

**WESTERN CAPE
ACADEMIC HOSPITALS
ANTIMICROBIAL RECOMMENDATIONS**

**and
WOUND CARE MANAGEMENT**



**NATIONAL HEALTH
LABORATORY SERVICE**

2011

Acknowledgements

This booklet has been made possible by valuable input from many different people at both Groote Schuur and Tygerberg Hospitals. As far as possible members of different departments were consulted about issues that particularly affected their discipline. Suggestions for changes are always welcome and should be communicated to Prof Elizabeth Wasserman at Tygerberg Hospital and Dr Stephen Oliver at Groote Schuur.

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This booklet is an initiative of the National Health Laboratory Service (NHLS) at Groote Schuur and Tygerberg Hospitals

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ANTIMICROBIAL AGENTS AVAILABLE

The doses stated are those generally prescribed for adults although exceptions may occur (where dose per kg is used, the calculation was performed for a 70 kg patient).

DRUG NAME	DOSE	DOSING INTERVAL	HOSPITAL COST (per day, in rands)
ANTIMICROBIALS – oral			
Amoxicillin	500mg	8 hourly	0.80
Azithromycin	500mg	daily	11.30
Cefixime	400mg	daily	20.55
Cefuroxime	250mg	12 hourly	2.63
Ciprofloxacin	500mg	12 hourly	0.60
Clarithromycin	500mg	12 hourly	3.52
Clindamycin	450mg	8 hourly	11.59
Co-amoxiclav	1g	12 hourly	2.63
Co-amoxiclav (for UTI only)	375mg	8 hourly	2.64
Cotrimoxazole	160/800mg (2 tabs)	12 hourly	0.42
Doxycycline	100mg	12 hourly	0.41
Erythromycin	500mg	6 hourly	3.36
Ethambutol	1.2g	daily	1.51
Ethionamide	750mg	daily	4.67
Flucloxacillin	500mg	6 hourly	2.70
Fusidic acid	500mg	8 hourly	106.20
Isoniazid	300mg	daily	0.14
Linezolid	600mg	12 hourly	513.17
Metronidazole suppository	1g	8 hourly	5.33
Metronidazole	400mg	8 hourly	0.19
Moxifloxacin	400mg	daily	26.77
Nitrofurantoin	100mg	8 hourly	6.23
Ofloxacin TB only	800mg	daily	4.45
Para-amino Salicylic acid [#]	4g	8 hourly	121.26
Penicillin V	500mg	6 hourly	1.26
Pyrazinamide	1.5g	daily	0.80
Rifampicin	600mg	daily	2.22
RHZE (4 drug combination for TB) [*]	5 tablets	daily	3.57
Terizidone	250mg	8 hourly	19.25
ANTIVIRALS – oral			
Abacavir	300mg	12 hourly	10.44
Acylovir H. simplex	400mg	8 hourly	1.03
Acylovir H. zoster	800mg	5 times daily	3.45
Lopinavir/ritonavir (Aluvia)	2 tablets	12 hourly	10.14
Lamivudine	150mg	12 hourly	1.26
Zidovudine	300mg	12 hourly	2.32
Stavudine	30 mg	12 hourly	0.55
Didanosine	400 mg	daily	4.81
Tenofovir	300mg	daily	4.37

^{*} 4-drug combination tablets (Rifampicin, isoniazid(H), pyraZinamide, Ethambutol) are provided by different suppliers under various trade names e.g. RIFAFOUR E-200, RIMSTAR and MYRIN PLUS. We recommend the use of the abbreviation RHZE when prescribing.

ANTIFUNGALS – oral

Fluconazole	400mg	daily	2.99
Griseofulvin	500mg	daily	2.25
Itraconazole	200mg	12 hourly	43.06
Ketoconazole	400mg	daily	5.02
Nystatin suspension	1ml	6 hourly	0.78
Voriconazole	200mg	12 hourly	200.29
Amphotericin B lozenges	1	6 hourly	16.97

ANTIHELMINTHICS – oral

Albendazole	400mg	stat	6.99
Praziquantel	3.5g	daily	58.22

ANTIMICROBIALS – parenteral

Amikacin	1g	daily	10.62
Ampicillin	1g	6 hourly	8.34
Capreomycin [#]	1g	daily	105.51
Cefazolin (prophylactic use)	1g	stat	4.02
Cefepime	1g (2g for Pseudomonas)	12 hourly	39.04
Ceftazidime	1g (2g for Pseudomonas)	8 hourly	154.80
Ceftriaxone	1g	daily	5.23
Ceftriaxone	2g (using 1g vial)	12 hourly	20.88
Cefotaxime	1g	8 hourly	13.53
Cefuroxime	750mg	8 hourly	29.40
Chloramphenicol	500mg	6 hourly	24.46
Ciprofloxacin	400mg	8 hourly	208.62
Clarithromycin	500mg	12 hourly	241.00
Clindamycin	600mg	8 hourly	35.60
Cloxacillin	2g	6 hourly	87.20
Co-amoxiclav	1.2g	8 hourly	45.00
Colistin	3MU	8 hourly	184.68
Cotrimoxazole	160/800mg (2 amps)	12 hourly	8.32
Erythromycin	1g	6 hourly	621.48
Ertapenem	1g	daily	368.33
Fusidic acid	500mg	8 hourly	410.97
Gentamicin	420mg	daily	11.44
Imipenem	500mg	6 hourly	484.80
Isoniazid	300mg	daily	(if prepared in pharmacy) 60.46
Kanamycin	1g	daily	11.50
Linezolid	600mg	12 hourly	521.00
Meropenem	1g	8 hourly	779.85
Metronidazole	500mg	8 hourly	13.65
Ofloxacin [#]	400mg	12 hourly	1535.24
Penicillin benzathine	2.4MU	weekly	7.56
Penicillin G (benzyl)	2MU	6 hourly	(using a 1MU vial) 44.64
Penicillin procaine	600 000U	daily	1.76
Piperacillin/tazobactam	4.5g	8 hourly	295.65
Rifampicin	600mg	daily	308.90
Streptomycin	1g	daily	4.62
Teicoplanin	200mg	daily	71.25
Tobramycin	420mg	daily	(six 80mg vials) 65.94

[#] not available at TBH

Vancomycin	1,5g	12 hourly	193.16
ANTIVIRALS – parenteral			
Acyclovir	500mg	8 hourly	307.62
Ganciclovir	350mg	12 hourly	632.38
ANTIFUNGALS – parenteral			
Amphotericin B	45mg	daily	32.44
Amphotericin B (bladder washouts)	50mg/l	daily	(incl 1lt water for injection)76.96
Fluconazole	400mg	daily	90.06
Voriconazole	200mg	12 hourly	681.00

GENERAL COMMENTS

This handbook is not intended to be an antibiotic textbook nor to replace the antibiotic section of the SAMF. Its function is to indicate the GSH and TBH antibiotic recommendations and to provide some additional therapeutic suggestions for a number of clinical situations. These guidelines pertain to local antibiotic sensitivity patterns and may not be appropriate in other areas.

Awareness of cost

Choices often exist between antibiotics of equal efficacy and safety but differing cost. Where such a choice exists the cheaper agent should be used whenever possible. If a more expensive agent is used empirically, a change to a cheaper, appropriate agent should be made as soon as the sensitivity report is available.

The cost of the same antibiotic can differ markedly depending on its route of administration e.g. IV versus oral or rectal metronidazole, IV versus oral cotrimoxazole, IV versus IM penicillin (see page 6)

Direct IV administration by slow injection into the drip tubing can be used for many agents e.g. aminoglycosides, penicillins and cephalosporins. This avoids the costs of minibags and additional lines.

Dose

There is an erroneous belief that maximal doses are always best. The dose most frequently used in adults is given in the listing on page 5. However, doses should be tailored to individual patients and may differ according to the site of infection. Always consider a loading dose in critically ill patients requiring ICU admission and ensure that the antibiotic is administered as soon as an infectious aetiology is considered. Delays result in poorer outcomes.

Duration of therapy

Duration of therapy should be determined by clinical factors such as site of infection, severity of illness and response to treatment. As a general guide, antibiotics can be discontinued within 48-72 hours of the temperature returning to normal. Infections at certain sites (e.g. pyelonephritis, osteitis or endocarditis) or with particular organisms, may require more prolonged therapy. Guidelines are given in the text where this is relevant. In uncomplicated infections oral antibiotics or an early change from IV to oral therapy is frequently justified.

With all antibiotics, but particularly with toxic agents, an ongoing re-evaluation of the patient's infection should occur with the aim of stopping the antibiotic as soon as it is no longer necessary.

Antibiotic levels

Measurement of serum antibiotic levels should be routinely performed when administering aminoglycosides or vancomycin.

For aminoglycosides a peak level should be established as soon as possible i.e. after the first or second dose, in order to confirm that an adequate dose for that patient is being administered. Peak levels are taken one hour after a bolus IM or IV, or one hour after an IV infusion is commenced. Once an adequate peak level has been achieved, only trough levels need be monitored (usually twice a week) provided the patient's renal function remains stable. Trough levels are taken just before the next dose. Requests for levels should be submitted to the pharmacology laboratory.

For vancomycin a peak level is usually not necessary. The first trough level should be measured just before the fourth dose. Thereafter trough levels should be measured twice a week (provided they are in the therapeutic range). When vancomycin is administered to patients in renal failure a stat dose should be followed by a "random" measurement of the vancomycin level one to five days later, depending on the degree of renal dysfunction. In patients with sensitive organisms, trough vancomycin levels should be maintained between 10 and 15 mg/l, but higher concentrations are recommended for organisms with higher MICs (consult with microbiology or infectious diseases and see "Vancomycin" below).

Antibiotic prescribing in renal impairment

Drug adjustments are based on the patient's estimated endogenous creatinine clearance using the modified Cockcroft and Gault formula:

$$\text{Creatinine clearance (ml/min)} = \frac{(140 - \text{age}) \times \text{Wt (kg)}}{\text{serum creatinine } (\mu\text{mol/l)}}$$

(For women multiply calculated creatinine clearance by 0.85 to adjust for lower contribution of muscle mass to total body weight.)

Most antibiotic dosages need to be adjusted in the setting of renal failure. Patients receiving dialysis may require dose adjustments especially if the dialysis leads to increased clearance of the drug.

The following agents listed need **not** be adjusted in renal failure. All other antibiotics, antifungals and HIV drugs require dose adjustments in renal insufficiency.

Antibiotics: azithromycin, ceftriaxone, ciprofloxacin, clindamycin, doxycycline, linezolid, moxifloxacin, rifabutin, rifampicin, isoniazid

Antifungals: amphotericin B, itraconazole and voriconazole

Antivirals: abacavir, efavirenz, nevirapine, lopinavir

Consult the following references for further information:

- South African Medical Formulary

- The Sanford Guide to Antimicrobial Therapy

Nosocomial Infection

Definition

Nosocomial infection can be defined as an infection occurring at least 48 hours after hospital admission. Infections that arise within 30 days of an operation and other infections that follow discharge from hospital may also be classified as hospital acquired depending on the nature of the infection.

Diagnosis

- The diagnosis of nosocomial sepsis is firstly based on clinical features. Always attempt to make a clinical assessment of the likely source of infection.
- It is essential to obtain appropriate microbiology cultures, including properly collected blood cultures, before antimicrobial therapy is initiated in view of the high risk of multi-drug resistant organisms.

Choice of antibiotics

- Choice of empiric antibiotic therapy is influenced by knowledge of local pathogens and antibiotic sensitivities, as well as by the nature and severity of the patient's condition, duration of hospitalization, location in the hospital (general ward vs ICU), previous infection or colonisation with particular pathogens and previous antibiotic therapy.
- Common nosocomial pathogens in the Western Cape include ESBL-producing Enterobacteriaceae which are resistant to all penicillins and cephalosporins, cloxacillin-resistant staphylococci and carbapenem-resistant Acinetobacter species.
- ICUs have the highest prevalence of nosocomial infections as well as the greatest rate of antibiotic resistance.
- For severely ill patients initial broad-spectrum antibiotic therapy is recommended, together with a commitment to de-escalate to more narrow-spectrum specific therapy, according to microbiological results. Initial broad-spectrum antibiotic therapy provides maximum benefit for the individual, severely infected patient, whereas switching to a specific antibiotic therapy according to microbiological data may help to minimize the risk of emerging resistance. (Gert Höffken, Michael S. Niederman. Nosocomial Pneumonia The Importance of a De-escalating Strategy for Antibiotic Treatment of Pneumonia in the ICU Chest 2002; 122:2183-2196)
- Antimicrobial regimens should always be reassessed after 48 – 72 hours. The aim must be to use a narrow spectrum antibiotic according to microbiology results and clinical evidence.
- The Study of the Efficacy of Nosocomial Infection Control (SENIC) demonstrated that a third of nosocomial infection might be prevented with appropriate infection control measures.

NOTES ON SPECIFIC AGENTS

PENICILLINS

Penicillin allergic patients

Different alternatives are appropriate in different clinical situations. For soft tissue infections, clindamycin can be used. Erythromycin is not recommended for severe infections as many staphylococci and some strains of *Streptococcus pyogenes* (group A β haemolytic streptococcus) are resistant. For pneumonia, moxifloxacin is a suitable agent. Where a penicillin/aminoglycoside combination is being used e.g. in abdominal infections, it may be appropriate to replace both agents with a second or third generation cephalosporin in penicillin allergic patients. Cross hypersensitivity reactions between penicillins and cephalosporins may occur in up to 5% of cases. **With a history of severe penicillin allergy e.g. anaphylaxis, it would be inadvisable to use a cephalosporin if a suitable alternative were available.**

AMOXICILLIN

- For most indications 500mg 8 hourly is the appropriate dose.
- Amoxicillin should not be used for pharyngitis as severe skin reactions can occur when this is due to Epstein-Barr virus. Oral penicillin V 500mg 12 hourly, given for ten days is equally effective.
- In respiratory tract infections, amoxicillin remains the oral drug of choice for pneumococci.

PENICILLIN

There are numerous preparations of injectable penicillins available in the pharmacy. As the trade names may change from time to time it is suggested that to avoid confusion the following terminology be adopted when prescribing:

NOTE: the term "bicillin" is particularly confusing and should no longer be used.

RECOMMENDED TERMINOLOGY	ROUTE	COMPONENTS	AMPOULE CONTENT	INDICATIONS	DOSE
benzathine penicillin (provides sustained low levels of penicillin)	IM	benzathine penicillin	1,2MU	prophylaxis for: rheumatic fever, recurrent cellulitis, recurrent meningococcal meningitis streptococcal sore throat	1,2MU every third week 1,2MU stat
			2,4MU	syphilis	see page 36
procaine penicillin	IM	procaine penicillin	300 000U	replaces benzyl penicillin when a daily or twice daily IM injection preferred to IV therapy	600 000U daily
				syphilis	see page 36
penicillin G	IV	sodium benzyl penicillin	1MU	infections for which oral or IM preparations are not suitable	2MU 6 hourly
			5MU	endocarditis and meningitis	5MU 6 hourly or 4MU 4 hourly ¹

¹ For the IV administration of penicillin G a 4 hourly or constant infusion regimen is preferable. Six hourly dosing can be used when dictated by staff shortages.

CLOXACILLIN

This agent is primarily used to treat staphylococcal infections and, if the isolate is sensitive to cloxacillin, cloxacillin is the best agent. It is worth remembering that cloxacillin-susceptible staphylococci are susceptible to most other beta-lactams except penicillin, amoxicillin, ampicillin and piperacillin. Thus in cases of a mixed infection, co-amoxiclav or a cephalosprin can be used to successfully treat a cloxacillin-susceptible staphylococcus. However, the converse is also true - staphylococci that are resistant to cloxacillin are resistant to ALL (currently available) beta-lactam agents.

