

ANTIBIOTIC GUIDELINES
3rd Edition
2011

MINISTRY OF HEALTH
GOVERNMENT OF FIJI

Prepared by the
National Drugs and Therapeutics
Subcommittee

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PREFACE

The publication of the Third Edition of the Antibiotic Drug Guidelines represents the culmination of the efforts of the National Medicines and Therapeutics Committee (NMTC) to publish clinical drug guidelines for common diseases in Fiji.

These guidelines are targeted for the health care settings. It aims to rationalize the usage of antibiotics on our Essential Medicines Formulary (EMF) and to establish consistency in the treatment of various infectious conditions. All recommended therapies are either evidence-based or universally accepted standards.

These are general guidelines; treatment of individual patients may vary depending upon local conditions and experience.

Chairman
National Medicines & Therapeutics Committee
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1. ABOUT ANTIMICROBIALS IN GENERAL

The number of antimicrobials available for the therapy has increased rapidly during the past few years. Brief summaries of antimicrobial agents commonly used in therapy are presented in this chapter.

ANTIBACTERIAL AGENTS

These are grouped based on their site of action on the bacteria, as given below:

CELL WALL SYNTHESIS

BETA-LACTAMS

- Penicillins
- Cephalosporins
- Carbapenems
- Monobactams

GLYCOPEPTIDES

- Vancomycin

PROTEIN SYNTHESIS

- Aminoglycosides (e.g. Gentamicin)
- Chloramphenicol
- Fusidic Acid
- Lincosamides (e.g. Clindamycin)
- Macrolides (e.g. Erythromycin)
- Tetracyclines

RNA POLYMERASE

- Rifampicin

DNA

- Quinolones (e.g. Nalidixic acid, Ciprofloxacin)
- Metronidazole
- Nitrofurantoin

FOLATE METABOLISM

- Trimethoprim
- Sulphonamides

BETA – LACTAM ANTIBIOTICS

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

Penicillins

Penicillin is active against *Streptococci*, *Neisseriae*, *Spirochaetes*, some anaerobes including *Clostridia* and a few other organisms. In Fiji, about 80 - 90% of the *Staphylococcus aureus* are β lactamase producers and hence are resistant to penicillin G and aminopenicillins. The prevalence of penicillinase producing *Neisseria gonorrhoea* is on the increase. There are reports of decreased susceptibility of pneumococci and streptococci to penicillin from other parts of the world. The only serious disadvantage of penicillins is hypersensitivity reaction.

A. Penicillin formulations available are:

1. **Penicillin G** (Crystalline Penicillin or Benzyl Penicillin) – for intravenous (IV) use. Needs to be given frequently (4 – 6 hourly).
2. **Procaine Penicillin** – Intramuscular (IM) preparation with a longer duration of action. Needs to be administered less frequently i.e. daily.
3. **Benzathine Penicillin** – given IM provides low levels of penicillin in the circulation for 3-4 weeks.
4. **Penicillin V** (Phenoxymethyl Penicillin) – an oral preparation, intrinsically less active than Penicillin G

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

1. Streptococcal infections e.g. tonsillopharyngitis
2. Infections due to *Streptococcus pneumoniae*.
3. Meningococcal infections e.g. meningitis, septicaemia
4. Syphilis
5. Clostridial infections, anthrax, diphtheria
6. Leptospirosis

B. Aminopenicillins

Ampicillin and amoxycillin are destroyed by staphylococcal β lactamases but have a slightly broader spectrum than penicillins because of their activity against some gram negative bacilli like *E.coli*, salmonella sp and shigella sp. They also have better activity against *H.influenzae* and enterococci compared with penicillin.

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

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

C. Anti –Staphylococcal Penicillins

These are narrow spectrum penicillins, resistant to Staphylococcal β lactamases. Methicillin, oxacillin, and cloxacillins fall into this category. Of these only cloxacillin, flucloxacillin and dicloxacillin are clinically useful and are to be used only for proven or suspected staphylococcal infections.

Flucloxacillin, suitable for oral administration, can cause cholestatic jaundice in some patients.

Some staphylococci have developed resistance to this group, by mechanisms other than β lactamase. These methicillin resistant *Staphylococcus aureus* (MRSA) will be resistant to all other β lactams (i.e. all penicillin, cephalosporins, monobactams and carbapenems).

D. Anti – Pseudomonal Penicillins

Newer penicillins with a high grade of activity against gram negative bacteria including pseudomonas, e.g. piperacillin, ticarcillin

E. β lactam and β lactamase inhibitor combinations

Eg Clavunate, Sulbactam

Augmentin is a preparation containing amoxycillin and clavulanic acid. Clavulanic acid has minimal antibacterial activity but inhibits β lactamase effectively. This combination is useful in the treatment of β lactamase producing bacteria. Sulbactam is another β lactam inhibitor used in combination with penicillins. Combinations are more expensive and so should be used only while treating infections with known β lactamase producers. Amoxycillin/ clavulanic acid combination can cause cholestasis.

Note: Hypersensitivity to any penicillin implies hypersensitivity to all penicillins. 5-10% of patients with Penicillin hypersensitivity, especially those with early manifestations, are also hypersensitive to cephalosporins.

Cephalosporins and related drugs

The cephalosporins have been traditionally divided into to three “ generations “ based on their spectrum of activity. In general, cephalosporins are less prone to hypersensitivity reactions, are more stable to staphylococcal penicillinases and have a broader spectrum than penicillins.

However, they are expensive and have very little action on enterococci. **None of them are effective against MRSA.** Cephalosporins also have been shown to select MRSA, vancomycin resistant enterococci and ceftriaxone resistant gram-negative bacilli. Therefore, indications for their use should be limited.

First generation cephalosporins include among others, cephalexin(oral), cephalothin and cefazolin * (parenteral). The spectrum of activity is similar, being effective against penicillinase producing staphylococci and other Gram-positive cocci (except MRSA and enterococci) and a few gram- negative enteric bacilli. There is no special advantage for any one first generation cephalosporins over another. They are not usually first choice for any infection. They may be used in some patients with penicillin hypersensitivity - those without immediate (IgE mediated) hypersensitivity..

Cephmandole* (parenteral), cefuroxime axetil* and cefaclor (oral) are “second generation drugs” which are more stable to some Gram-negative β -lactamase. Their activity against Gram-positive organisms is similar to, or less than, that of the first generation cephalosporins and they have varying degrees of activity against anaerobes. These drugs have a limited role in therapy and are more expensive.

The major activity of the third generation cephalosporins (ceftriaxone, ceftazidime*, cefotaxime*) is against gram-negative bacilli. They have some activity on gram-positive cocci and that against anaerobes varies. A major advantage of these agents is their ability to reach the central nervous system. Ceftazidime* has specific antipseudomonal activity. Ceftriaxone and cefotaxime* are useful in hospital-acquired and any other gram-negative septicemia and meningitis.

Monobactams (Aztreonam*) and Carbapenem (Imipenem*)

Aztreonam is active against gram-negative bacteria including pseudomonas and β -lactamase producing enterobacteriaceae. Carbapenems have a much broader spectrum, including gram-positive, gram-negative and some anaerobic bacteria.

Aminoglycosides (including gentamicin)

This group of antibiotics (gentamicin, tobramycin*, netilmicin*, amikacin*, Kanamycin*, neomycin, streptomycin) act by inhibiting protein synthesis in bacteria. They have good activity against aerobic gram-negative bacilli, including brucella. When given together with penicillin, they have good activity against enterococci. Streptomycin is useful against mycobacteria. Aminoglycosides are not absorbed when given orally and should be administered parenterally for systemic effects.

Aminoglycosides are ototoxic and nephrotoxic. The therapeutic index is low and blood levels need to be monitored if used for prolonged courses of either directed or empirical therapy for longer than 3 days (see below). In spite of this disadvantage, they are used widely for their action on gram-negative bacilli. Gentamicin is the least expensive and has good activity against 90% of gram-negative bacilli isolated in Fiji. It is the aminoglycoside of choice for empirical treatment of severe gram-negative sepsis including nosocomial infections.

The primary indication for aminoglycosides is as **short-term empirical therapy** pending the outcome of investigations. Their value as empirical drugs relates to their rapid bactericidal activity and the comparatively low levels of resistance in many community and health care-associated Gram-negative pathogens. When used empirically, no further doses should be given beyond 48 hours and if continuing empirical IV therapy is required (ie an organism is not grown) therapy should be changed to an alternative less toxic drug

Monitoring of aminoglycoside plasma concentrations is not required if the clinical plan is to cease therapy within 72 hours of commencement.

Aminoglycosides are indicated for **directed therapy in only a few circumstances.** These include, but are not restricted to:

- infections when resistance to other safer antimicrobials has been shown
- combination therapy for serious *Pseudomonas aeruginosa* infections and brucellosis
- low doses as synergistic treatment for streptococcal and enterococcal endocarditis.

Monitoring plasma concentrations of aminoglycosides is recommended in these patients and should commence on the first dose of directed therapy

The recommended initial dose of gentamicin is 4-6mg/kg/day as a single daily dose given slowly over 20 minutes. However single daily dose is not recommended in pregnant women and endocarditis. The first dose is given irrespective of renal function as follows:

Age	Initial dose of gentamicin
Neonates less than 34 weeks postconception	3mg/kg
Neonates 34-44 weeks postconception	3.5mg/kg
Infants and children less than 10 years	7.5mg/kg to maximum of 320mg
10-29 years	6mg/kg to maximum of 560mg
30-59 years	5mg/kg to maximum of 480mg
Greater than 60 years	4mg/kg to maximum of 400mg

After the first dose (see above), subsequent doses of the same size should be given for up to 3 days at intervals determined by the patient's renal function as follows:

Estimated creatinine clearance	Dosing interval	Maximum number of doses
Greater than 60ml/min	24 hours	3 (at 0, 24 and 48 hours)
40-60 ml/min	36 hours	2 (at 0 and 36 hours)
30-40 ml/min	48 hours	2 (at 0 and 48 hours)
Less than 30 ml/min	No further doses	1 (at 0 hours)

For prolonged courses (longer than 3 days), it is important to determine trough serum gentamicin levels periodically (at least twice a week) and to adjust the dosage to maintain the desirable serum levels. In general trough levels not exceeding 0.5 to 1 µg/mL are sought.

Tetracyclines

Tetracyclines also act by inhibiting protein synthesis and have broad spectrum of activity. This includes staphylococci, neisseriae, *H.influenzae*, some members of enterobacteriaceae, mycoplasma, clamydiae, rickettsiae and spirochaetes. For chlamydial and rickettsial infections this is the drug of choice. This group also has action against protozoa like *Entamoeba histolytica* and plasmodium sp.

The spectrum of activity of different tetracyclines is similar, but they are different in their pharmacokinetics. Most tetracyclines are excreted through the kidneys except doxycycline, which is safer in patients with renal impairment, but caution is required in patients with hepatic disease. Tetracycline should be used with caution in patients with pre-existing hepatic or renal disease, as they can lead to worsening of function. Doxycycline has a longer half-life than tetracycline.

Because of their effect on growing bones and teeth, these drugs are contraindicated in pregnancy, lactating mothers and in children.

Chloramphenicol

Also a broad-spectrum antibiotic, it acts by inhibiting protein synthesis. The spectrum includes both aerobes and anaerobes. It can be used topically, orally or parentally. **Bioavailability after oral administration is as good as parenteral use and the oral preparation can be used to initiate treatment in emergencies if the injection is not available.** Chloramphenicol is not safe in pregnancy and in neonates as it may cause Grey baby syndrome. This drug can also cause bone marrow suppression. Its use as far as possible should be limited to specific indications like typhoid fever, invasive salmonellosis, meningitis, brain abscess and occasionally anaerobic infections.

Macrolides

Erythromycin, roxithromycin*, azithromycin* and clarithromycin* act by inhibiting protein synthesis. They have similar antimicrobial spectra but differ in their pharmacokinetics and adverse effects.

They are active against gram-positive organisms, *H.influenzae*, neisseriae, mycoplasma sp, chlamydia and rikettsiae. They also act on toxoplasma, which is a protozoa

Erythromycin is absorbed orally and is distributed well. It does not cross the blood brain barrier. The main adverse reaction is gastric irritation. Some patients develop jaundice. Parenteral preparations can cause phlebitis and occasional cardiac arrhythmias (in high doses).

Its main use is in respiratory infections and as an alternative to penicillin in those hypersensitive to penicillin. It is the drug of choice in neonatal and obstetric chlamydial infection and is used in campylobacter infection. The newer macrolides have better bioavailability and fewer side effects. Azithromycin*, in addition to its use similar to that of erythromycin, is also used to treat toxoplasmosis. Clarithromycin* is used in treating mycobacterium avium complex (MAC) infections and *H.Pylori*.

Quinolones

These drugs interfere with transcription of DNA. The first drug to be used in this group, nalidixic acid, had a very narrow spectrum mainly limited to gram-negative bacilli. This drug is used widely in the treatment of UTI, since it concentrates in the urine.

The newer Quinolones, norfloxacin* and ciprofloxacin have a broader spectrum of activity. Norfloxacin is used in the treatment of urinary and gastrointestinal infections. Ciprofloxacin reaches high levels in the blood and is very effective against enterobacteriaceae, pseudomonas sp, and mycobacteria. *Ciprofloxacin is not very effective against Streptococcus pneumoniae*. It is therefore useful in treating gram-negative infections like hospital acquired septicaemias and gram-negative pneumonias. It is also useful in treating chloramphenicol resistant *Salmonella typhi* infections. Bacterial resistance develops rapidly if these agents are widely used.

They are well absorbed when given orally and have a good penetration into cells like macrophages. They do not cross the blood brain-barrier. Unlike many other antibiotics they reach the prostate.

Nalidixic acid* can cause GI upset and skin reactions. Quinolones have many adverse effects including dizziness, depression, and they can precipitate seizures. They may interact with many other drugs, for example theophylline.

Quinolones/ Ciprofloxacin is not recommended in pregnant women, infants, children and breastfeeding mothers.

Rifampicin

Rifampicin is used in the treatment of tuberculosis and infections with *S.aureus*. Rifabutin * is used in the treatment and prophylaxis of MAC infection. Since resistance emerges rapidly, these drugs should always be used in combination with other antibiotics.

Rifampicin colours urine, tears and other body fluids red. It can accelerate the metabolism of other drugs including oral contraceptives, warfarin, and phenytoin.

Nitroimidazoles

Metronidazole and tinidazole* are active against all anaerobic bacteria and protozoa like *T. vaginalis*, *G. lamblia* and *E. histolytica*. Metronidazole is well absorbed and can be administered IV, orally or rectally. The rectal preparation produces high levels and can be used to treat serious infections. It crosses the blood brain barrier.

Metronidazole is usually well tolerated. Common minor side effects include nausea, vomiting, metallic taste in mouth and disulfiram like reaction with alcohol.

Tinidazole has longer half-life and therefore can be administered less frequently.

Glycopeptides

Vancomycin acts by inhibiting peptidoglycan (cell wall) synthesis. All gram-positive organisms are susceptible. However, the drug is reserved for treating Gram-positive infections resistant to β lactams (MRSA and Ampicillin/ Gentamicin resistant enterococci) and some patients hypersensitive to β lactams. Its oral use for antibiotic associated diarrhoea should be limited to those caused by *Clostridium difficile* and unresponsive to metronidazole.

Vancomycin is given IV slowly over at least over one hour (10mg/ min) to prevent anaphylactoid reaction. Renal toxicity can occur, especially if given with aminoglycosides. Therefore, pay attention to dosage schedules and monitor serum levels and renal function.

ANTIVIRAL AGENTS

Several agents are now licensed for use; only Lamivudine tablets, Zidovudine (AZT) elixir and tablets, acyclovir injection and eye ointment are available on the Fiji EDL.

Acyclovir is a nucleoside analogue, effective against Herpes Simplex virus types I and II and Varicella zoster virus. Topical application or oral therapy is used for skin, mucous membranes and eye infections. Parenteral use is indicated for herpes encephalitis.

Famciclovir*, penciclovir* and valaciclovir* are recent modifications of acyclovir.

Other Antiviral Drugs	Cinical Use
Amantadine*	Prevention and treatment of influenza A, during outbreaks
Ganciclovir*	CMV infection in the immunocompromised
Tribavirin*	Effective against many viruses. Used for treatment of RSV infection in small children, Lassa fever and hanta virus infection
Zidovudine (AZT) Lamivudine Dideoxyinosine* (Didanosine) Dideoxycytosine* (Zalcitabine)	Treatment & post-exposure prevention of HIV/AIDS
Protease inhibitors: Saquinavir* Indinavir*	Treatment & post- exposure prevention of HIV/AIDS
Interferon alpha*	Treatment of hepatitis B, hepatitis C
Idoxuridine*	Topical treatment for HSV

ANTIFUNGAL AGENTS

Azoles

There are two main groups.

- a. For systemic Use: **Ketoconazole, fluconazole * and itraconazole***

Fluconazole* and ketoconazole are active against yeasts like candida, cryptococci, and histoplasma. These agents are useful in the treatment of systemic infections due to these organisms.

Fluconazole* is well-absorbed following oral administration and has good CNS penetration.

Ketoconazole* can cause hepatic toxicity.

Itraconazole* has activity against asperillus.

- b. For topical Use: **Miconazole*, clotrimazole* and econazole.**

These are used in the treatment of superficial candidiasis and dermatophytosis.

Amphotericin B

It is useful against most systemic fungal infections. Its use is associated with many side effects including flu-like reactions, GI effects and nephrotoxicity. **It should be given IV slowly over 4-6 hours.**

Flucytosine*

This drug is used mainly in combination with amphotericin in the treatment of systemic candida and cryptococcal infections. Adverse effects include bone marrow suppression and hepatotoxicity.

Griseofulvin

When given orally, it concentrates in keratinised tissues and prevent further invasion by dermatophytes.

Terbinafine*

A new drug effective against dermatophytes when used orally or topically.

Whitfield Ointment/Lotion (salicylic acid 10%)

Still the mainstay of treatment of dermatophytosis in Fiji.

Nystatin

Suspension is useful for oral thrush.

2. GENERAL GUIDELINES FOR USE OF ANTIBIOTICS

Prudent use principles for antibiotics

General

Antibiotics should be used only where the benefits are scientifically demonstrable and substantial.

In general, the antimicrobial spectrum of the drug selected should be the narrowest to cover the known or likely pathogen(s).

Single agents 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 dosage should be high enough to ensure efficacy and minimise the risk of resistance selection, and low enough to minimise the risk of dose related toxicity

Therapy

Choice of therapy should be based on either culture and susceptibility tests results (directed therapy), or known common pathogens in the condition and their current resistance patterns (empirical therapy).

Duration should be as short as possible, and should not exceed 7 days unless there is proof that this is inadequate.

Prophylaxis

Choice should be based on known or likely target pathogen(s).

Duration should be as short as possible. A single dose of antibiotic is recommended for surgical prophylaxis.

Longer-term prophylaxis should be administered only when it has been demonstrated that the benefits outweigh the risk of resistance selection or propagation.

REF: Australian Therapeutic Guidelines – Antibiotic, version 14, 2010

Antibiotics are frequently misused. This misuse not only causes unwanted reactions in the recipient, it also favours proliferation of resistant organisms. Unnecessary wastage of resources is another result.

There are two main situations where antibiotics are used:

1. For **treatment** of proven or suspected bacterial infections.
2. For **prevention** of bacterial infections.

2.1 Treatment Guidelines

- (a) Decide whether an antibiotic is really indicated.
- (b) If an antibiotic is indicated, the choice will depend on:

- (i) Efficacy

This depends on the spectrum of activity of the drug in relation to known or suspected causative agents. Whenever possible, antibiotic therapy should be guided by in vitro susceptibility tests. Knowledge about local susceptibility patterns of organisms frequently causing infection and previous clinical experience help in deciding on empirical, when this option is essential. Choose antibiotic with narrowest spectrum when applicable. **As far as possible, collect samples for culture before starting empirical therapy AND review the empirical therapy when susceptibility results are available.** In some situations, a gram stain (e.g. pus from deep abscesses) or direct antigen testing (e.g. meningitis) can help in initiating early directed therapy.

Efficacy also depends on pharmacokinetic factors like absorption, distribution (penetration into tissue etc.) metabolism and excretion of the drug.

- (ii) Safety

Potential adverse effects and risk of super infection should be considered.

- (iii) Costs.

- (iv) Potential for selection of resistant organisms.

