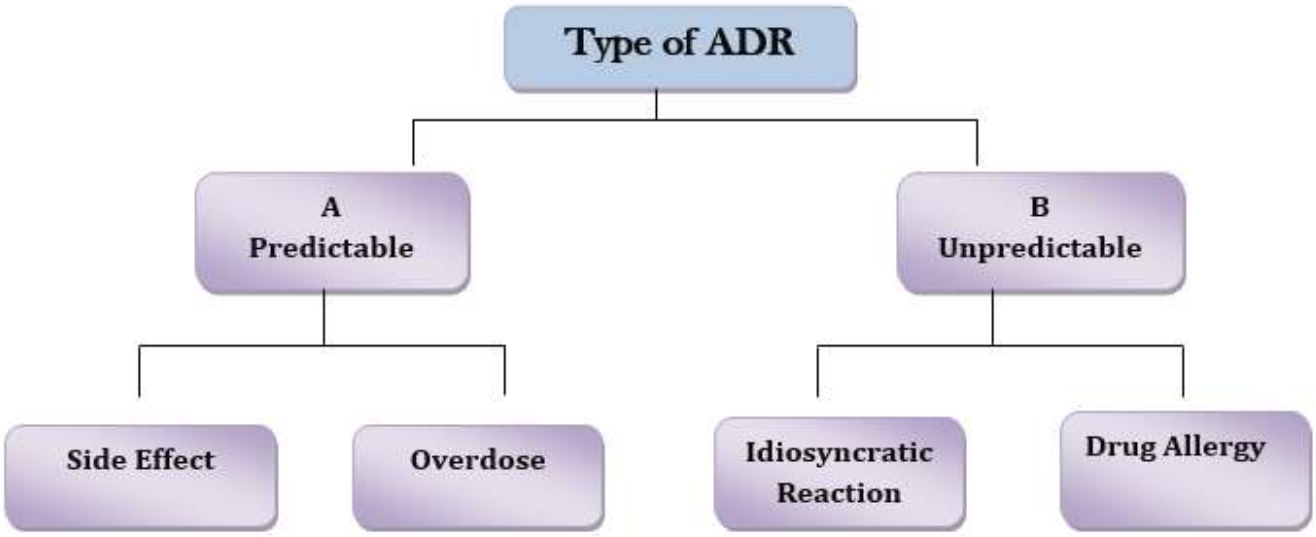

FIG-3

Drug Allergy is immunologically mediated reactions either antibody mediated or cell mediated.

Penicillin:

- Belongs to ß-lactam antibiotics.
- Generally effective at eradicating common bacterial infections such as skin, ear, sinus and upper respiratory tract infections.

Allergy to penicillin is the most commonly-reported medication allergy but true penicillin allergy is rare.

- Estimated frequency of anaphylaxis 1–5 per 10,000 cases of penicillin therapy.

Allergic reactions to penicillin categorized based on time of onset of symptoms:

- **Immediate reactions:**
  - Begin within an hour of the first administered dose.
  - Reactions are usually type I (IgE-mediated) reactions but can be also non IgE mediated.
  - May escalate to life-threatening anaphylaxis.
  - Severe Symptoms include Anaphylaxis, compromised airway, laryngeal edema, stridor, cough, throat tightness, wheezing, hypotension, collapse. Gastrointestinal symptoms (severe crampy abdominal pain, repetitive vomiting) together with cutaneous features.,
  - Non severe symptoms include: Mild urticaria, itching or rash, Mild angioedema (eg.lip swelling).
  - Moderate symptoms include: Generalized urticaria, significant pruritus, significant angioedema (excluding laryngeal edema). Persistent abdominal pain and/or vomiting.

The diagnosis of immediate allergic reactions to penicillin is based on clinical history, skin testing

when available, and sometimes graded challenge.

- **Delayed reactions*:***

- *Occur* at least 6 hours after dosing, with the majority occurring at 1-2 weeks after drug initiation.
- Severe Symptoms include severe cutaneous drug reaction (e.g., DRESS, SJS/TEN (DRESS= Drug rash with eosinophilia and systemic symptoms, SJS/TEN = Stevens-Johnson Syndrome/Toxic Epidermal Necrolysis)
- Non-Severe symptoms include benign maculopapular Rash

Usually mild and often related to a concomitant viral infection, especially in children.

- Rare delayed systemic reactions also exist and can be severe.
- Patients with past delayed systemic reactions, such as Stevens-Johnson syndrome, toxic epidermal necrolysis, hypersensitivity syndrome, or other exfoliating dermatoses should not receive penicillin again under any circumstances.

Risk of recurrent reactions depends on the time elapsed since the patient's last reaction.

- ~ 50% lose sensitivity after 5 years.
- ~ 80% lose sensitivity after 10 years.

Thorough history is an essential component in the evaluation of patients with suspected drug allergy:

- Why was the medication prescribed?
- How long ago did the reaction occur?
- Which systems (e.g., cutaneous, respiratory, GI) were involved in the reaction and what were the characteristics?
- Characterization of the cutaneous lesions important in determining the cause, further diagnostic tests and management decisions
- When during the course did the reaction occur?
- Was the patient taking concurrent medications at the time of the reaction?
- What was the therapeutic management required secondary to the reaction?
- Had the patient taken the same or cross-reacting medication before the reaction?
- Has the patient been exposed to the same or similar medication since the reaction?
- Does the patient have an underlying condition that favours reactions to certain medications?

Cross reactivity among B-lactams i.e., "penicillin, cephalosporins, carbapenems and monobactams".

- **Cephalosporins**: cross reactivity occurs because of the B-lactams ring and also the R chain side group.
  - Cross reactivity can be as high as 10%.
  - Avoid drugs with a similar R side chain.
- **Carbapenems:**
  - >99% of penicillin-allergic patients tolerate carbapenems e.g., meropenem.

- **Monobactams:**
  - No immune cross reactivity, therefore penicillin-allergic patients may receive aztreonam normally.
  - Not to be administered to patients who are allergic to ceftazidime (due to aztreonam and ceftazidime sharing an identical R1 side chain)

- **Diagnostic tests in drug allergy:**
  - Testing for immediate reactions:
    - Markers of anaphylaxis: tryptase.
    - Skin testing. Over 90% of reported penicillin allergies can be excluded by skin testing and oral provocation.
    - In vitro tests (specific IgE).
  - Drug Provocative graded challenge:
    - Purpose: To confirm or exclude an allergy to a specific drug. (It does not mean that the patient will not experience an immediate adverse reaction in the future)
    - Administration of progressively increasing doses of a medication until a full dose is reached.
    - Medication is introduced in a controlled manner to a patient who has a low likelihood of reacting to it.

- **Drug desensitization*:***
  - *A p*rocedure that modifies a patient's immune response to a drug allowing him/her to take the drug temporarily in a safe manner.
  - Done in case of:

- Immediate reactions (IgE-mediated and non-IgE mediated) drug allergy.
- When no other alternative exists.
- Contraindicated in severe exfoliative drug eruption (SJS, TEN, DRESS) and in reactions resulting in end organ damage.

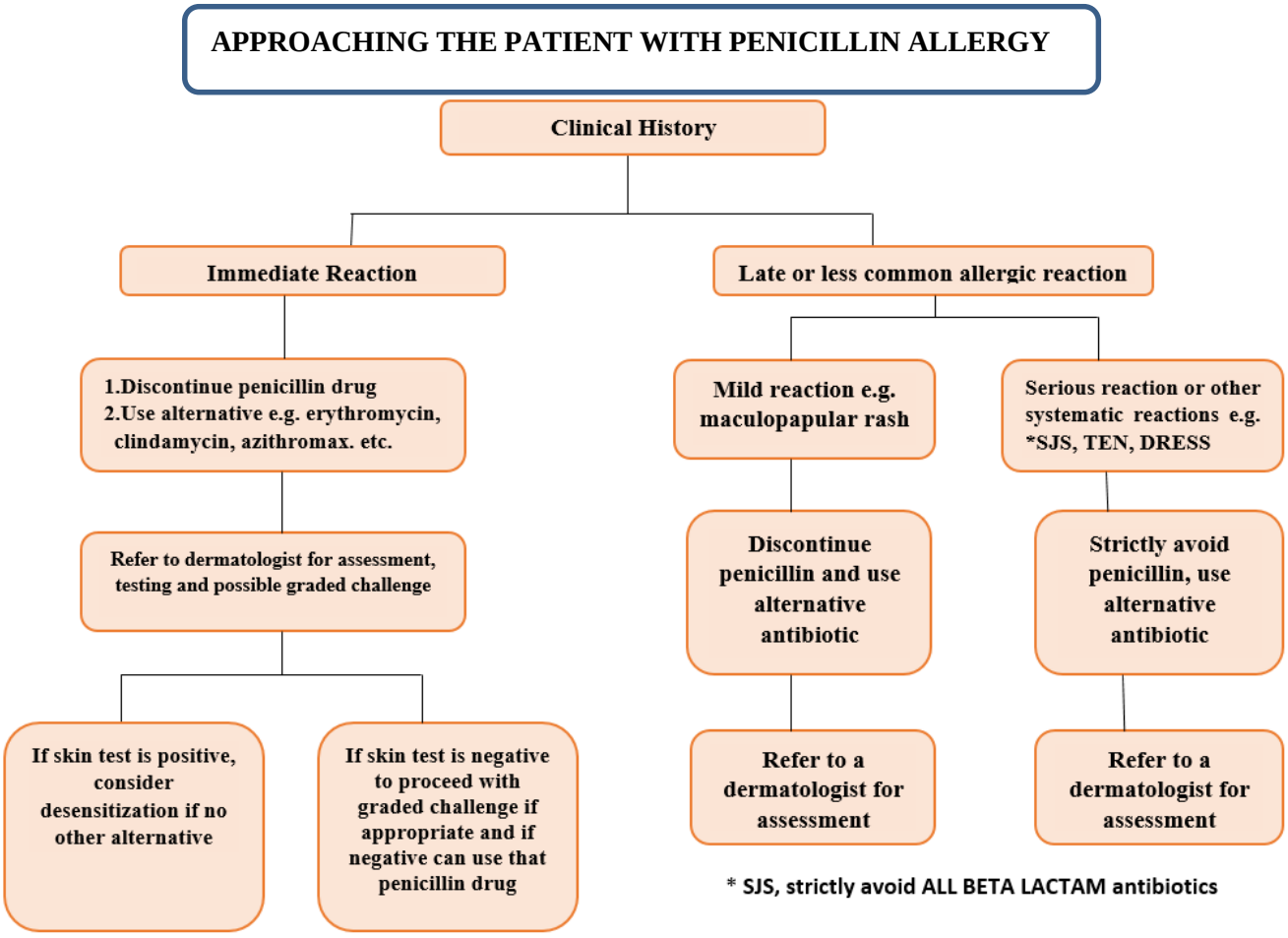

FIG-4

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TABLE 18: SUGGESTED DURATION OF ANTIBIOTIC THERAPY IN COMMON INFECTIONS

Early change from IV to oral regimens is cost effective in many infections. The recommended duration is a minimum or average time and should not be considered as absolute.

