FOREWORD

Antimicrobial resistance (AMR) has emerged as a major public health issues all over the world. Though it is a global problem, the major brunt of AMR is borne by developing countries. It is estimated that 50% or more of hospital antimicrobial use is inappropriate and more alarming was from the developing countries, where more than 90% of antibiotics used in surgical prophylaxis were inappropriate.

This results in treatment failure or ineffective management of infectious diseases. Antimicrobial resistance makes the treatment of patients difficult, costly and sometimes impossible. Resistance has emerged even to newer and more potent antimicrobial agents like carbapenems. It has been reported that almost USD 5.6 million per year per hospital is spent because of AMR.

An important strategy in combatting the development and spread of antimicrobial resistance is optimisation of prescribing of antimicrobials in all clinical settings, ensuring antimicrobials are prescribed and utilised according to principles of evidence based medicine.

Therefore, rational prescription of antibiotics not only will help minimize the morbidity and mortality due to resistant microbial infections but also curtail the cost incurred on patient management. In line with the rational prescription of antibiotics, Essential Medicines & Technology Division, Department of Medical Services under the guidance of the national experts from Jigme Dorji Wangchuck National Referral Hospital (JDWNRH) have come up with the 3rd Edition of the National Antibiotic Guideline based on scientific evidence, literature review and consistent with the already existing international guidelines as well as the local antibiogram of JDWNRH.

The treatment recommendations in this guideline for infectious diseases are grouped by organ systems and presented in a tabular format for ease of use. Brief descriptions of disease categories with their etiologic agents, corresponding antibiotic regimens (dose, route, frequency and duration) for adult, paediatric and neonate patients, with relevant comments are presented. A section on surgical prophylaxis has been added since antibiotic misuse to prevent surgical site infections also needs urgent attention.

We are confident that the guideline will rationalize the usage of antibiotics and establish consistency in the treatment of various infectious conditions in the country.

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ACKNOWLEDGEMENTS

We gratefully acknowledge the significant effort of all those who have contributed to the development and production of this edition. In addition, the efforts of contributors to past editions are acknowledged. Contributions to this edition (3rd) have been made by:

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The content of this guideline will undergo a process of continuous review. Comments or suggestions for improvement are welcome.
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CONTENTS

GENERAL PRINCIPLES OF ANTIMICROBIAL THERAPY

Antibiotic use should be evidence based.
The antimicrobial spectrum of the medicine used should be the narrowest to cover the known or likely pathogen(s).
Single agent should be used unless it has been proven that combination therapy is required to ensure efficacy or reduce the selection of clinically significant resistance.
The dose, frequency and route should be most appropriate to the clinical presentation.
Microbiology guided therapy should be used, where possible.
Duration of therapy should be as short as possible. Do not exceed 7 days without a clear indication.
Do not use antibiotic prophylaxis unless there is a clear indication.
Single dose of surgical prophylaxis is recommended for majority of procedures.

Most viral and some bacterial diseases are self-limiting and does not require antimicrobials. Inappropriate use of antimicrobials contributes to the development of resistance, unnecessary adverse effects and costs.
When an antimicrobial is prescribed, the indication and intendent duration of therapy should be documented.

PROPHYLACTIC, EMPIRICAL OR DIRECTED ANTIMICROBIAL THERAPY

Prophylactic therapy

Prophylactic use of antimicrobial is to prevent infection when there is a significant clinical risk.

- Restrict to situations in which it has been shown to be effective or where the consequences of infection are disastrous
- Surgical prophylaxis should be parenteral and commenced at least 1 hour before the surgical incision
- Base antimicrobial choice on likely pathogen.

Empirical therapy

Empirical therapy involves treatment of infections when the causative organism has not been identified.

- Specimen for culture should be sent prior to initiation of antimicrobials
- It should be guided by *local epidemiological data* and their *patterns of antimicrobial susceptibility*.
- Once commenced, review empirical therapy at 48 - 72 hours:
    - Stop therapy, if diagnosis excludes infection;
    - If causative organism is identified, follow directed therapy; and
    - If no causative organism is identified, re-evaluate the clinical and microbiological investigations.

Directed/Targeted therapy

Directed/targeted therapy is the treatment of infections where the causative organism has been identified and its sensitivity determined.

- Evaluate the results of culture and other clinical parameters to distinguish infections from colonization/contamination.
- Antimicrobial therapy directed at specific organisms should include the most effective, least toxic, narrowest spectrum medicine available.
- Consider de-escalation (e.g. change parenteral therapy to oral therapy, or change a broad to narrow spectrum)

ROUTES OF ADMINISTRATION

Oral therapy should be used in preference to parenteral therapy unless:

- oral administration is not tolerated or is not possible, e.g. swallowing difficulties;
- gastrointestinal absorption is an obvious problem (e.g. vomiting, severe diarrhoea);
- an oral antimicrobial with a suitable spectrum of activity is unavailable;
- high tissue concentrations are essential and are not readily achievable by oral administration, e.g. endocarditis, meningitis, osteomyelitis, septic arthritis and deep seated abscesses;
- urgent treatment is required due to severe and rapidly progressing illness;
- the patient is unlikely to adhere to the treatment; and
- it is not a preferred route of therapy e.g. in neonates.

Antibiotics such as ciprofloxacin and metronidazole have excellent oral bioavailability and are equally effective both orally as well as parenteral therapy.

Topical therapy should be restricted to proven indications, e.g. bacterial conjunctivitis. Antimicrobials for topical use should not be from classes used in systemic therapy.

DURATION OF THERAPY

Shortest possible duration of therapy should be used; in majority of infections, this should not exceed 7 days. Response to antimicrobial therapy can be assessed with clinical and laboratory parameters as follows:

- patient becomes afebrile;
- general condition improves and patient starts to accept oral feeds;
- leucocytosis, neutrophilia resolves; and
- ESR and/or CRP settles down towards normal.
- Use of novel markers like procalcitonin for de escalation

However, actual duration of antimicrobial therapy depends on the specific diagnosis, causative organism and the therapeutic response.

SINGLE OR COMBINATION THERAPY

Antimicrobial combinations should be avoided, unless indicated:

- To extend the spectrum of cover, e.g. empirical therapy of suspected mixed infections such as pelvic inflammatory disease;
- To achieve a bactericidal effect (synergy), e.g. enterococcal endocarditis;
- To prevent the emergence of resistant organisms, e.g. therapy of tuberculosis;
- To treat critically ill patients; and
- have proven pharmacokinetic enhancement.

ADVERSE EFFECTS

Adverse effects caused by antimicrobials can be classified as direct or indirect. Direct adverse effects include hypersensitivity, toxicity and interactions. Indirect adverse effects include effects on both commensal and environmental floras.

For detail, please refer Appendix II.

HYPERSENSITIVITY

Antibiotic hypersensitivity is common, and most frequently involves beta-lactams (Penicillins and Cephalosporins). While many nonspecific reactions are labelled as 'allergic', true type I (IgE-mediated) antibiotic hypersensitivity is strongly suggested by the development of urticaria, angioedema, bronchospasm, or anaphylaxis (with objectively demonstrated hypotension, hypoxia or tryptase elevation) within 1 hour of medicine administration (immediate/life threatening). Some instances of 'pseudo-allergy' (e.g. anaphylactoid responses to vancomycin infusions such as

'red-man syndrome') involve direct release of vasoactive mediators by non-IgE mechanisms. While not truly allergic, these responses may still be prevented by avoiding rapid infusions and administering of antihistamines if required.
Allergy to medicine is more commonly seen with certain infections, particularly with HIV and Epstein Barr virus infections, and allergic reactions are more likely to be severe in individuals receiving beta-blocker therapy.

Penicillin hypersensitivity

Between 1-10% of beta-lactam, antibiotic courses result in manifestations interpreted as due to hypersensitivity. Most reactions are late, non-IgE mediated and involve rash. Other later manifestations include fever, haemolysis and serum sickness-like reactions. The minority of reactions are immediate hypersensitivity reactions. Anaphylactic responses to penicillin occur approximately one in every 10,000 courses administered, with 10% of these reactions being fatal, most often associated with parenteral rather than oral administration.
Most of these reactions occur in people without a history of prior penicillin allergy. Notwithstanding this, a detailed history of penicillin reaction should always be sought before a course of penicillin is commenced.
A history of an immediate hypersensitivity reaction (urticaria, angioedema, bronchospasm, or anaphylaxis within 1 hour of medicine administration) contraindicates further exposure to penicillin and other beta-lactams. Late manifestations are only a relative contraindication.
Rashes, especially with amoxicillin/ampicillin are much less predictive of future reactions. Between 3 - 6% of patients hypersensitive to penicillin exhibit cross-reactivity with cephalosporins and a smaller percentage to carbapenems.

ANTIMICROBIAL RESISTANCE

The development and spread of antimicrobial resistance is a growing concern. Use of antimicrobials unnecessarily exposes patients to adverse effects with no clinical benefits. Although complex mechanisms are involved, use of antibiotics essentially exerts a selective pressure for emergence of resistant pathogens, the spread of which is facilitated by transfer of organisms between staffs and patients.
Causal association between antimicrobial use and the emergence of resistant organisms can be ascertained from the findings of resistance being more common with Healthcare Associated Infections (HAIs), compared to community-acquired infections. Patients with HAI are more likely to have received prior antimicrobials whilst the increased duration of exposure to antimicrobials increases the likelihood of colonization with resistant organisms.
Multidrug resistant organisms include multi-resistant Acinetobacter sp. and *Pseudomonas aeruginosa*, extended-spectrum β-lactamase (ESBL), methicillin-resistant *Staphylococcus aureus* (MRSA), Carbapenem-resistant Enterobacteriaceae (CRE), vancomycin-resistant *Enterococcus faecium* (VRE).
Antimicrobials are different from other categories of medications that their use in one patient can influence their effects in other patients in future. Considering the rapid rate at which resistant pathogens can spread, the misuse of antimicrobials can adversely impact the health of patients who are not even exposed to them. Since there is only limited number of antimicrobials available and that they are safe and cost-effective when their effectiveness is preserved, they are a valuable resource.

ANTIMICROBIAL STEWARDSHIP

It is an interdisciplinary approach aimed at ensuring the responsible use of antimicrobials. It includes interventions to monitor and direct antimicrobial use within a healthcare setting and community, so that an evidenced-based approach of antimicrobials use can be implemented.
Effective antimicrobial stewardship programs have been shown to improve the quality of patient care through optimization of treatment of infections and reduction in adverse effects following the use of antimicrobials.
The Antimicrobial Management Team should ideally include an infectious disease physician, a clinical microbiologist or any other clinicians and a clinical pharmacist as the core members with representations from primary care, and infection control. The program is usually governed within the hospital's quality improvement and patient safety governance structure.
Following are the stewardship strategies generally recommended:

- Implementing Antibiotic Guidelines based on local antibiogram;

- Establishing formulary restriction and approval systems for higher generation antibiotics;
- Reviewing of antimicrobial prescribing for feed backs and interventions; and
- Monitoring antimicrobial resistance and use.

CATEGORIES OF ANTIBIOTICS

As per the report of the WHO Expert Committee, 2017, the antibiotics has been categorized in three groups in order to ensure access to necessary antibiotics and appropriate prescribing as follows:

1. Access: first- and second-choice antibiotics for the empirical treatment of most common infectious syndromes;
2. Watch: antibiotics with higher resistance potential whose use as first- and second-choice treatment should be limited to a small number of syndromes or patient groups; and
3. Reserve: antibiotics to be used mainly as "last-resort" treatment options.

Access

The Access group includes antibiotics that are recommended as empirical first- or second-choice treatment options for common infectious syndromes. They should be widely available, at an affordable price, in appropriate formulations and of assured quality. First choices are usually narrow spectrum agents with positive risk-benefit ratios and low resistance potential; second choices are generally broader-spectrum antibiotics with higher resistance potential or less favourable risk–benefit ratios.

Access group antibiotics	
Beta-lactam medicines	Other antibacterials
Amoxicillin	Amikacin
Ampicillin	Azithromycin*
Benzathine benzylpenicillin	Chloramphenicol
Benzylpenicillin	Ciprofloxacin*
Cephalexin	Clarithromycin*
Cefazolin	Doxycycline
Cefixime*	Gentamicin
Cefotaxime*	Sulfamethoxazole + Trimethoprim
Ceftriaxone*	
Cloxacillin	* Watch group antibiotics for specific, limited indications
Phenoxymethylpenicillin	
Procaine benzylpenicillin	

Watch

The Watch group includes antibiotic *classes* that are considered generally to have higher resistance potential and that are still recommended as first- or second-choice treatments but for a limited number of indications. The group includes the highest priority agents on *the List of critically important antimicrobials for human medicine(CIA).* The CIA list ranks antimicrobials according to their relative importance in human medicine and can be used in the development of risk management strategies for the use of antimicrobials in food-production animals. Seven pharmacological classes were identified for this group. As noted above, monitoring systems should be in place to ensure that their use is in line with recommended indications.

Watch group antibiotics
Quinolones and fluoroquinolones e.g. ciprofloxacin, norfloxacin
3rd generation cephalosporins (with or without beta-lactamase inhibitor) e.g. Cefixime, ceftriaxone, Cefotaxime
Glycopeptides e.g. teicoplanin, vancomycin
Antipseudomonal penicillins with beta-lactamase inhibitor e.g. piperacillin + tazobactam
Carbapenems e.g. meropenem, imipenem + cilastatin
Penems e.g. faropenem

Reserve

The Reserve group includes antibiotics that should be treated as "last-resort" options, or tailored to highly specific patients and settings, when other alternatives would be inadequate or had already failed (e.g. serious life-threatening infections due to multidrug-resistant bacteria). To preserve their effectiveness, these medicines should be protected and prioritized as key targets of high-intensity national and international stewardship programmes involving monitoring and utilization reporting. Eight antibiotics or antibiotic classes were identified for this group.

Reserve group ("last-resort") antibiotics
Aztreonam
4th-generation cephalosporins e.g. cefepime
5th-generation cephalosporins e.g. cefaroline
Polymyxins e.g. Polymyxin B, colistin
Fosfomycin (IV)
Oxazolidinones e.g. linezolid
Tigecycline
Daptomycin

GETTING TO KNOW YOUR ANTIMICROBIALS
ANTIBACTERIALS

Penicillins

Narrow spectrum penicillin

These are mainly active against Gram-positive organisms, but are inactivated by beta-lactamases. Benzathine benzylpenicillin is given by IM and provides low levels of benzylpenicillin for up to 4 weeks. Benzylpenicillin (penicillin G) is administered parenterally and remains the treatment of choice for susceptible infections. Phenoxymethylpenicillin (penicillin V) is acid-stable and is given orally, although food impairs absorption. It is intrinsically less active than benzylpenicillin. Procaine penicillin is an IM preparation designed to extend the half-life of benzylpenicillin. It provides blood levels for up to 24 hours, but these are adequate only against highly susceptible organisms.

Cloxacillin is a narrow spectrum penicillin with specific anti-staphylococcal activity. It should ideally be dosed at 6 hourly intervals.

Moderate spectrum penicillin

The aminopenicillins, amoxicillin and ampicillin, have greater activity than benzylpenicillin against some Gram-negative organisms, e.g. *Escherichia coli*, *Haemophilus influenzae*, but are destroyed by beta-lactamase producing strains. They have no anti-pseudomonal activity. They are medicines of choice for enterococcal infections. Amoxicillin is better absorbed orally than ampicillin, not affected significantly by food and requires fewer oral doses per day, but when administered parenterally they are equivalent.

Extended spectrum penicillin

Extended spectrum Penicillins like piperacillin have additional anti-pseudomonal activities. Piperacillin is usually combined with beta-lactamase inhibitors. Additional treatment for anaerobes is not required.

Cephalosporins

First generation cephalosporin

Cephalexin and cephazolin have a similar range of antimicrobial activity. They are active against streptococci and staphylococci, including beta-lactamase-producing staphylococci, but inactive against enterococci or *Listeria monocytogenes*. Their Gram-negative spectrum includes mainly *Escherichia coli* and Klebsiella species, but they are inactive against other Gram-negative aerobes including Serratia, Enterobacter and Pseudomonas species. They are not effective against Gram-negative anaerobes. First generation cephalosporins have no activity against *H. influenza,* a common cause of pneumonia and meningitis. Cephazolin doses recommended are lower when treatment is for Gram-positive pathogens (1g, IV, 8H) than for Gram-negative pathogens (2g, IV, 8H).

Second generation cephalosporin

This group has broader spectrum of activity than the first generation. Their activity includes *S. aureus*, Streptococcus, Enterobacteriaceae, *H. influenzae*, *Moraxella catarrhalis* but not MRSA, enterococci, pseudomonas, *B. fragilis* and acinetobacter. Cefuroxime and Cefaclor are the commonly used second generations.

Third generation cephalosporin

Cefotaxime and ceftriaxone have a wide spectrum of activity covering the majority of community acquired enteric Gram-negative rods. The activity of these medicines against *Bacteroides fragilis* varies. These medicines are less active against staphylococci than earlier cephalosporins. None has clinically useful activity against enterococci or MRSA. However, unlike earlier cephalosporins, which do not enter the cerebrospinal fluid in therapeutically useful concentrations, these cephalosporins are effective in meningitis because of better penetration and higher intrinsic activity. Some organisms, e.g. Serratia, Citrobacter and Enterobacter species, have chromosomal cephalosporinases and resistance may develop during treatment. Plasmid mediated extended spectrum beta-lactamases (ESBLs) also inactivate all of these medicines (e.g. in *Escherichia coli*, *Klebsiella pneumoniae*) so alternative therapy is indicated.

Ceftriaxone is now the medicine of choice for treatment of gonococcal infections. Ceftriaxone is highly protein bound and can displace bilirubin from albumin, therefore its use in neonates is not recommended.

Ceftazidime, another member of the generation has similar activities and in addition has good activity against Pseudomonas.

Higher generation cephalosporins including cefepime, cefpirome, ceftobiprole have wider spectrum of activity.

Aminoglycosides

Aminoglycosides are amongst the most rapidly bactericidal agents available for treatment of aerobic Gram-negative sepsis.

Gentamicin has a broad gram-negative spectrum, including *Pseudomonas aeruginosa*, and is the aminoglycoside of choice for most cases of aerobic Gram-negative sepsis. Gram-negative isolates remain largely sensitive to gentamicin; therefore, it should be the aminoglycosides of choice.

