EMPIRICAL AND PROPHYLACTIC USE OF ANTIMICROBIALS

NATIONAL GUIDELINES 2016

The Sri Lanka College of Microbiologists
in Collaboration with other Professional Colleges in Healthcare
and
The Ministry of Health, Nutrition and Indigenous Medicine

Empirical and Prophylactic Use of Antimicrobials National Guidelines 2016

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Foreword

Antimicrobial resistance (AMR) has emerged as a major public health problem all over the world. Though it is a global problem, the major brunt of AMR is borne by developing countries like ours. The foremost driving force for developing resistance is irrational use of antimicrobials in health care settings. Rational prescription of antibiotics not only will help minimize the morbidity and mortality due to resistant microbial infections but also curtail the cost incurred on patient management.

In Sri Lanka, during the past decade the resistance rates for most organisms both in the health care settings as well as in the community have escalated at an alarming rate. This is especially so for Gram negative organisms causing infections. The most effective and practical mode of approach to minimize this problem is by having a national policy for the use of antimicrobials in the country and practicing of National antimicrobial guidelines will serve as an initiative for this task.

The Sri Lanka College of Microbiologists took the leading role in identifying this national requirement and developed these guidelines in collaboration with all other medical professional colleges and associations with the approval of the Ministry of Health. I would request the health care providers to give priority and their fullest support in implementing these guidelines in all health care institutions.

I wish to thank all stakeholders involved in the development of these guidelines and for the World Health Organization for the financial assistance provided.

Dr. PalithaMahipala
Director General of Health Services

Contributing Professional Colleges and Associations

- Sri Lanka College of Microbiologists
- Ceylon College of Physicians
- The College of Surgeons of Sri Lanka
- Sri Lanka College of Paediatricians
- Association of Orthopaedic Surgeons
- College of Anaesthesiologists of Sri Lanka
- Sri Lanka Dental Association
- College of Ophthalmologists
- Sri Lanka College of Obstetricians and Gynaecologists
- Sri Lanka Association of Urological Surgeons
- Sri Lanka College of Dermatologists
- Sri Lanka College of Haematologists
- Sri Lanka Heart Association
- Sri Lanka Association of Nephrology and Transplantation
- Association of Sri Lankan Neurologists
- Sri Lanka College of Oncologists
- College of Otorhinolaryngologists of Sri Lanka
- Sri Lanka College of Pulmonologists
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- Sri Lanka College of Venereologists

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Contents **Page**

General Comments

- These guidelines are developed with the intention of improving the outcome of infectious disease by early and appropriate antimicrobial therapy while minimizing the emergence of resistance to antimicrobial agents.

- Antimicrobial regimes given here are intended to be used for prophylactic or empirical therapy. Antimicrobial agents should be tailored whenever a microbiological diagnosis and antibiotic susceptibility results are available.

- Specimens for cultures and other investigations for an early microbiological diagnosis should be obtained before commencing empirical therapy whenever possible.

- Treatment options have been selected for the optimal use of antimicrobials in the country and may not include all therapeutic options available globally for a given infection.

- Antimicrobial doses given are for adults with average build and normal renal function unless otherwise specified.

- The main focus of these guidelines has been the common bacterial infections and the scope does not include a comprehensive range of infections caused by uncommon bacteria, viruses and fungal agents.

- These guidelines are not intended to serve as complete management guidelines for infectious diseases since other aspects of management of infections are not covered here.

- Best practices in antimicrobial therapy will continue to change with improving evidence base on infections and the guidelines will have to be revised accordingly in future.

Specific guidance for the use of antimicrobial agents

1. **Immediate penicillin or cephalosporin hypersensitivity** – most common entities are anaphylaxis or urticaria which generally occurs within one hour. In anaphylaxis usually more than one organ is involved, however some patients might have only hypotension or shock.

2. If **aminoglycosides** are used close monitoring of renal functions and adequate hydration is essential. Ideally assess serum levels when given for more than 48 hours and vestibular functions when given for more than 5 days.

3. Ideally assess serum levels of **vancomycin** when given for more than 48 hours to avoid under dosing and to minimize the risk of toxicity. If facilities are not available monitor renal functions with serum creatinine and adjust vancomycin dose accordingly.
   For elderly over 65 years, vancomycin dose should be 500 mg every 12 hours or 1g once daily.

4. If patient develops diarrhoea while on **clindamycin** discontinue therapy and contact microbiologist.

Dose calculation and administration of some parenteral antibiotics

This guideline is for immunocompetent, average adults with normal renal and liver functions.
For severe infections like meningitis, endocarditis and surgical prophylaxis refer the relevant guideline.

Antibiotic	Dose	Administration
Ampicillin	500mg-1g 6 hourly	IV injection, IM or IV infusion IV infusion given over 30-60 minutes
Penicillin	0.6-1.2g 6 hourly	Slow IV injection, IM or IV infusion IV infusion over 30-60 minutes

Antibiotic	Dose	Administration
Cefotaxime	1g 8 hourly	IM, IV injection or IV infusion IM doses over 1g need to be divided and given to more than one site
Ceftazidime	1g 8 hourly	IV injection or IV infusion Deep IM injection only if IV route is not possible
Ceftriaxone	1-2g daily	1g can be given by either IV injection or deep IM injection but more than 1g by IV infusion only
Cefuroxime	750mg 6-8 hourly	Lesser amounts can be given IM but 750 mg should be given by IV injection or IV infusion only
Clindamycin	600 mg 6-8 hourly	≥600mg IV infusion only IM injection possible for less than 600mg
Amikacin	Calculated for * ideal body weight 15mg/kg/day	Once daily dose by IV infusion only given over 60 minutes Multiple daily doses by slow IV injection over 3 minutes, IV infusion over 30 minutes or IM injection Adjust doses according to serum levels
Gentamicin	Calculated for * ideal body weight 5-7mg/kg/day	Once daily dose by IV infusion only given over 60 minutes Multiple daily doses by slow IV injection over 3 minutes, IV infusion over 30 minutes or IM injection. Adjust doses according to serum levels
Ciprofloxacin	200mg - 400mg 12 hourly	400mg over 60 minutes or 200 mg over 30 minutes IV infusion
Levofloxacin	500 mg once daily or 12 hourly	500 mg IV infusion over 60 minutes
Co-amoxiclav	1.2g 8 hourly	IV injection over 3-4 minutes or IV infusion over 3 hours

Antibiotic	Dose	Administration
Piperacillin-tazobactam	4.5g 8 hourly	IV infusion over 3 hours
Ticarcillin-clavulanate	3.2g 6-8 hourly	IV infusion over 3 hours
Imipenem	500mg 6 hourly or 1g 8 hourly	IV infusion given for 40 – 60 minutes
Meropenem	0.5 -1g 8 hourly	Slow IV injection over 5 minutes or IV infusion over 3 hours
Teicoplanin	400 mg every12 hourly for 3 doses then 400 mg once daily or 6mg/kg every 12 hourly for 3 doses then once daily	IV injection, IV infusion or IM injection Infusion is preferred over bolus injection
Vancomycin	1-1.5g 12 hourly Refer the chart below for loading dose when indicated	IV infusion over 100 minutes
Metronidazole	400mg 8 hourly	IV Infusion over 20 minutes

***Ideal body weight is calculated as**

For males: 50kg + 0.9kg per each cm over 152cm (2.3kg per each inch over 5 feet)
For females: 45.5kg + 0.9kg per each cm over 152cm (2.3kg per each inch over 5 feet)

Vancomycin loading doses should be considered for patients who have severe sepsis or with complicated infections (e.g. endocarditis, meningitis, nosocomial pneumonia). Loading dose of vancomycin is calculated according to the patient's actual body weight without adjusting for creatinine clearance.

	Loading dose of IV vancomycin infusion at a rate of about 10 mg/min			
Body weight of the patient	< 60 kg	60-80 kg	80-100 kg	>100 kg
Loading dose	1g	1.5 g	2g	2.5g

Bacterial endocarditis

- Bacterial endocarditis essentially needs prolonged intravenous therapy throughout the course except in specific situations (eg. oral doxycycline for coxiella infections).
- Duration of therapy depends on the organisms isolated. Contact Microbiologist for advice.
- Defervescence might take 5-10 days despite appropriate antibiotic therapy.

Condition	Primary therapy	Alternative therapy	Comments
Native valve bacterial endocarditis	crystalline penicillin 3-4 MU IV 4 hourly + [2]gentamicin 1mg/ kg IV 8 hourly or ampicillin 2g IV 4 hourly + [2]gentamicin 1mg/kg IV 8 hourly	[1]In immediate penicillin or cephalosporin hypersensitivity [3]vancomycin 1g IV infusion (over 100 minutes) 12 hourly + [2]gentamicin 1mg/kg IV 8 hourly other penicillin hypersensitivities (excluding immediate type) ceftriaxone 2g IV daily + [2]gentamicin 1mg/kg IV 8 hourly	Obtain 3 blood cultures depending on the urgency to start antibiotics. These samples should be collected 12 hours apart. If the patient needs antibiotics urgently all samples can be collected within 1 hour (with first and last samples drawn at least 1 hour apart) from different venepuncture sites. Treatment should not be delayed if blood culture facilities are not available. Antibiotics and duration should be revised according to culture results. Discuss with the microbiologist.

Native valve right sided bacterial endocarditis and/or IV illicit drug use	cloxacillin 2g IV 4 hourly or flucloxacillin 2g IV 4 hourly + [2]gentamicin 1mg /kg IV 8 hourly	[1]In immediate penicillin or cephalosporin hypersensitivity/high risk of MRSA [3]vancomycin 1g IV infusion (over 100 minutes) 12 hourly	Monitor renal functions when patient is on vancomycin or gentamicin.
Prosthetic valve endocarditis	[3]vancomycin 1g IV infusion (over 100 minutes) 12 hourly + [2]gentamicin1mg /kg IV 8 hourly + rifampicin 600mg po daily		Early surgical consultation required. Contact Microbiologist.
Pace maker endocarditis	[3]vancomycin 1g IV infusion (over 100 minutes) 12 hourly + [2]gentamicin 1mg /kg IV 8 hourly		Seek surgical advice regarding device removal.

[1]Immediate penicillin or cephalosporin hypersensitivity – refer page 2

[2]Ideally assess serum gentamicin level when given for more than 48 hours and vestibular functions when given for more than 5 days. As gentamicin is used for synergy, aim for a trough concentration of 0.5-1mg/ml and peak levels need not exceed 4µg/ml.

[3]For vancomycin - refer page 2

Antibiotics for Endocarditis in children – doses, route, frequency

Antibiotic	**Doses, route & frequency**
Ampicillin	50mg/kg IV 4 hourly
Ceftriaxone	100mg/kg per 24 h IV daily
Cloxacillin/flucloxacillin	200mg/kg per 24 h IV in 4-6 equally divided doses
Gentamicin	3mg/kg per 24 h IV in 1 dose or 3 equally divided doses
Penicillin	200 000U/kg per 24 h IV in 4-6 equally divided doses
Vancomycin	40 mg/kg per 24 h IV in 2-3 equally divided doses

Bone and joint infections

- In all cases of suspected acute septic arthritis and acute osteomyelitis, blood cultures should be obtained before commencing antimicrobial therapy.
- Joint aspirates or bone biopsies should ideally be obtained for culture.
- Empirical antibiotic therapy should be reviewed according to sensitivity test results.
- In chronic osteomyelitis bone biopsies should be obtained before commencing antimicrobial therapy.

Condition	Primary therapy	Alternative therapy	Comments
Acute septic arthritis (Non prosthetic joints)	flucloxacillin/cloxacillin 2g IV 6 hourly Children below 5 years add cefotaxime 50mg/kg IV 6-8 hourly or ceftriaxone 50-80mg/kg IV once daily In adults if an infection with a Gram negative organism is suspected add cefotaxime 2g IV 8 hourly or ceftriaxone 2g IV daily	[1]In immediate penicillin or cephalosporin hypersensitivity [4]clindamycin 600mg IV infusion 6 hourly or [3]vancomycin 1g IV infusion (over 100 minutes) 12 hourly or teicoplanin 400mg IV 12 hourly for 3 doses then 400mg IV daily	Acutely infected joints may require washouts in addition to antibiotics. Initial empirical therapy should ideally be guided by Gram stain results. Adjust therapy according to culture and susceptibility results. Renal function should be monitored with vancomycin therapy. Ceftriaxone should be avoided in neonates.

	Duration: Neonates- 3 weeks IV Children- total 3 weeks therapy with minimum of 3 days IV Adult- total 4 weeks therapy with minimum of 2 weeks IV		A shorter duration may be considered depending on the organism isolated and clinical response. Contact microbiologist.
Acute osteomyelitis	flucloxacillin 2g/ cloxacillin 2g IV 6 hourly If an infection with a Gram negative organism is suspected add cefotaxime 2g IV 8hourly/ceftriaxone 2g IV 12hourly Children below 5 years add cefotaxime 50mg/kg IV 6-8 hourly or ceftriaxone 50-80mg/kg IV once daily	[1]In immediate penicillin or cephalosporin hypersensitivity [4]clindamycin 300mg IV infusion 6 hourly or [3]vancomycin 1g IV infusion (over 100 minutes) 12 hourly or teicoplanin 400mg IV 12 hourly for 3 doses then 400mg IV daily	Monitor LFT with prolonged (> 2 weeks) cloxacillin therapy. Note: In addition to *S. aureus*, *Mycobacterium tuberculosis*, MRSA, Gram negative bacilli and streptococci may cause acute vertebral osteomyelitis. Ceftriaxone should be avoided in neonates.

	Duration: Neonates- 4 weeks IV Children- Minimum of 3 days IV followed by oral therapy. Total duration minimum of 3 weeks Adult- 4 weeks IV followed by oral therapy Total duration minimum of 6 weeks		
Chronic osteomyelitis	See comments		No empirical treatment. Antibiotic therapy should be guided by sensitivity patterns of culture isolates. Obtain biopsy for culture before commencing antibiotics. Antimicrobial therapy alone is not sufficient without surgical intervention. Duration: About 2 weeks IV and then orally for weeks to months.

Prosthetic joint infection	See comments		No empirical treatment. Antibiotic therapy should be guided by sensitivity of culture isolates. Multiple samples should be collected for culture during surgical procedures. Duration is from weeks to months depending on the management plan and causative organism. Contact microbiologist.
Suspected Gonococcal or Meningococcal septic arthritis (peripheral joints)	cefriaxone 2g IV once daily or cefotaxime 1g IV 8 hourly Duration: 10-14 days	ciprofloxacin 400mg IV 12 hourly	
Diabetic foot infections complicated with osteomyelitis **Mild to moderate infections**	[4]clindamycin 600mg IV infusion 6 hourly + ciprofloxacin 750mg po 12 hourly	co-amoxiclav 1.2g IV 8 hourly + ciprofloxacin 750mg po 12 hourly	Stop clindamycin and contact microbiologist if diarrhoea develops.

Severe diabetic foot infection with systemic sepsis	Duration: IV for 14 days Then continue with oral therapy for 4 weeks or more ticarcillin-clavulanic acid 3.2g IV 8 hourly or piperacillin-tazobactam 4.5g IV 8 hourly	meropenem 1g IV 8 hourly	

[1]Immediate penicillin or cephalosporin hypersensitivity - refer page 2

[3]For vancomycin - refer page 2

[4] For clindamycin- refer page 2

Prepared by the Sri Lanka College of Microbiologists in collaboration with The College of Surgeons of Sri Lanka, Ceylon College of Physicians and Association of Orthopaedic Surgeons

Central nervous system infections

- Blood cultures should be collected before starting empirical antibiotics.
- CSF cultures should be collected whenever possible prior to starting antibiotics.
- However, antibiotic therapy should not be delayed if the collection of sample is delayed due to unavoidable reasons.

Bacterial meningitis

Empirical antibiotic therapy according to the age and risk factors - doses, route, and frequency.