CO-AMOXICLAV

- The IV formulation must be administered immediately after reconstitution as the clavulanic acid begins to degrade after 20 minutes.
- The bacteriological spectrum includes streptococci, enterococci, staphylococci (cloxacillin-sensitive), community-acquired gram-negative bacilli, haemophili, (including those producing β -lactamase) and anaerobes – in view of the latter, it is unnecessary to add metronidazole to co-amoxiclav
- The most convenient and cost-effective oral dose is 1g 12 hourly – can be used for infection at any site amenable to oral therapy.

For hospitals that do not have this formulation available:

- The standard oral dose for urinary tract infections is 375mg (i.e. 250mg amoxicillin + 125mg clavulanic acid) given 8 hourly.spo
- Infections at other sites require higher doses of amoxicillin. This can be achieved by combining 250mg amoxicillin with 375mg co-amoxiclav thus providing 500mg amoxicillin with 125mg clavulanic acid. A composite 625mg co-amoxiclav tablet is available in S.A. but is more expensive.

NOTE: The common causative organisms for upper and lower respiratory tract infections remain sensitive to amoxicillin in the majority of instances and co-amoxiclav should therefore not be routinely prescribed for uncomplicated infections at these sites.

CEPHALOSPORINS

- Cephalosporins are broad spectrum agents with some individual differences.
- First generation cephalosporins cover mainly gram-positive organisms (streptococci and cloxacillin-sensitive staphylococci) but do have some gram-negative cover as well.
- Second, third and fourth generation cephalosporins may be used as an alternative to aminoglycosides in the treatment of gram-negative infections
- All have streptococcal cover that makes the addition of penicillin unnecessary (ceftazidime is an exception).
- **Currently available cephalosporins do not have any activity against enterococci.**
- Cefazolin, cefuroxime, ceftriaxone, cefotaxime and cefepime have good activity against cloxacillin-sensitive staphylococci.
- Cefixime 400 mg STAT is the treatment of choice for gonorrhoea
- Cefotaxime and ceftriaxone have the same antimicrobial activity, but differ in pharmacology. Ceftriaxone has greater protein binding and hence a longer half-life which allows for once or twice daily dosing.

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Ceftriaxone, which may be used as a once daily intravenous or intramuscular injection, is currently the most cost-effective third generation cephalosporin available. However, Roche has recently released the following safety advice: "Rocephin and calcium-containing solutions, including continuous calcium-containing infusions such as parenteral nutrition, should not be mixed or co-administered to any patient irrespective of

age, even via different infusion lines at different sites. As a further theoretical consideration and based on 5 half-lives of ceftriaxone, Rocephin and IV calcium-containing solutions should not be administered within 48 hours of each other in any patient". This recommendation was made following reports of intravascular or pulmonary precipitations in neonates, treated with ceftriaxone and calcium-containing IV solutions (including Ringer's lactate).

- Ceftazidime and cefepime are active against many strains of *Pseudomonas aeruginosa*.
- Third and fourth generation cephalosporins are used in CNS infections (at higher doses) because therapeutic levels are readily achievable in the CSF.
- Increasing resistance in hospital gram-negatives has made cephalosporins an inappropriate choice for empiric therapy in nosocomial infections.
- The only oral cephalosporin available at GSH and TBH is cefuroxime. At GSH this is a restricted agent and is only used in cases where co-amoxiclav is inappropriate for some reason.

CARBAPENEMS

Carbapenems are very broad-spectrum beta-lactam antibiotics, with activity against many Gram-positive and Gram-negative aerobic and anaerobic bacteria. Carbapenems are not active against cloxacillin-resistant staphylococci. Their use is generally limited to severe nosocomial infections. If carbapenems are used empirically for nosocomial infections, it is very important to 'step-down' to a narrower-spectrum agent if the results of susceptibility tests become available. Overuse of carbapenems promotes the emergence of resistance.

- Imipenem and meropenem have a similar spectrum of activity. Meropenem is the preferred agent for CNS infections.
- Ertapenem, a newer carbapenem, is not active against pseudomonas and acinetobacter. It is therefore most suitable for empiric treatment of severe nosocomial infections where these organisms are not frequently encountered, e.g. outside the ICU setting.

QUINOLONES

- Ciprofloxacin has excellent activity against haemophilus, legionella and gram-negative rods including pseudomonas. It is the drug of choice for shigellosis, typhoid, and **uncomplicated** UTIs, as defined in the treatment section. It also has some activity against staphylococci, chlamydia and mycobacteria but is seldom used for these indications. It has no useful activity against streptococci or anaerobes.
- When treating pseudomonas infections a higher dose (750mg oral) should be used.

Stat dose for UTI should be 500mg. This dose does not need to be released by a microbiologist.

- Ofloxacin is used mainly in the treatment of patients with MDR TB - it does however have a spectrum of activity almost identical to that of ciprofloxacin.

- Moxifloxacin is a new quinolone with improved activity against streptococci and anaerobes. It retains all the activity of the earlier quinolones, including legionella but is not useful in the treatment of pseudomonas infections. Its spectrum makes it an extremely useful agent in the treatment of respiratory tract infections and it is currently reserved for this indication for patients who are allergic to penicillin.
- The IV formulations of all quinolones should be used in severely ill patients as their oral absorption will be impaired.

COTRIMOXAZOLE

Although cotrimoxazole is seldom used nowadays for empiric treatment due to considerable resistance even among community acquired isolates, it remains an effective antibiotic for treatment of susceptible isolates.

It is also used for prophylaxis and treatment of *Pneumocystis* and other infections in HIV-positive persons.

Although adverse reactions are not uncommon, the lack of alternative therapies means that it may be worthwhile to attempt desensitisation.

The following protocol describes a simple approach for co-trimoxazole desensitization

Use co-trimoxazole suspension 240mg/5ml.

Desensitisation must be conducted in hospital and should be done WITHOUT antihistamine or steroid cover.

Take 1ml co-trimox suspension (240mg/5ml) and dilute to 1litre with distilled water and shake very well (**mixture A**)

Now take 1ml of mixture A and dilute with distilled water to 10ml. (**mixture B**).

Time	Dose	Dose in mls of undiluted co-trimoxazole suspension
Time 0	Administer 5ml of mixture B. (Discard balance of mixture B)	0.0005
Time 1hr	Administer 5ml of mixture A (after shaking well)	0.005
Time 2hr	Administer 50ml of mixture A (after shaking well) (Discard balance of mixture A)	0.05
Time 3hr	Administer 0,5ml of co-trimox suspension diluted to 5ml with water	0.5
Time 4hr	Administer 5ml of cotrimox suspension	5.0
Time 5hr	Administer 2 single strength cotrimox tablets	
Time 6 hr	Start full-dose cotrimoxazole	

Medicines Information Centre

Division of Pharmacology

University of Cape Town Faculty of Health Sciences

AMINOGLYCOSIDES

- The total daily dose should be given as a single daily dose, except when used for synergy in infective endocarditis.
- The practice of using beta-lactams plus aminoglycosides for synergy is generally not indicated (recent meta-analyses show no benefit) – exceptions are infective endocarditis and certain resistant organisms (eg pseudomonas, enterococci).

- The recommended maximum duration of usage is 14 days. The need to continue empiric aminoglycoside treatment should be reviewed after 48 hours according to clinical response and microbiological data.
- Peak levels as indicated below need to be achieved for effective bacterial killing.
- To avoid toxicity the antibiotic should be allowed to fall to the trough levels indicated below, before the next dose is given.
- Aminoglycoside toxicity is more common in elderly patients and alternative agents such as beta-lactam antibiotics should generally be used in patients of sixty years or older.
- Co-administration with other nephrotoxic and ototoxic drugs should be avoided if possible (eg vancomycin, amphotericin B).
- Remember that aminoglycoside-induced nephrotoxicity is generally reversible, whilst ototoxicity is often irreversible. Essential to discontinue aminoglycosides if hearing loss or vertigo occur.

THE FOLLOWING DOSING SCHEDULES APPLY TO BOTH ADULTS AND CHILDREN

AMINOGLYCOSIDE DOSING SCHEDULE¹				
<i>THE MOST IMPORTANT DOSE IS THE FIRST ONE - DO NOT UNDERDOSE</i>				
ANTIBIOTIC	DAILY DOSE¹	INTERVAL	PEAK² LEVEL (mg/l)	TROUGH² LEVEL (mg/l)
Gram-negative infection - normal renal function				
gentamicin/tobramycin	6mg/kg	daily	>8	<1
amikacin	15mg/kg	daily	>30	<1
Gram-negative infection - poor renal function				
gentamicin/tobramycin	3-4mg/kg⁴	A peak of above 8mg/l must be achieved. Repeat dose when level <1mg/l but if interval required to achieve this is >48 hours consider alternative therapy.		
amikacin	10mg/kg	A peak of above 30mg/l must be achieved. Repeat dose when level <1mg/l but if interval required to achieve this is >48 hours consider alternative therapy		
Streptococcal and enterococcal endocarditis³				
gentamicin/tobramycin	3mg/kg	12 hourly	3-8	<1

¹Doses calculated according to total body mass in obese patients may result in toxicity. Because of the narrow margin between effective and toxic levels, doses should be individualised according to age, weight and renal function. Obese patients should be dosed according to ideal body weight with a correction factor:

$$\text{Adjusted body weight} = \text{ideal body weight} + [0.4 \times (\text{actual body weight} - \text{ideal body weight})]$$

²Peak levels are taken one hour after a bolus IM or IV or one hour after an IV infusion is commenced. Trough levels are taken just before the next dose is given.

³Aminoglycosides used in combination with penicillin for the treatment of streptococcal or enterococcal endocarditis are given for their synergistic action and need only be administered at half the dosage used for gram-negative infections.

⁴A range is given to provide some flexibility when calculating doses. Remember that gentamicin is provided in vials of 80mg - round the calculated dose up to the next multiple of 80 for the initial dose and then adjust if necessary according to levels.

VANCOMYCIN

- Vancomycin is not an aminoglycoside, it is a glycopeptide, and only has activity against gram-positive organisms.
- If a staphylococcus is sensitive to cloxacillin, cloxacillin is a more effective agent than vancomycin.
- Vancomycin (15-20mg/kg) must be given by slow intravenous infusion over at least 1 hour to avoid the “red man syndrome”, which is due to histamine release
- As the plasma level of vancomycin appropriate for each patient is dependent on the MIC of the organism being treated, **it is essential that every attempt be made to identify the suspected pathogen. Before vancomycin therapy is considered, suitable specimens (including at least TWO blood cultures) must be submitted to the microbiology laboratory.**
- For most staphylococci trough levels of 10-15 mg/l will be therapeutic. This is normally achieved with a dose of 30mg/kg/day given 12 hourly however a trough level should always be checked just before the fourth dose in order to ascertain whether such levels are being achieved. Patients with complicated infections or infections due to staphylococci with higher MICs (>1mg/l) will require higher doses (40mg/kg/day) in order to achieve trough levels of 15-20 mg/l. If patient is on continuous infusion, maintain levels between 15-20 mg/l.

COLISTIN

- This is a polymyxin antibiotic, a relatively old agent, and use was virtually discontinued due to side effects and the availability of safer and more effective agents. However, with the emergence of multi-resistant gram-negative bacilli (esp *A. baumannii*), the drug has made a comeback. It should ONLY be used if infection with highly-resistant gram-negative organisms has been proven or is strongly suspected, and its use should always be discussed with a microbiologist or infectious disease specialist
- It has been reported to be both nephro- and neurotoxic, although the degree of toxicity has probably been overestimated, and recent research suggests that it may not be as toxic as previously thought. However, renal function should be monitored while the drug is being used, and the agent should be discontinued as soon as clinically appropriate. Dosing of colistin is still unclear, as different formulations and dosing recommendations can be found worldwide. The dosing recommendation used locally is: Normal renal function: 3 million units 8 hourly
- Reduced creatinine clearance:

Cr Clearance	Dose
50-90	3 million U bd
10-50	3 million U daily
<10	3 million U 36 hourly

Anuric	1.5 million U after each episode of dialysis
CVVHD*	3 million U 12 hourly

Sanford Guide to Antimicrobial Therapy 2007)

* Lancet Infect. Dis. 2006;6:589-601

METRONIDAZOLE

- Oral metronidazole is freely available and is the preferred route of administration.
- Metronidazole suppositories do not provide superior levels, are more expensive and should only be used when the oral route is not feasible.

ANTIFUNGAL AGENTS

AMPHOTERICIN B

- Given as a single dose by IV infusion over a 4 hour period.
- Febrile reactions are the most common and can be minimised by pretreatment with paracetamol or, in severe cases, hydrocortisone (50mg) .
- The standard dose of 0.7mg/kg should be increased to 1mg/kg/day (maximum 1.5mg/kg/day) when treating cryptococcal meningitis and certain filamentous fungal infections.
- Pre-existing renal impairment does not require alteration of the calculated daily dose. However, if renal function deteriorates significantly while on therapy consider changing to an alternative agent. Nephrotoxicity is almost always reversible.
- Alternate day dosing does not decrease renal toxicity but can be used for patient convenience. A double dose is then given (max 1.5mg/kg/dose) on alternate days.
- The renal toxicity of amphotericin B is decreased if patients are well hydrated. Pre and post-infusion hydration with 500ml saline (if clinical condition allows salt).
- Renal function and potassium and magnesium levels should be monitored twice weekly Aggressive replacement of potassium and magnesium (even when these are in the normal range) should be undertaken. FBCs should be monitored with prolonged therapy due to the risk of anaemia developing.

FLUCONAZOLE

- Fluconazole is available as an alternative antifungal agent when it is not appropriate to use amphotericin B. Amphotericin B remains the drug of choice for systemic fungal infections in most cases.
- Fluconazole has no activity against filamentous fungi such as *Aspergillus* and should not be substituted for amphotericin when such infections are suspected.
- Fluconazole is available in both oral and IV forms.
- A restricted agent at GSH and TBH except for AIDS patients with cryptococcal meningitis or oesophageal candidiasis – free fluconazole is available for these patients.

ITRACONAZOLE

- An alternative therapy to amphotericin for invasive aspergillosis, disseminated histoplasmosis, difficult dermatophycoses and other mould infections.
- A restricted agent at GSH and TBH

VORICONAZOLE

- Extremely expensive agent, restricted for invasive aspergillosis, for which it is the agent of choice.

Voriconazole for invasive aspergillosis

Invasive aspergillosis is an uncommon opportunistic infection in patients with haematological malignancies or post transplant. It has a very high mortality rate. Definitive diagnosis is difficult to achieve. Voriconazole has been shown to be the drug of choice for invasive aspergillosis (N Engl J Med 2002;347:408-15), however it is extremely expensive. At TBH contact the infectious diseases department. At GSH voriconazole 200 mg PO 12 hourly (**give loading dose of 400mg 12hourly for first two doses**) for 12 weeks will be made available for invasive aspergillosis, using the diagnostic criteria below (please obtain release from a microbiologist):

Definite invasive aspergillosis

- culture from a normally sterile site
- hyphae consistent with aspergillus on biopsy or aspirate plus culture from the same organ
- CXR evidence (not attributable to other factors) and culture from bronchoalveolar-lavage fluid

Probable invasive aspergillosis

- hyphae consistent with aspergillus in a biopsy specimen or aspirate without culture
- halo or an air-crescent sign on CT scan of the lung
- CXR evidence (not attributable to other factors) **plus either** hyphae consistent with the aspergillus in bronchoalveolar-lavage fluid **or** sputum or a sputum culture
- opacification of a sinus on CT or MRI **plus either** hyphae consistent with aspergillus on biopsy **or** culture

KETOCONAZOLE

- For antifungal therapy this has been superseded by fluconazole and itraconazole. Its use at GSH and TBH is limited to exploiting its pharmacokinetic interaction with ciclosporin.

ANTIVIRAL AGENTS

ACYCLOVIR is active against herpes simplex virus (HSV) and varicella-zoster virus (VZV) infections. The drug is formulated as a tablet, syrup, IV and as a topical preparation. Topical acyclovir for eye use is restricted to the Ophthalmology Department. Topical acyclovir cream has no role in the clinical management of any other HSV or VZV infections.