Amikacin is more resistant to enzymatic inactivation than gentamicin, so it should be reserved for treating infections resistant to other aminoglycosides.
All aminoglycosides are potentially ototoxic and nephrotoxic. Clinically significant adverse effects are more likely with advancing age, pre-existing renal impairment or hearing loss. Once-daily dosing of aminoglycosides is as efficacious and less nephrotoxic than the administration in divided daily doses. Therefore, once-daily dosing has been recommended throughout this guideline except in the following situations:

- There is insufficient evidence to justify change to a once-daily dose in pregnant women, patients with burns or cystic fibrosis; and
- In severely impaired renal function, the optimal dosage is not clearly established and needs to be adjusted with the creatinine clearance.

Chloramphenicol

Chloramphenicol is a broad-spectrum antibiotic with a range of activity that includes Gram-positive and Gram-negative bacteria, rickettsia and chlamydia. Infections due to *Salmonella typhi*, *Haemophilus influenzae* and *Bacteroides fragilis* have previously been the principal indications for chloramphenicol use.
Chloramphenicol causes a reversible dose-dependent bone marrow hypoplasia and rare, irreversible, dose-independent (idiosyncratic) aplasia (1 in 30 000 courses) that is sometimes fatal. In is also known to cause grey baby syndrome in neonates. Therefore, it is given only in severe infections and when there is no suitable alternative.

Glycopeptides

Vancomycin is active against Gram-positive organisms and reserved for infections caused by Methicillin-resistant *Staphylococcus aureus* (MRSA) and ampicillin-resistant enterococci. It is also used in prophylaxis and treatment of infection caused by Gram-positive bacteria in patients allergic to all other appropriate therapies. It can be used for orally for treatment of *Clostridium difficile* colitis that has not responding to metronidazole or is failing with a potentially life threatening colitis. It should be given as a slow IV infusion to prevent 'red-man' syndrome.
Teicoplanin has similar activity to vancomycin but does not penetrate CSF. It is more renal friendly and is administered once daily. Glycopeptides should be administered as slow IV infusions.

Macrolides

Erythromycin has a wide spectrum of activity covering both Gram-positive and Gram-negative cocci, Legionella, Bordetella, Corynebacterium, Mycoplasma, Chlamydia and anaerobes (both Gram-positive and negative), but not enteric Gram-negative rods. Community acquired respiratory infections are thus major indications. Erythromycin has an antibacterial spectrum that is similar but not identical to penicillin; it is thus an alternative in penicillin allergic patients. CSF penetration is poor. Newer macrolides like azithromycin and clarithromycin have fewer side effects, wider spectrum; need less frequent dosing and duration of treatment than erythromycin. Clarithromycin is active against *Mycobacterium avium* complex (MAC) and *Helicobacter pylori.*

Nitrofurantoins

Nitrofurantoin is useful for treatment and prophylaxis of infections of the lower urinary tract. It is not indicated for treatment of complicated urinary tract infection. Effective treatment of urinary tract infection depends on an adequate concentration in the urine. Therefore, in renal impairment, treatment is much less effective and carries an increased risk of toxicity because of impaired excretion of the medicine. Alkaline urine reduces its antibacterial activity and should not be used in urinary infections caused by Proteus species (they makes urine alkaline due to its urease activity).

Nitroimidazoles

Metronidazole has spectra of activity that encompass Gram-negative anaerobes such as *Bacteroides fragilis*, Gram-positive anaerobes such as *Clostridium* species and anaerobic protozoa including *Trichomonas vaginalis*, *Giardia lamblia* and *Entamoeba histolytica*. These medicines may cause a disulfiram-like reaction with alcohol and patients

must be instructed to abstain from alcohol during the course of treatment. Metronidazole has excellent oral (and rectal) absorption with equal bioavailability to intravenous route and can thus be an effective alternative when IV administration is not possible.
Metronidazole is an alternative to penicillin for the treatment of many oral infections where the patient is allergic to penicillin or the infection is due to beta-lactamase producing anaerobes. It is the medicine of choice for the treatment of acute necrotizing ulcerative gingivitis (Vincent's infection) and pericoronitis.

Quinolones

Ciprofloxacin has a wide range of activity against Gram-negative bacteria including *Haemophilus influenzae*, enteric Gram-negative rods, *Pseudomonas aeruginosa*, Gram-negative cocci, some Gram-positive cocci and intracellular organisms including *Legionella* and various species of mycobacteria. It has poor activity against streptococci and do not make a good choice for treatment of respiratory tract infections. However, newer quinolones like levofloxacin, moxifloxacin and others have emerged as alternative treatment choices for respiratory infections due to their improved spectrum against Gram-positive organisms. Quinolones are not useful against anaerobes.
Quinolones should be reserved for treatment of infections resistant to other antibiotics or where an oral medicine with this particular antibacterial spectrum is essential. Emerging resistance to quinolones, especially in enteric Gram-negative rods is a concern.
They cause arthropathy in the weight bearing joints of immature animals and are therefore, generally not recommended for children and growing adolescents. However, the significance of this effect in humans is uncertain and in some specific circumstances, short-term use may be justified in children. They are also known to cause tendon damage including rupture and should be used with caution especially in patients with tendon disorders, elderly and concomitant steroid use.

Rifamycin

Rifampicin is active against Gram-positive organisms, including staphylococci, and against mycobacteria. Rapid emergence of resistance means that they must always be used in combination with unrelated antimicrobials. Rifampicin is used for treatment of tuberculosis with other agents, treatment of selected MRSA infections and for chemoprophylaxis of contacts of *Haemophilus influenzae* type b and meningococcal disease. Once daily dosing is recommended for most susceptible infections, but evidence favours 12-hourly dosing in *S. aureus* infections. Thrombocytopenia, acute renal failure and an influenza-like syndrome occur, particularly with intermittent therapy. Rifampicin can cause hepatitis and liver function should therefore be checked before commencing treatment. Transient rise in transaminases are common and no action is required unless the patient is developing severe hepatitis. The patient should be informed about orange discoloration of urine and possible staining of soft contact lenses.
Rifampicin is a potent inducer of cytochrome P450 and has a significant medicine interaction issues. Therefore, medicine interaction should be checked when starting or stopping rifampicin in patients on other medications.

Sulphonamide and trimethoprim

Sulfamethoxazole combined with the dihydrofolate reductase inhibitor trimethoprim, has in the past found widespread use as a broad-spectrum agent, particularly in respiratory and urinary tract infections but no longer preferred due to frequent hypersensitivity reactions. It is currently used in the treatment and prophylaxis of *Pneumocystis jiroveci* infection and the treatment of *Listeria monocytogenes, toxoplasma* and *Nocardia* infection. Trimethoprim alone is as effective as sulfamethoxazole + trimethoprim in treatment and prophylaxis of uncomplicated urinary tract infection. Hypersensitivity reactions to trimethoprim + sulfamethoxazole are common.

Tetracycline

Tetracyclines have a broad spectrum of activity, which includes Gram-positive and Gram-negative bacteria, *Chlamydia*, *Rickettsia*, *Mycoplasma*, spirochetes, some non-tuberculous mycobacteria and some protozoa. They have good tissue penetration but do not enter CSF. Their main includes the treatment of pelvic inflammatory disease,

acne, periodontal disease, community acquired pneumonia, brucellosis, plague, cholera and Lyme disease. They are contraindicated in children less than 8 years of age. Tetracyclines are safe for use during the first 18 weeks of pregnancy (16 weeks' post-conception) after which they cause discoloration of the baby's teeth. They may be used for short courses in breastfeeding women. Photosensitivity reactions and candida/yeast overgrowth may occur with any tetracycline.

Doxycycline has a longer half-life, and absorption is not significantly affected by the presence of food. It is the preferred tetracycline in most situations, as once-daily dosing enhances adherence. Oesophagitis can occur with doxycycline, so it should be washed down with a glass of water and the patient instructed to remain upright for at least 30 minutes after administration. Doxycycline acts as a blood schizonticide, and is used for malaria prophylaxis.

Carbapenems

This group of antibiotics has the widest spectrum of activity including many Gram-positives, Gram-negatives and anaerobes. They are active against *Pseudomonas aeruginosa*, *Acinetobacter* and ESBLs but not against MRSA. They have good tissue and CSF penetration. They are particularly useful for the treatment of severe Hospital acquired infections and polymicrobial infections including septicaemia, hospital acquired pneumonia, intra-abdominal infections, skin and soft tissue infections and complicated urinary tract infections. However, their use should be strictly guided by culture and susceptibility reports.

Meropenem and imipenem are the commonly used carbapenems and the later has higher tendency to cause seizures especially in children.

Polymyxins

Polymyxin B has activity against many gram-negative organisms including *Acinetobacter baumannii* and *Pseudomonas aeruginosa*. However, due to toxicity (nephrotoxicity and neurotoxicity) its use is limited to infections caused by gram-negative organisms' resistant to other class of antimicrobials.

ANTIFUNGAL MEDICINES

Azoles

Clotrimazole and ketoconazole are used in mucocutaneous candidiasis, dermatophytosis and tinea versicolor. Fluconazole has additional activity against *Cryptococcus*. It has a good penetration of tissues and central nervous system. It is not significantly excreted in the urine. Azoles also have significant medicine interaction issues.

Polyenes

Amphotericin B has a good activity against wide range of yeasts (*Candida* and *Cryptococcus* species) and other fungi. It is also used in treatment of Leishmaniosis. However, it is associated with significant toxicity, which include nephrotoxicity, dyselectrolytemia and gastrointestinal side effects. Liposomal formulation of amphotericin B is associated with lesser incidences of adverse effects.

Nystatin is mainly active against *Candida* species. It is poorly absorbed from the gastrointestinal tract and is not absorbed through skin or mucous membranes when applied topically.

ANTIVIRALS

Antiviral medicines for herpes simplex virus infection

Acyclovir is active against herpes simplex virus and to a lesser extent varicella-zoster virus. It is poorly and erratically absorbed from the gut and even less through the skin. Ganciclovir is used for treatment of infections caused by cytomegalovirus (CMV).

ANTIPROTOZOAL MEDICINES

Amoebicide and antigiardial medicines

Metronidazole is the medicine of choice for acute invasive amoebic dysentery since it is very effective against vegetative forms of *Entamoeba histolytica*. It is also active against amoeba, which may have migrated to the liver. In addition, metronidazole is also the treatment of choice for *Giardia lamblia*.

Trichomonacides

Metronidazole is the medicine of choice for *Trichomonas vaginalis* infections. Contact tracing is recommended and sexual contacts should be treated simultaneously.

Leishmaniacides

Sodium stibogluconate, an organic pentavalent antimony compound is used in visceral leishmaniasis. It is given by IV or IM injection for 28 days for visceral and 20 days for cutaneous infections.
Amphotericin (particularly liposomal formulation), and Miltefosine are useful for antimony resistant infections.

ANTHELMINTICS

Benzimidazoles

Albendazole is used predominantly in intestinal nematode infections such as ascariasis, enterobiasis, hookworm and trichuris. Albendazole is preferred in systemic cestode (tapeworm) and nematode infections, such as hydatids (in conjunction with surgery), cysticercosis, strongyloidiasis and capillariasis. It may also be effective in trichinosis, toxocariasis and cutaneous larva migrans. The main adverse effect with albendazole is raised transaminases, gastrointestinal upset and haematological abnormalities, e.g. leucopenia. Albendazole should be avoided in pregnancy and in children less than 6 months of age.

Taenicides

Niclosamide is the most widely used medicine for tapeworm infections. An antiemetic can be given before treatment and a laxative can be given 2 hours after niclosamide.

RECOMMENDED ANTIMICORBIAL THERAPY FOR ADULT

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
BONE AND JOINT INFECTIONS					
Acute Osteomyelitis *Hypersensitive to penicillin*: For delayed/non-life threatening	*80% caused by Staphylococcus*	Cloxacillin 2g, IV, Q6H	Cephazolin 2g, IV, Q8H	4 - 6 weeks (initially IV then oral depending on response)	Obtain blood, pus and bone culture and sensitivity
		Cephazolin 2g, IV, Q8H		As above	
For immediate/life threatening		Vancomycin 1g, IV, Q12H		As above	*Vancomycin should be given as slow IV infusion, at least over an hour*
	Methicillin-resistant Staphylococcus aureus (MRSA)	Vancomycin, 1g, IV, Q12H	Cotrimoxazole 960mg, PO, Q12H **PLUS** Rifampicin 600mg PO, Q24H	As above	*Therapy should be based on proper culture and sensitivity report*
Chronic osteomyelitis and osteomyelitis involving bone & joint prostheses	*Staphylococcus aureus*, Enterobacteriaceae, Pseudomonas	Empirical therapy is not usually recommended; treatment must be guided by the susceptibility of the organism isolated from aspirations, biopsies and prosthetic materials.		6 weeks to 6 months depending on clinical response	
Septic arthritis	Management is same as acute osteomyelitis				
Gonococcal arthritis	*Neisseria gonorrhoeae*	Ceftriaxone 1g, IV, Q12H		At least 7 days	
Open fracture *General*	Staphylococcal	Cephazolin, 1g, IV, Q6H		5 days; longer, if infection is established	Debridement and irrigation of the wound has to be done before referral; Where cephazolin are not available, a dose of Benzylpenicillin 3 - 4 MU,
Type I and II Open fracture		Cephazolin 1g, IV, Q6H			

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
Type III Open fracture		Cephazolin 1g, IV, Q6H **PLUS** Gentamicin 5mg/kg, IV, Q8H			IM **OR** Ampicillin 1g, IV **PLUS** Gentamicin 5mg/kg, IV can be given STAT and refer to specialist
Open fracture with organic contamination		Cephazolin 1g, IV, Q6H **PLUS** Gentamicin 5mg/kg, IV, Q8H **PLUS** Metronidazole 7.5mg/kg, IV, Q8H			
		CARDIOVASCULAR SYSTEM INFECTIONS			
Native valve endocarditis: *Initial empirical therapy awaiting culture results*	*Streptococcus, Enterococcus, Staphylococcus aureus, Coagulase Negative Staphylococci (CoNS)*	Ampicillin 2g, IV, Q4H **PLUS** Gentamicin 3mg/kg, IV, Q24H **PLUS** Cloxacillin 2g, IV, Q4H	Benzylpenicillin 3MU, IV, Q4H **PLUS** Gentamicin 3mg/kg, IV, Q24H **PLUS** Cloxacillin 2g, IV, Q4H	4 - 6 weeks; Stop gentamicin after 14 days	Take 4 (10ml) samples 15 minutes apart; 3 samples (ESC 2015 and AHA guidelines)
Streptococcal endocarditis	*Viridans streptococci*	Benzylpenicillin 4MU, IV, Q4H **OR** Amoxicillin 25 - 50mg/kg, PO, Q4H **PLUS** Gentamicin 3mg/kg, IV, Q24H	Ceftriaxone 1g, IV, Q12H **PLUS** Gentamicin 3mg/kg, IV, Q24H	2 to 4 weeks	Stop gentamicin after 2 weeks
Penicillin resistant		Ceftriaxone 1g, IV, Q12H **PLUS**	Vancomycin 15mg/kg, IV, Q12H	4 to 6 weeks	

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
		Gentamicin 3mg/kg, IV, Q24H	**PLUS** Gentamicin 3mg/kg, IV, Q24H		
Enterococcal endocarditis *For penicillin susceptible isolates*	*Enterococcus faecalis, Enterococcus faecium*	Ampicillin 2g, IV, Q4H **PLUS** Gentamicin 3mg/kg, IV, Q24H		4 - 6 weeks; stop gentamicin after 2 weeks	
For penicillin resistant isolates		Vancomycin 15mg/kg, IV, Q12H **PLUS** Gentamicin 3mg/kg, IV, Q24H		6 weeks	
For High Level gentamicin Resistant isolates		Ampicillin 2g, IV, Q4H **PLUS** Ceftriaxone 1g, IV, Q12H		6 weeks	
Staphylococcal endocarditis *Left-sided*	*Methicillin-susceptible Staphylococcus aureus (MSSA)*	Cloxacillin, 2g, IV, Q4H	Cephazolin 2g, IV, Q8H	6 weeks	
	Methicillin-resistant Staphylococcus aureus (MRSA)	Vancomycin, 15mg/kg, IV, Q12H		6 weeks	
Right-sided	*Methicillin-susceptible Staphylococcus aureus (MSSA)*	Cloxacillin 2g IV, Q4H		2 weeks	*Usually seen in IV Drug users*
	Methicillin-resistant Staphylococcus aureus (MRSA)	Vancomycin, 15mg/kg, IV, Q12H		6 weeks	
Endocarditis caused by the HACEK group	Haemophilus, Aggregatibacter, Cardiobacterium,	Ceftriaxone, 1g, IV, Q12H		4 weeks	

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
	Eikenella, Kingella (HACEK group)				
Prosthetic valve endocarditis (*valve replacement less than 1 year*)	*Staphylococcus epidermidis, Staphylococcus aureus,* rarely enterobacteriaceae, diphtheroids	Vancomycin 15mg/kg IV, Q12H **PLUS** Gentamicin 3mg/kg, IV, Q24H **PLUS** Rifampicin 300mg, PO, Q8H		6 - 8 weeks; Stop gentamicin after 2 weeks	Rifampicin should be started after 3 days of starting vancomycin; If valve replacement is more than 1 year, treat as empirical regime as above
Blood culture-negative infective endocarditis	*Brucella spp.*	Doxycycline 200mg, PO, Q24H **PLUS** Cotrimoxazole 960mg, PO, Q12H **PLUS** Rifampicin 300-600mg,PO,Q24H		≥ 3- 6mpnths	
	C. burnetii	Doxycycline 200mg, PO, Q24H **PLUS** Hydroxychloroquine 200 - 600mg, PO, Q24H		> 18 months	
	Bartonella spp.	Doxycycline 100mg, PO, Q12H **PLUS** Gentamycin 3mg, IV, Q24H		4 weeks	Stop gentamycin after 2 weeks