CLINICAL DIAGNOSIS		DURATION OF THERAPY (DAYS)	COMMENTS
Bacteraemia due to Gram negative Bacilli (GNB) Bacteraemia with removable focus (no endocarditis)		Duration: 7-14 days	
Osteomyelitis	Adult; acute	42 -56 days	Depends on the location of the infection
	Adult; chronic	- 42 if surgical debridement, - > 42 days or longer if surgical intervention cannot be done or in case of atypical pathogens e.g., TB, Coxiella	Optimal duration of therapy unknown: A prolonged course of therapy is typically recommended but 6 weeks is probably adequate if surgical debridement is performed.
	Child; acute; *Staph*ylococcus and Enterobacteriaceae	Minimum 21-28 day MRSA may need longer duration, consult ID)	Duration to be guided by clinical response and normalisation of inflammatory markers
	Child; acute; *Strept*. meningococci, *Haemophilus*	14-21	
Infective endocarditis, native valve	Enterococci	28 or minimum 42 (resistant enterococcus)	Refer to Table 4 for specific pathogen related duration
	S. aureus	14 (uncomplicated right-sided only) or 28	
	Viridians streptococci	14 (uncomplicated IE) or 28	
Bacillary dysentery (Shigellosis)		Single dose, up to 3 days if no response	Infection due to S. dysenteriae type 1/ HIV co-infection: 5-7 days
Typhoid fever (Typhi):	Ceftriaxone	7–14	
	Ciprofloxacin	7–10	
	Azithromycin	5- 7	
H. pylori		14 For triple-drug regimes	
Pseudomembranous enterocolitis (*Clostridioides difficile*)		10	Longer duration might be needed in severe cases depending on response to therapy and clinical course.

TABLE 18: SUGGESTED DURATION OF ANTIBIOTIC THERAPY IN COMMON INFECTIONS

CLINICAL DIAGNOSIS	DURATION OF THERAPY (DAYS)	COMMENTS	CLINICAL DIAGNOSIS
Genital disease	Non-gonococcal urethritis or mucopurulent cervicitis	7 days Doxycycline or single dose Azithromycin	
	Pelvic inflammatory disease	14	
Septic arthritis (non-gonococcal)	Adult Infant/child	14–28 101-4	Duration to be guided by: clinical response to antibiotics, surgical intervention and normalisation of inflammatory markers
Cystitis	Cotrimoxazole, Ciprofloxacin	3	
	Nitrofurantoin	5	
	Fosfomycin	1	
Pyelonephritis		ranges from 5 to 10 days, depending on the clinical response and the antimicrobial chosen. (e.g Fluoroquinolones for 5-7 days, TMP-SMX 7-10 days, beta-lactam for 7-10 days) used)	
Pneumonia, pneumococcal		5 days	
CAP		minimum 5 days provided the patient is clinically stable and afebrile for 48-72 hrs..	
Pneumonia, staphylococcal		21-28	Variable, based on presence or absence of complication (e.g. endocarditis or metastatic infection) and until biomarkers normalise
Legionella, mycoplasma, chlamydia		7–10 minimum of five days until the patient is clinically stable and afebrile for at least 48 hours. Patients with severe pneumonia or chronic comorbidities may be slow to respond to therapy and often require 7 to 14 days of treatment.	

TABLE 18: SUGGESTED DURATION OF ANTIBIOTIC THERAPY IN COMMON INFECTIONS

CLINICAL DIAGNOSIS	DURATION OF THERAPY (DAYS)	COMMENTS	CLINICAL DIAGNOSIS
Lung abscess		Usually 28–48	
Meningitis	*N. meningitidis*	7	
	H. influenzae	minimum 7	
	S. pneumoniae	10–14	
	Listeria	21(longer in immunocompromised)	
	meningoencephalitis, group B *Strept*, coliform	21	
Group A *Strept*. pharyngitis Also see pharyngitis		10 days if Penicillin (Azithromycin 5 days in children & 3 days in adults)	
Acute sinusitis		5–7 (mild to moderate) 14 or longer therapy if severe infection	
Cellulitis		5-7 (up to 14 if severe infection, slow response, immunocompromised patient)	Until 3 days after acute inflammation disappears
Otitis media with effusion		<2 yrs: 10 >2 yrs: 5-7	

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19 GUIDELINES FOR ANTIMICROBIAL IN HAEMATOLOGY/ONCOLOGY IN ADULTS

19 A. Management of Febrile Neutropenia

Definition: Temperature of ≥ 38.3 °C once or ≥ 38.0 °C sustained for more than 1 hour AND ANC of <500 /mm3 or ANC of 1000/mm3 but expected to drop to <500 mm3 in the next 48 hours

Initial Assessment and Investigations:

- Detailed history and physical examination (type of chemotherapy, prior prophylactic antibiotics, immunosuppression, recent surgeries, any allergies)
- Recent cultures results including resistant bacteria
- Routine laboratory investigations including full blood count
- Two sets of blood cultures (one from central line if it is present) before antibiotics are started
- Chest imaging if any respiratory signs or symptoms

Empirical Treatment:

Piperacillin-tazobactam 4.5 g every 8 hours OR 4.5 g every 6 hours (If *Pseudomonas spp*. is highly suspected)

Penicillin allergy:

- Mild (itching, or mild rash without organ involvement): IV cefepime 2 g every 8 hours
- Severe (e.g., anaphylaxis, angioedema, severe cutaneous reaction such as, but not limited to, Steven Johnsons Syndrome -SJS):

(IV Aztreonam 2g q8h or IV Ciprofloxacin 500 mg q12h **PLUS** IV Vancomycin)

Add IV Vancomycin in the following conditions:

- Hemodynamic instability
- Bacteremia with gram positive organism pending susceptibilities
- Central venous catheter infection is suspected
- Soft tissue and skin infection
- Pneumonia

Stop After 48 hours if no growth of MRSA on blood cultures or a negative MRSA nasal swab (except if there is purulent soft tissue and skin infection or use of aztreonam as empirical therapy

Unstable hemodynamics /Septic shock: Infectious Diseases Consultation

Empirical Treatment:

Meropenem 1g every 8 hours plus IV Vancomycin plus (consider IV Amikacin)

Add empiric echinocandin (Anidulafungin 200 mg loading dose then 100 mg daily or Caspofungin 70 mg loading dose then 50 mg daily) in the following:

- Presence of central venous catheter for more than 7 days
- Total parenteral nutrition (TPN)
- Colonisation with *candida* species
- Severe neutropenic enterocolitis or intra-abdominal infection
- Broad spectrum antibiotics for more than 7 days duration

De-escalation and Discontinuation of Antimicrobials:

Antimicrobials can be discontinued if:

- ANC > 500 /mm3 for at least 48 hours
- Afebrile for 72 hours.
- Completion of appropriate duration of antimicrobial therapy if there is a documented source of infection

Patients with ANC <500 /mm3 who have clinically improved and have been afebrile for 72 hours and received at least 5 days of empiric antimicrobials and no clear source of infection:

- De-escalate antibiotics to oral fluoroquinolone (Levofloxacin 500-750 mg PO once daily **OR** Ciprofloxacin 500mg PO q12hr) prophylaxis until ANC recovery **OR**:
- Continuing IV antibiotics until ANC recovery (case by case depending on benefit and risk)

19 B. Antimicrobial Prophylaxis in Specific Immunocompromised Populations

Table 19 B - 1: Antimicrobial Prophylaxis in Patients with Acute Leukaemia

Type of prophylaxis	Population	Recommendations	Comments	Doses / monitoring
Antibacterial prophylaxis	Patients at high risk of febrile neutropenia (Temperature of ≥ 38.3°C and ANC < 0.5×10^9/L) **OR** profound protracted neutropenia (ANC < 0.1×10^9/L, lasts for ≥ 7 days)	No bacterial prophylaxis is recommended. Follow above guide if febrile neutropenia developed.	Clinician must be mindful of the risk to select not only for fluoroquinolone-resistant, gram-negative bacilli, but also for *Clostridium difficile* and Enterococci	
Antifungal prophylaxis	Patients at high risk of febrile neutropenia (temperature of ≥ 38.3°C and ANC < 0.5×10^9/L) **OR** profound protracted neutropenia (ANC < 0.1×10^9/L, lasts for ≥ 7 days) Not recommended for patients at low risk of profound, protracted neutropenia	Patient with ALL or AML lymphoid blast crisis: -If incidence of mold is low; Fluconazole is recommended -If the risk of mold infection exceeds 6%; 'mold active' triazole such as Voriconazole **OR** Posaconazole are recommended In patients with ALL; 'Mold active' triazole is not recommended In patients with CLL or CML; primary antifungal prophylaxis is not recommended	- Prophylaxis to be given during period of neutropenia - Prophylaxis to be started 24 hrs after last Anthracycline dose or on first day of chemotherapy in patients not receiving anthracycline based treatment -Prophylaxis to be re-started with each consolidation chemotherapy and continue until resolution of neutropenia	Fluconazole PO 400 mg q24hr **OR** Posaconazole* 300 mg PO q12hr on day 1, then 300 mg PO q24hr **OR** Voriconazole* 200 mg PO q12hr *TDM recommended for Posaconazole and Voriconazole