(c) Route of administration

This is another important consideration. Parenteral preparations are generally more expensive. These are indicated when the patient is seriously ill so oral absorption may be impaired, when large doses are required, when the drug has poor bioavailability when given orally, or the patient is unable to take oral medication. **Reassess parenteral therapy daily, and switch to oral therapy as soon as possible.**

Topical antibiotic use should be limited to a few indications where its efficacy is proven, such as eye infections. Widespread and inappropriate use of topical antibiotics can cause sensitisation in the patient and favours development of bacterial resistance.

(d) Combinations of antibiotics should be used only when indicated:

- (v) To extend the spectrum of cover in empirical therapy of suspected mixed infections or in life threatening infections.
- (vi) To achieve synergistic bactericidal effect e.g. β lactam and gentamicin for treatment of enterococcal infection.
- (vii) To prevent the emergence of resistant organisms e.g. treatment of tuberculosis
- (viii) To reduce dosage of a toxic drug e.g. amphotericin and flucytosine in the treatment of fungal infections.

(e) Duration of therapy varies depending on the nature of infection and the causative organism.

(f) The following IV antimicrobials are given by **slow infusion**:

- Gentamicin – loading dose over 20 – 30 minutes
- Vancomycin – over 1 hour (10mg/ minute)
- Metronidazole – over 20 minutes
- Erythromycin – over 1 hour
- Acyclovir – over one hour
- Amphotericin – over 4 – 6 hours
- Ciprofloxacin – over 1 hour

Note: In paediatric practice all IV antimicrobials are given by slow infusion to avoid thrombophlebitis.

2.2 Prophylactic use of Antibiotics

Indications for these are very limited and are discussed in detail in appropriate chapters.

Strategies for antimicrobial use in an institution

To prevent misuse or abuse of drugs, the following steps are recommended:

1. Each hospital should have a drug committee to formulate policies suitable for that hospital.
2. Antimicrobials available in the hospital should be categorised into a restricted and unrestricted list based on cost, safety and emergence of antimicrobial resistance. The restricted antibiotics in Fiji are:

Ceftriaxone Inj	Amphotericin B Inj	Vancomycin Inj
Ciprofloxacin Inj and Tabs	Piperacillin Inj	Erythromycin Inj
Metronidazole Inj	Acyclovir Inj	

(Note: This list is subject to change in future)

These drugs can be obtained only after a consultant approves. Initial supply will be limited to 48 hours for empirical therapy.

3. Audit antimicrobials, by product and by clinical unit on a routine basis (or by individual clinicians when indicated).
4. Continuing education for medical and paramedical staff on new drugs and the changing susceptibility patterns.
5. Microbiology investigation e.g. blood culture, wound swab, must be taken prior to commencement of an antimicrobial. Prior cleaning of wounds with normal saline should be done when taking wound swabs

3. CARDIOVASCULAR SYSTEM INFECTIONS

BACTERIAL ENDOCARDITIS

There are 3 important principles of management:

1. Treatment must be given intravenously except in rare cases
2. Treatment is prolonged – usually 4 -6 weeks.
3. Drug regimens should result in high enough concentrations and should be given for long enough

There are several alternative regimens reported in the literature and consultation with a physician or a microbiologist should be sought if necessary. Surgical consultation should be considered especially in cases, which are fulminating, complicated or slow to respond.

If bacterial endocarditis is suspected, three blood cultures (no more than one from each venipuncture) should be taken before initiating therapy. This should be possible even in fulminant infection where prompt empirical use of antimicrobials is essential.

3.1 Empirical Therapy

- Penicillin G 1.8g (3 mega units) IV 4 hourly **PLUS**
- Cloxacillin 2g IV 4 hourly **PLUS**
- Gentamicin 4-6mg/kg IV as a first dose. See Chapter 1 for subsequent dosing based on renal function

In patients hypersensitive to penicillin, in hospital acquired endocarditis, and if cardiac prosthetic valve in situ use:

- Vancomycin 1g IV 12 hourly, each dose to be infused over at least 1 hour (dose adjusted for renal function), **PLUS**
- Gentamicin 4-6 mg/kg IV as a first dose. See Chapter 1 for subsequent dosing based on renal function

These regimens may need to be modified, and in particular the gentamicin dose reduced, when the organism and its sensitivity pattern is known. If culture is negative, continue with the same regimen, except reduce the dose of gentamicin to 80 mg every 8 hours if renal function is normal, reduce dose further if renal function is reduced., and monitor renal function at least twice weekly

3.2 Specific Therapy

3.2.1 Streptococcal Endocarditis

Streptococcus viridans is generally highly sensitive to penicillin G.

- Penicillin G 1.8g (3 mega units) IV 4 hourly for 4 weeks **PLUS**
- Gentamicin 80mg IV 8 hourly for 2 weeks (maintenance dose adjusted according to plasma levels).

For patients with hypersensitivity to penicillin

- Cephalothin 2g IV 4 – 6 hourly X 4 weeks **PLUS**
- Gentamicin 80mg 8 hourly X 2 weeks (maintenance dose adjusted according to plasma levels)

Note: A longer course of 4-6 weeks of both penicillin and gentamicin therapy is advisable if relative resistance to penicillin is suspected. However, currently *Streptococcus* is highly sensitive to penicillin in Fiji.

Also in suitable patients responding to treatment well after the initial therapy, a home based therapy with ceftriaxone 2g IV daily to complete a course of 4 weeks can be considered.

3.2.2. Enterococcal Endocarditis

- Penicillin G 1.8g (3 mega units) IV 4 hourly for 6 weeks **PLUS**
- Gentamicin 80mg IV 8 hourly for 6 weeks (maintenance dose adjusted according to plasma levels).

For resistance or patients hypersensitivity to Penicillin use

- Vancomycin **PLUS** Gentamicin, as for empirical treatment, for 6 weeks.

3.2.3. Staphylococcal Endocarditis

(a) *Staphylococcus aureus* sensitive to Methicillin and Cloxacillin

- Cloxacillin 2g IV 4 hourly, for 6 weeks

Traditionally gentamicin 1mg/kg intravenously (adjusted for renal function) 8 hourly has been used for the first 3 –5 days as there is some evidence that it reduces the duration of bacteraemia. This is often followed by rifampicin though the evidence is lacking.

(b) *Staphylococci* resistant to Methicillin or patient hypersensitive to penicillin

- Vancomycin 1g IV 12 hourly, for 6 weeks (to be infused over at least 1 hour).

3.2.4 Gram-Negative Bacterial endocarditis

This is uncommon and early consultation with a microbiologist or physician is recommended.

3.2.5. Culture Negative Endocarditis

This maybe due to previous antibiotic use or unusual micro – organisms, such as fastidious streptococci, legionella sp., or fungi including *Candida albicans*. Unless fungal infection is strongly suspected , patients with culture negative endocarditis should be treated empirically with Pencillin G plus Gentamicin as for enterococcal endocarditis (see above), for a period of 6 weeks.

3.2.6. Prosthetic Valve Endocarditis

Can be due to low virulent members of normal flora that may be resistant to penicillin or cloxacillin

(a) Empirical therapy

- Vancomycin 1g IV 12 hourly (to be infused over at least one hour) for 6 weeks **PLUS**
- Gentamicin 4-6 mg/kg IV as a first dose. See Chapter 1 for subsequent dosing based on renal function

This regimen may need to be modified, and in particular the gentamicin dose reduced, when the organism and its sensitivity pattern is known. If culture is negative, continue with the same regimen, except reduce the dose of gentamicin to 80 mg every 8 hours if renal function is normal,,reduce dose further if renal function is reduced, and monitor renal function and gentamicin levels at least twice weekly

(b) Specific therapy as for native valve endocarditis

3.3 Monitoring Antibiotic Therapy.

Particular attention should be given to Therapeutic Drug Monitoring in Endocarditis. Recommended doses are for the commencement of treatment only and may need to be modified according to plasma levels attained.

Gentamicin

Gentamicin levels should be monitored, however the optimum method of monitoring levels in endocarditis is unknown. As doses are lower, dosing more frequent and synergy is the objective, the methods of monitoring used for gentamicin in other circumstances are inappropriate. Instead troughs should be measured only and values between 0.5 and 1mg/L will likely maximise synergy and minimise toxicity with 8 hourly dosing. Patients should be monitored for vestibular and auditory ototoxicity

Vancomycin

Vancomycin peak and troughs concentration should be first measured at 48hrs to 72 hrs, although a steady state may not have been reached at this time. Peak vancomycin levels of 30 to 40mg/L and trough levels of 5 to 15mg/L are recommended. These levels are specific for the management of endocarditis and do not necessarily apply to other circumstances.

Note: Currently only gentamicin levels can be measured in some laboratories in Fiji. Vancomycin levels are currently not measured in Fiji.

4. RESPIRATORY TRACT INFECTIONS

4.1 ACUTE UPPER RESPIRATORY TRACT INFECTIONS

4.1.1 GENERALISED INFECTIONS

The aetiology is usually viral. Most common symptoms subside in a few days, although cough may persist longer, ie 14 days or more. For rhinorrhoea, topical or oral decongestants provide some relief.

- Oxymetazoline* OR Xylometazoline* 2 to 3 drops into each nostril 2 to 3 times daily for not more than 5 days (do not use in children under the age of 6)

Paracetamol plus adequate hydration gives symptomatic relief of fever and discomfort. Patients require appropriate reassurance that usually antibiotics are unhelpful and are often harmful by causing side effects and increasing bacterial resistance

4.1.2 ACUTE SORE THROAT

Usually viral. Paracetamol, aspirin (in adults) or ibuprofen provide valuable symptomatic relief. Acute tonsillitis caused by *Streptococcus pyogenes* is difficult to distinguish clinically from viral aetiology, but is more likely if patients have all of the following features:

- Fever > 38⁰ C
- Tender cervical lymphadenopathy
- Tonsillar swelling or exudates
- No cough.

If bacterial infection is suspected, use

- Penicillin V 500mg orally 12 hourly for 10 days **OR**
- Benzathine Penicillin 1.2 mega units IM as a single dose

Although Amoxicillin is widely used, penicillin V has a narrow spectrum and covers *Streptococcus pyogenes* which is the organism of concern, therefore the use of amoxicillin is discouraged.

Alternative/ hypersensitive to Penicillin:

- Erythromycin 500mg orally 12 hourly for 10 days **OR**
- Erythromycin 250mg orally 6 hourly for 10 days

NOTE It is important to complete the course of therapy to prevent rheumatic fever, which is still a common problem in Fiji

4.1.3 ACUTE BACTERIAL OTITIS MEDIA

This is either viral or bacterial and usually self-limiting disease. Symptomatic therapy such as pain relief should be provided for the first 2 days.

If symptoms persists or suppurative complications develop then consider antibiotics

- Amoxicillin 500mg orally 8 hourly x 7 days

Alternative/ hypersensitive to Penicillin

- Doxycycline 100mg orally 12 hourly for 7 days (if available) **OR**
- Cefaclor SR 375mg orally 12 hourly for 7 days (for inpatient use only)

In complicated cases refer to ENT specialist.

4.1.4 OTITIS EXTERNA

Usual organisms include *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Proteus* and *Klebsiella* species.

Ear should be kept dry followed by instillation of topical steroid and antibiotic combination drops.

Indications for systemic antibiotics include fever, spread of inflammation to the pinna or folliculitis.

- Flucloxacillin 500mg orally 6 hourly for 5-7 days

In complex cases such as development of mastoiditis, hearing loss, refer to specialist.

4.1.5 ACUTE SINUSITIS

Acute bacterial sinusitis follows upper (usually viral) respiratory tract infections in between 0.5 to 5% of cases. It is caused by *Streptococcus pneumoniae* or *H. influenzae*.

Consider antibiotic therapy, as well as intranasal corticosteroids, for patients with severe rhinosinusitis symptoms (purulent nasal discharge, nasal congestion and/or facial pain or pressure) for more than 5 to 7 days plus any of the following features:

- high fever (38.4 °C or more)
 - unilateral maxillary sinus tenderness
 - severe headache
 - worsening symptoms after initial improvement.
- Amoxicillin 500mg orally 8 hourly for 5-7 days.

In patients hypersensitive to Penicillin

- Doxycycline 100mg orally 12 hourly. **OR**
- Cefaclor SR 375mg orally 12 hourly (for inpatient use)

Duration of antibiotic therapy should be for 7 – 10 days depending upon response.

4.1.6 ACUTE EPIGLOTTITIS

Seen mostly in children, may occur in adults. Urgent hospitalisation is required. Commonly caused by *H influenzae*

- Ceftriaxone 2 gm IV as single dose daily for 5 days

Early transfer to oral therapy is desirable.

4.2 LOWER RESPIRATORY TRACT INFECTIONS

4.2.1 ACUTE BRONCHITIS

In an immunocompetent adult or child, acute bronchitis is most often viral and does **not** require antibiotic therapy. Randomised controlled trials show that antibiotic therapy provides no overall benefit to the patient and may cause harm.

If severe, and particularly if sputum is voluminous and purulent, with fever, secondary bacterial infections is assumed:

- Amoxicillin 500mg orally 8 hourly for 5 -7 days.

Alternative:

- Doxycycline 100mg orally 12 hourly for 7 days (if available) **OR**
- Erythromycin 500mg orally 6 hourly for 5-7 days

4.2.2 ACUTE EXACERBATION OF CHRONIC BRONCHITIS

Acute exacerbation could be either viral or bacterial infection. Common organisms include *Strep pneumoniae*, *H Influenzae*, *Moraxella catarrhalis*. The indication for Antibiotic therapy is increased cough and dyspnoea TOGETHER with increased sputum volume and/or Purulence

Treatment as for Acute Bronchitis above

4.2.3 PNEUMONIA

4.2.3.1 COMMUNITY ACQUIRED

Choice of antibiotic is often empirical. In immunocompetent, otherwise healthy patients it is usually caused by single microorganisms such as *Streptococcus pneumoniae*, *H. influenzae*, *Mycoplasma pneumoniae*, *Chlamydia*. *Staph aureus* is not uncommon in Fiji.

Note: Pneumonia in poorly controlled diabetic patients, elderly patients, or patients with co-existent illness (e.g. cancer, liver disease, heart failure or renal failure) should be treated as more severe disease than in the absence of those conditions.

(a) Mild Disease

- Amoxicillin 500mg orally 8 hourly for 7 - 10 days **OR if unable to take oral therapy**
- Procaine Penicillin 3.6g (4 mega units) IM daily for 7 - 10 days

(switch to oral amoxicillin when able to take oral therapy)

Alternative:

- Doxycycline 100mg orally 12 hourly for 7 –10 days

If hypersensitive to penicillin or Mycoplasma or Chlamydia suspected:

- Erythromycin 500mg orally 6 hourly for – 10 - 14 days **OR**
- Doxycycline 100mg orally 12 hourly for 10 – 14 days

(b) Moderate Disease

- Penicillin G 1200mg (2 mega unit) IV 6 hourly for 7 -10 days

In patients hypersensitive to penicillin

- Chloramphenicol 1g IV 6 hourly X 7 –10 days

If the clinical response to parenteral therapy is satisfactory, high dose oral therapy may be substituted after a few days e.g. Amoxicillin 0.5 – 1.0g orally 8 hourly or to Chloramphenicol 0.5g – 1g orally 6 hourly for patients on chloramphenicol IV.

(c) Severe Disease

CORB uses the following patient parameters, based on the most abnormal results obtained during the initial 24 hours of inpatient stay:

C = acute confusion

O = oxygen saturation 90% or less

R = respiratory rate 30 breaths or more per minute

B = systolic blood pressure less than 90 mm Hg or diastolic blood pressure 60 mm Hg or less

Interpretation of CORB score: 'Severe pneumonia' = the presence of at least two of these features.

Empirical:

- Penicillin G 1200mg (2 mega unit) IV 6 hourly **PLUS**
- Cloxacillin 2g IV 6 hourly **PLUS**
- Gentamicin 4 – 6 mg/kg IV as a first dose. See Chapter 1 for subsequent dosing based on renal function

If no response within 48 hours, or the patient deteriorates on the above therapy, then the following may be added

- Erythromycin IV/ orally 500mg 6 hourly

If hypersensitive to penicillin

- Ceftriaxone 2g IV daily **PLUS**
- Erythromycin 0.5 – 1g IV (slow infusion over 1 hour) 6 hourly

Definitive therapy should be instituted based on bacteriological data.

If *Streptococcus anginosus* is proven

- Penicillin G 3 - 4 mega (1800 - 2400mg) IV 6 hourly X 21 days

If *Pseudomonas aeruginosa* is proven

- Piperacillin 4g IV 6 hourly **PLUS**
- Gentamicin 4 - 6 mg/kg IV as a first dose. See Chapter 1 for subsequent dosing based on renal function

If *Staphylococcus aureus* is proven

- Cloxacillin 2g IV 6 hourly for 3 to 4 weeks (oral therapy can be substituted once patient's condition is stabilised)

All severe pneumonia requires consultant advice.

4.2.3.2 HOSPITAL ACQUIRED PNEUMONIA

Refers to pneumonia not present at the time of admission and developing in patients after 48 hours of hospitalisation. It is usually due to Gram –ve organisms but *Staphylococcus aureus* is not uncommon in Fiji.

For mild pneumonia

- Amoxicillin plus clavulanate 500 + 125 orally, 12 hourly **PLUS**
- Amoxicillin 250mg, 12 hourly, for 5 - 7 days

For severe pneumonia, or if the patient is unable to take oral medications

- Cloxacillin 1g IV 6 hourly **PLUS**
- Gentamicin 4 – 6 mg/kg IV as a first dose. See Chapter 1 for subsequent dosing based on renal function

Add metronidazole 400 mg orally 8 hourly (or 500 mg IV 12 hourly) if aspiration is a likely cause of the hospital acquired pneumonia

Change to oral therapy (as for mild pneumonia above) when the patient is improving and/or can take oral medications

For complicated patients (eg in ICU and on a ventilator) who are likely to have a resistant organism, seek expert advice

4.2.3.4 IMMUNOSUPPRESSED PATIENTS

Pneumonia in immunosuppressed patients (eg patients with HIV, patients on long term corticosteroid therapy) may be recurrent and due to unusual organisms. A microbiologist or physician should be consulted regarding diagnosis and treatment.

REFER to *Pneumocystis jiroveci* (previously known as *Pneumocystis carinii*, or PCP) under opportunistic infections in HIV

4.2.3.5 ASPIRATION PNEUMONIA

Minor debris of aspiration pneumonia does not require antibiotic therapy. For severe disease or abscess formation, more prolonged and high dose treatment is indicated.

Streptococcus anginosus, anaerobes and occasionally gram negative bacilli and staphylococci to be considered.

- Penicillin G 1200mg (2mega units) IV 4 -6 hourly **PLUS**
- Metronidazole 400mg IV/orally 12 hourly

Switch to oral therapy with amoxicillin/clavulanate **PLUS** metronidazole when the patient is improving. For uncomplicated aspiration pneumonia total duration of therapy is usually 7 days. In extensive disease or lung abscess formation prolonged therapy is required

Alternative for penicillin hypersensitive patients

- Chloramphenicol 500mg – 1g IV / orally 6 hourly.

Note: In addition, flucloxacillin or gentamicin may be required if infection with either staphylococci or aerobic gram negative bacteria suspected or proven. If *Streptococcus anginosus* is isolated, high dose penicillin will be required and for a longer duration, usually 21 days.

4.2.4 LUNG ABSCESS AND EMPYEMA

- Penicillin G 2 mega units IV 6 hourly **PLUS**
- Cloxacillin 2g IV 6 hourly **PLUS**
- Metronidazole 400mg orally 12 hourly

Gentamicin should be added if aspiration is the likely cause of the abscess.

Adequate drainage of empyema is essential. The duration of therapy is usually prolonged.

Note: if the abscess is small and the patient is not unwell, then oral therapy can be given.

4.2.5 BRONCHIECTASIS WITH INFECTION

Patients with bronchiectasis often have chronically purulent sputum which if cultured grows organisms. If the patient is clinically stable, it is NOT appropriate to treat colonizing organisms as this will promote the emergence of antibiotic resistance.

(a) Mild acute exacerbation

- Amoxycillin 500mg orally 8 hourly for 7 – 10 days.

Alternative:

- Cefaclor SR 375mg 12 hourly for 7 – 10 days (for inpatient use only).