The dose and treatment duration of acyclovir depends on the clinical indication:

Severe or complicated HSV/VZV diseases:

- HSV encephalitis: The diagnosis should be confirmed by HSV PCR on CSF, but treatment should commence immediately upon clinical suspicion. Acyclovir is given 10mg/kg 8 hourly IV for 14-21 days. For neonatal infections a higher dose and prolonged treatment is recommended – 20mg/kg 8 hourly IV for 3 weeks. [Ref: Kimberlin D, HSV meningitis and encephalitis in neonates. Herpes 2004;11(2):65A-76A.]
- Severe systemic HSV infection/HSV hepatitis: The diagnosis should be confirmed by HSV PCR on a blood sample, but if diagnosis is suspected, empiric treatment should commence immediately. Consult the virology consultant on call. Acyclovir 5mg/kg IV 8 hourly for 7-14 days is indicated if the diagnosis is confirmed.
- Complicated chickenpox - e.g. pneumonia or immunocompromised patient. Acyclovir 10mg/kg IV 8 hourly. Oral acyclovir 800 mg five times daily can be used to complete the treatment course of 7-14 days when the patient has improved.

HSV/VZV disease in the immunocompromised patient

- Severe shingles (disseminated zoster or zoster ophthalmicus): Acyclovir 10mg/kg IV 8 hourly. Oral acyclovir 800 mg five times daily can be used to complete the treatment course of 7-14 days when the patient has improved.
- Any active shingles: Acyclovir 800mg orally 5 times/day for 7 days
- Episodic oral or genital herpes: Oral acyclovir 400mg 8 hourly for 7-14 days.
- Chronic suppression for frequent recurrences: Acyclovir 400mg orally 12 hourly.

Localised HSV disease in the immunocompetent patient

- Severe oral herpes: oral acyclovir 400mg 8 hourly for 7 days.
- Primary genital herpes: oral acyclovir 400mg 8 hourly for 7 days.
- Episodic genital herpes: oral acyclovir 800mg 8 hourly for 2 days [Ref: Wald,A; Two-Day Regimen of Acyclovir for Treatment of Recurrent Genital Herpes Simplex Virus Type 2 Infection. CID 2002; 34:944-8]
- Chronic suppression: Acyclovir 400mg orally 12 hourly.

Acyclovir reduces short term morbidity but does not alter recurrence rates. In immunocompetent person it needs to be started within 72 hours of onset for primary HSV infections and within 24 hours of onset of a recurrent episode.

VZV disease in the immunocompetent patient

- Chickenpox in adult: oral acyclovir 800mg 5 times a day for 7 days
- Shingles: oral acyclovir 800mg 5 times a day for 7 days

Acyclovir given within the first 72 hours of the onset of shingles significantly shortens the healing process of acute zoster, alleviates pain and reduces the incidence of other acute/chronic complications. For the treatment of chickenpox, acyclovir needs to be given within 24 hours of the onset of rash for it to have a beneficial effect.

GANCICLOVIR is the drug of choice for treating cytomegalovirus (CMV) disease in immunocompromised patients. The drug is only available as an IV formulation (oral ganciclovir has been discontinued due to its poor bioavailability). CMV disease needs induction treatment with IV ganciclovir 5mg/kg 12 hourly for 14 - 21 days, followed by maintenance therapy for CMV retinitis (either ganciclovir weekly by intra-ocular injections or IV 5mg/kg daily). In HIV-infected patients initiation of antiretroviral therapy is recommended as soon as possible after the diagnosis of CMV.

CMV disease should be managed in conjunction with the Division of Infectious Diseases, Department of Medicine. For treatment of CMV retinitis, please consult the ophthalmology department.

ANTIRETROVIRAL THERAPY (ART)

For long-term treatment of disease

- Current national guidelines for eligibility are 1) a CD4 count of <200, 2) a CD4 count of <350 if pregnant or has TB, 3) WHO stage 4, 4) MDR or XDR TB.
- HIV positive patients who do not require ART can be managed at their nearest primary care centre, whereas those eligible for ART should be referred to their closest primary level HIV clinic that is accredited for ART roll-out. Tertiary level HIV care and other specialist clinics for HIV-related disorders are available at GSH or TBH.

Two ART regimens are available:

- In adults first line (regimen 1) drugs consist of tenofovir, lamivudine and nevirapine or efavirenz. Prior to 2010 stavudine was used instead of tenofovir and many patients are still on this regimen
- Second line (regimen 2) is zidovudine, lamivudine and lopinavir/ritonavir. Prior to 2010 didanosine was used instead of lamivudine, but this is being phased out due to toxicity & appreciation of the fact that lamivudine has therapeutic value even if resistance to it has developed Switching from the first to second line is based on virological criteria (note that viral load measures are expensive and should only be requested by the adult or paediatric ID clinics, or in consultation with an ID specialist in the case of in-patients).

See the Antiviral prophylaxis section for recommendations regarding various post exposure prophylaxis.

RESTRICTED AGENTS AT GSH

For **antibacterial** agents, speed-dial: 76652 (microbiologist on call) - or Prof Mendelson & Dr van der Plas
 or: 0829075282
 For **antiviral** agents, speed dial: 76151 (virologist on call) or Prof Mendelson & Dr van der Plas
 or: 0720407261

ANTIMICROBIAL	COMMON CLINICAL INDICATION	AVAILABILITY
ACYCLOVIR (IV & syrup only), GANCICLOVIR ZIDOVUDINE	see section on antiviral agents	topical aciclovir available to Ophthalmology. Oral acyclovir freely available on request only for all other situations
AMIKACIN	gram-negative sepsis where the organism is resistant to gentamicin or empirically in nosocomial infection	all ICUs (including neonates) and for neutropenic sepsis (<i>indicate diagnosis on prescription sheet</i>) on request only for all other areas
AZITHROMYCIN		on request only
CEFAZOLIN	surgical prophylaxis only	prophylaxis (preferably single dose, 24 hour maximum)
CEFEPIME <small>(CEFTAZIDIME ALSO AVAILABLE BUT MORE EXPENSIVE WITH LITTLE ADDED BENEFIT)</small>	documented or suspected pseudomonas infections (together with an aminoglycoside or a quinolone in most cases)	on request only
CEFIXIME	stat dose for gonorrhoea	freely available
CEFTRIAXONE (CEFOTAXIME)	first line therapy for meningitis first-line therapy for severe pneumonia or pneumonia with co-morbidity. empiric therapy in CAPD peritonitis STAT dose for gonorrhoea	freely available in all cases of meningitis and stat dose for gonorrhoea (<i>indicate diagnosis on prescription sheet</i>) and for inclusion in peritoneal dialysis bags freely available to patients over 60 available in ICU's C13 & C15 on consultant's signature only On request only in all other instances Oral co-amoxiclav (1g bd) or cefuroxime can follow IV use of ceftriaxone without separate authorisation

<p>CEFUROXIME ORAL</p>	<p>oral cefuroxime will only be released in situations where it is not possible to use oral co-amoxiclav (e.g. allergy or resistance)</p>	<p>on request only</p>
<p>CIPROFLOXACIN MOXIFLOXACIN OFLOXACIN</p>	<p>ciprofloxacin: stat dose for uncomplicated cystitis recommended for pyelonephritis recommended therapy for shigellosis and salmonella infections other gram-negative infections including pseudomonas when an oral agent is required</p> <p>moxifloxacin: respiratory tract infections</p> <p>ofloxacin: alternative agent for mycobacteria</p>	<p>Ciprofloxacin freely available as a stat dose (only for uncomplicated UTI – see page 34) and for 3 days for treating dysentery or complicated UTI (<i>indicate diagnosis on prescription sheet</i>) Ofloxacin is freely available for the treatment of MDR TB or as a 2nd line drug in the event of toxicity from 1st line agents. It is also available to haematology as a prophylactic agent. ciprofloxacin and other quinolones on request only for all other situations</p>
<p>CLARITHROMYCIN</p>	<p>legionella pneumonia (IV form), <i>Helicobacter pylori</i> (oral form) <i>Mycobacterium avium</i> complex in AIDS patients</p>	<p>IV: C15 (consultants only), C27 for severe CAP otherwise on request only oral: 2nd line therapy for <i>H. pylori</i> otherwise on request only</p>
<p>CLINDAMYCIN</p>	<p>penicillin allergic patients, cloxacillin resistant staphylococcal infections or unresponsive cellulitis</p>	<p>24 hours in pen allergic patients - on request only for all other situations</p>
<p>CO-AMOXICLAV</p>	<p>broad spectrum agent with gram-negative, streptococcal, enterococcal, staphylococcal and anaerobic cover</p>	<p>Oral co-amoxiclav is freely available for UTI, in patients with bronchiectasis or chronic lung disease, to vascular clinic for patients with PVD, hand clinic, cellulitis or diabetic foot (<i>indicate diagnosis on prescription sheet</i>) and to patients over 60. On request only for all other uses. IV co-amoxiclav is available on request only. Oral co-amoxiclav can follow IV use of ceftriaxone without separate authorisation.</p>

<i>COLISTIN</i>	Unregistered drug available on authorisation from MCC for treatment of resistant gram-negative organisms (mainly <i>Acinetobacter</i>). <u>Clinical follow-up reports must be submitted to pharmacy for every patient treated.</u>	On request only
<i>FLUCONAZOLE,</i> <i>ITRACONAZOLE</i>	treatment of candida (and other yeast) infections maintenance therapy in AIDS patients with cryptococcal meningitis (fluconazole) difficult dermatophytes (itraconazole) alternatives to amphotericin B	fluconazole is freely available to HIV positive (indicate on prescription chart) patients with cryptococcal infections or oesophageal candidiasis, in haematology (oral form) and for HIV positive renal transplant patients for all other situations on request only
<i>FUSIDIC ACID</i>	cloxacillin resistant staphylococcal infections or unresponsive osteitis should usually be combined with a second agent	on request only
<i>IMIPENEM,</i> <i>MEROPENEM,</i> <i>ERTAPENEM</i>	very expensive broad spectrum agents for use with resistant organisms or empirically in exceptional cases	meropenem available to neonatal consultants otherwise on request only
<i>KETOCONAZOLE</i>	not used for its anti-fungal properties as fluconazole is superior used for its pharmacokinetic effect on cyclosporin	freely available for use with ciclosporin
<i>LINEZOLID</i>	alternative to vancomycin in resistant staphylococcal and enterococcal infections	on request only
<i>PIPERACILLIN/</i> <i>TAZOBACTAM</i>	broad spectrum agent with gram-negative (including pseudomonas and acinetobacter), streptococcal, enterococcal, staphylococcal and anaerobic cover	available for neutropenic sepsis (<i>indicate diagnosis on prescription sheet</i>) on request only for all other uses
<i>VALACYCLOVIR</i>		on request only
<i>VANCOMYCIN</i> <i>TEICOPLANIN</i>	cloxacillin resistant staphylococcal and penicillin/amoxycillin resistant enterococcal infections and penicillin allergic patients	Vancomycin available for use in CAPD patients, neonatal consultants and stat dose for pen allergic patients receiving a pacemaker on request only for all other uses
<i>VORICONAZOLE</i>	see page 18	on request only

THERAPY

Dosages are as listed on page 5 unless otherwise indicated.

SEPTICAEMIA

Empiric therapy

If the source of infection known

suspected sepsis of gut origin

treatment should be directed towards the most likely causative organism(s)

suspected sepsis of urinary tract origin

penicillin, gentamicin and metronidazole

gentamicin alone

Febrile neutropaenic patients

piperacillin/tazobactam and amikacin
or

imipenem (consult your local laboratory or microbiologist for susceptibility data)

If no response after 5-7 days add amphotericin B.

vancomycin if there is evidence of IV line infection

Suspected staphylococcal septicaemia

community acquired

cloxacillin

hospital acquired

vancomycin

Suspected gram-negative septicaemia

community acquired

gentamicin or ceftriaxone

hospital acquired (non-ICU related)

amikacin or ertapenem

HIV positive patients often have non-typhoid salmonella bacteraemia and the empiric choice of antibiotic should cover these organisms

ceftriaxone - for 6 weeks

The 6 weeks of therapy can be completed with oral ciprofloxacin or cotrimoxazole depending on organism susceptibility.

Patients who relapse after this initial episode should be placed on long-term suppressive therapy with ciprofloxacin or cotrimoxazole.

Directed therapy

Change to the most appropriate and cost effective antimicrobial once organism sensitivities are known.

ENDOCARDITIS

It is preferable to wait for a diagnosis based on culture or serology before starting therapy. However, patients who present with **severe disease of rapid onset require empiric therapy directed against staphylococci.**

Consultation with infectious diseases/ microbiology is advised.

Empiric therapy

Native valve

penicillin (4MU 4 hourly or 6MU 6 hourly) for four weeks plus gentamicin (3mg/kg/day given 12 hourly) for 2 weeks

If staphylococcal infection suspected (acute onset) add cloxacillin (2g 4 hourly or 3g 6 hourly)

Prosthetic valve

vancomycin (30mg/kg/day given 12 hourly) and rifampicin (15mg/kg/day given 12 hourly - oral) for 6 weeks plus gentamicin (3mg/kg/day given 12 hourly) for 2 weeks

Directed therapy (All doses as for empiric therapy)

Streptococcal (native valve)

fully susceptible to penicillin
(MIC $\leq 0,12$ mg/l)

penicillin alone for 4 weeks

The addition of gentamicin as above may be required where the disease is judged to have been present for more than three months at diagnosis.

SHORT COURSE THERAPY:(ONLY TO BE CONSIDERED IN CONSULTATION WITH INFECTIOUS DISEASES OR CARDIOLOGY SPECIALIST)

Two weeks of therapy using either penicillin or ceftriaxone 2g daily with gentamicin, in doses as given above, has been shown to be effective (Clin Micro & Infection Oct 1998;4 -supp3:S17-S26).

This regimen should not be considered for patients with extracardiac foci of infection or intracardiac abscess. (Transoesophageal echocardiogram is strongly recommended to exclude such complications.) Patients should also not have any degree of haemodynamic compromise, conduction disorder or embolic complication.

OUTPATIENT THERAPY(ONLY TO BE CONSIDERED IN CONSULTATION WITH INFECTIOUS DISEASES OR CARDIOLOGY SPECIALIST)

Suitable cases may be treated as outpatients using a once daily dose of ceftriaxone 2g for 4 weeks (JAMA Jan 8 1992;267(2):264-267.

Patients should have no haemodynamic compromise, conduction disorder or embolic complication. Outpatient clinical review by a competent health care worker should occur every few days.

moderately susceptible
(MIC $>0,12-0,5$ mg/l)

penicillin and gentamicin for 2 weeks followed by penicillin alone for a further 2 weeks

moderately resistant (MIC >0,5 - 8mg/l), all enterococci and <i>Abiotrophia/Granulicatella</i> spp. (nutritionally variant streptococci)	penicillin and gentamicin both for 4 weeks 6 weeks of therapy may be required in cases with a history of > 3 months, or mitral valve involvement
fully resistant (MIC >8mg/l)	vancomycin plus gentamicin for six weeks

Streptococcal (prosthetic valves)

fully susceptible to penicillin (MIC ≤0,12mg/l)	penicillin alone for 6 weeks Gentamicin can be added for the first 2 weeks, however, the addition of gentamicin has not demonstrated superior cure rates compared with penicillin alone for highly susceptible strains. Gentamicin should not be used if the creatinine clearance is <30ml/min (Circulation 2005; 111: 3167)
moderately susceptible (MIC >0,12-0,5mg/l)	penicillin and gentamicin for 6 weeks
moderately resistant (MIC >0,5-8mg/l), enterococci and <i>Abiotrophia/Granulicatella</i> spp. (nutritionally variant streptococci)	penicillin and gentamicin for 6 weeks
fully resistant (MIC >8mg/l)	vancomycin and gentamicin for 6 weeks

Notes:

- If an enterococcus shows high-level gentamicin resistance, streptomycin can be substituted for gentamicin. However, the laboratory should be consulted to determine whether the organism is susceptible to streptomycin.
- In patients unable to tolerate penicillin, vancomycin or ceftriaxone can be used as an alternative. However, it is crucial to establish the nature of the penicillin allergy, and microbiology / infectious disease consultation is advised in all such cases.
- In the exceedingly rare instance of a vancomycin-resistant enterococcal endocarditis, please consult with microbiology / infectious diseases unit.