Condition	Primary therapy	Alternative therapy	Comments
Acute bacterial meningitis Age 0-1 month	penicillin/ampicillin + cefotaxime	penicillin/ampicillin + [2]gentamicin	Ceftriaxone should be avoided in this age group. In premature neonates with long stay in special care units *S. aureus* (MSSA/MRSA), enterococci and resistant coliforms are possible pathogens; contact microbiologist.
Acute bacterial meningitis Age 1- 3 months	penicillin/ampicillin + cefotaxime /ceftriaxone		
Acute bacterial meningitis Age 3 months - 65 years	cefotaxime /ceftriaxone +/- [3]Vancomycin	[1]In immediate penicillin or cephalosporin hypersensitivity chloramphenicol +/- [3]vancomycin	The value of adjunctive dexamethasone therapy is documented in meningitis. In suspected meningococcal meningitis high dose corticosteroids should not be used.

			Dexamethasone 8-10mg (child:0.15mg/kg up to 10mg) IV, starting before or with the first dose of antibiotic, then 6 hourly for 2-4 days. Antibiotic therapy should not be delayed if corticosteriods are not available.
Acute bacterial meningitis Age >65 years, alcoholic patients, patients with debilitating disease	cefotaxime /ceftriaxone + ampicillin +/- [3]vancomycin	[1]In immediate penicillin or cephalosporin hypersensitivity chloramphenicol +/- [3]vancomycin	
Acute bacterial meningitis In immunocompromised patients eg: severe neutropenia, HIV	ampicillin + cefotaxime /ceftriaxone + [3]vancomycin	[1]In immediate penicillin or cephalosporin hypersensitivity chloramphenicol + [3]vancomycin	Contact microbiologist.
Acute bacterial meningitis Basilar skull fracture	cefotaxime /ceftriaxone +/- [3]vancomycin	[1]In immediate penicillin or cephalosporin hypersensitivity chloramphenicol/ aztreonam + [3]vancomycin	

Acute bacterial meningitis Penetrating trauma , post-neurosurgery	[3]vancomycin + ceftazidime	[3]vancomycin + aztreonam/meropenem	
CSF shunt infections	[3]vancomycin + ceftazidime	[3]vancomycin + meropenem	Removal of infected shunt with appropriate antimicrobial therapy is the most effective treatment. Contact microbiologist for doses and duration of antibiotic therapy and timing of shunt re-implantation. Intraventricular preparations of antibiotics can be used particularly when there is no improvement with IV antibiotics after 48 hours or where shunt removal is not possible.
Chronic meningitis	Treatment depends on the causative organism. No urgent need for empirical therapy.		Contact microbiologist for special investigations and treatment.
Meningoencephalitis	aciclovir + antibiotic/s according to the age group and risk factors		

[1]Immediate penicillin or cephalosporin hypersensitivity - refer page 2
[2]For aminoglycosides- refer page 2
[3]For vancomycin - refer page 2

Antibiotic duration for meningitis
If no pathogen is isolated continue the empirical regimen for a minimum of 10 days depending on the response.
In children under 3 months – minimum of 2 weeks
In neonates – 3 weeks

Duration of antibiotic treatment for specific pathogens

Microorganism	**Duration (days)**
Streptococcus pneumoniae	10-14
Haemophilus influenzae	7
Neisseria meningitidis	5-7
Group B *Streptococcus* *Listeria monocytogenes, Escherichia coli* and other coliforms	21 Longer duration in immunocompromised patients.
Staphylococcus aureus/ Staphylococcus epidermidis	14-28

Prophylaxis in meningitis – refer page 80,81

Intracranial abscess

Condition	Empirical therapy	Comments
Brain abscess	[3]Vancomycin + cefotaxime or ceftriaxone + metronidazole	Treatment of these conditions involves appropriate surgical intervention and parenteral antibiotic therapy. Specific antibiotic therapy depends on predisposing factors and specific organisms. Discuss with microbiologist.
Subdural empyema		
Cranial epidural abscess		

Duration of antibiotic treatment

The appropriate duration of antibiotic treatment depends on the antimicrobial susceptibility of the organism, size of the abscess, adequacy of surgical drainage and patient's response as determined clinically and by serial CT scans.

- If surgical intervention is carried out – IV antibiotics for 3-4 weeks
- If surgical intervention is not carried out – IV antibiotics for 6-8 weeks
- In immunocompromised – longer duration
- Presence of accompanying osteomyelitis – longer duration

Spinal epidural abscess

Condition	Empirical therapy	Comments
Spinal epidural abscess	[3]vancomycin + ceftazidime For 4-6 weeks. If associated with osteomyelitis, 8 weeks treatment.	Management includes appropriate surgical intervention and long term antibiotic therapy.

Doses, route and frequency of antibiotics for central nervous system infections - Adults

Antibiotic	Dose
Ampicillin	2g IV 4 hourly
Cefotaxime	2g IV 4-6 hourly
Ceftazidime	2g IV 8 hourly
Ceftriaxone	2g IV 12 hourly
Chloramphenicol	12.5mg-25mg/kg IV 6 hourly If high dose is used reduce the dose as soon as clinical improvement is noted
Meropenem	2g IV 8 hourly
Penicillin G	4 MU IV 4 hourly
Aztreonam	2g IV 6-8 hourly

	Dose
Vancomycin	500mg -750mg IV 6 hourly or 15mg/kg IV 8 hourly
Aciclovir	10mg/kg IV 8 hourly

Doses, route and frequency of antibiotics for central nervous system infections - Children over 1 month

Antibiotic	**Dose**
Ampicillin	50mg/kg IV 4-6 hourly (max 2g 4 hourly)
Cefotaxime	50mg/kg IV 6 hourly (max 12g daily)
Ceftazidime	50mg/kg IV 8 hourly (max 6g daily)
Ceftriaxone	80mg/kg IV daily (1m-12 yr, BW < 50kg) 2-4g IV daily (BW ≥ 50kg or > 12 yrs)
Chloramphenicol	12.5mg-25 mg/kg IV 6 hourly If high dose is used reduce the dose as soon as the clinical improvement is noted
Penicillin G	50mg/kg IV 4-6 hourly (max 2.4g 4 hourly)
Vancomycin	15mg/kg (max 500 mg) IV 8 hourly

Doses, route and frequency of antibiotics for central nervous system infections - Neonates

Antibiotic	Age	Dose
Ampicillin	<7 days	100 mg/kg IV 12 hourly
	7-21 days	100 mg/kg IV 8 hourly
	21-28 days	100 mg/kg IV 6 hourly
Cefotaxime	<7 days	50 mg/kg IV 12 hourly
	7-21 days	50 mg/kg IV 8 hourly
	21-28 days	50 mg/kg IV 6-8 hourly
Penicillin G	<7 days	50 mg/kg IV 12 hourly
	7-28 days	50 mg/kg IV 8 hourly
Gentamicin	< 29 weeks post menstrual age	2.5mg/kg IV daily
	29 - 35 weeks post menstrual age	2.5mg/kg IV 18 hourly
	> 35 weeks post menstrual age	2.5mg/kg IV 12 hourly

Prepared by the Sri Lanka College of Microbiologists in collaboration with Ceylon College of Physicians, The College of Surgeons of Sri Lanka, Sri Lanka College of Paediatricians and Association of Sri Lankan Neurologists

Diarrhoea in adults

- Most bacterial diarrhoeal diseases are self-limiting and usually do not require antibiotic therapy.
- Whenever possible, a microbiological diagnosis should be attempted. Since there are antibiotic resistant organisms, treatment should ideally be guided by antibiotic susceptibility data.

Condition	Primary therapy	Alternative therapy	Comments
Mild diarrhoea (≤6 unformed stools/day and no fever)	Rehydration Antibiotic therapy not recommended.		Treatment with co-trimoxazole or fluoroquinolones may increase the risk of haemolytic uraemic syndrome (HUS). Antibiotic therapy is recommended if cholera is suspected.
Severe diarrhoea (≥ 6 unformed stools per day and/or blood and mucus, fever)	ciprofloxacin 500mg po 12 hourly or ciprofloxacin 400mg IV 12 hourly for 3-5 days	co-trimoxazole 960mg po 12 hourly	If there is a history of recent antibiotic therapy add oral metronidazole to cover possible *Clostridium difficile* associated diarrhoea. IV therapy is required only when oral therapy is not tolerated.
Traveler's diarrhoea (moderate to severe)	ciprofloxacin 500mg po 12 hourly for 1-3 days azithromycin 1g po single dose or 500mg po once daily for 2-3 days	co-trimoxazole 960mg po 12 hourly for 3 days	Antibiotic therapy is not recommended for mild diarrhoea.

Antibiotic associated diarrhoea (severe continuous diarrhoea, +/- fever in elderly)	metronidazole 400mg po 8 hourly for 10-14 days	If not responding / relapsing/ severe: vancomycin* 125mg po 6 hourly for 10-14 days (IV preparation can be given orally)	If possible, stop antibiotics likely to be causing symptoms. Antibiotic therapy is not required in mild illness. If not responding or relapsing disease, contact microbiologist.
Suspected cholera	doxycycline 100mg po 12 hourly for 3 days	ciprofloxacin 1g po single dose or azithromycin 1g po single dose or erythromycin 500mg po 6 hourly for 3 days	Antibiotic therapy will reduce the volume and duration of diarrhoea. For pregnant women – amoxicillin 250mg po 6 hourly for 5 days. Alternatives - azithromycin or erythromycin.

*Intravenous vancomycin preparation may be given orally only for antibiotic associated diarrhoea. Dissolve 500mg vancomycin powder in water, measure the required volume and give orally or via nasogastric tube.

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Ear, nose and throat infections

Relevant specimens should be sent for culture and antibiotic sensitivity before starting antibiotics whenever possible. Antibiotic therapy should be guided by the sensitivity results.

Condition	Primary therapy	Alternative therapy	Comments
Otitis externa • Bacterial	Ear drops: 3 drops 3 times a day 0.5 % neomycin + 0.1% betamethasone combination or 0.3% ofloxacin/ 0.3% ciprofloxacin/ 0.3% gentamicin/ 5% chloramphenicol **+/-** 0.1% betamethasone **+/-** Systemic antibiotics: cloxacillin/flucloxacillin 500mg po 6 hourly or co-amoxiclav 625mg po 8 hourly for 5 to 7 days	[4]clindamycin 450mg po 8 hourly or ciprofloxacin 500mg po 12 hourly	Aminoglycoside ear drops should be considered only when there is no perforation of the ear drum. Avoid prolonged use. Instances of allergy and irritant effects have been reported with chloramphenicol ear drops. Local antibiotics can be combined with steroids when there is oedema. Indications for systemic antibiotics: Fever/ spread of inflammation to pinna / folliculitis / acute localized otitis externa/ infections not responding to topical treatment / patients with other comorbidities /immunocompromised. Review antibiotics according to culture results.

• Fungal (candida, aspergillus, mucor etc.)	1% clotrimazole solution 3 to 4 drops three times a day or 2% miconazole + 0.25 % betamethasone three times a day for 10 to14 days	1% tolnaftate solution 3 to 4 drops twice a day for 7 days or 1% econazole nitrate 1% triamsinolone creamsupervised instillation	
• Malignant	ciprofloxacin 400mg IV 12 hourly or ceftazidime 2g IV 8 hourly or ticarcillin-clavulanate 3.2g IV 8 hourly + topical therapy as in otitis externa	piperacillin-tazobactam 4.5g IV 8 hourly or meropenem1g IV 8 hourly	Mainly reported in diabetic and immunocompromised patients. Suspect malignant otitis externa in diabetic or immunocompromised patient with severe ear ache and refer to an ENT surgeon. Continue treatment for 4-6 weeks. Step down to oral ciprofloxacin with clinical improvement.

Otitis Media • Acute	If no antibiotics in prior month - amoxicillin 500mg po 8 hourly for 5-7 days If antibiotics used within last month or clinical failure with 3 days of amoxicillin- co-amoxiclav 625mg po 8 hourly for 5-7 days	azithromycin 500mg po once daily on day one followed by 250mg po once daily for 2-5 days or clarithromycin 500mg po 12 hourly for 5-7 days	Treat children < 2 years. For children > 2 years, who do not have complications can be observed without antibiotics for 48 hours. There is no place for topical antibiotics. If complicated or immunocompromised IV antibiotics should be used.
• Chronic mucoid type	0.3% ciprofloxacin otic solution or 5% chloramphenicol ear drops 3 to 4 drops twice a day for 1-2 weeks		Aural toilet is very important. Chloramphenicol ear drops should be avoided unless essential due to irritant effect. In acute exacerbations may have to use culture guided oral antibiotics. IV antibiotics may be required if severe and not responding to oral antibiotics. Duration depends on severity and complications.
• Chronic squamous type	0.3% ciprofloxacin otic solution or5% chloramphenicol ear drops 3 to 4 drops twice a day until surgical intervention		Surgical treatment is essential**.** Consult ENT surgeon.

Mastoiditis • Uncomplicated	co-amoxiclav 1.2g IV 8 hourly or ceftriaxone 1g IV daily for 7-10 days	ciprofloxacin 500mg po12 hourly + [4]clindamycin 900mg IV 8 hourly for 7-10 days	Switch to oral treatment with clinical response.
• Complicated (Eg. Mastoid abscess, intracranial extension, facial palsy)	co-amoxiclav 1.2g IV 8 hourly or ceftriaxone 1g IV daily for 7-10 days	ciprofloxacin 500 mg po 12 hourly + [4]clindamycin 900 mg IV 8 hourly for 7-10 days	Surgical treatment is essential. Consult ENT surgeon. Antibiotic therapy should be guided by the culture and ABST results.
Perichondritis of auricle	ciprofloxacin 400mg IV 12 hourly/ ceftazidime 1g IV 8 hourly +/- [4]clindamycin 900mg IV 8 hourly Total duration of therapy- 7-10 days		

Sinusitis • Acute allergic rhinosinusitis			Antibiotic therapy is not indicated.
• Acute Bacterial Sinusitis	If no antibiotics in prior month- amoxicillin 500mg po 8 hourly for 5-7 days If recent antibiotic use or no response to amoxicillinin 48 hours: co-amoxiclav 625mg po 8 hourly for 7-14 days	doxycycline 100mg po daily for 5-7days or azithromycin 500mg po daily on day one followed by 250mg po daily for 2-5 days or clarithromycin 500mg po 12 hourly for 7-10 days	Parenteral antibiotic therapy is required only for severe cases.
• Chronic Sinusitis	Antibiotics usually not effective. Treat acute exacerbations as acute sinusitis.		Consult ENT surgeon for assessment/surgical intervention.
• Fungal sinusitis			Refer to ENT surgeon. Surgical treatment is indicated in all types of fungal sinusitis.

Nasal vestibulitis • Mild • Severe	fucidin cream local application 2-3 times a day for 2 to 3 weeks cloxacillin/ flucloxacillin 500mg IV 6 hourly for 7-10 days + fucidin cream local application 2-3 times a day for 2 to 3 weeks		Commence treatment as early as possible.
Nasal septal abscess	cloxacillin/flucloxacillin 1g IV 6 hourly for 7 days	[4]clindamycin 900mg IV 8 hourly	Surgical intervention is essential. Consult ENT surgeon. Can reduce cloxacillin/fucloxacillin dose to 500mg after surgery.
Acute bacterial tonsillitis/ pharyngitis	phenoxymethyl penicillin 500mg po6 hourly or amoxicillin 500mg po 8 hourly or co-amoxiclav 625mg po 8 hourly for 10 days	clarithromycin 500mg po 12 hourly or cefalexin 500mg po 8 hourly for 10 days	As majority of pharyngitis are of viral origin, antibiotic treatment is not usually indicated. Associated cough, rhinorrhoea, hoarseness and/or oral ulcers suggest viral aetiology. Amoxicillin can cause a skin rash in patients with infectious mononucleosis.

Acute bacterial tonsillitis/ pharyngitis **not responding to oral therapy**	benzyl penicillin 1.2 MU 6 hourly step down to co-amoxiclav 625mg po 8 hourly total duration - 10 days	[4]clindamycin 600mg IV 8 hourly for 10 days or cefuroxime 750mg IV 8 hourly for 10 days	Step down to oral therapy with clinical improvement.
Peritonsillar abscess	benzyl penicillin 1.2 MU IV 6 hourly + metronidazole 500mg IV 8 hourly step down to co-amoxiclav 625mg po 8 hourly total duration - 10 days	[4]clindamycin 900mg IV 8 hourly for 10 days or cefuroxime 750mg IV 8 hourly	Surgical intervention is essential. Consult ENT surgeon. Step down to oral therapy after surgery with clinical improvement.
Retropharyngeal/ parapharyngeal abscess	co-amoxiclav 1.2g IV 8 hourly/ ceftriaxone 1g IV daily + metronidazole 500mg IV 8 hourly step down to co-amoxiclav 625mg po 8 hourly	[4]clindamycin 900mg IV 8 hourly + ciprofloxacin 400mg IV 12 hourly/ cefuroxime 750mg IV 8 hourly	Early surgical intervention and airway management are essential. Consult ENT surgeon. Step down to oral therapy after surgery with clinical improvement.