(b) Severe acute exacerbation

- Chloramphenicol 500mg 6 hourly orally /IV for 7 – 10 days

Alternative:

- Amoxycillin 500mg orally 8 hourly for 7- 10 days **PLUS**
- Metronidazole 400mg orally 8 hourly for 7 -10 days **OR**
- Cefaclor 375mg 12 hourly for 7 – 10 days (as a single agent) **OR**
- Doxycycline 100mg 12 hourly for 7 – 10 days (as a single agent)

Ciprofloxacin can be used to treat severe exacerbations if an organism (eg pseudomonas) resistant to the above antibiotics is cultured. However resistance is likely to develop if it is used repeatedly

5. GASTROINTESTINAL TRACT AND INTRA- ABDOMINAL INFECTIONS

5.1 CANDIDA OESOPHAGITIS

Uncommon in Fiji's population, most likely in immunocompromised (HIV) patients.

In patients with mild oesophageal candidiasis who are not immunosuppressed, use:

nystatin 100 000 units/mL suspension 1 mL orally, 6-hourly for 10 to 14 days.

In patients with severe oesophageal candidiasis or patients who are immunosuppressed, use:

fluconazole 200 to 400 mg (child: 3 to 6 mg/kg up to 400 mg) orally, daily for 14 to 21 days.

5.2 DIARRHOEAL DISEASES

Most diarrhoeal diseases are self-limiting and do not require antibiotic therapy. Oral rehydration is all that is required.

Anti-motility agents such as loperamide can be used for symptomatic relief in adults, provided that there is no evidence to suggest invasive disease or obstruction. **These agents should NOT be used in children.**

Antibiotic therapy is not generally required in the normal host unless there is evidence to suggest invasion with a bacterial pathogen e.g., persistent fever with bloody diarrhoea and/or rigors. However it should be considered for the following and treatment may have to be modified according to the results of culture and sensitivity tests.

Bacterial Infections

5.2.1 Shigellosis (*moderate and severe dysentery only*)

Recently in Fiji Shigella has been found to be sensitive to quinolones and cephalosporins only whereas in the past it was more sensitive to chloramphenicol. This may change in future therefore treatment should be guided by sensitivity results.

For moderate cases

- Chloramphenicol 500mg orally/ IV 6 hourly for 7 days **OR**
- Cotrimoxazole (trimethoprim/sulfamethoxazole 160 +800 mg) orally 12 hourly for 7 days **OR**
- Ciprofloxacin 500mg orally every 12 hours for 7 days (dose adjustment in renal impairment)

For severe cases

- Ciprofloxacin IV 200mg (dose adjustment in renal impairment) every 12 hours for 7 Days **OR**
- Ceftriaxone 2g IV once daily for 7 days

5.2.2 Salmonella enteritis

Antibiotic therapy is not generally advisable. Indicated in immunosuppressed or elderly people. Treat as for typhoid fever (see later) or based on antibiotics sensitivity for 5 days.

5.2.3 Campylobacter enteritis

Antibiotics are unnecessary in most cases. In severe cases;

- Erythromycin 500mg orally 6 hourly for 3 days **OR**
- Ciprofloxacin 500mg 12 hourly for 3 days

5.2.4 Empirical Therapy of presumed bacterial diarrhoea

As for shigellosis

5.3 PARASITIC INFECTIONS

5.3.1 Intestinal Amoebiasis

- Metronidazole 800mg 8 hourly for 6 -10 days

For hepatic involvement, metronidazole should be continued for 14 days.

5.3.2 Giardiasis

Treatment of asymptomatic passage of giardia cysts is unwarranted. For symptomatic patients use;

- Metronidazole 400mg orally 8 hourly for 7 days.

5.3.3 Strongyloidiasis

- Ivermectin* 200 microgram/kg orally with fatty food on day one, repeat after 7-14 days

5.4 ANTIBIOTIC ASSOCIATED DIARRHOEA

Unless ongoing antibiotic treatment is mandatory (eg for the treatment of endocarditis), cease treatment with any antibiotic likely to be causing the symptoms. *Clostridium difficile* is responsible for some cases but not all. For mild cases, observe patients after stopping antibiotics

For moderate cases consider:

- Metronidazole 400mg orally 8 hourly for 10 days

For severe and relapsing cases:

- Metronidazole as above **and** if no response use:
- Vancomycin* 125mg orally 6 hourly for 10 days

The emergence of Vancomycin resistant enterococci makes it essential to reserve vancomycin for severe cases unresponsive to Metronidazole

Contact Pharmacist-In charge regarding preparation of oral vancomycin.

5.5 TYPHOID/ PARATYPHOID FEVER

- Ciprofloxacin 500mg orally 12 hourly for 5 days or until patient is free of symptoms for 24 hours – whichever is the longest.

If oral treatment is not possible, give ciprofloxacin 400mg IV 12 hourly until patient can tolerate oral treatment

Alternative drugs are chloramphenicol, amoxicillin or cotrimoxazole, but these must be given for at least 2 weeks

It is essential the patient completes the full course of treatment, even if they have fully recovered.

5.6 INTRA – ABDOMINAL INFECTIONS

Example: cholecystitis, cholangitis, diverticulitis, peritonitis and intra – abdominal abscesses

Where possible, do culture and sensitivity tests. Surgery may be indicated in addition to antibiotics.

Enterobacteriaceae, enterococci and anaerobes are usual pathogens. *Strep anginosus* (milleri) is sometimes isolated in which case high dose Penicillin G will be required.

Empirical treatment:

- Ampicillin 1g IV 6 hourly for 10 – 14 days **PLUS**
Gentamicin 4 – 6 mg/kg IV as a first dose, See VChapter 1 for subsequent doses based on renal function **PLUS** Metronidazole 500mg suppository PR 12 hourly for 10 – 14 days OR less severe cases: 400mg orally 8 hourly.
For *Streptococcus anginosus*
- Penicillin G 1.8g (3 megaunit) every 4 hours for 21 days

5.7 HELICOBACTER PYLORI INFECTION

All patients with duodenal ulcer, proven Helicobacter pylori associated gastric ulcers or with mucosa associated lymphoma should be treated. Eradication of H pylori in non-ulcer dyspepsia or in asymptomatic patients is not of benefit.

The regimen with highest efficacy and best compliance, but which is expensive, is::

- Omeprazole* 20mg orally 12 hourly X 7 days **PLUS**
- Clarithromycin*¹ 500mg orally 12 hourly X 7 days **PLUS**
- Amoxicillin 1g 12 orally hourly X 7 days **OR**
- Metronidazole 400mg orally 12 hourly X 7 days

Because it is cheapest and readily available, the regimen recommended as first line therapy is:

- Ranitidine 300mg orally once daily (nocte) X 14 days **PLUS**
- Amoxicillin 500mg orally every 8 hourly X 14 days **PLUS**
- Metronidazole 400mg orally every 8 hourly X 14 days

For patients hypersensitive to Penicillin, substitute Amoxicillin with

- Doxycycline 100 mg 12 hourly

5.8 WORMS (HELMINTHS)

Hookworm, roundworm, threadworm & whipworm

- Mebendazole 100mg orally twice daily x 3 days

Mebendazole should not be used in the 1st trimester of pregnancy or in children under 6 months of age. In such cases Pyrantel can be used.

- Pyrantel 10mg/kg (up to maximum 750mg) orally single dose, repeat after 7 days if heavy infection

6. CENTRAL NERVOUS SYSTEM INFECTIONS

6.1 ACUTE BACTERIAL MENINGITIS

In **ADULTS**, *Streptococcus pneumoniae* is the mostly likely organism. *Haemophilus influenzae* and *Neisseria meningitidis* are less common. CSF microscopy and culture are vital in directing antibiotic therapy. Therefore a lumbar puncture and blood culture should be performed urgently and, if possible, before antibiotic treatment is commenced

Caution is required with lumbar puncture if the patient is in coma, has signs of increased intracranial pressure or has focal neurological signs. A CT scan of the head is preferred before lumbar puncture in such cases if facilities are available.

Bacterial meningitis is a medical emergency and antibiotic therapy should not be delayed if there is difficulty in obtaining a CSF sample. In such cases empirical therapy should be started immediately.

In rural areas or where there is a delay in transferring patient to a major hospital, if meningitis is suspected antibiotics should be started immediately, either with;

- Penicillin G 1.6 g (4 mega unit) IV/ IM, 6 hourly **OR**
- Ceftriaxone 2g IV 12 hourly, (if available)

In penicillin hypersensitive patients use;

- Chloramphenicol 1g IV 6 hourly.

Penicillin, chloramphenicol and ceftriaxone have proven effective in the treatment of meningitis. Chloramphenicol achieves good CSF penetration.

Dexamethasone has been found to be useful in children and recent literature suggests that it has a role in management of bacterial meningitis in adults. It should be given just before the first antibiotic dose.

- Dexamethasone 10mg IV just before the 1st dose of antibiotic followed by 10mg 6 hourly x 4 days

6.1.1 Empirical therapy

If meningitis is confirmed by CSF examination, but the organism is unknown, use:

- Penicillin G 1.8g (3 mega units) IV 4 hourly for 10 days **PLUS**
- Chloramphenicol 750mg – 1g IV 6 hourly for 10 days.

In patients hypersensitive to Penicillin use

- Chloramphenicol alone **OR**
- Ceftriaxone 2g IV 12 hourly

Change to appropriate regimen once the organism and susceptibility result is available. If no organism is identified, continue empirical therapy for a total of 10 days.

6.2.2 Specific Therapy

(a) *Pneumococcal/ Neisseria meningitidis* meningitis

- Penicillin G 1.8g (3 mega units) IV 4 hourly.

In penicillin hypersensitive patients

- Ceftriaxone 2g IV 12 hourly

Pneumococcal meningitis is to be treated for 10 – 14 days. Some very ill patients may require treatment for 21 days. Meningitis due *Neisseria meningitidis* usually requires only 7 days treatment.

NB: At the end of penicillin therapy, rifampicin 10mg/kg/dose (up to 600mg) orally 12 hourly for 4 doses should be given to eradicate nasopharyngeal carriage in cases of meningococcal meningitis. This treatment should also be given to all close contacts.

(b) *Gram negative bacterial meningitis and cryptococcal meningitis*, consultation is advisable.

Generally for gram-negative meningitis other than *H.influenzae*, a combination of ceftriaxone and gentamicin is useful and the treatment is for 21 days

6.2 BRAIN ABSCESS

Most brain abscesses are polymicrobial and can include anaerobic streptococci and bacteroides.

Use:

- Penicillin G 2.4g (4 mega units) IV 4 hourly **PLUS**
- Ceftriaxone 2g IV 12 hourly **PLUS**
- Metronidazole 500mg IV 8 hourly/ PR 12 hourly

Add cloxacillin if clinically or bacteriologically indicated.

For post neuro-surgical brain abscess, use

- Vancomycin 1g IV 12 hourly
- PLUS**
- Chloramphenicol 1g IV 6 hourly **OR**
 - Ceftriaxone 2g IV 12 hourly

The duration of treatment depends in clinical response and may be as long as 6 -8 weeks. Surgical drainage may be indicated especially if clinically response is poor.

6.3 EPIDURAL ABSCESS

This is generally due to *Staphylococcus aureus*. Urgent surgery is essential. Treatment should be based on gram stain and culture results of operative material. For initial empirical therapy use;

- Cloxacillin 2g IV 6 hourly **PLUS**
- Gentamicin 4-6 mg/kg IV as a first dose. See Chapter 1 for subsequent doses based on renal function

If the organism is proven to be *Staphylococcus Aureus*, stop the gentamicin.

This condition is often associated with osteomyelitis or disc infection, therefore subsequent management as for treatment of osteomyelitis.

6.4 HERPES SIMPLEX ENCEPHALITIS (suspected or proven)

- Acyclovir 10mg/kg IV 8 hourly for at least 14 days, each dose to be infused not less than 1 hour (adjust dose according to the renal function).

6.5 TOXOPLASMA ENCEPHALITIS

In AIDS cerebral infection with *Toxoplasma gondii* is common.

See under Opportunistic infections in HIV

7. URINARY TRACT INFECTIONS

7.1 UNCOMPLICATED LOWER URINARY TRACT INFECTIONS

Urine cultures are not mandatory in nonpregnant women with suspected uncomplicated cystitis, but should be performed if possible, before the administration of antibiotics, in pregnant women, men, and in all patients with recent antibiotic use, treatment failure or recurrent infection

Resistance of urinary pathogensto amoxycillin is as high as about 80% in Fiji. Resistance to trimethoprim is also rising. .

Empirical Therapy

- Nitrofurantoin 50 – 100mg orally 6 hourly **OR**
- Trimethoprim 300mg orally daily

In non – pregnant women treatment is for 3 – 5 days.

For UTI in pregnancy, see section under Female Genital Tract and Obstetric Infections

In men, treatment is for 10 – 14 days. Note urinary tract infection in younger males is uncommon. All younger males with confirmed UTI should be investigated to exclude an underlying abnormality.

Treatment failures are usually due to a resistant organism, an unsuspected underlying abnormality of the urinary tract or re-infection with a similar organism.

If relapse occurs, pyelonephritis should be considered and treatment given for 10 to 14 days.

7.2 UPPER URINARY TRACT (PYELONEPHRITIS) OR COMPLICATED INFECTIONS (E.g. severe illness, diabetes, immunocompromised states)

Attempt to define or exclude underlying anatomical or functional abnormality.

Treat for 14 days with antibiotics chosen on basis of urine culture and sensitivities.

If mild, oral treatment with amoxicillin plus clavulanate can be given for 10 days.

If sufficiently ill to need empirical or parenteral therapy, treat with:

- Ampicillin 2g IV 6 hourly PLUS
- Gentamicin 4-6 mg/kg IV as a first dose. See Chapter 1 for subsequent doses based on renal function

If the prolonged use of an aminoglycoside is undesirable. e.g. in the elderly, in the presence of significant renal failure or following a previous adverse reaction, use

- Ceftriaxone 1g IV daily

If Pseudomonas is isolated use;

- Ciprofloxacin 500mg orally 12 hourly

Change to oral therapy based on culture and sensitivity report once patient is clinically well and afebrile for a few days.

If hypersensitive to penicillin, gentamicin can be used alone.

Follow up of urine culture is desirable at the conclusion of therapy.

7.3 RECURRENT URINARY TRACT INFECTIONS (PROPHYLAXIS)

Recurrent infections occur either as relapse of a previously treated infection or because of re-infection. Treat the acute infection as above for a duration of 10 – 14 days.

Consider prophylaxis for women who have frequent symptomatic infections (eg two or more infections during one 6-month period or three or more infections over a 12-month period). Prophylactic therapy as follows (depending on sensitivity results):

- Nitrofurantoin 50 – 100mg orally at night **OR**
- Nalidixic acid 1g orally at night **OR**
- Trimethoprim 150mg orally at night.

Prophylactic antibiotic therapy to be continued for 3 -6 months, longer if required

7.4 CATHETER – ASSOCIATED URINARY INFECTIONS

Treat only if symptomatic. If treatment is needed, antimicrobial should be selected on the basis of the most recent urine culture results.

Where possible, removing the catheter may be all that is required. Prophylactic antibiotics should not be routinely administered at the time of catheter placement, change or removal.

7.5 ASYMPTOMATIC BACTERIURIA

Decision for treatment will depend on individual circumstances. Treatment often indicated in:

- Young children
- Pregnant women (treatment always indicated when detected)
- patients before urological procedures in which mucosal bleeding is anticipated
-

Choose antibiotic based on sensitivity results

If asymptomatic bacteriuria recurs in a pregnant woman, or the organism is Gp B Strep, seek further obstetric advice

7.6 CHRONIC BACTERIAL PROSTATITIS

Most cases (90% to 95%) of 'chronic' prostatitis, characterised by chronic pelvic pain, are not due to infection and repeated courses of antibiotic treatment should be avoided. Chronic bacterial prostatitis is rare.

Therapy should be guided by culture and sensitivity tests.

- Co-trimoxazole (Trimethoprim 80mg & Sulphamethoxazole 400mg) 2 tablets orally 12 hourly **OR**
- Trimethoprim 300mg orally daily for 12 weeks.

If culture is negative, Chlamydia might be responsible. Consider:

- Doxycycline 100mg orally 12 hourly for 3 weeks followed by 100mg daily for 3 weeks

In resistant cases:

- Ciprofloxacin 500mg orally 12 hourly for 4 weeks may be necessary.

Treatment of this condition is difficult and over treatment with antibiotics should be avoided.

7.7 ACUTE EPIDIDYMO-ORCHITIS

Non-sexual transmission – e.g. in prepubertal boys or older men

Mild to moderate

- Co Trimoxazole (trimethoprim 80mg and Sulphamethoxazole 400mg) 2 tablets orally 12 hourly X 14 days

Severe Infections

- Ampicillin 2g IV 6 hourly **PLUS**

- Gentamicin 4 - 6mg/ kg/ IV as a first dose. See Chapter 1 for subsequent doses based on renal function.

Sexual transmission – especially in adult men less than 35 years of age

Treat empirically as for gonorrhoea and chlamydial infection (see Sexually transmitted diseases)

7.8 CANDIDURIA

The presence of Candida in urine is common, particularly in association with indwelling catheters, and does not necessarily indicate renal tract infection. Antifungal therapy is not usually indicated and should not be initiated without consultation.

8. SEPTICAEMIA AND GENERALISED INFECTIONS

Patients with clinical features of septicemia require urgent empirical therapy. Microbiological specimens, especially blood cultures, should be obtained before the therapy is commenced. At least 2 blood culture specimens from two different sites should be obtained. Once the causative organisms have been identified and the sensitivities known, the antibiotic therapy may need modification. Duration of treatment varies from 10 – 21 days depending on severity, source of infection and organism involved.

8.1 **EMPIRICAL THERAPY**

No obvious source of infection

8.1.1 *Staphylococcus aureus* is the most common cause of septicaemia in Fiji.

- Cloxacillin 2g IV 4 hourly **PLUS**
- Gentamicin 4-6 mg/kg IV as a first dose. See Chapter 1 for subsequent doses based on renal function

For patients hypersensitive to penicillin replace Cloxacillin with

- Cephalothin 2g IV 6 hourly

Note: A small percentage of patients with penicillin hypersensitivity will also be hypersensitive to cephalothin (cephalosporins). If the patient has immediate (IgE mediated) hypersensitivity use vancomycin

8.1.2 Neutropenic patients ($<0.5 \times 10^9/L$)

The following regimen aimed primarily at enterobacteriaceae and *Pseudomonas aeruginosa*:

- Piperacillin 3g IV 4 hourly **PLUS**
- Gentamicin 4-6 mg/kg IV as a first dose. See Chapter 1 for subsequent doses based on renal function

See also section 2.7 below – Pseudomonas infections

If *Staphylococcus aureus* is suspected then **ADD**:

- Cloxacillin 2g IV 4 hourly.

8.2 **EMPIRICAL THERAPY**

Source of Infection clinically apparent

8.2.1 Source of Infection: Urinary Tract

Treat as for severe pyelonephritis

8.2.2 Source Of Infection: Biliary or Gastro-intestinal Tract

Treat as for intra-abdominal infection

8.2.3 Source Of Infection: Female Genital Tract

Treat as for severe pelvic inflammatory disease – either sexually or non-sexually acquired as appropriate

8.2.4 Source Of Infection: Skin

(a) Carbuncle and cellulitis

Treat as for severe cellulitis

(b) Decubitus and ischaemic ulcers, diabetic foot infection

Treat as for severe diabetic foot infection

8.2.5 Source Of Infection: Intravenous Cannulae including Central Venous Line

Infected cannula should be removed and along with any pus, submitted for culture

Staphylococcus aureus, coagulase negative staphylococci, aerobic gram-negative bacilli and *Candida sp* are likely pathogens

- Cloxacillin 2g IV 4 hourly **PLUS**
- Gentamicin 4-6 mg/kg IV as a first dose. See Chapter 1 for subsequent doses based on renal function

Patients hypersensitive to penicillin or in whom MRSA is likely:

- Vancomycin 1g IV 12 hourly (each dose infused over 1 hour) can be substituted for cloxacillin

These regimens do not cover candida. Contact microbiologist if infection with candida is suspected
Once sensitivity is available, adjust antibiotic accordingly

8.2.6 Source Of Infection: Lung

Treat as for severe pneumonia

8.2.7 Infections Due to Specific Organisms

In blood culture positive cases with known sensitivity, when patient is not seriously ill, monotherapy may be adequate, e.g. *Streptococcal* and *Staphylococcal* infection

Pseudomonas aeruginosa

- Piperacillin 3g IV 4 hourly **PLUS**
- Gentamicin 4-6 mg/kg IV as a first dose. See Chapter 1 for subsequent doses based on renal function

If hypersensitive to penicillin, or in cases of inadequate response use:

- Ciprofloxacin 500mg IV 12 hourly as a single drug

Duration of therapy for *Pseudomonas aeruginosa* infections varies from 2 -6 weeks, depending on the primary site of infection

9. NON- SURGICAL (MEDICAL) ANTIBIOTIC PROPHYLAXIS

9.1 HEPATITIS B IMMUNISATION

Pre-exposure

Indications:

1. All newborns
2. Those at risk of contracting infection e.g. health care workers
3. Sexual partners of HbsAg positive individuals

In these cases, a full course of Hepatitis B vaccine should be administered. The vaccine is given at 0, 1 and 6 months (except for infants – refer to immunization schedule). For dosage, refer to manufacturer's instructions.