Staphylococcal (cloxacillin/methicillin sensitive)

native valve	cloxacillin for 4-6 weeks two weeks of cloxacillin with one week of gentamicin has been shown to be effective in uncomplicated right-sided endocarditis with vegetations of <2cm. (Ann Intern Med 1996;125:969-74)
prosthetic valve	cloxacillin plus rifampicin for 6-8 weeks plus gentamicin for 2 weeks. If the isolate is resistant to rifampicin, fucidic acid can be used.

In the rare occurrence of a penicillin sensitive staphylococcus, penicillin should be used in preference to cloxacillin.

Staphylococcal (cloxacillin/methicillin resistant)

native valve	vancomycin for 4-6 weeks – as vancomycin is a less active agent than cloxacillin it is recommended to add a second agent according to sensitivities: rifampicin, fusidic acid or gentamicin can be used
prosthetic valve	vancomycin and rifampicin for 6-8 weeks plus gentamicin for 2 weeks

Infections of vascular grafts:

These should in general be treated as for prosthetic valve infections. Gram negative infections are however more likely in grafts in the abdomino-femoral area and a suitable agent should be added to the above regimens. High dose oral ciprofloxacin can be requested in these cases.

RESPIRATORY TRACT INFECTIONS

In respiratory tract infections moxifloxacin is a suitable alternative in penicillin allergic patients.

Upper respiratory tract infections:

<i>pharyngitis (S. pyogenes)</i>	BENZATHINE 1.2 MU IMI stat or oral penicillin V 500 mg 12 hourly for 10 days
<i>otitis media and sinusitis</i>	

acute:	amoxicillin (5 days for otitis & 10 days for sinusitis)
chronic	co-amoxiclav

Lower respiratory tract infections:

acute bronchitis

antibiotics are not indicated

acute exacerbations of chronic bronchitis

amoxicillin or doxycycline (co-amoxiclav or quinolones may be requested in special circumstances)

Penicillin (IV) or amoxicillin remain the drugs of choice for *Streptococcus pneumoniae*

Pneumococci isolated from blood cultures have their penicillin susceptibility reported according to meningitis criteria. Those reported as “I” or “R” may still be treated with high dose penicillin if the site of infection is not the central nervous system .

Recommendations for high dose penicillin or ampicillin are:

Antibiotic	Adults	Children
Penicillin G	2-4 MU 6 hrly IV	≥200 000 U/kg/day in divided doses
Ampicillin	2g 6hrly IV	
Amoxicillin	1g 8hrly po	90mg/kg/day in 3 divided doses

Pneumonia

Empiric therapy

Community acquired

mild to moderate

<65 years,
no co-morbidity

OUTPATIENT: - a single dose of IV (or IM) penicillin followed by oral amoxicillin 1g 8 hourly

IN-PATIENT: IV penicillin or ampicillin - add oral doxycycline or erythromycin if no response at 48 hours

>65 years *or* co-morbidity (i.e. cardio-respiratory illness, diabetes, alcoholism, HIV etc.)

ceftriaxone 1g/day- add oral doxycycline or erythromycin if no response at 48 hours

severe

ceftriaxone 1g/day *plus* IV clarithromycin

HIV-positive patients of any age with bilateral diffuse interstitial infiltrates on CXR plus evidence of hypoxia or desaturation of >5% on effort - submit induced sputum specimen to the microbiology laboratory for PCP immunofluorescence

Add cotrimoxazole to the above regimens to treat presumed pneumocystis pneumonia - one tablet (80/400mg) for each 4kg body weight per day This dose should be divided into 3 or 4 doses a day giving no more than 4 tablets per dose

Adjunctive prednisone 40mg 12 hourly should be given to hypoxic patients. This is given for 5 days followed by 40mg daily for 5 days and then 20mg daily for 11 days

Hospital acquired

general wards

ampicillin and amikacin

ertapenem if aminoglycosides contraindicated

The regimens above will not cover a high proportion of nosocomial staphylococcal infections. In patients where there is clinical (e.g. associated line sepsis) or laboratory evidence to suggest a staphylococcal aetiology the addition of vancomycin should be considered pending culture and sensitivity results.

ventilator associated

In certain units within a hospital, the use of agents such as piperacillin/tazobactam, carbapenems or quinolones may be dictated by the prevalence of highly resistant organisms (consult microbiologist).

Aspiration pneumonia, lung abscess

penicillin and metronidazole (if penicillin allergic use clindamycin alone). Switch to oral co-amoxiclav as soon as appropriate. Add appropriate gram-negative cover if the aspiration occurred while in hospital or a nursing home or in alcoholics. Depending on your local hospital gram-negative resistance profile, a suitable agent could be ceftriaxone, piperacillin/tazobactam, ertapenem or imipenem/meropenem.

NOTE: A Gram stain of a well-collected sputum may provide valuable information as to the causative agent.

Hospital acquired organisms are more likely to be resistant to ceftriaxone

Routine use of serology to diagnose "atypical" pneumonia is not recommended as this seldom influences management because convalescent serum is required to show a rise in antibody titres.

A urinary legionella antigen test is available for diagnosis of legionella infection.

Tuberculosis**all sites (new cases >8 years)****given 7 times/week**

2 months initial phase:

30-37 kg - 2 tabs RHZE*

38-54 kg - 3 tabs RHZE

55-70 kg - 4 tabs RHZE

>70 kg - 5 tabs RHZE

4 months continuation phase*

given 7 times/week

30-37kg - 2 tabs RH (150/75)

38-54kg - 3 tabs RH (150/75)

55-70kg - 2 tabs RH (300/150)

>70kg - 2 tabs RH (300/150)

retreatment (>8 years)**given 7 times/week**

2 months initial phase:

30-37kg - 2 tabs RHZE* plus 500mg streptomycin

38-54kg - 3 tabs RHZE plus 750mg streptomycin

55-70kg - 4 tabs RHZE plus 1g streptomycin

>70kg - 5 tabs RHZE plus 1g streptomycin

3rd month : as above but without the streptomycin

5 month continuation phase:

given 7 times/week

30-37kg - 2 tabs RH (150/75) plus 800mg ethambutol

38-54kg - 3 tabs RH (150/75) plus 800mg ethambutol

55-70kg - 2 tabs RH (300/150) plus 1,2g ethambutol

>70kg - 2 tabs RH (300/150) plus 1,2g ethambutol

CNS or bone & joint
involvementin patients unable to
swallow tabletsin patients unable to absorb
orally

Treatment duration for 9 months

Pyrazinamide tablets can be crushed and given by
nasogastric tube.

Isoniazid and rifampicin are available in syrup.

Isoniazid and rifampicin are available IV

Streptomycin can be given IM.

IV amikacin is an alternative for streptomycin.

IV ofloxacin can be obtained in selected cases

**Drug resistant
tuberculosis**TB culture and sensitivity should be requested in
patients presenting with symptoms and signs
suggestive of TB in the following settings:

Past history of TB

Health care worker/prisoner

Contact with known drug resistant TB patient

Or

failure of sputum conversion after 3 months of intensive phase TB chemotherapy

MDR-TB is a laboratory diagnosis defined as resistance to isoniazid and rifampicin with or without resistance to additional drugs.

Multiple resistances to other drugs not including rifampicin is defined as poly resistance and does not have the same connotation as MDR-TB.

XDR-TB is defined as an MDR strain plus resistance to any fluoroquinolone and any one of kanamycin, amikacin or capreomycin

Newly diagnosed patients with MDR/XDR TB need to be referred to the MDR outpatient unit at Brooklyn Chest Hospital. Contact: Tel 021 508 7417 and Fax No 021 5087423.

Standard therapy:

- a. Intensive 6 month treatment

a. Intensive treatment:

kanamycin 15mg/kg/day

ethionamide 500 – 750mg/day (< 50kg 500mg, >50kg 750mg/day)

ofloxacin 600-800mg/day (<50kg 600mg/day, >65kg 800mg/day)

pyrazinamide 1000mg – 2000mg/day

terizidone <50kg 500mg/day, >50kg 750mg/day.

- followed by:

- b. Maintenance treatment
18 months

b. Maintenance treatment:

ethionamide 500 – 750mg/day

ofloxacin 600 – 800mg/day

PZA 1000mg - 2000mg/day

terizidone <50kg 500mg/day, >50kg 750mg/day

Although it's becoming increasingly difficult to apply an individualised treatment, in certain circumstances this may be necessary. In such circumstances please consult Professors Willcox, Maartens or Mendelson or Dr van der Plas (GSH) or Dr. Taljaard (Tygerberg Adult Infectious Diseases Unit) or Professor Schaaf (Tygerberg Paediatrics)

Total duration of treatment should be at least 24 months.

All treatment must be fully supervised.

Progress should be monitored by monthly sputum smears and cultures for the duration of therapy.

Surgery should be considered in patients with localised disease which remains culture positive after 6 months treatment or possibly prophylactically to prevent relapse especially if relapse has previously occurred.

hepatotoxicity

TB drug-induced hepatitis is over-diagnosed: the case definition is transaminases more than 5-fold elevated or more than 3-fold elevated with symptoms/jaundice. Antituberculous therapy should be discontinued. The basis for the TB diagnosis should be reviewed. If the grounds for diagnosing TB were reasonable then commence three antituberculous drugs with low/no hepatotoxic potential (see background therapy below). Selected patients may then be rechallenged once symptoms of hepatitis have resolved, bilirubin levels return to normal and transaminases have decreased to <100. Rechallenge is **NOT** recommended for those who have had fulminant hepatitis (defined as hepatic encephalopathy with coagulopathy).

The rechallenge regimen of the American Thoracic Society (Am J Respir Crit Care Med 2006;174:935–52) have been followed as these are simple and quick. Rechallenge with PZA was previously not recommended, but a recent trial has shown that most patients tolerate it. PZA rechallenge should be considered in patients with severe TB (e.g. miliary, meningitis) or with drug resistance. Transaminase levels, especially ALT, should be monitored frequently (e.g. three times weekly) during rechallenge and every two weeks for a month following rechallenge.

If possible all patients with a drug induced liver injury should have their TB isolates sent for drug susceptibility testing. Do not rechallenge with an agent to which the isolate is resistant.

rechallenge regimen:	Background therapy	Ethambutol, streptomycin and ofloxacin.
	day 1	Rifampicin 450 or 600 mg daily depending on weight
	day 3	Check ALT
	day 4-6	Add INH 300mg daily
	day 7	Check ALT
	day 8	Consider PZA rechallenge (see text)

NB: Duration of therapy should be individualised after rechallenge – consult ID for advice. The following are guidelines:

- Pyrazinamide not rechallenged/not tolerated: stop ofloxacin and streptomycin, continue isoniazid, rifampicin and ethambutol for total duration 9 months
- Rifampicin not tolerated: continue streptomycin (for 2 months) and ofloxacin, isoniazid, and ethambutol for total duration of 18 months
- Isoniazid not tolerated: stop ofloxacin and streptomycin, add ethionamide (if tolerated – otherwise use ofloxacin) to rifampicin and ethambutol for total duration 12 months

Pneumocystis

cotrimoxazole - one tablet (80/400mg) for each 4kg body weight per day. This dose should be divided into 3 or 4 doses a day giving no more than 4 tablets per dose.

IV therapy is seldom indicated

Therapy should be continued for 3 weeks.

Adjunctive prednisone 40mg 12 hourly should be given to hypoxic patients and tapered over 3 weeks.

See page 45 for alternative and maintenance therapy.

Nocardia

cotrimoxazole - two tablets 12 hourly for at least six months. In CNS or disseminated disease, one tablet (80/400mg) for each 4kg body weight per day. This dose should be divided into 3 or 4 doses a day giving no more than 4 tablets per dose. Reduction in dose should be considered after a clinical response has been established.

alternative therapies are available - discuss with microbiologist

Legionella

a macrolide or a quinolone

CNS INFECTIONS***Meningitis*****Empiric therapy (presumed bacterial meningitis)**

ceftriaxone 2g 12 hourly

if older than 50 yrs, alcoholic, immunocompromised or severely debilitated add ampicillin to above regimen to cover *Listeria* empirically

Adjunctive steroid therapy, given before antibiotic administration, has been shown to reduce the risk of deafness (0.15 mg/kg/dose dexamethasone or betamethasone given 6 hourly for 2-4 days). Steroids should only be given if the diagnosis of bacterial meningitis is certain.

Directed therapy

Penicillin sensitive organism

penicillin (5MU 6 hourly or 4MU 4 hourly)

Staphylococcus (cloxacillin sensitive)

cloxacillin 3g 6 hourly

Gram negative bacilli

ceftriaxone as above for 21 days

Listeria monocytogenes

penicillin given as above or ampicillin (2g 4 hourly) for at least 21 days

M. tuberculosis

see under tuberculosis page 30

Cryptococcus

See under fungal infections page 42

If only penicillin has been used to treat meningococcal meningitis, ciprofloxacin 500 mg STAT must be given to the patient to eradicate nasopharyngeal carriage. This should be given at the end of penicillin therapy as adverse reactions to ciprofloxacin may be falsely attributed to the penicillin. **As ceftriaxone will also eradicate nasal carriage, ciprofloxacin is not required if initial therapy was this agent.**

Brain abscess

ceftriaxone (2g 12 hourly) plus metronidazole

In patients who present with no signs of inflammation and in those whose CRP rapidly returns to normal, two to three weeks of IV therapy is usually sufficient along with surgical drainage. Longer therapy may be required in patients who do not settle. IV therapy should be followed by oral therapy once the CRP has begun to fall if a suitable oral agent is available. This should be continued for two – three months with careful follow-up.

URINARY TRACT INFECTIONS

Acute uncomplicated lower UTI

a single oral dose of ciprofloxacin 500mg

This single dose regimen should only be considered in otherwise healthy, non-pregnant women of childbearing age with symptoms of less than one week duration. Its use in other categories of patients is associated with an unacceptable failure rate.

Complicated UTIs (includes all men, catheterised patients, pregnant women and patients with abnormal urinary tracts)

lower tract infections

Oral: ciprofloxacin (500mg 12 hourly), cefuroxime (250mg 12 hourly) or co-amoxiclav.

Parenteral: gentamicin or ceftriaxone if aminoglycosides not appropriate

therapy for 7 days (if quinolones used, 3 days is sufficient)

if associated with a urinary catheter – remove or replace catheter

upper tract infections (patients with signs such as significant fever $\geq 38^{\circ}\text{C}$, rigors, vomiting or loin pain)

therapy as above, but for 10 - 14 days (7 days for a quinolone)

Empiric therapy should be modified once organism sensitivity is known. **Amoxicillin and cotrimoxazole are still useful in patients with sensitive organisms, but are inappropriate for empiric therapy due to high levels of resistance.**

Candiduria

Asymptomatic candiduria in a catheterised patient does NOT need to be treated (CID 2000;30:19-24) Removing or changing the catheter would seem to be an appropriate action if possible and should be the first response in symptomatic patients. If candiduria persists after removal/change of catheter give amphotericin B bladder washouts for 3 days using one litre per day of 50mg amphotericin B per litre. Instill an aliquot of 200-300ml, then cross-clamp the catheter for 60-90 minutes. Allow bladder to drain and then repeat the procedure.

In some cases the use of oral fluconazole (200mg stat followed by 100mg/day) may be more appropriate - consult microbiologist if required.