Acute Laryngitis If symptoms persist >48hrs (voice change and pain)	Antibiotic treatment is generally not indicated. Treat as acute bacterial tonsillitis		Voice rest for 7-10 days.
Acute epiglottitis	ceftriaxone 1g IV daily or co-amoxiclav 1.2g IV 8 hourly step down to co-amoxiclav 625mg po 8 hourly	[4]clindamycin 900mg IV 8 hourly + levofloxacin 400mg IV 8 hourly followed by clindamycin 450mg po 8 hourly + levofloxacin 500 mg po12 hourly	Contact ENT surgeon immediately. Urgent surgical intervention/intubation needed for paediatric patients.
Lemierre's syndrome (suppurative jugular thrombophlebitis)	ceftriaxone 2g IV daily + metronidazole 500mg IV 8 hourly step down to co-amoxiclav 625mg po 8 hourly	[4]clindamycin 900 mg IV 8 hourly followed by clindamycin 450mg po8 hourly	Consult ENT surgeon.

[4]clindamycin – refer page 2

Prepared by the Sri Lanka College of Microbiologists in collaboration with the College of Otorhinolaryngologists of Sri Lanka.

Eye infections

- ❖ Individual containers of eye drops should be provided for each patient to minimize contamination.
- ❖ In out- patient department if multiple application containers are used, they should be discarded at the end of each day.

Condition	Primary therapy	Alternative therapy	Comments
Conjunctivitis			
• Bacterial	Antibacterial eye drops (ciprofloxacin, ofloxacin, tobramycin) 6 hourly + Antibacterial eye ointment at bedtime		If no response for 3 days refer to an ophthalmologist.
• Gonococcal (Ophthalmia neonatorum)	ceftriaxone 50mg/kg IM single dose (should not exceed 125mg)		Topical antimicrobials are not recommended. Treat mother and her sexual partner.
• Chlamydial	For neonates: erythromycin syrup 12.5mg/kg 6 hourly for 14 days For adults: doxycycline 100mg po 12 hourly for 1-3 weeks	For adults: erythromycin 500mg po 6 hourly for 1-3 weeks	

Condition	Primary therapy	Alternative therapy	Comments
Dacrocystitis	co-amoxiclav 625mg po 8 hourly or cloxacillin 500mg po 6 hourly	azithromycin 500mg po daily	Immediate ophthalmology referral is needed. Flucloxacillin can be used in place of cloxacillin.
Endophthalmitis • Acute bacterial	<u>Intravitreal</u> vancomycin 1mg + ceftazidime 2.25mg/ amikacin 0.4mg (Each agent diluted in 0.1ml of sterile water or normal saline (may need to repeat in 2-3 days)		Immediate ophthalmology referral is needed. Immediate vitrectomy may be needed. Needle aspiration of both vitreous and aqueous humor should be sent for culture and microscopy.
• Penetrating ocular traumaat risk of getting endophthalmitis	ciprofloxacin 750mg po stat followed by po 12 hourly/ 400mg IV 12 hourly +/- itraconozole (If plant material is involved)	ceftriaxone 2g IV daily	Immediate ophthalmology referral is needed. Needs intravitreal antibiotics guided by the Gram stain of material obtained during surgery.

Keratitis • Viral Herpes simplex Herpes zoster ophthalmicus with or without keratitis	aciclovir 3% eye ointment topically 5 times for 14 days or for at least 3 days after healing aciclovir 800mg po 5 times per day for 10 days		Immediate ophthalmology referral is needed.
• Bacterial	0.3 gatifloxacin eye drops/ 0.5% moxifloxacin eye drops + 0.3% tobramycin eye drops intensive therapy	0.3% gatifloxacin eye drops hourly or 0.3% gentamicin eye drops hourly	Immediate ophthalmology referral is needed.
• Contact lens associated	0.3 gatifloxacin eye drops/ 0.5% moxifloxacin eye drops + 0.3% tobramycin eye drops intensive therapy	0.3% gatifloxacin eye drops hourly or 0.3% gentamicin eye drops hourly	Immediate ophthalmology referral is needed.

• Fungal	natamycin 0.5% eye drops 1 drop every 1-2 hours	*amphotericin B 0.15% eye drops 1 drop every 1-2 hours Tail off according to clinical response	Acanthamoeba infection has to be excluded. Immediate ophthalmology referral is needed.
Marginal blepharitis (inflammation of lid margins)	Lid hygiene with gentle eyelid scrubs (e.g. twice daily with baby shampoo)		Consider topical antibiotic ointment over the lid margin if bacterial super-infection is suspected
Meibomian abscess (internal hordeolum) **Stye (external hordeolum)**	Surgical treatment +/- cloxacillin 500mg po 6 hourly for 5 days		Hot packs are adequate for external hordeolum. Role of topical antibiotics is unclear.
Orbital (post-septal) cellulitis	cloxacillin 2g IV 6 hourly + cefotaxime 2g IV 8 hourly/ ceftriaxone 2g IV daily + /- metronidazole 1g IV 12 hourly	[3]vancomycin 1g IV 8-12 hourly + levofloxacin 750mg IV daily +/- metronidazole 1g IV 12 hourly	Flucloxacillin can be used in place of cloxacillin

Periorbital (preseptal) cellulitis • skin and adenexal origin	co-amoxiclav 625mg po 8 hourly	cefalexin 500mg po 8 hourly	
• without evidence of external involvement	cloxacillin 2g IV 6 hourly + cefotaxime 1g IV 8 hourly/ ceftriaxone 2g IV daily +/- metronidazole 500mg IV 8 hourly	levofloxacin 750mg IV daily + clindamycin 600mg IV 8 hourly	Contact microbiologist in severe infections. Flucloxacillin can be used in place of cloxacillin. If MRSA is suspected replace cloxacillin with vancomycin/ teicoplanin. Switch to oral therapy with clinical improvement. Total duration - 7 days.
• children	Same medication as above (doses according to body weight)	Same medication as above (doses according to body weight)	For children, immediate ophthalmology referral is needed.

***Procedure for amphotericin B (0.15%) eye drop preparation:**

Step 1- Mix 10ml of sterile water in 50mg of amphotericin B powder. This will give 5mg/ml solution.

Step 2- Take 3ml (15mg) from above solution and mix with 7ml of sterile water. This will give 15mg/10ml. i.e. 0.15 solution.

[3]For vancomycin refer pages2

Prepared by the Sri Lanka College of Microbiologists in collaboration with the College of Ophthalmologists

Febrile neutropenia

- In febrile neutropenic patients, urgent therapy with intravenous broad spectrum antimicrobials is required. If the focus of infection is known, site specific treatment should be started. Septic screen including blood cultures has to be performed before commencing antibiotics. Empirical therapy should be reviewed with culture results.

- **Febrile neutropenia:** absolute neutrophil count of <500 cells/mm^3 or that is expected to decrease to < 500 cells/mm^3 during the next 48 hours and single oral temperature of ≥ 38.3^{0}C or a temperature of ≥38^{0}C sustained over 1 hour. Neutropenic patient with severe sepsis may not have fever, particularly the elderly or patients on corticosteroids.

- **Duration of therapy** is decided by the duration of neutropenia, causative organism and the site of infection. Appropriate antibiotics should be continued at least for the duration of neutropenia (until absolute neutrophil count is > 500 cells/mm^3) or longer if clinically necessary.

Condition	Primary therapy	Alternative therapy	Comments
Febrile neutropenia	piperacillin- tazobactam 4.5g IV 6 hourly / ceftazidime 1-2g IV 8 hourly +/- [2]amikacin 15mg/kg IV once daily	ticarcillin –clavulanate 3.2g IV 8 hourly / cefepime 1-2g IV 12 hourly +/- [2]gentamicin 5mg/kg IV once daily/ [2]netilmicin 6mg/kg IV once daily	Combination therapy could be considered if antibiotic resistance is suspected or proven. Contact microbiologist if fever persists beyond 96 hours of antibacterial therapy or clinical deterioration of the patient occurs.

Patients colonized with MRSA / clinical evidence of a vascular catheter related infection / skin and soft tissue infection / pneumonia/ in a unit with a high incidence of MRSA infection **In low risk adults ***	Add[3]vancomycin 1g IV 12 hourly (infusion over 100 minutes) in addition to above antibiotics co-amoxiclav 1.2g IV 8 hourly + ciprofloxacin 400mg IV 12 hourly	Add teicoplanin 400mg IV 12 hourly for 3 doses and then 400mg IV once daily	In patients with renal impairment teicoplanin is preferred. For elderly over 65 years, vancomycin dose should be 500mg 12 hourly or 1g once daily.
Febrile neutropenia in critically ill or haemodynamically unstable patient	meropenem 1g IV 8 hourly + **vancomycin 1g IV 12 hourly (infusion over 100 minutes) +/- [2]amikacin 15mg/kg IV once daily	imipenem 1g IV 8 hourly + teicoplanin 400mg IV 12 hourly for 3 doses and then 400mg IV daily +/- [2]gentamicin 5mg/kg IV once daily/ [2]netilmicin 6mg/kg IV once daily	

***Low risk- [**Ref-Prevention and treatment of cancer related infections, National Comprehensive Cancer Network (NCCN) guidelines version 2.2015]

- Out patient status at the time of development of fever
- Anticipated short duration of severe neutropenia (≤100 cells/mm^3 for <7d)
- Good performance status (ECOG 0-1)
- No comorbidities
- No hepatic insufficiency
- No renal insufficiency
- MASCC risk index score of equal to or greater than 21

➢ Indications for empirical antifungal therapy -

For patients who have persistent or recurrent fever after 4-7 days of broad spectrum antibiotics, overall duration of neutropenia for>7 days and no identified source of fever- Fluconazole 400mg IV/po once daily

If there is a high risk for mould infections (neutropenia lasting >10 days, allogenic HSCT (Haemopoeitic Stem Cell Transplant) recipients, treatment with high dose corticosteroids)- Voriconazole 6mg/kg IV12 hourly 2 doses followed by 4mg/kg IV 12 hourly or 400mg po 12 hourly followed by 200mg po 12 hourly

alternatively

Conventional amphotericin B 1mg /kg IV once daily or liposomal amphotericin B 3-5mg/kg IV once daily after initial test dose (refer product leaflet)

[2]For aminoglycosides- refer page 2

[3]For vancomycin - refer page 2

** For critically ill patients, may consider a loading dose of vancomycin. – refer page 5

➢ For paediatric doses – refer BNF for children

Genital and sexually transmitted infections

Condition	Primary Therapy	Alternative Therapy	Comments
Bacterial vaginosis	metronidazole 400mg po 12 hourly for 5-7 days or metronidazole 2g po single dose	Intravaginal metronidazole gel (0.75%) once daily for 5 days or Intravaginal [4]clindamycin cream (2%) once daily for 7 days or [4]clindamycin 300mg po 12 hourly for 7 days or tinidazole 2g po single dose	It is preferable to avoid high dose (2 g) metronidazole during pregnancy and breast feeding
Balanitis • Bacterial balanitis • Candida balanitis	co-amoxiclav 625mg po 8 hourly for 1 week clotrimazole cream 1% or miconazole cream 2% apply twice daily until symptoms resolve +/- fluconazole 150mg po stat		For refractory cases treat for anaerobic infections with metronidazole.

Chancroid	erythromycin 500mg po 6 hourly for 7days or azithromycin 1g po single dose	ceftriaxone 250mg IM single dose or ciprofloxacin 500mg po 12 hourly for 3days	
Epididymo-orchitis • If sexually acquired organisms are suspected (gonorrhoea and chlamydia infection)	ceftriaxone 250mg IM/IV single dose + doxycycline 100mg po 12 hourly for 10-14 days		Send a sample of mid-stream urine for culture. For refractory cases contact microbiologist. Advisable to screen for HIV and other STDs. Genitourinary tuberculosis may present as epididymo-orchitis.
• If urinary tract is the suspected source (enteric organisms)	ciprofloxacin 500mg po 12 hourly or cotrimoxazole 960mg po 12 hourly or co-amoxiclav 625mg po 8 hourly for 14 days	ceftriaxone 1g IV daily for 14 days	

Genital herpes • Initial episode	aciclovir 400mg po 8 hourly/aciclovir 200mg po 5 times daily for 7-10 days		
• Recurrent	aciclovir 400mg po 8 hourly/aciclovir 200mg po 5 times daily for 5 days		
• Genital herpes in HIV patients	aciclovir 400mg po 5 times daily for 7-10 days	In severe cases, initiation of therapy with aciclovir 5-10 mg/kg IV 8 hourly may be necessary. Induction therapy should be continued intravenously for 2-7 days or until clinical improvement and followed by oral antiviral therapy to complete a minimum of 10 days total treatment.	
• Suppressive treatment for genital herpes	aciclovir 400mg po 12 hourly or valaciclovir 500mg po once daily		Consider for patients with high recurrence rate (> 0.34 episodes per month)

Gonorrhoea • Uncomplicated anogenital infection in adults	cefixime 400mg po single dose / ceftriaxone 250mg IM single dose + doxycycline 100mg 12 hourly for 7 days		All patients should be treated for chlamydial co-infection. Ideally a Test-of-Cure should be done after 1 week of treatment.
• Pharyngeal infection	ceftriaxone 250mg IM single dose + doxycycline 100mg 12 hourly for 7 days		Patients with β-lactam allergy and suspected cephalosporin resistance should be referred to a venereologist. Pregnant and breast feeding women should be treated with azithromycin in place of doxycycline.
• Local complications of gonorrhoea in males	ceftriaxone 250mg IM single dose (or for 3 days)		
• Management of local complications of gonorrhoea in females (Bartholinitis)	ceftriaxone 250mg IM once daily for 3 days + doxycycline 100mg po for 7 days		

• Disseminated gonococcal infection (DGI) • Gonococcal meningitis and endocarditis	ceftriaxone 1g IM or IV every 24 hours To be continued for 24-48 hours after improvement is noted, at which time therapy may be switched to cefixime 400mg po 12 hourly to complete at least one week treatment ceftriaxone 1-2 g IV 12 hourly for 10-14 days for meningitis and at least 4 weeks for endocarditis		
Lympho granuloma venereum	doxycycline 100mg po 12hourly for 21 days or erythromycin 500mg po 6 hourly for 21days		
Non-gonococcal urethritis (NGU)/cervicitis (NGC)	doxycycline 100mg 12 hourly for 7 days	azithromycin 1g po single dose or erythromycin 500 mg twice daily for 14 days	

Ophthalmia neonatorum • Gonococcal • Chlamydial (co-infection likely)	ceftriaxone 50 mg/kg IM single dose (should not exceed 125mg) erythromycin base or ethylsuccinate 50mg/kg/day po divided into 4 doses for 14 days		Topical antimicrobials are not recommended
Phthirus pubis infestation	permethrin 1% cream Rinse and apply to damp hair. Wash off after 10 minutes or permethrin 5% cream Leave for 8-12 hours or phenothrin 0.2%. Apply to dry hair and wash off after 2 hours		

Pelvic Inflammatory Disease (PID) **Mild to moderate / outpatient regimens** • If sexually acquired organisms are suspected (multiple partners, recent change of partner or partner is found to be positive for STIs) • Non sexually acquired	ceftriaxone 250mg IM single dose + doxycycline 100mg po 12 hourly for 14 days + metronidazole 400mg po 12 hourly for 14 days co-amoxiclav 625mg 8 hourly + doxycycline 100mg po 12 hourly + metronidazole 400mg po 12 hourly for 14 days	ceftriaxone 250mg IM single dose + azithromycin 1g po single dose + metronidazole 400mg po 12 hourly for 14 days co-amoxiclav 625mg 8 hourly for 14 days + azithromycin 1g po single dose + metronidazole 400mg po 12 hourly for 14 days	Alternative therapy is recommended in pregnancy. Sexually acquired severe, pelvic inflammatory disease needs evaluation and in-patient treatment. Evaluate and treat sexual partners. Treatment differs if actinomycosis is suspected.