Post – Exposure

A. Following needle stick injury or mucosal/ broken skin contamination by body fluids, the following applies:

Test the exposed person and the donor of contaminating blood (patient) for HbsAg and Anti-HBsAg

EXPOSED PERSON	STATUS	ACTION
Full course of Hepatitis B vaccine with seroconversion within past 5 years	Protected	No prophylaxis needed
HBsAg positive	Already infected	No prophylaxis needed
Anti – HBsAg positive	Protected	No prophylaxis needed
HBsAg and Anti-HbsAg negative	Susceptible	Vaccinate. Add immunoglobulin if: <ul style="list-style-type: none">• Patient is HbsAg positive• Status of the patient is unknown

B. Neonates of mothers who are HbsAg positive

All such neonates should receive immunoglobulin in addition to vaccination. The immunoglobulin should be given within 48 hours of birth.

In cases where immunoglobulin is indicated:

A single dose should be given intramuscularly, within 7 days but *preferably within 48 hours of exposure*. The adult dose is 400 international units.

Dose for neonates: Check manufacturer's instructions.

A full course of Hepatitis B vaccine should be given, starting at the time as the immunoglobulin. For dosage, refer to the manufacturer's instructions

9.2 HIV – POST NEEDLESTICK INJURY PROPHYLAXIS

If the source of the inoculated blood or body fluids is HIV antibody positive, post exposure prophylaxis, with antiretrovirals, should be commenced as soon as possible and the recipient followed up for at least 6 months. If the source patient is also at a high risk of HIV then prophylaxis antiretroviral is warranted. Antiretroviral therapy should be commenced as soon as possible following the injury or preferably within hours.

- Ziduvudine 300mg orally 12 hourly X 4 weeks **PLUS**
- Lamivudine 150mg orally 12 hourly X 4 weeks

9.3 MENINGOCOCCAL AND H. INFLUENZAE MENINGITIS

Despite prophylaxis disease can still occur.

Indications:

1. Close contacts of the index case.
2. In epidemics: classroom and other institutional contacts.
3. Contacts who are young children (less than 4 years old).
4. Index case before discharge from hospital to eradicate nasopharyngeal carriage.

Note: for *Haemophilus influenzae* meningitis, the immunisation status of the contacts should be taken into consideration.

a) H. influenzae contacts

Adult:

- Rifampicin 600mg orally daily X 4 days

Children (over 4 weeks old):

- Rifampicin 10mg/ kg/ dose (max 600mg / dose) orally for 4 days

b) Meningococcal Contacts

Adult:

- Rifampicin 600mg orally 12 hourly for 2 days **OR**
- Ceftriaxone 250mg IM as a single dose **OR**
- Ciprofloxacin 500mg orally as a single dose.

Children (over 4 weeks old):

- Rifampicin 10mg/ kg /dose (max 600mg /dose) orally 12 hourly for 2 days **OR**
- Ceftriaxone 125mg IM as a single dose.

9.5 PREVENTION OF RECURRENCE OF RHEUMATIC FEVER

Continuous antimicrobial prophylaxis against *Streptococcus pyogenes* infection is recommended for patients with a well documented history of rheumatic fever. Intramuscular administration is preferred, especially in remote areas, as it is more effective and usually leads to better adherence.

No cardiac involvement:

- Benzathine Penicillin 1.2 mega units every 3 - 4 weeks for 5 years or up to 18 years **OR**
- Penicillin V 250 orally 12 hourly, duration same as above.

Patients hypersensitive to Penicillin:

- Erythromycin 250mg orally 12 hourly.

With cardiac involvement:

Drug prophylaxis same as above but until at least 40 years of age and preferably for life, in cases of severe carditis or moderate to severe residual valve disease (including those who have had valve surgery)

If there is evidence of initial cardiac involvement with subsequent resolution, then antibiotic prophylaxis is recommended for up to the age of 25 years.

Note: Compliance with oral prophylaxis is usually less optimal hence injection is preferred.

9.5 PREVENTION OF INFECTIVE ENDOCARDITIS

Prophylaxis for endocarditis is an accepted but an unproven practice. The recommendations listed below are based upon current international practice. The need for prophylaxis depends upon the cardiac condition of the patient and the likelihood of significant bacteraemia being caused by the procedure being performed.

Prophylaxis should be considered in all patients with structural heart disease undergoing surgical procedures and should be given in addition to antibiotics being given for prophylaxis against wound or other surgical infections (surgical prophylaxis).

9.5.1 For all patients at low risk (i.e. without prosthetic valves or a previous attack of infective endocarditis) undergoing dental procedures, oral surgery or upper respiratory tract surgery.

Under Local Anaesthetic

If the patient is not receiving long-term penicillin:

- Amoxicillin 3g orally, 1 hour before the procedure, then 1.5g 6 hours after the initial dose.

If the patient is hypersensitive to penicillin or receiving long term penicillin:

- Erythromycin 1g orally, 2 hours before procedure, then 500mg 6 hours after the procedure.

Under General Anaesthetic

- Ampicillin 2g IV just before the procedure commences or IM 30 minutes before the procedure commences **followed by** Ampicillin 500mg I/IM **or** Amoxicillin 500mg orally 6 hours later.

For patients hypersensitive to penicillin or receiving long term penicillin:

- Vancomycin 1g IV (slowly over 1 hour), the infusion ending just before the procedure commences.

9.5.2 For low risk patients having gastrointestinal, genitourinary or other major surgery, and for patients at high risk (i.e. patients with prosthetic valves or those who have had a previous attack of infective endocarditis) undergoing any type of dental or surgical procedures

- Ampicillin 2g IV just before the procedure commences or IM 30 minutes before the procedure commences, **followed by** Ampicillin 500mg IV/IM **or** Amoxicillin 500mg orally 6 hours later

Patients hypersensitive to Penicillin

- Vancomycin 1g IV (slowly over 1 hour), the infusion ending just before the procedure commences

9.6 POST SPLENECTOMY PROPHYLAXIS

Vaccine preparations available in Fiji include pneumococcal and HiB vaccines. Pneumococcal vaccine is recommended every 5 years, whereas HiB vaccine is recommended once only if the individual has not already been immunised. For elective splenectomy, vaccination should be given two weeks before surgery.

Antibiotic prophylaxis should be assessed for each patient individually. Those at the highest risk include children, during the 1st two years following splenectomy and those associated with severe underlying immunosuppression.

- Penicillin V 250mg orally 12 hourly

For patients hypersensitive to Penicillin

- Erythromycin 250mg orally daily.

Duration of prophylaxis remains unclear but it is recommended that patients should be covered for at least 2 years. However, the risk of bacterial sepsis remains life long.

10.1 PROPHYLAXIS FOR VISITORS TO MALARIOUS AREAS

- i) **Personal protection** against being bitten by mosquitoes is very important even when one is on drug prophylaxis. Keep body well covered, use mosquito nets and use repellants.
- ii) **Chemoprophylaxis.** The choice of drug depends on resistance, side effects of drug, patient criteria e.g. age, pregnancy, renal disease etc.

Prophylaxis is relative, not absolute. Breakthroughs can occur with any of the recommended drugs. The following is based on WHO recommendations for 1997.

Duration of prophylaxis:

Prophylactic drugs should be started at least one week before travel to endemic area. This allows time for the drug to reach adequate tissue levels and also helps to see how well the drug is tolerated. The drugs should be continued for the duration of stay and for a minimum of 4 weeks, preferably 6 weeks, after leaving the malarious area.

Return from malaria infested area:

Any illness within a year of return, especially within three months, might be malaria. Travellers should be warned to consult a doctor and say that they have been exposed to malaria if they fall ill within this period.

The following is only recommended and is not an inflexible directive. Some of the drugs mentioned are not available on the Fiji EDL.

**Prophylaxis in areas of Chloroquine resistant *P.falciparum*.
e.g. Papua New Guinea, Solomon Islands, Vanuatu.**

Adults

- Mefloquine* 250mg orally once weekly **OR**
- Chloroquine 300mg (base) orally once weekly **and** proguanil 200mg orally once daily **OR**
- Doxycycline 100mg orally once daily

Caution: Mefloquine may be associated with neuropsychiatric side effects. It may have antagonistic effects on anticonvulsants and is not safe in pregnancy. It should be avoided in the first trimester of pregnancy. It is contraindicated in patients with neuropsychiatric disorder, epilepsy or cardiac conduction defects. **Doxycycline is also to be avoided in pregnancy**

Children

Babies and children **MUST** be given malaria prophylaxis even if breastfed. Tablets may be broken and are easily crushed (mix with food e.g. jam). Chloroquine is available as syrup (50mg in 5 ml) and this formulation is recommended for babies and young children.

Either mefloquine alone or chloroquine + proguanil are recommended. Dosage as shown in tables below:

MEFLOQUINE

(Not recommended for children under 15 kg or 2 years of age.)

	Weight	Age	Dose (weekly)
Mefloquine 250 mg tablet	15 – 19 kg	2-5 years	¼ tablet
	20 – 30 kg	6-8 years	½ tablet
	31 – 45 kg	9-11 years	¾ tablet
	>45 kg	> 11 years	1 tablet

* Not available on EDL

CHLOROQUINE plus PROGUANIL

Both these drugs are well tolerated by children and appropriate for those under 2 years. The dose /kg given is the minimum recommended to give adequate protection against malaria.

- Chloroquine 5 mg/kg (up to 300mg) once weekly plus
- Proguanil 3mg/kg (up to 200 mg) once daily

Chloroquine and Proguanil *Adult dosage: Chloroquine 300mg weekly Proguanil 200mg daily	Age	Weight	Fraction of Adult Dose*
	Under 6 weeks		1/8
	6 weeks – 1 year	4 – 9 kg	1/4
	1 - 5 years	10 – 19 kg	1/2
	6 – 12 years	20 – 39 kg	3/4
	Over 12 years	> 40 kg	Adult dose

10.2 TREATMENT OF INFECTED PERSONS

If the infective species is not known or if the infection is mixed the treatment should be as for *P.falciparum*.

P.FALCIPARUM MALARIA

As *P. falciparum* is often resistant to Chloroquine, it should not be used for treatment.

Adults

Oral therapy

If no vomiting or impairment of consciousness and patient is able to swallow:

- Artemeter and lumafantrine* 20 + 120 mg, 4 tablets (child 5-14 kg 1 tablet, 15-24 kg 2 tablets, 25-34 kg 3 tablets) at 0, 8, 24, 36, 48 and 60 hours, making a total of 24 tablets

OR

- Quinine Sulphate 600mg orally 8 hourly for 7 days, **PLUS EITHER**
- Fansidar (pyrimethamine 25mg/ sulphadoxine 500mg) 3 tablets as single dose on day three **OR**
- Doxycycline 100mg 12 hourly for 7 days

Intravenous Therapy

If patient is seriously ill or cannot tolerate oral medication:

- *Artesunate 2.4 mg/kg IV on admission and repeated at 12 hours and 24 hours and then daily until oral therapy (6 doses as above) can be given **OR**
- Quinine dihydrochloride as below

Loading dose: 20mg /kg quinine dihydrochloride (maximum 1.4g of quinine salt) infused over 4 hours in 500ml of normal saline. Following this it is advisable to give 500ml 5 % dextrose before the next dose of quinine.

Maintenance dose to start 4 – 8 hours after loading dose is completed: 10mg/kg (maximum 700mg) in 500ml normal saline (infused over 4 hours) 8 hourly. Give 5% dextrose in between doses if necessary.

This is continued until the patient can swallow tablets to complete the 7-day course.

A loading dose of 20mg/kg of quinine should not be given if the patient has received quinine, quinidine or mefloquine during the previous 24 hours. Start on the maintenance dose of 10mg/kg. Dosage may have to be reduced in the presence of hepatic and renal dysfunction.

Quinine can produce hypoglycemia and over hydration may produce pulmonary oedema.

Quinine is followed by **EITHER**:

- Fansidar (Pyrimethamine 25mg/ sulphadoxine 500mg) 3 tablets as a single dose on day 3 **OR**
- Doxycycline 100mg 12 hourly for 7 days (Start as soon as possible)

Children

Dosage should not exceed adult dosage.

Oral Therapy

- Quinine sulphate 10mg/kg orally every 8 hours for 7 days **PLUS**
- Fansidar (pyrimethamine 25mg/ sulphadoxine 500mg) as a single dose on day 3 as shown below:

AGE	DOSE
6 weeks – 1 year	¼ tablet
1 – 4 years	½ tablet
5 – 6 years	1 tablet
7 – 9 years	1 ½ tablets
10 – 14 years	2 tablets
> 14 years	3 tablets

Alternative (not in children <2 years or <15 kg):

- Mefloquine* 20mg/kg of Mefloquine base as a dose or preferably as 2 divided doses 6 -8 hours apart.

Intravenous Therapy:

- Quinine dihydrochloride 10mg/kg every 8 hours in normal saline as described under adults (with volume reduced as appropriate), until patient can swallow, followed by quinine tablets (dosage as above) to complete a seven day course **PLUS**
- Fansidar as above on day 3

IV dextrose solution is required as discussed under adult.

Adjust volume as necessary.

Pregnancy

Malaria is dangerous to the mother in the last trimester and to the foetus throughout the pregnancy. Adult doses of oral and intravenous quinine can safely be given to pregnant women.

BENIGN MALARIA (VIVAX MALARIA)

Treatment should be aimed at eradicating blood and liver stages (radical cure).

Treat as for falciparum malaria (see above), and use primaquine (15 mg orally daily for 21 days after blood eradication) to eradicate liver stages

Children

- Artemeter and lumafantrine as for falciparum malaria above **FOLLOWED BY**
- Primaquine 250micrograms/ kg (max 15 mg) daily for 21 days

Pregnancy

Chloroquine (as for adults).

Primaquine postponed until after delivery since it is harmful to the foetus

- Chloroquine 600 mg (of base) each week to be continued during pregnancy.

11. FEMALE GENITAL TRACT AND OBSTETRIC INFECTIONS

11.1 PELVIC INFLAMMATORY DISEASE

The common organisms are gonococci, chlamydia and a mixture of aerobic and anaerobic organisms.

(a) Mild: for outpatient management

- Doxycycline 100mg orally 12 hourly X 10 days **PLUS**
- Metronidazole 400mg orally 12 hourly X 7 days **PLUS**
- Amoxicillin 500mg orally 8 hourly X 7 days

(b) Severe enough for admission

- Ampicillin 1g IV 6 hourly **PLUS**
- Gentamicin 4 – 6 mg/kg IV as a first dose. See Chapter 1 for subsequent doses based on renal function **PLUS**
- Metronidazole 400mg orally 12 hourly or 500mg PR 8 hourly

Change to oral when infection is resolving:

- Doxycycline 100mg orally 12 hourly X 10 days **PLUS**
- Metronidazole 400mg orally 12 hourly X 7 days.

Add other antibiotics if indicated.

Drainage may be required.

11.2 BARTHOLIN'S ABSCESS

Surgical drainage is required.

- Ampicillin 1g IV as a single dose, followed by oral Amoxicillin if indicated.

11.3 SEXUAL ASSAULT

For empirical therapy against gonorrhoea (and may cover Syphilis). This regimen may not prevent other STIs. It is important that the patient is followed up with clinical examination and serological tests. Antibiotic therapy is indicated where follow up maybe difficult

Adult

- Augmentin (Amoxicillin 500mg and Clavulanic acid 125 mg) 1 tablet orally **PLUS**
- Amoxicillin 2.5g as single dose orally

If Augmentin is not available, then use

- Amoxicillin 3g as a single dose **PLUS**
- Probenecid 500mg as a single dose

Children

- Ceftriaxone 125mg IM as a single dose.

11.4 INFECTIONS IN OBSTETRIC PRACTICE

11.4.1 LOWER URINARY TRACT

If asymptomatic delay treatment until culture and sensitivity result is known. If empirical treatment is indicated:

- Nitrofurantoin 50mg orally 6 hourly **OR**
- Cephalexin* 250mg orally 6 hourly

Change to appropriate antibiotic based upon culture and sensitivity result.

Treatment is usually for 10 – 14 days.

11.4.2 PYELONEPHRITIS

Urine and blood culture are indicated.

- Ampicillin 2 g IV 6 hourly **PLUS**
 - Gentamicin 4-6 mg/kg IV as a first dose. See Chapter 1 for subsequent doses based on renal function
- OR**
- Ceftriaxone 1 g IV 6 hourly as a single agent

Gentamicin may have adverse effects on the foetus. It should only be used where the benefits to the mother outweigh the risks to the foetus. It should be used for the minimum necessary period. Once patient has become afebrile for 72 hours, switch to oral therapy based on culture sensitivity results. Total duration of therapy is 10- 14 days.

11.4.3 BREAST ABSCESS

- Cloxacillin 1g IV 6 hourly X 48 hours, followed by oral treatment as indicated.

If hypersensitive to penicillin consider:

- Cephalothin 1 g IV 6 hourly **OR**
- Erythromycin 500mg orally 6 hourly.

Note: A small percentage of patients hypersensitive to penicillin may also be hypersensitive to Cephalothin (Cephalosporin)

11.4.4 PREMATURE RUPTURE OF MEMBRANES

(a) Pre-term

- Ampicillin 1g IV 6 hourly **PLUS**
- Gentamicin 4-6 mg/kg IV as a first dose. See Chapter 1 for subsequent doses based on renal function

Followed by

- Erythromycin 500mg orally 6 hourly **PLUS**
- Metronidazole 400mg orally 12 hourly

Duration of therapy is usually for one week.

(b) At Term

If the rupture has been for more than 18 hours, antibiotic has to be started

- Ampicillin 1g IV 6 hourly
- Gentamicin 4-6 mg/kg IV as a first dose. See Chapter 1 for subsequent doses based on renal function

The patient is usually induced, and antibiotic coverage includes pre-labour, during labour and post labour for a total of 72 hours.

12. SEXUALLY TRANSMITTED INFECTIONS

12.1 GONOCOCCAL INFECTIONS

Diagnosis should be confirmed by culture where possible and antibiotic sensitivity tests performed. All patients should also have serological tests for syphilis and HIV after confidential counselling.

Follow up cultures should be obtained 5 days following completion of treatment of all gonococcal infections.

12.1.1 Uncomplicated urethral, endocervical, rectal or pharyngeal infections

All these patients are treated for gonococcal and chlamydial infections.

- Probenecid 1g orally as a single dose **PLUS EITHER**
- Augmentin (Amoxicillin 500 mg with Clavulanic acid 125 mg) 1 tablet single dose **OR**
- Amoxicillin 2.5 g orally as a single dose

PLUS EITHER

- Doxycycline 100 mg orally 12 hourly for 7 days **OR**

Procaine penicillin 4 mega units IM as a single dose may be used in place of Augmentin and Amoxicillin.

Alternatives:

- Co-trimoxazole (sulphamethoxazole 400 mg with trimethoprim 80 mg) 5 tablets orally 12 hourly for 5 days **OR**
- Ceftriaxone 250 mg IM as a single dose
EITHER OF THE ABOVE WITH
- Doxycycline 100 mg 12 hourly for 7 days **OR**

12.1.2 Pregnant women

As above, but

- Erythromycin 500mg orally 6 hourly for 7 days should be substituted for doxycycline or tetracycline.

12.1.3 Sex partners

Persons exposed to gonorrhoea within the preceding 30 days should be examined; appropriate samples cultured and treated presumptively as above.

12.1.4 Disseminated Gonococcal Infection

Patients should be hospitalised.

- Ceftriaxone 1g IM/ IV once daily until 2 days after symptoms resolve **followed by**
 - Augmentin (amoxicillin 500 mg with clavulanic acid 125 mg) 1 tablet orally 8 hourly to complete 7 days
- OR** if infection is proven to be penicillin sensitive:
- Ampicillin 1g IV 6 hourly **followed by oral** Amoxicillin 500 mg orally 8 hourly to complete 7 days.