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
	Legionella spp.	Levofloxacin 500mg, PO, Q12H **PLUS** Rifampicin 300 - 1200mg, PO, Q24H		≥ 6 weeks	
	Mycoplasma spp.	Levofloxacin 500mg, PO, Q12H		6 months	
	T. whipplei	Doxycycline 200mg, PO, Q12H **PLUS** Hydroxychloroquine 200 - 600mg, PO, Q24H		≥ 18 months	
Rheumatic fever *Acute*	Group A streptococcus	Benzathine benzylpenicillin, 1.2MU, IM, STAT **OR** Penicillin V 500mg, PO, Q6H		10 days only for PO	In case of penicillin sensitivity, use erythromycin.
Secondary prophylaxis		Benzathine benzylpenicillin *Body wt.* > 27kg: 1.2MU, every 3 weeks; *Body wt.* < 27kg: 0.6MU, every 4 weeks	Penicillin V, 250mg, PO, Q12H **OR** Erythromycin 250mg, PO, Q12H	*Without carditis*: for 5 years after the last attack or 21 years of age (whichever is longer); *With carditis but no residual valvular disease*: for 10 years after the last attack, or 21 years of age (whichever is longer); *With persistent valvular disease*: for 10 years after last attack, or 40 years or lifelong prophylaxis	
		CENTRAL NERVOUS SYSTEM INFECTIONS			
Meningitis: *Initial empirical therapy*	*Streptococcus pneumoniae, Haemophilus influenzae, Neisseria meningitidis*	Benzylpenicillin 4MU, IV, Q4H **PLUS** Gentamicin 3mg, IV, Q24H	Cefotaxime 2g, IV, Q6H **OR** Ceftriaxone 1g, IV,	10 - 14 days	Adjunctive therapy with dexamethasone 10mg, IV, Q6H should be initiated 20minutes before the 1st

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
			Q12H **PLUS** Vancomycin 45 - 60mg/kg, IV, Q24H **add ampicillin if age more than 50 years*		dose of antibiotics and continued for 4 days
Organism specific therapy	*Streptococcus pneumoniae*	Benzylpenicillin 4MU, IV, Q4H	Ceftriaxone 1g, IV, Q12H	10 - 14 days	If isolate resistant to penicillin, patient may need alternative regimen like 3rd generation cephalosporins and/or vancomycin
	Neisseria meningitidis	Benzylpenicillin 4MU, IV, Q4H	Ceftriaxone 1g, IV, Q12H	7 days	
	Note: Close contacts and patients treated with penicillins should receive prophylaxis with rifampicin 600mg, PO, Q12H for 2 days or ciprofloxacin 500 mg, PO, STAT OR ceftriaxone 250 mg, IM STAT.				
	Haemophilus influenzae	Ampicillin 2g, IV, Q4H	Cefotaxime 2g, IV, Q6H **OR** Ceftriaxone 1g IV, Q12H	7 days	
	Listeria monocytogenes	Ampicillin 2g, IV, Q4H	Benzylpenicillin 4MU, IV, Q4H	21 days (may need up to 6 weeks in immunocompromised patients)	Commonly seen in neonates and immunocompromised adults
	Gram-negative bacilli	Cefotaxime 2g, IV, Q6H **OR** Ceftriaxone 1g, IV, Q12H		21 days	
	Pseudomonas	Ciprofloxacin 400mg, IV, Q8H	Ceftazidime 2g, IV, Q8H	21 days	

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
	Group B Streptococcus	Benzylpenicillin 4MU, IV, Q4H	Cefotaxime, 2g, IV, Q6H	21 days	Common cause of meningitis in neonates
	Staphylococcus aureus	Cloxacillin 2g, IV, Q4H		7 - 10 days	Cloxacillin should be given in the highest possible dose
	Methicillin-resistant *Staphylococcus aureus (MRSA)*	Vancomycin 15mg/kg, IV, Q12H		7 - 10 days	
Due to post-neurosurgery, post head trauma, cochlear implant	*Streptococcus pneumoniae* most common especially if CSF leakage; *Staphylococcus aureus,* coliforms and pseudomonas	Vancomycin 15mg/kg, IV, Q12H **PLUS** Ceftazidime 2g, IV, Q8H	Vancomycin 15mg/kg, IV, Q12H **PLUS** Meropenem 2g, IV, Q8H	Depend on surgical intervention and clinical response	Monitor renal function in patients receiving vancomycin and/or meropenem
Cryptococcal meningitis	*Cryptococcus neoformans* (especially in immunocompromised patients including HIV/AIDS)	Amphotericin B liposomal 3 - 4mg/kg, IV, Q24H		6 - 8 weeks followed by long-term suppressive therapy with oral fluconazole especially in AIDS	Needs special administration
Encephalitis	*Herpes simplex*	Acyclovir, 10mg/kg, IV, Q8H		14 - 21 days	*Administered as infusion over 1 hour*
Brain Abscess	Polymicrobial including *Streptococcus anginosus,* anaerobic bacteria, *Staphylococcus aureus and* gram-negatives	Benzylpenicillin 4MU, IV, Q4H **PLUS** Metronidazole 1g, IV as loading dose; and then 500mg, IV, Q8H	Ceftriaxone, 1g, IV, Q12H **PLUS** Metronidazole 1g, IV as loading dose; and then 500mg, IV, Q8H	4 to 8 weeks (Duration of treatment depends upon surgical intervention, clinical response and radiological evidence of resolution)	*Early surgical consultation is essential*
Neurocysticercosis	*Taenia solium*	Albendazole 400mg, PO, Q12H		15 - 30 days	*Prednisolone 1mg/kg, PO one day prior to starting albendazole and continue for 10 days*

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
		GASTROINTESTINAL TRACT INFECTIONS			
Cholera *In pregnancy*	*Vibrio cholerae*	Doxycycline 300mg, PO, STAT	Ciprofloxacin 1g, PO, STAT		Stool culture should be done; Fluid replacement is the mainstay therapy.
		Erythromycin 12.5mg/kg, PO, Q6H		3 days	
Diverticulitis (*Severe*)	*Escherichia coli,* Coliforms, Enterococci, Anaerobes	Ampicillin 1g, IV, Q6H **PLUS** Gentamicin 7.5mg/kg, IV, Q24H **PLUS** Metronidazole 400mg, PO, Q12H	Ciprofloxacin 400mg, IV, Q12H **PLUS** Metronidazole 400mg, PO, Q12H	5 - 7 days	
Eradication of *Helicobacter pylori*	*Helicobacter pylori*	Omeprazole 20mg, PO, Q12H **PLUS** Clarithromycin 500mg, PO, Q12H **PLUS** Amoxicillin 1g, PO, Q12H	Omeprazole 20mg, PO, Q12H **PLUS** Metronidazole 400mg, PO, Q12H **PLUS** Amoxicillin 1g, PO, Q12H	14 days	
Infective Diarrhoea **Traveller's diarrhoea:** *Mild (Non dysenteric)*		Norfloxacin 400mg, PO, STAT			Stool culture to be done; fluid replacement is main component of therapy
Severe (Dysenteric)		Norfloxacin 400mg, PO, Q12H	Ciprofloxacin 500mg, PO, Q12H	3 days	
Organism specific	*Yersinia, Escherichia coli*	Cotrimoxazole 960mg, PO, Q12H	Norfloxacin 400mg, PO, Q12H	5 days	

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
			OR Ciprofloxacin 500mg, PO, Q12H		
	Campylobacter	Norfloxacin 400mg, PO, Q12H	Erythromycin 500mg, PO, Q6H	5 days	
	Salmonella, Shigella	Amoxicillin 500mg, PO, Q8H **OR** Cotrimoxazole 960mg, PO, Q12H	Ceftriaxone 2g, IV, Q12H	5 - 7 days	If blood culture positive for the organisms, treat for 14 days;
	Giardia	Metronidazole 400mg, PO, Q8H **OR** Metronidazole 2g, PO, Q24H		5 days 3 days	
	Entamoeba histolytica (amoebiasis)	Metronidazole 800mg, PO, Q8H		7 - 10 days	
	Clostridium difficile	Metronidazole 400mg, PO, Q8H	Vancomycin 125mg, PO*, Q6H	10 - 14 days	* *Break the ampoule and give orally*
Peritonitis: Primary (Spontaneous bacterial peritonitis) *Treatment*		Ceftriaxone 1g, IV, Q12H	Ampicillin 500mg, IV, Q8H **PLUS** Gentamicin 5mg/kg, IV, Q24H	7 - 10 days	
Primary prophylaxis	Enterobacteriaceae, *Streptococcus pneumoniae,* Enterococci, anaerobes	Norfloxacin 400mg, PO, Q12H	Ceftriaxone 1g, IV, Q12H **OR** Ciprofloxacin 500mg, PO, Q12H	5 days	For cirrhotic patient with upper GI bleed

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
Secondary prophylaxis		Norfloxacin 400mg, PO, Q12H	Cotrimoxazole 960mg, PO, Q24H	Lifelong	
Enteric Fever	*Salmonella typhi, Salmonella paratyphi*	Ampicillin 1g, IV, Q6H	Ceftriaxone 1g, IV, Q12H	10 - 14 days	Culture and sensitivity is essential
		GENITAL TRACT INFECTIONS			
Vaginal candidiasis	*Candida albicans*	Clotrimazole 100mg vaginal pessary at night for 7 nights **OR** Vaginal pessary 400mg daily (4 x 100mg) for 3 nights **OR** Vaginal pessary 500mg single dose for 1 night *(Choose depending on severity, compliance*)	Fluconazole 150mg, PO, STAT (in chronic and resistant cases)		All topical and oral azoles give 80 - 95% cure; In pregnancy, avoid oral azoles.
Balanitis	*Candidal balanitis* is commoner than bacterial cause	Topical Clotrimazole 1% Ointment, Q12H	Fluconazole 150mg, PO, STAT (in chronic and resistant cases)	At least 7 days	
Bacterial vaginosis	*Gardnerella vaginalis, Mycoplasma hominis*	Metronidazole 2g, PO, STAT **OR** Metronidazole 400mg, PO, Q12H		7 days	*A 7 days course of oral metronidazole is slightly more effective than 2g stat; Avoid 2g stat dose in pregnancy.*

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
Gonococcal urethritis, Cervicitis	*Neisseria gonorrhoeae*	Ceftriaxone 250 mg, IM, STAT	Ciprofloxacin 500mg, PO, STAT		*Take samples for gram stain and culture wherever applicable; When specific diagnosis is difficult, follow syndromic treatment guideline as per National STI management guideline*
Chlamydia trachomatis urethritis, Cervicitis	*Chlamydia trachomatis*	Doxycycline 200mg, PO, STAT then 100mg, PO, Q12H	Erythromycin 500mg, PO, Q6H	7 days	
Trichomoniasis	*Trichomonas vaginalis*	Metronidazole 2g, PO, STAT **OR** Metronidazole 400mg, PO, Q12H		5 - 7 days	
Pelvic inflammatory disease (PID)	*Chlamydia* and *Neisseria gonorrhoeae*	Ceftriaxone 250mg, IM, STAT **PLUS** Metronidazole 400mg, PO, Q12H **PLUS** Doxycycline 100mg, PO, Q12H		14 days	
If pregnant		Ceftriaxone 250mg, IM, STAT **PLUS** Erythromycin 500mg, PO, Q6H		7 days	

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
Chanchroid	*Haemophilus ducreyi*	Erythromycin 500mg, PO, Q6H for 7 days	Ceftriaxone 250mg, IM, STAT **OR** Ciprofloxacin 500mg, PO, Q12H for 3 days		
Donovanosis (*Granuloma Inguinale*)	*Klebsiella granulomatis*	Doxycycline 100mg, PO, Q12H	Erythromycin 500mg, PO, Q6H **OR** Cotrimoxazole 960mg, PO, Q12H	All for minimum 3 weeks	
Syphilis *Early Syphilis*	*Treponema pallidum*	Benzathine benzylpenicillin 2.4MU, IM, STAT, divided equally at 2 different sites	Procaine penicillin 1.2MU, IM, Q24H	10 days	Primary, secondary or early latent syphilis of not more than 2 years duration
If allergic to penicillin		Doxycycline 100mg, PO, Q12H	Erythromycin 500mg, PO, Q6H	14 days	Use erythromycin, if pregnant
Late Latent Syphilis		Benzathine benzylpenicillin 2.4MU, IM, divided equally at 2 different sites every week for 3 weeks	Procaine penicillin 1.2MU, IM, Q24H	10 - 14 days	Infection of >2 years duration without evidence of treponema infection
If allergic to penicillin		Doxycycline 100mg, PO,Q12H	Erythromycin 500mg, PO, Q6H	30 days	Use erythromycin, if pregnant
Neurosyphilis		Benzylpenicillin 4MU, IV, Q6H for 14 days	Doxycycline 100mg, PO, Q8H for 30 days **OR** Erythromycin 500mg, PO, Q6H for 30 days in pregnancy		Give prednisolone 20mg, Q12H for 2 days before starting antibiotics and continue for next 48 hrs after commencing antibiotics.

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
		INTRA-ABDOMINAL INFECTIONS			
Appendicitis: *Uncomplicated/Unclassified*		Ampicillin 1g, IV, Q6H **PLUS** Metronidazole 7.5mg/kg, IV, Q8H **PLUS** Gentamicin 5mg/kg, IV, Q24H	Cefazolin 1g, IV, Q8H **PLUS** Metronidazole 7.5mg/kg, IV, Q8H	Single dose preoperatively and continue 5 to 7 days if managed conservatively	
Complicated		Ampicillin 1g, IV, Q6H **PLUS** Metronidazole 7.5mg/kg, IV, Q8H **PLUS** Gentamicin 5mg/kg, IV, Q24H	Culture based	5 - 7 days	
Cholecystitis		Ampicillin 1g, IV, Q6H **PLUS** Gentamicin 5mg/kg, IV, Q24H	Ceftriaxone 1g, IV, Q12H	5 - 7 days	
If severe		Ciprofloxacin 500mg, IV, Q12H **PLUS** Metronidazole 7.5mg/kg, IV, Q8H			
Cholangitis		Ampicillin 1g, IV, Q6H **PLUS** Gentamicin 5mg/kg, IV, Q24H	Ceftriaxone 1g, IV, Q12H **PLUS** Metronidazole 7.5mg/kg, IV, Q8H	5 - 7 days	In patient with chronic biliary obstruction, add Metronidazole 7.5mg/kg, IV, Q8H

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
Liver abscess *Pyogenic*		Ciprofloxacin 400mg, IV, Q12H PLUS Metronidazole 7.5mg/kg, IV, Q8H	Ceftriaxone 1g, IV, Q12H PLUS Metronidazole 7.5mg/kg, IV, Q8H	4 - 6 weeks	
Amoebic		Metronidazole 7.5mg/kg, IV, Q8H		10 days	Should be followed by diloxanide furoate 500 mg, PO, Q8H for 10 days
Duodenal perforation with peritonitis		Ampicillin 1g, IV, Q6H **PLUS** Metronidazole 7.5mg/kg, IV, Q8H **PLUS** Gentamicin 5mg/kg, IV, Q24H	Ceftriaxone 1g, IV, Q12H **PLUS** Metronidazole 7.5mg/kg, IV, Q8H	Until patient is put on oral diet	Should be followed by *H. pylori* eradication regimen
Intestinal obstruction		Ampicillin 1g, IV, Q6H **PLUS** Metronidazole 7.5mg/kg, IV, Q8H **PLUS** Gentamicin 5mg/kg, IV, Q24H	Based on culture	5 - 7 days	
Bowel injury: *Non-penetrating*		Ampicillin 1g, IV, Q6H	Cefazolin 1g, IV, Q8H	5 - 7 days	
Penetrating		Ampicillin 1g, IV, Q6H **PLUS** Metronidazole 7.5mg/kg, IV, Q8H	Ceftriaxone 1g, IV, Q12H **PLUS** Metronidazole 7.5mg/kg, IV, Q8H	5 - 7 days	
Pancreatitis: Complicated (with abscess/necrosis)		Piperacillin/tazobactam 4.5g, IV, Q6H	Imipenem 1g, IV, 8QH		

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
		OBSTETRICS AND GYNAECOLOGY INFECTIONS			
UTI in pregnancy	Usual urinary pathogens	Nitrofurantoin 50 - 100mg, PO, Q6H **OR** Amoxicillin 500mg, PO, Q8H	Cephalexin 500mg, PO, Q8H	5 days	Take urine for culture and sensitivity test before starting antibiotics; Ideally 2 post treatment cultures should be sterile
Post-abortal Infection: *Mild infection, non-septic*	*Escherichia coli, Staphylococcus aureus, Streptococcus, Pseudomonas*	Amoxicillin 500mg, PO, Q8H **PLUS** Metronidazole 500mg, PO, Q8H	Doxycycline 100mg, PO, Q12H	5 - 7 days	*Take culture before starting antibiotics*
Severe infections or septic		Ampicillin 1g, IV, Q6H **PLUS** Metronidazole 500mg, IV, Q8H	Ceftriaxone 1g, IV, Q12H PLUS Metronidazole 500mg, IV, Q8H	5 - 7 days	Early surgical intervention should be done
Chorioamnionitis, puerperal sepsis and infections after pelvic surgery		Ampicillin 1g, IV, Q6H **PLUS** Metronidazole 500mg, IV, Q8H **PLUS** Gentamicin 5mg/kg, IV, STAT			*IV antibiotics for 48 hours only; then switch to oral for 5 - 7 days*
		OPHTHALMIC INFECTIONS			
Conjunctivitis	*Staphylococcus aureus, Streptococcus pneumoniae, Haemophilus influenzae,* Coliforms (in contact lens users)	Chloramphenicol eye drops: 1 drop, Q2H, if severe; and Q6H when controlled; Ointment: at night if used alone, apply 3 - 4 times daily	Ciprofloxacin eye drops Q6H	5 - 7 days	