Table 19 B - 1: Antimicrobial Prophylaxis in Patients with Acute Leukaemia

Type of prophylaxis	Population	Recommendations	Comments	Doses / monitoring
Anti-PJP	Patients receiving chemotherapy regimens associated with > 3.5% risk for pneumonia from *Pneumocystis jirovecii*	Trimethoprim Sulfamethoxazole (TMP-SMX) In patients with hypersensitive to Sulfonamides or unable to tolerate TMP-SMX for other reasons, alternative options are dapsone, atovaquone or aerosolized pentamidine	-G6PD screening -Initial prophylaxis for most patients until completion of anti-leukemic therapy -Atovaquone with meals to reduce diarrhoea and GI adverse effects	TMP-SMX 1 SS tablet (80/400 mg) PO q24hr for CrCl30-50 mL/min) **OR** 1 DS tablet (160/800 mg) PO thrice /week **OR** Dapsone 100 mg PO q24hr **OR** Atovaquone 1500 mg PO q24hr
Antiviral (HSV/VZV)	Neutropenic patient undergoing induction chemotherapy	Prophylaxis with nucleoside analogue such as Acyclovir, Valacyclovir, Famciclovir	To be given until recovery of WBC count or resolution of mucositis, whichever occurs later	Acyclovir 400-800 mg PO q12hr **OR** Valacyclovir 500 mg PO q12hr **OR** Famciclovir 250 mg PO q12hr
Antiviral (Hepatitis B)	Patient with substantial risk of reactivation of HBV such as HBsAg positive treated with tyrosin Kinase inhibitors	Prophylaxis with nucleoside reverse transcription inhibitor such as entecavir or tenofovir		Entecavir 0.5mg PO daily **OR** Tenofovir 300mg PO daily

Table 19 B - 2 a: Antimicrobial Prophylaxis in Stem Cell Transplantation Recipients

I. Antibacterial prophylaxis

	Autologous / Allogenic stem cell transplant	Comments
Antibacterial prophylaxis	Not indicated unless patient develops fever during period of neutropenia (Refer to febrile neutropenia guideline)	
Prophylaxis for encapsulated organisms	If patient is not on Sulfamethoxazole/trimethoprim for PJP prophylaxis add: Penicillin VK: - Adults and Children (> 60 kg): 500 mg PO q12hr - Adults (< 60 kg) and Children (> 3 years and < 60 kg): 250 mg PO q12hr - Children (< 3 years): 125 mg PO q12hr	Indications: - High dose steroids (>20 mg prednisone equivalents daily for more than 1 month) or other immunosuppressive therapy - Chronic GVHD on immunosuppression - Asplenia (medically or surgically) - > 65 year post allogeneic stem cell transplant · Start from engraftment until 12 months post-transplant and at least 6 months after discontinuation of all immunosuppressive medications for chronic GVHD. · In asplenic patients: continue prophylaxis for 1 year after transplantation or until age of 6- or 2-years post splenectomy (whichever occurs later)

II. Antifungal Prophylaxis:

	Pre-engraftment During neutropenia and steroids therapy	**History of invasive mold infection**	**Post-engraftment: Cord blood, T cell depleted transplant, GVHD, high dose corticosteroids**	**Comments**
	Fluconazole **Adult dose :** 400 mg IV/PO **Paediatric dose:** 6 mg/kg/day (max 400 mg) **Duration** (From day -1 until engraftment)	**Voriconazole** **Adult dosing:** IV/PO 200 mg Q12h **Paediatric dosing: IV/PO** - < 20 kg: 50 mg twice daily - 20-40 kg: 100 mg twice daily - >40 kg: 200 mg twice daily **OR** **Posaconazole** -**Adult** dosing: delayed release tablet 300 mg or IV q24hr -**Paediatric dosing**: ≥13 years: delayed release tablet 300 mg PO or IV q24hr ≥13 years: Posaconazole suspension: 4 mg/kg three times daily (max 200 mg per dose) (From day -1 until 100+)	**Posaconazole** **OR** **Voriconazole** **Duration:** **(**From engraftment until 100+ or longer depending on risk factors for invasive fungal infections**)**	

III. PJP Prophylaxis:

Condition	Duration
Autologous stem cell transplant	From engraftment until 90 +
Allogeneic Stem Cell Transplantation	From engraftment until 6 months post-transplant
Anti-thymocyte globulin use	From engraftment until 1 year

Drug	Adult dosing	Paediatric Dosing
First line: Sulfamethoxazole/trimethoprim*	800/160 mg PO/IV thrice a week **OR** 400/80 mg daily	2.5 mg/kg PO/IV twice daily x 2 days/week (max 800/160 mg)
Dapsone	50 mg q12hr PO daily	2–4 mg/kg/day PO (maximum 100 mg)
Atovaquone	1500 mg PO daily	· 4-24 months: 45 mg/kg daily (max 1500 mg) · 2-13 years: 30 mg/kg daily (max 1500 mg) · ≥13 years: 1500 mg daily
Pentamidine (Inhalation)	300 mg once per month	· ≥ 5 years old: 300 mg monthly · < 5 years old: 9 mg/kg monthly (max 300 mg)
Pentamidine (Intravenous)	4 mg/kg every 4 weeks	4 mg/kg (maximum 300 mg) every 4 weeks

***In case of severe allergy to Sulfamethoxazole/trimethoprim, acceptable alternatives are atovaquone, inhaled pentamidine, and intravenous pentamidine**

IV. HSV/VZV Prophylaxis:

	Adult dosing	Paediatric dosing
Acyclovir	Oral : 400 mg q12hr Intravenous : 200 mg q12hr	Oral: 30-40 mg/kg twice daily (max 800 mg/dose) Intravenous: 250 mg/m2 every 12 hours (max 200 mg/dose)
	Start with conditioning regimen and then continue for one year after stem cell transplantation	

V. CMV Preemptive Therapy:

-A pre-emptive approach consists of regular monitoring of CMV reactivation with a CMV qPCR assay
- CMV viral load monitoring is done weekly starting from engraftment until Day 100 post transplantation

Threshold for CMV Viral Load For a pre-emptive Therapy

CMV Risk	Day 0-100	Day > 100
High Risk Cord blood recipients Haploidentical HLA-Mismatched T-cell depleted ≥ 1 mg/kg corticosteroids	**≥ 50 IU/ mL (1.70 log10)**	**≥ 500 IU/ mL (2.70 log10)**
Low Risk All transplants that do not meet above criteria	**≥ 150 IU/mL (2.18 log 10)**	

Induction: Duration is 2 weeks with one negative CMV PCR at the end of induction

Preferred:

· IV Ganciclovir 5 mg/kg q12hr **OR**

· Valganciclovir PO (Avoid in patient with poor oral intake, active gut GVHD, liver disease, diarrhoea or severe myelosuppression)

Dosing:

Adults and Peds > 50 kg: 900 mg PO q12hr

Peds ≥40 to<50 kg:
675 mg PO Q 12 hrs
Peds ≥ 30 to < 40 kg:
450 mg PO q12hr
Peds ≥20 to <30 kg:
450 mg PO q12hr *or* Liquid 14 mg/kg Q 12 hrs Peds ≥ 15 to <20 kg:

225 mg PO q12hr (= 1⁄2 pill) *or* Liquid 14 mg/kg q12hr
Peds ≥10 to < 15 kg:
Liquid 14 mg/kg q12hr

(For patient with impaired renal functions consult pharmacist)

Alternative: Foscarnet 90 mg/kg q12hr (Consult Infectious Diseases)

Maintenance: duration at least 2-3 weeks after induction therapy and/or until an undetectable CMV viral load is documented by CMV qPCR.

Preferred:

· IV Ganciclovir 5 mg/kg q24hr **OR**

· Valganciclovir PO (Avoid in patient with poor oral intake, active gut GVHD, liver disease, diarrhoea or severe myelosuppression)

Dosing:

Adults and peds > 50 kg: 900 mg PO q24hr

Peds ≥ 40 to < 50 kg: 675 mg PO q24hr
Peds ≥30 to < 40 kg: 450 mg PO q24hr
Peds ≥20 to <30 kg: 450 mg PO q24hr *or* Liquid 14 mg/kg q24hr

Peds ≥ 15 to <20 kg: 225 mg PO q24hr (= 1⁄2 pill) *or* Liquid 14 mg/kg q24hr

Peds ≥10 to < 15kg: Liquid 14 mg/kg q24hr (For patient with impaired renal functions consult pharmacist)

Alternative: Foscarnet 90 mg/kg q24hr (Consult Infectious Diseases)

For CMV Invasive Disease (Pneumonitis, colitis, hepatitis etc.) consult Infectious Disease

Table 19 B - 2 b : Management of Common Infections in Stem Cell Transplantation Recipients

