Red Cross War Memorial Children’s Hospital (RCWMCH)

Antimicrobial Recommendations

2012

NATIONAL HEALTH LABORATORY SERVICE
CONTACT DETAILS

PAEDIATRIC INFECTIOUS DISEASES (RCWMCH)

SENIOR REGISTRAR:
VIA SWITCHBOARD 0216585111
OR DIAL ‘9’ IF IN THE HOSPITAL

CONSULTANT ON DUTY:
(ROSTER AVAILABLE AT SWITCHBOARD OR IN WARDS)
PROF BRIAN ELEY: 021 658 5321, PAGE 4173
DR JAMES NUTTALL: 021 658 5499, 083 703 2996

MICROBIOLOGY (GSH)

MICROBIOLOGIST ON DUTY:
VIA SWITCHBOARD 0216585111
OR DIAL ‘9’ IF IN THE HOSPITAL
OR 082 907 5282

PHARMACY (RCWMCH)
021 658 5114 / 5537 / 5545
Produced by

Paediatric Infectious Diseases Unit
Red Cross War Memorial Children’s Hospital
Rondebosch, Cape Town
&
National Health Laboratory Service
Groote Schuur Hospital
Cape Town

Edited by

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As far as possible, members of different departments and sub-specialties were
consulted about issues that particularly affect their discipline.

The authors do not warrant that the information contained in this booklet is complete
and shall not be liable for any damages incurred as a result of its use.

Suggestions for changes are welcome and may be communicated to Dr James Nuttall
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Laboratory, Groote Schuur Hospital
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ANTIMICROBIAL AGENTS AVAILABLE AT RCWMCH (2012)

*Please check Antimicrobial Restrictions before prescribing.

All drugs & formulations listed are available on the Provincial Coding List (PCL) as at May 2012 except those drugs marked with asterisks (see below)

Items on the PCL can be ordered easily if unavailable in the pharmacy

* = Drug or a specific formulation of drug requires approval from Pharmaceutics and Therapeutics Committee (PTC), RCWMCH

# = Unregistered drug, requires Section 21 approval through the Medicines Control Council of South Africa (MCC)

**ung:** ointment

**gutte:** eye drops

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### ANTIBACTERIALS

<table>
<thead>
<tr>
<th></th>
<th>Oral (Per Os)</th>
<th>Parenteral (IV/IM/SC)</th>
<th>Topicals / Eye Preparations (ung/cream/gutte)</th>
<th>Estimated cost for 10kg child/day (May 2012) (to nearest vial for parenteral)</th>
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<tbody>
<tr>
<td><strong>Amikacin</strong></td>
<td></td>
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<td></td>
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<td>100mg</td>
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<td></td>
<td></td>
<td></td>
<td><strong>R5.64</strong></td>
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<td></td>
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<td></td>
<td><strong>R4.81</strong></td>
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<tr>
<td><strong>Amoxicillin</strong></td>
<td></td>
<td>125mg/5ml</td>
<td>250mg cap</td>
<td><strong>Susp: 125-R2.80, 250-R4.60</strong> Tab/cap: 250mg-R0.76</td>
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<tr>
<td></td>
<td></td>
<td>250mg/5ml</td>
<td>500mg cap</td>
<td></td>
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<tr>
<td><strong>Ampicillin</strong></td>
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<td>250mg</td>
<td></td>
<td><strong>R8.00</strong></td>
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<td></td>
<td></td>
<td>500mg</td>
<td></td>
<td><strong>R5.12</strong></td>
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<tr>
<td><strong>Azithromycin</strong></td>
<td>* 200mg/5ml</td>
<td></td>
<td></td>
<td><strong>Susp: R4.85</strong></td>
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<tr>
<td></td>
<td>* 500mg tab</td>
<td></td>
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<td><strong>Capreomycin</strong></td>
<td>1000mg</td>
<td></td>
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<td><strong>Cefamandole</strong></td>
<td>1000mg</td>
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<tr>
<td><strong>Cepalexin</strong></td>
<td>125mg/5ml</td>
<td></td>
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<tr>
<td></td>
<td>250mg/5ml</td>
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<td></td>
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<tr>
<td><strong>Cefazolin</strong></td>
<td>500mg</td>
<td>1000mg</td>
<td></td>
<td><strong>R12.56</strong></td>
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<td></td>
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<td><strong>R8.99</strong></td>
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<tr>
<td><strong>Cefepime</strong></td>
<td>500mg</td>
<td>* 1000mg</td>
<td>* 2000mg</td>
<td><strong>R151.98</strong></td>
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<td></td>
<td><strong>R61.38</strong></td>
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<td></td>
<td></td>
<td><strong>R38.91</strong></td>
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<td><strong>Cefixime</strong></td>
<td>400mg tab</td>
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<tr>
<td><strong>Cefotaxime</strong></td>
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<td>1000mg</td>
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<td><strong>R11.00</strong></td>
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<td></td>
<td></td>
<td><strong>R9.45</strong></td>
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<td><strong>R61.56</strong></td>
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<tr>
<td><strong>Ceftazidine</strong></td>
<td>500mg</td>
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<td><strong>R11.61</strong></td>
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<td><strong>R3.70</strong></td>
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<td>250mg tab</td>
<td><strong>Susp: R8.03</strong></td>
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<td></td>
<td>500mg tab</td>
<td>250mg</td>
<td>750mg</td>
<td><strong>IV: 250mg: R43.92, 750mg: R23.64</strong></td>
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<tr>
<td><strong>Chloramphenicol</strong></td>
<td>250mg cap</td>
<td>1000 mg</td>
<td></td>
<td><strong>Caps: R0.27</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.5% gutte, 10mg/g eye ung, Chloramphenicol + dexamethasone (0.5% + 0.1%) gutte</td>
<td><strong>IV: R11.34</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td><strong>Ung: R3.52</strong></td>
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<td><strong>Drops: R16.33</strong></td>
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<td><strong>Drops +dex: R9.26</strong></td>
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<td>Topicals / Eye Preparations (ung/cream/gutt)</td>
<td>Estimated cost for 10kg child/day (May 2012) (to nearest vial for parenteral)</td>
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<td></td>
<td>Suspension</td>
<td>Tablet/ Capsule</td>
<td>Vial/ amp</td>
<td></td>
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<tr>
<td>Ciprofloxacin</td>
<td>*250mg/5ml</td>
<td>250mg tab</td>
<td>200mg/100ml</td>
<td>Susp: R8.98 IV: R158.10</td>
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<td>Clarithromycin</td>
<td>*125mg/5ml</td>
<td>500mg tab</td>
<td>500mg</td>
<td>Susp: 125mg: R4.18 250mg:R8.10</td>
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<td>Clindamycin</td>
<td>150mg cap</td>
<td>600mg</td>
<td>Caps:R4.29 IV :R4.93</td>
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<td>Clofazimine</td>
<td>50mg cap</td>
<td>250mg</td>
<td>PCL</td>
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<tr>
<td>Cloxacillin</td>
<td>250mg</td>
<td>500mg</td>
<td>250mg vial: R39.92 500mg vial: R21.56</td>
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<tr>
<td>Co-Amoxiclav</td>
<td>125mg amoxicillin + 31.25mg clavulanic acid/5ml</td>
<td>250mg amoxicillin + 125mg clavulanic acid tab</td>
<td>600mg 1200mg</td>
<td>Susp125mg / 5ml: R2.25 250mg / 5ml: R1.62 Tab: 250mg amoxicillin +125mg clavulanic acid: R2.62</td>
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<tr>
<td></td>
<td></td>
<td>250mg amoxicillin + 62.5mg clavulanic acid/5ml</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>875mg amoxicillin +125mg clavulanic acid</td>
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<td></td>
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<tr>
<td># Colistin</td>
<td></td>
<td># 1 MU</td>
<td>Vial : R163.68</td>
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<tr>
<td>Co-trimoxazole</td>
<td>40:200mg/5ml</td>
<td>80:400mg tab</td>
<td>80:400mg</td>
<td>Susp:R0.15 Tab:R0.05 Amp:R0.85</td>
</tr>
<tr>
<td>(Trimethoprim/ Sulphamethoxazole)</td>
<td></td>
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</tr>
<tr>
<td>Doxycycline</td>
<td>100mg cap</td>
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<td>Cap:R0.15</td>
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<tr>
<td>Ertapenem</td>
<td></td>
<td>1000mg</td>
<td></td>
<td>R368.33</td>
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<tr>
<td>Erythromycin</td>
<td>125mg/5ml</td>
<td>250mg cap/tab</td>
<td>1000mg</td>
<td>Susp:125mg/5ml: R2.31 Vial:R302.92</td>
</tr>
<tr>
<td></td>
<td>250mg/5ml</td>
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</tr>
<tr>
<td>Ethambutol</td>
<td>400mg tab</td>
<td>100mg tab</td>
<td></td>
<td>Tab:R0.22</td>
</tr>
<tr>
<td>Ethionamide</td>
<td>250mg tab</td>
<td></td>
<td></td>
<td>Tab:R1.45</td>
</tr>
<tr>
<td>Framycetin/ Gramicidin/ Dexamethasone (Sofradex®)</td>
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<tr>
<td>Flucloxacillin</td>
<td>125mg/5ml</td>
<td>250mg cap</td>
<td></td>
<td>Susp:R6.16 Cap:R1.43</td>
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<tr>
<td>*Fusidic Acid</td>
<td>*250mg/5ml</td>
<td>*250mg tab</td>
<td>*500mg</td>
<td>Susp:R63.8 Tab: R53.10 Inj: R410.9 Ung: R36.18</td>
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<tr>
<td></td>
<td></td>
<td>*500mg</td>
<td>*10mg/1g eye ung</td>
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<tr>
<td>Gentamicin</td>
<td>20mg</td>
<td>80mg</td>
<td></td>
<td>Inj 20mg: R15.96 80mg 1.70</td>
</tr>
<tr>
<td>Gentamicin + Betamethasone + Clioquinol + Tolnaftate (Quadriderm®)</td>
<td></td>
<td></td>
<td>1mg + 0.5mg +10mg + 10mg per gram cream</td>
<td>R42.48</td>
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<tr>
<td>Imipenem</td>
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<td>500mg</td>
<td></td>
<td>R364.16</td>
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<td>Isoniazid (INH)</td>
<td>100mg tab</td>
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<td>R0.16</td>
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<tr>
<td>Kanamycin</td>
<td></td>
<td>1000mg</td>
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<td>R2.24</td>
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<td>Levofloxacin</td>
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<td>R2.50</td>
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<td>Topicals / Eye Preparations (ung/cream/gutte)</td>
<td>Estimated cost for 10kg child/day (May 2012) (to nearest vial for parenteral)</td>
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<td>Suspension</td>
<td>Tablet/Capsule</td>
<td>Vial/amp</td>
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<tr>
<td>Linezolid</td>
<td>20mg/ml</td>
<td>600mg tab</td>
<td>200mg</td>
<td>Susp: R157.47 Inj R143.75.</td>
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<tr>
<td>Meropenem</td>
<td>500mg</td>
<td>1000mg</td>
<td>Inj 500mg: R191.58 1000mg: R252.32</td>
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<tr>
<td>Metronidazole</td>
<td>200mg/5ml</td>
<td>200mg tab 400mg tab</td>
<td>500mg</td>
<td>Susp: R1.20 Tab 200mg R0.13 Tab 400mg R0.07 Inj R4.89 Supp 500mg: R1.94 Supp 1g: R1.42</td>
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<tr>
<td>Moxifloxacin</td>
<td>400mg tab</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mupirocin (Bactroban®)</td>
<td>2% ung, 2% nasal ung</td>
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<tr>
<td>Nalidixic acid</td>
<td>250mg/5ml</td>
<td>500mg tab</td>
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<td>Susp: 4.57 Tab: R7.65</td>
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<td>Neomycin + Betamethasone</td>
<td>0.00035% + 0.1%</td>
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<td>Not stocked</td>
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<tr>
<td>#Nitrofurantoin</td>
<td>#50mg cap #100mg cap</td>
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<td>Cap 50mg: R4.20</td>
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<td>Ofloxacin</td>
<td>200mg tab 400mg tab</td>
<td>200mg</td>
<td>0.3% gutte</td>
<td>Tab: 200mg: R2.96 400mg: R1.11 Vial: R427.52 Ung: R19.76</td>
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<tr>
<td>Oxytetracycline + Polymyxin B</td>
<td>5mg+10000u/g eye ointment</td>
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<td>Para-aminosalicylic Acid (PAS)</td>
<td>4g powder</td>
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<tr>
<td>Benzathine Penicillin</td>
<td>600 000U 1.2MU 2.4MU</td>
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<tr>
<td>Benzylpenicillin</td>
<td>300 000 units 1MU 5MU</td>
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<td>1MU: R11.64 5MU: R8.56</td>
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<tr>
<td>Phenoxy methyl penicillin (Penicillin V)</td>
<td>125mg/5ml 250mg/5ml</td>
<td>250mg tab</td>
<td></td>
<td>Susp 125mg / ml: R1.32 250mg / ml: R0.83 Tab: R0.48</td>
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<td>Procaine Penicillin</td>
<td>300 000 U/ml multi-dose vial (10ml)</td>
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<td>Piperacillin- Tazobactam</td>
<td>4g/500mg</td>
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<td>Vial: R60.00</td>
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<td>*Polymixin B/ neomycin/ dexamethasone (Maxitrol®)</td>
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<td>*Eye ung R21.21</td>
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<tr>
<td>Pyrazinamide</td>
<td>500mg tab #150mg tab</td>
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<tr>
<td>Rifampicin</td>
<td>100mg/5ml</td>
<td>150mg cap 450mg cap 600mg tab</td>
<td>300mg</td>
<td>Susp: R5.91 Vial R154.59</td>
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<td>Rifampicin/isoniazid</td>
<td>60/60mg tab * 150/75mg tab 300/150mg tab</td>
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<td>Parenteral (IV/IM/SC)</td>
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<tr>
<td><strong>Suspension</strong></td>
<td><strong>Tablet/Capsule</strong></td>
<td><strong>Vial/amp</strong></td>
<td></td>
<td></td>
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<tr>
<td>Rifampicin/ Isoniazid/ Pyrazinamide/ Ethambutol</td>
<td>150/75/400/ 275mg tab</td>
<td>Tab: R1.31</td>
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<tr>
<td>Silver sulphadiazine (Bactrazine®)</td>
<td>50g, 250g, 500g 1% cream</td>
<td>R10.95</td>
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<tr>
<td>Spectinomycin</td>
<td>2g</td>
<td>Not stocked</td>
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<tr>
<td>Streptokinase</td>
<td>750000iu 15000000iu</td>
<td>Vial 750000: R1013.56 1.5MU: R2998.00</td>
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<tr>
<td>Streptomycin</td>
<td>1g 5g</td>
<td>Vial: 1g : R5.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sulfadoxine + pyrimethamine</td>
<td>500mg+ 25mg</td>
<td>R5.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Teicoplanin</em></td>
<td>*200mg</td>
<td>BSA dosing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terizidone</td>
<td>250mg cap</td>
<td>Cap: R6.41</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tetracycline</td>
<td>250mg cap</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Tigecycline</em></td>
<td>*50mg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tobramycin</td>
<td>80mg</td>
<td>3mg/1g eye ung, 3mg/ ml eye gutte</td>
<td>R24.89</td>
<td></td>
</tr>
<tr>
<td>Vancomycin</td>
<td>500mg 1g</td>
<td>Vial 500mg: R32.33</td>
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</tbody>
</table>

### ANTIFUNGALS

<table>
<thead>
<tr>
<th></th>
<th>Oral (Per Os)</th>
<th>Parenteral (IV/IM/SC)</th>
<th>Topicals / Eye Preparations (ung/cream/gutte)</th>
<th>Estimated cost for 10kg child/day (May 2012) (to nearest vial for parenteral)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Suspension</strong></td>
<td><strong>Tablet/Capsule</strong></td>
<td><strong>Vial/amp</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amphotericin B</td>
<td>50mg</td>
<td>*10mg lozenge</td>
<td>Vial: R32.42 Loz: R12.73</td>
<td></td>
</tr>
<tr>
<td><em>Caspofungin</em></td>
<td>*50mg</td>
<td>Not stocked</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clotrimazole</td>
<td>15g cream 500mg tab (pv) 10% vaginal cream</td>
<td>Cream: R5.99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluconazole</td>
<td>*40mg/ml</td>
<td>*50mg cap *150mg cap *200mg cap</td>
<td>40mg/ml: R12.53</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10mg/ml 200mg tab</td>
<td>200mg</td>
<td>Diflucan donation Programme (free)</td>
<td></td>
</tr>
<tr>
<td>Griseofulvin</td>
<td>125mg 500mg</td>
<td>Tab 125mg: R1.83</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Itraconazole</td>
<td>100 mg cap</td>
<td>R11.60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ketoconazole</td>
<td>200mg tab</td>
<td>R1.44</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miconazole</td>
<td>20mg/g oral gel</td>
<td>R59.57</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Natamycin</em></td>
<td>*5% eye drops R1383.64</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nystatin</td>
<td>100 0000u/ml 15g cream, ung 100 000iu pv Susp: R1.23 Cream: R6.89 Ung: R14.71</td>
<td>R67.00</td>
<td></td>
<td></td>
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<tr>
<td><em>Posaconazole</em></td>
<td>*40mg/ml</td>
<td>R67.00</td>
<td></td>
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</tr>
<tr>
<td>Selenium Sulphide</td>
<td>2.5% suspension / shampoo</td>
<td>R23.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terbinafine</td>
<td>250mg tab</td>
<td>R0.71</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Tolnaftate</em></td>
<td>*10mg/g cream</td>
<td>R45.46</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oral (Per Os)</td>
<td>Parenteral (IV/ IM/SC)</td>
<td>Topicals / Eye Preparations (ung/cream/gutte)</td>
<td>Estimated cost for 10kg child/day (May 2012) (to nearest vial for parenteral)</td>
</tr>
<tr>
<td>----------------</td>
<td>---------------</td>
<td>------------------------</td>
<td>-----------------------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Suspension</strong></td>
<td>Tablet/ Capsule</td>
<td>Vial/ amp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*Voriconazole</td>
<td>*50mg tab *200mg tab</td>
<td>*200mg</td>
<td></td>
<td>Tab 50mg: R100 200mg: R200, IV: R340</td>
</tr>
</tbody>
</table>