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
	Pseudomonas	Topical Ciprofloxacin 1 drop, Q2H; reduce frequency as infection is controlled.	Tobramycin eye drop, Q6H	5 - 7 days; Continue for 48 hours after healing	
Corneal Infections *Corneal ulcers*		Moxifloxacin 0.5% eye drop: Apply eye drops throughout day and night; *Day 1*: apply every 15 min for 6H then, 30 minutes; *Day 3*: apply Q1H; *Day 4 - 14*: apply Q4H; **ADD** Fluconazole 0.3% eye drop: Apply 1 - 8H depending on severity (only in clinical suspicion or culture proven fungal cause)	Topical chloramphenicol 0.4% eye drop/ 1% eye ointment OR Ciprofloxacin 0.3% eye drop	Maximum duration of treatment 21 days	
Ocular Herpes simplex		Acyclovir ointment, 5 times daily		14 days or at least up to 3 days after healing	
		ORO-DENTAL INFECTIONS			
Dental infections *Mild*	*Viridians, Streptococcus spp., Anaerobic streptococcus, Bacteroides*	Amoxicillin 500mg, PO, Q8H	Erythromycin 500mg, PO, Q6H	5 days	Antibiotics are required only in spreading infections and systemic involvements
Moderate/ Severe		Amoxicillin 500mg, PO, Q8H **PLUS**	Erythromycin 500mg, PO, Q6H **PLUS**	5 days	

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
		Metronidazole 400mg, PO, Q8H	Metronidazole 400mg, PO, Q8H		
Facial cellulitis	Beta-haemolytic streptococcus and *Staphylococcus aureus*	Amoxicillin 500mg, PO, Q8H **OR** Cloxacillin 500mg, PO, Q6H	Cephalexin 500mg, PO, Q8H	5 days	
Acute necrotizing ulcerative gingivitis (Vincent's gingivitis)	Fusiform bacteria and spirochetes	Metronidazole 400mg, PO, Q8H **PLUS** Chlorhexidine mouthwash (0.2%) or Hydrogen peroxide mouthwash (6%)	Doxycycline 200mg, STAT, and then, Q12H **PLUS** Chlorhexidine mouthwash (0.2%) or Hydrogen peroxide mouthwash (6%)	5 days	Antibiotic alone will not respond without local measures such as scaling, irrigation and oral hygiene advice
Pericoronitis	Mixed infections	Amoxicillin 500mg, PO, Q8H **PLUS** Metronidazole 400mg, PO, Q8H	Doxycycline 100mg, PO, Q12H	5 days	
Periodontitis	Mixed infections	Amoxicillin 500mg, PO, Q8H **PLUS** Metronidazole 400mg, PO, Q8H	Doxycycline 100mg, PO, Q12H	5 days	
Periodontal/Periapical abscess	*Viridans, Streptococcus species, anaerobic streptococcus, Bacteroides*	Amoxicillin 500mg, PO, Q8H	Cloxacillin 500mg, PO, Q6H	5 days	

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
Osteomyelitis of the jaw	*Staphylococcus aureus, Haemolytic streptococcus, Bacteroides, Actinomyces*	Amoxicillin 500mg, PO, Q6H **OR** Ampicillin 1g, IV, Q6H **PLUS** Cloxacillin 1g, IV, Q6H	Metronidazole 400mg, IV, Q6H **PLUS** Cloxacillin 1g, IV, Q6H	7 - 10 days	
Antibiotic prophylaxis against infective endocarditis for dental procedures		Amoxicillin 2g, PO, STAT	Erythromycin 500mg, PO STAT **OR** Cephalexin 2g, PO, STAT	30 - 60 minutes before procedure	
		SKIN AND SOFT TISSUE INFECTIONS			
Soft Tissue Infection *Skin surface infection*		Cloxacillin 2g, IV, Q6H	Culture based	5 - 7 days	
Deep skin infection		Ampicillin 25mg/kg, IV, Q6H **PLUS** Metronidazole 7.5mg/kg, IV, 8H **PLUS** Gentamicin 7.5mg/kg, IV, Q24H	Culture based	5 - 7 days	
Gas gangrene		Ceftriaxone 2g, IV, Q12H		5 - 7 days	
Impetigo *Impetigo contagiosa*	*Streptococcus pyogenes*	Penicillin V 500mg, PO, Q6H	Amoxicillin, 500mg, PO, Q8H	7 days	Where oral administration is not possible, procaine penicillin 0.6MU, IM, Q24H may be substituted; Where infection is widespread or
Bullous impetigo	*Staphylococcus aureus*	Cloxacillin, 500mg, PO, Q6H	Erythromycin 500mg, PO, Q6H		

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
					severe, combine cloxacillin with amoxicillin
Boils, Folliculitis	*Staphylococcus aureus*	Cloxacillin 500mg, PO, Q6H	Cephalexin 500mg, PO, Q8H **OR** Erythromycin 500mg, PO, Q6H **OR** Cotrimoxazole 480mg, PO, Q12H	5 days	Boils usually require I & D
Burns		Cloxacillin 2g, IV, Q6H	Ampicillin 25mg/kg, IV, Q6H		
Erythrasma	*Corynebacterium minutissimum*	Erythromycin 500mg, PO, Q6H		5 days	
Erysipelas	Commonly *Streptococcus pyogenes;* occasionally *Staphylococcus aureus* alone or co-infection with *Streptococcus pyogenes*	Penicillin V 500mg, PO, Q6H	Erythromycin 500mg, PO, Q6H	7 - 10 days	Add cloxacillin, if Staphylococcus aureus suspected
Cellulitis *Following surgical procedure, cuts abrasions, crush injury, insect bites, limb oedema*	*Staphylococcus aureus, Streptococcus pyogenes*	Cloxacillin 500mg, PO, Q6H	Erythromycin 500mg, PO, Q6H OR Cephalexin 500 mg, PO, Q6H	7 days	*Surgical referral where appropriate*
Following complicated surgical and orofacial cellulitis	*Staphylococcus aureus, Streptococcus pyogenes* and anaerobes	Cloxacillin 500mg, PO, Q6H **PLUS** Metronidazole 500mg, PO, Q8H	Cephalexin 500mg, PO, Q6H **PLUS** Metronidazole 500mg, PO, Q8H	7 days	

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
Paronychia (*Nail infection*)	*Staphylococcus aureus, Streptococcus pyogenes*	Cloxacillin 500mg, PO, Q6H	Erythromycin 500mg, PO, Q6H	7 days	
Leg ulcer and foot infections in diabetes	*Staphylococcus aureus, Streptococcus A, B, C, G;* plus, in severe infections anaerobes, coliforms	based on culture			
Bites: *Animal*	*Staphylococcus aureus, alpha-and beta-haemolytic streptococci, anaerobes, Pasteurella multocida,* Capnocytophaga spp.	Penicillin V 500mg, PO, Q6H **PLUS** Metronidazole 500mg, PO, Q8H	Amoxicillin 500mg, PO, Q8H **PLUS** Metronidazole 500mg, PO, Q8H	5 - 7 days	*Assess for tetanus and rabies risk; Thorough wound cleaning with antiseptics/soap and water immediately after the bite is mandatory; Replace penicillins with doxycycline in penicillin allergy*
Human	*Staphylococcus aureus,* alpha - & beta - haemolytic streptococci, anaerobes	As above	As above	As above	Assess for Hepatitis B & C risk; HIV risk
Snake	Gram-negative bacteria, Pseudomonas and Staphylococcus	Amoxicillin 500mg, PO, Q8H	Ceftriaxone 1g, IV, Q12H	5 - 7 days	Consider antibiotic therapy only when there is risk of secondary infection; Consider anti-venom therapy where indicated
Necrotising fasciitis and soft tissue infection or synergistic gangrene	Mixed anaerobes and aerobes	Benzylpenicillin 2.4MU, IV, Q6H **PLUS** Metronidazole 7.5mg/kg, IV, Q8H **PLUS** Gentamicin 5mg/kg, IV, Q24H	Meropenem 1g, IV, Q8H **PLUS** Clindamycin 600-900mg, IV, Q8H **PLUS** Vancomycin 15mg/kg, IV, Q6 - 8H	Treatment should be individualized and continued until no further debridement are needed and patient's haemodynamic has normalised.	Surgical intervention usually required

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
Acne: *Moderate to severe*	*Propionibacterium acnes*	Doxycycline 100mg, PO, Q12H for the first day followed by Q24H	Erythromycin 500mg, PO, Q12H	At least for 3 months	If there is no improvement after the first 3 months, consider another oral agent.
Otitis externa	*Staphylococcus aureus, Streptococcus A,C,G*	Amoxicillin, 500mg, PO, Q8H **OR** Penicillin V, 500mg, PO, Q6H	Erythromycin 500mg, PO, Q6H	5 days	
Scabies *In pregnancy/ lactating mother*	*Mite (Sarcoptes scabiei)*	Gamma Benzene Hexachloride	Apply thinly over whole body, omitting head and neck, wash off using cool water after 24 hours; Repeat if necessary after 7 days.		*Treat all members of the household & close contacts simultaneously; Wash all clothing in hot water and sundry all beddings and linens.*
		Sulphur 6 % ointment	Apply Q12H after bath	3 days	
Infectious Atopic Dermatitis	*Oral antibiotics are used when the dermatitis has not settled with other measures and there is suspicion that infection is contributing to the dermatitis; and there is obvious secondary infection, particularly if using wet dressings.*	Cloxacillin, 500mg, PO, Q6H **OR** Cephalexin 500mg, PO, Q8H		5 - 7 days	
		LOWER RESPIRATORY TRACT INFECTIONS			
Acute bronchitis	Mostly viral; *Bordetella pertussis, Chlamydophila pneumoniae,* and *Mycoplasma pneumonia*	Amoxicillin 500mg, PO, Q8H	Doxycycline 200mg, PO, STAT then 100mg, PO, Q12H	5 days	Antibiotics may be considered for acute bronchitis in someone with significant comorbidity or secondary infections.

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
Acute infective exacerbation of COPD	*Streptococcus pneumoniae, Haemophilus influenzae, Moraxella catarrhalis*	Amoxicillin 500mg, PO, Q8H **PLUS** Doxycycline 200mg, PO, STAT then 100mg, PO, Q24H	Ampicillin 1g, IV, Q6H **PLUS** Doxycycline 200mg, PO, STAT then 100mg, PO, Q12H	5 days	Antibiotic therapy should not be used unless patient has clinical signs of infections: 1. Increased sputum purulent; 2. Increased sputum; and 3. Increased breathlessness and cough
Infective exacerbation of COPD: No history of use of antimicrobials in last 3 months and no associated comorbidity conditions		Doxycycline 200mg, PO, STAT then 100mg, PO, Q24H	Amoxicillin 500mg, PO, Q8H **PLUS** Erythromycin 500mg, PO, Q6H	5 days	
Presence of comorbidities, such as chronic heart, liver, or renal disease; diabetes mellitus; alcoholism; malignancies; asplenia; immunosuppressing conditions or use of immunosuppressants; use of antimicrobials within the previous 3 months	*Resistant streptococci*	Ampicillin 1g, IV, Q8H **PLUS** Doxycycline 200mg, PO, STAT then 100mg, PO, Q24H	Ceftriaxone 1g, IV, Q12H **PLUS** Doxycycline 200mg, PO, STAT then 100mg, PO, Q24H	7 days	
Community acquired pneumonia *Outpatient* No comorbidities	*Streptococcus pneumoniae, Haemophilus influenzae, Moraxella catarrhalis, Mycoplasma*	Doxycycline 100mg, PO, Q12H	Doxycycline 200mg, PO, STAT then 100mg, PO, Q12H	5 days	

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
With comorbidities like heart disease, chronic lung diseases, liver, renal disease, DM, Malignancies and immunocompromised	*pneumoniae, Chlamydia psittaci* and *pneumoniae, Coxiella burnetii*	Amoxicillin 1g, PO, Q8H **PLUS** Doxycycline 100mg, PO, Q12H	Ciprofloxacin 500mg, PO, Q12H	7 days	Wherever *Staphylococcal pneumoniae* is suspected or proven by culture, add cloxacillin
Inpatient (Non-ICU)		Ampicillin 1g, IV, Q8H **PLUS** Doxycycline 200mg, PO, STAT then 100mg, PO, Q24H	Ceftriaxone 1g, IV, Q12H **PLUS** Doxycycline 200mg, PO, STAT then 100mg, PO, Q12H	7 days	
Inpatient (ICU)		Ceftriaxone 1g, IV, Q12H **PLUS** Erythromycin 500mg, PO, Q6H	Piperacillin/tazobactam 4.5g, IV, Q6H		Take sputum and blood cultures before initiation of antibiotics
Hospital acquired pneumonia: *Not high risk of mortality and no factors increasing the likelihood o MRSA*	Hospital pathogens such as Coliforms, Pseudomonas, Acinetobacter, *Staphylococcus aureus including MRSA*	Ceftriaxone 1g, IV, Q12H **PLUS** Gentamicin 5mg/kg, IV, Q24H	Piperacillin/tazobactam 4.5g, IV, Q6H	7 days	
Not at high risk of mortality but with factors increasing the likelihood of MRSA		Ceftazidime 2g, IV, Q8H **PLUS** Vancomycin 15mg/kg, IV, Q12H	Piperacillin/tazobactam 4.5g, IV, Q6H **PLUS** Vancomycin 15mg/kg, IV, Q12H		
High risk of mortality or receipt of intravenous antibiotics during the prior 90 days		Piperacillin/tazobactam 4.5g, IV, Q6H **PLUS** Gentamicin 5mg/kg, IV, Q24H	Meropenem 1g, IV, Q8H **PLUS** Amikacin 15mg/kg, IV, Q24H		If MRSA suspected/isolated, add vancomycin 15mg/kg, IV, Q12H

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
Ventilator associated pneumonia (VAP)		Piperacillin/tazobactam 4.5g, IV, Q6H **PLUS** Gentamicin 5mg/kg, IV, Q24H	Meropenem 1g, IV, Q8H **PLUS** Amikacin 15mg/kg, IV, Q24H	7 - 14 days	If MRSA suspected/isolated, add vancomycin 15mg/kg, IV, Q12H
Lung abscess	*Staphylococcus aureus, Streptococcus pneumoniae, anaerobes, gram-negative rods*	Ampicillin 1g, IV, Q6H **PLUS** Metronidazole 500mg, IV or 400mg, PO, Q8H	Ceftriaxone 1g, IV, Q12H **PLUS** Metronidazole 500mg, IV or 400mg, PO, Q8H	4 - 6 weeks (IV plus oral)	Drainage may be required along with antimicrobial therapy for abscess size 6 - 8cm or larger
Parapneumonic effusion: *Community acquired*	*Streptococcus pneumoniae*, Streptococcus milleri group, *Staphylococcus aureus*	Ampicillin 1g, IV, Q6H **PLUS** Metronidazole 500mg, IV, Q8H	Ceftriaxone 1g, IV, Q12H PLUS Metronidazole 500mg, IV, Q8H	7 days	
Hospital acquired: Not high risk of mortality and no factors increasing the likelihood of MRSA	Hospital pathogens such as Coliforms, Pseudomonas, Acinetobacter, *Staphylococcus aureus* including MRSA	Ceftriaxone 1g, IV, Q12H **PLUS** Gentamicin 5mg/kg, IV, Q24H **PLUS** Metronidazole 500mg, IV, Q8H	Piperacillin/tazobactam 4.5g, IV, Q6H	7 days	
Not at high risk of mortality but with factors increasing the likelihood of MRSA		Ceftazidime 2g, IV, Q8H **PLUS** Vancomycin 15mg/kg, IV, Q12H	Piperacillin/tazobactam 4.5g, IV, Q6H **PLUS** Vancomycin 15mg/kg, IV, Q12H		

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
		PLUS Metronidazole 500mg, IV, Q8H			
High risk of mortality or receipt of intravenous antibiotics during the prior 90 days		Piperacillin/tazobactam 4.5g, IV, Q6H **PLUS** Gentamicin 5mg/kg, IV, Q24H	Meropenem 1g, IV, Q8H **PLUS** Amikacin 15mg/kg, IV, Q24H		If MRSA suspected /isolated, add vancomycin 15mg/kg, IV, Q12H
Empyema: *Community acquired*	*Streptococcus pneumoniae*, Streptococcus milleri group, *Staphylococcus aureus,* anaerobes	Ampicillin 1g, IV, Q6H **PLUS** Metronidazole 500mg, IV, Q8H	Ceftriaxone 1g, IV, Q12H **PLUS** Metronidazole 500mg, IV or 400mg, PO, Q8H	2 - 4 weeks	
Hospital acquired: Not high risk of mortality and no factors increasing the likelihood of MRSA	Methicillin-resistant *Staphylococcus aureus* and *Pseudomonas Aeruginosa*	Ceftriaxone 1g, IV, Q12H **PLUS** Gentamicin 5mg/kg, IV, Q24H	Piperacillin/tazobactam 4.5g, IV, Q6H		
Not at high risk of mortality but with factors increasing the likelihood of MRSA		Ceftazidime 2g, IV, Q8H **PLUS** Vancomycin 15mg/kg, IV, Q12H	Piperacillin/tazobactam 4.5g, IV, Q6H **PLUS** Vancomycin 15mg/kg, IV, Q12H	7 days	
High risk of mortality or receipt of intravenous antibiotics during the prior 90 days		Piperacillin/tazobactam 4.5g, IV, Q6H **PLUS** Gentamicin 5mg/kg, IV, Q24H	Meropenem 1g, IV, Q8H **PLUS** Amikacin 15mg/kg, IV, Q24H		If MRSA suspected /isolated, add vancomycin 15mg/kg, IV, Q12H

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
Bronchiectasis (infective exacerbation) *Outpatient*	*Staphylococcus aureus, Streptococcus pneumoniae, anaerobes, gram-negative rods, Haemophilus*	Amoxicillin 1g, PO, Q8H **PLUS** Doxycycline 200mg, PO, STAT then 100mg, PO, Q12H	Amoxicillin 1g, PO, Q8H **PLUS** Doxycycline 200mg, PO, STAT then 100mg, PO, Q12H	14 days	*Sputum culture should be taken*
Inpatient		Ampicillin 1g, IV, Q6H **PLUS** Doxycycline 200mg, PO, STAT then 100mg, PO, Q12H	Ciprofloxacin 500mg, IV, Q12H **OR** Ceftriaxone 1g, IV, Q12H **PLUS** Doxycycline 200mg, PO, STAT then 100mg, PO, Q12H		
UPPER RESPIRATORY TRACT INFECTIONS					
	The majority of sore throat is viral, but there is clinical overlap between viral and bacterial infections.				
Sore throat/Pharyngitis/ Tonsillitis	*Streptococcus pyogenes*	Amoxicillin 500mg, PO, Q8H **OR** Penicillin V 500mg, PO, Q12H	Erythromycin 500mg, PO, Q6H	10 days	Antibiotics should be used only if there is strong suspicion of bacterial infections