Severe PID	co-amoxiclav 1.2 IV 8 hourly + ciprofloxacin 400mg IV 12 hourly + metronidazole 500mg IV 12 hourly Switch to oral with clinical improvement. Total duration- at least for 14 days	ceftriaxone 1g IV daily + doxycycline 100mg po 12 hourly + metronidazole 500mg IV 12 hourly Switch to oral with clinical improvement. Total duration- at least for 14 days	
Prostatitis • Acute Prostatitis a) mild to moderate	ciprofloxacin 500mg po 12 hourly or ofloxacin 200mg po 12 hourly for 14-28 days	If there is a high risk of STD ceftriaxone 250mg IM single dose + doxycycline 100mg po 12 hourly for14 days	
b) severe	co-amoxiclav 1.2g IV 8 hourly for 14 days + [2]gentamicin 4-6mg/kg IV daily		May switch to oral therapy depending on the clinical response and ABST results. (Some patients may need longer duration of treatment).

• Chronic Prostatitis	ciprofloxacin 500mg po 12 hourly for 28 days	co-trimoxazole 960mg po 12 hourly for 28 days	
Syphilis • Early Syphilis (primary, secondary and early latent)	benzathine penicillin 2.4 MU IM single dose	[1]In immediate penicillin or cephalosporin hypersensitivity doxycycline 100mg po 12 hourly for 14 days or erythromycin 500mg po 6 hourly for 14 days	Erythromycin is used when doxycycline is contraindicated in pregnancy and lactation. If non penicillin regimen is used during pregnancy, neonate should be treated with a 10 day course of IV penicillin.
• Late syphilis (late latent syphilis, syphilis of unknown duration, gummatous syphilis and cardiovascular syphilis)	benzathine penicillin 2.4 MU IM weekly for 3 weeks	[1]In immediate penicillin or cephalosporin hypersensitivity doxycycline 100mg po 12 hourly for 28 days or erythromycin 500mg po 6 hourly for 28 days	If a patient misses a dose of penicillin in a course of weekly therapy, the missed dose can be given within 7 days of the scheduled date.

• Neurosyphilis • Congenital syphilis a) If baby presents within first seven days of delivery b) If baby presents between 8-30 days of delivery c) If baby presents more than one month after delivery	benzyl penicillin 4 MU IV every4 hourly for 14 days benzyl penicillin 50,000 units / kg IV 12 hourly for 7 days and then 50,000 units / kg IV 8 hourly for 3 days (altogether for 10 days) benzyl penicillin 50,000 units / kg IV 8 hourly for 10 days benzyl penicillin 50,000 units / kg IV 4-6 hourly for 10 days	doxycycline 200mg 12 hourly for 28 days	Asymptomatic babies born to mothers who received adequate treatment for syphilis 4 weeks prior to delivery with no serologic evidence in the baby, should be treated with a single dose of benzathine penicillin 50,000 units / kg IM single dose.
Trichomonas vaginalis infection	metronidazole 2g po single dose or metronidazole 400mg 12 hourly for 5-7 days	tinidazole 2g po single dose	
Vaginal candidiasis • Acute uncomplicated	Topical clotrimazole pessary 500mg single dose at night or clotrimazole pessary 200mg	fluconazole 150mg po single dose or itraconazole 200mg po 12 hourly 1 day	Oral therapy is indicated when intolerant to topical treatment. Avoid oral therapy in pregnancy. Treatment

	for 3 nights or clotrimazole pessary 100mg for 6 nights or clotrimazole vaginal cream (10%) 5g stat or econazole pessary 150 mg for 3 nights or miconazole ovule 1.2g stat or miconazole pessary 100mg for 14 nights or nystatin pessary (100,000 units) 1-2 for 14 nights		indicated for symptomatic partners as well. Oral therapy is indicated in recurrent infections, in severe infections and when intolerant to topical treatment. Need culture as certain candida non-albicans spp. are resistant to azoles.
• Recurrent episodes (≥4 episodes per year)	fluconazole 150mg po weekly for six months		

[1]Immediate penicillin or cephalosporin hypersensitivity - refer page 2
[2]For aminoglycosides- refer page 2
[4]For clindamycin - refer page 2
Prepared by the Sri Lanka College of Microbiologists in collaboration with Sri Lanka College of Venereologists

Intra-abdominal infections

Condition	Primary therapy	Alternative therapy	Comments
Acute appendicitis	Appendicectomy is the primary treatment		In the absence of perforation antibiotic therapy is limited to surgical prophylaxis.
Acute uncomplicated appendicitis where surgery is not feasible	co-amoxiclav 1.2g IV 8 hourly + metronidazole 500mg IV 8 hourly	cefuroxime 750mg IV 8 hourly + metronidazole 500mg IV 8 hourly [1]In immediate penicillin or cephalosporin hypersensitivity ciprofloxacin 400mg IV 12 hourly + metronidazole 500mg IV 8 hourly	Conservative approach is less effective as long term recurrence rate is high.

Appendicular abscess	cefotaxime 1g IV 8 hourly/ ceftriaxone 2g IV daily + metronidazole 500mg IV 8 hourly	co-amoxiclav 1.2g IV 8 hourly + ciprofloxacin 400mg IV 12 hourly/ [2]gentamicin 4-6mg/kg IVonce daily + metronidazole 500mg IV 8 hourly [1]In immediate penicillin or cephalosporin hypersensitivity ciprofloxacin 400mg IV 12 hourly + [4]clindamycin 600mg IV 8 hourly +/- metronidazole 500mg IV 8 hourly	Continue treatment one week with IV followed by oral to complete 28 days or till CRP becomes normal. Continue metronidazole only up to 10-14 days. Ultra sound guided percutaneous drainage is recommended.

Biliary tract infections • Mild cholecystitis and cholangitis	co-amoxiclav 1.2g IV 8 hourly/ cefotaxime 1g IV 8 hourly + [2]gentamicin 4-6mg/kg IV once daily +/- metronidazole 500g IV 8 hourly	ciprofloxacin 400mg IV 12 hourly +/- [2]gentamicin 4-6mg/kg IV once daily + metronidazole 500g IV 8 hourly	Gentamicin should not be continued for more than 72 hours. Convert to oral therapy on clinical improvement. Anti-anaerobic therapy is not indicated unless there is a biliary obstruction or biliary enteric anastomosis. Adequate biliary drainage is complementary to antibiotic therapy. Ceftriaxone is not recommended as it is associated with formation of biliary sludge.
• Severe cholecystitis/ cholangitis (haemodynamic instability, advanced age,immuno-compromised state, unresponsive to initial therapy)	piperacillin-tazobactam 4.5g IV 8 hourly/ ticarcillin-clavulanate 3.2g IV 8 hourly +/- metronidazole 500mg IV 8 hourly	cefotaxime 1g IV 8 hourly + metronidazole 500mg IV 8 hourly or meropenem 1g IV 8 hourly +/- metronidazole 500mg IV 8 hourly	

• Health care associated biliary infection of any severity	meropenem 1g IV 8 hourly +/- metronidazole 500mg IV 8 hourly +/- teicoplanin 400mg IV 12 hourly 3 doses followed by 400mg daily	piperacillin-tazobactam 4.5g IV 8 hourly + [2]amikacin 15mg/kg IV once daily +/- metronidazole 500mg IV 8 hourly +/- teicoplanin 400mg IV 12 hourly 3 doses followed by 400mg daily	

Diverticulitis • Mild	co-amoxiclav 625mg po 8 hourly	ciprofloxacin 750mg po 12 hourly + metronidazole 400mg po 8 hourly or cotrimoxazole 960mg po 12 hourly + metronidazole 500mg po 8 hourly	Almost all infections are polymicrobial. Drainage for source control has a great impact on the outcome. Assess the need for drainage in patients with poor response.
• Moderate to severe	piperacillin-tazobactam 4.5g IV 8 hourly/ ticarcillin-clavulanate 3.2g IV 8 hourly + metronidazole 500mg IV 8 hourly	meropenem 1g IV 8 hourly + metronidazole 500mg IV 8 hourly or imipenem 500mg IV 6 hourly + metronidazole 500mg IV 8 hourly	

		[1]In immediate penicillin or cephalosporin hypersensitivity ciprofloxacin 400mg IV 12 hourly + [2]amikacin 15mg/kg IV once daily + metronidazole 500mg IV 8 hourly	
Liver abscess	ceftriaxone 2g IV daily + metronidazole 500mg IV 8 hourly or ampicillin 1g IV 6 hourly + [2]gentamicin 4-6mg/kg IV once daily + metronidazole 500mg IV 8 hourly	ciprofloxacin 400mg IV 12 hourly + metronidazole 500mg IV 8 hourly	Melioidosis needs to be excluded. Liver abscesses resulting from surgical procedures may need a carbapenem. Discuss with the consultant microbiologist. Aspirate should be sent for Gram stain, aerobic/anaerobic culture, testing for fungal and mycobacterial pathogens. *Entamoeba histolytica* should be considered based on epidemiologic factors.

Pancreatitis • Mild to moderate • Severe acute pancreatitis with necrosis	Antibiotic therapy or prophylaxis is not recommended meropenem 1g IV 8 hourly or piperacillin-tazobactam 4.5g IV 8 hourly	ciprofloxacin 400mg IV 12 hourly + [2]amikacin 15mg/kg IV daily + metronidazole 500mg IV 8 hourly	CT severity index is a reliable indicator of severity. In severe pancreatitis there is more than 30% necrosis. In the absence of CT facilities CRP > 150 mg/dl can be considered as severe pancreatitis. CT guided percutaneous aspiration is recommended when infected necrosis is suspected. Treatment of choice in infected necrosis is surgical debridement. Specimens should be sent for Gram stain and culture.
Peritonitis • Spontaneous bacterial peritonitis/ Primary peritonitis • Secondary bacterial peritonitis (perforation of bowel and diverticula)	cefotaxime 1g IV 8 hourly or ceftriaxone 2g IV daily	levofloxacin 750mg IV daily	Consider repeat paracentesis 48 hours after therapy. Change antibiotics if PMN (polymorphonuclear leukocyte)has dropped by 25% or if there is no clinical response.

a) Mild to moderate (Localized)	co-amoxiclav 1.2g IV 8 hourly/ cefotaxime 1g IV 8 hourly + [2]gentamicin 4-6mg/kg IV daily + metronidazole 500mg IV 8 hourly	ticarcillin-clavulanate 3.2g IV 8 hourly + metronidazole 500mg IV 8 hourly [1]In immediate penicillin or cephalosporin hypersensitivity ciprofloxacin 400mg IV 12 hourly + [2]gentamicin 4-6mg/kg IV daily + metronidazole 500mg IV 8 hourly	If blood culture is positive treat for 2 weeks. Ceftriaxone should be avoided in liver impairment.
b) Severe (Generalized)	piperacillin-tazobactam 4.5g IV 8 hourly/ ticarcillin-clavulanate 3.2g IV 8 hourly + metronidazole 500mg IV 8 hourly	meropenem 1g IV 8 hourly/ imipenem 500mg IV 6 hourly + metronidazole 500mg IV 8 hourly	Empiric anti-fungal therapy is not generally indicated unless patient has risk factors. Contact microbiologist regarding antifungal treatment.

		[1]In immediate penicillin or cephalosporin hypersensitivity ciprofloxacin 400mg IV 12 hourly + [2]gentamicin 4-6mg/kg IV daily + metronidazole 500mg IV 8 hourly	
• **Peritonitis related to peritoneal dialysis** a) Moderate	intra peritoneal intermittent dosing* vancomycin 15-30mg/kg every 5-7days (maximum dose of 2g) + ceftazidime 1-1.5g daily or intra peritoneal continuous dosing** vancomycin loading dose of 1g/L followed by a	intra peritoneal intermittent dosing* teicoplanin 15mg/kg once daily + ceftazidime 1-1.5g daily or intra peritoneal continuous dosing** teicoplanin loading dose of 400mg/L followed by	Vancomycin and ceftazidime can be mixed in the dialysis fluid of the same dialysis bag. Do not mix vancomycin and ceftazidime in a syringe or in an empty peritoneal dialysis fluid bag. If facilities are not available for measurement of serum vancomycin levels, vancomycin treatment should be monitored with serum creatinine. Timing of intermittent dosing

b) Severe	maintenance dose of 25mg/L in all exchanges + ceftazidime loading dose of 250mg/L followed by a maintenance dose of 125mg/L [3]vancomycin 1g IV 12 hourly (infusion over 100 minutes) + ceftazidime 1g IV 8 hourly	maintenance dose of teicoplanin 200mg/L in all exchanges + gentamicin 0.6mg/kg /exchange daily	depends on trough level of vancomycin (repeat dose when trough level is 15mg/ml) Adjust doses according to renal functions. In intermittent dosing, the antibiotic-containing dialysis solution must be allowed to dwell for at least 6 hours to allow adequate absorption of the antibiotic into the systemic circulation.

[1]Immediate penicillin or cephalosporin hypersensitivity - refer page 2
[2]For aminoglycosides- refer page 2
[3]For vancomycin - refer page 2

* Antibiotic is added once daily to the dialysate.
**Antibiotic is added per liter exchange of the dialysate.

Prepared by the Sri Lanka College of Microbiologists in collaboration with the Ceylon College of Physicians, The college of Surgeons of Sri Lanka and Sri Lanka Association of Nephrology and Transplantation

Oral cavity and associated structure infections

Condition	Primary therapy	Alternative therapy	Comments
Acute suppurative sialadenitis / suppurative parotitis	cloxacillin 2g IV 4-6 hourly + metronidazole 500mg IV 8 hourly	[1]In immediate penicillin or cephalosporin hypersensitivity [4]clindamycin 450mg - 600mg IV 8 hourly	Surgical drainage, culture and antibiotic sensitivity may be necessary. Flucloxacillin can be used in place of cloxacillin.
Cervico-facial actinomycosis	penicillin 3-4 MU IV 6 hourly followed by oral penicillin 500mg -1g 6 hourly	[1]In immediate penicillin or cephalosporin hypersensitivity [4]clindamycin 600mg IV 8 hourly followed by 450mg po 6 hourly	2 - 6 weeks of parenteral therapy followed by oral therapy for a total duration of 6 - 12 months for serious infections and bulky disease, whereas a shorter duration for less extensive disease. Contact microbiologist.
<u>Dentoalveolar infections</u> Tooth abscess/ inflamed wisdom tooth area / root canal infection			Surgical drainage and removal of necrotic tissue is essential. Local treatment may be adequate in mild cases.

Indications for adjunctive antibiotics • Fever > 100° F • Malaise • Lymphadenopathy • Trismus • Increased swelling • Cellulitis • Osteomyelitis • Persistent infection	amoxicillin 500mg po 8 hourly + metronidazole 400mg po 8 hourly for 3-5 days	co-amoxiclav 625mg po 8 hourly or [1]In immediate penicillin or cephalosporin hypersensitivity [4]clindamycin450mg po 8 hourly	**Conditions not requiring adjunctive antibiotics** 1. Pain without signs and symptoms of infection **a**. Symptomatic irreversible pulpitis **b**. Acute peri-radicular periodontitis 2. Teeth with necrotic pulps and a radiolucency 3. Teeth with a sinus tract (chronic peri-radicular abscess) 4. Localized fluctuant swellings

Gangrenous stomatitis (Noma/cancrum oris)	ampicillin 2g IV 6 hourly for a minimum of 48hours followed by amoxicillin 500mg po 8 hourly	co-amoxiclav 1.2g IV 8 hourly followed by 625mg po 8 hourly or [1]In immediate penicillin or cephalosporin hypersensitivity [4]clindamycin 600mg IV followed by 450mg po 6-8 hourly	Correct underlying problems in the oral cavity, dehydration, malnutrition and debility.
Parapharyngeal space infection/ Ludwig's angina/ peritonsillar abscess	co-amoxiclav 1.2g IV 8 hourly + metronidazole 1g IV loading dose followed by metronidazole 500mg IV 6 hourly	ticarcillin-clavulanate 3.2g IV 8 hourly or [1]In immediate penicillin or cephalosporin hypersensitivity [4]clindamycin 600mg – 900mg IV 8 hourly	Potentially life threatening. Manage the airway. IV antibiotics to be given for a minimum period of 48 hours or until patient respond adequately. Then switch to oral therapy. Culture and antibiotic sensitivity is advised in parapharyngeal space infections. Contact microbiologist.
Periodontal disease • Gingivitis	0.2% chlorhexidine mouth wash 8-12 hourly		Chlorhexidine gluconate may be incompatible with some ingredients in toothpaste; leave an interval of at least 30 minutes between using mouthwash and toothpaste. Debridement is important. No indication for antibiotics. IV antibiotics may be required in severe infections.