Repeat urine culture after completion of 3 days amphotericin washout therapy. If candida still present treat as for candidaemia.

Prostatitis

acute

quinolone for 14 days

chronic

quinolone 6 weeks therapy required

Use co-trimoxazole if organism isolated is sensitive to this agent.

OBSTETRIC AND GYNAECOLOGICAL INFECTIONS

Candida vaginitis

Clotrimazole vaginal pessary 500mg single dose. If vulval irritation, add clotrimazole cream to vulva twice daily continued for three days after symptoms resolve. For difficult cases fluconazole 150mg stat dose may be used if motivated for (*Brit J Obs Gyn* 1989;96:226).

Trichomoniasis

metronidazole 2g as a single dose

Pelvic infection

stage 1

ceftriaxone 250mg IM or cefixime 400mg orally STAT plus doxycycline for 14 days and metronidazole 400mg 12 hourly for 14 days

stage 2 or 3

penicillin and gentamicin plus metronidazole suppository (IV available if required)
 Stat dose of ceftriaxone 250mg IM for gonorrhoea. Change to oral doxycycline and co-amoxiclav . **There is no need to continue metronidazole once co-amoxiclav has been commenced.**

Intrauterine infection following rupture of membranes

ceftriaxone IV and metronidazole

Puerperal sepsis

penicillin and gentamicin (or ceftriaxone if breast feeding) plus metronidazole, followed by co-amoxiclav or cefuroxime plus metronidazole

Acute pyelonephritis in pregnancy

ceftriaxone followed by cefuroxime or co-amoxiclav orally for a total of 14 days

SEXUALLY TRANSMITTED INFECTIONS

Syndromic management:

genital ulcer

benzathine penicillin 2.4MU IM STAT
 erythromycin 500mg 6 hourly for 7days
 acyclovir 400mg 8 hourly for 7 days

vaginal discharge (if not due to candida)

cefixime 400mg orally or ceftriaxone 250mg IM STAT
 doxycycline 100mg 12 hourly for 7 days

urethral discharge

metronidazole 2g STAT
 cefixime 400mg orally or ceftriaxone 250mg IM STAT
 doxycycline 100mg 12 hourly for 7 days
 If symptoms persist, and above therapy was adhered to, give metronidazole 2g stat.

Syphilis

If there are no clinical signs for staging, regard as latent

primary and secondary

benzathine penicillin (2.4MU IM as a single dose)

or erythromycin (500mg 6 hourly) for 14 days (only for pregnant women, who must be given a course of doxycycline after delivery as erythromycin does not reliably treat syphilis)

or ceftriaxone 1g daily for 14 days

or doxycycline (100mg 12 hourly) for 14 days

latent and syphilis in HIV positive patients

benzathine penicillin (2.4MU IM) at weekly intervals for 3 weeks

	<p><i>or</i> erythromycin (500mg 6 hourly) for 28 days (only for pregnant women, who must be given a course of doxycycline after delivery as erythromycin does not reliably treat syphilis)</p> <p>ceftriaxone 1g daily for 14 days</p> <p><i>or</i> doxycycline (100mg 12 hourly) for 28 days</p>
neurosyphilis	<p>penicillin G (4MU 4 hourly) for 14 days or by continuous infusion</p> <p><i>or</i> procaine penicillin (2.4MU IM daily) plus probenecid (500mg 6 hourly) for 14 days</p>
pregnancy	<p>as above, but only penicillin reliably treats the baby - consider desensitisation in penicillin-allergic patients</p>
<i>Gonorrhoea</i>	<p>ceftriaxone 250mg STAT OR cefixime 400 mg PO STAT</p>
disseminated/arthritis	<p>ceftriaxone 1g daily for 2 weeks (ciprofloxacin can be used if sensitivity established)</p>
<i>Chlamydial infection</i>	<p>doxycycline (100mg 12 hourly) for 7 days</p>
<i>Chancroid</i>	<p>erythromycin 500mg 6 hourly for 7 days</p>
<i>Trichomonas</i>	<p>metronidazole 2g STAT</p>
Bacterial vaginosis	<p>Can use metronidazole 2g STAT as in syndromic management but 400mg 12hourly for 7 days has been shown to be more effective</p>

PERITONITIS

<i>Surgical</i>	<p>penicillin, gentamicin and metronidazole</p>
<i>Spontaneous (in patients with pre-existing liver disease)</i>	<p>ceftriaxone</p>
<i>Peritonitis in dialysis patients</i>	<p>ceftriaxone (250mg/l) and vancomycin (15mg/l) into the bag empirically. Rationalise once sensitivity of the organism is known.</p>

GASTROINTESTINAL INFECTIONS

<i>Shigellosis</i>	<p>ciprofloxacin for 3 days (7 days may be required in HIV positive patients)</p> <p>If associated with bacteraemia treat for 14 days</p>
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<i>Typhoid</i>	ciprofloxacin for 7 days is the drug of choice (ceftriaxone for 7 -14 days is an alternative)
<i>Salmonellosis (non-typhoid salmonellas)</i>	Fluid replacement only for most immunocompetent patients HIV positive patients should receive ciprofloxacin for 4 weeks due to the high risk of bacteraemia.
<i>Amoebiasis (including liver abscess)</i>	metronidazole (800mg 8 hourly) for 10 days
<i>Giardiasis</i>	metronidazole (2g daily as a single dose) for 3 days
<i>Pseudomembranous colitis</i>	stop causative antimicrobial agent if possible oral metronidazole 400mg 8 hourly for 10 days or oral vancomycin if poor response
<i>Isospora belli</i>	co-trimoxazole 2 tabs (2X80/400mg) 6 hourly for 10 days followed by maintenance therapy - see page 46 Discuss with ID specialist if recurrent infection
<i>Cryptosporidium</i>	no effective treatment available at present but patients respond well to ART.
<i>Microsporidium</i>	albendazole 400mg 12 hourly for one month (only some species respond)
<i>Helicobacter pylori</i>	metronidazole 400mg 12 hourly plus amoxicillin 1g 12 hourly plus a proton pump inhibitor for 14 days clarithromycin can be substituted for either of the above drugs for allergy or treatment failure

HELMINTHIC INFESTATIONS

<i>Ascaris, Trichuris, Enterobius, Taenia, hookworm</i>	albendazole 400mg stat or mebendazole suspension 100mg 12 hourly for 3 days. In heavy mixed infestations involving Trichuris, a single daily dose of albendazole may be inadequate and the dose may be given for 3 consecutive days.
<i>Hydatid disease</i>	albendazole 15mg/kg/day up to 800mg/day given 12 hourly for at least three months In difficult cases (e.g. bone) extended therapy may be required. If surgery or PAIR (Percutaneous Aspiration Injection of scolical & Re-aspiration) is considered, treat for at least four days before and one month after the procedure.

Cysticercosis

The decision to treat will depend on the anatomical situation of the lesions. Patients with intraventricular cysts will benefit from chemotherapy whereas patients with extensive intracranial disease may not, due to the effects of treatment-induced inflammation

albendazole 800mg/day given 12 hourly (15mg/kg/day in children) for 8 days

praziquantel 50-100mg/kg/day given 8 hourly for 15-30 days.

Given together with corticosteroids to minimise inflammatory reaction, eg. dexamethasone 8mg/day po in divided doses for 8 days

Schistosomiasis

praziquantel 40mg/kg as a single dose

SOFT TISSUE INFECTIONS*Erysipelas*

penicillin IV or IM followed by oral penicillin or amoxicillin

Cellulitis

IV cloxacillin - convert to oral flucloxacillin 500mg 6 hourly (note that it is unnecessary to add penicillin as cloxacillin will also cover streptococci)

Clindamycin is available for penicillin allergic patients or cases where clinical response to cloxacillin is poor. Where infection with gram-negative bacilli and/or anaerobes is suspected (e.g. in diabetics or patients with peripheral vascular disease) add gentamicin and metronidazole or use co-amoxiclav.

Wound infection

cloxacillin IV or oral flucloxacillin

Many infected wounds do not require antibiotic therapy and resolve with drainage and dressing. If a mixed infection is suspected (e.g. post gynaecological or abdominal surgery) - consider penicillin, aminoglycoside and metronidazole or co-amoxiclav.

Clostridial myonecrosis

metronidazole (or penicillin)

Necrotising fasciitis

penicillin, aminoglycoside and metronidazole
Substitution of penicillin and metronidazole with clindamycin may be considered, co-amoxiclav can be used if aminoglycoside contraindicated.

Tetanus

metronidazole 500mg 6 hourly for 7-10 days
debride any wounds that are present

BURNS*Streptococcus pyogenes*

co-amoxiclav or clindamycin for 10 days (used because penicillin often fails due to the presence of staphylococcal beta-lactamase in this situation)

Septicaemia

Therapy would depend on sensitivity patterns of organisms prevalent in the local burns unit
Rationalise once sensitivity of the organism known.

ORTHOPAEDIC INFECTIONS*Septic arthritis, osteomyelitis empiric therapy*

cloxacillin IV, change to oral flucloxacillin 1g 6 hourly when appropriate - for a total of 4 - 6 weeks therapy

Fusidic acid may be added for non-response or relapse.

Therapy should be adjusted in response to blood or pus culture results.

gonococcal

ceftriaxone for 2 weeks or ciprofloxacin if sensitivity has been established in the laboratory

Open fractures

see prophylaxis page 49

EYE INFECTIONS*Conjunctivitis*

chloramphenicol eye drops or ointment
if no response or if culture indicates resistance, use ciprofloxacin eye drops (restricted)

gonococcal

ceftriaxone 1g as a stat dose

Blepharitis

tetracycline eye ointment or fusidic acid eye drops (available only to the Ophthalmology Dept. or on request)

doxycycline 100mg daily for 3 months has been successful in difficult cases

Corneal ulcers

quinolone eye drops - if no response or if indicated by culture results, change to topical and subconjunctival gentamicin and ceftazidime
herpetic ulcers - topical acyclovir

Endophthalmitis

intravitreal vancomycin 1mg and ceftazidime 2.25mg with dexamethasone 0.2mg unless fungal infection suspected

oral ciprofloxacin 750mg 12 hourly may be added in difficult cases

Post intraocular surgery

no standard recommendation at present

Fungal infections

these infections are rare and no standard recommendation exists - consult the Ophthalmology Dept.

IV amphotericin B may be considered in severe cases.

Penetrating eye injuries

see prophylaxis page 49

FUNGAL INFECTIONS

Aspergillosis

invasive

voriconazole 200 mg 12 hourly (400mg 12 hourly loading dose on first day) is the agent of choice

amphotericin B 1mg/kg/day The duration of therapy is yet to be defined but total doses of 2 - 2,5g are usually recommended.

Candidiasis

oral

nystatin suspension 1ml 6 hourly swirled and swallowed

oesophageal

fluconazole 200 mg daily for two weeks

specify if patient is HIV positive so that pharmacy can issue donated stock – this does not require microbiology release

vaginal

Local preparations are available and are recommended in pregnancy. For difficult cases fluconazole 150mg stat dose may be used if motivated for (*Brit J Obs Gyn* 1989;96:226).

urinary tract

Asymptomatic candiduria in a catheterised patient does not need to be treated (CID 2000;30:19-24). Removing or changing the catheter would seem to be an appropriate action if possible and should be the first response in symptomatic patients. If candiduria persists after removal/change of catheter give amphotericin B bladder washouts for 3 days using one litre per day of 50mg amphotericin B per litre. Instill an aliquot of 200-300ml, then cross-clamp the catheter for 60-90 minutes. Allow bladder to drain and then repeat the procedure.

In some cases the use of oral fluconazole (200mg stat followed by 100mg/day) may be more appropriate - consult microbiologist if required.

	Repeat urine culture after completion of 3 days amphotericin washout therapy. If candida still present treat as for candidaemia.
positive blood cultures (in immunocompetent patients)	amphotericin B 0,7mg/kg/day If IV catheter related, the catheter should be removed Therapy should be continued for two weeks after the last positive blood culture. Blood cultures need to be repeated while the patient is on therapy. Fluconazole 400mg orally daily is an effective alternative. (NEJM 1994;331:1325-1330)
positive blood cultures (in immunocompromised patients) or suspected metastatic infection (including endocarditis)	amphotericin B 0,7mg/kg/day The end point of therapy is ill defined. An approach is to continue therapy for one month after the patient becomes afebrile. In endocarditis surgery is almost always required and therapy should be continued for 6 - 10 weeks thereafter.
intra-abdominal	Isolation of candida from the initial surgical specimens does not always require therapy. However repeated isolation or symptomatic infection should be treated with amphotericin B 0,7mg/kg/day for two weeks.

Cryptococcosis

HIV positive	amphotericin B 1 mg/kg/day for 14 days. In the acute phase daily therapeutic lumbar puncture, removing sufficient CSF to lower pressure to 18cm H ₂ O is important in patients with raised intracranial pressure. Thereafter fluconazole 400mg daily orally (600mg if also on rifampicin) for 8 weeks followed by maintenance therapy.
HIV negative	amphotericin B 1 mg/kg/day for 6 weeks or until antigen titre is negative or stable at 8 or less and cultures are negative ID should be consulted in all cases.

MALARIA

Uncomplicated *Plasmodium falciparum*

Disease severity is frequently underestimated, so careful monitoring is mandatory. Patients with uncomplicated malaria have mild symptoms, are ambulant, with normal mental function, and have no organ dysfunction.

Oral artemether-lumefantrine (Coartem®) is indicated for non-severe cases of malaria, who are not in the first trimester of pregnancy.

Dose: 4 tablets (80mg artemether and 480mg lumefantrine per tablet) repeated after 8 hours on day one and then 12 hourly for a further 2 days. Give each dose with fat containing food / drink to ensure adequate absorption.

If in any doubt of the severity of the malaria, discuss immediately with an ID specialist.

Severe P. falciparum

e.g. impaired consciousness, convulsions, severe weakness, severe vomiting, dehydration, respiratory distress, macroscopic haematuria, abnormal bleeding (retinal haemorrhages, DIC), shock, visible jaundice, severe anaemia (Hb<5g/dl); hypoglycaemia (Hgt<2.2mmol/l); acidosis (pH<7.25 / bicarb < 15mmol/l); renal impairment (creatinine >250µmol/l); hyperlactataemia (venous lactate>4mmol/l); parasite density >4%.

NB: ALL severe falciparum malaria cases MUST be discussed with an ID specialist on admission

Uncomplicated malaria including *P. vivax* or *P. ovale*

If unsure of species – treat for *P. falciparum*

TOXOPLASMOSIS

immunocompetent patients

pregnant women

ALTERNATIVE REGIMEN (poorly tolerated)

Quinine 600mg 8 hourly orally for 7 days PLUS doxycycline 200mg stat then 100mg daily for 7 days. (Replace doxycycline with clindamycin 10 mg/kg 12 hourly in children and pregnancy) Add doxycycline 2-3 days after starting quinine (to ensure that adverse effects from quinine are not confused with those of doxycycline).

IVI artesunate is the preferred treatment. Dose: 2,4mg/kg IVI at 0, 12 and 24hr and then daily until able to tolerate oral treatment.

Only available at hospitals registered in the Parenteral Artesunate Access Programme, including Groote Schuur, Tygerberg, Jooste and Victoria Hospitals. Contact ID specialist on Call to assist with dosing and completion of forms for Section 21 MCC approval. To enrol in access programme, contact Dr Elsime Visser-Kift on 021 406 6779.

ALTERNATIVE REGIMEN

Commence therapy with **IV quinine** 20mg/kg stat given over 4 hours followed by 10mg/kg 8 hourly over 4 hours.

Once the patient improves, follow with artemether-lumefantrine (or oral quinine and doxycycline / clindamycin), dosed as above.

Low threshold for adding a broad-spectrum intravenous antibiotic (e.g. ceftriaxone, co-amoxiclav) because of the high incidence of bacterial infections in these patients.