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
	Corynebacterium diphtheriae	Benzylpenicillin 1MU, IV, Q6H		14 days	Once patient is able to swallow, switch to penicillin V 250mg, PO, Q6H
Sinusitis *Acute*		Amoxicillin 500mg, PO, Q8H	Amoxicillin/clavulanate (500mg/125mg), PO, Q8H	5 days	Most sinusitis does not require antibiotics except: 1. Symptoms lasting longer than 7 days with purulent nasal discharge, sinus tenderness or maxillary toothache; 2. Severe symptoms and high fever more than 39°C or higher at onset of illness and lasting for more than 3 days; and 3. Worsening symptoms after initial improvement.
Chronic (more than 12 weeks)		Amoxicillin 500mg, PO, Q8H	Amoxicillin/clavulanate (500mg/125mg), PO, Q8H	3 - 10 weeks	
Otitis media *Acute*	*Streptococcus pneumoniae, Haemophilus influenzae, Moraxella catarrhalis*	Amoxicillin 500mg, PO, Q8H	Erythromycin 500mg, PO, Q6H	5 days	
Chronic	Decide therapy based on culture and sensitivity reports				
Acute epiglottitis	*Haemophilus influenzae, Streptococcus pneumoniae, Streptococcus pyogenes, Staphylococcus aureus*	Ampicillin 1g, IV, Q6H **OR** Chloramphenicol 500mg, IV, Q6H	Cefotaxime 1g, IV, Q8H	5 - 7 days	It is a medical emergency; Avoid throat examination; Be prepared for emergency intubation.
		URINARY TRACT INFECTIONS			
Uncomplicated Cystitis in women	*Escherichia coli* , Klebsiella spp., *Staphylococcus*	Nitrofurantoin 100mg, PO, Q6H	Cotrimoxazole 960mg, PO, Q12H for 3 days **OR**	7 days	

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
	saprophyticus, Enterococcus faecalis		Cephalexin 500mg, PO, Q12H		
UTI in men		Cotrimoxazole 960mg, PO, Q12H	Ciprofloxacin 500mg, PO, Q12H	7 days	If prostate involved, extend to 14 days.
Acute Pyelonephritis: *Uncomplicated*	Coliforms, Pseudomonas	Ciprofloxacin 500mg, PO, Q12H		10 days	
Complicated		Ceftriaxone 1g, IV, Q24H	Piperacillin/tazobactam 4.5g, IV, Q6H	7 - 10 days	
Acute Prostatitis: *Mild to moderate*	Usual UTI causing pathogens and occasionally STI causing organisms	Cotrimoxazole 960mg, PO, Q12H		14 days	
Severe case		Ampicillin 2g, IV, Q6H **PLUS** Gentamicin 5mg/kg, IV, Q24H	Ceftriaxone 1g, IV, Q12H	14 days	Can change to oral after substantial clinical improvement.
Chronic Bacterial Prostatitis	Same as above	Cotrimoxazole 960mg, PO, Q12H **OR** Norfloxacin 400mg, PO, Q12H	Ciprofloxacin 500mg, PO, Q12H **OR** Doxycycline 100mg, PO, Q12H	4 weeks	
Epididymo-orchitis	*Chlamydia, trachomatis, Neisseria gonorrhoeae, Escherichia coli*	Ceftriaxone 250mg, IM, STAT **PLUS** Doxycycline 100mg, PO, Q12H	Ciprofloxacin 500mg, PO, Q12H **PLUS** Doxycycline 100mg, PO, Q12H	7 days	

RECOMMENDED ANTIMICROBIAL THERAPY FOR PAEDIATRICS

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
BONE AND JOINT INFECTIONS					
Acute osteomyelitis					
For patients hypersensitive to penicillin For delayed/non-life threatening	80% caused by *Staphylococcus*	Cloxacillin 50mg/kg, IV, Q6H (Max.), Then PO dose	Cefazolin 25mg/kg, IV, Q8H	IV for at least 3 days then oral depending on response; 3 - 4 weeks of oral if good response; 4 - 6 weeks if slow response and involvement of pelvis and spine.	Obtain blood, pus and bone culture and sensitivity; Switch to oral therapy after 72 hours; 72 hours, if afebrile and pain-free for 24 hours, and CRP decreased by two third of the highest value
		Cephazolin 25mg/kg, IV, Q8H, after AST			
For immediate/ life threatening		Vancomycin 15mg/kg, IV, Q6H			Vancomycin should be given as slow IV infusion, at least over an hour
	Methicillin-resistant *Staphylococcus aureus* (MRSA)	Vancomycin 15mg/kg, IV, Q6H		As above; Switch to oral cotrimoxazole, if response is good to vancomycin and if sensitive to cotrimoxazole.	Therapy should be based on proper culture and sensitivity report.
Chronic osteomyelitis and osteomyelitis involving bone & joint prostheses	*Staphylococcus aureus*, Enterobacteriaceae including pseudomonas	Treatment must be guided by the susceptibility of the organism isolated from aspirations, biopsies and prosthetic materials	6 weeks to 6 months depending on clinical response		Consult specialists

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
Septic arthritis		Management is same as acute osteomyelitis; Urgent consultation when the hip is involved; At least 2 weeks for *Streptococcus pneumoniae*, kingella, Streptococci; Longer if *Staphylococcus aureus*, gram negative and if arthrotomy done			
		CARDIOVASCULAR SYSTEM INFECTIONS			
Native valve endocarditis: *Initial empirical therapy awaiting culture results*	*Streptococcus viridans* (after dental procedures) *Staphylococcus aureus* (no underlying heart disease), *Enterococci, CoNS* (presence of an indwelling central venous catheter)	Ampicillin 50mg/kg, IV, Q6H; (Max. 200mg/kg/day) **PLUS** Gentamicin 3mg/kg, IV, Q24H **PLUS** Cloxacillin 50mg/kg, IV, Q6H; (Max. 200mg/kg/day)	Benzylpenicillin 0.05MU/kg, IV, Q6H; (Max. 0.2 MU/kg/day) **PLUS** Gentamicin 3mg/kg, IV, Q24H **PLUS** Cloxacillin 50mg/kg, IV, Q6H; (Max. 200mg/kg/day)	4 - 6 weeks; Stop Gentamicin after 14 days	Take at least 3 blood cultures at least 30 minutes apart from different sites prior to initiation of antibiotics;
Native valve-streptococcal endocarditis: *For penicillin sensitive isolates*	*Viridans streptococci*	Ampicillin 50mg/kg, IV, Q6H; (Max. 200mg/kg/day) **OR** Benzylpenicillin 0.05MU/kg, IV, Q6H; (Max. 0.2 MU/kg/day) **PLUS** Gentamicin 3mg/kg, IV, Q24H	Ceftriaxone 100mg/kg, IV, Q24H **PLUS** Gentamicin 3mg/kg, IV, Q24H	4 weeks; Stop Gentamicin after 2 weeks	In all patients receiving gentamicin and/or vancomycin periodic monitoring of hearing and kidney function is essential.

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
For penicillin resistant isolates		Ceftriaxone 100mg/kg, IV, Q24H **PLUS** Gentamicin 3mg/kg, IV, Q24H	Vancomycin 15mg/kg, IV, Q6H (if unable to tolerate or resistant to penicillins or cephalosporins and/or no improvement)	4 weeks; Stop gentamicin after 2 weeks	
Staphylococcal endocarditis	Methicillin-susceptible *Staphylococcus aureus (MSSA)*	Cloxacillin 50mg/kg, IV, Q6H; (Max. 200mg/kg/day)	Cefazolin 100mg/kg, IV, Q8H	6 weeks for left sided IE; 2 weeks for right sided IE	
	Methicillin-resistant *Staphylococcus aureus* (MRSA)	Vancomycin 15mg/kg, IV, Q8H		6 weeks	
Enterococcal endocarditis	*Enterococcus faecalis, Enterococcus faecium*	Ampicillin 50mg/kg, IV, Q6H (Max. 200mg/kg/day) **PLUS** Gentamicin 1mg/kg, IV, Q8H	Benzylpenicillin 0.05MU/kg, IV, Q6H (Max. 0.2MU/kg/day) **PLUS** Gentamicin 3mg/kg, IV, Q24H	4 - 6 weeks	In cases where response to appropriate treatment is poor, surgical removal of the valves may be indicated
For penicillin resistant isolates		Vancomycin 15mg/kg, IV, Q8H **PLUS** Gentamicin 1mg/kg, IV, Q8H		4 - 6 weeks	

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
Prosthetic valve endocarditis (*Valve replacement less than 1 year*)	*Staphylococcus epidermidis, Staphylococcus aureus,* rarely enterobacteriaceae, diphtheroids and fungi	Cloxacillin 50mg/kg, IV, Q6H **PLUS** Gentamicin 3mg/kg, IV, Q24H **PLUS** Rifampicin 20mg/kg, PO, Q8H (start 3 - 4 days later)	Vancomycin 15mg/kg, IV, Q6H **PLUS** Gentamicin 3mg/kg, IV, Q24H **PLUS** Rifampicin 20mg/kg, PO, Q8H (start 3 - 4 days later)	6 - 8 weeks; Stop gentamicin after 2 weeks	Change to appropriate regimen after culture and sensitivity results; If valve replacement is more than 1 year, treat on empirical regime as above
Rheumatic fever: *Acute*	Group A Streptococcus	Penicillin V 12.5mg/kg, PO, Q6H; *Body wt.* < 27kg: 250mg, PO, Q12H/Q8H; *Body wt.* > 27kg: 500mg, PO, Q12H/Q8H **OR** Benzathine benzylpenicillin 1.2MU, IM, STAT	Erythromycin 2.5mg/kg, PO, Q8H	10 days	
Secondary prophylaxis	Group A Streptococcus	Benzathine benzylpenicillin *Body wt. >27kg*: 1.2MU, every 3 weeks; *Body wt.* < 27kg: 0.6MU, every 3 weeks	Penicillin V 250mg, PO, Q12H **OR** Erythromycin 250mg, PO, Q12H	*Without carditis*: 5 years or until 21 years (or longer); *With carditis but no valvular disease*: 10 years or until 21 years (or longer); *With persistent valvular disease*: lifelong	
		CENTRAL NERVOUS SYSTEM INFECTIONS			
Meningitis: *Initial empirical therapy* (Children 2 months to 12 years)	*Haemophilus influenzae, Streptococcus pneumoniae, Neisseria meningitidis*	Ampicillin 50mg/kg, IV, Q6H; (Max. 200mg/kg/day) **PLUS**	Ceftriaxone 50mg/kg, IV, Q12H; (Max. 100mg/kg/day)	10 - 14 days	No proven benefit of steroids in bacterial meningitis in children (*Brouwer MC, Cochrane Review 2015*)

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
Organism specific therapy		Chloramphenicol 25mg/kg, IV, Q6H; (Max. 100mg/kg/day)			
	Streptococcus pneumoniae	Ampicillin 50mg/kg, IV, Q6H; (Max. 200mg/kg/day) **OR** Benzylpenicillin 0.1MU/kg, IV, Q6H (Max. 0.4MU/kg/day)	Ceftriaxone 25mg/kg, IV, Q12H; (Max. 100mg/kg/day)	10 -14 days	
	Neisseria meningitidis	Ampicillin 50mg/kg, IV, Q6H; (Max. 200mg/kg/day) **OR** Benzylpenicillin 0.1MU/kg, IV, Q6H; (Max. 0.4 MU/kg/day)	Ceftriaxone 25mg/kg, IV, Q12H; (Max. 100mg/kg/day)	5 - 7 days, if uncomplicated; (can increase to 7 - 10 days)	
	Patients treated with penicillins and chloramphenicol, and close contacts of patient should receive rifampicin 10mg/kg, PO, Q12H for 2 days OR ciprofloxacin 20mg/kg, STAT as prophylaxis				
	Haemophilus influenzae	Chloramphenicol 25mg/kg, IV, Q6H; (Max. 100mg/kg/day)	Ceftriaxone 50mg/kg, IV, Q12H; (Max. 100mg/kg/day)	7 - 10 days	
	Note: Close contacts and children < 2 years old should receive prophylaxis of rifampicin 20mg/kg/day, PO, Q8H for 4 days				
	Gram negative bacilli	Ampicillin 50mg/kg, IV, Q6H; (Max. 200mg/kg/day) **PLUS** Gentamicin 7.5mg/kg, IV, Q24H		21 days	
	Pseudomonas aeruginosa	Ciprofloxacin 10mg/kg, IV, Q8H	Ceftazidime 50mg/kg, IV, Q8H;	21 days	

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
		(Max. 150mg/kg/day)			
	Methicillin-sensitive *Staphylococcus aureus (MSSA)*	Cloxacillin 50mg/kg, IV, Q6H; (Max. 200mg/kg/day)		7 - 10 days	
	Methicillin-resistant *Staphylococcus aureus* (MRSA)	Vancomycin 15mg/kg, IV, Q6H; (Max. 60g/kg/day)		7 - 10 days	
Encephalitis	*Herpes simplex*	Acyclovir 20mg/kg, IV, Q8H; (Max. 60mg/kg/day)		14 - 21 days	Administered as infusion over one hour
Brain abscess	Polymicrobial including *Streptococcus anginosus,* anaerobic bacteria, *Staphylococcus aureus* and gram negative bacteria	Ceftriaxone 50mg/kg, IV, Q12H; (Max. 100mg/kg/day) **PLUS** Metronidazole 7.5mg/kg, IV, Q6H; (Max. 30mg/kg/day)	Benzylpenicillin 0.5MU/kg, IV, Q6H; (Max. 0.2MU/kg/day) **PLUS** Metronidazole 15mg/kg, IV, Q12H	4 - 8 weeks (Duration of treatment depends upon surgical intervention, clinical response and radiological evidence of resolution.)	If culture positive, add Cloxacillin; Early surgical consultation is essential.
Neurocysticercosis	*Taenia solium*	Albendazole 7.5mg/kg, PO, Q12H		8 - 28 days; 7 days (longer if multiple lesion and subarachnoid)	Prednisolone 1-2 mg/kg/day for 2 weeks; Seek specialist advice
		GASTROINTESTINAL TRACT INFECTIONS			
Cholera	*Vibrio cholerae*	Erythromycin 12.5mg/kg, PO, Q6H	Ciprofloxacin 20mg/kg, PO, STAT	3 days	Stool culture should be done; Fluid replacement is the mainstay therapy
	Bacillary dysentery	Cotrimoxazole 4 - 5mg/kg, PO, Q12H	Ceftriaxone 50 - 75mg/kg, IV, Q24H	5 days	If culture and sensitivity is available, treat accordingly

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
	Giardia	Metronidazole 10mg/kg, PO, Q8H		7 days	
	Entamoeba histolytica	Metronidazole 10mg/kg, PO, Q8H		7 days	
Peritonitis: Primary (*Spontaneous bacterial peritonitis*)	*Streptococcus pneumoniae* is the commonest organism, enterobacteriaceae	Ceftriaxone 100mg/kg/day, IV, Q12 - 24H	Cefotaxime 100mg/kg/day, IV, Q8H	7 - 10 days	
Enteric fever	*Salmonella typhi, Salmonella paratyphi*	Ampicillin 100mg/kg/day, IV, Q6H **OR** Cotrimoxazole 8 - 10mg/kg, PO, Q12H	Ceftriaxone 75 - 100mg/kg/day, IV, Q24H	10 - 14 days	Culture and sensitivity essential;
		SKIN AND SOFT TISSUE INFECTIONS			
Impetigo	*Streptococcus pyogenes, Staphylococcus aureus*	Cloxacillin 12.5mg/kg, PO, Q6H	Cotrimoxazole 4mg/kg, PO, Q12H	5 days	.
Boils	*Staphylococcus aureus*	Cloxacillin 12.5mg/kg, PO, Q6H	Cotrimoxazole 4mg/kg, PO, Q12H	5 - 7 days	Boils usually require I & D
Cellulitis: *Following surgical procedure, cuts abrasions, crush injury, insect bites, limb oedema*	*Staphylococcus aureus, Streptococcus pyogenes*	Cloxacillin 12.5mg/kg, PO, Q6H	Cephalexin 50mg/kg, PO, Q6H	7 days	If culture is streptococcus positive, switch to benzylpenicillin IV; Surgical referral where appropriate

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
Following complicated surgical and orofacial cellulitis	*Staphylococcus aureus, Streptococcus pyogenes* and anaerobes	Cloxacillin 50 mg/kg, IV Q6H; (Max. 200mg/kg/day) **PLUS** Metronidazole 10mg/kg, IV, Q8H	Cephalexin 50mg/kg, PO, Q6H **PLUS** Metronidazole 15mg/kg, IV, Q12H	7 days	Metronidazole may be added if involvement of oral cavity.
Periorbital cellulitis: *With entry site skin lesion*	*Staphylococcus aureus*	Cloxacillin 150mg/kg/day, IV, Q6H		7 days	Rule out meningitis
Without skin lesion (bloodstream infections)	*Haemophilus influenzae*, *Streptococcus pneumoniae,* Streptococcus, Staphylococcus	Ceftriaxone 50mg/kg, IV, Q24H			
Paronychia (*nail infection*)	*Staphylococcus aureus, Streptococcus pyogenes*	Cloxacillin 50mg/kg/day, PO, Q6H	Erythromycin 50mg/kg, PO, Q6H	7 days	May need I & D; If no improvement with antibiotics, consider candida and herpes
Scabies *For children more than 2 years*	*Mite (Sarcoptes scabiei)*	Gamma benzene hexachloride	Apply thinly over whole body, omitting head and neck, wash off using cool water after 12 hours; repeat if necessary after 7 days		Treat all members of the household & close contacts simultaneously; Wash all clothing in hot water and sundry all beddings and linens.
Children below 2 years		Sulphur 6% ointment	Apply HS after bath	3 days	
Infectious atopic dermatitis		Cloxacillin 12.5mg/kg, PO, Q6H		5 - 7 days	