**ANTIPARASITICS**

<table>
<thead>
<tr>
<th></th>
<th>Oral (Per Os)</th>
<th>Parenteral (IV/ IM/SC)</th>
<th>Topicals / Eye Preparations (ung/cream/gutte)</th>
<th>Estimated cost for 10kg child/day (May 2012) (to nearest vial for parenteral)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Suspension</strong></td>
<td>Tablet/ Capsule</td>
<td>Vial/ amp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Albendazole</td>
<td>*20mg/ml</td>
<td>400mg tab 200mg tab</td>
<td></td>
<td>Susp: R4.70 Tab: R1.60</td>
</tr>
<tr>
<td>#Artesunate</td>
<td></td>
<td>#60mg</td>
<td></td>
<td>Access programme via Pharmacology, UCT</td>
</tr>
<tr>
<td>Artemether-</td>
<td></td>
<td>20/120mg tab</td>
<td></td>
<td>R4.59</td>
</tr>
<tr>
<td>Lumefantrine</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Chloroquine</td>
<td>68mg/5ml (50mg base)</td>
<td>200mg tab (146.7mg base) 200mg tab (150mg base)</td>
<td></td>
<td>Susp: R2.28 Tab: R0.20</td>
</tr>
<tr>
<td># Ivermectin</td>
<td>#3 mg tab</td>
<td></td>
<td></td>
<td>R73.00</td>
</tr>
<tr>
<td>Mebendazole</td>
<td>*100mg tab 500mg tab</td>
<td></td>
<td></td>
<td>Tab: R1.57</td>
</tr>
<tr>
<td>*Piperazine</td>
<td>*500mg/ 5ml</td>
<td></td>
<td></td>
<td>R1.64</td>
</tr>
<tr>
<td>Praziquantel</td>
<td>500mg tab 600mg tab</td>
<td></td>
<td></td>
<td>Tab 600mg: R32.44</td>
</tr>
<tr>
<td>#Primaquine</td>
<td>#15mg tab</td>
<td></td>
<td></td>
<td>R6.45</td>
</tr>
<tr>
<td>*Pyrimethamine</td>
<td>*25mg tab</td>
<td></td>
<td></td>
<td>R3.36</td>
</tr>
<tr>
<td>Pyrimethamine-</td>
<td>500mg/25mg</td>
<td></td>
<td></td>
<td>R5.05</td>
</tr>
<tr>
<td>sulfadoxine</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quinine</td>
<td>300mg tab 300mg</td>
<td></td>
<td></td>
<td>Tab: R2.44 IV: R7.21</td>
</tr>
<tr>
<td>Scabicides:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benzyl benzoate</td>
<td></td>
<td></td>
<td></td>
<td>25%: R1.29</td>
</tr>
<tr>
<td>Monosulfiram</td>
<td></td>
<td></td>
<td></td>
<td>Soap: R7.74</td>
</tr>
<tr>
<td>Sulphur</td>
<td></td>
<td></td>
<td></td>
<td>5 % ung: 0-6mo (manufactured in pharmacy) R25.10</td>
</tr>
<tr>
<td>Pediculosis:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gammabenzene-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>hexachloride</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Gambex®)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oral (Per Os)</td>
<td>Parenteral (IV/IM/SC)</td>
<td>Topicals / Eye Preparations (ung/cream/gutte)</td>
<td>Estimated cost for 10kg child/day (May 2012) (to nearest vial for parenteral)</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>---------------</td>
<td>-----------------------</td>
<td>-----------------------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Abacavir</strong></td>
<td>20mg/ml</td>
<td>300mg tab</td>
<td></td>
<td>Susp: R3.55, Tab: R3.29</td>
</tr>
<tr>
<td><strong>Aciclovir</strong></td>
<td>200mg/5ml</td>
<td>200mg dispersible tab, 400mg tab</td>
<td>250mg</td>
<td>Susp: R18.59, Tab: 200mg: R0.72, Tab: R1.75, Ung: R190.00</td>
</tr>
<tr>
<td><strong>Atazanavir</strong></td>
<td>150mg caps</td>
<td></td>
<td></td>
<td>R345.00</td>
</tr>
<tr>
<td><strong>Amantadine</strong></td>
<td>100mg caps</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong># Darunavir</strong></td>
<td>300mg tab</td>
<td>75mg tab</td>
<td></td>
<td>300mg: R10.40</td>
</tr>
<tr>
<td><strong>Efavirenz</strong></td>
<td>50mg cap</td>
<td>200mg cap, 600mg tab</td>
<td></td>
<td>50mg: R2.47, 200mg: R3.43, 600mg: R1.33</td>
</tr>
<tr>
<td><strong>Didanosine (DDI)</strong></td>
<td>25mg tab</td>
<td>50mg tab, 100mg tab</td>
<td>25mg, 250mg, 400mg</td>
<td>25mg: R1.48, 100mg: R2.26, EC: 250mg: R2.43, 400mg: R3.60</td>
</tr>
<tr>
<td><strong>Famciclovir</strong></td>
<td>250mg tab</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ganciclovir</strong></td>
<td></td>
<td>500mg</td>
<td></td>
<td>R76.74</td>
</tr>
<tr>
<td><strong>Lamivudine (3TC)</strong></td>
<td>10mg/ml</td>
<td>150mg tab, 300mg tab</td>
<td></td>
<td>Susp: R0.72, Tab (150mg): R0.69</td>
</tr>
<tr>
<td><strong>Lamivudine/ Zidovudine (3TC/AZT)</strong></td>
<td>150mg/300mg tab</td>
<td></td>
<td></td>
<td>R2.45</td>
</tr>
<tr>
<td><strong>Lopinavir/ Ritonavir</strong></td>
<td>80mg: 20mg/ ml</td>
<td>200mg: 50mg tab #100mg:25mg tab</td>
<td></td>
<td>Susp: R3.25, Tab: (200mg:50mg): R2.42, (100mg:25mg): R3.05</td>
</tr>
<tr>
<td><strong>Nevirapine (NVP)</strong></td>
<td>10mg/ml</td>
<td>200mg tab</td>
<td></td>
<td>R80.80, R0.52</td>
</tr>
<tr>
<td><strong>Oseltamivir</strong></td>
<td>12mg/ml</td>
<td>75mg cap</td>
<td></td>
<td>R7.99</td>
</tr>
<tr>
<td><strong>Ribavirin</strong></td>
<td>200mg tab</td>
<td></td>
<td></td>
<td>R6.53</td>
</tr>
<tr>
<td><strong># Raltegravir</strong></td>
<td>400mg tab</td>
<td>100mg tab</td>
<td></td>
<td>400mg: R60.00</td>
</tr>
<tr>
<td><strong>Ritonavir</strong></td>
<td>80mg/ml</td>
<td>100mg cap</td>
<td></td>
<td>R1.88, Cap: R1.71</td>
</tr>
<tr>
<td><strong>Stavudine (D4T)</strong></td>
<td>1mg/ml</td>
<td>15mg cap, 20mg cap, 30mg cap</td>
<td></td>
<td>Susp: R1.98, 15mg: R0.41, 20mg: R0.46, 30mg: R0.41</td>
</tr>
<tr>
<td><strong>Tenofovir</strong></td>
<td>300mg tab</td>
<td></td>
<td></td>
<td>R8.48</td>
</tr>
<tr>
<td><strong>Tenofovir disoproxil fumarate/emtricitabine (Truvada®)</strong></td>
<td>300mg/200mg</td>
<td></td>
<td></td>
<td>Tab: R8.48</td>
</tr>
<tr>
<td><strong>Trifluorothymidine</strong></td>
<td></td>
<td>1% eye drops</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Valaciclovir</strong></td>
<td>250mg tab</td>
<td>#500mg tab</td>
<td></td>
<td>Tab: 500mg: R27.14</td>
</tr>
<tr>
<td><strong>Valganciclovir</strong></td>
<td>60mg/ml</td>
<td>450mg cap</td>
<td></td>
<td>Cap: R621.86, Suspension: manufactured in Pharmacy under sterile conditions.</td>
</tr>
<tr>
<td><strong>Zanamivir</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Zidovudine (AZT)</strong></td>
<td>10mg/ml</td>
<td>100mg cap, 300mg tab</td>
<td>200mg</td>
<td>Vial: R20.69</td>
</tr>
</tbody>
</table>
RESTRICTED ANTIMICROBIALS AT RCWMCH

The use of the antimicrobials listed below requires clearance either from infectious diseases (ID) or microbiology (refer inside front cover for contact details) or the ward consultant as indicated in the table below.

Motivation for clearance should be supported by relevant clinical details and preferably microbiological evidence.

Clearance is indicated to the Pharmacy by
1. Name, signature and date of the ID consultant/ID senior registrar or relevant ward consultant (whichever is applicable) on the prescription sheet, or
2. Telephonically by the ID consultant/ID senior registrar/microbiologist on-call or relevant ward consultant providing patient name, hospital folder number, ward/out-patient clinic, diagnosis.

Note:
- The diagnosis for which the restricted drug is being prescribed must be indicated on the in-patient or out-patient prescription chart.
- Restricted drugs that are cleared for use but NOT on the Provincial Coding List (PCL) must still be approved by the RCWMCH Pharmaceutics and Therapeutics Committee (PTC) and drugs not registered by the Medicines Control Council of South Africa require Section 21 approval.

The Pharmacy is authorized to deny the release or continuation of restricted agents for which the clinical condition being treated has not been indicated on the prescription sheet and/or the necessary clearance has not been obtained.

<table>
<thead>
<tr>
<th>REQUIRE CLEARANCE BY INFECTIOUS DISEASES (ID) OR MICROBIOLOGY</th>
<th>REQUIRE CLEARANCE BY WARD CONSULTANT</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID only</td>
<td>Cefepime</td>
</tr>
<tr>
<td>Clarithromycin</td>
<td>Ceftazidime</td>
</tr>
<tr>
<td>Ofloxacin, Levofoxacin, Moxifloxacin</td>
<td>Ciprofloxacin IV</td>
</tr>
<tr>
<td>Terizidone</td>
<td>*Colistin (in PICU)</td>
</tr>
<tr>
<td>*Valganciclovir (non-transplant patients)</td>
<td>*Fusidic Acid</td>
</tr>
<tr>
<td>*Darunavir, *Raltegravir</td>
<td>Imipenem</td>
</tr>
<tr>
<td></td>
<td>Meropenem</td>
</tr>
<tr>
<td></td>
<td>Ertapenem</td>
</tr>
<tr>
<td></td>
<td>Vancomycin</td>
</tr>
<tr>
<td>ID or microbiology</td>
<td>Ganciclovir</td>
</tr>
<tr>
<td>*Caspofungin, *Posaconazole, *Voriconazole,</td>
<td>Fluconazole</td>
</tr>
<tr>
<td>*Colistin (outside PICU)</td>
<td></td>
</tr>
<tr>
<td>Linezolid</td>
<td></td>
</tr>
<tr>
<td>*Teicoplanin, *Tigecycline</td>
<td></td>
</tr>
</tbody>
</table>

* = antimicrobial drugs that are currently not included on Provincial Coding List (PCL) i.e. require motivation to RCWMCH PTC. Colistin also requires MCC approval.
GENERAL PRINCIPLES OF PRESCRIBING ANTIMICROBIALS

Diagnosis

Consider the possible infecting pathogens and the severity of the condition to be treated. Specimens for microbiological examination should be taken before starting antimicrobial therapy. This is always important but especially in children with suspected infective endocarditis or urinary tract infections. Isolation of bacteria from a specimen does not automatically mean antibiotic treatment is required - treat the patient, not the culture result.

Selection of antimicrobial agents

Empirical therapy may involve the use of broad-spectrum antimicrobial agents in order to cover a range of potential pathogens. However, therapy should be guided by microbiologic evidence whenever possible. When sensitivities become available, switching to narrow-spectrum agents will help reduce the development of resistance.

Route of administration

Choose the route of administration, remembering that oral therapy is frequently appropriate. Monitor the child’s response and consider changing from IV to oral therapy when possible.

Calculation of body surface area (m²)

\[
\text{Body Surface Area (m²)} = \sqrt{\frac{\text{Mass (kg)} \times \text{Length (cm)}}{3600}}
\]

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. However, infections at certain sites (e.g. osteitis or endocarditis), with particular organisms or in immunocompromised individuals may require prolonged therapy. Guidelines are given in the text where this is relevant. With all antibiotics, 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.

Dose

Maximal doses do not always need to be given – the dose depends on the site and severity of infection as well as pharmacokinetics of the antibiotic. Dosing recommendations have been provided throughout the booklet. Infections that commonly require higher doses include infective endocarditis and meningitis, while uncomplicated urinary tract infections can be treated with lower doses since the drugs used are concentrated in the urine.
Drug allergy

Before prescribing any antibiotic ask the caregiver and/or child about ALLERGIES (see note on penicillin allergy below). Do not assume records in the notes are accurate.

Cost

Choices often exist between antibiotics of equal efficacy and safety but differing cost. Where such a choice exists, the least expensive agent should be used whenever possible. This has been a guiding principle in the development of this document.

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. (Refer to table for costs using 10kg child as an example)

Antibiotic levels

Aminoglycosides:
Measurement of serum antibiotic levels should be routinely performed when administering aminoglycosides. Trough levels are taken just before the next dose. Peak levels are taken one hour after a bolus IM or IV, or one hour after an IV infusion is commenced. A peak level should be established as soon as possible i.e. after the first or second dose. Once an adequate peak level has been achieved only trough levels need to be monitored (usually twice a week) provided the patient remains stable. Requests for levels should be submitted to the pharmacology laboratory indicating exact times of doses and samples. (Refer to next page for dosing table and acceptable levels)

Vancomycin:
Routine measurement of Vancomycin trough levels is indicated for all patients and is particularly important when treating infections due to strains with raised Minimal Inhibitory Concentrations (MICs) or when drug toxicity is a concern. The first trough level should be measured 48 hours after starting therapy. In patients with sensitive organisms, trough Vancomycin levels should be maintained between 10-15 mg/l,

Clinical outcomes tend to be worse when treating strains with higher (although still sensitive) MICs of 1 or 2 mg/l. In these instances aim for higher trough levels of 15-20 mg/l (CID 2007;44:1536, Arch Int Med 2006;166:2138).

In cases of renal failure (especially in patients on dialysis), levels are measured to determine when to administer the next dose. The level should be measured one to five days after the previous dose. The interval will depend on the degree of renal dysfunction.

Combinations of Vancomycin and aminoglycosides should be avoided wherever possible.
NOTES ON COMMONLY USED AGENTS

Antibacterial Agents

Aminoglycosides

The aminoglycosides in use at RCWMCH are Gentamicin, Tobramycin and Amikacin. Streptomycin is reserved for treating TB and tobramycin is currently used primarily for the treatment of Acinetobacter infections. Aminoglycosides have activity primarily against aerobic Gram-negative bacilli. They have no anaerobic cover. They are used most commonly where infection with a Gram-negative bacillus is suspected or confirmed e.g. UTI, abdominal sepsis, severe pneumonia. Aminoglycosides have some activity against staphylococci, but are not first line agents for treating staphylococcal infections and should not be used alone for this purpose.

They can also be used in combination with either penicillin (or rarely vancomycin) to treat streptococcal or enterococcal endocarditis. If used in combination, they are used at lower than normal doses, as their action is synergistic with the other agent.

Aminoglycosides should not be used for longer than 14 days, unless unavoidable.

Aminoglycosides demonstrate concentration-dependent killing - the higher the serum concentration, the better the killing activity. Peak levels are thus checked to ensure a high enough concentration. They also have a post-antibiotic effect – even at low concentrations in serum, they inhibit re-growth of bacteria. Aminoglycosides can thus be given as a single daily dose, with no loss of efficacy, and reduced potential for toxicity.

As discussed earlier, trough levels should be measured just before the dose is given and peak levels measured one hour after a bolus IM or IV dose, or one hour after commencing an IV infusion.