12.1.5 Infants with Gonococcal Ophthalmia

Exclude disseminated gonococcal infection by careful physical examination; aspiration of joints, blood and CSF cultures, where indicated.

All patients must have careful ophthalmological examination and systemic therapy is essential.

(a) Penicillin sensitive *N. gonorrhoeae*

- Penicillin G 50,000 units/kg/dose IV 12 hourly (6 hourly for infants more than 1 week old) for 7 days.

If meningitis or disseminated infection is present, the duration should be increased to 14 days.

(b) Penicillinase producing *N. gonorrhoeae*

- Ceftriaxone 25 – 50 mg/kg/day IV or IM as a single daily dose for 7 days.

Irrigation of eyes with saline is a useful adjunctive therapy.
Topical antibiotics alone are insufficient and are unnecessary when appropriate systemic therapy is given.

Treat mother and sexual partner.

12.1.6 Gonococcal Ophthalmia in older children and adults

Gonococcal Ophthalmia in adults and children more than 20 kg with non-disseminated disease.

- Ceftriaxone 1g IM as a single dose.

Irrigation of eyes with saline is a useful adjunctive therapy.

Topical antibiotics alone are insufficient, and are unnecessary when appropriate systemic therapy is given.

12.1.7 Infection in children following child abuse

- Ceftriaxone 125mg IM as a single dose (or 250mg if child >45kg) **PLUS**
- Doxycycline 100mg orally 12 hourly for 7 days **or**
- for children <9 years old: use Erythromycin

12.2 CHLAMYDIAL INFECTIONS

The decision to treat chlamydial infection alone is based on proven absence of gonorrhoea and presence of chlamydia on testing. Antigen testing is done on endocervical swabs, male urethral swabs or urine, and conjunctival swabs.

Special swabs are available in Suva only at present.

- Azithromycin 1 gm orally as a single dose **OR**
- Doxycycline 100mg orally 12 hourly for 7 days

Where doxycycline is contraindicated (e.g. children, infants, pregnancy):

- Erythromycin 500mg orally 6 hourly for 7 days.

Test of cure is not necessary since resistance of *C. trachomatis* to the above regimens has not been observed.

Sex Partners

Sex partners should be treated for *C. trachomatis* if their contact was within 30 days of onset of symptoms in index case.

12.3 SYPHILIS

Irrespective of clinical presentation anyone suspected of having a STI should have a serological test for syphilis. VDRL test may be negative during primary syphilis therefore treatment should be given to persons presenting with clinical features of primary syphilis e.g. genital ulcers.

All patients with syphilis should be counselled regarding the risks of HIV and be encouraged to be tested for HIV.

12.3.1 Early syphilis – Primary, secondary or early latent syphilis of less than 1 year’s duration.

- Benzathine penicillin 2.4 mega units IM as a single dose.

For penicillin hypersensitivity in non-pregnant patients:

- Doxycycline 100mg orally 12 hourly for 2 weeks **OR**
- Erythromycin 500mg orally 6 hourly for 2 weeks.

Pregnancy: see below

Follow up:

Patient should be re-examined clinically and serologically at 3 months and 6 months.

Patients should have a CSF examination and repeat treatment if:

- (i) VDRL titres have not declined four fold by 3 months in primary or secondary syphilis or by 6 months in early latent syphilis **OR**
- (ii) Signs or symptoms persist and re-infection has been ruled out.

12.3.2 HIV infected patient with syphilis

Initial treatment as above.

Follow up is as follows:

Repeat VDRL test at 1,2,3,6 and 12 months. Any patient with a four-fold increase in titre at any time should have a CSF examination and treated accordingly.

12.3.3 Late latent syphilis (more than 1 year’s duration)

- Gummas and Cardiovascular syphilis Benzathine Penicillin 2.3 mega units IM as a single dose per week for 3 consecutive weeks (total dose 7.2 million units).

Penicillin hypersensitivity in non-pregnant patients:

- Doxycycline 100 mg orally 12 hourly for 4 weeks

Follow up:

Repeat VDRL at 6 and 12 months.

Patient should be evaluated for neurosyphilis if:

1. Neurological signs or symptoms are present
2. Treatment failure (serologically or clinically)

12.3.4 Neurosyphilis

- Penicillin G 1.2 – 2.4 g (2-4 mega units) IV every 4 hours for 10 -14 days **followed by**
- Benzathine Penicillin 2.4 mega units IM weekly for 3 doses.

For those hypersensitive to penicillin, contact Microbiologist or Physician.

Follow up:

If CSF pleocytosis is present initially, repeat CSF examination (VDRL and cell count) every 6 months until the cell count is normal. Re-treat if no decrease in cell count at 6 months or if it is not normal by 2 years.

12.3.5 Syphilis in pregnancy

Pregnant women should be screened early in pregnancy, at first booking to antenatal clinic. Screening should be repeated in the third trimester and preferably again at delivery. Patients should be treated with the penicillin regimen appropriate for the stage of syphilis except for early syphilis, which should be treated as follows:

- Benzathine penicillin 2.4 million units IM given as one dose per week for 3 weeks **OR**
- Procaine penicillin 1.2 mega units daily for 10-14 days (especially after 20 weeks gestation).

Following treatment, monthly VDRL testing should be done for duration of pregnancy.

A repeat course is indicated:

- (a) if the sexual partner was not treated simultaneously
- (b) if the titre is not falling within 6 weeks.

Those hypersensitive to penicillin:

Penicillin therapy after desensitisation is preferred.

For less serious allergy:

- Cephalothin 1 g IV 6 hourly (initially as inpatient), for 10 days.

Note: A small percentage of patients hypersensitive to penicillin are also hypersensitive to cephalothin (cephalosporins).

12.3.6 Infants of VDRL positive mothers

Infants should be treated if any one of the following is present:

In mothers:

- (1) Syphilis untreated or inadequately treated during pregnancy
- (2) Syphilis during pregnancy treated with non-penicillin regimen
- (3) Syphilis during pregnancy treated with an appropriate regimen but the expected decrease in VDRL antibody titres did not occur after therapy
- (4) Syphilis treated less than one month before delivery
- (5) Undocumented syphilis treatment
- (6) Syphilis treated before or during pregnancy but with insufficient serological follow up during pregnancy to assess the response to treatment and current infection status.

In infants:

- (1) Any evidence of active disease (revealed by physical or X-ray findings)
- (2) VDRL titres more than in the mother
- (3) Baby is positive in FTA-Abs IgM test.

If there is no evidence (physical or X-ray) of congenital syphilis but mother or infant has one of the above-mentioned features:

- Procaine Penicillin 50,000 units/kg IM daily for 10-14 days **OR**
- Benzathine Penicillin 50,000 units/kg IM once a week for 3 weeks

Follow up: Repeat VDRL every 3 months till VDRL is negative: Repeat treatment if it remains positive.

12.3.7 Congenital syphilis

When baby has any of the following features it is considered to have congenital syphilis:

- (1) Clinical signs of syphilis
- (2) X-ray changes
- (3) Neurological manifestations

Do CSF VDRL test, cell count, protein estimation in such babies.

If any of the following abnormalities exist indicating neurosyphilis i.e.:

- a) CSF VDRL is reactive
- b) Leucocyte count is $>5/\text{mm}^3$
- c) Protein $>400 \text{ mg/L}$.

Then treat as follows:

- Penicillin G 50,000 units/kg IV 12 hourly for 7 days followed by 50,000 units/kg 8 hourly for a total of 14 days

If CSF findings are negative (congenital syphilis without neurosyphilis) give the same treatment but for 10 days only.

Follow up:

If CSF was positive, repeat VDRL at 6 months. If CSF was negative, follow up as in (3.6).

If no response to treatment, re-treat or consider neurosyphilis.

12.3.8 Older infants and children

If congenital syphilis or neurological involvement:

- Penicillin G 50,000 units/kg IV every 4 - 6 hours for 10-14 days.

Definite acquired syphilis and no neurological involvement:

- Benzathine penicillin 50,000 units/kg IM (max 2.4 mega units/dose) as a single dose.

Evaluate for sexual abuse.

12.3.9 Sex partner

Trace and treat contacts wherever possible as appropriate for the stage of the disease.

12.4 HERPES SIMPLEX VIRUS INFECTION (HSV)

Primary Genital Herpes

- Acyclovir* 400mg orally 8 hourly for 5 days.

Sex Partners:

Evaluate sex partner(s) with genital lesions and treat.

Patient and partner(s) should be counselled about the natural history of the disease with emphasis on potential for recurrences.

Advise abstinence from sexual activity while lesions are present.

12.5 **TRICHOMONIASIS**

- Metronidazole 2 g orally as a single dose.

Recurrent attacks:

- Metronidazole 400 mg orally 12 hourly for 5 days.

Trichomoniasis during pregnancy:

For severe infections in the first trimester.

- Econazole pessaries 150mg at night for 3 days.

Metronidazole is contraindicated in the first trimester of pregnancy and its safety in the last two trimesters of pregnancy is not proven.

For patients with severe symptoms and resistant to econazole the following may be considered after the first trimester:

- Metronidazole 2 g orally as a single dose.

Sex Partners:

Require evaluation and treatment.

12.6 **VULVOVAGINAL CANDIDIASIS**

(This is not strictly a STI but is covered in this section for convenience)

- Econazole nitrate (150 mg vaginal Pessary) 1 pessary at bed time for 3 days.

Sex partners: Treatment not necessary unless candidial balanitis is present, when local therapy is sufficient.

12.7 **BACTERIAL VAGINOSIS**

(non specific vaginitis, Gardnerella vaginosis)

(This is not a proven STI but is covered in this section for convenience.)

- Metronidazole 400 mg orally 12 hourly for 7 days.

Alternative:

- Amoxicillin 500 mg orally 8 hourly for 7 days (preferred if treatment required in pregnancy but less effective than metronidazole).

Sex Partner: Treatment of sex partner is not necessary.

12.8 **GENITAL WARTS**

Genital warts are caused by certain types of Human papilloma virus (HPV). The goal of treatment is removal of exophytic warts and relieving signs and symptoms and not eradication of HPV.

12.8.1 External Genital/ Perianal Warts

- Podophyllin* (20-25%) in compound tincture of benzoin applied to the wart/s.

Note: Burning, pain and inflammation may occur in up to 50% of patients treated with podophyllin.

Total area of wart treated per session should be less than 10cm²

Avoid surrounding skin as far as possible.

Thoroughly wash off after 4 hours.

Repeat applications at weekly intervals.

Contraindicated in pregnancy and breastfeeding mothers.

12.8.2 Vaginal warts

- Podophyllin* (20-25%) in compound tincture of benzoin.

Treatment area should be dry before speculum is removed.

Treat less than 2cm² per session.

Repeat application at weekly intervals.

Contraindicated in pregnancy and breastfeeding mothers.

12.8.3 Urethral meatus

Podophyllin regimen

12.8.4 Anal Warts

Surgical removal.

12.8.5 Oral Warts

Surgical removal or electrocautery.

12.9 CHANCROID (Causative agent *H. ducreyi*)

Considered in the differential diagnosis of any patient with a painful genital ulcer. Nearly 50% of cases have painful inguinal adenopathy.

- Azithromycin 1 gm orally as a single dose **OR**
- Ceftriaxone 500 mg in 2ml of 1% lignocaine IM, or 500 mg IV, as a single dose **OR**
- Erythromycin base 500 mg orally 6 hourly for 7 days.

Alternatives:

- Co-trimoxazole (Sulphamethoxazole 400 mg with trimethoprim 80 mg) 2 tablets orally 12 hourly for 7 days **OR**
- Augmentin (amoxicillin 500 mg with clavulanic acid 125 mg) 1 tablet orally 8 hourly for 7 days.

Sex Partners:

Sex partners, within the 3 weeks preceding onset of symptoms in patients, whether symptomatic or not, should be examined and treated with the above recommended regimen.

Follow up:

Symptomatic improvement is seen within 3 days and resolution of lesions within 7 days. Observe patients until ulcer is completely healed.

12.10 LYMPHOGRANULOMA VENEREUM (LGV)

Caused by LGV serovars of *C. trachomatis*.

Inguinal adenopathy is the most common clinical manifestation.

- Doxycycline 100 mg orally 12 hourly for 21 days.

Alternative:

- Erythromycin 500 mg orally 6 hourly for 21 days.

Sex partners:

Should be treated unless shown to be free from infection.

13. SURGICAL ANTIBIOTIC PROPHYLAXIS

Prophylaxis is the use of antibiotics to prevent surgical site infection and, in some circumstances, bacteraemia. This must be distinguished from their use in early treatment, where infection is already established although not necessarily evident preoperatively (eg removal of a perforated appendix).

Surgical procedures which do not traverse areas with normal flora, other than the prepared skin, do not routinely require prophylaxis.

Prophylaxis should be considered where:

1. there is significant risk of infection e.g. colonic resection
2. infection although uncommon would have severe consequences e.g. that associated with prosthetic implants.

Sufficient concentration of drugs should be available in the tissues at the time of exposure. Therefore, give IM antibiotics 30 minutes to one hour earlier, or IV at induction, rectal or oral 2–4 hours preoperatively.

Antimicrobial prophylaxis should not continue for more than one dose in most cases. This is to avoid suppression of normal flora and superinfection, and reduce the development of resistant organisms. Giving more than 1 dose is not advised except where specifically recommended such as;

- i) when there is a delay in starting the operation
- ii) if the operation is prolonged and the antibiotic has a short half life (e.g. less than 4 hours).

Drugs which will cover the likely organisms are usually chosen. All pre-existing infections should be treated before surgery.

13.1 ORTHOPAEDICS

13.1.1 Clean procedure

- Cloxacillin 2 g IV or Cephalothin 2 g IV at the time of induction for procedures involving insertion of prosthetic or transplant material and internal fixation of fractures of large bones. Allow 5 minutes to elapse between administration of antibiotics and application of tourniquet.

13.1.2 **Compound fractures** will be classified, as “dirty” and a course of antibiotics should be given as treatment.

Course of Treatment:

- Cloxacillin 2 gm IV 6 hourly **PLUS**
- Gentamicin 4-6 mg/kg IV as a first dose, See Chapter 1 for subsequent doses based on renal function

Duration of therapy may vary. If there is no sign of infection antibiotics may be required only for 24 hours.

Consider penicillin G if wound is suspected to be contaminated with *Clostridium perfringens*.

Add metronidazole if there is perineal involvement.

Tetanus toxoid should be given if patient is not immune (last immunisation more than 5 years ago).

13.2 GENTO-URINARY SURGERY

Patients should be shown to have sterile urine pre-operatively. If there is evidence of urinary tract infection the patient should be treated based on the culture and sensitivity results.

If an immediate operation is required and there is bacteriuria or clinical evidence of a urinary tract infection, give a single dose of gentamicin

- Gentamicin 4-6mg/kg IV as a single dose at the time of induction

Single dose prophylaxis may be used before prostatectomy to reduce bacteraemia

- Gentamicin 2 mg/kg IV as a single dose at the time of induction

13.3 CAESARIAN SECTION

13.3.1 All patients who have had vaginal examination(s) and/or ruptured membranes:

- Ampicillin 1- 2g IV at induction

13.3.2 If any sign of infection is present: full 5 – 7 days of antibiotic therapy is recommended

- Gentamicin 240mg as a first dose. See Chapter 1 for subsequent doses based on renal function **PLUS**
- Ampicillin 1g IV 6 hourly

Other antibiotics may be required as indicated by culture and sensitivity results or if there is no clinical response.

13.4 ELECTIVE GYNAECOLOGICAL SURGERY

When the vaginal vault is to be opened, i.e. at hysterectomy.

- Metronidazole 400mg orally 4 hours before surgery **PLUS**
- Ampicillin 1gm IV at induction.

13.5 ELECTIVE GASTRODUODENAL AND BILIARY SURGERY, APPENDICECTOMY AND COLORECTAL SURGERY

- Ampicillin 1-2gm IV at induction **PLUS**
- Gentamicin 2-3mg/kg IV at induction **PLUS**
- Metronidazole suppository 1g rectally 2 hours before surgery as a single dose or 500mg IV (over 20 minutes) to finish at the time of induction.

In low risk surgery, metronidazole is not necessary.

In major colorectal surgery, a second dose of Metronidazole may be required at 4 -6 hours post-induction.

Appendicectomy in situations of gangrene, perforation or abscess should be followed by a therapeutic course with ampicillin, gentamicin and metronidazole for approximately 7 days.

13.6 NEUROLOGICAL SURGERY

Use of prophylaxis is indicated in prolonged procedures, re-explorations and microsurgery.

- Cephalothin 2g IV **OR**
- Cloxacillin 2g IV at the time of induction

13.7 OROPHARYNGEAL AND THORACIC SURGERY

- Cephalothin 2g IV at time of induction.

Add metronidazole if there is a risk of anaerobic infection.

13.8 VASCULAR SURGERY

For arterial reconstructive surgery involving the abdominal aorta and/or the lower limb particularly if a groin incision is involved or if there is implantation of prosthetic material.

- Gentamicin 2mg/kg IV at the time of induction **PLUS**
- Cephalothin 2 g IV at induction as a single agent **OR**
- Cloxacillin 2 g IV at the time of induction

13.9 LOWER LIMB AMPUTATION (for ischaemia or sepsis)

- Penicillin G 1.2 g (2 mega units) IV 6 hourly to start at induction and continue for 48 hours **PLUS**
- Metronidazole 1g rectally 2 hours before surgery **followed by** 400mg orally 8 hourly for 48 hours.

In amputations for diabetic sepsis **add:**

- Gentamicin 2mg/kg IV at induction **followed by** 80 mg IV 8 hourly for 48 hours (dose adjusted for renal function)

13.10 PROPHYLAXIS FOR PATIENTS AT RISK FOR INFECTIVE ENDOCARDITIS

Refer to Section on Non-Surgical prophylaxis, chapter 9.

14. SKIN, MUSCLE AND BONE INFECTIONS

14.1 SKIN AND SOFT TISSUE INFECTIONS

Mild infections require only good skin hygiene.

Antiseptics such as chlorhexidine or povidone iodine may be useful in some cases.

14.1.1 Impetigo

Mild – above measures are adequate

More severe which may be due to *Streptococcus* or *Staphylococcus*, consider

- Flucloxacillin 500 mg (children 12.5 mg/kg up to 500 mg) orally 6 hourly for 10 days

If strep pyogenes is confirmed or suspected, use:

- Penicillin V 500 mg orally 6 hourly for 10 days **OR**
- Procaine Penicillin 1.2 mega units daily for 10 days

For patient hypersensitive to penicillin

- Erythromycin 500 mg orally 6 hourly for 10 days

14.1.2 Folliculitis, Boils and Carbuncles

Usually caused by *Staphylococcus aureus* and/or *Streptococcus pyogenes*

If mild and patient is not diabetic or immunosuppressed, antibiotics are not usually required. If the lesions are small and few in number they may be managed by local antiseptics and hot compresses, with drainage if appropriate.

In other cases:

- Flucloxacillin 500 mg orally 6 hourly for 7 days.

If hypersensitive to penicillin:

- Erythromycin 500 mg orally 6 hourly for 7 days.

If boils are persistent seek expert advice.

14.1.3 Cellulitis

Usually due to *Streptococcus pyogenes* and *Staphylococcus aureus* but could be due to variety of organisms. Therefore, do pus and blood cultures if possible before starting therapy, especially in diabetics and immunocompromised patients. Depending upon severity the duration will range from 10 – 14 days.

Mild Infection in patients who are not diabetic or immunosuppressed:

- Penicillin V 500 mg orally 6 hourly for 7 days **OR**
- Procaine Penicillin 1.2 megaunits IM daily for 7 days

Patients hypersensitive to penicillin:

Mild Infection:

- Erythromycin 500 mg orally 6 hourly for 7 days

If not responding, add:

- Flucloxacillin 500 mg orally 6 hourly for 7 days.

Severe cases including diabetics and immunosuppressed patients:

- Cloxacillin 2g IV 6 hourly initially (until infection subsides), **followed by** Flucloxacillin 500mg orally 6 hourly to complete a course of 10 - 14 days.

If not responding, change antibiotic according to culture results and /or consult physician or microbiologist.