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
Congenital syphilis: *For infants born to seropositive mothers*		Benzathine benzylpenicillin 0.05MU/kg, IM, STAT		Single dose	This is an epidemiological treatment irrespective of mothers treatment status
Early congenital syphilis (< 2 years)		Benzylpenicillin 0.05MU/kg, IV, Q12H for first 7 days, then Q8H for next 3 days	Procaine benzylpenicillin 0.05MU/kg, IM, Q24H	10 days	Periodic follow up of the child is important
Congenital syphilis (>2 years duration)		Benzylpenicillin 0.05MU/kg, IV, Q4 - 6H for 10 - 14 days	Erythromycin 12.5mg/kg, PO, Q6H for 30 days		
		LOWER RESPIRATORY TRACT INFECTIONS			
Pneumonia *1 - 3 months (pneumonitis syndrome); Afebrile*	*Chlamydia trachomatis, Streptococcus pneumoniae, Staphylococcus aureus (rare), Bordetella pertussis*	Amoxicillin 25 - 40mg/kg, PO, Q12H	Amoxicillin/clavulanate 80 - 90mg/kg/day, PO, Q8H	7 days	If pertussis suspected, use erythromycin 12.5mg/kg, PO, Q6H for 14 days
If febrile		Ampicillin 25mg/kg, IV, Q6H **PLUS** Gentamicin 7.5mg/kg, IV, Q24H	Ceftriaxone 80mg/kg, IV, Q24H		
4 months - 5 years Outpatient	*Haemophilus influenzae, Streptococcus pneumoniae,* mycoplasma	Amoxicillin 25 - 40mg/kg, PO, Q12H	Amoxicillin/clavulanate 80 - 90mg/kg/day, PO, Q8H	7 days	
In-patient (Non ICU)		Ampicillin 25mg/kg, IV, Q6H	Ceftriaxone 80mg/kg, IV, Q24H	7 days	
In-patient (ICU)		Ceftriaxone 80mg/kg, IV, Q24H	As per the sensitivity report	7 days	

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
5 - 15 years Outpatient	*Streptococcus pneumoniae, Mycoplasma pneumoniae,* Chlamydia	Amoxicillin 15mg/kg, PO, Q8H	Erythromycin 12.5mg/kg, PO, Q6H	7 days	
Hospitalized		Ampicillin 25mg/kg, IV, Q6H **PLUS** Erythromycin 12.5mg/kg, PO, Q6H	Ceftriaxone 80mg/kg, IV, Q24H	7 days	
Empyema/parapneumonic effusion	*Streptococcus pneumoniae, Haemophilus influenzae, Staphylococcus aureus,* Group A streptococcus; Gram-negative organisms, fungi, and malignancy	Ampicillin 25mg/kg, IV, Q6H **PLUS** Metronidazole 10mg/kg, IV, Q8H	Ceftriaxone 80mg/kg, IV, Q24H **PLUS** Metronidazole 10mg/kg, IV,Q8H	2 - 4 weeks	
Lung abscess	Bacteroides spp., Fusobacterium spp., Peptostreptococcus spp., Streptococcus spp., *Staphylococcus aureus, Escherichia coli, Klebsiella pneumoniae, Pseudomonas aeruginosa,* and very rarely *Mycoplasma pneumoniae*	Ampicillin 25mg/kg, IV, Q6H **PLUS** Metronidazole 10mg/kg, IV, Q8H	Ceftriaxone 80mg/kg, IV, Q24H **PLUS** Metronidazole 10mg/kg, IV, Q8H	Intravenous for 2 - 3 weeks for total duration of 4 - 6 weeks; Change antibiotic according to sensitivity report;	Surgical intervention if no response after 7-10 days of appropriate antimicrobial therapy
		UPPER RESPIRATORY TRACT INFECTIONS			
Sore throat/ pharyngitis/ tonsillitis	The majority of sore throat is viral, but there is clinical overlap between viral and bacterial infections.				

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
	Streptococcus pyogenes	Amoxicillin 15mg/kg, PO, Q8H **OR** Penicillin V 15mg/kg, PO, Q12H; *Body wt.* < 27kg: 250mg, Q12H; *Body wt.* > 27kg: 500mg, Q12H	Erythromycin 12.5mg/kg, PO, Q6H	10 days (given 10 days to prevent immunological sequelae for most patients)	Antibiotics should be used only if there is strong suspicion of bacterial infections
	Corynebacterium diphtheriae	Benzylpenicillin 0.025 - 0.04MU/kg, IV/IM, Q6H **OR** Procaine penicillin, *Body wt.*<10kg: 0.3MU/day, IM; *Body wt.*>10kg: 0.6MU/day	Erythromycin 12.5mg/kg, PO, Q6H	14 days	Discuss urgently with microbiology unit if diphtheria is suspected; Anti-toxin is an essential component of the treatment.
Sinusitis *Acute bacterial rhinosinusitis*	*Moraxella catarrhalis, Haemophilus influenzae, Staphylococcus aureus, Streptococcus pneumoniae*	Amoxicillin 15mg/kg, PO, Q8H	Amoxicillin/clavulanate 80 - 90 mg/kg/day, PO, Q8H	7 - 10 days	
Bacterial sinusitis is uncommon in children under 7 years, therefore routine antibiotic therapy is not recommended. Most sinusitis does not require antibiotics except in: *1. Symptoms lasting longer than 7 days with purulent nasal discharge, sinus tenderness or maxillary toothache;* *2. Severe symptoms and high fever more than 39^{o}C or higher at onset of illness and lasting for more than 3 days; and* *3. Worsening symptoms after initial improvement.*					
Otitis media *Acute*	*Streptococcus pneumoniae, Haemophilus influenzae, Moraxella catarrhalis*	Amoxicillin 15mg/kg, PO, Q8H	Erythromycin 12.5mg/kg, PO, Q6H	5 days	Regular wicking of ear, if drainage is present.
Chronic		Decide therapy based on culture and sensitivity reports			

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
Acute epiglottitis	*Haemophilus influenzae, Streptococcus pneumoniae, Streptococcus pyogenes, Staphylococcus aureus*	Ampicillin 25mg/kg, IV, Q6H **PLUS** Chloramphenicol 25mg/kg, IV, Q6H	Ceftriaxone 100mg/kg, IV, Q24H	5 - 7 days	It is a medical emergency; Avoid throat examination
		URINARY TRACT INFECTIONS			
UTI in children: *Well or mildly unwell child or age >3 months*	*Escherichia coli,* Klebsiella spp., *Staphylococcus saprophyticus, Enterococcus faecalis*	Nitrofurantoin 5 - 7 mg/kg, PO, Q6H **OR** Cotrimoxazole 8 - 12 mg/kg, PO, Q12H	Cephalexin 25 - 100 mg/kg/day, PO, Q6H	3 - 5 days	Avoid norfloxacin in children; In cases where urine culture grows proteus species, do not use nitrofurantoin
Unwell child or age <3 months		Gentamicin 7.5mg/kg, IV, Q24H	Ceftriaxone 50 - 75 mg/kg, IV, Q24H	5 - 7 days	
Acute pyelonephritis	Coliforms, Pseudomonas	Ampicillin 25mg/kg, IV, Q6H; (Max. 100mg/kg/day) **PLUS** Gentamicin 7.5mg/kg, IV, Q24H	Ceftriaxone 50 - 75 mg/kg, IV, Q24H	7 - 14 days	Send urine and blood cultures; Investigate for any functional or anatomical abnormalities with an USG KUB

RECOMMENDED ANTIMICROBIAL THERAPY FOR NEONATES

** For dosages, refer to appendix I*

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
Conjunctivitis	Chlamydial	Erythromycin, PO		10 - 14 days	
	Gonococcal	Ceftriaxone 25 - 50 mg/kg (Max. 125mg) IV/ IM, STAT	Cefotaxime, for neonates with hyperbilirubinemia	Single dose	Saline irrigation of eyes
	Staphylococcus aureus Mild	Topical therapy		7 days	
	Moderate to severe	Oral or IV therapy			
	Methicillin-sensitive *Staphylococcus aureus (MSSA)*	Cloxacillin, PO, IV **OR** Cefazolin (for non-CNS infections), IM/IV			
	Methicillin-resistant *Staphylococcus aureus (MRSA)*	Vancomycin, IV			
	Other gram-negative Mild	Neomycin + Polymixin + Bacitracin eye ointment		Duration of therapy dependent on clinical course	
	Moderate to severe	Systemic therapy			
Gastrointestinal infections	Necrotizing enterocolitis (NEC) or peritonitis secondary to bowel rupture	Ampicillin, IV **PLUS** Gentamicin, IM/IV for ≥10 days	Cefotaxime, IV/IM **PLUS** Gentamicin, IM/IV ± Metronidazole	Duration of therapy dependent on clinical response and risk of persisting intra-abdominal abscess.	Surgical drainage

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
	Salmonella	Ampicillin, IM/IV	Cefotaxime, IM/IV	7 - 10 days	Observe for focal complications (e.g., meningitis, arthritis)
Omphalitis and funisitis *Empiric therapy*	Coliform bacilli, *Staphylococcus aureus* and anaerobes	Cloxacillin, PO/IV	Gentamicin, IM/IV	≥10 days	For suspected *MRSA:* add vancomycin; Appropriate wound management for infected cord and necrotic tissue.
Organism specific therapy	Group A or B streptococci	Benzylpenicillin, IV		≥7 - 14 days (shorter course for superficial funisitis without invasive infection)	Group A streptococcus usually causes "wet cord" without pus and with minimal erythema; single dose of Benzathine benzylpenicillin, IM adequate.
	Methicillin-sensitive *Staphylococcus aureus (MSSA)*	Cloxacillin, IM/IV		≥5 - 7 days (shorter course for without invasive infection)	Assess for bacteraemia and other focus of infection
	Methicillin-resistant *Staphylococcus aureus (MRSA)*	Vancomycin, IV			
Osteomyelitis, suppurative arthritis *Empiric therapy*		Cloxacillin, IV **PLUS** Gentamicin, IM/IV	Cloxacillin, IV **PLUS** Cefotaxime, IM/IV	Minimum 3 weeks for osteomyelitis and 2 - 3 weeks for arthritis therapy	Surgical drainage of pus; Physical therapy may be needed

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
Organism specific therapy	*Escherichia coli and* Klebsiella spp.	Ampicillin, IM/IV **PLUS** Gentamicin, IM/IV	Cefotaxime, IM/IV **OR** Gentamicin, IM/IV		
	Enterobacter, Serratia, or Citrobacter	Ampicillin, IM/IV **PLUS** Gentamicin, IM/IV	Cefotaxime, IM/IV		
	Gonococcal arthritis and tenosynovitis	Cefotaxime, IM/IV		7 days	
	Methicillin-sensitive *Staphylococcus aureus (MSSA)*	Cloxacillin, IV	Cefazolin, IV		Add rifampicin, if persistently positive cultures
	Methicillin-resistant *Staphylococcus aureus (MRSA)*	Vancomycin, IV			
	Group B streptococcus	Benzylpenicillin, IV	Ampicillin, IM/IV		
	Haemophilus influenzae	Ampicillin, IV	Amoxicillin, PO **OR** Amoxicillin + Clavulanate, PO		Start with IV therapy and switch to oral therapy when clinically stable
	For penicillin resistant isolates	Cefotaxime, IM/IV			
Otitis media: *Empiric therapy*	Pneumococcus, Haemophilus, Coliforms and *Staphylococcus aureus*	Cloxacillin, IV **PLUS** Gentamicin, IM/IV	Cloxacillin, IV **PLUS** Cefotaxime, IM/IV		

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
Pulmonary infections: *Empiric therapy with early onset of pulmonary infiltrates* (within the first 48 - 72 hour of life)		Ampicillin, IM/IV **PLUS** Gentamicin, IM/IV	Cefotaxime, IM/IV	7 days	
	Aspiration pneumonia	Ampicillin, IM/IV **PLUS** Gentamicin, IM/IV		7 days	Early onset neonatal pneumonia may represent aspiration of amniotic fluid, particularly if fluid is not sterile; Mild aspiration episodes may not require antibiotic therapy.
Organism specific therapy	*Chlamydia trachomatis*	Erythromycin, PO		14 days	
	Pertussis	Erythromycin, PO		14 days	
	Pseudomonas aeruginosa	Ciprofloxacin, IV **PLUS** Gentamicin, IM/IV	Ceftazidime, IM/IV **+/-** Gentamicin, IM/IV	≥10 - 14 days	
	Methicillin-sensitive *Staphylococcus aureus (MSSA)*	Cloxacillin, IV	Cefazolin, IV	Duration of therapy depends on extent of disease; should be individualized with therapy up to 21 days or greater.	Thoracostomy drainage of empyema; Add rifampicin if persistently positive cultures
	Methicillin-resistant *Staphylococcus aureus (MRSA)*	Vancomycin, IV			
	Group B streptococcus	Benzylpenicillin, IV	Ampicillin, IM/IV	10 days	For serious infections, ADD gentamicin for synergy until clinically improved.

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
Sepsis *(With or without meningitis)* Initial therapy, organism unknown *Early onset*		Ampicillin, IM/IV **PLUS** Gentamicin, IM/IV	Cefotaxime, IV	10 days for sepsis without a focus; minimum of 21 days for gram-negative meningitis (or at least 14 days after CSF is sterile) and 14 - 21 days for GBS meningitis and other gram - positive bacteria	If clinically suspected meningitis, increase dose till meningitis is excluded; Cefotaxime preferred if meningitis suspected or cannot be excluded.
Initial therapy, organism unknown *Late onset*		Ampicillin, IM/IV **PLUS** Gentamicin, IM/IV	Cefotaxime, IV		Start high dose of ampicillin for all LOS till meningitis excluded.
Organism specific therapy	*Enterococcus* spp.	Ampicillin, IM/IV **PLUS** Gentamicin, IM/IV			
	Penicillin resistant	Vancomycin, IV **PLUS** Gentamicin, IM/IV			
	Escherichia coli	Gentamicin, IM/IV, *if no CNS infection;* Cefotaxime, IM/IV, *if CNS infection*			
	Gonococcal	Cefotaxime, IM/IV		10 - 14 days	
	Listeria monocytogenes	Ampicillin, IM/IV **PLUS** Gentamicin, IM/IV		14 days (Sepsis); 2 - 4 weeks for CNS infection	
	Pseudomonas aeruginosa	Ciprofloxacin, IV **PLUS** Gentamicin, IM/IV	Ceftazidime, IM/IV **PLUS** Amikacin, IM/IV		Piperacillin/tazobactam should not be used for CNS infection.

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
	Methicillin-sensitive *Staphylococcus aureus (MSSA)*	Cloxacillin, IM/IV	Cefazolin, IM/IV		
	Methicillin-resistant *Staphylococcus aureus (MRSA)*	Vancomycin, IV			
	Staphylococcus epidermidis (or any coagulase-negative staphylococci)	Cloxacillin, IM/IV **OR** Cefazolin, IM/IV	Vancomycin, IV		Cefazolin does not enter CNS; Add rifampicin if cultures persistently positive.
	Group A streptococcus	Benzylpenicillin, IV	Ampicillin, IV		
	Group B streptococcus	Benzylpenicillin, IV **PLUS** Gentamicin, IM/IV	Ampicillin, IV **PLUS** Gentamicin, IM/IV	10 days for bacteraemia/sepsis; minimum of 14 days for meningitis	Continue gentamicin until clinical and microbiological response documented
Breast abscess	Methicillin-sensitive *Staphylococcus aureus* (MSSA)	Cloxacillin, IM/IV		Treatment duration individualized until clinical findings have completely resolved.	
	Methicillin-resistant *Staphylococcus aureus* (MRSA)	Vancomycin, IV **PLUS** Cefotaxime, IM/IV			
	Gram-negative rods	Gentamicin, IV			
Impetigo neonatorum	Methicillin-sensitive *Staphylococcus aureus* (MSSA)	Cloxacillin, IM/IV		5 days	

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
	Methicillin-resistant *Staphylococcus aureus* (MRSA)	Vancomycin, IV			
	Group B streptococcus	Benzylpenicillin, IV	Ampicillin, IM/IV	7 - 14 days	
Syphilis: *Congenital (<1 month of age)* Proven or highly probable disease: (1) abnormal physical examination; (2) serum quantitative nontreponemal serologic titre 4-fold higher than mother's titre		Benzylpenicillin 0.05MU/kg, IV, Q12H (day of life 1 - 7), Q8H (>7 days) **OR** Procaine benzylpenicillin 0.05MU/kg, IM Q24H;		10 days	
Normal physical examination, serum quantitative nontreponemal serologic titre ≤ maternal titre, and maternal treatment was (1) none, inadequate, or undocumented; (2) erythromycin, azithromycin, or other non-penicillin regimen; or		*Evaluation abnormal or not done completely*: Benzylpenicillin 0.05MU/kg, IV, Q12H (day of life 1 - 7), Q8H (>7 days) **OR** Procaine benzylpenicillin 0.05MU/kg, IM, Q24H;			

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
(3) <4 weeks before delivery		*Evaluation normal*: Benzylpenicillin 0.05 MU/kg, IV, Q12H (day of life 1 - 7), Q8H (>7 days) **OR** Procaine benzylpenicillin 0.05MU/kg, IM, Q24H **OR** Benzathine benzylpenicillin 0.05MU/kg, IM STAT			
Normal physical examination, serum quantitative nontreponemal serologic titre ≤ maternal titre, mother treated adequately during pregnancy and >4 weeks before delivery; no evidence of reinfection or relapse in mother		Benzathine benzylpenicillin 0.05MU/kg, IM, STAT		10 days	Reliable follow-up important if only a single dose of Benzathine penicillin given
Normal physical examination, serum quantitative non-treponemal serologic titre ≤maternal titre, mother's treatment adequate before pregnancy		No treatment; But if follow-up of maternal serology is uncertain; Benzathine benzylpenicillin 0.05MU/kg, IM, STAT		Single dose	

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
Tetanus neonatorum		Metronidazole, IV/PO **PLUS** Human TIG 3,000 - 6,000IU, IM, STAT	Benzylpenicillin 200 - 400mg/kg, IV (200 - 400mg/kg), if TIG not available	10 - 14 days	Wound cleaning and debridement vital
Urinary tract infection *Empiric therapy*		Ampicillin, IV **PLUS** Gentamicin, IM/IV	Ampicillin, IV **PLUS** Cefotaxime, IM/IV		Recurrent UTI in neonates may need causative evaluation
Organism specific therapy	*Escherichia coli, Klebsiella, Enterobacter*, Serratia	Ampicillin, IM/IV	Cefotaxime, IM/IV	7 - 10 days	
	Enterococcus	Ampicillin, IM/IV; *For pyelonephritis*, **ADD** Gentamicin, IM/IV until cultures are sterile	.	7 days for cystitis; 10 - 14 days for pyelonephritis	
	Penicillin resistant	Vancomycin, IV; *For pyelonephritis*, **ADD** Gentamicin, IM/IV until cultures are sterile			
	Pseudomonas aeruginosa	Ciprofloxacin, IV	Ceftazidime, IM/IV **OR** Meropenem, IV	7 - 10 days	

SEPSIS SYNDROME

Sepsis is defined as life-threatening organ dysfunction caused by a dysregulated host response to infection. Organ dysfunction can be identified as an acute change in *total SOFA score ≥2 points* consequent to the infection. The baseline SOFA score can be assumed zero in patients not known to have pre-existing organ dysfunction. *A SOFA score ≥2 reflects an overall mortality risk of approximately 10% in a general hospital population with suspected infection.* Even patients presenting with modest dysfunction can deteriorate further, emphasizing the seriousness of this condition and the need for prompt and appropriate intervention, if not already being instituted.