<table>
<thead>
<tr>
<th>AMINOGLYCOSIDE DOSING SCHEDULE</th>
</tr>
</thead>
<tbody>
<tr>
<td>THE MOST IMPORTANT DOSE IS THE FIRST ONE – DO NOT UNDERDOSE</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ANTIBIOTIC</th>
<th>DOSE</th>
<th>INTERVAL</th>
<th>PEAK LEVEL (mg/l)</th>
<th>TROUGH LEVEL (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gentamicin</td>
<td>5-7.5 mg/kg/dose</td>
<td>daily</td>
<td>&gt;8</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Amikacin</td>
<td>15 mg/kg/dose</td>
<td>daily</td>
<td>&gt;30</td>
<td>&lt;1</td>
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<tr>
<td>Gentamicin</td>
<td>3-4 mg/kg/dose</td>
<td>A peak of above 8mg/l must be achieved. Repeat dose when level &lt;1mg/l but if interval required to achieve this is &gt;48 hours consider alternative therapy.</td>
<td></td>
<td></td>
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<tr>
<td>Amikacin</td>
<td>10 mg/kg/dose</td>
<td>A peak of above 30mg/l must be achieved. Repeat dose when level &lt;1mg/l but if interval required to achieve this is &gt;48 hours consider alternative therapy</td>
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<tr>
<td>Gentamicin</td>
<td>1.5mg/kg/dose</td>
<td>12 hourly</td>
<td>3-8</td>
<td>&lt;1</td>
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</table>
Carbapenems

The commonly used carbapenems are **Meropenem, Imipenem** and **Ertapenem**. These are all very broad spectrum agents, with activity against most Gram negative bacilli, streptococci (poor enterococcal cover), cloxacillin susceptible *S. aureus* and anaerobes. Ertapenem has a slightly narrower spectrum than Imipenem or Meropenem – Ertapenem has poor activity against *Acinetobacter* spp. and *Pseudomonas* spp.

These agents are reserved for infections with organisms known or suspected to be highly resistant.

Cephalosporins

The available cephalosporins at RCWMCH are **Cefazolin, Cefuroxime, Ceftriaxone, Cefotaxime, Ceftazidime** and **Cefepime**. Cephalosporins are broad spectrum agents, with activity against Gram positive and Gram negative organisms (but little effective anaerobic cover).

The use of cephalosporins is strongly linked to the development of antibiotic resistance and should be used for specific indications only. They can be used where aminoglycosides may be inappropriate (e.g. due to intrinsic renal dysfunction) or for treating CNS infections. It is important to remember that cephalosporins have NO activity against cloxacillin-resistant staphylococci as well as enterococci.

- Cefazolin is used for surgical prophylaxis
- Cefuroxime is used orally to treat UTIs.
- 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 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.

- **Cefotaxime** is an alternative to ceftriaxone.
- Ceftazidime and **Cefepime’s** primary indication in children is for treating suspected or confirmed infections with *P. aeruginosa*. 
Colistin

Colistin 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.

In children with normal renal function a dose of 50,000 to 75,000 IU/kg/day in 3 divided doses is recommended (maximum dose 3 million units 8 hourly). The dosing interval may be prolonged in patients with renal failure (refer table below for guidance – note that this table includes adult dosages, no data exist regarding recommendations for dosing in children with abnormal renal function).

Reduced creatinine clearance:

<table>
<thead>
<tr>
<th>Cr Clearance</th>
<th>Recommended adult dose</th>
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<tr>
<td>50-90</td>
<td>3 million U 12 hourly</td>
</tr>
<tr>
<td>10-50</td>
<td>3 million U daily</td>
</tr>
<tr>
<td>&lt;10</td>
<td>3 million U 36 hourly</td>
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<tr>
<td>Haemodialysis</td>
<td>3 million U after each episode of dialysis</td>
</tr>
<tr>
<td>Continuous renal replacement therapy</td>
<td>4.5 million units daily</td>
</tr>
</tbody>
</table>

(Sanford Guide to Antimicrobial Therapy 2007 & 2011)

Co-trimoxazole (Trimethoprim + sulfamethoxazole)

Traditionally regarded as an antibacterial agent and widely used as such, although widespread resistance has developed and few bacterial organisms remain susceptible. In instances where a pathogen is known to be susceptible to Co-trimoxazole, it remains a useful and effective agent. Co-trimoxazole also has activity against other pathogens and its main current indication is for the prophylaxis and treatment of infections due to Pneumocystis jiroveci in immunocompromised patients. Also used in the treatment of nocardiosis, prophylaxis and treatment of toxoplasmosis and Isospora belli diarrhoea. Well absorbed orally and widely distributed. Not recommended in infants under 4-6 weeks of age due to increased risk of hyperbilirubinaemia and kernicterus. There is a wide spectrum of potential side-effects; sulfamethoxazole is more frequently implicated in hypersensitivity reactions and gastrointestinal disturbances.
Macrolides / Lincosamides

The macrolides (Erythromycin, Clarithromycin and Azithromycin) and lincosamides (Clindamycin) are not structurally related, but are often linked together as they share very similar mechanisms of action, and thus cross resistance can exist.

The spectrum of activity of the macrolides includes Gram positive organisms (staphylococci, streptococci and some corynebacteria), atypical organisms (Legionella, Chlamydia and Mycoplasma) and Campylobacter spp. It must be remembered that amongst isolates of *S. pneumoniae* and *S. aureus*, resistance to these agents is well described. There is some (limited) evidence that azithromycin can be used to treat cryptosporidiosis; however its efficacy is variable. The newer macrolides have a similar spectrum to erythromycin and do not have the same degree of GIT side effects as erythromycin; however they are also more expensive.

Clindamycin has activity mainly against staphylococci and streptococci, as well as many anaerobic bacteria. Pneumococcal resistance to clindamycin is less common than to erythromycin, but staphylococcal resistance to clindamycin is unfortunately becoming more common among nosocomial isolates. However, for community acquired cellulitis / soft tissue infections clindamycin is still a very good agent, and some would consider it the drug of choice for necrotizing fasciitis.

Neither the macrolides nor lincosamides have any effective enterococcal activity.

Metronidazole

Bactericidal and is indicated for the treatment of anaerobic infections including peritonitis and necrotising enterocolitis (but excluding actinomycosis). It also has antiprotozoal activity (see under Antiparasitic Agents)

Oxazolidinones

Linezolid
This is a new class of antibiotic, with excellent Gram positive activity, but no activity against Gram negative organisms. It is a useful alternative to vancomycin for MRSA, especially if an oral agent is required. Prolonged use has been associated with both haematological abnormalities as well as neuropathy, and it is very expensive. Its use must always be discussed with a microbiologist or infectious disease specialist.

Penicillins

**Benzathine Penicillin, Benzylpenicillin, Phenoxyethylpenicillin, Procaine Penicillin, Amoxicillin, Ampicillin**
Effective against all *S. pyogenes*, most other streptococci, enterococci and many anaerobes. Reduced susceptibility is an increasing concern amongst pneumococci, but these agents are still the best options for treating infections outside the CNS (e.g. pneumonia, otitis media) caused by *S. pneumoniae with intermediate resistance to
Amoxicillin/ampicillin. Amoxicillin/ampicillin are also effective against most *H. influenzae* isolates.

**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 / amoxycillin / ampicillin). Thus in cases of a mixed infection, Co-Amoxiclav or a cephalosprin can be used to successfully treat a staphylococcal infection. However, the converse is also true – staphylococci that are resistant to cloxacillin are resistant to **ALL** beta-lactam agents.

**Co-Amoxiclav**
This is a relatively broad spectrum agent that is available in both oral and IV formulations (IV not available at RCWMCH). Its spectrum includes streptococci, cloxacillin-susceptible staphylococci, haemophili, Gram-negative bacilli and anaerobes. Its main indications are for treating urinary tract infections, dental infections, bite wounds and as a second-line agent for otitis media (if amoxicillin alone has failed). Current paediatric oral preparations contain Amoxicillin and Clavulanic acid in a ratio of 4:1. The maximum dose of clavulanic acid should not exceed 10 mg/kg/day. To achieve the recommended dose of amoxicillin of 30 mg/kg/dose 8 hourly add additional amoxicillin separately to limit the clavulanic acid dose and minimize risk of gastrointestinal side-effects.

**Piperacillin-Tazobactam**
This broad spectrum agent is only available intravenously, and the spectrum is much the same as Co-Amoxiclav (including good anaerobic cover). However, it has a broader Gram-negative spectrum than Co-Amoxiclav, and will provide cover against some *Acinetobacter* and *Pseudomonas* species as well as many of the enteric Gram-negative bacilli. It should only be used for treating suspected or confirmed nosocomial infections, or if a community-acquired infection with *Pseudomonas aeruginosa* is suspected.

**Penicillin allergy**
There are usually alternatives to penicillin if there is a documented history of penicillin allergy. However, it is important to take a detailed history of the allergic reaction, as many supposed allergic reactions do not represent true allergy.

Alternatives to penicillin include:
- Clindamycin (especially for skin and soft tissue infection)
- Vancomycin (primarily for treating enterococcal infection)
- Cephalosporins (pneumonia and abdominal sepsis)

There is less than 5% chance of cross reactivity with a cephalosporin. **If there is a documented history of severe penicillin allergy (e.g. anaphylaxis), all cephalosporins should be avoided.** If a cephalosporin is considered, a cephalosporin with a different side chain from the offending penicillin should be used. Cefuroxime has a unique side chain, and can be used in cases of side-chain allergy. If in doubt about
suitable alternatives, please consult the microbiologist, infectious diseases unit or allergy service.

**Quinolones**

The fluoroquinolones, **Ciprofloxacin** and **Ofloxacin**, are very effective agents for treating Gram-negative infections. **Ofloxacin, Levofloxacin** and **Moxifloxacin** are used primarily as part of combination therapy for multi-drug resistant (MDR) TB. **Nalidixic acid** is only available orally and is used to treat mild dysentery.

Ciprofloxacin and ofloxacin also have very good activity against legionella, neisseria and haemophili, and some activity against staphylococci and chlamydia, although they are seldom used on their own for the latter two organisms. They provide no effective anaerobic cover and have unpredictable activity against Gram-positive organisms. They are available orally or IV. Oral bioavailability is equivalent to IV, and they should thus be administered orally unless there are clinical reasons that the drug may not be absorbed (e.g. ileus, severe vomiting and/or diarrhoea etc). Ciprofloxacin is used to treat various resistant Gram-negative organisms, including *P. aeruginosa*. When used to treat Pseudomonas infections, a higher dose should be used.

Some of the newer fluoroquinolones (e.g. Moxifloxacin) have better activity against Gram-positive organisms, including streptococci.

**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 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 dose 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. Refer to section on antibiotic levels for further details.

**Antifungal Agents**

**Amphotericin B**

This is the broadest spectrum antifungal agent available at RCWMCH. It has activity against most yeast species, and a wide variety of filamentous fungi.

Febrile reactions are the most common side effect, and can be prevented by premedication with paracetamol (or hydrocortisone in severe cases)
Poor renal function is not a contra-indication to amphotericin use, but renal function should be monitored while the patient is being treated. Electrolytes should also be measured regularly as hypokalemia & hypomagnesemia are common and require replacement therapy. If renal function deteriorates on Amphotericin, then consider changing to an alternative if possible. Renal toxicity can be reduced by ensuring patients are well hydrated. This can be achieved by pre-emptive hydration i.e. infusing normal saline with 20 mmol/l of KCL at 10-15 ml/kg over 2-4 hours before each daily infusion of Amphotericin B. In addition, renal toxicity may possibly be reduced by infusing over a longer period of time. There is fairly good evidence that Amphotericin B given as a continuous infusion is associated with less nephrotoxicity (J Antimicrob Chemotherapy 2004; 54: 803; BMJ 2001; 322:579). However, there is little evidence regarding efficacy in proven fungal infections – the majority of studies have been conducted in febrile neutropaenic patients. Thus the decision to use continuous infusion should be made judiciously.

**Echinocandins**

The echinocandins (e.g. Caspofungin) are a new class of antifungal agent. They are only available intravenously, and have excellent activity against Candida species. However, they have poor activity against Cryptococcus, Zygomycetes (which cause mucormycosis) and Fusarium. They have some activity against Aspergillus, but are not commonly used for this purpose. Their primary indication would be as an alternative agent for candidaemia, usually only when azoles and amphotericin B cannot be used. Their use should always be discussed with a microbiologist or infectious diseases specialist.

**Azoles**

**Fluconazole**

This azole antifungal has activity against many Candida species as well as *Cryptococcus neoformans*. It does NOT, however, have activity against filamentous fungi. The vast majority of *C. albicans* isolates are susceptible to this agent. The susceptibility of other Candida species is less predictable. It is as effective as amphotericin B for treating yeast infections, if the yeasts are susceptible. It should not be used as an empiric agent for suspected fungal infection unless there is reason to suspect that the causative organism is susceptible (e.g. *C. albicans* from surveillance cultures), or if there are compelling clinical reasons not to use amphotericin B.

**Itraconazole**

This azole has slightly better activity against moulds than Fluconazole, and is thus sometimes used as an alternative agent for aspergillosis (Voriconazole is better), difficult dermatophyte infections and histoplasmosis.

**Posaconazole**

This is one of the newest azoles, and has broader cover for moulds than previous azoles – including against agents of mucormycosis. Its use in this setting is still limited to case reports and case series, but it could be considered as an option for treatment of mucormycosis.
Voriconazole
 Extremely expensive agent restricted for treatment of invasive aspergillosis, for which it is the agent of choice (N Engl J Med 2002;347:408-15), and allergic bronchopulmonary aspergillosis (ABPA). Invasive aspergillosis is an uncommon opportunistic infection in patients with haematological malignancies or posttransplant. It has a very high mortality rate. Definitive diagnosis is difficult to achieve but some diagnostic criteria are listed below:

**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 of 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

ABPA occurs most commonly in children with underlying cystic fibrosis or asthma. Any case of suspected or proven aspergillosis should be discussed with the infectious diseases unit or pulmonology unit prior to starting therapy.

**Antiparasitic Agents**

**Antihelminthics**
*Praziquantel* is the agent of choice in the treatment of schistosomiasis. It is well tolerated and may be used as a single dose or two divided doses. Retreatment may be required.

*Albendazole* is the drug of choice in mixed nematodal infections. It is also used in hydatid disease, cysticercosis, strongyloidiasis, visceral larva migrans and as an alternative agent in giardiasis. *Mebendazole* is an alternative broadspectrum antihelminthic.

**Antimalarials**

Intravenous *Artesunate* has greater efficacy, less toxicity and is simpler to administer than intravenous quinine and is now recommended as first-line therapy for severe malaria. Artesunate is not yet registered in South Africa but is available all-hours at RCWMCH via the Parenteral Artesunate Access Programme on a named-patient basis
with informed consent of the caregiver and Section 21 approval. Contact the infectious diseases doctor-on-call for clearance. **Quinine** is the alternative agent and is a rapidly acting blood schizonticide with some gametocytocidal activity. It has no exoerythrocytic activity.

**Artemether-lumefantrine** is recommended first-line therapy for uncomplicated malaria, particularly as oral quinine is poorly tolerated and is associated with drug interactions and significant side-effects resulting in reduced adherence to treatment completion. Artemesinin derivatives are the most rapidly acting antimalarials and increase cure rates and may decrease transmission and delay development of resistance.

**Doxycycline** (if >8 years of age) or **Clindamycin** (if <8 years of age) are additive therapy for acute falciparum malaria that is treated with intravenous Artesunate or quinine, although clindamycin oral suspension is not currently available in South Africa. Doxycycline or Clindamycin are not recommended if the patient is treated with Artemether-lumefantrine initially or if Artemether-lumefantrine is used following intravenous Artesunate.

**Chloroquine** and **Primaquine** are used in the treatment of Plasmodium vivax, ovale or malariae infections. Primaquine, which is required to eradicate exoerythrocytic (latent hepatic phase) parasites, currently requires Section 21 application to the Medicines Control Council of South Africa for each patient that requires it.

Options for chemoprophylaxis against malaria in children include **Mefloquine** (if >5kg body weight), Atovaquone-proguanil (if ≥11 kg body weight) and **Doxycycline** (if >8 years of age)

**Ectoparasiticides, including scabicides**

**Benzyl benzoate** is used in scabies and pediculosis (lice infestation). It is irritant to skin but can be used diluted for infants and small children. **Sulphur ointment (5%)** may be used for scabies or lice and is especially useful in treating infants and small children.

**Metronidazole**

Effective for the treatment of amoebic dysentery and amoebic liver abscess. It eradicates vegetative amoebae in the bowel lumen and wall, and in extra-intestinal tissues. An additional luminal amoebicide is not necessary if metronidazole is used for 10 days or longer. Also used for the treatment of giardiasis and trichomoniasis.

**Antiviral Agents**

**Aciclovir**

This agent is active against herpes simplex and varicella virus infections. A higher dose is needed to treat varicella virus infections. Available as both oral and IV formulations. IV therapy is restricted for severe life threatening herpes virus infections such as HSV
encephalitis, neonatal HSV infection and varicella pneumonia. In cases of herpes stomatitis, oral therapy should only be prescribed for primary infections or in immunocompromised patients. Oral therapy may also be prescribed for immunocompromised children with primary varicella. To have a beneficial effect, Aciclovir should ideally be started within 24-48 hours after onset of symptoms.

**Ganciclovir IV and Valganciclovir oral**
This is a modified form of acyclovir. It is used primarily for the treatment or prophylaxis of systemic CMV infection, as well as for EBV infection after organ transplantation. The diagnosis of these conditions can be difficult - if in doubt about whether or not to start a patient on this agent, it is best to consult the infectious diseases unit or virology department.

**Oseltamivir**
This antiviral is effective against influenza A and B strains. It exerts its anti-viral action by inhibiting the neuraminidase enzyme of influenza A and B viruses. It may be used for primary prevention or treatment of influenza. A 5-day course of oral Oseltamivir in symptomatic children is associated with shortening of the acute illness, reduced incidence of otitis media and significant reduction in viral shedding. The drug should ideally be commenced within 24 hours of onset of influenza symptoms. It has no beneficial effect on other respiratory viruses that may mimic influenza. Thus unless there is a high index of suspicion, influenza infection should be confirmed before commencing therapy.