Patients hypersensitive to penicillin

- Cephalothin 2 g IV 6 hourly for 10 –14 days

***Note** : A small percentage of patients hypersensitive to penicillin will also be hypersensitive to cephalothin (cephalosporins). If the patient has immediate hypersensitivity (IgE mediated), use a macrolide or vancomycin.*

14.1.4 Abscess

In mild infections IV cloxacillin is not necessary. A full course of oral flucloxacillin is still indicated. Incision and drainage should be done if and when indicated. *Staphylococcus aureus* is the single most important cause. However, do culture and sensitivity.

- Cloxacillin 2 g IV 6 hourly generally for 48 hours, or until infection subsides, **followed by** Flucloxacillin 500 mg 6 hourly to complete a course of 7-14 days

14.1.5 Bites

Bites can get infected with a variety of aerobic and anaerobic organisms.

Wounds require thorough cleaning, debridement and rest. The decision to use antibiotics will depend on the severity of the bite and evidence of infection.

For small superficial wounds seen early, antibiotics may not be necessary. If obviously infected, a wound swab should be taken and the wound debrided and its closure delayed. These require broad-spectrum antibiotic cover.

Tetanus Toxoid should be administered if the patient is not immune (immunisation more than 5 years ago).

See immunisation schedule

If antibiotic necessary:

Less severe wounds:

- Procaine penicillin 1.2 mega units IM for 5 days **OR**
- Procaine Penicillin 1.2 mega units IM as a single dose, followed by Amoxicillin plus clavulanate 500 + 125 mg 12 hourly **WITH** Amoxicillin 250mg 12 hourly for 5 days.

Severe, multiple or infected wounds:

- Metronidazole 400 mg orally 12 hourly **PLUS**
- Ceftriaxone 1 gm IV daily

14.1.6 Surgical or Traumatic wound infections (restricted to skin and soft tissues)

Antibiotics may not be necessary in mild infections. Where there is collection, drain the pus. Take sample for culture and sensitivity before starting antibiotics.

- Flucloxacillin 500 mg orally 6 hourly for 10- - 14 days

For severe infection:

- Cloxacillin 2 g IV 6 hourly **PLUS**
- Gentamicin 4-6 mg/kg IV as a first dose. See Chapter 1 for subsequent doses based on renal function

Antibiotics may need to be changed based on culture and sensitivity results.

14.1.7 Diabetic Foot Infections

Diabetic foot infection may involve the skin and soft tissue as well as underlying muscle and bone, and should always be regarded as serious. They are often caused by mixed infection with aerobes and anaerobes, gram-positive and gram-negative organisms. Surgical debridement is often necessary. Surgical advice should be sought (this may not be necessary in mild cases)

Proper dressings and wound care are also extremely important.

Adjust drug dosage according to renal function (for drugs excreted via the kidneys), as renal impairment is common in diabetic patients.

The duration of treatment depends upon response.

Mild to Moderate infections:

- Metronidazole 400 mg 12 hourly **PLUS**
- Flucloxacillin 500 mg orally 6 hourly

Severe Infections:

- Metronidazole 400 mg orally 12 hourly **PLUS**
- Cloxacillin 2 g IV 6 hourly **PLUS**
- Gentamicin 4-6 mg/kg IV as a first dose. See Chapter 1 for subsequent doses based on renal function

Consider PR Metronidazole 500mg 12 hourly or 500mg IV 8 hourly if patient is too sick to take oral medications.

Alternative:

- Metronidazole 400 mg orally 12 hourly **PLUS**
- Cephalothin 2 g IV 4 hourly **PLUS**
- Gentamicin 4-6 mg/kg IV as a first dose. See Chapter 1 for subsequent doses based on renal function

Change to oral therapy when the infection is under control

Depending on the organism subsequently isolated, other antibiotics may be indicated. The duration of treatment will depend upon the response.

14.1.8 Necrotising Cellulitis or Fasciitis

Urgent surgical debridement in addition to broad-spectrum antibiotics to cover enterobacteriaceae, anaerobes, streptococcus species and *Staphylococcus aureus*.

- Penicillin G 2.4 g (4 mega units) IV 4 hourly **PLUS**
- Gentamicin 4-6 mg/kg IV as a first dose. See Chapter 1 for subsequent doses based on renal function **PLUS**
- Metronidazole 1 g rectally 12 hourly.

14.1.9 Myositis/ Myonecrosis

Gas gangrene is usually caused by *C perfringens*. It is a surgical emergency.

- Penicillin G 2.4 g (4 mega units) IV 4 hourly

If hypersensitive to penicillin:

- Metronidazole 500 mg IV 8 hourly (infused over 20 minutes)

14.1.10 Burns

For minor burns use sterilised gauze dressing impregnated with white soft paraffin, supplied by pharmacy.

For severe burns or if there is evidence of infection:

- Topical Silvazine cream (1 % silver Sulphadiazine + 0.2 % Chlorhexidine)

It is active against most gram-positive organisms and gram-negative bacteria and yeasts. It can be used with or without a light dressing. It does not penetrate eschar

Systemic antibiotic treatment should not be used routinely but only to treat infections based on culture results.

A single dose of an antibiotic maybe given before surgical debridement, in accordance with the latest microbiology results.

14.1.11 Pyomyositis

Staphylococcus aureus is the most common organism

- Cloxacillin 2 g IV 6 hourly

Duration of therapy depends upon severity and may vary from 14 –21 days. Oral therapy should be instituted as soon as it is appropriate.

If hypersensitive to penicillin:

- Cephalothin 2 g IV 6 hourly

Note: a small percentage of patients hypersensitive to penicillin will also be hypersensitive to cephalothin (cephalosporins). If the patient has immediate hypersensitivity (IgE mediated), use vancomycin

Surgical drainage may be necessary. Antibiotics may need to be adjusted according to culture results.

14.1.12 Mastitis

Acute mastitis is usually associated with lactation and is frequently due to *Staphylococcus aureus*. Milk stasis is to be avoided and therefore suckling and manual expression are important.

In the absence of systemic symptoms these measures are adequate.

If systemic symptoms develop, start antibiotics

- Flucloxacillin 500 mg orally 6 hourly

In severe cases IV therapy may be required.

- Cloxacillin 2 g IV 6 hourly.

In patients hypersensitive to Penicillin

- Cephalothin 2g IV 6 hourly

Duration of therapy will depend upon response.

Note: a small percentage of patients hypersensitive to penicillin will also be hypersensitive to cephalothin (cephalosporins). If the patient has immediate hypersensitivity (IgE mediated) use clindamycin (if available) or erythromycin

14.2 BONE INFECTIONS – OSTEOMYELITIS

The usual causative agent is *Staphylococcus aureus*, or occasionally streptococcus sp.

Intravenous treatment should be given until the patient has been afebrile for several days, when appropriate oral treatment can be substituted. The duration of treatment should be at least 4 and usually 6 weeks. Do culture and sensitivity.

Empirical therapy:

- Cloxacillin 2 g IV 6 hourly, **followed by** Flucloxacillin 1 g orally 6 hourly, for a total course of 6 weeks or longer if necessary, especially in chronic cases.

If oral flucloxacillin causes nausea and vomiting the dose can be reduced to

- Flucloxacillin 500 mg orally 6 hourly **PLUS**
- Probenecid 500 mg 12 hourly

In severe infections consider **adding**:

- Gentamicin 4-6mg/kg mg IV as a first dose. See Chapter 1 for subsequent doses based on renal function

In patients hypersensitive to Penicillin

- Cephalothin 2g IV 6 hourly

In Methicillin resistant *Staphylococcus aureus* or patients with immediate hypersensitivity to penicillin (IgE mediated) use;

- Vancomycin 1 g IV 12 hourly (infuse over 1 hour) **followed by**
- Rifampicin 600mg orally daily

The duration of treatment is as above.

14.3 SEPTIC ARTHRITIS

Empirical therapy – as for osteomyelitis:

- Cloxacillin 2 g IV 6 hourly for at least 2 weeks or until the patient has been afebrile for a few days, **followed by** Flucloxacillin 1 g orally 6 hourly

Duration of treatment and the use of Probenecid is the same as that stated under osteomyelitis

Urgent surgical drainage /lavage and microbiological examination of pus maybe required. Change antibiotics according to culture and sensitivity as appropriate.

15. EYE INFECTIONS

Note: In eye infections there is no place for local steroids, unless specifically recommended by an ophthalmologist.

15.1 ACUTE BACTERIAL CONJUNCTIVITIS

Red and sticky eyes with pus discharging in varying degrees.

- Chloramphenicol 0.5% eye drops 1-2 drops in both eyes at 2 hourly intervals for first day, then 6 hourly for a total of one week (Chloramphenicol 1% eye ointment may be used as an alternative at night) **OR**
- Polyantibiotic eye drops hourly during day time and Polyantibiotic eye ointment applied at night.

15.2 TRACHOMA

Conjunctivitis caused by *Chlamydia trachomatis*

- Azithromycin 1 gm orally as a single dose

If azithromycin is unavailable, use tetracycline 1% eye ointment – twice a day in both eyes for minimum of 6 weeks. Repeat if necessary for another 6 weeks after an interval of 6 months **15.3 EYE LID INFECTIONS**

Stye or tarsal cysts.

Painless tarsal cyst – no antibiotic therapy is necessary.

If infected:

- Use same regimen as in acute conjunctivitis.

15.4 CORNEAL INFECTION

Corneal ulcer with or without pus in anterior chamber.

- Gentamicin 0.3% eye drops – to be reviewed after organism sensitivity is known. Gentamicin to be used half hourly in affected eye with active ulceration. Treatment to be supplemented with subconjunctival injection if pus is present in anterior chamber. (This injection should be given preferably by an Ophthalmologist).
- If Gentamicin not available, polyantibiotic or Chloramphenicol eye drops to be used.

Frequency is reduced with clinical improvement

- Atropine 1% eye ointment must be applied 3 times daily along with antibiotics in active corneal ulceration.

15.5 DENDRITIC CORNEAL ULCERATION

Aetiology is herpes simplex virus

- Acyclovir* 3% eye ointment 3 hourly during day time and 4 hourly at night. Continue for 14 days or at least 3 days after complete healing.

Alternative

- Idoxuridine* 0.1% eye drops hourly during daytime and 2 hourly at night

Antibiotic eye drops have no place here.

15.6 INJURIES

(a) Non perforating eye injuries where cornea is not involved

Non-Infected:

- Chloramphenicol 0.5% eye drops at least 4 times daily during day (to prevent infection) for up to 7 days.

Infected:

- If infected as suggested by sticky discharge, use the regimen as for acute conjunctivitis.

(b) Cornea involved, without infection

- Chloramphenicol 1% eye ointment stat (applied once only), and eye pad daily until cornea is healed. Healing should take place within a few days.

(c) Cornea involved and infection present (suggested by corneal opacification around injury, redness and discharge)

- Treated as for corneal ulcer

15.7 ORBITAL CELLULITIS

This is a serious infection requiring specialised Ophthalmology care and referral to an ophthalmologist.

- Cloxacillin 2 g IV 6 hourly **PLUS**
- Gentamicin 4-6 mg/kg IV as a first dose, See Chapter 1 for subsequent doses based on renal function

If response is inadequate **ADD**

- Ampicillin 2 g IV 6 hourly

15.8 OPHTHALMIA NEONATORUM

See Sexually Transmitted Infections

16. DENTAL INFECTIONS

16.1 ACUTE DENTO-ALVEOLAR INFECTIONS

(Abscesses and Periodontal infections)

Odontogenic infections require clinical dental management to remove the source of the infection. Antibiotics should be considered *only* when the infection has spread beyond the confines of the jaw and has produced facial swelling, or when there are systemic symptoms and fever.

(a) Abscess without Cellulitis

- Penicillin V 500 mg orally 6 hourly for 5 days **OR**
- Amoxicillin 500 mg orally 8 hourly for 5 days.

If hypersensitive to Penicillin

- Erythromycin 500 mg orally 6 hourly for 5 days

(b) Abscess with Cellulitis

- Penicillin 1g stat and 500 mg 6 hourly for 7 days **OR**
- Amoxicillin 500 mg orally 8 hourly for 7 days **PLUS EITHER OF THESE WITH**
- Metronidazole 400 mg orally 12 hourly for 7 days.

If hypersensitive to Penicillin:

- Erythromycin 500 mg orally 6 hourly for 7 days **PLUS**
- Metronidazole 400 mg orally 12 hourly for 7 days.

Severe Infection:

- Penicillin G 600 mg (1 mega unit) IV 4 - 6 hourly **OR**
- Ampicillin 1 g IV 4 - 6 hourly **PLUS (either of these with)**
- Metronidazole 400 mg 12 hourly for 7 days.

16.2 PERICORONITIS

(Infection of gums around teeth)

- Metronidazole 400 mg orally 12 hourly for 5 days **OR**
- Penicillin V 500 mg orally 6 hourly for 5 days **OR**
- Amoxicillin 500 mg 8 hourly for 5 days **PLUS with each of the above**
- Chlorhexidine 0.2% aqueous solution mouthwash

16.3 ACUTE NECROTISING ULCERATIVE GINGIVITIS

- Metronidazole 400 mg orally 12 hourly for 7 days
- Peroxide* or Perborate* mouth rinse 3 times a day – hold it for 2 minutes **PLUS**
- Chlorhexidine 0.2% aqueous solution mouthwash 3 times a day.

Scaling, oral hygiene and appropriate pain relief are also important.

In severe cases, penicillin V 500mg orally 6 hourly for 5 days should be added to the above regimen

16.4 ORAL ULCERS

- Antiseptic oral rinse e.g. Chlorhexidine 0.2% aqueous solution mouthwash 3 times daily for 7 – 14 days **PLUS**
- Topical use of analgesic/ anaesthetic e.g. Choline salicylate* **PLUS**
- Triamcinolone 0.1% in Orabase* 2 – 3 times daily for 7 – 14 days.

16.5 CANDIDIASIS

- Nystatin suspension 100,000 U (1mL) 4 times a day (swirl around the mouth and swallow) for 7 – 14 days **OR**

- Nyastatin Lozenges* – 1 lozenge (dissolves slowly in mouth) 4 times a day for 7 – 14 days.

For severe infections needing systemic therapy, consider amphotericin, ketoconazole or fluconazole*. These patients require referral.

16.6 FACIAL FRACTURES (involving mucus membranes)

- Penicillin V 500 mg orally 6 hourly for 7 days

If patient cannot swallow tablets or capsules, suspension may be used.

If parenteral therapy is considered necessary:

- Procaine penicillin 1.2 mega units IM daily for 5 days

If hypersensitive to Penicillin:

- Erythromycin 500mg 6 hourly orally (or IV if severe) 6 hourly for 7 days.

Antiseptic mouthwash e.g. Chlorhexidine 0.2% aqueous solution for 4 – 6 weeks and analgesics as required.

16.7 DENTO-ALVEOLAR SURGERY (Tooth extraction, cyst removal etc)

Indications for antibiotic therapy:

- (i) Signs of infection e.g. fever
- (ii) Excessive trauma during surgery

- Penicillin V 500 mg orally 6 hourly for 5 days
-

If hypersensitive to Penicillin:

- Erythromycin 500 mg orally 6 hourly for 5 days.

Analgesics, anti-inflammatory and decongestant therapy as required.

Patients with valvular heart disease require prophylaxis – see Non Surgical Prophylaxis – chapter 9

16.8 ALVEOLITIS (DRY SOCKET)

Antibiotics are required only if there are systemic signs of infection. Various dental dressings, antiseptics mouthwash as required.

General Information – Prescribing Antimicrobials in Children

1. In general, children over 40kg should receive adult dose.
2. In all cases the maximum dose should not exceed adult dosage.
3. Special care should be taken in neonates, especially in the first few weeks of life. Dosage intervals may need to be extended owing to poor drug metabolism and excretion.
4. All intravenous antimicrobials should be given by slow infusion to avoid thrombophlebitis.
5. Gentamicin levels should be monitored whenever possible; renal function however needs to be monitored in all children on gentamicin

CARDIOVASCULAR SYSTEM INFECTIONS

BACTERIAL ENDOCARDITIS

There are 3 important principles of management:

1. Treatment must be given intravenously for at least 2 weeks
2. Treatment is prolonged – usually 4-6 weeks
3. Drug regimens must be used in high enough concentrations.

There are several alternative regimens reported in the literature and consultation with a physician or microbiologist should be sought if necessary. Surgical consultation should be considered especially in cases, which are fulminating, complicated or slow respond.

Take blood for culture before initiating therapy. *S aureus* is not an uncommon cause of endocarditis in Fiji, hence cloxacillin is included in the empirical regimen. Other common organisms include *viridans* group streptococci and occasionally gram-negative bacilli.

Empirical treatment:

- Penicillin G 100,000 units/kg/dose (max 3 mega units/dose) 4 hourly for 6 weeks **PLUS**
- Cloxacillin 50mg/kg/dose (max 2g/dose) 4 hourly for 6 weeks **PLUS**
- Gentamicin 2 – 2.5mg/kg/dose (max 80 mg/dose) 8 hourly IV for 2 weeks (dose adjusted for renal function)

Monitor gentamicin levels.

If hypersensitive to Penicillin, in hospital acquired endocarditis or if prosthetic valve in situ:

- Vancomycin 30mg/kg/dose (max 1.5 gm/dose) IV (infused over 1 hour) 12 hourly **PLUS**
- Gentamicin 2 – 2.5mg/kg/dose (maximum 80 mg/dose) 8 hourly IV for 2 weeks (dose adjusted for renal function)

Blood levels of both gentamicin and vancomycin should be monitored if possible

Drug therapy may need to be altered based on culture and sensitivity results. If the blood culture is negative, continue with empirical therapy if the patient is responding.

PREVENTION OF INFECTIVE ENDOCARDITIS

All children with structural heart disease - congenital (except ASD) or rheumatic - require antibiotic prophylaxis.

(a) Low risk patients (i.e. without prosthetic valves or previous attack of endocarditis) undergoing dental treatment, oral surgery or surgical procedures of the respiratory tract.

- Ampicillin 50mg/kg (max 1g) IV just before procedure OR Amoxycillin 50mg/kg (max 2 g) orally 1 hour before procedure,

(cb) **Low risk patients** having gastrointestinal or urinary procedures or other major surgery, and for **High risk patients** (i.e. prosthetic valve, previous attack of the infective endocarditis) undergoing any type of dental or surgical procedures

- Ampicillin 50mg/kg (max 1g IV just before procedure followed by Ampicillin 25mg/kg (max 500mg) IV/IM or Amoxicillin 25mg/kg (500mg) orally 6 hours later

If hypersensitive to penicillin:

- Vancomycin 20mg/kg IV (max 500mg) (infused over 1 hour) started 60minutes before procedure. May repeat once after 12 hours.

RESPIRATORY INFECTIONS

ACUTE SORE THROAT

Streptococcal sore throat is diagnosed by the presence of tender enlarged lymph nodes in the neck and white exudates in throat or β -haemolytic streptococcus group A on throat swab culture.

- Benzathine Penicillin: 25 000 – 50 000 units /kg/ dose (max 1.2 mega units) as a single IM dose **OR**

Penicillin V 7.5 – 15mg/ kg/ dose (max 500 mg/ dose) orally twice daily for 10 days Although amoxicillin is widely used, penicillin V has a narrow spectrum and covers *Strep Pyogenes*, which is the organism of concern, so the use of amoxicillin is discouraged

If hypersensitive to penicillin:

- Erythromycin 12.5mg/kg/dose (max 500mg/dose) orally 6 hourly for 10 days.

ACUTE BACTERIAL OTITIS MEDIA & SINUSITIS

Common organisms are *Streptococcus pneumoniae*, *Haemophilus influenzae* & *Staphylococcus aureus*.
Diagnostic criteria: pus draining from ear for less than 2 weeks or red, bulging immobile eardrum

- Amoxicillin 10 – 30mg/kg/dose (max 500mg) orally 8 hourly for 5 days.

The following shows Amoxicillin oral dosage according to age/weight:

< 2 months (< 5kg):	62.5 mg 8 hourly
2 months up to 12 months (6 – 9kg):	125 mg 8 hourly
12 months up to 5 years (10 – 19 kg):	250 mg 8 hourly

OR

- Co – trimoxazole syrup (40mg Trimethoprim & 200mg Sulphamethoxazole/ 5ml). Dosage for co-trimoxazole is calculated as Trimethoprim 2.5mg/ kg/ dose orally 12 hourly for 7 -10 days.