• Necrotising periodontal disease	amoxicillin 500mg po 8 hourly + metronidazole 400mg po 8 hourly	co-amoxiclav 625mg po 8 hourly or [1]In immediate penicillin or cephalosporin hypersensitivity [4]clindamycin 300mg po 6-8 hourly	Duration of treatment is usually for 7 days. Systemic antibiotics are usually not indicated. Drainage and removal of the cause is important in all forms.
• Periodontitis/abscesses of the periodontium Chronic periodontitis/ Aggressive periodontitis	amoxicillin 500mg po 8 hourly + metronidazole 400mg po 8 hourly	doxycycline 200mg loading on day1 and then100mg daily or co-amoxiclav 625mg po 8 hourly or [1]In immediate penicillin or cephalosporin hypersensitivity [4]clindamycin450mg po 6-8 hourly	Duration- 7 days. Doxycycline is contraindicated in pregnancy and in children.

[1]Immediate penicillin or cephalosporin hypersensitivity – refer page 2

[4] Clindamycin – refer page 2

Prepared by Sri Lanka College of Microbiologists in collaboration with Sri Lanka Dental Association

Pregnancy related infections

Condition	Primary therapy	Alternative therapy	Comments
Asymptomatic bacteriuria in pregnancy			Screen in 1st trimester with urine culture. If positive treat according to antibiotic sensitivity. Screen monthly for recurrences.
Wound infections following Caesarean section • Mild -moderate • Severe	cloxacillin 500mg po 6 hourly or co-amoxiclav 625mg po 8 hourly cefuroxime 750mg IV 8 hourly +/- metronidazole 500mg IV 8 hourly or co-amoxiclav 1.2g IV 8 hourly	[1]In immediate penicillin hypersensitivity [4]clindamycin 600mg IV 8 hourly	
Chickenpox	aciclovir 800mg po 5 times per day for 7 days		For prophylaxis following exposure - contact microbiologist.

Chorioamnionitis (Intra amniotic infection syndrome - IAIS)	ampicillin 2g IV 6 hourly + [2]gentamicin 5mg/ kg IV once daily + metronidazole 500mg IV 8 hourly or ceftriaxone 2g IV daily + metronidazole 500mg IV 8 hourly	[4]clindamycin 600mg IV 8 hourly + [2]gentamicin 5mg/ kg IV once daily	Given the imprecision of the diagnosis of IAIS, antibiotic therapy should be considered in mothers with fever ($\geq 38^0$C) during labour. Add azithromycin 1 g stat po if STI are suspected. Necessary obstetric interventions to be carried out together with antibiotic therapy.

Condition	Primary therapy	Alternative therapy	Comments
Episiotomy infections • Superficial	cefuroxime 500mg po12 hourly +/- metronidazole 500mg IV 8 hourly	[4]clindamycin 300mg po 6 hourly + [2]gentamicin 5mg/ kg IV once daily	Surgical exploration may be required.
• Deep Necrotizing fasciitis / myonecrosis	piperacillin–tazobactam 4.5g IV 8 hourly or ticarcillin-clavulanate 3.2g IV 8 hourly + [4]clindamycin 600mg IV 8 hourly	ceftriaxone 2g IV daily + [4]clindamycin 600mg IV 8 hourly	Require prompt surgical debridement.
Influenza in pregnancy	oseltamivir 75-150mg po 12 hourly for 5 days		Pregnant women are at high risk of developing complications of influenza. Send specimens for viral studies before starting antivirals.

Intrapartum prophylaxis for Group B streptococcal infection	Intrapartum benzyl penicillin 3g (5 MU) IV loading dose followed by 1.2g (2 MU) IV 4 hourly until delivery	Intrapartumampicillin2g IV loading dose followed by 1g IV 4 hourly until delivery [1]In immediate penicillin hypersensitivity clindamycin 900 mg IV 8 hourly or [3]vancomycin 1g IV 12 hourly until delivery	Intrapartum antibiotics are indicated in • GBS carriage • GBS bacteriuria • previously GBS infected baby • maternal pyrexia in labour ($\geq 38^{o}C$) • rupture of membranes $\geq$ 18 hours

Condition	Primary therapy	Alternative therapy	Comments
Postpartum mastitis with/without abscess	cloxacillin 500mg po 6 hourly or in severe cellulitis: cloxacillin 1-2g IV 6 hourly	cefalexin 500mg po 6-8 hourly or [1]In immediate penicillin hypersensitivity [4]clindamycin 450mg po 8 hourly	Flucloxacillin can be used in place of cloxacillin. If MRSA is detected in aspirated pus, treat according to antibiotic sensitivities. Ciprofloxacin and fusidic acid are best avoided in breast feeding. Surgical intervention may be required.
Premature rupture of membranes at term In mothers who have proven colonisation with Group B streptococci (GBS) including bacteriuria or a past history of an infected baby	benzyl penicillin 3g (5 MU) IV loading dose followed by 1.2g (2MU) IV 4 hourly until delivery	[1]In immediate penicillin hypersensitivity clindamycin 900mg IV 8 hourly	Immediate induction of labour is recommended.
Preterm premature rupture of membranes	erythromycin 250mg po 6 hourly for 7 days	ampicillin 2g IV 6 hourly for 48 hours followed by amoxicillin 500mg po 8 hourly for next 5 days	Change antibiotics depending on the culture and sensitivity of the high vaginal swab.

Postpartum endometritis	ampicillin 2g IV 6 hourly + [2]gentamicin 5mg/ kg IV once daily + metronidazole 500mg IV 8hourly or co-amoxiclav 1.2g IV 8 hourly + [2]gentamicin 5mg /kg IV once daily	ceftriaxone 2g IV daily + metronidazole 500mg IV 8 hourly [1]In immediate penicillin hypersensitivity [4]clindamycin 600mg IV 8 hourly + [2]gentamicin 5mg / kg IV once daily	Add azithromycin 1g stat po or erythromycin 500mg po 6 hourly if STI are suspected.

Condition	Primary therapy	Alternative therapy	Comments
Pyelonephritis in pregnancy	co-amoxiclav 1.2g IV 8 hourly or cefuroxime 750mg IV 8 hourly	ceftriaxone 1g IV daily or cefotaxime 1g IV 8 hourly	Switch to oral therapy following clinical response and continue to complete 14 days. Therapy is best guided by the culture and ABST result.
Septic abortion	cefuroxime 750mg -1.5g IV 8 hourly + metronidazole 500mg IV 8 hourly +/- [2]gentamicin 5mg/kg IV once daily +/- doxycycline 100mg po 12 hourly or co-amoxiclav 1.2gIV8hourly + [2]gentamicin 5mg/kg IV once daily +/- doxycycline 100mg po 12 hourly	ceftriaxone 2g IV daily + metronidazole 500mg IV 8 hourly +/- doxycycline 100mg po 12 hourly [1]In immediate penicillin hypersensitivity clindamycin 600mg IV 8 hourly + [2]gentamicin 5mg/kg IV once daily +/- doxycycline 100mg po 12 hourly	Surgical removal of infected tissue is essential. Doxycycline is required if sexually transmitted infections (STI) are suspected.

UTI in pregnancy or breast feeding	cephalexin 500mg po 8-12 hourly or nitrofurantoin 50mg 6 hourly or 100mg po 12 hourly	co-amoxiclav 625mg po 8 hourly	Send urine for culture prior to antibiotic therapy. Duration- 7 days. Repeat urine culture 48 hours after completion of treatment to confirm clearance of infection. Avoid nitrofurantoin in 3rd trimester.

[1]Immediate penicillin or cephalosporin hypersensitivity - refer page 2
[2]For aminoglycosides- refer page 2
[3]For vancomycin - refer page 2
[4]For clindamycin- refer page 2

Prepared by Sri Lanka College of Microbiologists in collaboration with Sri Lanka College of Obstetricians & Gynaecologists

Prophylaxis: Medical

This guideline includes following conditions.

1. Post splenectomy
2. Rheumatic fever
3. Infective endocarditis
4. Bacterial meningitis
5. Cirrhotic patients with gastrointestinal bleeding
6. Spontaneous bacterial peritonitis
7. Recurrent cellulitis

Condition	Primary prophylaxis	Alternative	Comments
1A. Post splenectomy antibiotic prophylaxis	**For adults and children over 2 years:** penicillin 250mg po 12 hourly or amoxicillin 250mg po daily **For children under 2 years:** penicillin 125mg po 12 hourly or amoxicillin 20mg/kg po daily	[1]In immediate penicillin or cephalosporin hypersensitivity erythromycin 250mg po daily for all ages	Duration : at least for two years after splenectomy. Antibiotic prophylaxis need to be given irrespective of vaccinations.

1B. Post splenectomy vaccine prophylaxis

Adults

1. Pneumococcal vaccine (Polysaccharide 23 valent)**
   Revaccination - only once after 5 years
2. Meningococcal vaccine
   Revaccination needed every 5 years
3. Haemophilus influenzae type b (Hib) vaccine
   Revaccination not needed.
4. Influenza vaccine annually

**Current CDC ACIP guideline recommends 13 valent conjugate pneumococcal vaccine followed by 23 valent polysaccharide vaccine after 2 months.

Children < 2 years

1. Pneumococcal conjugate vaccine – 1-3 doses (2 months apart) depending on age / previous vaccination
   Re-vaccination with polysaccharide– only once after 5 years

2. Haemophilus influenzae type b (Hib) vaccine
   Previously immunized (had 3 doses with pentavalent vaccine)
   One booster dose at least 2 weeks prior to surgery
   No re-vaccination required

3. Meningococcal conjugate vaccine prior to surgery – not available in Sri Lanka
   Quadrivalent polysaccharide vaccine to be given at the age of 2 years
   Re- vaccination – every 5 years

   NB: Complete immunization according to national schedule

Children > 2 years

1. Pneumococcal vaccine (Polysaccharide 23 valent vaccine)
   Two doses (2 months apart)
   Re-vaccination – only one booster dose after 5 years

2. Haemophilus influenzae type b (Hib) vaccine
   previously immunized – 1 booster dose at least 2 weeks prior to surgery
   No re-vaccination required

   previously unimmunized - 2 doses (2 months apart)
   No re-vaccination required

3. Meningococcal vaccine – Quadrivalent polysaccharide vaccine
   One dose at least 2 weeks prior to surgery
   Re- vaccination – every 5 years

- For elective splenectomy vaccinate at least 2 weeks (preferably 4 -6 weeks) before surgery
- All vaccines could be given simultaneously to different sites
- For emergency splenectomy- administer vaccines at the time of discharge
- For patients commencing on **immunosuppressive treatment** vaccination should be started at least 2 weeks (preferably 4 -6 weeks) prior to commencement. If it is not possible vaccination should be delayed at least 3 months post therapy.

Condition	Primary prophylaxis	Alternative	Comments
2. Rheumatic fever	benzathine penicillin Adult and children >20 kg: 900mg (1.2 MU) IM every 3-4 weeks Children < 20kg: 450mg (600,000 units) IM every 3-4 weeks or phenoxymethyl penicillin 250mg po 12 hourly for all ages	[1]In immediate penicillin or cephalosporin hypersensitivity erythromycin 250mg po 12 hourly for all ages	Duration : Patients without clinically evident valve disease - 10 years since last episode of acute rheumatic fever or until 21 years of age whichever is longer Patients with residual valve disease and in those who have had valve surgery -at least 40 years or for life. (lifelong prophylaxis is preferable but may not be practical)

3.Prevention of Infective Endocarditis

Antibiotic prophylaxis is needed for patients with following cardiac conditions (A) undergoing procedures mentioned below (B).

A. Cardiac conditions

- Prosthetic cardiac valve or prosthetic material used for cardiac valve repair
- Previous Infective Endocarditis
- Congenital Heart Disease (CHD)***
    - Unrepaired cyanotic CHD, including palliative shunts and conduits
    - Completely repaired congenital heart defect with prosthetic material or device, during the first 6 months after the procedure
    - Repaired CHD with residual defects at the site or adjacent to the site of a prosthetic patch or prosthetic device (which inhibit endothelialisation)
- Cardiac transplantation recipients who develop cardiac valvulopathy.

***Except for the conditions listed, generally antibiotic prophylaxis is no longer recommended for any other form of CHD.

B. Procedures

- All **dental procedures** that involve manipulation of gingival tissue or the periapical region of teeth or perforation of the oral mucosa **except**
    - routine anaesthetic injections through non-infected tissue
    - taking dental radiographs
    - placement of removable prosthodontic or orthodontic appliances
    - adjustment of orthodontic appliances

- placement of orthodontic brackets
- shedding of deciduous teeth
- bleeding from trauma to the lips or oral mucosa

- **Invasive respiratory procedures**
  - An invasive procedure of the respiratory tract that involves incision or biopsy of the respiratory mucosa (eg: tonsillectomy, adenoidectomy, bronchoscopy only if the procedure involves incision of the respiratory tract mucosa).
  - For the procedures carried out to treat established infection in respiratory tract (eg: drainage of an abscess or empyema), include agents active against viridans streptococci, *S. aureus* or MRSA if infection by these organisms is known or suspected. Contact microbiologist if needed.

- **Invasive gastro intestinal (GI) or genitourinary (GU) tract procedures**
  - If the patient is having an established GI or GU tract infection or for those who receive antibiotics to prevent wound infection or sepsis associated with a GI or GU tract procedure, include an agent active against enterococci, in peri-operative regimen.
  - In elective procedures of urinary tract, if the patient is having enterococcal urinary tract infection or colonization, antibiotic therapy should be given to eradicate enterococci from the urine prior to the procedure. Contact microbiologist if needed.

- **Procedures involving infected skin and musculoskeletal tissue**
  - The therapeutic regimen should include coverage against staphylococci and beta-haemolytic streptococci.

Condition	Primary prophylaxis	Alternative	Comments
Prevention of Endocarditis	amoxicillin po Adults: 2g Children: 50 mg/kg	cefalexin po Adults: 2g Children: 50 mg/kg or clindamycin po Adults: 600mg Children: 20 mg/kg or azithromycin/ clarithromycin po Adults: 500mg Children: 15 mg/kg	Oral prophylaxis should be given as a single dose one hour before the procedure.
	ampicillin IV or IM Adults: 2g Children: 50 mg/kg	ceftriaxone IV or IM Adults: 1g Children: 50 mg/kg or clindamycin IV Adults: 600mg Children: 15 mg/kg	Single dose. IV – just before the procedure IM – 30minutes before the procedure.

4.Prophylaxis for Invasive meningococcal infections	ciprofloxacin Adults: 500mg po single dose Children: • 2-5 years: 125mg • 5-12 years: 250mg • 12-18 years: 500mg	ceftriaxone Adults: 250mg IM single dose (option during pregnancy) Children: • 1 month-12 years: 125mg IM single dose • 12-18 years: 250mg IM single dose or rifampicin Adults:600mg po12hourly for2 days Children: • neonate -1year:5mg/kg • 1-12 years: 10mg/kg (max.600mg) • 12-18 years: 600mg po 12 hourly for 2 days	Indications for prophylaxis - contact microbiologist

Invasive *Haemophilus influenzae* type b infections	rifampicin Adults:600mg po once daily for 4 days Children: • 1-3 months: 10mg/kg, • 3 months-12 years: 20mg/kg (max.600mg) • 12-18 years: 600mg po once daily for 4 days	ceftriaxone Adults:1g IM/IV once daily for2 days Children: 25mg/kg (max.1g) IM/IV once daily for 4 days	Indications for prophylaxis - contact microbiologist. If the index case is under 2 years of age, a full course of Hib vaccination should be given as soon as possible after recovery irrespective of previous vaccination. Unvaccinated contacts under 5 years should also be vaccinated.
5.Cirrhotic patients with gastro-intestinal bleeding, prior to endoscopy	norfloxacin 400mg po 1 hour before procedure and then 12 hourly for 1- 2 days	If oral therapy is not feasible, ciprofloxacin 400mg IV at induction and then 12hourly for 1- 2 days	
6.Prevention of Spontaneous bacterial peritonitis Indications: • Patients with ascites and a very low ascetic protein	norfloxacin 400mgpo daily or co-trimoxazole 960mg po daily 5 days per week	ciprofloxacin 750mg po once a week	Duration needs to be decided by the attending physician

concentration (<10 g/L) • Patients with advanced cirrhosis requiring surgical procedures • Previous history of proven spontaneous bacterial peritonitis			
7. Recurrent cellulitis associated with lymphoedema/ erysipelas	penicillin 250-1000mgpo 12 hourly or benzathine penicillin 1.2 MU IM every 2-4 weeks	erythromycin 250-500mg po 12 hourly	No clinical consensus exists regarding effectiveness and duration.