	Preferred	Alternative	Comments
Pneumocystis pneumonia	TMP-SMX: (PO or IV) · Treatment **dose**: Trimethoprim component 15 mg/kg/day given q8hr or q6hr (divided doses) · **Duration**: 21 days **Secondary prophylaxis** to be considered for patients with ongoing immunosuppression	**In non-severe cases:** · Clindamycin iv 600 mg q6hr **PLUS** Primaquine 30 mg daily (Check G6PD status) · Atovaquone 750 mg PO q12hr **In severe cases**: Pentamidine 4 mg/kg/day IV **Duration**: 21 days	**Adjunctive steroids** therapy for severe PCP (PaO2 <70 mmHg on room air) · Day 1 to 5: Prednisolone 40 mg PO. q12hr · Day 6 to 10: Prednisolone 40 mg PO OD · Day 11 to 21: Prednisolone 20 mg PO OD
Invasive aspergillosis	Voriconazole 6 mg/kg IV or PO q12hr x 2 days, followed by 4 mg/kg q12hr Duration: till resolution of symptoms, signs and radiologic changes (minimum of 6 weeks)	- Posaconazole Delayed release tablets 300 mg q12hr for 2 doses then 300 mg daily -Posaconazole suspension 200 mg q6hr then 400 mg q12hr - Liposomal Amphotericin B 3-5mg/KG/day IV	· ID consult · CT scan looking for: macronodules, halo sign or cavitation · Request BLA and or Serum Galactomannan antigen · Monitor Voriconazole serum level (target 1.0-5.5 mg/L)
Invasive mucormycosis	Liposomal Amphotericin B 5-10 mg/kg/day IV till resolution of symptom, signs and radiologic changes	Isavuconazonium sulfate 372 mg PO/IV q8hr x 6 doses and then 372 mg PO/IV daily	· Surgical debridement · Hyperbaric oxygen therapy · Consider changing to oral Isavuconazole or Posaconazole delayed release tablet as a step-down oral therapy after IV Liposomal Amphotericin B or IV Isavuconazole in patients with good clinical response . Review or consider reduction of immunosuppressive therapy when possible

Table 19 -B- 3: Antimicrobial Prophylaxis in Haematology/Oncology Patients on Specific Biological Agents

Agents	Antibacterial	Antifungal	Antiviral	PJP
Preferred	Not recommended routinely	Fluconazole 400 mg PO/IV daily (candida prophylaxis only) Posaconazole 300 mg PO/IV q12hr x2 load, then 300 mg daily (mold-active prophylaxis)	For *HSV/VZV* Acyclovir 400 mg PO q12hr **OR** 2 mg/kg IV q12hr 2 mg/ (adjusted body weight in obese) For *HBV* -Screening before the start of cancer treatments. -HbsAg positive patients should receive antiviral prophylaxis during treatment and for at least 12 months after its completion. Entecavir 0.5mg PO daily **OR** Tenofovir 300 mg PO daily	TMP/SMX 480mg PO daily **OR** 960mg PO three times per week
Alternative	Not recommended routinely	Caspofungin70 mg IV x1 load, then 50 mg IV daily **OR** Isavuconazole 372 mg PO/IV q8h x6 load, then 372 mg daily **OR** Liposomal amphotericin B 3-5 mg/kg IIV daily (AdjBW in obese) **OR** Voriconazole 400 mg PO q12hr x2 load, then 200 mg q12hr **OR** Voriconazole 6 mg/kg IV q12hr x 2 loading doses, then 4 mg/kg q12hr (AdjBW in obese)	Famciclovir 250 mg PO **OR** Valacyclovir 500 mg PO	If drug interaction, intolerance, allergy, or contraindication to TMP/SMX: Dapsone100 mg PO daily **OR** inhaled Pentamidine 300 mg inhaled every 4 weeks

Table 19 -B- 3: Antimicrobial Prophylaxis in Haematology/Oncology Patients on Specific Biological Agents

Specific Biological and immunosuppressive agents and recommended prophylaxis

Agents	Antibacterial	Antifungal	Antiviral	PJP
Proteasome inhibitors	No routine prophylaxis	No routine prophylaxis	Prophylaxis for *HSV/VZV* during treatment	No routine prophylaxis
Daratumumab	No routine prophylaxis	No routine prophylaxis	Prophylaxis for *HSV/VZV* during treatment and 3 months after	No routine prophylaxis
High-dose Steroids	No routine prophylaxis	Mold-active prophylaxis if ≥ 1 mg/kg/day prednisone equivalents for 2 weeks (threshold not well defined, consider patient-specific risk factors)	Prophylaxis for *HSV/VZV* during treatment if given ≥ 10 mg/day prednisone equivalents	Prophylaxis if ≥ 20 mg/day prednisone equivalents for 4 weeks Prophylaxis should be continued while steroids are being weaned and/or for a period of 6 weeks after cessation
Purine Analogs **(Fludarabine, cladribine,** **clofarabine, pentostatin)**	No routine prophylaxis	Consider mold-active prophylaxis if ANC <500 cells/mm3 for >7 days	Prophylaxis for *HSV/* during treatment	Consider during treatment course (Especially if CD4 <200 cells/mm3), may consider continuing up to 6 months after treatment
Alemtuzumab	No routine prophylaxis	No routine prophylaxis	*HSV* prophylaxis until minimum of 2 months after treatment and CD4 > 200 cell mm^3 CMV surveillance	PJP prophylaxis until minimum of 2 months after treatment and CD4 > 200 cells/mm3

Table 19 -B- 3: Antimicrobial Prophylaxis in Haematology/Oncology Patients on Specific Biological Agents

Agents	Antibacterial	Antifungal	Antiviral	PJP
BTK inhibitors (e.g. ibrutinib)	No routine prophylaxis	No routine prophylaxis	Higher infection risk in first 6 months. Consider *VZV* prophylaxis: Acyclovir 400 mg q12hr **OR** Valacyclovir 500 mg q12hr	Higher infection risk in first 6 months Consider PJP prophylaxis: TMP/SMX 480mg PO daily **OR** 960mg PO three times per week
PI3K inhibitors (e.g. idelalisib)	No routine prophylaxis	No routine prophylaxis	CMV surveillance	Consider PJP prophylaxis: TMP/SMX 480mg PO daily **OR** 960mg PO three times per week

Table 19 B-4: Antimicrobial Prophylaxis in Patients with Multiple Myeloma Treated with CAR-T Cell Therapy or Bispecific Antibodies

Pathogen	Intervention	Indication/Duration
Bacterial	Levofloxacin 500 mg PO daily **OR** Augmentin 875/125 mg PO twice a day if allergy or intolerance to fluoroquinolone	CAR T-cell: Start when ANC < 500 ion and continue until neutrophil recovery BsAb: Start with onset of therapy and administer during the first month
	Immunoglobulin replacement: suggested 400 mg/kg once every 4 weeks	CAR T-cell: Day +30 through 1 year. After 1 year continue until serum IgG >400 mg/dL BsAb: Start at second month of therapy and continue until end of therapy or serum IgG >400 mg/dL *(*whichever is longer)
	Pneumococcal conjugate vaccine (PCV)	Revaccination can begin 3–6 months after CAR T-cell therapy. administer 1 dose of PCV15 followed by 1 dose of PPSV23 at least 1 year later. Update vaccination status prior to starting BsAb
Herpes Simplex	Acyclovir 400–800 mg PO twice a day	Universal and indefinite prophylaxis

Table 19 B- 5: Antimicrobial Prophylaxis of Patients with Inflammatory Arthritis Treated with Disease-Modifying Antirheumatic Drugs (DMARD)

(Abatacept ABA, Adalimumab ADA, Certolizumab pegol CZB, Etanercept ETN, Golimumab GOL, Infliximab INF, Rituximab RTX, Tocilizumab TCZ, Ustekinumab UST)

Pathogen	Recommendation
Mycobacterium tuberculosis All patients require screening for tuberculosis (TB) before starting a biologic agent · After consultation with ID, Patients should be treated with prophylactic anti-TB treatment prior to commencing a biologic agent; therapy may be commenced after completing at least 1 month of anti-TB treatment and patients should be monitored every 3 months - Patients who have had previous inadequate treatment for active TB should be investigated for active TB · Patients with evidence of active TB should be treated before starting a biologic agent; therapy may be commenced after completing at least 3 months of anti-TB treatment and there is evidence that the patient is improving with evidence of culture negativity. Special attention should be given to anti-TB interactions with drugs commonly used to treat AIIRD	· **Options include:** **Preferred:** Isoniazid 300 mg **PLUS** Pyridoxine (12.5-25 mg) PO q24hr Duration: 6- months **OR** - Isoniazid 15mg/kg (maximum dose 900 mg PO once weekly + Pyridoxine (12.5-25 mg) once weekly **PLUS** -Rifapentine: Adults and children, dosed once weekly PO: - 10.0-14.0 kg dose = 300 mg - 14.1-25.0 kg = 450 mg - 25.1-32.0 kg = 600 mg - 32.1-49.9 kg = 750 mg - > 50.0 kg = 900 mg -Duration for 12 weeks. **OR** - Rifampicin 450 mg-600 mg PO q24hr **PLUS** Isoniazid 300 mg PO q24hr **PLUS** Pyridoxine (12.5-25 mg) PO q23hr - Duration: for 3–4 months _ **OR** - Rifampicin for 450 mg-600 mg PO q24hr -Duration: 4 months
HBV and HCV	Screen for hepatitis B and C viral infection · Start pre-emptive anti-viral treatment for HBV during therapy (regardless of HBV DNA levels) and for 12 months after cessation of therapy Entecavir 0.5mg PO daily **OR** Tenofovir 300 mg PO daily · Use biologic therapy with caution in patients with HCV infection
HIV	Screen for HIV prior to commencing a biologic · Anti-TNF therapy can be given in combination with Highly Active Antiretroviral therapy after ID consultation; if CD4+ count >200 cells/mm3 and viral load undetectable

Table 19 B- 5: Antimicrobial Prophylaxis of Patients with Inflammatory Arthritis Treated with Disease-Modifying Antirheumatic Drugs (DMARD)	
Pathogen	**Recommendation**
Pneumocystis jirovecii Pneumonia	Consider primary prophylaxis in patients on Rituximab TMP-SMX 480mg PO daily **OR** TMP-SMX 960mg three times per week