**Antiretroviral agents (ARVs)**
ARVs are prescribed as part of combination antiretroviral therapy (cART) regimen, or for prophylaxis to breastfed infants of HIV-infected mothers or following occupational or sexual exposure to HIV. cART regimens usually include three or more drugs from at least two different classes of ARVs and are generally only commenced after careful consideration of clinical and immunological stage of HIV disease, and assessment of caregiver ability to adhere to long-term treatment. Therapy is usually life-long. Toxicity and adherence monitoring form a vital component of management.
INFECTIONS AND DRUG DOSAGES

Cardiovascular System (see also prophylaxis section)

Acute rheumatic fever
Phenoxymethylpenicillin <25 kg: 250 mg; ≥25 kg: 500 mg 12 hourly PO x 10 days

Note: 1. For penicillin-allergic patients, use Erythromycin 10 mg/kg/dose 6 hourly PO × 10 days

Infective Endocarditis
Ideally, one should wait for confirmation of the diagnosis and identification of an organism before commencing therapy for infective endocarditis. However, if the patient presents with severe disease, empiric therapy should be commenced, and should be directed at staphylococci as well as streptococci.

Empiric therapy (native valve)
Benzylpenicillin 100 000 U/kg/dose 6 hourly IV + gentamicin 1,5 mg/kg/dose 12 hourly IV + Cloxacillin 50 mg/kg/dose 6 hourly IV x 4 weeks

Empiric therapy (prosthetic valve)
All cases of suspected prosthetic valve endocarditis should be discussed with a cardiologist before therapy is commenced. Empiric therapy usually consists of Vancomycin and Rifampicin for 6 weeks and gentamicin for the first 2 weeks

Directed therapy (native valve)
- Viridans streptococci (penicillin MIC <0.12 ug/ml)
  (All doses as for empiric therapy – see above)
  Benzylpenicillin x 4 weeks

- Viridans streptococci (penicillin MIC between 0.12 ug/ml and 0.5 ug/ml)
  Benzylpenicillin + Gentamicin x 2 weeks, followed by Benzylpenicillin for a further 2 weeks (total 4 weeks therapy)

- Penicillin susceptible enterococci, Abiotrophia species, and viridans streptococci with penicillin MIC between 0.5 ug/ml and 4 ug/ml
  Benzylpenicillin + Gentamicin x 4-6 weeks. The addition of an aminoglycoside is only of benefit if the organism does not display high level aminoglycoside resistance.

- Penicillin resistant enterococci and viridans streptococci with penicillin MICs >= 4 ug/ml
  Vancomycin and Gentamicin x 6 weeks. The addition of an aminoglycoside is only of benefit if the organism does not display high level aminoglycoside resistance

- S. aureus (cloxacillin susceptible)
Cloxacillin x 4-6 weeks
The addition of gentamicin for the first 3-5 days used to be recommended in the past however there is no evidence that this improves outcomes

- **S. aureus (cloxacillin resistant – MRSA)**
  Vancomycin x 4 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

- **HACEK organisms**
  Ceftriaxone 100 mg/kg/dose once daily x 4 weeks

Prosthetic valve endocarditis

- **Viridans streptococci (penicillin MIC <0.12 ug/ml)**
  Benzylpenicillin x 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)

- **Viridans streptococci (penicillin MIC between 0.12 ug/ml and 0.5 ug/ml)**
  Benzylpenicillin + Gentamicin x 6 weeks

- **Penicillin susceptible enterococci, Abiotrophia species, and viridans streptococci with penicillin MIC between 0.5 ug/ml and 4 ug/ml**
  Benzylpenicillin + Gentamicin x 6 weeks

- **Penicillin resistant enterococci and viridans streptococci with penicillin MICs >= 4 ug/ml**
  Vancomycin + Gentamicin x 6 weeks. The addition of an aminoglycoside is only of benefit if the organism does not display high level aminoglycoside resistance

- **S. aureus (cloxacillin susceptible)**
  Cloxacillin x 6 weeks
  The addition of Gentamicin for the first 3-5 days used to be recommended in the past however there is no evidence that this improves outcomes

- **S. aureus (cloxacillin resistant – MRSA)**
  Vancomycin + Rifampicin x 6-8 weeks plus Gentamicin for the first 2 weeks

**Note:**
1. 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.
2. In patients unable to tolerate Penicillin, Vancomycin or Ceftriaxone can be used as an alternative (ceftriaxone not suitable for enterococcal infection). However, it
is crucial to establish the nature of the penicillin allergy, and microbiology / infectious disease consultation is advised in all cases.
3. In the exceedingly rare instance of a vancomycin-resistant enterococcal endocarditis, please consult with microbiology / infectious diseases unit.
4. Avoid the use of ceftriaxone in patients receiving concomitant intravenous calcium-containing fluids including total parenteral nutrition; Cefotaxime 50mg/kg/dose 6 hourly IV is a suitable alternative.
5. HACEK organisms: Haemophilus, Aggregatibacter, Cardiobacterium, Eikenella & Kingella.

Central Nervous System (see also prophylaxis section)

Brain abscess
Ceftriaxone 50 mg/kg/dose 12 hourly IV + Metronidazole 7.5 mg/kg/dose 8 hourly IV

Note: 1. Avoid the use of Ceftriaxone in patients receiving concomitant intravenous calcium-containing fluids including total parenteral nutrition; Cefotaxime 50 mg/kg/dose 6 hourly IV is a suitable alternative.
2. If there is a good clinical response to therapy, 2 weeks of antibiotics is usually sufficient.

Cryptococcal meningitis
Induction phase
Amphotericin B 0.7-1.0 mg/kg/dose once daily IV + Fluconazole 12 mg/kg/dose once daily IV (maximum 800 mg) x 2 weeks.
Consolidation phase
Fluconazole 12 mg/kg/dose once daily IV or PO for a further 8 weeks (maximum dose 800mg).
Secondary prophylaxis
Fluconazole 6 mg/kg/dose once daily PO (maximum dose 200 mg).

Note: 1. Manage all cases in consultation with the infectious diseases unit.
2. Controlled infusion over 4 hours of Amphotericin B 1 mg/kg in 5% dextrose water (NOT normal saline or ½ normal saline) should be given. A ‘test dose’, previously common practice, need not be given if the daily dose is run slowly over the first 30 minutes of administration.
3. Adequate hydration should be maintained during Amphotericin B treatment. Side-effects include renal impairment, hypokalemia, hypomagnesemia, renal tubular acidosis, anemia, febrile reactions and chemical phlebitis.
4. CSF opening pressure should be measured and raised intracranial pressure treated aggressively with serial lumbar punctures.
5. Relapse episodes: induction phase should be prolonged to 4-8 weeks, preferably until CSF fungal culture is negative.
6. Secondary prophylaxis may be discontinued in HIV-infected children > 2 years of age with adequate immune reconstitution associated with antiretroviral therapy i.e. for children between 2 and 5 years if adherent to ART and anti-fungal.
maintenance therapy for at least 1 year and the CD4% > 25% or CD4 > 750 cells/mm³ on at least two occasions; for children > 5 years if adherent to ART and anti-fungal maintenance therapy for at least 1 year and the CD4 > 200 cells/mm³ on at least two occasions

Herpes simplex encephalitis
0-12 years of age: Aciclovir 20 mg/kg/dose 8 hourly IV x 14-21 days
>12 years of age: Aciclovir 10 mg/kg/dose 8 hourly IV x 14-21 days

Note: 1. If HSV encephalitis is considered, begin treatment before confirmation of infection
2. In neonates with HSV encephalitis, treatment duration is at least 21 days and treatment should only be stopped once CSF herpes simplex PCR is negative

Meningitis
Pathogen unknown
Ceftriaxone 50 mg/kg/dose 12 hourly IV
If <2 months of age add Ampicillin 50 mg/kg/dose 6 hourly IV for at least 48 hours until Listeria infection is excluded.

Dexamethasone 0.15 mg/kg/dose 6 hourly IV for 2 days is added in children >2 months of age with suspected bacterial meningitis, and should be given immediately before (15-20 minutes) or simultaneous to the first antibiotic infusion

When pathogen cultured:
H. influenzae & S. pneumoniae - treat for 10 days
N. meningitidis - treat for 5-7 days
Grp B Streptococcus - treat for 14 days
L. monocytogenes - treat for 21 days
Gram-negatives (neonates) - treat for 14-21 days

Tuberculous meningitis - refer to section on Tuberculosis

Note: 1. Avoid the use of Ceftriaxone in patients receiving concomitant intravenous calcium-containing fluids including total parenteral nutrition; Cefotaxime 50 mg/kg/dose 6 hourly IV is a suitable alternative.
2. Ceftriaxone should be switched to Benzylpenicillin 100 000 u/kg/dose 6 hourly IV OR Ampicillin 50 mg/kg/dose 6 hourly IV if the organism is susceptible

Neurocysticercosis
Calcified cysticerci and a single dying lesion visible on CT scan require no anthelminthic treatment. Clearance of presumed gastrointestinal infestation is advisable.
Albendazole: <2 years of age 200 mg; >2 years of age 400 mg as a single dose PO

Patients with multiple cysts usually have a mixture of live and dying cysts and are assumed to have active disease and require treatment.
Albendazole 7.5 mg/kg/dose 12 hourly PO x 7 days (maximum dose: 400 mg/dose)

Prevention of neurological manifestations:
In massive infestations, cysticidal therapy may trigger an inflammatory response. Delaying antihelminthic therapy and adding corticosteroids may lessen the risk. 24 hours prior to Albendazole therapy: dexamethasone 0.15 mg/kg/dose 6 hourly

Follow with oral therapy as soon as possible to take oral: prednisone 1 mg/kg/day Continue for the duration of the Albendazole therapy.

Eye/Ear/Nose/Throat/Dental

Sinusitis (acute bacterial)
Amoxicillin 30 mg/kg/dose 8 hourly PO x 10 days

Conjunctivitis
Chloramphenicol eye drops or ointment applied as frequently as is practical plus frequent eye irrigation with normal saline. For gonococcal or chlamydial infections see section on neonatal infections

Dental abscess
Co-Amoxiclav 15 mg/kg/dose 8 hourly PO × 5 days

For more severe cases or patients unable to take medication orally, Cefuroxime 50 mg/kg/dose 8 hourly IV + Metronidazole 7.5 mg/kg/dose 8 hourly IV × 5 days

If there is uncertainty about the diagnosis or poor clinical response to initial treatment, consider referral to a dental surgeon or ENT specialist.

Diphtheria (see also prophylaxis section)
Benzylpenicillin 50 000 U/kg/dose 6 hourly IV x 7-10 days

Note: 1. Diptheria antitoxin is currently unavailable in S.A. 2. Erythromycin 10 mg/kg/dose 6 hourly PO or IV is an alternative to penicillin 3. The patient should be isolated and elimination of the organism documented by 2 consecutive negative cultures of throat swabs after completion of treatment 4. Diphtheria is a notifiable condition

Otitis media:
Acute
Amoxicillin 30 mg/kg/dose 8 hourly or 45 mg/kg/dose 12 hourly PO

Note: 1. Treatment duration for acute otitis media is 5-7 days 2. Treat for 7-10 days in children ≤2 years of age, HIV-infected children or complicated cases (recurrent or chronic cases)
3. Treatment failure: high-dose Co-Amoxiclav: Co-Amoxiclav 15 mg/kg/dose + Amoxicillin 15 mg/kg/dose 8 hourly PO x 5-7 days OR Ceftriaxone 50 mg/kg/dose once daily IV/IM x 3 days
4. Referral to ENT specialist for consideration of tympanocentesis or grommets should be considered for treatment failure, recurrent infections or hearing loss

Chronic
Dry mopping, together with the use of acetic acid eardrops, for 4 weeks is the most important part of treatment. Routine microscopy, culture & sensitivity testing of ear swabs is usually unhelpful, but remember that TB is an important cause of chronic otitis media.

Pharyngotonsillitis
Benzathine Penicillin <25 kg: 600 000 U; ≥25 kg: 1.2 MU as a single dose IMI
OR
Phenoxymethylpenicillin <25 kg: 250 mg 12 hourly; ≥25 kg: 500 mg 12 hourly PO x 10 days

Note: 1. To minimize the discomfort of intramuscular administration, the medication should be given at room temperature.
2. Phenoxymethylpenicillin should be given 30 minutes before food
3. Amoxicillin may result in a skin rash if Epstein-Barr virus infection is present and lead to an erroneous diagnosis of penicillin allergy

Fungal Infections

Local infections
Oral thrush
Nystatin suspension (100 000 IU/ml) 1 ml into the mouth 4 times a day may be used in younger children with mild oral thrush. Miconazole gel topically 3 times daily until cleared is effective for moderate to severe thrush.

Severe oral and/or oesophageal candidiasis
Fluconazole 6 mg/kg/dose once daily PO x 14-21 days

Napkin area/flexures
Clotrimazole cream topically 3 times daily / with napkin changes. Include barrier cream such as zinc & castor oil cream for napkin dermatitis. For more severe dermatitis, the addition of 1% hydrocortisone cream is beneficial

Invasive disease
Empiric therapy
Amphotericin B 0.7-1.0 mg/kg/dose once daily IV

Alternative therapy is Fluconazole 6-12 mg/kg/dose once daily IV but this has a narrower spectrum of cover
Directed therapy

Candidaemia
Amphotericin B 0.7-1.0 mg/kg/dose once daily IV

Note: 1. Current recommendations state that therapy should continue for 2 weeks after the last positive blood culture  
2. If the isolate is susceptible to Fluconazole (e.g. C. albicans), Fluconazole 6-12 mg/kg/dose once daily IV/PO can be used

Cryptococcosis
For disseminated, non-meningeal disease treat as for cryptococcal meningitis

Aspergillosis
Voriconazole 7mg/kg/dose 12 hourly IV or PO is the preferred agent for treatment and maintenance therapy. Duration of therapy is poorly defined, but usually between 6 and 12 weeks for invasive pulmonary aspergillosis

Alternative therapy is Amphotericin B 1.0-1.5 mg/kg/dose once daily IV

Note: Refer to section on cryptococcal meningitis for details on administration and monitoring of Amphotericin B therapy

Gastro-intestinal Infections

Amoebiasis
Metronidazole 15 mg/kg/dose 8 hourly x 10 days

Bacterial dysentery
Nalidixic acid 12.5 mg/kg/dose 6 hourly PO x 3-5 days

If ill and toxic or <3 months of age: ceftriaxone 50 mg/kg/dose once daily IV x 5 days

Cholera
Ciprofloxacin 20 mg/kg/dose as a single dose PO

Note: 1. Oral or parenteral rehydration therapy to correct dehydration and electrolyte abnormalities is the most important modality of treatment and should be initiated as early as possible  
2. Antimicrobial therapy should be considered for patients who are moderately to severely ill  
3. Antimicrobial susceptibilities of newly isolated organisms should be determined  
4. Alternative therapy for children >8 years of age is Doxycycline 4 mg/kg/dose as a single dose PO
**Cryptosporidium**
Nitazoxanide may be considered in immunocompromised patients with severe, persistent diarrhea but requires approval from the Medicines Control Council of South Africa and the RCWMCH Pharmaceutics and Therapeutics Committee

**Diarrhoeal disease**

**Acute (<5 days)**
Nil

**Persistent (>5 days)**
Cholestyramine: <6 months of age 500 mg; >6 months of age 1 g 6 hourly PO x 5 days  
+ Gentamicin 10 mg/kg/dose 4 hourly PO x 3 days (maximum dose 60mg)

**Giardiasis**
Metronidazole 7.5 mg/kg/dose 8 hourly PO x 5 days
May also be used as a once daily dose according to age:
- 1-3 years of age: 500 mg
- 3-7 years of age: 600-800 mg
- 7-10 years of age: 1 g

An alternative over the age of 2 years is Albendazole 400 mg once daily PO x 5 days

**Peritonitis /necrotizing enterocolitis**
Benzylpenicillin 50 000 U/kg/dose 6 hourly IV + Gentamicin 7.5 mg/kg/ dose once daily IV + Metronidazole 7.5 mg/kg/dose 8 hourly IV

**Typhoid fever**
Ceftriaxone 50 mg/kg/dose once daily IV x 7-10 days

*Note:* 1. An alternative is Ciprofloxacin 15 mg/kg/dose 12 hourly PO x 7-10 days  
2. Antimicrobial therapy is usually not indicated for non-invasive gastroenteritis caused by non-typhoidal *Salmonella* species

**Worm infestation**
Albendazole: <2 years of age 200 mg; >2 years of age 400 mg as a single dose PO

**Musculoskeletal System**

**Acute osteomyelitis**
Cloxacinilin 50 mg/kg/dose 6 hourly IV

*Note:* 1. Open surgical drainage is imperative in almost all cases  
2. Following a good clinical response (usually 3-4 days), change to Flucloxacillin 25 mg/kg/dose 6 hourly PO. Treat for a total of 6 weeks.
3. Neonates and infants <6 months of age, may present with septic arthritis as the immature growth plate is not an effective barrier to the spread of infection from bone and surrounding soft tissues (osteomyelitis) into the joint.

4. In neonates and infants <6 months of age with a history of previous hospitalization (e.g. premature neonates), add Fusidic Acid 15 mg/kg/dose 8 hourly PO.