[1]Immediate penicillin or cephalosporin hypersensitivity - refer page 2

Prepared by the Sri Lanka College of Microbiologists in collaboration with Ceylon College of Physicians, The College of Surgeons of Sri Lanka and Sri Lanka Heart Association.

Prophylaxis: Surgical

- Identification of **specific surgical procedures** in which prophylactic antibiotics are beneficial**, the optimal agents, timing** and **duration** are important aspects that need consideration in administering prophylactic antibiotics in surgery.

Classification of Surgical procedures (NICE Guidelines - UK 2008)

Type of surgery	Description
Clean	An incision in which no inflammation is encountered in a surgical procedure, without a break in sterile technique, and during which the respiratory, alimentary and genitourinary tracts are not entered.
Potentially contaminated (Clean-contaminated)	An incision through which the respiratory, alimentary or genitourinary tract is entered under controlled conditions but with no contamination encountered.
Contaminated	An incision undertaken during an operation in which there is a major break in sterile technique or gross spillage from the gastrointestinal tract, or an incision in which acute, non-purulent inflammation is encountered. Open traumatic wounds that are more than 12–24 hours old also fall into this category.
Dirty (infected)	An incision undertaken during an operation in which the viscera are perforated or when acute inflammation with pus is encountered during the operation (for example, emergency surgery for faecal peritonitis), or for traumatic wounds where treatment is delayed, or there is faecal contamination or devitalized tissue present.

Patient care recommendations for reducing surgical site infections

- ❖ Advise patients to shower using a soap containing antiseptic on the day of surgery.
- ❖ It is not necessary to remove hair in order to reduce surgical site infection. If hair removal is required prior to surgery, use hair clippers on the day of surgery. Do not use razors for hair removal as they increase the risk of surgical site infections. There is a risk of skin reactions with depilatory creams.
- ❖ Treat any existing infections prior to elective surgery e.g. Dental caries, UTI.
- ❖ Nasal screening and decolonization for *Staphylococcus aureus* is recommended for selected procedures (i.e. cardiac, orthopaedic, neurosurgical procedures with implants).
- ❖ Screen preoperative blood glucose levels and maintain glycaemic control.
- ❖ Intraoperative oxygenation and body temperature should be maintained.
- ❖ Maintain perioperative normothermia.

  It is important to understand that infections due to lapses in surgical technique, operating theatre procedures, aseptic technique during and after operation cannot be prevented by use of prophylactic antibiotics.

General recommendations:

Antibiotic prophylaxis is indicated in some clean and all clean-contaminated surgeries.

In contaminated surgeries either antibiotic prophylaxis or therapy is recommended depending on patient's clinical condition.
In dirty surgeries antibiotic therapy (not prophylaxis) is indicated.
Antibiotic prophylaxis is indicated in the following clean surgical procedures

- Surgery involving introduction of prosthetic material
- Surgery where consequences of infection would be catastrophic
  E.g. neurosurgery, open heart surgery, orthopedic surgery or ophthalmic surgery
- Surgery with impaired host defences

a) Duration and dose:

- Prophylactic antibiotic therapy should generally be limited to a single dose. However if further doses are considered it should not be continued for more than 24 hours of the end of surgery or confined to a maximum of three doses.
- When the operation is longer than the half-life of the antibiotic given, a repeat dose is indicated as follows:
  - β- lactams (eg. cefuroxime) : repeat after 3-4 hours.
  - Clindamycin: repeat every 3-6 hours.
  - Vancomycin: repeat every 6-12 hours.
- When there is significant blood loss during surgery (>1.5 L or 25% of total blood volume), a repeat dose is recommended.
- The practice of continuing prophylactic antibiotics until surgical drains have been removed is not proven to be beneficial.
- Gentamicin dose should be calculated according to ideal body weight of patient, especially in the case of obese patients.

  Ideal body weight:
  - For males = 50kg+0.9kg per each cm over 152cm (2.3kg per each inch over 5 feet)
  - For females = 45.5kg+0.9kg per each cm over 152cm (2.3kg per each inch over 5 feet)
  - Pediatric patients weighing more than 40kg should receive weight-based doses unless the dose or daily dose exceeds the recommended adult dose.

b) Timing:

- IV antibiotics should ideally be given 30 minutes prior to incision **except:**
  - Vancomycin infusion (1g over 100 minutes) should be started 2 hours prior to surgical incision. The infusion should finish 15 – 30 minutes prior to incision.

- Ciprofloxacin infusion (400mg over 60 minutes, 200mg over 30 minutes) should be started 60 minutes prior to surgical incision. Oral ciprofloxacin should be given 2 hours prior to surgery.
- Gentamicin infusion should be started 1 hour prior to surgical incision.

- In orthopaedic surgery where application of a tourniquet is required prophylaxis needs to be given at least 10 minutes prior to application of tourniquet.

Type of surgery	Primary prophylaxis	Alternative prophylaxis	Comments
Cardiothoracic e.g. coronary artery bypass graft (CABG), valve repairs and placement of temporary or permanent implantable cardiac devices including ventricular assist devices (VADs) and pacemakers, non cardiac thoracic procedures include lobectomy, pneumonectomy, thoracoscopy, lung resection and thoracotomy	Adults: cefuroxime 1.5g IV/ co-amoxiclav 1.2g IV +/- [2]gentamicin 5mg/kg IV single dose	[1]In immediate penicillin or cephalosporin hypersensitivity or in units with high prevalence of MRSA and for patients colonized with MRSA: Adult: [3]vancomycin 15mg/kg IV/ teicoplanin 6mg/kg IV + [2]gentamicin 5mg/kg IV single dose Children <12 yrs : [3]vancomycin 15mg/kg IV/ teicoplanin 10mg/kg IV + [2]gentamicin 7mg/kg IV single dose	Vancomycin dose should not exceed more than 1.5g **per dose** in adults and 2g **per day** for children. Gentamicin should be limited to a single dose given as slow IV infusion over 30 minutes. Flucloxacillin can be used in place of cloxacillin. Duration of prophylaxis ranging from a single dose up to 24 – 48 hours postoperatively is appropriate.

	Children <12 yrs : cefuroxime 50mg/kg IV/ co-amoxiclav 30mg/kg IV +/- [2]gentamicin 7mg/kg IV single dose or cloxacillin 50mg/kg IV + [2]gentamicin 7mg/kg IV single dose		
Vascular surgery E.g. reconstruction of abdominal aorta, procedures on the leg that involve a groin incision (except surgeries for varicose veins) or implantation of foreign material, lower extremity amputation for ischemia	Adults: cefuroxime 1.5g IV +/- [2]gentamicin 5mg/kg IV single dose	Adults: co-amoxiclav 1.2g IV +/- [2]gentamicin 5mg/kg IV single dose	In institutions where MRSA rate is high or patient is colonized with MRSA or patient is having immediate penicillin or cephalosporin hypersensitivity*, vancomycin or teicoplanin is recommended. Vancomycin dose should not exceed more

	Children <12 yrs : cefuroxime 50mg/kg IV/ co-amoxiclav 30mg/kg IV +/- [2]gentamicin 7mg/kg IV single dose In units with high prevalence of MRSA and for MRSA carriers: Adults: [3]vancomycin 15mg/kg IV + [2]gentamicin 5mg/kg IV single dose	Children <12 yrs : cloxacillin 50mg/kg IV + [2]gentamicin 7mg/kg IV single dose Adults: teicoplanin 6mg/kg IV + [2]gentamicin 5mg/kg IV single dose Children: teicoplanin 10mg/kg IV + [2]gentamicin 7mg/kg IV single dose	than 1.5g per dose. Adjust gentamicin dose according to renal functions. Flucloxacillin can be used in place of cloxacillin.

	Children: [3]vancomycin 15mg/kg IV + [2]gentamicin 7mg/kg IV single dose		
ENT surgery Prophylaxis is recommended for procedures that involve an invasion through oral, nasal, pharyngeal or oesophageal mucosa, stapidectomy or similar operation.	cefuroxime 1.5g IV +/- metronidazole 500mg IV	co-amoxiclav 1.2g IV or [4]clindamycin 600mg IV	Prophylaxis is not recommended for clean ear surgery and tonsillectomy.
Oro-maxillo-facial surgery	cefuroxime 1.5g IV + metronidazole 500mg IV	co-amoxiclav 1.2g IV or [4]clindamycin 600mg IV	
Gastrointestinal tract surgery • Colorectal surgery, appendicectomy	cefuroxime 1.5g IV + metronidazole 500mg IV	[2]gentamicin 2mg/kg IV/ co-amoxiclav 1.2 g IV + metronidazole 500mg IV	

• Upper gastrointestinal tract E.g. endoscopic gastrostomy, gastroduodenal and oesophageal surgery	cefuroxime 1.5g IV	co-amoxiclav 1.2g IV	
• Biliary surgery including laparoscopic surgery and ERCP	cefuroxime 1.5g IV or co-amoxiclav 1.2g IV	ciprofloxacin 200-400mg IV infusion over 30-60 minutes or ciprofloxacin 500-750mg orally 2 hours before the procedure	Contact microbiologist for complicated patients.
Neurosurgery • Clean surgery • Clean contaminated Eg. cross sinuses or naso/oropharynx	cefuroxime 1.5g IV cefuroxime 1.5g IV + metronidazole 500mg IVor co-amoxiclav 1.2g IV	[4]clindamycin 900mg IV [4]clindamycin 900mg IV	In institutions where MRSA rate is high or patient is colonized with MRSA or patient is having immediate penicillin or cephalosporin hypersensitivity[1], use vancomycin 1.5g IV infusion over 100 minutes.

• CSF shunt surgery	cefuroxime 1.5g IV + metronidazole 500mg IV or co-amoxiclav 1.2g IV	[4]clindamycin 900mg IV	
Obstetric and Gynaecological surgery • Caesarean section (after the cord is clamped)	cefuroxime 1.5g IV or co-amoxiclav 1.2g IV	co-amoxiclav 1.2g IV [1]In immediate penicillin/ cephalosporin hypersensitivity [4]clindamycin 600mg IV	If there is a history of pelvic inflammatory disease, gonorrhoea or multiple sexual partners add doxycycline 100mg orally at least one hour prior to surgery followed by 200mg 6 hours after the procedure. Antibiotic prophylaxis is not recommended for insertion of IUCD, hysteroscopy, diagnostic laparoscopy and laparoscopic sterilization
• Hysterectomy (abdominal or vaginal)	cefuroxime 1.5g IV or [2]gentamicin 4-6mg/kg IV infusion (over 30 minutes) single dose + metronidazole 500mg IV	co-amoxiclav 1.2g IV	

• Surgical evacuation of retained products / surgical management of miscarriage	cefuroxime 1.5g IV + metronidazole 500mg IV or co-amoxiclav 1.2g IV	[1]In immediate penicillin/ cephalosporin hypersensitivity [4]clindamycin 600mg IV	
• Vaginal mesh procedure	cefuroxime 1.5g IV + metronidazole 500mg IV or co-amoxiclav 1.2g IV +/- metronidazole 500mg IV		

General surgery • Hernia repair with mesh	cefuroxime 1.5g IV + metronidazole 500mg IV	co-amoxiclav 1.2g IV +/- metronidazole 500mg IV In immediate penicillin or cephalosporin hypersensitivity [4]clindamycin 600mg IV	For herniorrhaphy antibiotics are not recommended.
Orthopaedic surgery • Joint replacement/ internal fixation of closed fractures/hip fracture repair/spinal surgery/implantation of internal fixation devices (nails, screws, plates, wires)	cefuroxime 1.5g IV +/- [2]gentamicin 2mg/kg IV	Adults : cloxacillin 2g IV + [2]gentamicin 2mg/kg IV [1]In immediate penicillin or cephalosporin hypersensitivity [3]vancomycin 1.5g IV/ teicoplanin 400mg IV + [2]gentamicin 2mg/kg IV Children : cloxacillin 50mg/kg up to 2g IV + [2]gentamicin 2.5mg/kg IV	The prophylactic antimicrobials infusion should be completed 10 minutes prior to inflation of the proximal tourniquet. In institutions where MRSA rate is high or patient is colonized with MRSA , use vancomycin or teicoplanin . Gentamicin should be limited to a single dose. Flucloxacillin can be used in place of cloxacillin.

• Clean operations involving hand, knee or foot and not involving implantation of foreign materials (eg: arthroscopy)			Prophylaxis is not indicated
Urological surgery • Transrectal prostatic biopsy	ciprofloxacin 500mg po 2 hours before surgery or ciprofloxacin 200-400mg IV infusion over 30-60 minutes or cefuroxime 1.5g IV		
• TURP • Ureterorenoscopy + lithotripsy / lithotrity • Open urological surgery	[2]gentamicin 5mg/kg IV single dose or ciprofloxacin 500mg po		Need to have sterile urine pre-operatively. Treat bacteriuria according to culture sensitivity. Co-trimoxazole is not recommended as prophylaxis due to high prevalence of resistance in Sri Lanka.

• Flexible cystoscopy	2 hours before surgery or ciprofloxacin 200-400mg IV infusion over 30-60 minutes		Prophylaxis is not indicated
Peritoneal dialysis catheter placement	vancomycin 1g IV 12 hours prior to the procedure		
Ophthalmic surgery Cataract surgery, vitrectomy, keratoplasty, intraocular lens implantation, glaucoma procedures, strabotomy, retinal detachment repair, laser in situ keratomileusis and laser-assisted subepithelial keratectomy	gentamicin or chloramphenicol eye drops: one drop every 5–15 minutes for five doses within the hour before the start of the procedure or 8 hourly for 3 days pre-operatively	moxifloxacin or gatifloxacin eye drops	The addition of subconjunctival, intracameral or intravitreal cefuroxime or fourth generation fluoroquinolones at the end of the procedure is optional.

Solid organ transplant surgery	Adults: cefuroxime 1.5g IV +/- [2]gentamicin 5mg/kg IV single dose Children <12 yrs : cefuroxime 50mg/kg IV + [2]gentamicin 7mg/kg IV single dose In units with high prevalence of MRSA and for patients colonized with MRSA, Adults: [3]vancomycin 15mg/kg IV + [2]gentamicin 5mg/kg IV single dose	Adults: co-amoxiclav 1.2g IV +/- [2]gentamicin 5mg/kg IV single dose Children <12 yrs : cloxacillin 50mg/kg IV + [2]gentamicin 7mg/kg IV single dose Adults: teicoplanin 6mg/kg IV + [2]gentamicin 5mg/kg IV single dose	Gentamicin should be limited to a single dose. For patients with immediate penicillin or cephalosporin hypersensitivity[1], clindamycin or vancomycin given in combination with gentamicin, aztreonam, or a fluoroquinolone is a reasonable alternative. Flucloxacillin can be used in place of cloxacillin.

	Children: vancomycin 15mg/kg IV + [2]gentamicin 7mg/kg IV single dose or piperacillin– tazobactam 4.5g IV	Children: teicoplanin 10mg/kg IV + [2]gentamicin 7mg/kg IV single dose or cefotaxime 1g IV + ampicillin 2g IV	
Plastic surgery Clean with risk factors or clean contaminated	cefuroxime 1.5g IV	co-amoxiclav 1.2g IV	

[1]Immediate penicillin or cephalosporin hypersensitivity - refer page 2.