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Table 20 : Hospital Acquired Infection (HAI)

Category	Etiology	Recommendation
Hospital Acquired infections:	-Usually occurs 48 hours or more after admission or within 30 days of receiving healthcare. -Preventing hospital-acquired infections requires strict hand hygiene, proper sterilization of equipment, adherence to aseptic techniques, minimizing invasive device use, and following infection control protocols	
A) Surgical Site Infection (SSI)	Please refer to Table: 9 Guidelines for Treatment of Skin and Soft tissue infection	
B) Ventilator Associated Infection (VAP)	Please refer to Table: 1 Guidelines for Treatment of Respiratory Infections in Adults	
C)Catheter related Urinary tract Infection (CUTI)	Please refer to Table # 10	
D)Catheter Related Bloodstream Infection (CLABSI)	Bloodstream infections directly related to an intravascular catheter ● Clinical signs of infection. ● Blood cultures:(Obtained before antibiotic administration): ○ Paired peripheral and catheter-drawn cultures. ○ Time to positivity (catheter culture positive >2 hours earlier than peripheral). ● Quantitative or semi-quantitative culture of catheter tip (>15 CFUs for significance). Empirical therapy; could be started based on the severity of illness, the risk factors for infection, and the likely pathogens	
Organisms	Gram-positive: *Staphylococcus aureus, coagulase-negative staphylococci (S. epidermidis*). Gram-negative: *Klebsiella spp., Pseudomonas aeruginosa, Enterobacter spp*. Fungi: *Candida spp*. (in immunocompromised patients)	
Empiric Therapy	Low MDR Risk setting:	Vancomycin: 15–20 mg/kg IV q8–12hr (adjust for renal function).
	High MDR Risk: Add Gram-negative coverage	Piperacillin-Tazobactam: 4.5 g IV q6hr **OR** Meropenem: 1 g IV q8hr

Table 20 : Hospital Acquired Infection (HAI)

Category	Etiology	Recommendation
	Fungal Risk Factors (use candida score or if the patient is having neutropenia, TPN use for > 72 hours)	- Add Echinocandins (e.g., Caspofungin 70 mg loading, then 50 mg daily or anidulafungin 200 mg loading then 100 mg daily).
Definitive Therapy	Gram-Positive Pathogens: - MSSA:	- Cloxacillin 2g IV q4hr **OR** Cefazolin 2g IV q8hr for 14 days.
	MRSA	- Vancomycin 15–20 mg/kg IV q8–12hr **OR** Daptomycin 6–10 mg/kg IV daily Duration of therapy: -Uncomplicated: 14 days. -Complicated: At least 4–6 weeks (e.g., endocarditis, osteomyelitis, metastatic infections
	Coagulase-Negative Staphylococci (CoNS)	-Vancomycin 15-20 mg/kg q8-12hr ● Uncomplicated CLABSI: ○ Duration: 5–7 days (if the catheter is removed). ○ Up to 10–14 days if the catheter is retained, with antibiotic lock therapy. ● Complicated CLABSI: ○ 4–6 weeks (e.g., endocarditis, osteomyelitis
	Enterococcus	-If susceptible: Ampicillin 1-2g IV q4-6hr **OR** Vancomycin 15–20 mg/kg IV q8–12hr; for -VRE : Linezolid 600 mg IV/PO q12hr **OR** Daptomycin 8–12 mg/kg IV dq24hr Duration of therapy: 7-14 days.
	Gram-Negative Pathogens:	Tailor therapy based on pathogen susceptibility e.g.: Ceftriaxone **OR** Piperacillin-Tazobactam, **OR Carbapenems**

Table 20 : Hospital Acquired Infection (HAI)

Category	Etiology	Recommendation
		Duration of therapy: Generally: 7–14 days. -Shorter courses (7 days) may be appropriate for patients who respond rapidly to treatment and have no complications. -Longer course (10-14 days) for non-fermenters (e.g., Pseudomonas aeruginosa
	Fungal Pathogen	- Start Echinocandins, transition to Fluconazole 400 mg q24hr IV if susceptible Duration of therapy: 14 days from the first negative culture.
Central Line Management		Remove central line if infection is caused by S. aureus, Candida spp., or Pseudomonas aeruginosa. - Use antibiotic lock therapy alongside systemic therapy if line removal is not feasible. - Get Echocardiogram for all patients with persistent bacteremia or complications, or fungal pathogens
Prevention		- Use aseptic technique during catheter insertion and care. - Apply chlorhexidine for skin antisepsis. - Review the necessity of central lines daily; remove unnecessary lines promptly.

Anti-rabies prophylaxis schedule

- **Pre exposure prophylaxis:**

Pre-exposure prophylaxis is recommended for those at permanent risk of exposure such as laboratory workers, veterinarians and animal handlers. The WHO and MoH recommends a 3 dose schedule at Day 0, 7 and 21 or 28. Check for antibodies every 6 months. If the titer falls below 0.5 IU/L, offer a booster dose.

- **Post exposure prophylaxis (PEP) for Immunologically naïve individuals of all age groups:**

Category	Contact with suspected rabid animal	PEP measures
I	Touching or feeding animals, licks on the skin	• Local wound treatment *
II	Nibbling of uncovered skin, minor scratches or abrasions without bleeding, licks on broken skin	• Local wound treatment • PEP **
III	Single or multiple transdermal bites or scratches, contamination of mucus membrane with saliva from licks, exposure to bat bites or scratches	• Local wound treatment • PEP • HRIG ***

* **Local wound treatment:** Immediate flush and washing by soap and running water.

** **PEP:** 4 doses anti-rabies vaccine (ARV), Intramuscular into deltoid muscle on days 0, 7, 14 and 28. Vaccine should not be given in the gluteal region.

*** **Human rabies immune globulin (HRIG):** 20 IU/kg body weight, half dose should be infiltrated into the depth and around the wound and other half should be given intra-muscularly at a site distant from that of vaccine inoculation. If case seen after 48 hours of bite but within 8 days of bite, offer full dose intra-muscularly.

Note: Please refer to the manufacturer instructions for the currently used vaccine and HRIG.

- **Post exposure prophylaxis for previously immunized individuals of all age groups:**

  - Local wound treatment
  - If animal bite is within 6 months of completed PEP, there is no need of further vaccination
  - If 6 months have elapsed after the last dose of the complete PEP then offer 2 doses (day 0 and 3) for category II bites and 3 doses for Category III bites (Day 0, 3 and 7)
  - After 3 years of previous vaccination, offer full course of PEP

- **Post exposure prophylaxis in immunocompromised host:**

HIV-infected individuals receiving ART who are clinically well and immunologically stable (i.e., normal CD4 percentage > 25% for children aged <5 years and CD4 >200 for aged > 5 years)	• Local wound treatment • PEP
HIV-infected persons not receiving ART or do not meet minimum CD4 cell count criteria with WHO category II and III exposure	• Local wound treatment • PEP • HRIG

Vaccination Schedule for Tetanus

WHO recommends that an individual receives **6 doses** (3 primary and 3 booster doses) of tetanus-toxoid-containing vaccines (TTCV) for life long protection:

1. **Primary Doses:**
    - **Dose 1:** At 2 months of age (Hexa-DTaP)
    - **Dose 2:** At 4 months of age (Hexa-DTaP) (At least 4-6 weeks after the previous dose)
    - **Dose 3:** At 6 months of age (Penta-DTwP) (At least 4-6 weeks after the previous dose)

2. **Booster Doses:**
    - **Booster 1:** At 13 months of age (DTP)
    - **Booster 2:** > 7 years of age (Class/Grade 1). (DT/DTap)
    - **Booster 3:** Above 12-13 years of age (Class/Grade 6) (Tdap)

Types of Vaccines:

- Diphtheria and tetanus (DT) vaccines.
- Diphtheria, tetanus, and acellular pertussis (DTaP) vaccines.
- Tetanus and diphtheria (Td) vaccines.
- Tetanus, diphtheria, and pertussis (Tdap) vaccines
- Diphtheria, tetanus, and whole cell pertussis (DTwP) vaccines.
- Diphtheria, tetanus, and pertussis (DTP) vaccines.

Post-Exposure Prophylaxis (PEP) guidelines for Tetanus:

1. **Risk Assessment of the Wound:**
    - **Clean, Minor Wounds:** Minimal risk (superficial cuts, surgical wounds in sterile settings).
    - **High-Risk Wounds:** Increased risk includes wounds contaminated with dirt, feces, soil, saliva, puncture wounds, crush injuries, burns, frostbite, necrotic, or avascular tissue.
    -
2. **PEP Recommendations Based on Immunization Status:**

Vaccination History	Clean, Minor Wounds	High-Risk Wounds
Fully Vaccinated (≥3 doses, with last dose within the past 10 years)	No action required.	Booster dose of Td or Tdap (if last dose >5 years ago).