Artemether-lumefantrine, dosed as above, followed by primaquine base 15mg daily for 14 days to eradicate the hypnozoite stage in the liver and prevent relapse Primaquine is currently available from GSH with MCC authorisation. Exclude G6PD deficiency before treating with primaquine.

no treatment usually required

spiramycin 3g/daily is the treatment of choice, but both this and the alternative, sulphadiazine

are unavailable in S.A. Consider cotrimoxazole as below (risk to the foetus if used late in pregnancy)

immunosuppressed patients both HIV positive and HIV negative patients

cotrimoxazole one tablet (80/400mg) for each 8kg body weight per day, given 12hourly. The usual dose is therefore 4 tabs 12hourly – given for 1 month – followed by half the dose (2 tabs) 12hrly for 3 months

AAC 1998;42:1346-9

See page 45 for alternative and maintenance therapy.

BRUCELLOSIS

doxycycline 100mg 12 hourly for 6 weeks PLUS streptomycin daily for 3 weeks has been shown to be the most efficacious combination therapy, especially with bone involvement . Rifampicin 15mg/kg/day given 12 hourly for 6 weeks can replace the streptomycin if necessary.

TICK BITE FEVER

doxycycline 100mg 12 hourly for 7 days - if IV required use IV ciprofloxacin or chloramphenicol.

clarithromycin is an alternative for milder disease when tetracyclines are contraindicated (eg in pregnancy, children <8 years old)

TREATMENT OF OPPORTUNISTIC INFECTIONS IN AIDS PATIENTS

(Alternative agents are given as these patients are very often intolerant of drugs) For details on cotrimoxazole desensitisation see cotrimoxazole page 14)

Maintenance therapy is sometimes referred to as secondary prophylaxis in other texts.

Patients on HAART who have CD4 counts of >200 for more than 6 months may discontinue maintenance therapy

Pneumocystis

cotrimoxazole - one tablet (80/400mg) for each 4kg body weight per day This dose should be divided into 3 or 4 doses a day giving no more than 4 tablets per dose.

IV therapy is seldom indicated

or clindamycin plus primaquine 15mg daily
primaquine is currently only available with MCC release (consult Infectious Diseases if this therapy is contemplated).

Therapy should be continued for 3 weeks.

Adjunctive prednisone 40mg 12 hourly should be given to hypoxic patients. This is given for 5 days followed by 40mg daily for 5 days and then 20mg daily for 11 days.

maintenance therapy

cotrimoxazole 2 tabs (2X80/400mg) daily

or dapsone 100mg daily

Toxoplasma

cotrimoxazole one tablet (80/400mg) for each 8kg body weight per day, given 12hourly. The usual dose is therefore 4 tabs 12hourly – given for 1 month – followed by half the dose (2 tabs) 12hrly for 3 months

AAC 1998;42:1346-9

or clindamycin 600mg 8 hourly, pyrimethamine 50mg daily plus folinic acid 15 mg daily (to prevent bone marrow suppression from pyrimethamine – folic acid is ineffective) for 6 weeks.

maintenance therapy

cotrimoxazole 2 tabs (2X80/400mg) daily

or clindamycin 300-450 8 hourly, pyrimethamine 25-50 mg daily plus folinic acid

Cryptococcus neoformans

amphotericin B 1 mg/kg/day for 14 days. In the acute phase daily therapeutic lumbar puncture, removing sufficient CSF to lower pressure to 18cm H₂O is important in patients with raised intracranial pressure.

Thereafter fluconazole 400mg daily orally (600mg if also on rifampicin) for 8 weeks.

maintenance therapy

fluconazole 200mg daily for life, or until CD4 count >200 (provided minimum 12 months therapy has been given).

relapse

amphotericin B 1 mg/kg/day for 14 days

Thereafter fluconazole 800mg daily orally for 8 weeks followed by maintenance therapy using 400mg daily

Candida (oesophageal)

fluconazole 200 mg daily for two weeks

maintenance therapy

not usually recommended

Mycobacterium avium complex

clarithromycin 500mg 12 hourly plus ethambutol 15mg/kg/day (treatment is continued until CD4 count rises >100 on antiretroviral therapy)

Herpes simplex

acyclovir 400mg 8 hourly for 7 - 14 days

maintenance therapy

not usually recommended - acyclovir 400mg 12 hourly if frequent recurrences

Isospora belli

co-trimoxazole 2 tabs (2X80/400mg) 6 hourly for 10 days

maintenance therapy

ciprofloxacin 500mg 12 hourly for 10 days

recurrence

cotrimoxazole 2 tabs (2X80/400mg) daily

cotrimoxazole plus ciprofloxacin for 10 days followed by maintenance therapy as above

Cryptosporidium

no effective treatment available

Microsporidium

albendazole 400mg 12 hourly for one month

PROPHYLAXIS

SURGICAL PROPHYLAXIS

GENERAL PRINCIPLES

- The need for prophylactic antibiotic therapy is based on the risk of wound contamination
- Antibiotic prophylaxis is not required for clean operations/procedures in patients who have minimal risk of contamination. In all other situations, prophylaxis should be considered
- Prophylaxis must be given within 60 minutes before the first incision, usually at induction
- The prophylactic dose is a single dose equal to the standard therapeutic dose.
- A second dose is given only if there is massive blood loss or surgery is prolonged, i.e. 2-3 hours for cefazolin OR > 8 hours for metronidazole IV.
- Post-operative doses of prophylactic drugs are generally unnecessary.
- Prophylactic antibiotics do not replace the need for good surgical technique and adherence to infection control measures.

Type of surgery	Antibiotic used
Cardiothoracic surgery	<ul style="list-style-type: none"> • cefazolin, IV, 1 g * • further doses of 1g may be given 8 hourly for up to 24 hours. With bypass surgery or with excessive blood loss give a second 1g dose at 2-3 hours.
Lower limb amputation	<ul style="list-style-type: none"> • cefazolin, IV, 1 g * <p>PLUS</p> <ul style="list-style-type: none"> • metronidazole, IV, 500 mg
Orthopaedic surgery	<ul style="list-style-type: none"> • cefazolin, IV, 1 g * • for trauma related procedures see
Head and neck surgery	<ul style="list-style-type: none"> • cefazolin, IV, 1 g * <p>For procedures involving the oropharyngeal mucosa</p> <p>ADD</p> <ul style="list-style-type: none"> • metronidazole, IV, 500 mg
Abdominal surgery Upper GIT	<ul style="list-style-type: none"> • cefazolin, IV, 1 g *

* If patient >80 kg use 2g dose

Type of surgery	Antibiotic used
Colorectal and appendix	<ul style="list-style-type: none"> • cefazolin, IV, 1 g * <p>PLUS</p> <ul style="list-style-type: none"> • metronidazole IV, 500 mg <p>If perforation has occurred, treat patient for infection with a course of appropriate antibiotics (refer to page 37 for treatment of peritonitis)</p>
Biliary	<p>Only for high risk patients: bile obstruction, jaundice, biliary stones or cholecystitis, or re-operation, ERCP:</p> <ul style="list-style-type: none"> • cefazolin, IV, 1 g * <p>PLUS</p> <ul style="list-style-type: none"> • metronidazole IV, 500 mg
Pelvic surgery	<ul style="list-style-type: none"> • cefazolin, IV, 1 g * <p>PLUS</p> <ul style="list-style-type: none"> • metronidazole IV, 500 mg
ENT surgery	<ul style="list-style-type: none"> • cefazolin, IV, 1 g * <p>For procedures involving the oropharyngeal mucosa:</p> <p>ADD</p> <ul style="list-style-type: none"> • metronidazole, IV, 500 mg
Nephro-urological surgery	<ul style="list-style-type: none"> • cefazolin, IV, 1 g * • Treat patients with preoperative bacteriuria according to urine MC+S. • Trans-rectal prostate biopsy: oral ciprofloxacin 500mg 12hrs before and after surgery • Cystoscopy: 500mg ciprofloxacin before procedure
Ophthalmic surgery	<ul style="list-style-type: none"> • chloramphenicol 0.5% ophthalmic drops, instil 1 drop 2–4 hourly for 24 hours prior to surgery, preferably use separate vial for each patient.
Neurosurgery	<ul style="list-style-type: none"> • cefazolin, IV, 1 g *

SEVERE β -LACTAM ALLERGY

In most situations use clindamycin, IV, 600 mg. It is not necessary to add metronidazole as clindamycin has good anaerobic cover.

Where Gram-negative cover is required, e.g., colo-rectal, biliary or pelvic surgery, add gentamicin 6 mg/kg as a single dose.

* If patient >80 kg use 2g dose

ANTIBIOTIC PROPHYLAXIS IN TRAUMA

Bites

There is no clear evidence of benefit for antibiotic prophylaxis in minor animal bites. High dose oral co-amoxiclav should be used in severe animal bites and all human bites. In penicillin allergic patients tetracycline or clindamycin would be appropriate choices. Remember to check whether prophylaxis is needed for rabies, tetanus or HIV.

Open fractures

Distinguish between

- open fractures with minimal contamination which require only penicillin or cefazolin IV x 48 hrs

and

- open fractures with significant contamination (high risk of environmental contamination, delay in treatment or significant tissue destruction). These require early treatment with cloxacillin, gentamicin and metronidazole.

Head injuries

Compound depressed skull fractures and penetrating spinal cord injuries: Ceftriaxone 2g/day plus metronidazole for 5 days
CSF leaks: No prophylactic antibiotics

Penetrating eye injuries

Cefazolin 1g IV 8 hrly plus ciprofloxacin 750mg 12 hrly, both for 3 days

MEDICAL PROPHYLAXIS

RHEUMATIC FEVER

– prevention of recurrences (secondary prophylaxis)

benzathine penicillin 1.2MU IM every 4 weeks (every 3 weeks if possible in motivated patients with severe cardiac lesions)

Patients unable to have IM injections – penicillin V 250mg 12 hourly

Penicillin-allergic patients, erythromycin 250mg 12 hourly

Duration:

without proven carditis - 5 years after last attack or until 18 (whichever is longer)

with mild carditis (mild regurgitation or healed carditis) - 10 years after last attack or until 25 (whichever is longer)

with severe valvular disease - lifelong

ENDOCARDITIS PROPHYLAXIS

These recommendations are based on those of the American Heart Association as published in AHA Scientific Statement. 1998

Table 1 lists the cardiac conditions for which endocarditis prophylaxis is and is not recommended.

Table 2 lists the clinical situations in which endocarditis prophylaxis should be given.

TABLE 1 : CARDIAC CONDITIONS*ENDOCARDITIS PROPHYLAXIS RECOMMENDED*

Prosthetic cardiac valves, including bioprosthetic and homograft valves
 Previous bacterial endocarditis even in the absence of heart disease
 Surgically constructed systemic-pulmonary shunts or conduits
 Congenital cardiac malformations other than isolated secundum atrial septal defect*
 Rheumatic and other acquired valvular dysfunction, even after valvular surgery*
 Hypertrophic cardiomyopathy*
 Mitral valve prolapse with valvular regurgitation*

(*The need for prophylaxis in these conditions has been questioned and recent guidelines of both the AHA and British Society for Antimicrobial Chemotherapy have removed them from the list. This is currently under consideration by South African cardiologists.)

*ENDOCARDITIS PROPHYLAXIS **NOT** RECOMMENDED*

Isolated secundum atrial septal defect
 Surgical repair without residua beyond 6 months of secundum atrial septal defect, ventricular septal defect, or patent ductus arteriosus
 Previous coronary artery bypass graft surgery
 Mitral valve prolapse without valvular regurgitation#
 Physiological, functional, or innocent heart murmurs
 Previous Kawasaki disease without valvular dysfunction
 Previous rheumatic fever without valvular dysfunction
 Cardiac pacemaker and implanted defibrillators

TABLE 2: DENTAL OR SURGICAL PROCEDURES*ENDOCARDITIS PROPHYLAXIS RECOMMENDED*

All dental procedures involving dento-gingival manipulation
 Tonsillectomy and/or adenoidectomy
 Surgical operations that involve intestinal or respiratory mucosa
 Bronchoscopy with a rigid bronchoscope
 Nasal packing and nasal intubation
 Sclerotherapy for oesophageal varices
 Oesophageal dilation
 Oesophageal laser therapy
 Biliary tract surgery
 Gall stones – lithotripsy
 ERCP
 Cystoscopy
 Urethral dilatation
 Urethral catheterization if urinary tract infection is present#
 Prostatic surgery
 Incision and drainage of infected tissue#
 Vaginal hysterectomy
 Caesarean section
 Vaginal delivery in the presence of infection# (includes prolonged labour with prolonged rupture of membranes and difficult manipulative vaginal deliveries)

Cosmetic piercing of tongue or involving oral mucosa (such procedures should be discouraged in patients who are at risk for endocarditis)

*ENDOCARDITIS PROPHYLAXIS **NOT** RECOMMENDED*

Dental procedures not likely to induce gingival bleeding, such as simple adjustment of orthodontic appliances or fillings above the gum line

Injection of local intraoral anaesthetic (except intraligamentary injections)

Shedding of primary teeth

Tympanostomy tube insertion

Endotracheal intubation

Bronchoscopy with a flexible bronchoscope, with or without biopsy

Cardiac catheterization

Transoesophageal ECG

Oesophageal varices - banding

Endoscopy with or without gastrointestinal biopsy

Barium enema

Proctoscopy

Renal stones – lithotripsy

Circumcision

Cosmetic piercing involving urethral mucosa

In the absence of infection; urethral catheterization, dilatation and curettage, uncomplicated vaginal delivery, therapeutic abortion, sterilization procedures, or insertion or removal of intrauterine devices

#Antibiotic therapy should be directed against the known or most likely bacterial pathogen.

TABLE 3: RECOMMENDED REGIMENS FOR DENTAL, ORAL OR UPPER RESPIRATORY TRACT PROCEDURES

Standard regimen	amoxicillin 3g orally 1 hour before procedure
Nasal packing and nasal intubation	cloxacillin 2g IV at induction or just prior to procedure
Penicillin allergic patients and patients who are on long-term penicillin prophylaxis for rheumatic fever	clindamycin 600mg orally 1 hour before procedure
Patients unable to take oral medications	ampicillin 2g IV at induction or IM 30 minutes before procedure
Patients unable to take oral medications who are penicillin allergic or on long-term penicillin prophylaxis	clindamycin 600mg IV given in 50ml over 10 minutes at induction or up to 30 minutes before procedure

TABLE 4: RECOMMENDED REGIMENS FOR GENITOURINARY OR GASTROINTESTINAL PROCEDURES

For genitourinary or gastrointestinal procedures in which prophylaxis is recommended (see Table 2 above) the choice of agent is dictated by the common occurrence of enterococcal infections and the possibility of aerobic gram-negative organisms.

Standard regimen	ampicillin 2g IV plus gentamicin 1,5mg/kg at induction or up to 30 minutes before procedure. If surgery lasts more than 6 hours the parenteral regimen may be repeated once 6 hours after the initial dose. (Gentamicin would not normally be given at a dosage interval of 6 hours but this is done here for practical purposes - so that both drugs can be given together.)
Penicillin allergic patients and patients who are on long-term penicillin prophylaxis for rheumatic disease	vancomycin 1g given over 1 hour followed by gentamicin 1,5mg/kg at induction or up to 30 minutes before procedure. If surgery lasts more than 6 hours the gentamicin may be repeated 8 hours after the initial dose. No additional vancomycin is necessary.

NOTE: Patients with prosthetic heart valves were previously considered high-risk cases and parenteral prophylaxis was considered essential. The use of regimens as outlined above is now recommended for these patients.

MALARIA PROPHYLAXIS

Prophylaxis for malarious areas in sub-Saharan Africa:

mefloquine 250mg weekly

or

doxycycline 100mg daily

or

atovaquone 250mg plus proguanil 100mg daily

Prophylaxis should be continued for 4 weeks after returning (except for atovaquone/proguanil which can be discontinued after 1 week).