[2] For aminoglycosides- refer page 2

[3] For vancomycin - refer page2

[4] For clindamycin - refer page 2

Prepared by the Sri Lanka College of Microbiologists in collaboration with The College of Surgeons of Sri Lanka, College of Anaesthesiologists, College of Ophthalmologists, Sri Lanka Association of Urological Surgeons, Association of Orthopaedic Surgeons, Sri Lanka College of Obstetricians & Gynaecologists, College of Otorhinolaryngologists of Sri Lanka and Sri Lanka Dental Association

Prophylaxis: Trauma

- Antibiotic prophylaxis is required only for certain categories of trauma. Conditions requiring prophylaxis are listed below.
- Assess the need for tetanus vaccination.

Type of trauma	Primary prophylaxis	Alternative prophylaxis	Comments
Head and neck trauma • Penetrating cranio-cerebral injury • Depressed skull fractures • Basal skull fracture	cefuroxime 1.5g IV stat and thereafter 750mg IV 8 hourly + metronidazole 500mg IV 8 hourly Duration: 5 days	co-amoxiclav 1.2g IV 8 hourly [1]In immediate penicillin or cephalosporin hypersensitivity [3]vancomycin 1g IV infusion (over 100 minutes) 12 hourly + metronidazole 500mg IV 8 hourly	Antibiotics may need to be reviewed according to culture reports, evidence of meningitis or scalp infection. Antimicrobial prophylaxis is not required.
Open limb fractures* • Type 1 and 11	cloxacillin 2g IV 6 hourly	[4]clindamycin 600mg IV 6 hourly	Metronidazole IV should be added in the presence of faecal or potential clostridial contamination (e.g. farm related injuries). Flucloxacillin can be used in place of cloxacillin.

• Type 111	cefuroxime 750mg IV 8 hourly + metronidazole 500mg IV 8 hourly + [2]gentamicin 5mg/kg IV once daily	[4]clindamycin 600mg IV 6 hourly + [2]gentamicin 5mg/kg IV once daily	In type III fractures, antibiotics should be continued for 72 hours after injury or not more than 24 hours after soft tissue coverage has been achieved.
Penetrating abdominal trauma	co-amoxiclav 1.2g IV 8 hourly + metronidazole 500mg IV 8 hourly	cefuroxime 750mg IV 8 hourly + metronidazole 500mg IV 8 hourly	Discontinue prophylactic antibiotics after 24 hours if there is no acute hollow viscous injury. Reassess after 24 hours regarding continuation of antibiotics.
Thoracic trauma penetrating chest injury requiring chest drain placement	cefuroxime 750mg IV 8 hourly for 24 hours	co-amoxiclav 1.2g IV 8 hourly for 24 hours	Reassess after 24 hours to decide on continuation.

[1]Immediate penicillin or cephalosporin hypersensitivity - refer page 2

[2]For aminoglycosides- refer page 2

[3]For vancomycin - refer page 2

[4]For clindamycin - refer page 2

* **Open Fractures – Gustilo Classification**

Type I	Open fracture with a skin wound < 1 cm in length and clean
Type II	Open fracture with a laceration > 1 cm in length without extensive soft tissue damage, flaps, or avulsions
Type III	Open segmental fracture with > 10 cm wound with extensive soft tissue injury or a traumatic amputation (special categories in Type III include gunshot fractures and open fractures caused by farm injuries)
Type III_A	Adequate soft tissue coverage
Type III_B	Significant soft tissue loss with exposed bone that requires soft tissue transfer to achieve coverage
Type III_C	Associated vascular injury that require repair for limb preservation.

Prepared by the Sri Lanka College of Microbiologists in collaboration with The College of Surgeons of Sri Lanka and the Association of Orthopaedic Surgeons

Respiratory tract infections

- ❖ Blood cultures should be collected in moderate to severe pneumonia and other respiratory infections with evidence of sepsis.

Condition	Primary therapy	Alternative therapy	Comments
Acute Bronchitis **Antibiotics might be considered in** • a severe attack on initial presentation • persistent symptoms for 5-7 days with no evidence of resolving • patients with known cardiopulmonary disease • presence of abnormal lung signs Persistent paroxysmal cough>14 days - consider pertussis	amoxicillin 500mg po 8hourly or erythromycin 250-500mg po 6 hourly or clarithromycin 250-500mg po 12hourly Duration: 5 days erythromycin 500mg po 6 hourly 14 days or clarithromycin 500mg po12 hourly 7-10 days	doxycycline 100mg po 12hourly for 5-7 days or co-amoxiclav 625mg po 8hourly or cefuroxime 500mg po 12hourly Duration:5 days azithromycin 500mg po on day one followed by 250mg po daily for 5 days or co-trimoxazole 960mg po12 hourly for 7 days	Antibiotics are usually not recommended. CRP may be used to guide the antibiotic therapy. If >100mg/L- prescribe antibiotics. If 20-100mg/ L – review the need. Avoid doxycycline in pregnancy and children. Quinolones should be avoided. Exclude pulmonary TB if cough persists> 2 weeks.

Acute bacterial exacerbation of chronic obstructive pulmonary disease (COPD) • Patients without risk factors for pseudomonas infection (refer comments) a) Out-patient Mild exacerbations	co-amoxiclav 625mg po 8 hourly or clarithromycin 500mg po12 hourly or cefuroxime 500mg po12 hourly Duration: 7-10 days	doxycycline 200mg loading dose and 100mg daily or co-trimoxazole 960mg po12 hourly	Antibiotics are indicated if at least 2 out of following 3 symptoms are present - Change in character and severity of cough - Change in volume purulence and increased viscosity of sputum - Increasing breathlessness from baseline **Risk factors for pseudomonas infection** 1.Microbiologically confirmed previous pseudomonas infection 2. Patients with severe COPD (GOLD stages III & IV) • 2 infective exacerbations per year • recent hospitalization (> 2 days during past 90 days) • frequent antibiotics during last year (more than 4 courses of antibiotics)
b) In-patient Moderate to severe exacerbations	co-amoxiclav 1.2g IV 8 hourly or cefuroxime 750mg-1.5g IV 8 hourly Duration:7-10days	cefotaxime 1-2g IV 8 hourly or ceftriaxone 1-2g IV 12 hourly	

• Patients with risk factors for Pseudomonas infection (refer comments) a) Out-patient b) In-patient	ciprofloxacin 500-750mg po 12hourly for 10 days ceftazidime 1-2g IV 8 hourly for 10 days	piperacillin-tazobactam 2. 5g IV 6 hourly or ticarcillin –clavulanic acid 3.2g IV 8 hourly Duration: 10 days	**GOLD: Global initiative of Obstructive Lung Diseases** Above patients should ideally be managed in a specialized unit under a respiratory physician's supervision.
Acute infective exacerbation of bronchiectasis Clinical symptoms change in character and severity of cough, change in volume, purulence and increased viscosity of sputum, increasing breathlessness from baseline	**Out-patient** co-amoxiclav 625mg po 8 hourly or cefuroxime 500mg po 12 hourly **In-patient** co-amoxiclav 1.2g IV 8 hourly	[1]In immediate penicillin or cephalosporin hypersensitivity clarithromycin 500mg po 12 hourly for 7-10 days or doxycycline 200mg po loading dose and 100mg daily Duration: 7-10 days	**Caution**: ciprofloxacin, levofloxacin and moxifloxacin (quinolones) can mask / promote resistance of *Mycobacterium tuberculosis* and atypical mycobacterial infections

Previous microbiologically confirmed or suspected Pseudomonas infection	or cefotaxime 1-2g IV 8 hourly or ceftriaxone 1-2g IV daily Duration : 7-10 days **Out-patients** ciprofloxacin 500-750mgpo12 hourly **In-patients** ceftazidime 1-2g IV 8hourly Duration: 14 days	piperacillin–tazobactam 4.5g IV 6-8 hourly or meropenem 1g IV 8 hourly or imipenem 500mg IV 6 hourly	
Empyema If fever persist after drainage	co-amoxiclav 1.2g IV 8 hourly or ceftriaxone 1g IV once daily + metronidazole 500mg IV 8 hourly piperacillin-tazobactam 4.5g IV 8 hourly	[4]clindamycin 600mg IV 8 hourly/ 300-450mg po 6-8 hourly	Duration: 2-6 weeks. Exclude *Mycobacterium tuberculosis* in sub-acute/chronic infections.

If MRSA suspected	Add[3]vancomycin 1g IV infusion (over 100 minutes) 12 hourly	teicoplanin 400mg IV 12 hourly for 3 doses followed by 400mg IV daily	Duration 4-6 weeks.
Lung abscess			
a) systemically well	amoxicillin 1g po 8 hourly + metronidazole 400mg po 8 hourly	[4]clindamycin 300-450mg po 6-8 hourly	
b) systemically unwell	ceftriaxone 1g IV once daily + metronidazole 500mg IV 8 hourly/ [4]clindamycin 600mg IV 8 hourly	co-amoxiclav 1.2g IV 8 hourly	
c) If MRSA Suspected	Add[3]vancomycin 1g IV infusion (over 100 minutes) 12 hourly	Add teicoplanin 400mg IV 12 hourly for 3 doses followed by 400mg IV daily	
d) If multi-resistant pathogens are suspected	piperacillin-tazobactam 4.5g IV 8 hourly		

Pneumonia **Community acquired** • **Mild (CURB 65 = 0-1)** Out-patient a) No comorbidities	amoxicillin 500mg-1gpo 8 hourly or cefuroxime 500mg po 12 hourly Duration: 5-7 days	erythromycin 500mg po 6 hourly or clarithromycin 500mg po12 hourly or doxycycline 200mg loading dose followed by 100mg once daily Duration: 5-7 days or azithromycin 500mg on day 1 followed by 250mg once daily for4 days	**CURB 65 score** can be used as a severity indicator. - **C**onfusion (new onset) - **U**rea > 7mmol/l (20mg/dl) - **R**espiratory Rate > 30/min - **B**P (systolic< 90 or diastolic < 60mmHg) - **Age ≥ 65**years **CURB ≥ 1** needs hospital admission **CURB 4-5** may need ICU care (Outpatient settings- where urea is not available **CRB 65** may be used.**)** **Other factors to consider in hospitalization** – co-morbidities- poorly controlled DM,COPD, CRF, underlying malignancies etc. The decision to hospitalise a patient will ultimately depends on the judgment of the clinician.
b) With comorbidities (alcoholism, COPD, bronchiectasis, IV drug users etc.) or Use of antimicrobials within previous 3 months	amoxicillin 1g po 8 hourly + clarithromycin500mg po12 hourly Minimum duration of 5 days	cefuroxime 500mg po 12 hourly + doxycycline 200mg po loading dose followed by 100mg daily Minimum duration of 5 days	

• **Moderate** **(CURB 65 = 2)** Patient requires hospitalization.	co-amoxiclav 1.2g IV 8 hourly/ cefuroxime 1.5g IV 8 hourly + clarithromycin 500mg po12 hourly	[1]In immediate penicillin or cephalosporin hypersensitivity levofloxacin 750mg po IV daily	**Restrict levofloxacin/ moxifloxacin usage as they are reserved as second line anti TB drugs.**
• **Severe** **(CURB 65 = 3-5)** May need ICU admission	cefotaxime 1g IV 8 hourly/ ceftriaxone 1-2g IV daily + clarithromycin 500mg IV or po12 hourly	levofloxacin 500mg IV 12 hourly or moxifloxacin 400mg IV daily	
For suspected community acquired MRSA (CA-MRSA) pneumonia	Add[3]vancomycin 1g IV infusion (over 100 minutes) 12 hourly	Add teicoplanin 400mgIV 12 hourly for 3 doses then 400mg IV daily or linezolid 600mg IV 12 hourly	Contact microbiologist if patient presents with sepsis, haemoptysis, multilobar infiltrates, and leucopenia. Specific combination therapy is recommended for PVL (Panton-Valentine Leukocidin) producing CA- MRSA pneumonia.
With risk factors for Pseudomonas • Cystic fibrosis • COPD • Bronchiectasis	piperacillin-tazobactam 4.5g IV 8 hourly + ciprofloxacin 400mg IV 12 hourly/	meropenem 1g IV 8 hourly/ imipenem 500mg IV 6 hourly +	

	levofloxacin 500mg IV 12 hourly	[2]gentamicin 5-7mg/kg IV daily [1]In immediate penicillin or cephalosporin hypersensitivity ciprofloxacin 400mg IV 12 hourly + [2]gentamicin 5-7mg/kg IV daily	
Suspected viral pneumonia	oseltamivir 75mg po 12 hourly for 5 days In severe pneumonia 150mg po 12 hourly for 5-10 days		Effective in influenza pneumonia only. Send specimens for viral studies before starting antivirals.
Pneumonia **Health care associated (HCAP) or Ventilator-associated (VAP)** • **Early onset** 2- 5 days after intubation / admission **and** **No risk factors** for multi-drug resistant organisms (refer comments)	ceftriaxone 2g IV daily / cefotaxime 1g IV 8 hourly + levofloxacin 750mg IV daily or 500mg IV 12 hourly/	cefepime 1-2g IV 8–12 hourly	Risk factors for multi-drug resistant organisms - Recent hospitalisation for at least 48 hours during preceding 90 days - Resident in nursing home - Chronic haemodialysis - Critically ill

	clarithromycin 500mg po /IV 12hourly		Therapy should be guided by local antibiotic sensitivity data. Contact microbiologist.
• **Early onset with risk factors** (refer comments) **or** **Late onset** (>5 daysafter intubation/admission)	piperacillin-tazobactam 4.5g IV 6-8 hourly/ cefepime1-2g IV 8-12 hourly/ ceftazidime 2g IV 8 hourly + ciprofloxacin 400mg IV 8 hourly/ [2]amikacin15mg/kg IV once daily/ [2]gentamicin 5-7mg/kg IV once daily	imipenem 500mg every 6 hourly/ meropenem1g every 8 hourly + ciprofloxacin 400mg IV 8 hourly/ [2]amikacin15mg/kg IV once daily/ [2]gentamicin 5-7mg/kg IV once daily	.
• **If MRSA suspected**	Add[3]vancomycin 1g IV infusion (over 100 minutes) 12 hourly	Add teicoplanin 400mg IV 12 hourly for 3 doses then 400mg IV daily	

Pneumonia in neutropenic patients (Absolute neutrophil count< 500/mm^3)	piperacillin–tazobactam 4.5g IV 6-8 hourly/ meropenem 1g IV 8 hourly/imipenem 500mg IV6 hourly + levofloxacin 750mg IV daily or 500mg IV 12 hourly + amphotericin B 1mg/kg IV per day + co-trimoxazole 4 tablets (480mg per tablet) po 8 hourly	piperacillin–tazobactam 4.5g IV 6-8 hourly/ meropenem 1g IV 8 hourly/imipenem 500mg IV6 hourly + levofloxacin 750mg IV daily or 500mg IV 12 hourly + *****voriconazole + co-trimoxazole 4 tablets (480mg per tablet) po 8 hourly	Liposomal amphotericin B or amphotericin B lipid complex preferred over conventional amphotericin B (refer product leaflet for dosage).

[1]Immediate penicillin or cephalosporin hypersensitivity - refer page 2

[2] For aminoglycosides- refer page 2

[3]For vancomycin - refer page 2

[4]For clindamycin - refer page 2

***** voriconazole dose – 6mg/kg IV 12 hourly on day 1, followed by either 4mg/kg IV 12 hourly or 200mg po 12 hourly if actual body weight ≥ 40kg ;if actual body weight < 40kg use100mg po 12 hourly.

Prepared by the Sri Lanka College of Microbiologists in collaboration with Ceylon College of Physicians and Sri Lanka College of Pulmonologists

Severe sepsis / Septic shock

Important points to note:

- Intravenous broad spectrum antibiotic therapy should be started as early as possible within the first hour of recognition of severe sepsis and in septic shock. Treat sepsis according to suspected source of infection. If a source of infection is identified rapid specific treatment is essential. Refer to the relevant guideline for appropriate choice of antibiotics.
- Empirical anti-fungal drugs should be considered in patients on total parenteral nutrition, prolonged use of broad spectrum antimicrobials, neutropenia, immunosuppression, haematological malignancies or transplant recipients.
- All patients presenting with sepsis should be evaluated for the presence of a focus of infection to control the source of sepsis.
- Septic screen (blood cultures- preferably two and also through central lines if present, urine culture, respiratory secretions and pus) should be done prior to starting antibiotics. In addition, full blood count, CRP and serum procalcitonin (where available) need to be done.
- The antimicrobial regimen should be reassessed daily. Clinical response to antibiotics may take 48 hours or more. Therefore frequent change of antibiotics should be avoided unless a new focus of infection is suspected.
- Empirical therapy should be changed to susceptibility profile guided therapy when cultures are positive.
- Therapy is generally indicated for 7-10 days. Longer courses may be considered in patients who have a slow clinical response, undrainable foci of infection or who have immune deficiencies including neutropenia.
- If the presenting clinical syndrome is determined to be due to a non-infectious cause, the antimicrobial therapy should be stopped promptly.