Vaccination History	Clean, Minor Wounds	High-Risk Wounds
Incomplete Vaccination (Less than 3 doses or unknown history)	Single dose of Td or Tdap (start catch-up schedule)	Single dose of Td or Tdap AND Tetanus Immunoglobulin (TIG)
Unvaccinated (No prior doses)	Single dose of Td or Tdap (start catch-up schedule)	Single dose of Td or Tdap AND Tetanus Immunoglobulin (TIG)

3. **Dosage and Administration:**

   - **Tdap/Td Vaccine:**
     - **Dose:** 0.5 mL intramuscular (IM)
     - **Site:** Deltoid muscle or anterolateral thigh

   - **Tetanus Immunoglobulin (TIG):**

     - **Indication:** For high-risk wounds in partially vaccinated or unvaccinated individuals
     - **Dose:** 250–500 IU IM (higher dose may be needed for large or heavily contaminated wounds)
     - **Site:** Different anatomical site from the vaccine (to avoid interaction)

4. **Wound Care:**

   - Clean and debride the wound to remove necrotic tissue and contaminants
   - Apply antiseptic agents as appropriate
   - Ensure follow-up for wound healing and infection monitoring

5. **Follow-Up:**

   - **Unvaccinated/Partially Vaccinated Individuals:** Complete the remaining doses of the tetanus vaccination schedule as per national guidelines (typically at 4-week and 6-month intervals after the initial dose)
   - **Documentation:** Record wound type, vaccination given, TIG administered, and patient's follow-up schedule

6. **Special Situations:**

   - **Pregnant Women:** If at risk, administer a dose of Tdap (preferably during the third trimester, but at any time if exposure occurs)
   - **Immunocompromised Patients:** TIG should always be given for high-risk wounds, regardless of vaccination status

ANTIBIOTIC USE IN DENTISTRY

This guide has been developed to promote safe and effective antimicrobial prescribing and antibiotic stewardship by dental practitioners in Oman. The guide also aims to help rationalize and improve standards of antibiotic prescribing within dentistry and enhance patient care. The benefits of prescribing antibiotics to treat or prevent infections are limited by several problems associated with their use including development of microbial resistance, allergic reactions, drug interactions and other side effects. Prescription of antibiotics is mostly used as an adjunct to the primary active dental treatment. Therefore, antibiotics should not be used to delay or postpone the needed dental procedure.

Generally, irresponsible, or inappropriate use of antibiotics include:

- Prescribing in the absence of an infection or where local measures will suffice.
- Prescribing prophylactically when not indicated by evidence.
- An incorrect dose or inappropriate duration.
- Incorrect selection of antibiotics, according to indications and causative pathogens.
- Choosing an incorrect antibiotic for a patient with a known allergy.
- Not adjusting medication or dose considering age, pregnancy, allergies, underlying medical condition and drug interactions.
- Prescribing antibiotics without referring to the latest international updates and guidelines.

This section contains the latest recommended antibiotics to be used for treatment of bacterial infections, indications, and doses (Table 1). It also describes situations where antibiotics are used before dental procedures to prevent or minimize risk of bacterial infection (prophylaxis) [Table 2]. Finally, it lists the oral conditions (or symptoms) that do not require systemic antibiotics (Table 3).

1- Infective conditions in dental, oral and maxillofacial region and antimicrobial guidelines used for treatment.

Table 1 Summary of dental, oral & maxillofacial conditions that **require** treatment by antimicrobial agents

CATEGORY OF ORAL AND MAXILLOFA-CIAL PATHOLOGY	ANATOMIC SITE / DIAGNOSIS	ETIOLOGIES	TREATMENT INDICATION	SUGGESTED REGIMENS (Adult doses)		COMMENTS
				FIRST LINE First line: Antibiotic used for non-allergic adult patient	**SECOND LINE or ALTERNATIVE**	
Odontogenic and facial space infection	**Endodontic Infections (Pulpitis)**	*Viridans and other streptococci, Peptostreptococcus spp, Bacteroides spp, and other oral anaerobes*	Antibiotic treatment is not indicated, active dental treatment to remove the cause or root canal treatment.	**Systemic antibiotics are not indicated for pulpitis**		Reversible pulpitis requires removal of cause, Irreversible pulpitis requires removal of dental pulp (pulp extirpation) followed by root canal treatment
	Periapical abscess (collection of pus)	*Peptostreptococcus*, *Fusobacterium nucleatum*, *Prevotella* spp., *Staphylococcus aureus*	Indicated Only if associated with systemic Involvement (fever/malaise) or cellulitis / swelling.	**Mild to moderate Amoxicillin** 500mg orally TID for 5 days OR	Allergic to Penicillin patients: **Clindamycin** 150-300 mg orally q6hr for 5 days	Antibiotics are used as an adjunct to active dental treatment to remove or treat source of infection.

				Amoxicillin-clavulanate 500/125 mg or 875/125 mg every 8–12 hours If sever infection: Piperacillin-tazobactam 3.375 gm IV q 6 hr		
	Facial Cellulitis (An infected inflammatory swelling)	*Staphylococcus aureus, Streptococcus pyogenes, Streptococcus viridans, Anaerobic bacteria (Prevotella, Porphyromonas, and Fusobacterium), Peptostreptococcus spp.*	• Establish a drainage (Microbiological culture and sensitivity test for exudates) • Remove or treat the cause • Supportive care according to systemic involvement	**Amoxicillin** 500mg orally TID for 5 days If necessary, for unresponsive infections, add **Metronidazole** 500 mg orally TID for 5 days **OR Amoxicillin-clavulanate** 625mg orally q8 hrs for 5 days **OR** 1g orally q12 hrs for 5 days	Allergic to penicillin patients: Clindamycin 150-300 mg orally q6hr for 5 days* Allergic to penicillin patients: Clindamycin 150-300 mg orally q6hr *	Must review patient in 24-72 hours to re-assess the response and the need to switch antibiotic for specific microorganism **Switch to IV for deep infections compromising the airways, swallowing, raising floor of the mouth, trismus or with systemic involvements**

						Consult Oral and Maxillofacial Surgery as necessary. *Duration can be adjusted depending on the severity of disease or necessity of the case.
	Spreading dento-facial abscesses and Ludwig's angina	*Streptococcus* spp., *Staphylococcus aureus*, *Bacteroides* spp., *Fusobacterium* spp. *Prevotella spp.*	**Urgent / emergency referral is required:** **• Immediate assessment of airway, breathing, circulation including all vital signs** **• Supportive care according to systemic involvement** **• Urgent/ emergency Aggressive surgical drainage and removal or treatment of cause**	**Antibiotics (almost always IV) are recommended with other measures** Ampicillin 500mg IV q8 hr for 5 days **PLUS,** **Metronidazole** 500 mg IV q 8hr **OR** Amoxicillin-clavulanate 1.2g orally TID	Allergic to penicillin patients: Adults Clindamycin 150-300mg orally QID Duration can be adjusted depending on the severity of disease or necessity of the case	Consult Oral and Maxillofacial Surgery as necessary. Admission, close observation and monitoring of progress. Re-assess every 1-6 hours after primary treatment and change accordingly **Metronidazole** can be used as

			• Microbiological culture and sensitivity **• Blood workups**	for 5 days If severe infection: Piperacillin-tazobactam 3.375 gm IV q 6 hr		adjunct to a penicillin in severe spreading infections Intravenous infusion for inpatients
	Alveolar Osteitis (Dry Socket)	*Rare secondary infection by: Streptococcus* spp., *Actinomyces* spp., *Fusobacterium* spp., *Prevotella* spp.	This is primarily a non-infective condition. Secondary infection may occur and progress.	**Systemic antibiotics are not indicated for dry socket**		
	Pericoronitis *(Definition: Inflammation of the soft tissues around a partially* *erupted tooth, usually an impacted mandibular third molar)*	*Streptococcus spp., Fusobacterium nucleatum, Prevotella spp.*	*Antibiotics are only recommended as an adjunct* *to local measures where there is evidence of systemic spread or with severe localized swelling and cellulitis*	Amoxicillin 500mg orally TID for 5 days If necessary, add **Metronidazole** 500 mg orally TID for 5 days	Allergic to penicillin patients: Adults Clindamycin 150-300mg orally QID	Remove source of infection or causatives Irrigation and antiseptic mouthwash Consult Oral and Maxillofacial Surgery as necessary.

	Other Dentoalveolar surgical infections Example, Infections that follow surgery (uncommon > 5%)	*Staphylococcus aureus*, *Streptococcus* spp., *Fusobacterium* spp., *Prevotella* spp.	Post-operative infection presenting with cellulitis/ fluctuation/ purulent discharge for more than 3 days, swelling and pain that did not subside after 48 hours post-surgery, persistent hyperpyrexia (not dry socket)	Amoxicillin 500mg orally TID for 5 days If necessary, add Metronidazole 500 mg orally TID for 5 days	Allergic to penicillin patients: Clindamycin 150-300 mg orally q6hr for 5 days	This is not a prophylactic treatment. Duration can be adjusted depending on the severity of disease or necessity of the case Cross-reference for indication of surgical prophylaxis
Periodontal diseases	**Acute necrotizing (ulcerative) Gingivitis** Only if systemic involvement	*Fusobacterium nucleatum*, *Treponema* spp., *Prevotella intermedia*, *Porphyromonas gingivalis*, *Spirochetes*	Only if systemic involvement	Metronidazole 500mg orally TID for 5 days* **PLUS** Amoxicillin 500mg orally TID for up to 5 days*	Allergic to penicillin patients: Clindamycin 150-300 mg orally q6hr for 5 days For immunocompromised/	Local measures of debridement and irrigation/mouth wash, Smoking cessation, Debridement/irrigation under LA. Consider recommending an antiseptic mouthwash