The following shows Co-trimoxazole syrup dosage according to age/weight:

1-2 months (< 5kg):	2.5mLs 12 hourly
2 months to 12 months (6-9 kg):	5.0mLs 12 hourly
12 months to 5 years (10 – 19 kg):	7.5mLs 12 hourly

Infants < 2 months ideally should be admitted and treated as follows (Note: avoid Co-trimoxazole infants < 1 month)

- Ampicillin 25 mg/kg/dose IV 6 hourly for 7 – 10days **PLUS**
- Gentamicin 2 mg/kg/dose IV 12 hourly for 5 – 7 days

If hypersensitive to penicillin:

- Erythromycin 12.5mg/kg/dose (max 500mg/dose) orally 8 hourly for 7 days

ACUTE EPIGLOTTITIS

This is paediatric emergency. Stridor of epiglottitis is usually of lower pitch than that heard in croup and there is expiratory element which resembles a snore. These children can also present with aphonia and drooling. The most common micro-organism is *Haemophilus influenzae*. Do not attempt to examine the throat as this can precipitate a laryngeal spasm causing acute obstructive episode. Refer for admission.

- Ceftriaxone 25mg/kg (up to 1gm) IV daily for 5 days

COMMUNITY ACQUIRED PNEUMONIA

Infants under 2 months of age are considered to have severe pneumonia – see Moderate to Severe disease below.

Mild Disease

Infant age: 2 months – 1 year (6 – 9 kg)

Clinically – cough and tachypnoea (respiratory rate 50 breaths per minute or more). No chest indrawing.

- Procaine Penicillin 400,000 units/dose IM daily for 5 days **OR**
- Amoxicillin syrup (125mg/5mL) 25 mg/ kg/ dose (max 250mg) orally 12 hourly for 3 days **OR**
- Co-trimoxazole syrup (40mg Trimethoprim and 200mg Sulphamethoxazole in 5ml), dosage for Co-trimoxazole is calculated as trimethoprim 2.5mg/kg/dose orally 12 hourly for 3 days

Review child after two days or sooner if child is not improving.

Children aged 1 to 5 years

Cough, no chest indrawing. Fast breathing is 40 breaths per minute or more.

- Procaine Penicillin 25,000 – 50,000 units/kg (max 1 mega unit) IM daily for 5 days **OR**
- Amoxicillin syrup (125mg/5mLs) 25 mg/kg/dose (max 375mg /dose) orally 12 hourly for 3 days **OR**
- Co- trimoxazole syrup (40mg Trimethoprim & 200mg Sulphamethoxazole in 5mLs), dosage for co-trimoxazole is calculated as trimethoprim 2.5mg/kg/dose orally 12 hourly for 3 days.

Review as above.

Children over age 5 years

- Procaine Penicillin 25,000 – 50,000 units/kg (max 2 mega unit) IM daily for 5 days **OR**
- Amoxicillin syrup 10 – 20mg/kg/dose (max 500 mg/dose) 8 hourly orally for 5 days

Review as above.

Moderate to severe disease

Clinical finding of chest indrawing in child with cough, fever. Before starting antibiotics blood or any other samples required should be taken for culture

Infants less than 2 months

- All pneumonia in infants less than two months should be regarded as **severe** and therefore child should be admitted and treated.

- Severely malnourished children should receive double antibiotic therapy to cover gram positive and gram-negative organisms, until culture and sensitivity results are available.
- Ampicillin 50mg/kg/dose IV 6 hourly **PLUS**
- Gentamicin 2.5mg/kg/dose IV 12 hourly in infants < 2 months

If there is any suggestion of Staphylococcal infection:

- Cloxacillin 50mg/kg/dose IV 6 hourly **PLUS**
- Gentamicin 2.5mg/kg/dose IV as above

The total duration of therapy is 7 – 10 days, and 14 days for Staph infection

Children aged 2 months and over

- Penicillin G 50,000units/kg/dose (max 1 mega unit / dose) IV 6 hourly for 3 days **followed by** Procaine penicillin 50,000 units/kg/dose (max 2 mega units) IM daily to complete at least 7 days **PLUS**
- Gentamicin 2.5mg/kg/dose IV 12 hourly

Where Staphylococcal infection is suspected;

- Cloxacillin 50 mg /kg/dose (max 500mg/dose) IV 6 hourly for a minimum of 14 days

ATYPICAL PNEUMONIA (Non-Viral)

Mycoplasma pneumoniae can cause pneumonia in children. Onset is more gradual than pneumonia due to *Streptococcus pneumoniae* or *H. influenzae*.

- Erythromycin 10 –12.5mg/kg/dose (max 500mg/dose) IV 6 – 8 hourly (by slow infusion in Normal Saline) **OR** orally (depending on clinical condition) for 7 – 10 days

LUNG ABSCESS AND/OR EMPYMA

Usually staphylococcal in aetiology. Other organisms including anaerobes may be involved; consider the addition of other antibiotics if necessary e.g. Metronidazole or Chloramphenicol. Empyema must be drained adequately. Surgical drainage of lung abscess will depend on the size.

- Cloxacillin 50-mg/kg/dose (max 2g/dose) IV 6 hourly for 2 weeks **followed by** Flucloxacillin 25mg/kg/dose (max 500mg /dose) orally 6 hourly.
Treatment is usually for 10 -14 days, or longer if required depending upon the response.
PLUS
- Gentamicin 2 –2.5mg/kg/dose (max 80mg/dose) IV 8 hourly for 5 – 7 days (to start at the same time as cloxacillin)

Clinician may decide to add Rifampicin 10 – 15mg/kg (max 600mg) orally daily for 10 –14 days together with Cloxacillin (never alone)

GASTROINTESTINAL INFECTIONS

ACUTE GASTROENTERITIS

Oral rehydration therapy – (ORS – Oral; Rehydration Solution) is the mainstay of treatment to correct dehydration and replaces losses.

The indications for antibiotic treatment in acute diarrhoea are cholera and bloody diarrhoea. Regimens shown below are for empirical therapy where immediate treatment is required. Antibiotic therapy should be modified if necessary according to culture and sensitivity results

Bloody Diarrhoea

Rule out non-bacterial causes of bloody stools and collect stool sample for culture and sensitivity testing before starting antibiotic therapy. Antibiotic therapy is generally not recommended in uncomplicated diarrhoea or mild cases.

Regimens include:

- Co-trimoxazole (Trimethoprim 40mg and Sulphamethoxazole 200mg/5mLs) calculated as Trimethoprim 2.5/kg/dose, 12 hourly for 5 days **OR**
- Chloramphenicol 12.5 mg/kg/dose (max 500mg/dose) orally 6 hourly for 5 days. **OR**
- Ceftriaxone 50mg/kg daily IV X 3 days in dysentery with seizures (neurotoxin)

Cholera

- Co-trimoxazole suspension (Trimethoprim 40mg and Sulphamethoxazole 200mg/5mLs) calculated as Trimethoprim 2.5mg/kg/dose, 12 hourly for 3-4 days.

CHRONIC DIARRHOEA

Chronic diarrhoea also requires investigation for non- infective causes

Giardiasis:

- Metronidazole 10 mg/kg/dose (max 400mg/dose) orally 8 hourly for 7 – 10 days

Amoebic Dysentery:

- Metronidazole 10mg/kg/dose (max 400mg/dose) orally 8 hourly for 7 -10 days

Strongyloidosis:

- Ivermectin 200microgram/kg orally with fatty food on day one, repeat after 7-14 days

TYPHOID /PARATYPHOID FEVER

- Ciprofloxacin 15mg/kg (to a maximum of 500 mg) orally 12 hourly for 5 days or until patient is free of symptoms for 24 hours – whichever is the longest.
If oral treatment is not possible, give ciprofloxacin 10mg/kg (up to maximum of 400 mg) IV 12 hourly until patient can tolerate oral treatment

Alternative drugs are chloramphenicol, amoxicillin or cotrimoxazole, but these must be given for at least 2 weeks

It is essential the patient completes the full course of treatment, even if they have fully recovered.

CENTRAL NERVOUS SYSTEM INFECTIONS

ACUTE BACTERIAL MENINGITIS

Treatment of meningitis in children includes:

- 1) Antibiotic therapy
- 2) Dexamethasone
- 3) Therapy to eradicate nasopharyngeal carriage of *H. influenzae* and meningococcus, both for index case and contacts – see Non – Surgical Prophylaxis – chapter 13

Infants two months and above

Usually blood cultures are taken and a CSF specimen is taken for culture and bacterial antigens before institution of antibiotics, unless there is a contraindication to lumbar puncture, for example a very sick child and/or raised intracranial pressure

- Penicillin G 100,000 units/kg/dose (max 4 mega units/dose) IV 6 hourly **PLUS**
- Chloramphenicol 25mg/kg/dose (max 1g /dose) IV 6 hourly

Duration of treatment varies from 10 to 14 days depending on causative organism and clinical state of the child.

Added Drugs:

- Dexamethasone 0.15mg/kg/dose IV 6 hourly for 4 days (first dose to be given before antibiotics are given).

If there is no clinical response or bacteria resistant to above drugs:

- Ceftriaxone 50mg/kg (max 2g/dose) IV as a single dose daily for 10 – 14 days

BRAIN ABSCESS

When a brain abscess is suspected treat for 6 weeks. CT scan and surgical drainage may be indicated.

- Ceftriaxone 50mg/kg (maximum 2g) IV as a single daily dose **PLUS**
- Metronidazole 15mg/kg stat then 7.5mg/kg/dose IV 8 hourly **PLUS**
- Cloxacillin 50mg/kg/dose (max 2g/dose) IV 6 hourly

In infants under the age of 2 months

- Ceftriaxone 50mg/kg/dose IV in a single daily dose **PLUS**
- Ampicillin 50-75mg/kg/dose IV 6 hourly

Treatment should be for 21 days.

HERPES SIMPLEX ENCEPHALITIS **(SUSPECTED OR PROVEN)**

- Acyclovir 500mg/m²/dose IV 8 hourly for 14 days, each dose to be infused over not less than one hour (dosage adjusted according to renal function)

[Body Surface Area in m²:

Multiply height (in cm) by weight (in kg), and then divide the answer by 3600. Find the square root of this figure.]

URINARY TRACT INFECTIONS

Appropriate collection of urine is essential before starting antibiotics. Adjust antibiotics if necessary when culture and sensitivity results are available. Treat for 7 – 10 days. All children with proven UTI should undergo investigations to determine whether there is some abnormality in the urinary system.

- Trimethoprim suspension (50mg/5mLs) 2.5mg/kg/dose, 12 hourly (maximum 300mg/day) for 7 -10 days

Serious cases of UTI (temperature equal to or more than 39° C), dehydrated, not tolerating oral medication, not feeding well or less than 3 months of age of age need admission.

- Ampicillin 25 – 50 mg/kg/dose (max 1g/dose) IV 6 hourly **PLUS**
- Gentamicin 2mg/kg/dose (max 80mg/dose) IV 8 to 12 hourly **OR**
- Ceftriaxone 50mg/kg/dose dose (max 1g/day) IV daily as a single agent

Children with vesico-uretic reflux will need to be on prophylactic antibiotics:

- Trimethoprim suspension (50mg/5mLs) 1-2 mg/kg as a single dose daily at night **OR**
- Co-trimoxazole suspension (Trimethoprim 40mg and Sulphamethoxazole 200mg/5mLs) calculated as Trimethoprim 1-2mg/kg/dose at night (avoid in children under 1 month old) **OR**
- Nitrofurantoin 1-2mg/kg/dose (max 50mg/dose) at night (avoid in children under 3 months old) **OR**
- Nalidixic acid 12.5mg/kg/dose at night (avoid in children under 3 months old)

SKIN, MUSCLE AND BONE INFECTIONS

SKIN AND SOFT TISSUE INFECTIONS

Mild disease requires only good skin hygiene. Topical antibiotics are not required.

Impetigo

Can resolve with topical agents e.g. Chlorhexidine or Povidone iodine. If oral antibiotics are required, they need to cover the causative agents, usually *Staphylococcus aureus*, occasionally *Streptococcus pyogenes*.

- Flucloxacillin 12.5mg/kg/dose (max 500mg/dose) orally 6 hourly for 5-7 days. Do culture & sensitivity of pus and change antibiotic if necessary.

If hypersensitive to penicillin:

- Erythromycin 10 – 12.5mg/kg/dose (max 500mg/dose) orally 6 – 8 hourly for 5 – 7 days

Folliculitis, Boils and Carbuncles

Usually caused by *Staphylococcus aureus* and /or *Streptococcus pyogenes*.

If small and few apply local antiseptics and hot compresses with drainage where appropriate.

If lesions are extensive or if there are systemic signs:

- Cloxacillin 12.5mg/kg/dose (max 500mg/dose) IV 6 hourly until there is a clinical response, **followed by**
- Flucloxacillin 12.5mg/kg/dose (max 500mg/dose) orally 6 hourly for a total of 7 days

In some cases oral flucloxacillin may be all that is required.

If hypersensitive to penicillin:

- Erythromycin 10 – 12.5mg/kg/dose (max 500mg/dose) orally 6 -8 hourly for 7 days.

Cellulitis

Usually due to *Streptococcus pyogenes* and *Staphylococcus aureus* but could be due to variety of organisms. Therefore, do culture before starting therapy.

- Cloxacillin 25 – 50mg/kg/dose (max 1g/dose) IV 6 hourly until there is a clinical response, **followed by**
- Flucloxacillin 12.5 mg/kg/dose (max 500mg/dose) orally 6 hourly to complete a total of 5-10 days.

Consider the following if flucloxacillin is not available, or addition of Penicillin if patient is not responding to cloxacillin:

- Penicillin G 50, 000 units/kg/dose IV 6 hourly until there is clinical response, **followed by**
- Amoxicillin 10 -20 mg/kg/dose (max 500mg/dose) orally 8 hourly to complete a total of 5-10 days.

Mild Cases;

Consider oral amoxicillin or flucloxacillin; dosage as above.

Erysipelas

- Penicillin G 50,000 – 100,000 units/kg/dose (max 4 mega units/dose) 6 hourly until there is clinical response, followed by
- Procaine Penicillin 50,000 units/kg IM daily to complete 7 days

Abscess

Incision and drainage should be done if and when indicated. *Staphylococcus aureus* is the single most important cause. However, do culture.

If abscess is mild and there are no signs of systemic infections:

- Flucloxacillin 12.5mg/kg/dose (max 500mg/dose) orally 6 hourly for 7 days

In moderate to severe cases:

- Cloxacillin 25-50mg/kg dose (max 1g/dose) IV 6 hourly until there is clinical response **followed by**
- Flucloxacillin 12.5mg/kg/dose (max 500mg/dose) orally 6 hourly for 7 days

Suppurative Wound Infections (Surgical or Traumatic)

Local measures such as surgical drainage and irrigation with normal saline usually suffice. If there is surrounding cellulitis and/or systemic symptoms are present – take wound swab and treat with:

- Flucloxacillin 12.5mg /kg/dose (max 500mg / dose) orally 6 hourly

If gram-negative organisms are suspected add:

- Gentamicin 2mg/kg/dose (max 80mg/dose) IV 8 –12 hourly **OR**
- Cephalothin 25 –50mg /kg/dose (max 2g/dose) IV 6 hourly **OR**
- Ceftriaxone 50mg/kg/dose (max 2g/dose) IV as a single dose daily.

Duration depends on response to therapy, approximately 7 days or may be longer. Antibiotics may need to be changed based on culture and sensitivity results.

ACUTE OSTEOMYELITIS

Advice from orthopaedic surgeon is to be sought in all cases of osteomyelitis (acute and chronic)

- Cloxacillin 50 mg/kg/dose (max 2g/dose) IV 4 – 6 hourly for 2 -4 weeks **followed by** Flucloxacillin 25mg/kg/dose (max 1g/dose) orally 6 hourly for a total of **4 -6 weeks**
PLUS
- Gentamicin 2mg/kg/dose (max 80mg/dose) IV 8 hourly for 1 week

Alternative:

- Ceftriaxone 50mg/kg/dose (max 2g/dose) IV as a single dose daily for 4 – 6 weeks

In children under 5 years

In this age group *H.influenzae* is not an uncommon causative organism. If cultured, to cloxacillin therapy (as above) add:

- Ampicillin 25 – 50 mg/kg/dose IV 6 hourly for 2 -4 weeks, **followed by**
- Amoxicillin 25 – 50mg/kg/dose orally 8 hourly to complete a total of 4 – 6 weeks

SEPTIC ARTHRITIS

Aspiration and culture of synovial fluid and surgical consultations is essential. Treatment should be altered according to culture and sensitivity results.

Empirical therapy:

- Cloxacillin 50mg/kg/dose (max 2g/dose) IV 6 hourly for at least 2 -4 weeks **followed by**
- Flucloxacillin 25 – 50 mg/kg/dose (max 1g/dose) orally 6 hourly for a total of 4 – 6 weeks

In neonates and Infants **ADD:**

- Gentamicin 2mg/kg/dose IV 12 hourly for 1 week initially

Alternative:

- Ceftriaxone 50mg/kg/dose (max 2g /dose) IV as a single dose daily for 4 – 6 weeks

ORBITAL CELLULITIS

The most common organisms are *streptococci*, *staphylococci*, *H influenzae*. Other organisms are possible, hence the use of gentamicin

- Cloxacillin 50mg/kg/dose (max 2g/dose) IV 6 hourly **PLUS**
- Gentamicin 2mg/kg/dose (max: 80mg/dose) IV 8 – 12 hourly for 7 – 10 days.

INFANT IMMUNISATION SCHEDULE

BCG – Bacillus Calmette –Guerin vaccine
 OPV – Oral Polio vaccine
 HBV – Hepatitis B vaccine
 DPT – Diphtheria Pertussis Tetanus vaccine
 HIB – Haemophilus influenzae type B vaccine
 TT – Tetanus Toxoid

INFANTS

Age	Vaccine	Dose and Mode of Administration
Birth	BCG OPV 0 HBV 0	0.05mL – intradermal 2 drops - oral 10micrograms – intramuscular
6 weeks	DTP-Hep B-Hib 1 OPV1	0.5ml -Intramuscular 2 drops - oral
10 weeks	DTP-Hep B-Hib 2 OPV2	0.5ml -Intramuscular 2 drops - oral
14 weeks	DTP-Hep B-Hib 3 OPV3	0.5ml -Intramuscular 2 drops - oral
12 months	Measles/ Rubella 1	0.5mL - intramuscular

SCHOOL CHILDREN

Age	Vaccine	Dose and Mode of Administration
At School Entry	TT4 MR2	0.5mL – intramuscular 0.5mL – intramuscular
At School Leaving	TT 5	0.5mL – intramuscular

NONIMMUNISED or PARTIALLY IMMUNISED CHILDREN

Vaccine	Age when Identified	Number of doses needed in total	Dose	Administration	Interval Between Doses
BCG	<12 months	1	0.05 mL	Intradermal	N/A
DTP-Hep B-Hib	<8 years	3	0.5mL	Intramuscular	1 month
TT	>8 years	3	0.5mL	Intramuscular	1 month
Hep B	>8 years	3	0.5mL	Intramuscular	1 month
MR	>12 months < school entry	1	0.5mL	Intramuscular	N/A
	>School Entry	2	0.5mL	Intramuscular	1 month
OPV	Any age	3	2 drops	Oral	1 month

Three doses of Hepatitis B vaccine can be given but it is recommended that the immunological status of the child is first determined.

ANTENATAL WOMEN (for neonatal tetanus prevention)

A. First Pregnancy

Dose	When to give	Expected duration of protection
TT1	At first contact or as early as possible in pregnancy	None
TT 2	At least 4 weeks after TT 1	1 – 3 years
TT 3	At least 6 months after TT 2	5 years
TT 4	At least one year after TT 3 or during subsequent pregnancy	10 years
TT 5	At least one year after TT 4 or during subsequent pregnancy	All childbearing years

It is envisaged that the first three doses can be administered to a woman in her first pregnancy. The third dose, if need be can given during MCH clinic for the baby.

18. SPECIAL INFECTIONS

MRSA INFECTION/COLONISATION

Infections due to methicillin resistant staphylococci (MRSA) are increasing in Fiji. All patients or staff from whom MRSA is isolated will not necessarily require systemic antibiotic therapy

The drug of choice in treating serious MRSA infection is vancomycin, however, it is expensive, is not readily available and is not efficient in eradicating the organisms from carriage sites such as the pharynx, nares and gut.