5. In unwell / septicaemic neonates and infants <6 months of age, add Ceftriaxone 50 mg/kg/dose once daily IV.

6. Continue treatment according to culture results (e.g. change to Amoxicillin if pneumococcus or streptococcal species are cultured)

**Septic arthritis**

6 months - <2 years of age

Cloxacillin IV followed by Flucloxacillin PO (doses as above) + Ampicillin 50 mg/kg/dose 6 hourly IV followed by Amoxicillin 30 mg/kg/dose 8 hourly PO. Treat for a total of 3 weeks.

≥2 years of age

Cloxacillin IV followed by Flucloxacillin PO (doses as above)

**Note:** 1. Open surgical drainage is imperative in almost all cases
2. Continue treatment according to culture results (e.g. change to Amoxicillin if pneumococcus or streptococcal species are cultured)

**Neonatal Infections**

**Congenital syphilis**
Benzylpenicillin 50 000 U/kg/dose 12 hourly IV x 10 days

An alternative is Procaine Penicillin 50 000 U/kg/dose IM once daily x 10 days

**Conjunctivitis**
Organism unknown
Chloramphenicol eye drops or ointment applied as frequently as is practical + frequent eye irrigation with normal saline

**Gonococcal**
Ceftriaxone 25 mg/kg/dose as a single dose IV/IM + frequent eye irrigation with normal saline

**Chlamydial**
Erythromycin 10 mg/kg/dose 6 hourly PO x 14 days

**Note:** 1. An association between oral Erythromycin and infantile hypertrophic pyloric
stenosis (IHPS) has been reported in infants <1 month of age. Azithromycin has been used in infants <1 month of age but is not currently approved for treatment <6 months of age.

**Tetanus neonatorum** (see also prophylaxis section)
Human anti-tetanus immunoglobulin (HTIG): neonate 500 U; child 2000 U as a single dose IM, debridement of wound/umbilical stump, Metronidazole 15mg/kg IV over 60 minutes as loading dose followed by 7.5mg/kg/dose 12 hourly IV (<4 weeks of age) or 8 hourly IV (>4 weeks of age) x 14 days

**Note:**
1. Alternative is Benzylpenicillin 50 000 U/kg/dose 12 hourly IV x 7-10 days
2. Supportive management in ICU is usually necessary
3. Immunize children after recovery from tetanus, as disease does not confer immunity

**Umbilical sepsis**
Benzylpenicillin 50 000 U/kg/dose 6 hourly IV + Gentamicin 7.5 mg/kg/dose once daily IV + Metronidazole 7.5 mg/kg/dose 8 hourly IV

**Parasitic Infections**

**Hydatid disease**
Albendazole 7.5 mg/kg/dose 12 hourly PO x 28 days, stop for 2 weeks and then repeat cycle for a total of 3 cycles

**Malaria** (see also prophylaxis section)
*Plasmodium falciparum*

≤1 year of age
Treat as complicated (see below)

>1 year of age
*Uncomplicated*
Artemether-Lumefantrine (Coartem®)

- 5 - <15 kg: One tablet stat, followed by one after 8 hours and then one twice daily on each of the following two days (total course =6 tablets) administered with fat-containing food or drink
- 15 - <25 kg: Two tablets stat, followed by two after 8 hours and then two twice daily on each of the following two days (total course =12 tablets) administered with fat-containing food or drink
- 25 - <35 kg: Three tablets stat, followed by three after 8 hours and then three twice daily on each of the following two days (total course=18 tablets) administered with fat-containing food or drink
- 35 - <65 kg: Four tablets stat, followed by four after 8 hours and then four twice daily on each of the following two days (total course=24 tablets) administered with fat-containing food or drink
Alternative treatment is Quinine dihydrochloride salt 10 mg/kg/dose 8 hourly PO or IV x 7-10 days. As soon as can be tolerated after starting Quinine, commence Clindamycin 10 mg/kg/dose 12 hourly PO (or 5 mg/kg/dose 8 hourly PO) × 7 days (if <8 years of age) or Doxycycline 4 mg/kg/dose stat then 2 mg/kg/dose once daily with a meal or fluids for at least 7 days or until negative smears (if >8 years of age).

**Complicated**

Artesunate 2.4mg/kg/dose IV (a weight-based dosing schedule of reconstituted artesunate solution is available) at 0,12, 24 hours and daily thereafter until oral medication can be taken. Then switch to full course of Artemether-Lumefantrine (Coartem®). At least 3 IV doses should be given before switching to oral therapy can be considered. If the patient requires the complete 7 day treatment with IV Artesunate, concomitant treatment with IV Clindamycin is recommended. Artesunate is not yet registered in South Africa but is available all-hours at RCCH via the Parenteral Artesunate Access Programme on a named-patient basis with informed consent of the caregiver and Section 21 approval. Contact the infectious diseases doctor-on-call for clearance.

Alternative therapy is Quinine. Loading dose of Quinine dihydrochloride salt 20 mg/kg body weight diluted in 5-10 ml/kg body weight 5% dextrose water by IV infusion over 4 hours. Six to eight hours after starting the loading dose, a maintenance dose of 10 mg/kg/dose diluted in 5-10 ml/kg body weight 5% dextrose water infused over 4-6 hours every 8 hours. Intravenous quinine should be administered until the patient can tolerate oral medication. Thereafter, oral Quinine should be continued to complete a total duration of therapy of 7-10 days.

As soon as can be tolerated after starting Quinine, commence Clindamycin 10 mg/kg/dose 12 hourly PO (or 5 mg/kg/dose 8 hourly PO) × 7 days (if <8 years of age) or Doxycycline 4 mg/kg/dose stat then 2 mg/kg/dose once daily with a meal or fluids for at least 7 days or until negative smears (if >8 years of age). Clindamycin suspension is not currently available in SA and an alternative is to use Artemether-Lumefantrine (Coartem®) following IV quinine.

**Plasmodium malariae**

Chloroquine base 10 mg/kg as a single dose PO (maximum dose 600 mg base) then 5 mg base/kg 6-8 hours later, and once daily on days 2 and 3

**Plasmodium vivax & ovale**

Chloroquine as above followed by Primaquine 0.25-0.3 mg base/kg daily PO x 14 days

**Note:** 1. A child with uncomplicated malaria is alert, can tolerate oral medication, can sit, stand or walk unaided as appropriate for age and has no clinical or laboratory evidence of severe malaria

2. Ideally, treatment should be started in hospital. Initial doses should be directly observed. Observe for 1 hour to ensure dose is not vomited
3. Children who are vomiting but who have no other indications of severe malaria should be treated with intravenous Artesunate in the usual recommended dose until the child can take medication orally.
4. In complicated malaria, the loading dose of Quinine should only be omitted if the patient has received Quinine or Mefloquine prophylaxis in the preceding 24 hours.
5. In mixed infections which include P. falciparum, or if there is doubt about the species, initial treatment of the acute attack is as for P. falciparum.
6. Primaquine is currently only available on Section 21 application to the Medicines Control Council of South Africa. Patients should be checked for G6PD deficiency before starting treatment with Primaquine (0.5-0.8 mg/kg/dose once weekly × 8 weeks has been used to minimize haemolysis in G6PD-deficient patients). Primaquine is not advised in children less than one year of age.

**Schistosomiasis** (Bilharzia)
Praziquantel 20 mg/kg/dose 12 hourly PO x 1 day (i.e. 2 doses)

<table>
<thead>
<tr>
<th>Respiratory Infections</th>
<th>Ambulant</th>
<th>Hospitalised</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community acquired pneumonia</td>
<td>Hospitalisation is recommended</td>
<td>Ampicillin 50 mg/kg/dose 6 hourly IV + Gentamicin 7.5 mg/kg/dose once daily IV</td>
</tr>
<tr>
<td>0-2 months of age</td>
<td>Amoxicillin 30 mg/kg/dose 8 hourly or 45 mg/kg/dose 12 hourly PO x 5-7 days</td>
<td>Ampicillin 50 mg/kg/dose 6 hourly IV OR Amoxicillin 30 mg/kg/dose 8 hourly or 45 mg/kg/dose 12 hourly PO Add Gentamicin 7.5 mg/kg/dose once daily IV to all hospitalized children known to be HIV-infected, children in whom HIV infection has not been excluded and severely malnourished children If staphylococcal infection is suspected, add Cloxacillin 50 mg/kg/dose 6 hourly IV and treat for a minimum of 10 days</td>
</tr>
<tr>
<td>2 months-5 years of age</td>
<td>Amoxicillin 30 mg/kg/dose 8 hourly or 45 mg/kg/dose 12 hourly PO x 5-7 days</td>
<td>Ampicillin 50 mg/kg/dose 6 hourly IV OR Amoxicillin 30 mg/kg/dose 8 hourly or 45 mg/kg/dose 12 hourly PO Add Gentamicin 7.5 mg/kg/dose once daily IV to all hospitalized children known to be HIV-infected, children in whom HIV infection has not been excluded and severely malnourished children If staphylococcal infection is suspected, add Cloxacillin 50 mg/kg/dose 6 hourly IV and treat for a minimum of 10 days</td>
</tr>
<tr>
<td>≥5 years of age</td>
<td>Amoxicillin 30 mg/kg/dose 8 hourly or 45 mg/kg/dose 12 hourly PO x 5-7 days</td>
<td>Ampicillin 50 mg/kg/dose 6 hourly IV OR Amoxicillin 30 mg/kg/dose 8 hourly or 45 mg/kg/dose 12 hourly PO Add Gentamicin 7.5 mg/kg/dose once daily IV to all hospitalized children known to be HIV-infected, children in whom HIV infection has not been excluded and severely malnourished children If staphylococcal infection is suspected, add Cloxacillin 50 mg/kg/dose 6 hourly IV and treat for a minimum of 10 days</td>
</tr>
</tbody>
</table>
Note: 1. Empiric treatment for pneumocystis is recommended for all children with severe pneumonia in whom HIV infection has not been excluded (refer to recommended doses below)
2. Staphylococcal infection should be suspected in children who fail to respond to therapy within 48 hours or those with suggestive chest X-ray changes e.g. pneumatocele, empyema or abscess
3. If atypical organisms (e.g. mycoplasma or chlamydia) are suspected, add Erythromycin 10 mg/kg/dose 6 hourly PO x 10-14 days
4. Mycoplasma and chlamydial infections should be suspected if there is no clinical response to routine antibiotics within 48 hours of starting treatment, or if there is wheezing in children older than 5 years of age.

Pertussis (see also prophylaxis section)
Erythromycin 10mg/kg/dose 6 hourly x 14 days

Note: An association between oral Erythromycin and infantile hypertrophic pyloric stenosis (IHPS) has been reported in infants <1 month of age. Azithromycin has been used in infants <1 month of age but is not currently approved for treatment <6 months of age

Pneumocystis pneumonia (see also prophylaxis section)
Co-trimoxazole (dose according to trimethoprim component) 10 mg/kg IV loading dose followed by 5 mg/kg/dose 6 hourly IV or PO x 21 days

At the time of initiating treatment for pneumocystis pneumonia add prednisone 1-2 mg/kg/dose daily PO x 10-14 days or until no longer hypoxic, then taper over 1 week

Septicemia

The diagnosis of sepsis is firstly based on clinical features. Always attempt to make a clinical assessment of the likely source of infection. Obtain appropriate microbiology cultures, including properly collected blood cultures, before antimicrobial therapy is initiated.

The decision of which empiric antibiotics to use for a septic patient, in the absence of any positive cultures, can be difficult. The factors that need to be taken into account include whether the infection is community or hospital-acquired (nosocomial), the likely site of the infection and the immune status of the child.

Nosocomial infection is usually defined as an infection acquired at least 48-72 hours after hospital admission. The risk of infection with hospital acquired organisms increases with the duration of hospitalization. Remember that patients transferred from other hospitals may carry resistant bacteria on arrival, as may patients who have recently been discharged from hospital (within last 2 weeks). Common nosocomial pathogens in RCWMCH 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/step down to narrower spectrum specific therapy, according to microbiological results. Initial broad-spectrum antibiotic therapy provides maximum benefit for the individual, severely infected patient, whereas switching to specific antibiotic therapy according to microbiological data may help to minimize the risk of emerging resistance. 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. Consideration should be given to stopping antibiotic therapy if sepsis is not confirmed or if an alternative diagnosis is made.

As a general rule, antibiotics can usually be stopped once there has been a good clinical response, and the patient has been apyrexial for 48-72 hours. However, defining an adequate clinical response in a very young patient is not always as easy as in older children or adults. There appears to be little benefit in prolonging antibiotic therapy past about 7-10 days (and possibly even less) for many infections, although certain infections (such as meningitis, osteitis, pyelonephritis and endocarditis) may require prolonged courses.

Up to one third of nosocomial infections might be prevented with appropriate infection control measures.

The following recommendations are based on current susceptibility data at RCWMCH, and may not be applicable to other centres. If there is no response to treatment or doubt about appropriate antibiotic regimens, please consult with the infectious diseases unit or microbiology department.

Community-acquired
Ampicillin 50 mg/kg/dose 6 hourly IV + Gentamicin 7.5 mg/kg/dose once daily IV
If intrinsic renal dysfunction is present, Ceftriaxone 50 mg/kg/dose once daily IV may be used

Suspected staphylococcal infection:
Cloxacillin 50 mg/kg/dose 6 hourly IV is added (if the patient is on ceftriaxone, there is no value in adding cloxacillin)

Hospital-acquired
Ertapenem 15mg/kg/dose 12 hourly IV

Meropenem 40 mg/kg/dose 8 hourly IV is indicated where hospital acquired meningitis is suspected, or if a patient is known to be colonized with or at high risk for infection with Pseudomonas or Acinetobacter organisms.
Suspected staphylococcal infection:
Vancomycin 15 mg/kg/dose 6 hourly IV should only be added initially if there is
evidence of possible staphylococcal sepsis, e.g. thrombophlebitis, indwelling central
vascular line > 48hrs, other foci of suspected staphylococcal infection such as
pneumonia with breakdown or empyema.

Sexually Transmitted Infections

<table>
<thead>
<tr>
<th>Causative agent</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacterial vaginosis</td>
<td>Metronidazole 7.5mg/kg/dose 8 hourly PO + amoxicillin 30mg/kg/dose 8 hourly PO x 7 days</td>
</tr>
<tr>
<td>Candidiasis</td>
<td>Nystatin cream OR 1% Clotrimazole cream OR 2% Miconazole cream applied intravaginally 8 hourly x 7 days</td>
</tr>
<tr>
<td>Gonorrhoea</td>
<td>Ceftriaxone IM as a single dose: &lt;25 kg 125 mg; &gt;25 kg 250mg</td>
</tr>
</tbody>
</table>
| Chlamydia trachomatis                | *<8 years: Erythromycin 10-15 mg/kg/dose 6 hourly PO × 14 days*
|                                      | *>8 years: Doxycycline 100 mg twice daily PO x 7 days OR Erythromycin for 14 days*
|                                      | *Alternative is: Azithromycin 20 mg/kg/dose as a single dose PO (maximum dose 1 g)* |
| Trichomonas vaginalis or Gardnerella vaginalis | Metronidazole 7.5mg/kg/dose 8 hourly PO x 7 days                        |
| Syphilis                             | Benzathine penicillin 50 000 u/kg/dose once weekly × 3 doses IM (maximum dose 2.4 MU)
|                                      | For penicillin-allergic patients:
|                                      | Children <8 years of age: Erythromycin 10-15 mg/kg/dose 6 hourly PO × 30 days
|                                      | Children >8 years of age: Doxycycline 2 mg/kg/dose 12 hourly PO × 14 days (maximum dose 100 mg) |

Skin / Soft Tissue Infections

Bite (animal or human)
Co-Amoxiclav 15 mg/kg/dose + Amoxicillin 15 mg/kg/dose 8 hourly PO x 5 days

If no refrigerator is available or for penicillin-allergic patients, Erythromycin 10
mg/kg/dose 6 hourly PO × 5 days + Metronidazole 7.5 mg/kg/dose 8 hourly PO x 5 days
is an alternative

Refer to the section on post-exposure prophylaxis for rabies

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**Cellulitis**

Localised or mild
Flucloxacillin 25 mg/kg/dose 6 hourly PO x 5–10 days

Severe
Benzylpenicillin 25 000 U/kg/dose 6 hourly + Cloxacillin 50 mg/kg/dose 6 hourly IV x 5 days

If there is clinical improvement after 48 hours of treatment, consider changing to Co-Amoxiclav 15 mg/kg/dose 8 hourly PO × 5 days

**Impetigo**

Localised
Silver sulfadiazine (Flamazine®) topically

Generalised
Silver sulfadiazine (Flamazine®) topically + Flucloxacillin 25 mg/kg/dose 6 hourly PO x 5 days OR Erythromycin 10 mg/kg/dose 6 hourly PO × 5 days

**Pediculosis (lice) and scabies**

<6 months of age: 5% sulphur ointment twice daily × 3 days
6 months–2 years of age: ¼ strength Benzyl benzoate as a single application
2-12 years of age: ½ strength Benzyl benzoate as a single application
>12 years of age: full strength Benzyl benzoate as a single application

Tetmesol soap to wash body, clothes and linen

**Note:**
1. Treat all affected family or institutionalized members
2. Fine combing or shaving of hair is required for removal of viable lice eggs (nits)
3. If Benzyl benzoate is not tolerated, use 5% Sulphur ointment
4. Alternatives include Gammabenzene-hexachloride and Permethrin but these agents may have toxic side-effects in young children

**Superficial abscess**
Surgical drainage alone may suffice.
If surrounding cellulitis or systemically unwell, Cloxacillin IV or Flucloxacillin PO may be indicated.