	Antibiotics are recommended only as an adjunct to local measures for necrotizing periodontal disease where there is evidence of systemic involvement			Duration can be adjusted depending on the severity of disease or necessity of the case	unresponsive or severe cases Use combination Metronidazole / Amoxicillin Switch to IV for deep infections compromising the airways, swallowing, raising floor of the mouth, trismus or with systemic involvements Duration can be adjusted depending on the severity of disease or necessity of the case	Provide or refer for smoking cessation support if indicated Review for further treatment and maintenance Consider systemic issues, especially in the presence of a limited response to treatment at review
	Periodontal abscess (collection of pus) Only if systemic	*Porphyromonas gingivalis*, *Prevotella intermedia*, *Fusobacterium nucleatum*, *Aggregatibacter actinomycetemcomitans*,	Only if systemic involvement or cellulitis	Amoxicillin 500mg orally TID for 5 days	Allergic to penicillin patients: Clindamycin 150-300 mg orally q6hr for 5 days	Local measures of periodontal tissue care or

	involvement or cellulitis Antibiotics are only recommended as an adjunct to definitive treatment for periodontal abscesses where there is an elevated temperature, evidence of systemic spread and local lymph node involvement	*Treponema denticola*, *Peptostreptococcus* spp.		**PLUS** Metronidazole 500mg orally TID for 5 days Duration can be adjusted depending on the severity of disease or necessity of the case		Remove source of infection (local periodontal therapy or extraction)
	Gingivitis	*Streptococcus* spp., *Fusobacterium nucleatum*, *Prevotella intermedia*	**Systemic antibiotics are not indicated for treatment of gingivitis**			
	Periodontitis: Antibiotic therapy **is rarely** required for periodontitis; only consider	*Porphyromonas gingivalis*, *Tannerella forsythia*, *Treponema denticola*, *Prevotella intermedia*	Consult Specialist (0eriodontist) for non-responsive patient to local measures	Amoxicillin 500mg orally TID for up to 5 days **PLUS**	Allergic to penicillin patients: Clindamycin 150-300 mg orally q6hr for 5 days	Systemic antibiotics are only recommended as an adjunct to effective mechanical debridement, oral

	antibiotic therapy for the following patients, preferably under the care of a **periodontist**: 1- Patients with rapidly progressing periodontitis 2- Patients with - periodontitis that has not responded to dental treatment 3- Immunocompromised patients, including patients with poorly controlled diabetes.			Metronidazole 500mg orally TID for 5 days Duration can be adjusted depending on the severity of disease or necessity of the case		hygiene instruction and management of modifiable risk factors in patients aged <40-45 years with rapidly progressing periodontal disease Seek care of specialized periodontist as necessary.
Implant related infections	**Peri-implant mucositis (stomatitis)**	*Porphyromonas gingivalis, Tannerella forsythia, and Treponema denticola*	**Antibiotics are not recommended for peri-implant mucositis,** often associated with local factors including plaque accumulation. Identifying and addressing these contributing factors is key to managing and preventing the condition.			

	Peri-implantitis *(Definition: an inflammatory disease of the soft tissues surrounding an implant,* *accompanied by bone loss and multifactorial pathogenesis)*	*Porphyromonas gingivalis, Prevotella intermedia, Fusobacterium nucleatum, Staphylococcus aureus*	Depending on the extent of peri-implantitis Antibiotics are used as an adjunct to local measures for the treatment of peri-implantitis	Amoxicillin 500mg orally TID for up to 5 days Duration can be adjusted depending on the severity of disease or necessity of case	Allergic to penicillin patients: Clindamycin 150-300 mg orally q6hr for 5 days	Consult Specialist -Elimination of cause -Nonsurgical / surgical management of the case Advice on improving oral hygiene and smoking cessation
Maxillary sinus infections	Uncomplicated acute **sinusitis** Chronis sinusitis	Kindly refer to the guidelines for treatment of maxillary sinus infections in ENT Section (Table 2).				
Salivary gland infection	**Acute suppurative sialadenitis** *(Sialadenitis is inflammation and swelling of the parotid,*	*Staphylococcus aureus, Streptococcus pneumoniae, Streptococcus viridans, Haemophilus influenzae, Escherichia coli, Pseudomonas aeruginosa*	Antibiotics with local measures are recommended for acute bacterial sialadenitis	Amoxicillin 500mg orally TID for 5 days* If necessary, add Metronidazole 500 mg orally TID for 5 days*	Allergic to penicillin patients: Clindamycin 150-300 mg orally q6hr for 5 days	• Establish a drainage *(Microbiological culture and sensitivity test for exudates)* • Remove or treat the cause • Supportive care according to systemic involvement

	submandibular, sublingual *or minor salivary glands)* Associated with enlarged hot and tense major salivary glands, pus expressed through the ducts.		and not recommended for chronic sialadenitis which can be managed with local measures	**OR** Amoxicillin 625mg orally TID for 5 days* or 1g orally BID for 5 days* *Duration can be adjusted depending on the severity of disease or necessity of the case		• For severe cases, see (Dento-facial space infection) • Consult Oral and Maxillofacial Surgery
Bone infections	**Osteomyelitis**	*Staphylococcus aureus*, *Streptococcus* spp., *Actinomyces* spp.	Antibiotics **are recommended** for the management of osteomyelitis as an adjunct to surgical debridement. SIGNS & SYMPTOMS: • Deep-seated throbbing pain	Antibiotic treatment should be based on the identification of pathogens from bone cultures at the time of bone biopsy or debridement.		• Comprehensive clinical assessment • Radiographs, CT/CBCT and MRI scans • Microbiological sampling, culturing and antibiotic sensitivity testing

			• Swelling (initially soft because of oedema, later firm with involvement • of the periosteum) • Non-healing necrotic bone • Sequestrum formation • Trismus • Fever • Halitosis • Extraoral draining sinuses • Lymphadenopathy			• Removal of necrotic bone/sequestrum • Surgical debridement • Initially prescribe IV antibiotics followed by oral antibiotics until Resolution.
	Medication related osteonecrosis of the jaw (MRONJ) *(MRONJ is where exposed necrotic bone in the maxillofacial region has persisted for* *more than 8 weeks in a patient who is, or has, undergone*	Secondary infection with *Actinomyces* spp., *Streptococcus* spp., *Staphylococcus aureus*, *Prevotella* spp., *Fusobacterium* spp.	Antibiotics are recommended for MRONJ were secondary bacterial infection is present. Refer to local guideline for management of MRONJ			• Remove sources of irritation/trauma • Ensure good oral hygiene Consideration must be given to why the MRONJ has occurred. If it is associated with terminal metastatic cancer, a very

	treatment with antiresorptive *or antiangiogenic agents without current or previous radiotherapy to the area)*					conservative approach to management is appropriate Microbiological sampling, culture and antibiotic sensitivity testing • Prescribe antiseptic oral rinses • Prescribe appropriate antibiotics where infection is evident • Surgical debridement of sequestra (with care) with non-responsive lesions • Review
	Osteoradionecrosis (ORN)	Secondary infection with	Antibiotics are recommended to control secondary bacterial			• Remove any possible sources of

	(a sequela of radiation therapy in head and neck cancer patients)	*Actinomyces* spp., *Staphylococcus aureus*, *Streptococcus* spp., *Prevotella* spp., *Fusobacterium* spp.	infections associated with early-stage osteoradionecrosis Refer to local guidelines for management of ORN			irritation/trauma, e.g., denture • Perform minor debridement, eliminating sharp bone edges, sharp tooth surfaces • Advise patient to maintain local hygiene of the area of exposed bone with topical antibiotic agents • Microbiological sampling, culture and antibiotic sensitivity testing • Prescribe appropriate antibiotic • Conservative bone sequestromy may

						be required in extensive cases • Surgical removal of large areas of necrotic bone may be required • Prescribe or advise analgesics to control pain and fever
Oral viral (herpes) infections	Primary herpetic gingivostomatitis	Kindly refer to the guidelines for treatment of viral infections (Table 13).				
	Herpes zoster (Shingles)	Kindly refer to the guidelines for treatment of viral infections (Table 13).				
	Herpes labialis (cold sores)	Herpes Simplex Virus Type 1 (HSV-1),	Topical agent of Acyclovir cream 5%, apply every 4 hours for 5 days	Systemic antiviral therapy is not indicated		
	Bell's palsy	Kindly refer to the guidelines for treatment of idiopathic facial nerve palsy VII in ENT Section (Table 2).				
Oral Candidal Infections	*Pseudomembranous candidiasis and erythematous candidiasis*	*Primarily candida albicans.* Other species are implicated (*C. glabrata C. tropicalis or C. krusei*)	Indicated if there is no response to local measures (see comment)	Miconazole oral gel, Nystatin oral drops or Systemic Fluconazole		Advice patients on steroid inhaler to rinse mouth with water and

						brush teeth after use. Refer resistant cases to specialist for full medical assessment & care.
	Denture stomatitis			Same as above		Oral and denture hygiene
	Angular cheilitis	*Polymicrobial including candidal species and bacterial species (Staphylococcus aureus, Streptococcus species)*	Topical treatment is required.	Miconazole cream 2% AND/OR Sodium Fusidate Ointment 2%	if not responsive, add Hydrocortisone 1% ointment. Systemic antifungals (Fluconazole) is recommended in severe or resistant cases	Adress underlying factors such as nutritional deficiencies or ill-fitting denture.
Specific infections in oral cavity	e.g. Tuberculosis	Please refer to the local TB treatment manual and consult ID specialist				
	Oral Mucormycosis	Multifactorial & treatment is often multidisciplinary. Kindly refer to the guidelines for treatment of idiopathic facial nerve palsy VII in ENT Section (Table 2).				
	Oral Syphilis	Kindly refer to the guidelines for sexually transmitted diseases Section (Table 11).				

- *Prescription of antibiotics without active dental treatment and referral is not appropriate*
- *If the patient is allergic, has had penicillin within the previous month (resistant bacteria) or has Meticillin-Resistant Staphylococcus Aureus (MRSA) a different antibiotic should be used.*
- *Drainage must be established if there is pus; antibiotics will not remove pus.*
- *(Dose of AMOXICILLIN in children is 12.5mg/kg up to 500mg)*

2- Antibiotics used before dental procedures to prevent or minimize bacterial infection

Antibiotic prophylaxis involves the administration of **single dose of antibiotic** before the dental procedure to minimize the risk of bacterial infection. This is recommended when the potential risk of is high, and the anticipated infection is serious, and evidence shows it can be prevented by pre-operative antibiotics.

Infections might occur at distant site (e.g., heart) or at local surgical site. Antibiotics prophylaxis is no longer recommended for distant sites such as prosthetic joint because the risk is low. Surgical prophylaxis aims at preventing an anticipated infection of the surgical/extraction site.