Septic shock is a subset of sepsis in which underlying circulatory and cellular/metabolic abnormalities are profound enough to substantially increase mortality. Patients with septic shock can be identified with a clinical construct of sepsis with persisting hypotension requiring vasopressors to maintain MAP ≥65 mmHg and having a serum lactate level >2 mmol/L (18 mg/dL) despite adequate volume resuscitation. With these criteria, hospital mortality is in excess of 40%.

The Sequential Organ Failure Assessment (SOFA) Score*

	SOFA Score				
Variables	**0**	**1**	**2**	**3**	**4**
Respiratory PaO_2/FiO_2, mmHg	>400	≤400	≤300	≤200+	≤100+
Coagulation Platelets x 10^3 /µL**	>150	15	≤100	≤50	≤20
Liver Bilirubin, mg/dL***	<1.2	1.2 - 1.9	2.0 - 5.9	6.0 - 11.9	>12.0
Cardiovascular Hypotension	No hypotension	Mean arterial pressure <70mmHg	Dop ≤5 or dob (any dose)****	Dop >5, epi ≤ 0.1, or norepi ≤0.1****	Dop >15, epi ≤ 0.1, or norepi ≤0.1****
Central Nervous System Glasgow Coma Score Scale	15	13 - 14	10 - 12	6 - 9	<6
Renal Creatine, mg/dL or urine output, mL/d*****	<1.2	1.2 - 1.9	2.0 - 3.4	3.5 - 4.9 or <500	>5.0 or <200

* Norepi indicates norepinephrine; Dob, dobutamine; Dop, dopamine; Epi, epinephrine; and FiO2, fraction of inspired oxygen
** Values are with respiratory support
*** To convert bilirubin from mg/dL to µmol/L, multiply by 17.1
****Adrenergic agents administered for at least 1 hour (doses are given in µg/kg per minute)
***** To convert creatine from mg/dL to µmol/L, multiply by 88.4

**Source: JAMA. 2016;315(8):801-810. doi:10.1001/jama.2016.0287*

RECOMMENDED ANTIMICROBIAL THERAPY FOR SEPSIS

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
Septicaemia: *Community acquired:* Non-neutropenic patient	Streptococcus, Haemophilus, *Staphylococcus aureus,* Coliforms	Ampicillin 1g, IV, Q6H **PLUS** Gentamicin 5mg/kg, IV, Q24H	Ceftriaxone 2g, IV, Q24H	Minimum 7 days	In all septic patients, thorough septic screening to locate focus of infection is mandatory; Change to appropriate antibiotics depending on culture and sensitivity results; Though antibiotic therapy is the mainstay of treatment, substantial benefit can be achieved by removing/changing catheters, removing foreign bodies, draining abscess etc.; If response is inadequate after 3-4 days of treatment, review antibiotic regimen; If MRSA suspected or proven, appropriate therapy with Vancomycin is warranted.
Neutropenic patients	*Pseudomonas aeruginosa,* Enterobacteriaceae, *Staphylococcus aureus*	Ciprofloxacin 500mg, IV, Q12H **PLUS** Gentamicin 5mg/kg, IV, Q24H	Meropenem 1g, IV, Q6H	Till afebrile for 5 days and neutrophil count is >500/µl	
Asplenic patients	Pneumococcus, Haemophilus, Meningococcus	Benzylpenicillin 2MU, IV, Q4H	Ceftriaxone 2g, IV, Q12H	7 - 10 days	
Septic shock	Streptococcus, Staphylococcus and Gram-negatives	Ceftriaxone 2g, IV, Q12H **PLUS** Gentamicin 5mg/kg, IV, Q24H	Piperacillin/tazobactam 4.5g, IV, Q6H	7 - 10 days	
Hospital acquired: Non-neutropenic	Pseudomonas, Acinetobacter, Coliforms, Enterococcus, *Staphylococcus aureus* including *MRSA*	Ceftazidime 2g, IV, Q8H **PLUS** Gentamicin 5mg/kg, IV, Q24H	Piperacillin/tazobactam 4.5g, IV, Q6H **PLUS** Gentamicin 5mg/kg, IV, Q24H	7 - 10 days	
Neutropenic		Piperacillin/tazobactam 4.5g, IV, Q6H **OR** Ceftazidime 2g, IV, Q8H **PLUS** Gentamicin 5mg/kg, IV, Q24H	Meropenem 1g, IV, Q6H	7 - 10 days	

Illness	Common Causative Agents	Recommended Antibiotic Therapy	Alternative Antibiotic Therapy	Recommended Duration of Treatment	Remarks
Sepsis in burns	Pseudomonas, Staphylococcus and Streptococcus	Ampicillin 1g, IV, Q6H **OR** Cloxacillin 1g, IV, Q6H **PLUS** Gentamicin 5mg/kg, IV, Q24H	Ceftriaxone 2g, IV, Q24H **PLUS** Gentamicin 5mg/kg, IV, Q24H		Add vancomycin where MRSA suspected or confirmed by culture; Prophylactic antibiotics have no proven role in burns.

SURGICAL PROPHYLAXIS

Surgical antibiotic prophylaxis is defined as the use of antibiotics to prevent infections at the surgical site. Prophylaxis has become the standard of care for contaminated and clean contaminated surgery and for surgery involving insertion of artificial devices. The antibiotic selected should only cover the likely pathogens.

Principles of surgical antibiotic prophylaxis

1. Decide if prophylaxis is appropriate. Only use antibiotic prophylaxis if there is a significant risk of infection.
2. Determine the bacterial flora most likely to cause the postoperative infection (not every species needs to be covered). Antibiotic selection may need to be modified according to patient risk factors.
3. Surgical antibiotic prophylaxis should not be the only strategy used to reduce the risk of postoperative infection. Minimising the risk requires a comprehensive approach to patient management, including optimal perioperative medical management (e.g. perioperative glycaemic control in patients with diabetes), adequate debridement, and good surgical technique. Do not use antibiotic prophylaxis to overcome poor surgical technique or preparation.
4. Preoperative intravenous (IV) antibiotic administration should occur up to 60 minutes (ideally 15-30 minutes) before surgical incision.
5. A single dose of antibiotic(s) is sufficient for the majority of procedures. Prophylaxis should not extend beyond 24 hours. Postoperative doses of IV antibiotics of up to 24 hours are only required in defined circumstances, such as some vascular surgeries or a lower limb amputation, for which a benefit for up to 24 hours of prophylaxis.
6. Urinary or intravascular catheters or indwelling surgical drains that remain in situ are not a justification to extend the duration of antibiotic prophylaxis.
7. Antibiotic prophylaxis with urinary catheter insertion or removal is not recommended with the exception of some high-risk patients following urological procedures.
8. Antibiotics for infective endocarditis prophylaxis may be needed for patients with specific cardiac conditions (see Prophylaxis for Endocarditis section).
9. Review antibiotic prophylaxis protocols regularly as both cost and hospital antibiotic resistance patterns may change.
10. A second dose of antibiotic dose may be given if:
    i. Significant delay (60 minutes) in starting the operation after initial dose given;
    ii. Operation is prolonged beyond 3 hours (for cephazolin); and
    iii. Excessive blood loss (≥ 1500 ml) during the operation
11. If MRSA proven or suspected, add Vancomycin 1g IV over at least 1 hour completing infusion by time of induction.

Patient care recommendations for reducing surgical site infections

- Advise patients to shower using a soap containing antiseptic on the day of surgery.
- It is not necessary to remove hair in order to reduce surgical site infection. If hair removal is required prior to surgery, use hair clippers on the day of surgery. Do not use razors for hair removal as they increase the risk of surgical site infections. There is a risk of skin reactions with depilatory creams.
- Treat any existing infections prior to elective surgery e.g. Dental caries, UTI.
- Screen preoperative blood glucose levels and maintain glycaemic control.
- Intraoperative oxygenation and body temperature should be maintained.
- Maintain perioperative normothermia. It is important to understand that infections due to lapses in surgical technique, operating theatre procedures, and aseptic technique during and after operation cannot be prevented by use of prophylactic antibiotics.

Indications for surgical antibiotic prophylaxis

Surgical procedures are usually ranked as clean, clean-contaminated and contaminated. Widely accepted indications for antibiotic prophylaxis are contaminated and clean-contaminated surgery and operations involving the insertion of an artificial device or prosthetic material.

RECOMMENDED ANTIMICROBIAL THERAPY FOR SURGICAL PROPHYLAXIS

Surgical Procedures	Common Causative Agents	Recommended Antibiotic Therapy
Abdominal surgery: *Biliary surgery including laparoscopic cholecystectomy*	*Escherichia coli,* Klebsiella spp.	Cephazolin 2g, IV at the time of induction of anaesthesia
Gastroduodenal and oesophageal surgery	*Escherichia coli,* Klebsiella spp., Streptococci	Cephazolin 2g, IV at the time of induction of anaesthesia
Colorectal surgery, appendectomy and small intestinal surgery	*Escherichia coli,* Klebsiella spp. and anaerobic gram-negative bacteria like Bacteroides spp.	Cephazolin 2g, IV **PLUS** Metronidazole 500mg, IV at the time of induction of anaesthesia
Endoscopic retrograde cholangiopancreatography (ERCP)		Cephazolin 2g, IV at the time of induction of anaesthesia
Head and neck surgery	Staphylococci, Streptococci, anaerobes	Cephazolin 2g, IV **PLUS** Metronidazole 500mg, IV at the time of induction of anaesthesia
Lower limb amputation	Risk of clostridial infection	Cephazolin 2g, IV at the time of induction of anaesthesia, then 2 further doses Q8H after; *For ischaemic limb*, **ADD** Metronidazole 500mg, IV then another dose Q12H later
Neurosurgery	*Staphylococcus aureus,* Coagulase-negative staphylococci (CoNS), Diphtheroids	Cephazolin 2g, IV at the time of induction of anaesthesia
Obstetric and gynaecological surgery: *Caesarean Section (elective & emergency)*		Cephazolin, *Body wt.*<120: 2g; Body wt.>120kg: 3g; IV at the time of induction of anaesthesia **Metronidazole 500mg, IV **PLUS** Gentamicin 5mg/kg, IV, when cephazolin is not available*
Dilatation and curettage (D/C) or Dilatation and evacuation (D/E)		Doxycycline 100mg, PO one hour before procedure and 200mg, PO after 2 hours
Postpartum evacuation with breast feeding		Metronidazole 500mg, PO, Q12H for 5 days and azithromycin 1g, PO one hour before procedure
Hysterosalpingography(HSG)/lap and dye test		Doxycycline 100mg, PO, Q12H for 5 days

Surgical Procedures	Common Causative Agents	Recommended Antibiotic Therapy
Loop Electrosurgical Excision Procedure (LEEP)		No antibiotics needed, unless features symptoms suggestive of PID
Laparoscopy		Cephazolin 2g, IV at the time of induction of anaesthesia
Hysterectomy		Cephazolin 2g, IV at the time of induction of anaesthesia; *For vaginal hysterectomy*, **ADD** Metronidazole 500mg, IV **Metronidazole 500mg, IV* **PLUS** *Gentamicin 5mg/kg, IV, when cephazolin is not available*
Normal vaginal delivery: First and second degree tear, episiotomy		No antibiotics required
Third and fourth degree tear after repair		Amoxicillin 500mg, PO, Q8H **PLUS** Metronidazole 400mg Q12H for 5 days
Instrumental delivery		No antibiotics required
Ophthalmic surgery: *Cataract surgery*	*Staphylococcus aureus,* Coagulase-negative staphylococci (CoNS)*, Pseudomonas*	Cephazolin 1- 2.5mg, IV into anterior chamber at the end of surgery, STAT
Orthopaedic surgery	*Staphylococcus aureus, Gram-negative bacilli*	Cephazolin 2g, IV at the time of induction of anaesthesia
Urological surgery: *Transurethral resection of Prostate (TURP)*		Cephazolin 2g, IV at the time of induction of anaesthesia
Procedure where urological tract NOT entered and urine is sterile		Antibiotic prophylaxis often NOT required
For implantation of prosthetic devices	Coliforms, *Staphylococcus aureus*	Cephazolin 2g, IV **PLUS** Gentamicin 2mg/kg, IV at the time of induction of anaesthesia
Procedure where urological tract is entered		Cephazolin 2g, IV at the time of induction of anaesthesia; *For radical prostatectomy,* **ADD** Gentamicin 2mg/kg, IV
Transrectal prostate biopsy		Ciprofloxacin 500mg, PO, 1 - 2H before procedure
Vascular surgery	*Staphylococcus aureus*	Cephazolin 2g, IV at the time of induction of anaesthesia; then 2 further doses Q8H
Infective endocarditis prophylaxis: *Upper respiratory tract procedures*		Amoxicillin 3g, PO, 4H pre-operatively, then 3g after procedure **OR** Ampicillin 1g, IV at the time of induction; then 500mg, 6 hours later

Surgical Procedures	Common Causative Agents	Recommended Antibiotic Therapy
Special risk: patients with prosthetic valve endocarditis/undergoing genitourinary/GI and other procedures		Ampicillin 1g, IV at the time of induction of anaesthesia; followed by amoxicillin 500mg, 6H later **PLUS** Gentamicin 120mg, IV at the time of induction of anaesthesia
Penicillin allergic patients		Vancomycin 1g, IV, 1H pre-operatively **PLUS** Gentamicin 120mg, IV at the time of induction of anaesthesia

APPENDIX I

ANTIMICROBIAL DOSAGES AND DOSING ADJUSTMENT FOR RENAL INSUFFICIENCY FOR NEONATES

Estimated GFR (eGFR)/Creatinine Clearance (CrCl) from plasma creatinine

eGFR (mL/min/1.73m²) = kL/Pcr

k = 0.33 (Low birth weight during first year of life), 0.45 (Term AGA during first year of life)

L= length (cm)

Pcr = plasma creatinine (mg/dL)

Antibiotics	Route	Dosages (mg/kg/day) and Intervals of Administration					Renal Dose / Remarks
		Chronologic Age =< 28 days				Chronological age 29-60 days	
		Body Weight =< 2000g		Body Weight >2000g			
		0 - 7 days	8 - 28 days	0 - 7 days	8 - 28 days		
Amoxicillin /Clavulanate, Amphotericin B Deoxycholate	PO	-	-	15mg/kg/day, Q12H	15mg/kg/day, Q12H	15mg/kg/day, Q12H	CrCl (mL/min) / Dose: 10-30 — 100% Q12H; <10 — 100% Q24H
	IV	1mg/kg/day, Q24H	1mg/kg/day, Q24H	1mg/kg/day, Q24H	1mg/kg/day, Q24H	1mg/kg/day, Q24H	
Ampicillin (*Non-meningitis*)	IM, IV	50mg/kg/day, Q12H	75mg/kg/day, Q12H	50mg/kg/day, Q8H	50mg/kg/day, Q8H	50mg/kg/day, Q6H	CrCl (mL/min) / Dose: 10-20 — 100% Q6-12H; <10 — 100% Q12H
Ampicillin (*Meningitis*)	IV	100mg/kg/dose (Interval A)*					
Azithromycin	PO	10mg/kg/day, Q24H	10mg/kg/day, Q24H	10mg/kg/day, Q24H	10mg/kg/day, Q24H	10mg/kg/day, Q24H	CrCl (mL/min) / Dose: 35-54 — 100% Q8H; 11-34 — 50% Q12H; <10 — 50% Q18-24H
Cefazolin	IM, IV	25mg/kg/day, Q12H	25mg/kg/day, Q8H	25mg/kg/day, Q12H	25mg/kg/day, Q8H	25mg/kg/day, Q8H	
Cefotaxime (*Non-meningitis*)	IM, IV	50mg/kg/day, Q12H	50mg/kg/day, Q8H	50mg/kg/day, Q12H	50mg/kg/day, Q8H	50mg/kg/day, Q6H	Over 30 min; CrCl (mL/min) / Dose: >50 — Q6H

							10-50 Q8-12H <10 Q24H
Ceftazidime	IM, IV	50mg/kg/day, Q12H	50mg/kg/day, Q8H	50mg/kg/day, Q12H	50mg/kg/day, Q8H	50mg/kg/day, Q8H	
Ceftriaxone	IM, IV	-	-	50mg/kg/day, Q24H	50mg/kg/day, Q24H	50mg/kg/day, Q24H	CrCl (mL/min) Dose >50 100% 10-50 100% Q24H <10 50% Q24H
Chloramphenicol	IM, IV	25mg/kg/day, Q24H	25mg/kg/day, Q12H	25mg/kg/day, Q24H	25mg/kg/day, Q12H	12.5 - 25 mg/kg/day, Q6H	
Ciprofloxacin	IV, PO	10mg/kg/day, Q12H	10mg/kg/day, Q12H	10mg/kg/day, Q12H	10mg/kg/day, Q12H	10mg/kg/day, Q12H	Over 30-60 min CrCl (mL/min) Dose >50 100% 10-50 50-75% Q12H <10 50% Q12H
Clindamycin	IM,IV, PO	5mg/kg/day, Q8H	5mg/kg/day, Q8H	7mg/kg/day, Q8H	15mg/kg/day, Q12H	10mg/kg/day, Q8H	No dosage adjustment required
Erythromycin	PO	10mg/kg/day, Q12H	10mg/kg/day, Q8H	10mg/kg/day, Q12H	10mg/kg/day, Q8H	10mg/kg/day, Q6H	CrCl (mL/min) Dose <10 25-50%
Meropenem							CrCl (mL/min) Dose 26 - 50 100% Q12H 10 - 25 50% Q12H <10 50% Q24H
-sepsis	IV	20mg/kg/day, Q12H	20mg/kg/day, Q8H	20mg/kg/day, Q8H	30mg/kg/day, Q8H	30mg/kg/day, Q8H	
-meningitis	IV	40mg/kg/day, Q8H	40mg/kg/day, Q8H	40mg/kg/day, Q8H	40mg/kg/day, Q8H	40mg/kg/day, Q8H	
Metronidazole (*start with initial loading dose*)	IV, PO	7.5mg/kg/day, Q12H	*See foot note*	7.5mg/kg/day, Q8H	7.5mg/kg/day, Q6H	7.5mg/kg/day, Q6H	CrCl (mL/min) Dose <10 50%