**Tinea capitis**
Griseofulvin 10 mg/kg/dose once daily PO x 6 weeks

**Tick Bite Fever**
Children >8 years of age
Doxycycline 2 mg/kg/dose 12 hourly PO x 1 day followed by Doxycycline 1 mg/kg/dose 12 hourly PO x 7 - 10 days
Children <8 years of age
Doxycycline 2 mg/kg/dose 12 hourly PO x 2 days followed by Erythromycin 10 mg/kg/dose 6 hourly PO x 7 days OR Chloramphenicol 12.5 mg/kg/dose 6 hourly PO x 7 days

Note: 1. Doxycycline should still be considered one of the drugs of choice, particularly in severe cases. Short course therapy (2 days) may be sufficient.
2. Erythromycin is not recommended as stand-alone therapy nor is it recommended as continuation therapy in severe cases.
3. Newer macrolides are effective alternatives to Doxycycline: Azithromycin 10 mg/kg/day once daily × 3 days OR Clarithromycin 15 mg/kg/day 12 hourly × 7 days
4. Ciprofloxacin 10 mg/kg/dose (maximum dose 400 mg) 8 hourly IV is the recommended parenteral alternative.

Tuberculosis (see also prophylaxis section)

A. Drug-susceptible TB
Please refer to the weight-based TB drug dosing chart for children (2012)

Children <8 years of age

• Uncomplicated TB disease: new HIV-uninfected TB cases with uncomplicated intra-thoracic TB, and/or lymphadenopathy, or pleural effusions
Rimactizid® (Rifampicin 60 mg/INH 60 mg) + Pyrazinamide once daily 7 days/week PO x 2 months, followed by Rimactazid (Rifampicin 60 mg/INH 60 mg) once daily 7 days/week PO x 4 months dosed according to weight-based TB drug dosing chart

• Complicated TB disease: drug-susceptible or presumed drug-susceptible TB who are smear-positive, cavitatory TB, extensive or severe TB, or HIV infection (excluding TB meningitis)
Rimactizid® (Rifampicin 60 mg/INH 60 mg) + Pyrazinamide + Ethambutol once daily 7 days/week PO x 2 months, followed by Rimactazid 60/60 (Rifampicin 60 mg/INH 60 mg) once daily 7 days/week PO x 4 months dosed according to weight-based TB drug dosing chart

• TB meningitis or miliary TB
Rimactazid 60/60 (Rifampicin 60 mg/INH 60 mg) + Pyrazinamide + Ethionamide once daily 7 days/week PO × 6 months dosed according to weight-based TB drug dosing chart
Children ≥8 years of age (& adults)

• All forms of TB disease

Rifafour or Rimstar-4 (Rifampicin 150 mg/INH 75 mg/PZA 400 mg/Ethambutol 275 mg) once daily 7 days/week PO × 2 months followed by Rimactazid (Rifampicin/INH) once daily PO × 4 months dosed according to weight-based TB drug dosing chart

Note: 1. All children with suspected or proven TB should have an HIV test and if HIV-infected should be referred for assessment for antiretroviral therapy
2. All TB drugs are given once daily every day of the week
3. Duration of TB therapy may be extended beyond 6 months based on the clinical, radiological and microbiological response to 6 months of treatment
4. Drug dosages should be adjusted on a monthly basis according to the current weight of the patient
5. Children >8 years of age (or >35 kg body weight) at the time of TB diagnosis are routinely treated as adults – refer to appropriate TB drug dosing chart
6. Children with uncomplicated TB disease should receive treatment at their local TB clinic
7. All children with severe forms of TB (TB meningitis, military TB, TB peritonitis, spinal or skeletal TB) and those suspected of having multi-drug resistant (MDR) TB (in contact with MDR TB case or not responding to first-line therapy) should be referred for expert opinion and management
8. For children who experience persistent vomiting associated with taking TB medication, consider dividing the dose and administering twice daily (particularly ethionamide)
9. Supplemental pyridoxine (usually 12.5 mg (1/2 tablet) in children and 25 mg (1 tablet) in adults once daily) is recommended particularly in malnourished patients and patients receiving antiretroviral therapy
10. Prednisone 2-4 mg/kg/dose daily PO × 4 weeks then tapered over 2 weeks is added to the treatment regimen for patients with TB meningitis and pericardial TB
11. Caregivers with sputum smear-positive TB should be commenced on treatment or referred to their local TB clinic/hospital. While in the hospital they should be isolated with their child in a respiratory isolation cubicle. If in doubt contact the Infection Control Sister.

B. Drug-resistant TB

INH mono-resistant TB
An 8-9-month course of Rifampicin, Pyrazinamide and Ethambutol is recommended. A fluorquinolone should be added in the presence of extensive disease. If an INH-resistant patient fails to respond to treatment or if INH mono-resistance is discovered late in the course of drug-susceptible therapy, do not add a single drug to the failing regimen. Instead add 2 or 3 effective drugs to the regimen and continue treatment for 8-9 months after the first negative culture.
Multi-drug resistant TB
The regimen for MDR-TB should include 4-7 drugs to which the isolate is susceptible. High-dose INH (15-20 mg/kg) should be added to the treatment regimen. Daily therapy should be administered without interruptions over weekends. After the intensive phase (6 months) the injectable agent is usually discontinued. The optimal duration of therapy is not known. A long course of therapy is required, extending 12-18 months beyond the time of bacteriological conversion.

Extensive drug resistant TB
The regimen for XDR-TB should include at least 4 drugs to which the isolate is expected or known to be susceptible. An injectable should be included if susceptibility is documented or expected. In HIV-infected patients, Thiocetazone is not recommended because of the high risk of skin rashes including Stevens-Johnson syndrome. The standardized XDR-TB regimen in South Africa currently includes Capreomycin, PAS, Ethionime, PZA and Terizidone. The addition of high-dose INH, Moxifloxacin and Linezolid should be considered depending on the setting and available resources. Drugs used in resistant TB:

<table>
<thead>
<tr>
<th>Drug</th>
<th>Daily dose administered once daily unless otherwise stated</th>
<th>Maximum daily dose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First line agents</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isoniazid</td>
<td>15-20 mg/kg</td>
<td>400 mg</td>
</tr>
<tr>
<td>Pyrazinamide</td>
<td>30-40 mg/kg</td>
<td>2.0 grams</td>
</tr>
<tr>
<td>Ethambutol</td>
<td>20-25 mg/kg</td>
<td>2.5 grams</td>
</tr>
<tr>
<td><strong>Injectable anti-TB agents</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Amikacin</td>
<td>15-22.5 mg/kg*</td>
<td>1.0 gram</td>
</tr>
<tr>
<td>- Kanamycin</td>
<td>15-30 mg/kg</td>
<td>1.0 gram</td>
</tr>
<tr>
<td>Capreomycin</td>
<td>15-30 mg/kg</td>
<td>1.0 gram</td>
</tr>
<tr>
<td><strong>Fluoroquinozolones</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ofloxacin</td>
<td>15-20 mg/kg</td>
<td>800 mg</td>
</tr>
<tr>
<td>Ciprofloxacin#</td>
<td>30-40 mg/kg (in 2 divided doses)</td>
<td>2.0 grams</td>
</tr>
<tr>
<td>Levofoxacin</td>
<td>&lt;5 yrs: 20 mg/kg</td>
<td>750 mg</td>
</tr>
<tr>
<td></td>
<td>&gt;5 yrs: 10 mg/kg</td>
<td></td>
</tr>
<tr>
<td>Moxifloxacin</td>
<td>&gt;8 yrs: 7.5-10 mg/kg</td>
<td>400 mg</td>
</tr>
<tr>
<td><strong>Oral bacteriostatic agents</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethionamide</td>
<td>15-20 mg/kg</td>
<td>1.0 grams</td>
</tr>
</tbody>
</table>
Terizidone 10-20 mg/kg 750 mg
Para-aminosalicylic acid (PAS) 150 mg (in 2-3 divided doses) 8-12 grams

**Anti-TB agents not for routine use in MDR-TB**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dosage</th>
<th>Total Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linezolid</td>
<td>20 mg/kg (in 2 divided doses)</td>
<td>1200 mg</td>
</tr>
<tr>
<td>Co-Amoxiclav</td>
<td>30-45 mg/kg (3 divided doses)</td>
<td>4 grams</td>
</tr>
<tr>
<td>Clarithromycin</td>
<td>30 mg/kg (2 divided doses)</td>
<td>1000 mg</td>
</tr>
<tr>
<td>Clofazimine</td>
<td>5 mg/kg</td>
<td></td>
</tr>
</tbody>
</table>

* Amikacin administered daily for 1st month, then thrice weekly, intramuscularly

# Ciprofloxacin is generally not recommended but may be useful in young children

**Note:** MDR-TB, pre-XDR-TB and XDR-TB should be treated under the direction of a TB specialist

**Urinary Tract Infection (see also prophylaxis section)**

**Out-patient**
Co-Amoxiclav 15 mg/kg/dose + Amoxicillin 15 mg/kg/dose 8 hourly PO x 7 days OR Cefuroxime 10 mg/kg/dose 12 hourly PO x 7 days

If no refrigerator is available, an alternative is Ciprofloxacin 15 mg/kg/dose 12 hourly PO x 7 days

**Sick (Requiring admission)**
Gentamicin 7.5 mg/kg/dose once daily IV x 7-10 days

If intrinsic renal failure is present, an alternative is Ceftriaxone 50 mg/kg/dose once daily IV x 7-10 days

**Note:** 1. Measure renal function and gentamicin levels serially to monitor potential toxicity (refer to aminoglycoside dosing schedule on page 10)
2. If there is clinical improvement after 48 hours of intravenous treatment, consider changing to oral therapy for the remainder of 10 days
3. Nalidixic acid is not recommended for treatment as it is only an antiseptic

**Viral Infections (see also prophylaxis section)**

**Cytomegalovirus**
Systemic infection (incl. pneumonitis, oesophagitis, colitis, encephalitis, chorioretinitis)
Ganciclovir 5 mg/kg/dose 12 hourly IV x 14-21 days
Valganciclovir is used in post-transplant patients on maintenance therapy on discharge after intravenous Ganciclovir, CMV end-organ disease in HIV-infected children after intravenous Ganciclovir and for CMV retinitis in HIV-infected children.

**Herpes simplex virus infections**
- Gingivo-stomatitis / eczema herpeticum
  Aciclovir 20 mg/kg/dose 6 hourly PO × 7 days

**HIV infection (see also prophylaxis & occupational exposure sections)**
**Antiretroviral therapy**
Please refer to the weight-based antiretroviral drug dosing chart for children.

**Influenza**
Oseltamivir twice daily PO × 5 days, dosed according to table below:

<table>
<thead>
<tr>
<th>Children &lt;1 year of age</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td><strong>Dose</strong></td>
</tr>
<tr>
<td>Premature neonates (&lt;38 weeks)</td>
<td>1 mg/kg/dose twice daily</td>
</tr>
<tr>
<td>Infants 0-12 months</td>
<td>3 mg/kg/dose twice daily</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Children 1-12 years of age</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Weight</strong></td>
<td><strong>Dose</strong></td>
</tr>
<tr>
<td>15 kg or less</td>
<td>30 mg twice daily</td>
</tr>
<tr>
<td>15-23 kg</td>
<td>45 mg twice daily</td>
</tr>
<tr>
<td>24-40 kg</td>
<td>60 mg twice daily</td>
</tr>
<tr>
<td>&gt;40 kg</td>
<td>75 mg twice daily</td>
</tr>
</tbody>
</table>

**Varicella**
**Uncomplicated (immunocompromised patients only)**
Aciclovir 20 mg/kg/dose 6 hourly PO × 7 days (maximum dose 800 mg)

**Pneumonia**
Aciclovir 20 mg/kg/dose 8 hourly IV x 7 days
PROPHYLAXIS

Primary prophylaxis is prevention of disease occurring in individuals at high risk for a specific disease or diseases while secondary prophylaxis is prevention of recurrent episodes of a specific disease in individuals who have previously had the disease.

Prophylaxis may be active by eliciting a specific protective immune response to a disease (vaccination) or passive by providing short-term immunological protection against a specific disease (with the use of specific immunoglobulin preparations) or longer-term with the use of prophylactic antimicrobial medication or regular immunoglobulin therapy.

### National Immunisation Programme

<table>
<thead>
<tr>
<th>Age of child</th>
<th>Vaccines needed</th>
<th>How &amp; where it is given</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth</td>
<td>BCG: Bacille Calmette Guerin OPV: Oral Polio Vaccine</td>
<td>Intradermal, right arm Drops by mouth</td>
</tr>
<tr>
<td>6 weeks</td>
<td>OPV: Oral Polio Vaccine RV: Rotavirus Vaccine DTaP-IPV//Hib: Diphtheria, Tetanus, acellular Pertussis, Inactivated Polio Vaccine &amp; Haemophilus influenzae type b Combined Hep B: Hepatitis B Vaccine PCV13 : Pneumococcal Conjugated Vaccine</td>
<td>Drops by mouth Liquid by mouth Intramuscular, left thigh Intramuscular, right thigh</td>
</tr>
<tr>
<td>10 weeks</td>
<td>DTaP-IPV//Hib: Diphtheria, Tetanus, acellular Pertussis, Inactivated Polio Vaccine &amp; Haemophilus influenzae type b Combined Hep B: Hepatitis B Vaccine</td>
<td>Intramuscular, left thigh Intramuscular, right thigh</td>
</tr>
<tr>
<td>14 weeks</td>
<td>RV: Rotavirus Vaccine DTaP-IPV//Hib: Diphtheria, Tetanus, acellular Pertussis, Inactivated Polio Vaccine &amp; Haemophilus influenzae type b Combined Hep B: Hepatitis B Vaccine PCV13: Pneumococcal Conjugated Vaccine</td>
<td>Liquid by mouth Intramuscular, left thigh Intramuscular, right thigh</td>
</tr>
<tr>
<td>9 months</td>
<td>Measles Vaccine PCV13: Pneumococcal Conjugated Vaccine</td>
<td>Intramuscular, left thigh Intramuscular, right thigh</td>
</tr>
<tr>
<td>18 months</td>
<td>DTaP-IPV//Hib: Diphtheria, Tetanus, acellular Pertussis, Inactivated Polio Vaccine &amp; Haemophilus influenzae type b Combined Measles Vaccine</td>
<td>Intramuscular, left arm Intramuscular, right arm</td>
</tr>
<tr>
<td>Age</td>
<td>Vaccine &amp; Strength Details</td>
<td>Route of Administration</td>
</tr>
<tr>
<td>------</td>
<td>---------------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>6 years</td>
<td>Td Vaccine: Tetanus &amp; reduced strength of diptheria Vaccine</td>
<td>Intramuscular, left arm</td>
</tr>
<tr>
<td>12 years</td>
<td>Td Vaccine: Tetanus &amp; reduced strength of diptheria Vaccine</td>
<td>Intramuscular, left arm</td>
</tr>
</tbody>
</table>

**Note:**
1. Td should not be administered below the age of 6 years
2. Rotavirus Vaccine should not be administered after 24 weeks of age
3. Pre-term babies should receive vaccinations according to chronological age and at the normal dose

---

**Catch-up immunization (subject to revision by DOH)**

**BCG vaccine**  
Catch-up BCG vaccination may be administered up to the age of 12 months.  
Before catch-up BCG is administered the HIV status of the child should be established.  
**CHILDREN WITH CONFIRMED HIV INFECTION SHOULD NOT RECEIVE BCG IMMUNISATION**

**Rotavirus vaccine**  
Catch-up Rotavirus vaccination may be considered up to the age of 6 months with the following provisos:  
Do not give the 1\textsuperscript{st} dose if the child is above 14 weeks of age  
Do not give the 2\textsuperscript{nd} dose if the child is above 24 weeks of age

**PCV\textsubscript{13}**  
Children < 1 year:  
- Administer 1\textsuperscript{st} dose as soon as possible  
- Administer 2\textsuperscript{nd} dose at least 4 weeks after the first dose  
- Administer 3\textsuperscript{rd} dose at 9 months of age or older, at least 8 weeks after the 2\textsuperscript{nd} dose

**DTaP-IPV//Hib**  
Give all missed doses (maximum of 4 doses) at least 4 weeks apart if the child is < 24 months old; **DTaP-IPV//Hib SHOULD NOT BE ADMINISTERED BEYOND THE AGE OF 24 MONTHS**

Children > 24 months who missed DTaP-IPV//Hib and other vaccines: administer OPV, Measles, Hepatitis B vaccine and tetanus toxoid (TT) at the same time point

Currently, a suitable DTP-Hib combination for children > 24 months of age is not available in South Africa

**Hepatitis B vaccine**  
Administer all missed doses (maximum of 3 doses) in children less than 5 years of age

**Measles**  
Children < 17 months who missed the 9 month measles dose should receive the 1\textsuperscript{st} dose as soon as possible and the 2\textsuperscript{nd} dose at 18 months of age  
Children ≥ 17 months of age who missed the 1\textsuperscript{st} measles vaccine dose immediately and their 2\textsuperscript{nd} dose 4 weeks later

**NB:** **LIVE ATTENUATED MEASLES VACCINE IS CONTRAINDICATED IN CHILDREN WITH ADVANCED HIV**
INFECTION/AIDS

Td
Administer outstanding doses of Td from 6 years of age.