Table 2 Summary of dental, oral & maxillofacial conditions and the antibiotic prophylaxis requirement

PROPHYLACTIC PROTOCOL	CLINICAL SITUATION	ETIOLOGIES	PROCEDURES AND RECOMMENDATION	ANTIBIOTIC USED FOR NON-ALLERGIC ADULT PATIENT	ADDITIONAL
Prevention of infective endocarditis	Kindly refer to Prophylaxis of Infective Endocarditis Section (Tables 5 A/B)				
Surgical prophylaxis	Minor oral surgery	*Staphylococcus aureus, Streptococcus spp., Fusobacterium spp., Prevotella spp., Eikenella corrodens* For maxillary sinus surgery: *Streptococcus pneumoniae, Haemophilus influenzae, Staphylococcus aureus*	Healthy patients Antibiotic prophylaxis is not recommended to prevent postoperative complications when performing peri-radicular surgery, minor surgical removal of soft tissue lesions, extraction of impacted wisdom teeth, surgical extractions of teeth or retained roots		Therapeutic antibiotics are not recommended for peri-radicular surgery in the absence of systemic infection

PROPHYACTIC PROTOCOL	CLINICAL SITUATION	ETIOLOGIES	PROCEDURES AND RECOMMENDATION	ANTIBIOTIC USED FOR NON-ALLERGIC ADULT PATIENT	ADDITIONAL
	In major oral, maxillofacial and craniofacial surgery including Head and neck surgery, Orthognathic surgery etc.	Mandibular surgery: *Staphylococcus aureus, Streptococcus spp., Fusobacterium nucleatum* Maxillary surgery: *Staphylococcus aureus, Streptococcus spp., Haemophilus influenzae*	Antibiotic prophylaxis is recommended	Cefazolin 2g (child: 30 mg/kg up to 2 g) intravenously, within the 60 minutes before surgical incision; intraoperative redosing may be required. Do not give additional doses once the procedure is completed **PLUS** Metronidazole 500mg (child: 12.5 mg/kg up to 500 mg) intravenously, within the 120 minutes before surgical incision; intraoperative redosing may be required. Do not give additional doses once the procedure is completed	If allergic to penicillin Clindamycin 600 mg IV pre-op

PROPHYACTIC PROTOCOL	CLINICAL SITUATION	ETIOLOGIES	PROCEDURES AND RECOMMENDATION	ANTIBIOTIC USED FOR NON-ALLERGIC ADULT PATIENT	ADDITIONAL
	Most facial or compound skull fractures	*Staphylococcus aureus, Streptococcus spp., Fusobacterium spp., Peptostreptococcus, Prevotella spp., Actinomyces spp.* Compound fractures: *Streptococcus pneumoniae, Escherichia coli, Pseudomonas aeruginosa*	Antibiotic prophylaxis is normally only recommended for open reduction of mandibular fractures	Regimen as above when indicated	
	Bone or soft tissue graft	**Bone graft :** *Staphylococcus aureus, Streptococcus spp., Actinomyces spp., Peptostreptococcus, Prevotella spp.* **Soft tissue** graft: *Staphylococcus aureus, Streptococcus spp., Fusobacterium spp., Prevotella spp.*	Antibiotic prophylaxis is recommended for intraoral bone grafts. Antibiotic prophylaxis is not recommended for soft tissue surgery and grafting	Regimen as above.	

PROPHYACTIC PROTOCOL	CLINICAL SITUATION	ETIOLOGIES	PROCEDURES AND RECOMMENDATION	ANTIBIOTIC USED FOR NON-ALLERGIC ADULT PATIENT	ADDITIONAL
	Surgery involving bone in patients who have been taking bisphosphonates or antiresorptive medications		Antibiotic prophylaxis is not recommended to reduce the risk of medication-related osteonecrosis of the jaw.		
	Surgery involving bone following radiotherapy to the jaws		See below under ORN		
	Oral antral communications (OAC) and (OAF) fistula repair	*Streptococcus pneumoniae, Haemophilus influenzae, Staphylococcus aureus, Streptococcus spp., Fusobacterium spp., Prevotella spp.*	There is high risk of sinus infection immediately following an OAC. Antibiotics are recommended to prevent acute sinusitis.	To be given once OAC is confirmed: Penicillin V Adults 500mg orally four times a day for up to 5 days (Children 12-17yrs: 500mg orally four times a day for up to 5 days)	Second choice (Penicillin allergy) Doxycycline Adults Initially 200mg orally 1 dose for one day, then maintenance 100mg once a day for 4 days (Children 12-17 years: Initially 200mg orally 1 dose for one day, then maintenance 100mg once a day

PROPHYACTIC PROTOCOL	CLINICAL SITUATION	ETIOLOGIES	PROCEDURES AND RECOMMENDATION	ANTIBIOTIC USED FOR NON-ALLERGIC ADULT PATIENT	ADDITIONAL
					For a further 4 days) Clarithromycin Adults 500mg orally twice a day for up to 5 days (Children 12-17yrs: 500mg orally twice a day for up to 5 days).
	Implantology	*Staphylococcus aureus, Streptococcus viridans, Propionibacterium acnes, Prevotella spp.*	Antibiotics prophylaxis is not routinely recommended for placing dental implants (alone) Antibiotic prophylaxis is recommended for intraoral bone augmentation when placing dental implants	For implants with intraoral bone augmentation: First choice Amoxicillin Adults: 2g orally one hour before surgery	Second choice (Penicillin allergy) Clindamycin Adults: 600mg orally one hour before surgery
Antibiotic prophylaxis For Medically compromised patients	Prevention of infective endocarditis in cardiac patients		**Unless stated above,** antibacterial prophylaxis is **not routinely recommended** for the prevention of infective		Kindly refer to Prophylaxis of Infective Endocarditis Section (Tables 5 A/B)

PROPHYACTIC PROTOCOL	CLINICAL SITUATION	ETIOLOGIES	PROCEDURES AND RECOMMENDATION	ANTIBIOTIC USED FOR NON-ALLERGIC ADULT PATIENT	ADDITIONAL
			endocarditis in patients undergoing dental procedures		
	Joint replacements		Antibiotic prophylaxis **is not recommended** for dental procedures in patients with joint replacements		
	Patients with cardiac pacemakers, penile, breast or intra-ocular implants		Antibiotic prophylaxis **is not recommended** for dental procedures in patients with cardiac pacemakers, penile, breast or intra-ocular implants		
	Patients undergoing renal dialysis		Antibiotic prophylaxis for patients undergoing renal dialysis **is not normally** recommended for dental procedures		
	Patients with intravenous access devices		Antibiotic prophylaxis **is not required** for dental procedures in patients with intravenous access devices		

PROPHYACTIC PROTOCOL	CLINICAL SITUATION	ETIOLOGIES	PROCEDURES AND RECOMMENDATION	ANTIBIOTIC USED FOR NON-ALLERGIC ADULT PATIENT	ADDITIONAL
	Diabetic patients		Antibiotic prophylaxis **is not routinely recommended** for diabetic patients undergoing dental procedures		
	HIV patients undergoing dental procedures		Antibiotic prophylaxis **is not routinely recommended** for HIV patients undergoing dental procedures		
	Patients undergoing chemotherapy		Antibiotic prophylaxis for dental procedures is **not normally recommended** for patients undergoing chemotherapy		Refer to local guidelines
	Risk of developing osteoradionecrosis (ORN)		Antibiotic prophylaxis **may be recommended for dental extractions** following an assessment of the risk of developing ORN		Refer to local guidelines

PROPHYACTIC PROTOCOL	CLINICAL SITUATION	ETIOLOGIES	PROCEDURES AND RECOMMENDATION	ANTIBIOTIC USED FOR NON-ALLERGIC ADULT PATIENT	ADDITIONAL
	Prevent medication related osteonecrosis of the jaws (MRONJ)		Antibiotic prophylaxis is **not recommended** for dental procedures to prevent MRONJ		
	Solid organ transplants prior to interventive dental procedures		Antibiotic prophylaxis is **not routinely required** for patients with solid organ transplants prior to interventive dental procedures		
	haemopoietic or lymphoid tumours		Antibiotic prophylaxis for dental procedures is **not routinely recommended** for patients with haemopoietic or lymphoid tumours		

LIST OF ORAL CONDITIONS (OR SYMPTOMS) THAT DO NOT REQUIRE SYSTEMIC ANTIBIOTICS

Table 3 List of oral conditions (or symptoms) that do not require systemic antibiotics

Condition	Antibiotic recommendation	Comments
Pulpitis/ dental pain	Antibiotics are not recommended for acute pulpitis to prevent pain associated with pulpitis	Treat the cause
Gingivitis	Antibiotics are not recommended	Local measures only
Dry socket (prevention)	Antibiotics are not recommended	
Dry socket (treatment)	Antibiotics are not recommended for the management of dry socket in the absence of signs of a spreading infection	Local measures
Endodontic therapy (unless there is spread of infection)	Antibiotics are not recommended for most endodontic treatment* Antibiotics are also not recommended to prevent postoperative pain, swelling or endodontic flare-ups	Antibiotics should not be used to delay providing dental treatment
Peri-implant mucositis	Antibiotics are not recommended for peri-implant mucositis	Local measures
Tooth avulsion and reimplantation	Antibiotics are not recommended when reimplanting avulsed teeth in the absence of systemic infection	Assess after reimplantation
Auto transplantation	Antibiotic prophylaxis **may be** indicated for auto transplantation	Specialist procedure
Oral mucosa lesions (lichen planus/leukoplakia)	Not recommended	Refer to specialist for assessment and prescription of appropriate treatment
Oral mucositis		
Recurrent aphthous stomatitis		
Hairy tongue		
Oral candida infections		
Geographic tongue		
Burning mouth/ syndrome		

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