NOTE: Avoidance of mosquito bites and application of insect repellents are vital adjuncts to chemoprophylaxis. Refer to Pharmacology Department, Medicines Information Centre – 406-6783/6780 or Dr Jantjie Taljaard at the Infectious Diseases Unit at Tygerberg Academic Hospital – 083 419 1452 if further information required.

MENINGOCOCCAL MENINGITIS PROPHYLAXIS

Prophylaxis is only given to household contacts and medical staff who have performed mouth to mouth resuscitation or endotracheal intubation on the patient. Ciprofloxacin 500mg STAT is the drug of choice. Alternatives include rifampicin or ceftriaxone.

Table 3: Antibiotics for chemoprophylaxis of meningococcal disease

Generic Name	Dose		Route	Duration [Days]
	Adults	Children		
Rifampicin	600mg bd.	10mg/kg bd.	PO	2 days
Ciprofloxacin	500mg	10mg/kg	PO	Single Dose
Ceftriaxone	250mg	<15 years 125mg	IM	Single Dose

ANTIVIRAL PROPHYLAXIS

HIV

PREVENTION OF MOTHER-TO-CHILD TRANSMISSION OF HIV

- Women who are eligible for ART (CD4 count <350 OR WHO stage 4) must be urgently referred to their nearest antiretroviral treatment centre to initiate HAART.
- For women not qualifying for long-term HAART give zidovudine 300 mg 12 hourly from 14 weeks gestation. At onset of labour or rupture of membranes a single dose of nevirapine (NVP) 200mg should be given together with tenofovir plus emtricitabine (in the combination tablet Truvada) and AZT changed to 300mg 3 hourly. Maternal AZT is stopped at delivery.
- Women can be given nevirapine in all stages of labour. It is only too late to give nevirapine if the baby is delivering imminently (the head is crowning).
- All babies on the PMTCT program should receive NVP daily after delivery for 6 weeks if they are formula fed or stop two weeks after weaning if breast-fed. Nevirapine dose for infants:
 - Birth weight 2.5 kg or more: 15 mg
 - Birth weight <2.5 kg: 10 mg daily
 - If the baby delivers less than two hours after the mother takes nevirapine, the baby should receive a dose of nevirapine immediately after delivery.
 - Babies born more than two hours after the mother received nevirapine should receive a single dose at 6 - 72 hours.

HIV PROPHYLAXIS FOR RAPE SURVIVORS

Rape survivors attending GSH and TBH within 72 hours of assault can obtain tenofovir 300mg PLUS lamivudine 300 mg given once daily for 4 weeks, with monitoring as outlined for occupational exposures below. If the patient is able to tolerate a third drug, alluvia 2 tabs bd should be administered. There is no evidence for starting ART after 72 hours.

References

MMWR January 21, 2005/Vol.54/RR-2

OCCUPATIONAL POST-EXPOSURE HIV PROPHYLAXIS

All exposures must be properly documented and followed up by the staff health clinic. Emergency post-exposure prophylaxis (PEP) is available in trauma unit (GSH) or Medical Emergencies F1 (TBH). The risk of a healthcare worker acquiring HIV following a percutaneous (needlestick or sharps) or mucosal splash injury with HIV-infected blood is very low at 0.3% and 0.09% respectively. The risk of acquiring HIV is increased when the sharps injury is deep, when the injury involves a hollow needle used in a vein or artery or when the source patient's viral load is high. Zidovudine post-exposure has been shown to reduce the risk by 81%.

PEP should be started **immediately after the injury** even if the HIV status of the source patient is unknown. Delaying PEP will significantly reduce its efficacy and should be avoided. Animal data suggests that prophylaxis after 24 hours is ineffective **and every effort should be made to ensure that PEP is accessible to staff within this time period**. It is not unreasonable however to offer PEP up to 72 hours after the incident – these cases should be discussed with an ID specialist so that a clear risk-benefit assessment can be made. PEP should not be given to persons who are already HIV-infected.

Combination ART is advocated using either 2 or 3 drugs (see table). Tenofovir 300mg od and lamivudine 300mg od should be used as the backbone, with addition of a third agent, lopinavir/ritonavir (Aluvia – 2 tablets 12 hourly) indicated for percutaneous exposures (see table). Stavudine or zidovudine may be substituted for tenofovir, however zidovudine is strongly associated with gastrointestinal symptoms, especially within the first 2-3 days. If the source patient is on ART, the choice of PEP regimen should be discussed with an ID specialist. **All PEP must be continued for 28 days.**

PEP should **not** be offered for exposures to body fluids which carry no risk of infection (eg vomitus, urine, faeces or saliva) or when the source is known to be HIV seronegative. If there are features suggesting seroconversion illness, prophylaxis should be continued until the results of additional tests are available (discuss with an Infectious Diseases specialist).

Follow-up testing will be arranged through Staff Health. Other potentially transmissible pathogens such as hepatitis B, C and syphilis will be reviewed.

Recommendations for post exposure prophylaxis (PEP) after exposure to infectious material (includes blood, CSF, semen, vaginal secretions & synovial/pleural/ pericardial/ peritoneal/amniotic fluid) from HIV seropositive patients.

*

Exposure	HIV status of source patient	
	Positive or Unknown*	Negative
Intact skin	No PEP	No PEP
Mucosal splash/ Non-intact skin	2 Drugs	No PEP
Percutaneous injury	3 Drugs	No PEP

*If subsequent testing reveals the source to be HIV seronegative, PEP can be stopped. In the event of the source HIV status remaining unknown, the full 28 day course of PEP should be completed.

HEPATITIS A

- Household, community or health care workers in contact with a hepatitis A infected person can be given PEP if HepA IgG negative.
- Vaccine alone is favoured unless > 2 weeks since contact or if the contact is immunocompromised or has pre-existing liver disease where vaccine plus immune globulin should be given. The efficacy of the vaccine alone in persons over 40 years is not well established and HNIG should be given in addition.
- Infants < 1 year immunoglobulin should be given (vaccine not licensed for use in this age group)
- Dose
 - vaccine- 2 doses a month apart
 - human normal immune globulin (HNIG)- 0.02-0.04 ml/kg
 - vaccine and immune globulin should be given at different sites

HEPATITIS B

- A previously vaccinated person with a surface antibody titre of > 10 IU/ml requires no PEP.
- Contacts are infectious if they are hepatitis B surface antigen-positive (HBsAg).
- Mucocutaneous exposure to blood and body fluids require PEP with hepatitis B immune globulin (HBIG) and vaccine.
- Institutional or household contacts (no defined exposure) require vaccine only.
- Newborns of HBsAg-positive mothers
 - If mother eAg positive: HBIG and vaccine (1st dose at birth)
 - If mother eAg negative: vaccine only (1st dose at birth)
- Dose (vaccine and immunoglobulin to be given at different sites)
 - HBIG (200 IU/2ml)
 - Newborn - <5 years: 200 IU
 - 5-9 years: 300 IU
 - >10 years: 500 IU
 - Vaccine: 3 doses at 0, 1 and 3 months

HEPATITIS C

- No effective PEP but early diagnosis and treatment is important.
- Baseline ALT and anti-HCV should be performed on the exposed healthcare worker.
- Follow-up testing at 6, 12 and 24 weeks advised. – do ALT and if increased do HCV RNA PCR

INFLUENZA

- PEP is usually given to control an outbreak in an institution or to prevent secondary cases in a family. Check the availability of these drugs with the pharmacy.
- Dose
 - Zanamivir: 10 mg daily (inhaled) for 10 days
 - Oseltamivir: 2 mg/kg/dose, maximum 75 mg/dose, once a day for 7-10 days

MEASLES

- Household or community contacts.
- Vaccine (<72 hours post exposure) or HNIG can be given.
- Vaccine is not suitable for contacts <6 months old, pregnant women and immunocompromised contacts. These individuals should be given HNIG.
- Dose
 - Vaccine: 1 dose if >1 year old, if <1 year, repeat at 15 months
 - HNIG: 0.2-0.25 ml/kg (max 15 ml)

MUMPS

- No effective PEP.

RUBELLA

- No effective PEP.

RABIES

- Dog bites are the cause of most rabies cases in SA.
- PEP prophylaxis involves the use of vaccine ± rabies immune globulin (RIG).
- There is no cut-off time to start rabies PEP.
- Risk of acquiring rabies depends on the site and severity of the bite.
- Exposure
 - Low risk (superficial scratch – no bleeding, licking of broken skin): give vaccine only
 - High risk (bites and scratches that penetrate the skin and draw blood. licking of mucous membranes): RIG and vaccine
- Dose
 - Vaccine- 0.5-1 ml (depends on supplier) on day 0, 3,7,14 and 28. Vaccine is given into the deltoid (adults) or anterolateral thigh (infants).- NOT into gluteus maximus.
 - RIG 20 IU/kg infiltrated into the wound, remainder into the buttock. Supplied in 2ml ampoules containing 300IU. Dose (ml)= body weight (kg) X 0.13.
- Clean the wound thoroughly with soap and water for 5 minutes then apply antiseptic solution e.g. 70% alcohol or iodine solution. Avoid suturing.
- Prophylactic antibiotics and tetanus toxoid should be given after high risk exposures.
- Late presentation (>48hrs) and immunocompromised people – as above but double dose of vaccine on day 0
- If previously immunised – only vaccine on day 0 & 3.

VARICELLA

- The recommended form of PEP following VZV exposure (chickenpox or shingles) depends on the context:
 - Healthy non-immune contacts: vaccine <72 hours post-exposure or acyclovir from day 7-21 post-exposure
 - Pregnant women who are not immune: Zoster immune globulin (ZIG) at any stage of pregnancy or acyclovir from day 7-21 post-exposure
 - Neonates born to mothers who develop chickenpox 7 days before, and up to 28 days after delivery: ZIG (acyclovir is a second option if ZIG is not available)
 - Infants under 6 months of age who are exposed to chickenpox (as maternal immunity is usually lost by 2-3 months): ZIG (acyclovir, a second option)

- Immunocompromised patients: ZIG (vaccine is safe for most immunocompromised patients but the protective efficacy is less). Acyclovir is a second option.
- Dose
 - Vaccine
 - <13 years old: 1 dose
 - >13 years old: 2 doses 4 weeks apart
 - Acyclovir:
 - Adults: 800 mg 5 x daily
 - Children: 40 mg/kg/day in 4 divided doses
 - ZIG (200 IU/2ml)
 - 0-5 years: 2 ml
 - 6-10 years: 4 ml
 - 11-14 years: 5 ml
 - > 15 years: 6ml

ANTIMICROBIAL AGENTS IN PREGNANCY**GENERALLY CONTRAINDICATED**

albendazole	erythromycin estolate
doxycycline	streptomycin
efavirenz (avoid during first trimester)	tetracyclines

TRY TO AVOID, USE ONLY IF ESSENTIAL

amikacin	nalidixic acid
aminoglycosides	ofloxacin (avoid during 1 st trimester)
chloramphenicol*	pentamidine
ciprofloxacin (avoid during 1 st trimester)	piperacillin/tazobactam
colistin	praziquantel (avoid during 1 st trimester)
co-trimoxazole*	primaquine
fluconazole (dose-dependent toxicity)	pyrimethamine
ganciclovir	quinine
gentamicin	quinolones (avoid during 1 st trimester)
griseofulvin	sulphonamides*
imipenem	trimethoprim/sulfamethoxazole*
itraconazole	vancomycin
ketoconazole	
linezolid	
mebendazole (avoid during 1 st trimester)	

PROBABLY SAFE, USE WHEN CLEARLY INDICATED

acyclovir	erythromycin (avoid estolate derivative)
amoxicillin	ethambutol
ampicillin	ethionamide
amphotericin B	isoniazid
cefazolin	methenamine mandelate
cefotaxime	metronidazole (avoid during 1 st trimester)
cefoxitin	nitrofurantoin*
ceftazidime	nystatin
ceftriaxone	penicillins
cephalosporins	piperacillin
clindamycin	pyrazinamide
cloxacillin	rifampicin (Vit K needed at birth)
co-amoxiclav	tenofovir (limited data, concern about bone and renal toxicity)
ertapenem	zidovudine

*contraindicated near term

ANTIMICROBIAL AGENTS DURING LACTATION

GENERALLY CONTRAINDICATED

chloramphenicol

metronidazole (if essential give 2g STAT and then bottle feed for 24 hours)

COMPATIBLE

amikacin

amoxicillin

ampicillin

acyclovir

cephalosporins

cloxacillin

erythromycin

ethambutol

fluconazole

gentamycin

isoniazid (monitor infant for peripheral neuritis, hepatitis & pyridoxine deficiency)

mebendazole

nalidixic acid*

nystatin

penicillins

piperacillin

praziquantel (bottle feed for 72 hours)

quinine*

rifampicin

streptomycin

sulphonamides* (in healthy, full-term neonate. Avoid in ill, stressed or premature infants)

tetracycline

trimethoprim*

vancomycin

* avoid in infants with G6PD deficiency

NO HUMAN DATA – PROBABLY COMPATIBLE

albendazole (in normal doses)

ethionamide

LIMITED HUMAN DATA – PROBABLY COMPATIBLE

ciprofloxacin

mefloquine

clindamycin

methenamine

colistin

nitrofurantoin*

imipenem

ofloxacin

meropenem

ertapenem

kanamycin

pyrazinamide

ketoconazole

primaquine

NO HUMAN DATA – POTENTIAL TOXICITY

griseofulvin

linezolid

Compiled by the Medicines Information Centre, Division of Clinical Pharmacology, UCT

Need help? Phone 021-406 6829 or 021-406 6780 or 021-406 6783

ANTIMICROBIAL AGENTS IN PORPHYRIA

These ratings have been assigned on the basis of published information, a comparison of drugs of similar structure, personal experience and intuition. Published experience is not necessarily available to support every rating and ratings should serve as a guide only.

AVOID

chloramphenicol	ethionamide	nalidixic acid
clindamycin	griseofulvin	nitrofunantoin
cotrimoxazole	indinavir	pyrazinamide
dapsone	ketoconazole	sulfonamides
sulfonamides	miconazole	trimethoprim

MAY PROVE TO BE UNSAFE: USE WITH EXTREME CAUTION

albendazole	itraconazole	rifampicin
amprenavir	metronidazole	ritonavir
doxycycline	minocycline	ritonavir
efavirenz	nelfinavir	tetracyclines
fluconazole	nevirapine	zidovudine
isoniazid	rifabutin	

USE WITH CAUTION

abacavir	foscarnet	ofloxacin
azithromycin	lamivudine	pentamidine
cephalosporins (other)	linezolid	saquinavir
ciprofloxacin	mebendazole	stavudine
clarithromycin	mefloquine	zalcitabine
didanosine	moxifloxacin	

THOUGHT TO BE SAFE

acyclovir	ertapenem	niclosamide
amikacin	ethambutol	nystatin
aminoglycosides	famciclovir	penicillin
amoxicillin	flucloxacillin	piperacillin
amphotericin	fusidic acid	primaquine
ampicillin	ganciclovir	proguanil
ceftazidime	gentamicin	pyrimethamine
ceftriaxone	imipenem	quinine
cefuroxime	methenamine	streptomycin
cloxacillin	mandelate	valaciclovir
co-amoxiclav	natamycin	valganciclovir
didanosine	neomycin	vancomycin

INSUFFICIENT DATA FOR A RECOMMENDATION (AVOID IF POSSIBLE)

colistin	emtricitabine	tazobactam
clofazimine	framycetin	terizidone
	praziquantel	

GENERAL PRINCIPLES OF WOUND MANAGEMENT

Wound management has undergone great change over the years. Many principles that were regularly practiced for decades have been challenged and changed by medical research. Despite the confusion, a few principles need to be applied - the most basic one being the **maintenance of a warm, moist wound healing environment** to promote wound autolysis, fibroblastic activity, and the resultant formation of granulation and epithelialisation tissue. All modern wound management practice is centred around this basic fundamental.