Other vaccines:

Influenza vaccine
Annual vaccination is recommended for:
1. All children at high risk for influenza and its complications because of underlying medical conditions and who are receiving regular medical care for conditions such as chronic pulmonary and cardiac diseases, chronic renal diseases, diabetes mellitus and similar metabolic disorders, individuals who are immunosuppressed and (including HIV-infected persons with CD4 counts above 100 cells/ul), morbid obesity.
2. Children on long-term aspirin therapy
3. Medical and nursing staff in contact with high-risk patients
4. Adults and children who are family contacts of high-risk patients.

Dosage:
Children <12 years of age: single IM dose of either a split-product or subunit vaccine.
Children <9 years of age who have never been vaccinated: 2 doses, 1 month apart.
Children <3 years of age should receive half the adult dose on 2 occasions, 1 month apart.
Influenza vaccine is not recommended for infants less than 6 months of age.

Varicella vaccine
This live-attenuated vaccine is currently not available through the national immunization programme.

The vaccine is licensed for use from 9 months of age. Dose: 9 months-12 years: 1 dose of 0.5ml SC; ≥13 years: 2 doses of 0.5ml SC with an interval of at least 6 weeks between doses.

The vaccine is safe and immunogenic in HIV-infected children with mild/moderate disease and/or mild/moderate immunosuppression (CD4 percentage >15%). At present it is used in selective patient groups for primary prevention against chickenpox e.g. before transfer to Brooklyn Chest Hospital or Sarah Fox Home, and in patients on immunosuppressive therapy. The vaccine is effective for post-exposure prophylaxis (secondary prophylaxis), provided that it is administered within 72 hours of exposure.

Immunoglobulins

Short-term passive immunity may be provided by means of immunoglobulin solutions. For post-exposure prophylaxis specific immunoglobulins administered intramuscularly are available against hepatitis A, measles, varicella zoster, hepatitis B, tetanus and rabies (& Rhesus antigen). Alternatively, immunisation has been shown to provide effective prophylaxis following exposure to several infections including chickenpox,
measles, hepatitis A and hepatitis B.

Intravenous immunoglobulin therapy (IVIG, Polygam) is used for replacement therapy in patients with primary or secondary antibody deficiency states. The usual dose for primary antibody deficiencies is 200-600 mg/kg every 4 weeks. It is also used as an immunomodulatory agent in idiopathic thrombocytopenic purpura, Kawasaki syndrome, Guillain-Barre syndrome with dosing that is specific to each condition.

Immunoglobulins may interfere with vaccine responses. Please consult the manufacturer’s guidelines / an ID specialist about the optimal timing of immunisation relative to the administration of immunoglobulins.

All prescriptions of immunoglobulins should be discussed with the infectious diseases/immunology service or relevant clinical specialty.
Prophylaxis For Specific Conditions & Diseases

Asplenia
Birth – 6 months: Co-trimoxazole (40 mg Trimethoprim + 200 mg Sulfamethoxazole/5 ml syrup) 5ml daily
6 months – 5 years: Penicillin V 125 mg 12 hourly PO
> 5 years: Phenoxymethylpenicillin 250 mg 12 hourly PO

Note:
1. Continue Penicillin prophylaxis throughout childhood
2. Pneumococcal vaccination: Complete the primary vaccine series with the PCV_{13} vaccine, if necessary. Additional protection may be gained by combining the pneumococcal polysaccharide vaccine with PCV_{13}. Administer a single dose of the polysaccharide vaccine at 2 years of age or at least 8 weeks after the last dose of PCV_{13}. A booster dose of the polysaccharide vaccine is advisable 5 years after the first dose.
3. Hib vaccination: Complete the primary vaccine series with Hib conjugate vaccine
4. Meningococcal vaccination: Absence of a spleen predisposes to meningococcal infection. This risk may be reduced by vaccinating with the tetravalent meningococcal polysaccharide vaccine from the age of 2 years
5. Annual Influenza vaccination is recommended
6. If possible, complete primary immunization 2 weeks before an elective splenectomy
7. Following an emergency splenectomy pneumococcal vaccination can begin immediately; delay Hib-conjugate and meningococcal vaccination by at least 2 weeks

Diphtheria
Close contacts (household and regular visitors):
Regardless of immunisation status, isolate contact and swab throat for culture.
Keep under surveillance for 7 days.
All close contacts:
Erythromycin 12.5 mg/kg/dose 6 hourly PO X 7 days (maximum dose: 1g/day)
OR
If contacts cannot be kept under surveillance
Benzathine penicillin (depot formulation), IM, single dose
<30kg: 600 000 units
>30kg: 1.2 million units
If 1^{st} culture was positive, follow up throat culture after 2 weeks and retreat:
Erythromycin 12.5 mg/kg/dose 6 hourly PO X 10 days (maximum dose: 1g/day)

HIV: Prevention of Mother To Child Transmission (PMTCT)
Pregnant women who are eligible for lifelong combination antiretroviral therapy (cART) (CD4 count ≤350 or WHO clinical stage 3 or 4) must be urgently referred to their nearest antiretroviral treatment centre to initiate treatment. Women on lifelong cART
should continue their regimen throughout labour and delivery. They do not require additional intrapartum single dose (sd) Nevirapine (NVP) + Tenofovir (TDF) + Emtricitabine (FTC) or 3-hourly Zidovudine (AZT) during labour.

Pregnant women who do not qualify for cART, should receive Zidovudine (AZT) 300 mg 12 hourly from 14 weeks gestation. At the onset of active labour or rupture of membranes or 4 hours prior to elective caesarean section, a single dose of Nevirapine (NVP) 200mg + Tenofovir (TDF) 300mg + Emtricitabine (FTC) 200mg is given. AZT 300mg 3-hourly is given during labour and stopped at delivery.

All HIV-exposed infants should receive once daily NVP prophylaxis (dNVPp) initiated as soon as possible after delivery (preferably in labour ward) and continued for the first 6 weeks of life irrespective of feeding choice. This includes babies born to mothers who are on cART.

NVP may be administered orally or via nasogastric tube (NGT). Note that NVP sticks to plastic therefore flush NGT with 1ml normal saline after dose. If the baby vomits, the first dose of NVP may be repeated.

Therapeutic drug monitoring (TDM) and liver function tests (ALT/TSB) may be considered in critically ill newborns, inadvertent overdose, conditions that limit enteral absorption or suspected adverse events.

Continue dNVPp beyond 6 weeks of age if infant HIV PCR result is negative, breastmilk feeding is ongoing and mother is not on cART or on cART for <3 months. Consider the use of pasteurized own mother’s milk (POMM) until adequate viral suppression. dNVPp should be continued until one week after the final breastmilk feed of infants whose mothers do not qualify for cART.

Discontinue dNVPp at 6 weeks of age if mother has been adherent on cART for at least 3 months. Discontinue dNVPp at any age if infant HIV PCR result is positive, and fast-track infant for cART.

Mothers of HIV-infected infants should be encouraged to continue exclusive breastfeeding for the first 6 months, then introduce appropriate complementary foods, and continue breastfeeding until the infant is 12 months of age while the infant continues to receive dNVPp. Mothers of HIV-infected infants should consider relactation if not breastfeeding. HIV-infected mothers who are not on cART who decide to stop breastfeeding at any time should do so gradually during one month whilst the baby continues to receive dNVPp until one week after the final breastmilk feed.
NVP oral suspension (10 mg/ml) doses for infant prophylaxis:

Table 1: Birth weight ≥2kg

<table>
<thead>
<tr>
<th>Age or weight</th>
<th>Dose (mg)</th>
<th>Dose (ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Once daily</td>
<td>Once daily</td>
</tr>
<tr>
<td>Birth to 6 weeks of age</td>
<td>Refer to Table 2</td>
<td>Refer to Table 2</td>
</tr>
<tr>
<td>• &lt;2kg birth weight</td>
<td>10 mg</td>
<td>1 ml</td>
</tr>
<tr>
<td>• 2 - 2.5kg birth weight</td>
<td>15 mg</td>
<td>1.5 ml</td>
</tr>
<tr>
<td>• &gt;2.5kg birth weight</td>
<td>20 mg</td>
<td>2 ml</td>
</tr>
<tr>
<td>6 weeks-6 months</td>
<td>30 mg</td>
<td>3 ml</td>
</tr>
<tr>
<td>6 months-9 months</td>
<td>40 mg</td>
<td>4 ml</td>
</tr>
</tbody>
</table>

Table 2: Birth weight <2kg

<table>
<thead>
<tr>
<th>Birth weight 1800 – 1999g</th>
<th>Birth weight &lt;1800g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Dose (mg)</td>
</tr>
<tr>
<td></td>
<td>Once daily</td>
</tr>
<tr>
<td>Day 0-14</td>
<td>5mg</td>
</tr>
<tr>
<td>Day 15-42</td>
<td>10mg</td>
</tr>
<tr>
<td>6 wks-6 mths</td>
<td>20mg</td>
</tr>
<tr>
<td>&lt;14 days old</td>
<td>At discharge home</td>
</tr>
</tbody>
</table>

In circumstances when oral medication is unlikely to be tolerated or absorbed, replace NVP with intravenous AZT. Oral AZT has limited efficacy in preventing postnatal transmission. Breastmilk should be pasteurized in these instances. In the event of NVP toxicity, replace dNVPp with oral AZT.

AZT doses for infant prophylaxis:

<table>
<thead>
<tr>
<th>AZT oral solution (10mg/ml)</th>
<th>Birth weight / gestational age</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥2kg</td>
<td>12mg (1.2ml) 12 hourly</td>
<td></td>
</tr>
<tr>
<td>&lt;2kg</td>
<td>4mg/kg (0.4ml/kg) 12 hourly</td>
<td></td>
</tr>
<tr>
<td>If gestational age &lt;35 weeks</td>
<td>2mg/kg (0.2ml/kg) 12 hourly</td>
<td></td>
</tr>
</tbody>
</table>

AZT intravenous infusion (10mg/ml in 200mg vial)
Not a multi-dose vial: prepare in sterile pharmacy for multiple doses

| ≥35 weeks gestation | 1.5mg/kg/dose 6 hourly |
| <35 weeks gestation | 1.5mg/kg/dose 12 hourly |
**Infective endocarditis**
Prophylaxis should be given to children with congenital or rheumatic heart lesions

Dental extractions/extensive fillings or upper respiratory tract surgery
Amoxicillin 50 mg/kg/dose PO as a single dose 1 hour pre-op.
<5 years of age: 750mg
5-<10 years of age: 1.5 g
≥10 years of age: 2 g

If patient is nil by mouth pre-anaesthetic, Ampicillin 50 mg/kg/dose IV 15 – 30 minutes before surgery

If patient is allergic to Penicillin, use Clindamycin PO or IV as follows:
<5 years of age: 150 mg,
5-<10 years of age: 300 mg,
≥10 years of age: 600 mg

Genitourinary surgery or instrumentation
Ampicillin 50 mg/kg/dose IV + Gentamicin 1.5 mg/kg/dose IV 15 – 30 minutes before surgery

If patient is allergic to penicillin, Vancomycin 20 mg/kg/dose infused over 60 minutes + Gentamicin 1.5 mg/kg/dose IV

**Note:** Second doses of antibiotics after high-risk procedures may be indicated.
Amoxicillin may be given once the patient is able to take orally or Ampicillin 25 mg/kg/dose may be given after return from theatre.

**Malaria (not available through RCWMCH pharmacy)**

<table>
<thead>
<tr>
<th>Dosing regimen</th>
<th>Mefloquine 1 tablet=250 mg</th>
<th>Atovaquone-Proguanil 1 paediatric tablet=125 mg atovaquone plus 50 mg proguanil</th>
<th>Doxycycline 1 tablet=50 or 100mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 5 kg</td>
<td>Contraindicated</td>
<td>Contraindicated</td>
<td>Contraindicated</td>
</tr>
<tr>
<td>5–10 kg</td>
<td>62.5 mg (1/4 tablet)</td>
<td>62.5 mg (1/4 tablet)</td>
<td>Contraindicated</td>
</tr>
<tr>
<td>11–20 kg</td>
<td>62.5 mg (1/4 tablet)</td>
<td>½ paediatric tablet</td>
<td>Contraindicated</td>
</tr>
</tbody>
</table>

Dose weekly, starting 1 week before entering the area, once weekly while in the area, and once weekly for 4 weeks after the last possible exposure to malaria.

Dose daily, starting 1-2 days before exposure, continued daily during exposure and for 7 days after the last possible exposure to malaria.

Dose daily, starting 1-2 days before entering the area, continuing daily while in the area, and daily for 4 weeks after the last possible exposure to malaria.
### Meningococcal infection

#### Children

<table>
<thead>
<tr>
<th>Weight</th>
<th>Ceftriaxone</th>
<th>Ciprofloxacin</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;12 years</td>
<td>125 mg</td>
<td>250 mg</td>
</tr>
<tr>
<td>≥12 years</td>
<td>250 mg</td>
<td>500 mg</td>
</tr>
</tbody>
</table>

OR

Ciprofloxacin single dose PO

- 6-<12 years of age: 250 mg
- ≥12 years of age: 500 mg

If <6 years of age and able to swallow a tablet, a single 250 mg tablet may be considered

#### Adults

Ciprofloxacin 500 mg single dose PO

OR

Ceftriaxone 250 mg single dose IM

**Note:** Household contacts, day care centre contacts and close contacts in crowded hostels or dormitories would require prophylaxis. School and work contacts do not generally need prophylaxis. Hospital contacts need treatment only if contact has been intense and intimate e.g. mouth-to-mouth resuscitation

### Pertussis (not available for adults through RCWMCH pharmacy)

Erythromycin 10 mg/kg/dose 6 hourly PO x 7 days (adult dose 500 mg 6 hourly PO x 7 days)

### Pneumocystis infection associated with HIV infection

Co-trimoxazole (40 mg trimethoprim + 200 mg sulfamethoxazole/5 ml syrup or 80 mg trimethoprim + 400 mg sulfamethoxazole / single strength tablet)

- <5 kg: 2.5 ml daily
- 5-<14 kg: 5ml or ½ tablet daily
- 14-<30 kg: 10ml or 1 tablet daily
• ≥30 kg: 2 tablets daily

Note: 1. All HIV-exposed infants and children <18 months of age should receive prophylaxis, starting from 4-6 weeks of age and continued until HIV infection can be excluded (negative PCR test ≥6 weeks of age in non-breastfed children or negative PCR test at least 6 weeks after the last breastfeed)
2. All HIV-exposed breastfeeding children of any age should receive prophylaxis until HIV infection can be excluded by HIV antibody testing (Determine rapid test or HIV ELISA) if >18 months of age or virological testing (HIV DNA PCR test) if <18 months of age
3. All HIV-infected children <12 months of age should receive prophylaxis regardless of clinical stage or CD4 count
4. For HIV-infected children >12 months of age, prophylaxis is recommended for all symptomatic children (WHO clinical stage 2, 3 or 4) or children with CD4 <25%.
5. All children who begin Co-trimoxazole prophylaxis should continue until the age of 5 years when they can be reassessed unless discontinuation of prophylaxis is authorized by an infectious diseases consultant in the context of antiretroviral therapy-associated immune reconstitution
6. Children >5 years of age should receive prophylaxis according to adult recommendations (any WHO clinical stage + CD4 count <350 cells/mm³ OR WHO clinical stage 3 or 4 irrespective of CD4 count)
7. For Co-trimoxazole intolerant patients, desensitisation should be considered (discuss with infectious diseases consultant). An alternative is Dapsone 2 mg/kg/day (maximum daily dose 100 mg) or 4 mg/kg/week

Rabies
Post exposure prophylaxis (PEP)

Dog bites are the cause of most rabies cases in SA.
PEP involves the use of vaccine with or without 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
• Category 1: Touching or feeding animal or a licking of intact skin: vaccine is not indicated
• Category 2: Nibbling of uncovered skin, superficial scratch but no bleeding: wound cleaning + a course of vaccine
• Category 3: Bites, scratches that penetrate skin and draw blood, licks of mucous membranes or broken skin: wound cleaning + a course of vaccine + RIG

Doses
• Vaccine: 0.5-1 ml (depends on supplier) on day 0, 3, 7, 14 and 28 given into the deltoid muscle (adults) or anterolateral thigh (infants & children). Vaccine should be given as soon as possible after injury but
should not be withheld if presentation to health facility is delayed.

- RIG: 20 IU/kg infiltrated into the wound and remainder into the deltoid muscle (not buttocks) given at a different site at the same time as vaccine (or up to 7 days after the first vaccine). Supplied in 2 ml ampoules containing 300 IU. Dose (ml) = body weight (kg) × 0.13.

Thorough cleaning of the wound with an antiseptic solution is paramount. Prophylactic antibiotics and tetanus prophylaxis should be given after high risk exposures.

**Rheumatic fever**
Secondary prophylaxis against streptococcal pharyngitis

Benzathine penicillin 3-4 weekly
- <30 kg: 600-900 000 units IM
- ≥30 kg: 1.2 million units IM

**Note:**
1. For patients who do not have established rheumatic heart disease, prophylaxis should be continued until 21 years of age. Patients with established rheumatic heart disease should receive Penicillin until they are at least 35 years of age
2. For patients unable to have intramuscular injections (e.g. on warfarin), Phenoxymethylpenicillin 250 mg 12 hourly PO
3. For penicillin-allergic patients, use Erythromycin 250 mg 12 hourly PO

**Sexual assault**
Antiretroviral post exposure prophylaxis
Please refer to Antiretroviral Post-Exposure Prophylaxis (PEP) After Acute Sexual Assault in Children chart available in Trauma / Emergency Unit

**Tetanus**
Clean minor wounds
Children with clean minor wounds do not require tetanus immunoglobulin (TIG) or antibiotics. Tetanus toxoid (TT) vaccine (0.5 ml IM) should always be administered, except in fully immunised patients who have received a booster within the past 5 years.