For treating serious infections (septicaemia, endocarditis etc) vancomycin injection is recommended, **to be given according to the dosage regimens in the individual chapters.**

If vancomycin is not available, and in conditions such as diabetic foot ulcers due to MRSA, a combination of rifampicin with another anti-staphylococcal drug like fusidic acid can be used. Since resistance to rifampicin develops during treatment, this drug should never be given alone. The choice of these drugs should be based on sensitivity test results. Consult microbiologist for advice.

- Rifampicin 300- 600mg orally 12 hourly **PLUS**
- Fusidic Acid 500mg orally 8 – 12 hourly for 2 weeks

Some patients may not be able to tolerate this regimen and other combinations may have to be tried.

For clearance of MRSA carriage topical application of mupirocin ointment may be useful.

LEPTOSPIROSIS

Less serious infections with leptospira will resolve without antibiotics. In more severe cases the following is recommended:

- Penicillin G 1.2g (2 mega units) IV 6 hourly for 7 days **OR**
- Doxycycline 100mg orally 12 hourly for 7 days

Note: Chloramphenicol is not effective.

19. TREATMENT OF TUBERCULOSIS

The WHO declared a global emergency in 1993 in recognition of its growing importance in Public Health problems. A new framework for effective TB control was developed and a global strategy called DOTS (Directly Observed treatment Short course) was introduced. DOTS strategy is applied to all patients confirmed to have TB in Fiji. Patients undergo intensive phase (first 2-3 months) in hospital and continuation phase (4-5 months) at home under the guidance of an appointed supervisor.

Diagnosis of TB wherever possible should be based on smear examination, culture, imaging techniques and if indicated tissue biopsy.

Treatment of TB consists of multi-drug regimen administered to the patient for a period of 6-9 months, or longer in exceptional cases. Choice of regimen and its length is determined by the category of the disease. Vast majority of TB cases present as pulmonary TB. Ensuring adherence with treatment and performing appropriate contact tracing and screening, with institution of preventive treatment if appropriate is vital. Prior to treatment a baseline renal function and liver function is important. Visual acuity is to be assessed if Ethambutol is used.

Essential Anti-Tuberculosis Drugs

There are three main properties of antituberculosis drugs: bactericidal activity, sterilizing activity and ability to prevent resistance. Rifampicin and isoniazid are the most powerful bactericidal drugs, active against all populations of TB bacilli. Rifampicin is the most potent sterilizing drug available. Pyrazinamide and streptomycin are also bactericidal against certain population of TB bacilli. Streptomycin is bactericidal against rapidly multiplying TB bacilli. Ethambutol is used in association with more powerful drugs to prevent the emergence of resistant bacilli, as it is bacteriostatic.

Rifampicin, Isoniazid and Pyrazinamide are hepatotoxic. Streptomycin and ethambutol are excreted by the kidney.

Combination preparations available in Fiji include rifampicin and isoniazid (Rifampinah), which comes in two strengths: 300/150mg and 150/100mg

In adults pyridoxine is usually given with isoniazid to minimise neurological side effects.

19.1 Standard Short Course Therapy

Case category	Intensive phase (Weight >50kg Daily dose)	Continuation phase (Weight >50kg daily dose)
New	Rifampicin 10mg/kg (600mg) Isoniazid 5mg/kg (300mg) Pyrazinamide 25mg/kg (2G) Ethambutol 15mg/kg (800mg) 2 months	Rifampicin (600mg) Isoniazid (300mg) 4 months
Retreatment	Rifampicin 10mg/kg (600mg) Isoniazid 5mg/kg (300mg) Pyrazinamide 25mg/kg (2G) Ethambutol 15mg/kg (800mg) Streptomycin (15mg/kg) 3 months {2months}	Rifampicin (600mg) Isoniazid (300mg) Ethambutol (800mg) 5 months

Pyridoxine 25mg orally daily is given as a routine with the above drugs

To maximize adherence and drug levels, all medication should ideally be given together in a single daily dose, 30 minutes before breakfast.

Standard short course therapy usually renders a patient non-infectious within 2 weeks of starting therapy and produces a cure in approximately 98% of cases.

The usual cause of treatment failure is poor adherence and in such cases directly observed therapy should be given or treatment regimen changed, and TB specialist contacted.

Resistance to current anti-TB drugs has not been reported in Fiji.

19.2 Treatment of Extra-pulmonary TB

This is more difficult to diagnose than pulmonary disease, often requiring invasive procedures to obtain diagnostic specimens. Patients with this form of disease are not infectious unless they also have pulmonary involvement.

Therapeutic regimen is the same as for pulmonary TB but of longer duration and is often combined with surgery.

Corticosteroids are essential in the treatment of tuberculous pericarditis and may be of benefit in the first few weeks of treatment of tuberculosis meningitis.

19.3 Treatment Regimens in Special Situations

19.3.1 Pregnancy and Breastfeeding

Most anti-TB drugs are safe for use in pregnancy except for streptomycin, which can cause ototoxicity in the foetus.

All anti-TB drugs are compatible with breastfeeding which should not be stopped during treatment. The baby should be given prophylaxis with isoniazid for at least 3 months beyond the time the mother is considered non-infectious. BCG vaccination of the newborn should be postponed until the end of isoniazid prophylaxis.

19.3.2 Oral Contraceptives

Rifampicin interacts with oral contraceptives and another form of contraception is advisable. Rifampicin interacts with other drugs as well, see under chapter 1.

19.3.3 Liver Disorders

Liver function should be checked before commencement of therapy. In the presence of pre-existing liver disease or if aspartate transaminase (AST)/ alanine transaminase (ALT) levels are more than twice the normal, regular monitoring of liver function test is essential. If patient develops jaundice or AST and ALT levels rise above 5 times the normal, anti-TB drugs should be stopped. However, Streptomycin and Ethambutol can be continued.

19.3.4 Renal Failure

Isoniazid, Rifampicin and Pyrazinamide are safe. Streptomycin and Ethambutol usage requires dose adjustment and monitoring of renal function.

19.3.5 HIV Infection

Standard short course therapy may be prolonged to 9 months in HIV infected individuals. Adverse drug reactions and interactions are common.

19.4 TB in Children

When a child contracts TB it means there are infectious adults around. The vaccine BCG is given at birth to all babies to protect them from severe manifestation of the disease i.e. TB meningitis, miliary TB.

Diagnosis is dependent on history, chest X-ray findings, and positive mantoux tests. Gastric aspirates obtained for AFB microscopy has a place in supporting the diagnosis of Pulmonary TB, but it is invasive and is rarely carried out in pediatric and TB units.

Chemoprophylaxis

In cases of latent infection, full-blown TB can develop later. Treatment at this stage will prevent development of this disease later.

Preventive treatment should be considered in:

- Adults with strongly positive tuberculin reaction (i.e. > 15mm in duration or 10mm with blisters),
- Immune-suppressed contacts with evidence of previously untreated inactive TB.
- Children exposed to or born to smear positive patients or mothers suffering infectious form of TB respectively

[NB] Active TB must be

- Isoniazid 300mg daily at least for 6 months **PLUS**
- Pyridoxine 25mg orally once daily

20.1 *Pneumocystis carinii* (now called *pneumocystis jiroveci*) Pneumonia

Pneumocystis jiroveci pneumonia is the commonest pulmonary infection in AIDS.

Presentation is often with indolent onset of fever, non-productive cough, progressive dyspnea and bilateral crackles

The gold standard for therapy at present is with Co-trimoxazole (trimethoprim 80 mg and Sulphamethoxazole 400mg), which is effective in approximately 90% of patients. However the incidence of side effects is higher.

- Co-Trimoxazole (Trimethoprim component 15-20 mg/kg per day orally / IV in 2-4 divided doses) X 21 days

Prophylaxis (after first episode of infection):

- Co-trimoxazole (Trimethoprim 160mg / Sulphamethoxazole 800 mg) orally daily or two times daily for 2 days of a week

20.2 CEREBRAL TOXOPLASMOSIS

Toxoplasmosis is the most common cause of secondary CNS infection in patients with AIDS. The standard treatment is combination therapy with Pyrimethamine* and Sulphadiazine*.

(a) Primary Therapy

- Sulphadiazine* 1 – 1.5g orally / IV 6 hourly **PLUS**
- Pyrimethamine* 50mg orally initially then 25mg orally daily,

Calcium Folate can be added to reduce bone marrow suppression, and the white cell and platelet count must be monitored closely.

In patients hypersensitive to Sulphonamides substitute sulphadiazine with

- Clindamycin* 600mg orally/ IV 6 hourly

Duration of therapy is for 3 – 6 weeks depending on clinical response.

(b) Prophylaxis

Relapse is common, so maintenance therapy is necessary while the patient is immunosuppressed;

- Co-trimoxazole (Trimethoprim 160mg / Sulphamethoxazole 800 mg) orally once daily **PLUS**
- Pyrimethamine* 25mg orally daily

OR

- Clindamycin* 600mg orally 8 hourly **PLUS**
- Pyrimethamine* AND Folinic Acid* as above.

20.3 CRYPTOCOCCAL MENINGITIS

Therapy should be initiated immediately in any patient with evidence of cryptococcal infection. The diagnosis depends upon the presence of budding yeasts in the CSF and detection of cryptococcal antigen in the blood and CSF.

(a) Initial Therapy:

- Amphotericin B 0.7 –1.0 mg/ kg/ day IV once daily
The duration of treatment is achieved when total cumulative dose reaches 3g

With (if tolerated)

- 5-flucytosine 25 mg/ kg IV or orally 6 hourly X 14 days

OR (Mild Disease)

- Fluconazole 200 – 400mg IV or orally once daily X 8 –10 weeks (as a single agent)

(b) Maintenance Therapy

- Fluconazole 200mg / day

Primary prophylaxis is not recommended

20.4 HERPES SIMPLEX

Therapy (primary infection, 1st episode):

- Acyclovir* 400mg orally 8 hourly X 7 – 10 days **OR** until clinical resolution.

Severe Disease

- Acyclovir 5 – 10mg/kg IV every 8 hours X 7 – 10 days **OR** until clinical resolution (dose and frequency reduced in renal failure)

Long-term suppressive therapy for frequent recurrent episodes

- Acyclovir* 400mg orally twice daily

20.5 HERPES ZOSTER

Therapy

- Acyclovir* 800 mg orally 5 times per day at least for 7 days (until lesions crust)

Disseminated

- Acyclovir 10 mg/kg/day 8 hourly IV at least 7 days

20.6 FUNGAL SKIN INFECTIONS

20.6.1 Superficial Skin Infection

- Whitfield's ointment applied two times daily X 2 weeks
- Ketoconazole* cream or ointment

Extensive disease

- Griseofulvin 250-500mg orally once daily **OR**
- Ketoconazole 200mg orally once daily

Duration of therapy is usually 1 – 3 months

20.6.2 Candidiasis

Oropharyngeal (Oral Thrush)

- Nystatin 500,000 units gargle 4 times per day until symptoms resolve (10 – 14 days)

Vaginitis

- Econazole intravaginal suppository 200mg X 3 days

Oesophagitis

- Fluconazole 200 mg for the first dose, then 100mg orally daily X 2 – 3 weeks

Consider maintenance therapy with Fluconazole 100 mg orally for recurrent oesophagitis.

20.7 HIV RELATED DIARRHOEA

Salmonella / Shigella Enterocolitis (may cause bacteremia or focal extraintestinal infection)

- Ciprofloxacin 500mg orally 12 hourly X 14 days

Campylobacter colitis (this may cause bacteremia)

- Erythromycin 500mg orally 6 hourly X 2 weeks

Cryptosporidiosis

- Paramomycin* 500mg orally every 8 hours X 2 weeks

20.8 TREATMENT OF *Mycobacterium tuberculosis*

Refer to chapter 19 under Tuberculosis.

21. TREATMENT OF ANAPHYLAXIS

Allergic reactions may be triggered by a variety of factors including drugs (eg Penicillin), foods (eg shellfish), insect stings and chemicals. There is a wide spectrum of severity ranging from a harmless skin rash (urticaria), to potentially fatal airway obstruction (laryngeal oedema) and full blown anaphylaxis (hypotension, bronchospasm). Anaphylaxis is much more common in adults than children.

The mainstays of treatment are oxygen, adrenaline and intravenous fluid. Steroids may prevent relapse and antihistamine provide some relief of urticaria itch but these drugs do nothing for the life threatening features of acute severe anaphylaxis.

In ADULTS:

1. Airway and Breathing

Administer high flow oxygen via face mask. Administer a bronchodilator.
Give *Salbutamol 5mg via nebulizer.*

2. Adrenaline

If severe (hypotension or severe bronchospasm or stridor or hypoxia):

Give adrenaline 0.5mg intramuscularly and repeat in 5 minutes if required

OR

If less severe (systolic blood pressure greater than 90mmHg, mild bronchospasm, no stridor and no hypoxia):

Give adrenaline 100mcg intravenously each minute until symptoms subside

3. Intravenous Fluids

Give 0.9% saline 250ml intravenous bolus and repeat if necessary.

NOTE: Large volumes of intravenous fluid may be necessary to maintain adequate blood pressure in severe anaphylaxis.

4. Corticosteroids

Give hydrocortisone succinate 200mg intravenously THEN 100mg six hourly

OR

Give dexamethasone 8mg intramuscularly

OR

Give prednisone 50mg orally daily

NOTE All patients with significant anaphylaxis should be observed for 24 hours as relapse may occur.

5. Anti-histamines

Give promethazine 25mg intramuscularly followed by either 25mg intramuscularly three times daily or 20mg orally

6. Other Issues

1. Proper documentation of all cases.
2. Patient and relatives should be educated to avoid subsequent episodes.
3. Patient may be provided with a medic alert bracelet.
4. Some patients may require adrenaline syringes for home use.

In CHILDREN:

1. Airway and Breathing

Administer high flow oxygen via a face mask. Bronchodilators reduce bronchospasm.

Give *salbutamol 2.5mg via nebuliser in children 5 years of age or under, for children older than 5 years give salbutamol 5mg via nebuliser*

2. Adrenaline

Give *adrenaline 10mcg/kg IV over 1 minute and repeat in 5 minutes if required.*

NOTE: If intravenous access is not available then adrenaline may be given via the intramuscular route:

Give *adrenaline 10mcg/kg intramuscularly*

3. Intravenous Fluids

Give *0.9% saline 10ml/kg bolus intravenously and repeat as necessary*

4. Corticosteroids

Give *Hydrocortisone succinate 4mg / kg intravenously*

OR

Give *Dexamethasone 0.2mg/ kg intramuscularly*

OR

Give *Prednisolone 1mg/ kg orally*

NOTE: All patients with significant anaphylaxis should be observed for 24 hours as relapse may occur.

5. Anti-histamines

Consider use of promethazine

6. Other Issues

6. Proper documentation of all cases.
7. Patient and relatives should be educated to avoid subsequent episodes.
8. Patient may be provided with a medic alert bracelet.
9. Some patients may require adrenaline syringes for home use

22. ANTIBIOTIC USE DURING PREGNANCY AND BREASTFEEDING

PREGNANCY

The nature of adverse effects of drug use during pregnancy depends upon the time of exposure, teratogenicity being a major risk to drug exposure during the first trimester, while in second and third trimesters fetal growth and functional development may be affected.

Categorization of drugs in pregnancy*

Category A

Drugs which have been taken by a large number of pregnant women and women of childbearing age without any proven increase in the frequency of malformations or other direct or indirect harmful effects on the fetus having been observed.

Category B1

Drugs which have been only taken by a limited number of pregnant women and women of child bearing age, without an increase in the frequency of malformation or other direct or indirect harmful effects on human fetus having been observed. Studies in animals have not shown evidence of an increased occurrence of fetal damage.

Category B2

Drugs which have been taken by only a limited number of pregnant women and women of childbearing age, without an increase in the frequency of malformation or other direct or indirect harmful effects on the human fetus having been observed. Studies in animals are inadequate or maybe lacking, but available data show no evidence of an increased occurrence of fetal damage.

Category B3

Drugs which have been taken by only a limited number of pregnant women and women of childbearing age, without an increase in the frequency of malformation or other direct or indirect harmful effects on the human fetus having been observed. Studies in animals have shown evidence of an increased occurrence of fetal damage, the significance of which is considered uncertain in humans.

Category C

Drugs, which owing to their pharmacological effects, have caused or maybe suspected of causing, harmful effects on the human fetus or neonate without causing malformations. These effects maybe reversible. Accompanying texts should be consulted for further details.

Category D

Drugs, which have caused, are suspected to have caused or maybe expected to cause, an increased incidence on human fetal malformations or irreversible damage. These drugs may also have adverse pharmacological effects. Accompanying texts should be consulted for further details.

Category X

Drugs which have such a high risk of causing permanent damage to the fetus that they should not be used in pregnancy or when there is a possibility of pregnancy.

BREASTFEEDING

There are two important issues to consider when prescribing drugs/ antibiotics during breast-feeding; firstly the likely exposure of the drug to the infant (who is an innocent bystander) and secondly the likely effect the drug may have on milk supply. A risk benefit analysis is warranted.

Simple advice such as feeding the infant just before the next dose or alternatively taking the medication just after breastfeeding thus avoiding likely peak milk concentrations can be given.

Antimicrobial	Use in breastfeeding	Use in Pregnancy
Acyclovir	Safe to use	B3
Amoxycillin	Safe to use, may cause loose bowel action in infant.	A
Amoxycillin + clavulanic acid	Safe to use, may cause loose bowel action in infant.	B1
Amphotericin	Safe to use	B3

Antimicrobial	Use in breastfeeding	Use in Pregnancy
Ampicillin	Safe to use, may cause loose bowel action in infant.	A
Benzathine penicillin	Safe to use, may cause loose bowel action in infant.	A
Benzyl penicillin	Safe to use, may cause loose bowel action in infant.	A
Cefaclor	Safe to use, may cause loose bowel action in infant.	B1
Ceftriaxone	Safe to use, may cause loose bowel action in infant.	B1
Cephalothin	Safe to use, may cause loose bowel action in infant.	A
Chloramphenicol	Safe to use, may cause loose bowel action in infant.	A
Chloroquine (prophylaxis)	Safe to use	A
Chloroquine (treatment)	Contact specialist, risk benefit ratio in favour of use.	D
Ciprofloxacin	Use alternatives when possible, short courses maybe acceptable in some circumstances.	B3
Cotrimoxazole	Avoid use in ill, stressed, pre-term infants or infants with hyperbilirubinaemia or G6PD deficiency.	C, Contraindicated in late pregnancy
Dapsone	Neonates with G6PD deficiency are susceptible to dapsone haemolysis. Contact specialist.	B2
Doxycycline	Theoretical risk, no case reported. Short courses of 7 – 10 days.	D , safe to use during the 1 st 18 weeks of pregnancy
Econazole	<i>Safe to use</i>	A
Erythromycin	Safe to use, may cause loose bowel action in infant.	A
Ethambutol	Safe to use	A
Flucloxacillin	Safe to use, may cause loose bowel action in infant.	B1
Gentamicin	Safe to use	D , reserve for severe or life threatening infections, fetal nephrotoxicity and ototoxicity have been reported.
Griseofulvin	Avoid use	B3
Isoniazid	Safe to use	A
Ketoconazole	Maybe used, very small amounts excreted in breast milk.	B3
Lamivudine	Discourage breastfeeding, risk of postnatal transmission.	B3
Mebendazole	Maybe used, poorly absorbed by mother	B3
Metronidazole	Safe to use, may cause bitterness in milk. Dose preferably twice daily after breastfeeding.	B2
Nitrofurantoin	Use with caution, may cause haemolysis in G6PD deficiency	A
Nystatin	Safe to use	A
Phenoxymethylpenicillin	Safe to use, may cause loose bowel actions in infant	A
Piperacillin	Safe to use, may cause loose bowel actions in infant	B1
Primaquine	Avoid use	D , avoid use in 3 rd trimester, may cause neonatal haemolysis & methaemoglobinemia

Antimicrobial	Use in breastfeeding	Use in Pregnancy
Procaine penicillin	Safe to use, may cause loose bowel actions in infant	A
Pyrantel	Safe to use	B2, avoid use in 1 st trimester.
Pyrazinamide	Amount too small to be harmful	B2
Quinine		D
Rifampicin	Maybe used	C
Sulphonamides		C
Streptomycin	Safe to use	D
Tetracycline	Theoretical risk, no case reported. Short courses of 7 – 10 days.	D , safe to use during the 1 st 18 weeks of pregnancy
Trimethoprim	Safe to use	B3
Vancomycin	Safe to use	B2
Zidovudine	Discourage breastfeeding, risk of postnatal transmission.	B3

* By Australian Drug Evaluation Committee (ADEC)

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