PATIENT ASSESSMENT

It is imperative before any specific wound regimen is considered, that a thorough patient assessment occurs. There are many factors that interfere with the wound healing process and these need to be identified and addressed at the first instance by a multi-disciplinary team. Examples of detrimental factors that can be altered are nutritional status, presence of systemic or local infection, sleep and stress levels, smoking, uncontrolled diabetes, anaemia and iatrogenic factors such as steroidal therapy. Factors that cannot be changed such as age and underlying medical condition need to be compensated for.

WOUND ASSESSMENT

The wound needs to be thoroughly assessed initially and at each dressing change and the following objective and subjective data recorded:

- Location of the wound
- Aetiology
- Wound dimensions
- Amount/ Colour/ Consistency/ Odour of wound exudate
- Condition of surrounding skin
- Pain levels
- Colour of wound bed/ Stage of wound healing
- Treatment objectives
- Current treatment regimen

Recording such details on a designated chart is an efficient way of documenting wound management practice.

Some form of peripheral wound assessment should be performed and documented daily by recording on a chart. Dressings should not be removed for this purpose, but the chart should be thoroughly completed at each dressing change. Treatment objectives are likely to change as the wound progresses through the stages of wound healing.

THE IDEAL DRESSING

After the wound has been thoroughly assessed, the GSH Wound Management Protocol will assist in determining a dressing regimen. The ideal dressing could take many forms, but the following elements will be consistently present:

Removal of excess exudate

Wound exudate is not harmful as it contains vital cells for wound autolysis and regeneration. If excess exudate is not absorbed by the dressing in place, however, maceration of surrounding healthy tissue can result which could lead to further tissue breakdown.

Maintenance of a moist wound environment

A moist wound interface is essential to facilitate wound autolysis and fibroblast proliferation (Winter,1962; Dyson,1988). Traditional dressings used in the management of wounds, eg. gauze dressings; often allow the wound to dry out and cause trauma to granulation tissue on removal, delaying healing time.

Provision of a barrier to pathogens

Strike-through is the term used to describe the situation where wound exudate leaks through to the outside of a secondary dressing. If this occurs, pathogens have a direct pathway through this wet dressing, onto the wound surface, even though the dressing remains intact (Dealey,1994; Hallet & Hampton,1999). In this situation, the dressing must be replaced immediately. Modern wound products absorb such exudate more effectively and delay such an occurrence, although it can still occur.

Provision of thermal insulation

An optimal wound healing temperature is 37.5 degrees Celsius. If the temperature drops below 35 degrees or exceeds 40 degrees, mitotic activity is delayed for up to four hours (Torrance,1986; Myers, 1982;). Modern wound products are designed to be left intact for as long as possible to maintain this optimal temperature. Every time a dressing is changed, the temperature of the wound is markedly decreased. This is perpetuated by cold lotions being applied during the cleansing process. For this reason, it is recommended that normal saline be warmed prior to application.

Protection from mechanical trauma.

Newly formed granulation tissue is very fragile. Dressings or dressing techniques which traumatise the wound can cause destruction of this precious tissue. All modern wound products you will encounter are non adherent to prevent such an occurrence. **Traditional cleansing methods involving the wiping of the wound surface with cotton wool or gauze also cause such trauma, and hence, should be avoided. Irrigating a wound with a syringe filled with warmed normal saline is the preferred method.**

Avoidance of fibres or toxic substances

Fibres in a wound from cotton wool, gauze, or similar products, interfere with the wound healing process. In effect, such fibres act as foreign bodies. To this end, cotton wool should not be used for wound cleansing or drying. Wounds do not have to be dried, as a moist environment is optimal. Surrounding skin can be dried with gauze squares. Many studies have identified skin disinfectants (antiseptics) to be toxic to fibroblasts, and thus an inhibiting factor to granulation tissue formation (Leaper, 1988; Goldheim, 1993; Flanagan, 1997; Ferguson, 1993). Antiseptics have no place in the treatment of clean granulating wounds. Dressing products impregnated with an antiseptic or antibiotic can be considered to have the same negative effect on wound healing.

Cost Effectiveness

The continual need for economic rationalisation is an ongoing concern for all health professionals. New generation wound products are often condemned for their perceived expense. There is a need for one to think laterally in this regard to discover that these products, when used correctly, have the potential to save the health budget a great deal of expense. Two of the main features of these products is that they increase the rate of wound healing, and need to be replaced infrequently. One of the most expensive commodities on any unit is nursing time. A dressing that is changed 1-2 times a week, as opposed to daily or twice daily, saves the unit a great deal of expenditure on nursing time and disposable dressing products such as dressing packs, saline etc. In addition, a faster healing rate results in a reduced length of stay which also results in savings. A comparative costing audit will provide objective data to support the cost effectiveness of new generation products.

Hypoallergenicity

The ideal dressing is hypoallergenic. Most new generation wound products will claim to have this property but one needs to be aware that it is impossible to predict this with all patients.

Ease of use, adaptability, comfort

It is essential that the dressing in place has these qualities in order to be accepted by patients and colleagues. Many products are available specifically for use around difficult body parts. Time spent in choosing appropriate products will increase the longevity of the product as it will be less likely to peel off prematurely.

FREQUENCY OF DRESSING CHANGES

Standard daily dressing changes are contraindicated with new generation dressing products unless the wound is infected. These dressings are designed to be left in situ until leakage or strike through occurs, which could be up to five to seven days.

TRADITIONAL WOUND HEALING METHODS

Traditional wound healing practices involving the use of dry dressings are no longer advocated for use on granulating wounds as they do not create a moist wound environment which has been identified as an essential factor in the promotion of wound healing. The traditional gauze dressing also has the potential to dehydrate the wound surface and to traumatise granulation tissue on removal. Many other traditional wound healing theories exist including exposing the wound to air and sunlight, and allowing scab formation to occur. The former practice results in the wound cooling down and drying out which will impair fibroblast proliferation and the formation of granulation tissue. Pathogens may also enter the wound at this time which could be potentially harmful. The practice of allowing eschar to form on the wound surface impairs the wound healing process as this acts as a barrier to migrating epithelial cells. The application of a dressing which promotes a moist wound healing environment will prohibit the formation of eschar. If an eschar is present on a wound surface, it must be removed. Mechanical debridement is the most effective way of achieving this, although the application of a hydrogel will rehydrate the eschar, causing it to become softer and able to be easily lifted off with forceps. Hydrocolloids also have debriding properties.

CLASSIFICATION AND CORRECT USE OF WOUND PHARMACEUTICALS

This section will provide a brief outline of the properties, correct use of, indications and contraindications of some of the major generic categories of new generation wound dressings. All of these dressings promote thermal insulation and a moist wound healing environment.

GENERIC DRESSING TYPES

- Semi-permeable films
- Hydrogels
- Foams
- Hydrocolloids
- Alginates
- Vacuum Assisted Closure
- Combinations

GENERAL PRINCIPLES OF DRESSING SELECTION

- Consider / moderate causative factors
- No single dressing is appropriate for all stages of wound healing
- Selection- take into account
 - causative factors
 - presence of infection
 - cost
 - patient acceptability
 - ease of use

SEMI-PERMEABLE FILMS (e.g. OPSITE, TEGADERM)

<ul style="list-style-type: none"> • Permeable to oxygen and water vapour • Mechanical barrier to moisture/ bacteria • Non-toxic, transparent, highly conformable 	<p>CONTRAINDICATIONS</p> <ul style="list-style-type: none"> • Infected wounds • Fragile skin • Exuding wounds • Cavities (as primary dressing) • Sloughy or necrotic wounds
<p>INDICATIONS</p> <ul style="list-style-type: none"> • Primary Dressing (ie. next to wound surface) <ul style="list-style-type: none"> Intravenous insertion site Surgical wounds (non exuding) Protection- abraded skin • Secondary dressing <ul style="list-style-type: none"> Over foams, alginates, hydrogels 	<p>PRACTICAL ISSUES</p> <ul style="list-style-type: none"> • Clean, dry, skin • 3-4 cm from wound edge • Change when leakage etc..

HYDROGELS (e.g. INTRASITE GEL, NUGEL, GRANUGEL)

<ul style="list-style-type: none"> • Made up of 70- 80% H₂O • Absorbs minimal/ moderate amount exudate • Desloughs/ debrides by rehydration • Odour remission (slight) • Ease of application and removal • Initial cooling effect 	<p>CONTRAINDICATIONS</p> <ul style="list-style-type: none"> • Infected wounds • Wounds with heavy exudate
<p>INDICATIONS</p> <ul style="list-style-type: none"> • Wounds with little exudate • Ulcers • Sloughy/ necrotic wounds • Shallow/ deep cavities 	<p>PRACTICAL ISSUES</p> <ul style="list-style-type: none"> • Excessive amount may cause maceration • Requires a secondary dressing • Change frequently if debriding is required

FOAMS (e.g. LYOFOAM, ALLEVYN, TIELLE)

<ul style="list-style-type: none"> • Open-cell polyurethane sheet • Surface cells collapsed- draw blood and exudate through collapsed cells • Particle free • Gas permeable • Easily cut/ conformable 	<p>CONTRAINDICATIONS</p> <ul style="list-style-type: none"> • No absolute • ? Dry wounds/ eschar
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<p>INDICATIONS</p> <ul style="list-style-type: none"> • Moderate to heavy exudate • Cavity wounds (foam cavity filler available) • Ulcers/ pressure areas • Infected wounds <p>Secondary dressing</p>	<p>PRACTICAL ISSUES</p> <ul style="list-style-type: none"> • Apply 2cm from margin
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HYDROCOLLOIDS (e.g. GRANUFLEX, COMFEEL)

<ul style="list-style-type: none"> • Flexible, water resistant outer layer • Hydroactive particles at skin contact layer • Excludes atmospheric oxygen and promotes blood supply • Maintains pH 6.0 - inhibits growth of pathogens • Debriding agent 	<p>CONTRAINDICATIONS</p> <ul style="list-style-type: none"> • Infected wounds • Active vasculitis • Full thickness burns • Ulcers secondary to TB, syphilis, fungal infection
<p>INDICATIONS</p> <ul style="list-style-type: none"> • Low - moderate exudate • Sloughy wounds • Ulcers/ pressure areas • Superficial burns • Suture lines • Abrased skin 	<p>PRACTICAL ISSUES</p> <ul style="list-style-type: none"> • Produces yellow gel with characteristic odour • Watch for hypergranulation • If cavity present, use hydrocolloid paste/gel under wafer • Wound can enlarge initially (autolysis) • Apply wafer 2cm from wound margin • Change only when leakage occurs • Do not use in conjunction with other products eg. hydrogel

ALGINATES (e.g. KALTOSTAT)

<ul style="list-style-type: none"> • Calcium alginate fibre • Polysaccharide - seaweed • Absorbs exudate and tissue fluid to form hydrophilic gel: $\text{CaAlg} + \text{Na}$ (in wound exudate) \rightleftharpoons $\text{NaAlg} + \text{Ca}$ • Haemostatic (Ca ions released into wound assist clotting cascade) • Facilitates de-sloughing 	<p>CONTRAINDICATIONS</p> <ul style="list-style-type: none"> • Dry wounds/ eschar • Deep sinuses
<p>INDICATIONS</p> <ul style="list-style-type: none"> • Moderate - heavy exudate • Donor sites • Venous ulcers • Pressure sores • Infected wounds (although 	<p>PRACTICAL ISSUES</p> <ul style="list-style-type: none"> • Change only when strike through occurs • Change daily if infected • Do not soak in saline prior to application - should not be

traditional gauze dressings more cost effective in most instances)	necessary
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VACCUUM- ASSISTED CLOSURE (e.g. COLDEX)

<ul style="list-style-type: none"> • Sub atmospheric pressures created promotes angiogenesis and increased blood supply (growth factors/ macrophages etc..) to wound • Wound exudate effectively removed - provides bacterial clearance • Promotes wound autolysis and granulation ++ 	<p>CONTRAINDICATIONS</p> <ul style="list-style-type: none"> • Presence of eschar (debride prior) • Patients at risk of bed rest complications (decreases mobility) • Wounds situated close to major blood vessels- risk of haemorrhage
<p>INDICATIONS</p> <ul style="list-style-type: none"> • Clean, sloughy, and infected wounds 	<p>PRACTICAL ISSUES</p> <ul style="list-style-type: none"> • Attach vaccuum tubing to wall suction (40-80mmHg) or VAC pump (up to 200mmHg) • Suction can be disconnected for toileting etc.. (keep tube ends sterile) • Pressure care necessary

COMBINATIONS/ OTHER

The above section has provided an overview of the main generic dressing types. Obviously many more exist on the market alongside combinations of different groups. Refer to product guidelines in Wound Management Reference Folder in unit areas for more specific product descriptions.

CLINICALLY INFECTED WOUNDS

Once an infection is established in a wound, very specific wound management follows. Such a diagnosis should ideally be substantiated by a microbiology report on a wound swab. (NB: When taking a wound swab, it is essential that the wound be irrigated with normal saline **prior** to the swab being taken.)

If a wound shows clinical signs of infection, and the patient is systemically unwell, the Western Cape Antibiotic Recommendations booklet will guide the choice of empiric systemic antibiotics. When culture and sensitivity results become available any appropriate changes should be made. Topical antibiotic application is controversial in most instances, as such substances may interfere with the wound healing process. Topical antiseptics are not recommended in most instances as they can be rapidly deactivated in the presence of wound exudate. Application of silver sulphadiazide cream is advocated, however, in limited situations, such as in the presence of pseudomonas, as it has sustained release properties.

Alongside the systemic administration of specific antibiotics, daily saline irrigation and dressing changes are required in the treatment of infected wounds. This is the only instance in the utilisation of new generation wound care products where the frequency of dressing changes can be pre-determined. This is also the one scenario where the application of traditional gauze dressings is a cost effective option due to the frequency of dressing changes.

A diet high in protein, or protein supplements should be ensured (as in all situations where tissue repair is required).

MALIGNANT WOUNDS

Due to their underlying aetiology, these wounds are unlikely to heal. Hence, the following recommended guidelines for treatment can differ markedly from non-malignant wounds. More information can be obtained from the Radiotherapy Department (Sr. Grehan bleep 1044)

If the wound appears clean, vaseline scraped (use a limited amount) onto gauze is applied daily. Wounds are cleaned with saline when necessary using an irrigation method. If slough is present, substitute ichthammol ointment (spread thinly over gauze) for vaseline.

Fungating wounds are rinsed with normal saline and an ichthammol ointment dressing is applied. Acriflavine can be substituted if ichthammol induces pain. Large amounts of exudate are contained by using incontinence pads or nappies held in place with elastomesh.

Malodorous malignant wounds are irrigated with hydrogen peroxide and rinsed with sodium bicarbonate in water (deodorising effect). Ichthammol ointment or glycerine and ichthammol lotion is then applied sparingly. Metronidazole powder can be used in conjunction with this treatment. This regime is recommended for a period of 3-4 days only. Residual odour can be eliminated with application of eucalyptus oil on clothing or outer dressing.

Povidone iodine products are not recommended for use on malignant wounds.

Wounds arising from skin, mouth, and breast cancers have specific wound treatment regimes and should be referred directly to Radiotherapy Department, L block, Groote Schuur Hospital.

Patients undergoing radiation therapy should be referred to L block dressing room prior to treatment to prevent radiation skin changes (burns). If desquamation occurs, wounds are treated with acriflavine dressings.

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FURTHER INFORMATION

Can be obtained from the following members of the GSH Wound Management Consultative Committee

Prof. D. Hudson Dept. Plastic & Reconstructive Surgery ext. 3426	Plastic surgery registrar on call
Ms. C. Grehan Dept. Radiation Oncology bleep 1044 ext. 4356	Ms V. Morris Infection Control Dept bleep 1141 ext. 5116