**All other wounds (dirty wounds)**
TIG is given if the immune status is not known, or if the patient is not completely immunised, or has completed a TT course but the last booster was received more than 5-10 years earlier.

TIG as a single dose IM:
- <5 years of age: 75U
- 5-<10 years of age: 125U
- >10 years of age: 250U
TT (0.5 ml IM) is always given, except in those who have completed a TT course with the last booster within the past 5 years

**Note:** In contaminated wounds or wounds with much devitalised tissue, TT and TIG are adjuncts to other essential measures such as adequate debridement and judicious antimicrobial therapy. TT and TIG should be given at the same time and the course of vaccination completed.

**Tuberculosis**

**Drug-susceptible TB contact**
All children <5 years of age (or HIV-infected children of any age) in close contact with an adult or adolescent with pulmonary TB or children with a positive Mantoux skin test, who are asymptomatic, should receive a 6-month course of Isoniazid preventive therapy (IPT) to prevent the development of TB disease. The likelihood of TB infection in these children is high and a Mantoux skin test is not required prior to commencing IPT.

SYMPTOMATIC children should be evaluated to exclude TB disease. Important symptoms of TB in children include persistent non-remitting cough or wheeze for >2 weeks, documented loss of weight or failure to thrive during the past 3 months, fatigue or reduced playfulness, and persistent fever for >2 weeks.

Please refer to the weight-based TB drug dosing chart for children for dosing details

**Drug-resistant TB contact**
Exposure to INH mono-resistant TB: Rifampicin 15-20 mg/kg/day x 4 months
Exposure to MDR-TB: Isoniazid 15-20 mg/kg/day + Ethambutol 20-25 mg/kg/day or Ethionamide 15-20 mg/kg/day, + Ofloxacin 15-20 mg/kg/day x 6 months (3 drugs)
Exposure to pre-XDR-TB or XDR-TB: Isoniazid 15-20 mg/kg/day x 6 months

**Urinary tract infection**

<3 months of age
Cefuroxime 5 mg/kg/dose 12 hourly PO
Alternative is Co-Amoxiclav 7.5 mg/kg/dose 12 hourly PO

>3 months of age
Nalidixic acid 25 mg/kg/dose once daily (at bedtime) PO if potty-trained; if still in nappies split dose & give 12 hourly

**Note:** 1. Prophylaxis is indicated for children (<2 years of age) awaiting further urinary tract investigation (usually micturating cystourethrogram or other imaging) following an initial well-documented episode/s of UTI as well as in children with previously documented abnormalities of the urinary tract. If there is any uncertainty as to whether prophylaxis is indicated, the renal unit should be contacted for advice.
2. Currently available oral liquid formulations of Cefuroxime and Co-Amoxiclav both require refrigeration after reconstitution.

**Varicella (chicken pox)**

Post exposure prophylaxis must be given to the following high-risk patients exposed to varicella zoster virus (chicken pox or shingles):

- Neonates whose mothers develop varicella from 5 days before delivery to 2 days after delivery
- Premature neonates (<28 weeks gestation or <1000 g at birth)
- Infants <6 months of age
- Immunocompromised children

Varicella-zoster immunoglobulin (VZIG) should be given within 3 days of exposure. If given later than 5 days after exposure the course of varicella may be attenuated although the disease may not be prevented.

**VZIG as a single dose IM:**

- Neonates: usually 1 ml
- ≤5 years of age: 2 ml
- 6-10 years of age: 4 ml
- 11-14 years of age: 5 ml
- ≥15 years of age: 6 ml

If VZIG is not available, Aciclovir 20 mg/kg/dose 8 hourly × 10 days (ideally from day 7-21 post-exposure) may be used although there is limited evidence supporting this intervention.

Varicella zoster vaccine may also be effective as post-exposure prophylaxis for those at risk of severe disease if given within 3 days of the appearance of the rash in the index case (unregistered indication). Dose: 9 months-12 years single dose (0.5 ml) SC; ≥13 years 2 doses (0.5 ml each) with an interval of at least 6 weeks between doses. It is a live attenuated vaccine and it should not be given to severely immunocompromised individuals as post exposure prophylaxis.
Antimicrobial Prophylaxis In Surgery And Trauma

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 immunocompetent patients, who have minimal risk of contamination. In all other situations, prophylaxis should be considered.
• The drug chosen should be active against the pathogens most likely to be associated with wound infections.
• Prophylaxis must be given at most 60 minutes prior to first incision. The ideal is to give the first dose 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.

Recommendations for prophylaxis:

Upper GIT surgery
Cefazolin 25 mg/kg IV (maximum dose 1 g)

Note: Use Clindamycin 10 mg/kg IV in most situations of severe beta-lactam allergy.

Colo-rectal and appendix surgery
Cefazolin 25 mg/kg IV (maximum dose 1 g) + Metronidazole 7.5 mg/kg IV

Note: 1. If intestinal perforation has occurred, treat patient for infection with a course of appropriate antibiotics (refer to page 31 for treatment of peritonitis)
2. Use Clindamycin 10 mg/kg IV in most situations of severe beta-lactam allergy. It is not necessary then to add Metronidazole as Clindamycin provides good anaerobic cover. Add Gentamicin 7.5 mg/kg as a single dose for Gram-negative cover

Head and neck and ENT surgery
Cefazolin 25 mg/kg IV (maximum dose 1 g)

Add Metronidazole 7.5 mg/kg IV if procedure involves oropharyngeal mucosa

Cardiovascular surgery
Cefazolin 25 mg/kg IV (maximum dose 1 g)
Note: Further doses may be given 8 hourly for up to 24 hours or extended to 48 hrs if multiple lines are in place. With bypass surgery or with excessive blood loss give a second dose at 2-3 hrs.

Orthopaedic surgery
Compound (open) fractures
Cefoxitin 50 mg/kg/dose 6 hourly IV (maximum dose 3 g) until secondary wound closure completed (e.g. skin flap)

Open reduction & internal fixation of closed fractures
Cefoxitin 50 mg/kg/dose 6 hourly IV (maximum dose 3 g) × 24 hours

Note: An alternative is Cefazolin 25 mg/kg/dose 6 hourly IV (maximum dose 1 g)

Open fractures
1. Minimal contamination:
   Cefazolin 25 mg/kg/dose 8 hourly IV x 48 hours
2. Significant contamination (High risk of environmental contamination; delay in treatment; significant tissue destruction): Requires early treatment with Cloxacillin + Gentamicin + Metronidazole

Severe animal bites and all human bites
Co-Amoxiclav 15 mg/kg/dose 8 hourly PO x 5 days

Note: 1. There is no clear evidence of benefit for antibiotic prophylaxis in minor animal bites
   2. In penicillin-allergic patients Tetracycline or Clindamycin would be appropriate choices
   3. Remember to check whether prophylaxis is needed for rabies, tetanus or HIV

Neurosurgery
Cefazolin 25 mg/kg IV (maximum dose 1 g)

Compound depressed skull fractures and penetrating spinal cord injuries
Ceftriaxone 100 mg/kg/dose once daily IV + Metronidazole 7.5 mg/kg 8hrly IV for 5 days

Note: Prophylactic antibiotics are not indicated for CSF leaks

Penetrating eye injuries
Cefazolin 25 mg/kg 8 hourly IV + Ciprofloxacin 12 hourly, both for 3 days

Ophthalmic surgery
Chloramphenicol 0.5% ophthalmic drops: instil 1 drop 2–4 hourly for 24 hours prior to surgery, preferably use a separate vial for each patient
NOTIFIABLE MEDICAL CONDITIONS

Notification of the scheduled list of notifiable diseases is a statutory obligation. Form GW 17/5 must be completed for each case of any of the scheduled notifiable diseases by the clinician at the place of diagnosis of such a case. All completed GW 17/5 forms must be sent within seven days to the Local Health Authority. At RCWMCH this is done by the Infection Control Sister (Sr. Charmaine Rinquist page no 4585 or ext. 5470).

In addition, certain conditions (column 1 in table below), require immediate telephonic reporting (weekdays during office hours 021-400 3984, fax 021 421 1960, after-hours & weekends 021 424 7715) for a rapid outbreak response aimed at containment. The doctor in charge of the case must also immediately inform the referral health facility of the case (whether probable or confirmed).

Other conditions (column 2 in table below) are under active surveillance and require telephonic reporting within 24 hours to the relevant Provincial Surveillance Officer (phone 021-483 9917, fax 021-483 2682, after-hours & weekends 082 0635994/082 5509002). Alternatively, contact the Infection Control Sister (see above) on weekdays during office hours in order to obtain case investigation forms and an EPID number.

### Conditions associated with outbreaks:
- Anthrax
- Cholera
- Diphtheria
- Food poisoning (outbreak of >4 persons)
- Haemorrhagic fever of Africa (Congo, Dengue, Lassa, Marburg & Rift Valley fever)
- Lead poisoning
- Legionellosis
- Meningococcal infections
- Paratyphoid fever
- Plague
- Poisoning from any agricultural or stock remedy (e.g. pesticides/fertilizers)
- Rabies (specify whether human cases or human contact)
- Multi-drug resistant tuberculosis
- Typhoid fever
- Yellow fever

### Conditions under active surveillance:
- Acute flaccid paralysis
- Measles
- Tetanus neonatorum

### Conditions requiring routine notification process:
- Complete Form GW 17/5

### Conditions associated with outbreaks: Require immediate telephonic reporting (021 424 7715) for outbreak response aimed at containment + Form GW 17/5

### Conditions under active surveillance: Require telephonic reporting within 24 hours + Form GW 17/5

### Conditions requiring routine notification process: Complete Form GW 17/5
OCCUPATIONAL HEALTH OF HOSPITAL STAFF

Immunisation
Recommendations for all health care workers (HCWs) are:

Hepatitis A
Recommended for non-immune HCWs. Primary course consists of a single dose; a booster dose is recommended 6-12 months later to ensure adequate long-term antibody protection. Hepatitis A vaccine is currently not routinely provided to HCWs by hospital staff health clinic.

Hepatitis B
A series of three intramuscular injections is required to achieve optimal protection. Two primary immunization schedules can be recommended:

- Standard schedule: 3 doses 4 weeks apart OR
- Extended schedule: immunization at day 0, 1 month and 6 months

Immune status should be checked 2-4 weeks after the third vaccine dose. Hepatitis B vaccine is routinely provided free-of-charge to all HCWs by hospital staff health clinics.

Influenza
Since the antigenicity of influenza viruses is constantly changing, vaccines are formulated each spring to contain the two A strains and one B strain considered most likely to cause disease in the coming winter. Recommendations are based on ongoing surveillance by WHO-accredited regional influenza laboratories. Influenza vaccine is best given in April each year but can be given at any time until the end of winter. While HCWs should be vaccinated to protect themselves, it is even more important to be vaccinated to decrease the spread of influenza viruses in health facilities. Influenza vaccine does not protect against other respiratory infections nor provide 100% protection against influenza viruses. Influenza vaccine is routinely provided free-of-charge to all HCWs by hospital staff health clinic.

Varicella (chicken pox)
Recommended for non-immune HCWs. Primary course consists of two doses with an interval of at least 6 weeks between doses.
Contraindicated in pregnancy (vaccine contains live attenuated virus)
Varicella vaccine is currently not routinely provided to HCWs by hospital staff health clinics.

Rubella
Immunization is recommended for all non-immune women HCWs of child-bearing potential but is currently not routinely provided by hospital staff health clinics.
Occupational exposure to infections & post exposure prophylaxis

HIV and other blood-borne infections such as Hepatitis B and C can be transmitted to HCWs during occupational exposure. The risk of acquiring HIV infection following a percutaneous (needle-stick or sharps) injury with HIV-infected blood is very low at 0.3%; the risk from a mucosal splash injury with HIV-infected blood is even less at 0.09%.

Post exposure prophylaxis (PEP) can reduce the risk of acquiring infection following occupational exposure and should be commenced as soon as possible after the injury. In all occupational exposure incidents, proper documentation and follow-up by the staff health clinic is essential in order to claim compensation at a later date.

Immediate action:
► Wash area
► If sharps injury, encourage bleeding
► Notify supervisor

Where to go without delay:
RCWMCH:
Mon - Fri 08h00 – 16h00: Occupational Health Staff Clinic (Ground Floor, Nursing Home, ext. 5283)
After-hours: Trauma Unit (ext. 5198)
Groote Schuur Hospital: 021 404 5486/90 (staff health clinic; 07h00 – 16h00)
After-hours: Trauma Unit

Urgent bloods to be taken:
• From source patient (if known):
  ► Supervisor of staff member to arrange bloods & consent from legal guardian/caregiver of source patient or medical superintendent if legal guardian/caregiver is not available
  ► **Send 1 adult purple-top (EDTA) tube or 2 purple-top (EDTA) microtainers for HIV testing:** tick “HIV serology” on NHLS lab request form and (PCR will be done automatically if HIV rapid test is positive and child is < 18 mths of age, or confirmatory HIV ELISA if >18 months of age)
  ► **Send 1 yellow-top tube for Hepatitis testing:** tick “Clinical Hepatitis-B + C” (Hep B surface antigen & Hep C antibodies) on NHLS lab request form

• From staff member
  Bloods to be taken in Trauma Unit
  ► **Send two yellow-top tubes**
  On NHLS lab request form tick:
  1. “Hepatitis immunity-B” (Hep B surface antibodies) and “Clinical Hepatitis-C” (Hep C antibodies) on NHLS lab request form
  2. “HIV serology”
  3. Creatinine and request “estimated creatinine clearance” (provide age, gender and weight of staff member)
Unless source patient is known to be HIV-uninfected, start HIV post exposure prophylaxis (PEP) in Trauma Unit, ideally within 30 minutes of exposure. Trauma doctor to prescribe 3-day starter pack of ART:

- **Mucocutaneous exposure (splash):**
  - Tenofovir 1 tab (300 mg) once daily
  - Lamivudine 1 tab (300 mg) once daily

- **Percutaneous exposure (sharps injury):**
  - Tenofovir 1 tab (300 mg) once daily
  - Lamivudine 1 tab (300 mg) once daily
  - Lopinavir / Ritonavir (200 / 50 mg adult tabs): 2 tabs twice daily

Forms to be completed in Trauma Unit (COID Act, No. 130 of 1993)

- Staff member to complete Percutaneous Innoculation Report (sharps injuries or splash)
- Trauma Doctor to document incident in staff member’s hospital folder

**Next working day**

- Make appointment with Occupational Health Nurse (ext. 5283) to receive outstanding results, review need for Hepatitis B prophylaxis and obtain new prescriptions
- If HIV infection is confirmed in the source patient, cannot be excluded, or if source patient is unknown then duration of HIV PEP is 28 days
- Follow-up includes psychological support, management of drug side-effects if indicated, and HIV testing at 6 wks, 3 months and 6 months

**Hepatitis B**

Contacts (source patients) are infectious if they are hepatitis B surface antigen (HBsAg) positive.

Following mucocutaneous exposure to blood or body fluids from a HBsAg positive patient:

1. A previously vaccinated HCW with hepatitis B surface antibody (HBsAb) titre >10 mIU/ml does not require PEP
2. A HCW who is not known to have completed a hepatitis B vaccination schedule OR who has HBsAb titre <10 mIU/ml should receive hepatitis B immunoglobulin (HBIG) 500 IU as a single dose IM preferably within 48 hours (but not later than a week) after exposure + hepatitis B vaccine (first dose of schedule of 3, or as booster dose) given at a different site, at the same time as HBIG (or within a week).

It may not always be practical to wait for laboratory determination of hepatitis serology and/or antibody titres and under these circumstances immunoglobulin is usually given.

**Hepatitis C**

No effective PEP. Follow-up testing at 6, 12 and 24 weeks is advised
**Rubella**
No effective PEP

**Varicella (chicken pox)**
Varicella-zoster immunoglobulin (VZIG) may be given to non-immune contacts within 3 days of exposure.

If given later than 5 days after exposure the course of varicella may be attenuated although the disease may not be prevented. Dose of VZIG: 6 ml as a single dose IM.

VZIG is in short supply and should be reserved for immunocompromised patients in contact with varicella. A healthy (non pregnant), non immune HCW who is exposed to varicella should receive varicella vaccine within 3 days of exposure. A second dose 6 weeks later is recommended.

If neither VZIG nor varicella vaccine are available, acyclovir 20 mg/kg/dose 8 hourly × 10 days (ideally from day 7-21 post-exposure) may be used although there is no evidence supporting this intervention.
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### Lopinavir/ Ritonavir

**M**

- Maxitrol
- Mebendazole
- Meropenem
- Metronidazole
- Miconazole
- Monosulfiram
- Moxifloxacin
- Mupirocin

**N**

- Nalidixic acid
- Natamycin
- Neomycin + Betamethasone
- Nevirapine
- Nitrofurantoin
- Nystatin

**O**

- Ofloxacin
- Oseltamivir
- Oxytetracycline + Polymyxin

**P**

- Para-aminosalicylic acid
- Phenoxyethylpenicillin
- Piperacillin-Tazobactam
- Piperazine
- Posaconazole
- Praziquantel
- Primaquine
- Procaine Penicillin
- Pyrazinamide
- Pyrimethamine
- Pyrimethamine-sulfadoxine

**Q**

- Quadriderm
- Quinine
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