Cloxacillin	IM, IV	25mg/kg/day, Q12H	25mg/kg/day, Q8H	25mg/kg/day, Q8H	25mg/kg/day, Q6H	37.5mg/kg/day, Q6H	CrCl (mL/min) <10: Use lower range of usual dose
Benzathine benzylpenicillin	IM	0.05MU	0.05MU	0.05MU	0.05MU	0.05MU	HL P.1003 CrCl (mL/min) 10 - 50: 100% Q8 - 12H <10: 100% Q12H
Benzylpenicillin (GBS sepsis, Congenital syphilis)	IV	0.0.5MU, Q12H	0.05MU, Q8H	0.05MU, Q12H	0.05MU, Q8H	0.05MU, Q6H	
Benzylpenicillin (GBS meningitis)	IV	0.1 MU, Q12H	0.1MU, Q8H	0.1MU, Q8H	0.1MU, Q6H	0.1MU, Q6H	
Procaine benzylpenicillin	IM	0.05MU, Q24H	0.05MU, Q24H	0.05MU, Q24H	0.05MU, Q24H	0.05MU, Q24H	
Piperacillin/ tazobactam	IV	100mg/kg/day, Q8H	80mg/kg/day, Q6H	80mg/kg/day, Q6H	80mg/kg/day, Q6H	80mg/kg/day, Q6H	CrCl (mL/min) >50: 100% 10-50: 70% Q6H <10: 70% Q8H
Rifampicin	IV, PO	10mg/kg/day, Q24H	10mg/kg/day, Q24H	10mg/kg/day, Q24H	10mg/kg/day, Q24H	10mg/kg/day, Q24H	No dose adjustment required - give normal dose but use with caution if dose is above 10mg/kg daily

**Age specific intervals*

Corrected gestational age (weeks)	Postnatal age (Days)	Interval A	Interval B
<=29	0 - 28	Q12H	Q12H
	>28	Q8H	Q8H
30 - 36	0 - 14	Q12H	Q8H
	>14	Q8H	Q6H
37 - 44	0 - 7	Q12H	Q8H
	>7	Q8H	Q6H

Corrected gestational age (weeks)	Postnatal age (Days)	Interval A	Interval B
>=45	All	Q6H	Q6H

AMINOGLYCOSIDES

Empiric Dosage (mg/kg) by gestational and postnatal Age							
		<32 weeks		32 - 36 weeks		>=37 weeks (Term)	
Antibiotic	Route	0 - 14 days	>14 days	0 - 7 days	>7 days	0 - 7 days	>7 days
Amikacin	IM, IV	15mg/kg, Q48H	15mg/kg, Q24H	15mg/kg, Q24H	15mg/kg, Q24H	15mg/kg, Q24H	17.5mg/kg, Q24H
Gentamicin	IM, IV	5mg/kg, Q48H	5mg/kg, Q36H	4mg/kg, Q36H	4mg/kg, Q24H	4mg/kg, Q24H	4mg/kg, Q24H

RENAL ADJUSTMENT DOSE

1. Amikacin

CrCl (mL/min)	Dose modification
>50%	90%, single dose
10 - 50	70%, single dose
<10	30%, single dose

2. Gentamicin

CrCl (mL/min)	Dose modification
>50%	100%
10 - 50	2mg/kg, Q12H
<10	1mg/kg, Q24H - 48H

3. Vancomycin

Empiric Dosage (mg/kg/dose) by Gestational and Serum Creatinine					
	<=28 weeks			>28 weeks	
Serum Creatinine	Dose	Frequency	Serum Creatinine	Dose	Frequency
< 0.5	15	Q12H	<0.7	15	Q12H
0.5 - 0.7	20	Q24H	0.7 - 0.9	20	Q24H
0.8 - 1	15	Q24H	1 - 1.2	15	Q24H
1.1 - 1.4	10	Q24H	1.3 - 1.6	10	Q24H
> 1.4	15	Q48H	> 1.6	15	Q48H

APPENDIX II

DOSING ADJUSTMENT FOR RENAL INSUFFICIENCY

Medicine	Normal T1/2 (H)	Normal dose interval	Creatinine clearance (mL/min)	Dose	Interval
Acyclovir	2 - 4	8H	25 - 50 10 - 25 < 10	NI NI Reduce by 50%	Q12H Q24H Q24H
Amikacin	1.5 - 3	Q8H - Q12H		Loading dose 5 - 7.5 mg/kg; *subsequent doses are best determined by serum levels and assessment of renal insufficiency.*	
Amoxicillin	0.7 - 2	Q8H - Q12H	10 - 50 <10	NI NI	Q12H Q24H
Ampicillin	1 - 4	Q6H - Q12H	10 - 50 <10	NI NI	Q6H - Q12H Q12H
Cefazolin	1.5 - 2.5	Q6H - 8H	35 - 54 11 - 34 < 10	NI reduce by 50% reduce by 50% *Note: Give initial loading dose, then adjust subsequent doses for renal function.*	Q8H
Cefotaxime	1 - 3.5	Q6H - Q12H	< 20	Reduce by 50%	NI
Ceftazidime	1 - 2	Q8H - Q12H	30 - 50 10 - 30 < 10	NI NI NI	Q12H Q 24H Q24H - Q48H
Cephalexin	0.5 - 1.2	Q6H - Q8H	10 - 40 < 40	NI NI	Q8H - Q12H Q12H - Q24H
Ciprofloxacin	1.2 - 5	Q8H - Q12 H	< 30 (IV) 30 - 50 (PO) < 30 (PO)	Reduce by 50% Reduce by 50% Reduce by 50%	Q8H - Q24H Q12H Q24 H
Erythromycin	1.5 - 2	Q6H - Q12H	< 10	Reduce by 25 - 50%	NI
Gentamicin	1.5 - 3	Q8H - 12H	>50 <50	NI *Give usual initial dose and monitor levels.*	NI
Imipenem/cilastatin	1 - 1.4	Q6H - Q8H	41 - 70 21 - 40 6 - 20 ≤5	Reduce by 50% Reduce by 63% Reduce by 75% in max daily dose *Should not receive imipenem unless on hemodialysis*	Q6H Q8H Q12H

Medicine	Normal T1/2 (H)	Normal dose interval	Creatinine clearance (mL/min)	Dose	Interval
Meropenem	1 - 1.5	Q8H	26 - 50 10 - 25 < 10	NI Reduce by 50% Reduce by 50%	Q12H Q12H Q24H
Metronidazole	6 - 12	Q6H - Q12 H	< 10	Reduce by 50%	NI
Norfloxacin	3 - 4	Q12H	10 - 50 < 10	NI NI	Q12H - Q24H Q24H
Oxacillin	23 - 45 minutes	Q4H - Q12H	< 10	Use lower range of the normal dose	NI
Benzylpenicillin	20 - 50 minutes	Q4H - Q6 H	10 - 50 < 10	Reduce by 25% Reduce by 50-80%	NI
Penicillin V	30 - 40 minutes	Q6H - Q8 H	< 10	NI	Q8H
Piperacillin/tazobactam	0.5 - 1.5/ 0.7 - 1.6	Q6H - Q8 H	20 - 40 < 20	Reduce by 30% Reduce by 30%	Q6H Q8H
Rifampicin	1.5 - 5	Q12H - Q24H	10 - 50 <10	Reduce by 50% Reduce by 50%	NI NI
Sulfamethoxazole/ trimethoprim	9 - 12/ 6 - 11	Q12H	15 - 30 < 15	Reduce by 50% Not recommended	NI
Vancomycin *Note: Alternative would be to give single dose and then check a trough level.*	2.2 - 8	Q6H - Q12 H	>90 70 - 89 46 - 69 30 - 45 15 - 29 <15	NI NI NI NI NI 10 - 20mg/kg *Subsequent doses best determined by levels.*	Q6H Q8H Q12H Q18H Q24H

APPENDIX III

COMMON ADVERSE EFFECTS, MEDICINE INTERACTIONS AND SPECIAL CONSIDERATIONS OF ANTI-INFECTIVES

Medicine	Adverse Effects	Interactions	Cautions/Contraindications
Aminoglycosides: *Gentamicin* *Neomycin*	Nephrotoxicity, ototoxicity. Nephrotoxicity can be anticipated if treated for >7-10 days. Vestibular or cochlear ototoxicity occurs in about 2-4% of treated people. Irreversible in 50% of patients showing symptoms of hearing loss.	Increased risk of nephrotoxicity with cyclosporine and cytotoxics. Increased risk of ototoxicity with loop diuretics.	Use with caution in elderly, during pregnancy and in renal impairment. Monitor ototoxicity. If renal function deteriorates, measure medicine concentration daily; adjust dose if necessary and consider an alternative antibiotic.
Carbapenems: *Imipenem* *Meropenem*	Side-effects nausea, vomiting, diarrhoea abdominal pain, disturbances in liver function tests; thrombocythemia, positive Coombs' test; less commonly eosinophilia and thrombocytopenia; rarely convulsions (especially imipenem)	Reduces plasma concentration of valproate Increased nephrotoxicity with other nephrotoxic medicines	Hypersensitivity to beta-lactam antibacterial Hepatic and renal impairment. Manufacturer advises use only if potential benefit outweighs risk in pregnancy.
Cephalosporins: *Cephalexin* *Ceftriaxone* *Cefotaxime* *Cephazolin*	Allergy occurs in up to 10% of people receiving penicillins; anaphylaxis occurs in 0.01%. Common adverse effects include diarrhoea, nausea and rash.	May enhance anticoagulant effect of warfarin.	In severe renal impairment, there is increased risk of neurotoxicity (seizures or coma) with high doses. Monitor renal function and complete blood picture during prolonged (>10 days) and/or high dose treatment. Rapid IV administration of large doses may result in seizures.
Chloramphenicol	Nausea, vomiting, diarrhoea. Reversible bone marrow suppression.	May enhance anticoagulant effect of warfarin. Effect of sulphonylureas enhanced. Plasma concentration	Avoid in pre-existing bone marrow depression and blood dyscrasias. Caution in G6PD deficiency. Reduce dose in severe hepatic impairment. Avoid in neonates and preterm infants due to risk of grey

Medicine	Adverse Effects	Interactions	Cautions/Contraindications
		reduced by Phenobarbital. Increases phenytoin concentration.	syndrome. Consider stopping treatment if hematologic changes occur.
Glycopeptides: *Vancomycin*	More common with rapid IV infusion. Fever, chills and itch with IM use. Thrombophlebitis with IV use.		Risk of nephrotoxicity and ototoxicity increased when used with aminoglycosides.
Macrolides: *Erythromycin*	Common ones include nausea, vomiting, diarrhoea, abdominal pain and cramps.	Increases risk of cardiac arrhythmias with amiodarone. May enhance anticoagulant effect of warfarin. Increases plasma concentrations of antiepileptics, theophylline and cyclosporine.	High degree of cross-resistance between erythromycin and other newer macrolides.
Nitroimidazoles: *Metronidazole*	Thrombophlebitis (IV), nausea, vomiting, diarrhoea and metallic taste. May cause leukopenia and peripheral neuropathy at high doses and/or prolonged treatment.	Disulfiram like reaction with alcohol. Effect of warfarin enhanced. Increased plasma phenytoin concentration.	May aggravate existing neurological disease. Caution in history of blood dyscrasias. Monitor blood count. Avoid alcohol.
Nitrofurantoin	Nausea and vomiting. Anorexia, dyspepsia, allergic skin reactions, headache, dizziness and vertigo.		Use with caution in G6PD deficiency, renal impairment, breastfeeding and elderly. Avoid in neonates.
Penicillins: *Amoxicillin* *Cloxacillin*	Allergy occurs in up to 10% of people. Generally, well tolerated. May cause diarrhoea, nausea, rash, urticaria, pain and inflammation at site of injection.		Parenteral medicines like benzyl penicillin have high sodium content so high doses can precipitate cardiac failure. High parenteral doses and/or

Medicine	Adverse Effects	Interactions	Cautions/Contraindications
Penicillin V *Benzylpenicillin* *Benzathine benzylpenicillin*			prolonged treatment may result in electrolyte disturbance and neurotoxicity. Use frequent doses for maximal antibacterial effect.
Quinolones: *Ciprofloxacin* *Norfloxacin* *Ofloxacin*	Rash, itch, nausea, vomiting, diarrhoea, abdominal pain, dyspepsia	Increased risk of convulsions with NSAIDs and theophylline. May enhance anticoagulant effect of warfarin. Increased risk of nephrotoxicity with cyclosporine	Use with caution in epilepsy, myasthenia gravis and G6PD deficiency. Increased risk of tendon damage in elderly. Not recommended for use in children unless benefit outweighs risk of arthropathy. Ensure adequate fluid intake to prevent crystalluria.
Rifamycins: *Rifampicin*	Transient GI symptoms, orange-red coloration of body fluids, staining of soft contact lenses.	Reduces effect of oral contraceptives.	Avoid in severe hepatic impairment
Sulfamethoxazole + trimethoprim	Fever, nausea (with oral use), vomiting, diarrhoea, anorexia, rash, itch, sore mouth and hyperkalaemia.	Increased risk of ventricular arrhythmias with amiodarone. Effect of anticoagulants, antidiabetics, antiepileptics increased. Risk of nephrotoxicity with cyclosporine. Antifolate effect increased with antimalarials.	Use with caution in HIV infection, SLE, G6PD deficiency, and blood dyscrasias. Monitor complete blood picture, renal function and folate status with high doses and prolonged treatment. Maintain adequate fluid intake.

Medicine	Adverse Effects	Interactions	Cautions/Contraindications
Tetracyclines: *Doxycycline*	Nausea, vomiting, epigastric burning; tooth discoloration, reduced born growth in children below 8 years; photosensitivity.	Possibly increases plasma cyclosporine concentration.	Use with caution in SLE, and when used concomitantly with oral retinoids and other hepatotoxic medicines. Safe in only the first 18 weeks of pregnancy. Take with plenty of water to reduce risk of oesophageal ulcers.
Refer to TB guideline and Malaria guideline for details on antimalarial and anti-TB medicines			
Azoles: Ketoconazole	Rash, headache, nausea, vomiting, abdominal pain, diarrhoea and elevated liver enzymes		
Griseofulvin	Headache, GI symptoms, fatigue and dizziness	Reduced anticoagulant effect of warfarin. Reduced effect of oral contraceptives.	Avoid in pregnancy and breastfeeding. Men not advised to father a child during, and for 6 months after, treatment. Use non-hormonal methods of contraception during treatment.
Nystatin	Nausea, vomiting and diarrhoea.		
Acyclovir	Nausea, vomiting, diarrhoea, hallucination (high dose), headache, encephalopathy.		Use with caution in neurological abnormalities. Risk of nephrotoxicity, adjust dose in renal impairment.
Refer to HIV/AIDS treatment guideline for details on Antiretroviral medicines			

Medicine	Adverse Effects	Interactions	Cautions/Contraindications
Albendazole			Reduce dose in hepatic impairment during prolonged treatment. Avoid in pregnancy.

Appendix IV

ANTIBIOGRAM of JDWNRH (2016)

Organisms	n = No of isolates	Penicillin	Ampicillin	Cefazolin	Cloxacillin	Ceftriaxone	Ceftazidime	Imipenem	Erythromycin	Tetracycline	Doxycycline	Nitrofurantoin	Norfloxacin	Ciprofloxacin	Cotrimoxazole	Gentamicin	Amikacin	Chloramphenicol	Piperacillin
Blood	5861																		
Escherichia coli	53		10	27		42		93 (n = 29)						54		83	92 (n = 26)		
K. pneumoniae	39			11		23		90 (n = 20)						54		83	75 (n = 16)		
S. aureus	25	21			92						100				96				
Acinetobacter spp.	28						17	6						54		39	50		
Salmonella Typhi	8		88			88								50					
Salmonella Paratyphi B	2		100			100								50					
Salmonella spp.	3		100			100								50					
S. pneumoniae	9	100							89						17			88	
Gonococcal Infection	330																		
N. gonorrhoea	176	15				99													
Respiratory	2166																		
K. pneumoniae	117		0	54		56								89		95			
Escherichia coli	78		13	41		51								64		87			
P. aeruginosa	31						84							97		100			

Organisms	n = No of isolates	Penicillin	Ampicillin	Cefazolin	Cloxacillin	Ceftriaxone	Ceftazidime	Imipenem	Erythromycin	Tetracycline	Doxycycline	Nitrofurantoin	Norfloxacin	Ciprofloxacin	Cotrimoxazole	Gentamicin	Amikacin	Chloramphenicol	Piperacillin
H. influenzae	23		67			91		93						96	75			50	
S. pneumoniae	12	100							83										
Skin & subcutaneous	2991																		
S. aureus	375	1			78						97				80				
Escherichia coli	278		14	37		42								50		85			
P. aeruginosa	92						76							75		78			61 (n = 31)
S. pyogenes	80	100							77										
Stool	1132																		
Salmonella Typhi B	5		80			50 (n = 4)								80	100			100	
Shigella sonnei	11		100			100				82				40	73			100	
Shigella flexneri	2		100							0				0	0			100	
Uropathogens	16463																		
Escherichia coli	2104		31	62		64						95	62		49	93			
K. pneumoniae	189			44		48						56	80		51	80			
S. saprophyticus	106										88	95	96	98	86				

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