Condition	Primary therapy	Alternative therapy	Comments
Community acquired severe sepsis	ceftriaxone 2g IV daily or 1g IV 12hourly / cefotaxime 1g IV 8 hourly + [2]gentamicin 5mg/kg IV once daily +/- metronidazole 500mg IV 8 hourly	levofloxacin 500mg IV 12 hourly + [2]gentamicin 5mg/kg IV once daily +/- metronidazole 500mg IV 8 hourly	Need for gentamicin / amikacin should be reviewed on day 2. As vancomycin, gentamicin and amikacin are nephrotoxic, combinations of these need to be given with caution. Close monitoring of renal functions and adequate hydration is essential. Ideally assess serum gentamicin/amikacin level when given for more than 48 hours and vestibular functions when given for more than 5 days. For elderly over 65 years, vancomycin dose should be 500mg every 12 hours or 1g once daily.
Hospital acquired severe sepsis	meropenem 1g IV 8 hourly + [2]gentamicin 5mg/kg IV once daily/ [2]amikacin 15mg/kg IV once daily If MRSA is suspected add teicoplanin 400mg IV 12 hourly for 3 doses followed by 400mg IV once daily or [3]vancomycin 1g IV infusion (over 100 minutes) 12 hourly	piperacillin-tazobactam 4.5g IV 8 hourly + [2]gentamicin 5mg/kg IVonce daily If MRSA is suspected add teicoplanin 400mg IV 12 hourly for 3 doses followed by 400mg IV once daily or [3]vancomycin 1g IV infusion (over 100 minutes) 12 hourly	

		[1]In immediate penicillin or cephalosporin hypersensitivity ciprofloxacin 400mg IV 12 hourly + [2]amikacin 15mg/kg IV once daily +/- teicoplanin 400mg IV 12 hourly for 3 doses followed by 400mg IV once daily or [3]vancomycin 1g IV infusion (over 100 minutes) 12 hourly	
Post-splenectomy sepsis	ceftriaxone 2g IV daily/ cefotaxime 1g IV 8 hourly +/- [3]vancomycin 1g IV infusion (over 100 minutes) 12 hourly		Patients should be investigated for malaria and treated accordingly if there is a history of recent visit to an endemic country.

	For children: ceftriaxone 80mg/kg IV once daily as an infusion or cefotaxime 50mg /kg IV 8 hourly(6 hourly in severe infections) +/- [3]vancomycin IV 15mg/kg 6 hourly		

[1]Immediate penicillin or cephalosporin hypersensitivity - refer page 2

[2] For aminoglycosides- refer page 2

[3] For critically ill patients, may consider a loading dose of vancomycin – refer page 5

Prepared by the Sri Lanka College of Microbiologists in collaboration with College of Anaesthesiologists Sri Lanka and Ceylon College of Physicians

Skin and soft tissue infections

Condition	Primary therapy	Alternative therapy	Comments
Animal bites Infected or at high risk of infection	co-amoxiclav 625mg po 8 hourly	doxycycline 100mg po 12 hourly + metronidazole 400mg po 8 hourly	Duration: 5-7 days. Assess for risk of rabies. Primary wound closure is not recommended except for face. Check tetanus immunization status.
Burns • Not infected	1% silver sulfadiazine cream 1-2 times per day or 0.5% silver nitrate solution 1-2 times per day		
• Infected burn wound (early stage)	cloxacillin 1g IV / flucloxacillin 500mg po 6 hourly / co-amoxiclav 1.2g IV 8 hourly	ciprofloxacin 400mg IV 12 hourly + clindamycin 600mg IV 8 hourly	The antibiotic treatment should be in addition to local antiseptics.
• Infected burn wound (late stage)	ceftazidime 1g IV 8 hourly + cloxacillin 1g IV/ flucloxacillin 500mg po 6 hourly	[3]vancomycin 1g IV infusion (over 100 minutes) 12 hourly+ piperacillin-tazobactam 4.5 g IV 8 hourly / [1]In immediate penicillin or	Teicoplanin 400mg IV 12 hourly for three doses followed by 400mg daily can be used in place of vancomycin.

	or ticarcillin-clavulanic acid 3.2g IV 8 hourly	cephalosporin hypersensitivity ciprofloxacin 400mg IV 12 hourly	
• Burn wound with sepsis	[3]vancomycin 1g IV infusion (over 100 minutes) 12 hourly + piperacillin-tazobactam 4.5 g IV 8 hourly	meropenem 1g IV 8 hourly / imipenem 500mg IV 6 hourly + [3]vancomycin 1g IV infusion (over 100 minutes) 12 hourly	According to the patient's body weight a loading dose of vancomycin should be given. Refer page 5
Cellulitis • **mild** (patients not requiring hospitalization)	cefalexin 500mg po 8 hourly or cloxacillin /flucloxacillin 500mg po 6 hourly	erythromycin 500mg po 6 hourly	Duration: 10 -14 days depending on the response.
• **severe** a) Without risk factors	benzyl penicillin 1.2gm IV 6 hourly +/- cloxacillin /flucloxacillin 500mg -1g IV 6 hourly + /- [4]clindamycin 600mg IV 8 hourly	If MRSA infection is suspected or [1]In immediate penicillin or cephalosporin hypersensitivity [3]vancomycin 1g IV infusion (over 100	Duration: 14 days With good clinical response IV therapy can be converted to oral therapy. Send a blood culture before starting antibiotics. Teicoplanin 400mg IV 12 hourly for three doses followed by 400mg daily can be used in place of vancomycin.

b)with risk factors eg: Diabetes	cloxacillin 1- 2g IV 6 hourly + [4]clindamycin 600mg IV 8 hourly or co - amoxiclav 1.2g IV 8 hourly +/- [4]clindamycin 600mg IV 8 hourly	minutes)12 hourly + [4]clindamycin 600mg IV 8 hourly [4]clindamycin 600mg IV 8 hourly + ticarcillin-clavulanic acid 3.2g IV 8 hourly	According to the patient's body weight a loading dose of vancomycin should be given. Refer page 5 If there is significant systemic toxicity, consider the possibility of necrotizing fasciitis. Identify and treat predisposing conditions such as oedema, obesity, eczema, venous insufficiency and toe web abnormalities. Administration of prophylactic antibiotics, (oral penicillin 250mg 12 hourly or erythromycin 250mg 12 hourly) for 4–52 weeks or intramuscular benzathine penicillin every 2–4 weeks, should be considered in patients who have 3–4 episodes of cellulitis per year despite attempts to treat or control predisposing factors.

Cutaneous abscesses, Furuncles (boils) Small lesion and without fever	Antibiotic treatment not indicated		Incision & drainage (I & D)
Large or multiple lesions or with fever	cloxacillin 500mg-1g po 6 hourly	[4]clindamycin 300-600mg po 6-8 hourly or co-trimoxazole 960mg po 12 hourly	I & D and send pus for culture and ABST If no response after 2-3 days look for complications and consider IV therapy. Flucloxacillin can be used in place of cloxacillin.
Diabetic foot ulcer • mild infection	co-amoxiclav 625mg po 8 hourly	[1]In immediate penicillin or cephalosporin hypersensitivity [4]clindamycin 300-600mg po 6-8 hourly + ciprofloxacin 500mg po 12 hourly	Antibiotic therapy is not recommended for ulcer without inflammation. Use rotational antiseptics.
• severe infection	piperacillin-tazobactam 4.5g IV 8 hourly or ticarcillin-clavulanic acid 3.2g IV 8 hourly	[1]In immediate penicillin or cephalosporin hypersensitivity [3]vancomycin 1g IV infusion (over 100	Exclude osteomyelitis. Teicoplanin 400mg IV 12 hourly for three doses followed by 400mg daily can be used in place of vancomycin.

	+ [3]vancomycin 1g IV infusion (over 100 minutes) 12 hourly	minutes)12 hourly + ciprofloxacin 400 mg IV 12 hourly	According to the patient's body weight a loading dose of vancomycin should be given. Refer page 5
Erysipelas	penicillin G 1.2 MU IV 6 hourly or penicillin 500mg po 6 hourly	erythromycin 500 mg po 12 hourly or cefalexin 500mg po 8 hourly	Erythromycin 250 mg po 6 hourly also can be used.
Erythrasma	erythromycin 500mg po 12 hourly	cefalexin 500mg po 8 hourly	Duration: 7-14 days
Impetigo • Crusted lesions	framycetin cream local application 12 hourly		Duration: 7 days Crusts need to be removed with soap and water or saline before local application.
• Bullous lesions	cloxacillin 500mg po 6 hourly	erythromycin 500mg po 6 hourly or cefalexin 250- 500mg po 6 hourly	Flucloxacillin can be used in place of cloxacillin.
Mastitis • Mild	cloxacillin 500mg po 6 hourly	cefalexin500mg po 6 hourly	Breast feeding can be continued or milk from the infected breast can be expressed

		or [4]clindamycin 300 mg po 6 hourly	manually or by a pump. Flucloxacillin can be used in place of cloxacillin.
• Severe mastitis / breast abscess	cloxacillin1-2g IV 6 hourly or co-trimoxazole 960mg po 12 hourly	[3]vancomycin 1g IV infusion (over 100 minutes) 12 hourly or teicoplanin 400mg IV 12 hourly for three doses then 400mg daily	I & D if there is an abscess. Discontinue breast feeding. Switch to oral therapy when symptoms resolve. If ABST is not available step down to co-trimoxazole 960mg po 12 hourly. According to the patient's body weight a loading dose of vancomycin should be given. Refer page 5

Necrotizing fasciitis	piperacillin- tazobactam 4.5g IV 8 hourly + [4]clindamycin 600-900mg IV 8 hourly or ceftriaxone 1g IV 12 hourly + ciprofloxacin 400mg IV 12 hourly + metronidazole 500mg IV 8 hourly	meropenem 1g IV 8 hourly + [4]clindamycin 600-900mg IV 8 hourly [1]In immediate penicillin or cephalosporin hypersensitivity ciprofloxacin 400mg IV 12 hourly or levofloxacillin 500mg IV 12 hourly + [4]clindamycin 600-900mg IV 8 hourly	Obtain surgical opinion urgently. If clostridia are suspected add penicillin G 2-4 million units IV 6 hourly.
Paronychia	cloxacillin 500mg po 6 hourly	co-amoxiclav 625mg po 8 hourly or erythromycin 500mg po 6 hourly	Incision and drainage if there is an abscess. Send pus for culture. Herpes simplex virus and candida spp. can also cause paronychia. Flucloxacillin can be used in place of cloxacillin.

Surgical site infections • Mild	Systemic antibiotics are not necessary		Manage with antiseptics.
• Mild to moderate infections with surrounding cellulitis	cloxacillin 500mg po 6 hourly	co-amoxiclav 625mg po 8 hourly [1]In immediate penicillin or cephalosporin hypersensitivity [4]clindamycin 300mg po 8 hourly	Send pus for culture prior to antibiotic therapy. Flucloxacillin can be used in place of cloxacillin.
• Severe infections with systemic symptoms	cloxacillin 1-2g IV 6 hourly + [2]gentamicin 4-6mg/kg IV infusion (over 30 minutes) once daily	ticarcillin-clavulanic acid 3.2g IV 8 hourly or piperacillin –tazobactam 4.5g IV 8 hourly [1]In immediate penicillin or cephalosprin hypersensitivity ciprofloxacin 400mg IV12 hourly + [4]clindamycin 600mg IV 8 hourly	

• If MRSA is suspected	[3]vancomycin 1g IV infusion (over 100 minutes) 12 hourly	teicoplanin 400mg IV 12 hourly for 3 doses then 400mg daily	Decolonize if MRSA is isolated. According to the patient's body weight a loading dose of vancomycin should be given. Refer page 5
Suppurative salivary gland infections/ parotitis	cloxacillin2g IV 6 hourly	co-amoxyclav 1.2g IV 8 hourly or [4]clindamycin 450 mg IV or orally 8 hourly	Early surgical drainage may be necessary. Duration: 10 days With good clinical response IV therapy can be converted to oral therapy. Flucloxacillin can be used in place of cloxacillin.

[1]Immediate penicillin or cephalosporin hypersensitivity - refer page 2

[2] For aminoglycosides- refer page 2

[3]For vancomycin - refer page 2

[4]For clindamycin - refer page 2

Prepared by the Sri Lanka College of Microbiologists in collaboration with Sri Lanka College of Dermatologists and Ceylon College of Physicians

Special situations: drowning, transfusion associated infections

Condition	Primary therapy	Alternative therapy	Comments
Drowning (Sea and fresh water)	co- amoxiclav 1.2g IV 8 hourly + ciprofloxacin 400mg IV 12 hourly		Corticosteroids have been shown to be of no benefit in the management of submersion injuries.
Transfusion associated bacterial infections	[3]vancomycin 1g IV infusion (over 100 minutes) 12 hourly + ceftazidime 1g IV 8 hourly	[3]vancomycin 1g IV infusion (over 100 minutes) 12 hourly+ piperacillin-tazobactam 4.5g IV 8 hourly [1]In immediate penicillin or cephalosporin hypersensitivity ciprofloxacin 400mg IV 12 hourly+[3]vancomycin 1g IV infusion (over 100 minutes) 12 hourly	

[1]Immediate penicillin or cephalosporin hypersensitivity - refer page 2

[3]For vancomycin - refer page 2

Prepared by the Sri Lanka College of Microbiologists in collaboration with Ceylon College of Physicians, Sri Lanka College of Haematologists and Sri Lanka College of Transfusion Physicians

Specific infections

- This guideline includes brucellosis, enteric fever, leptospirosis, melioidosis, tetanus and typhus.

Condition	Primary therapy	Alternative therapy	Comments
Brucellosis (Non- focal disease)	doxycycline 100mg po 12 hourly for 6 weeks + [2]gentamicin 5mg/kg IV once daily for 1 week	co-trimoxazole 960mg po 6 hourly for 6 weeks + [2]gentamicin 5mg/kg IV once daily for 1 week	Renal functions should be monitored. Endocarditis is rare but is the commonest cause of death. For focal infections including endocarditis contact microbiologist.
Enteric fever	ceftriaxone 2g IV daily for 10-14 days	chloramphenicol 12.5 -25mg/kg IV 6 hourly for 14 days or amoxicillin 1g po 8 hourly for 14 days	Clinical improvement precedes defervescence. Step down according to ABST. In cases of continuing fever for more than 10 days exclude endocarditis and other complications.
Leptospirosis	benzyl penicillin 1.5 MU IV 6 hourly or ceftriaxone 1g IV daily or cefotaxime 1g IV 8 hourly	In mild illness: doxycycline 100mg po 12 hourly	Duration - 7 days. Adjust the doses according to renal function. Can step down to oral amoxicillin 500mg 8 hourly.

Condition	Primary therapy	Alternative therapy	Comments
Melioidosis	**Induction stage** ceftazidime 2g IV 6-8 hourly +/- co-trimoxazole 320/1600 mg po 12 hourly + folic acid 5mgdaily po	meropenem 1g IV 8 hourly or imipenem 1g IV 8 hourly +/- co-trimoxazole 320/1600 mg po 12 hourly + folic acid 5mg daily po	Induction stage For duration of intravenous therapy- discuss with microbiologist Induction stage should be followed by eradication stage – discuss with microbiologist
Tetanus	tetanus immunoglobulin 500 units IM+ metronidazole 400mg po 8 hourlyor 500mg IV 6 hourly for 7-10 days	tetanus immunoglobulin 500 units IM + doxycycline 200mg loading dose followed by100mg po 12 hourly for 7-10 days	Wound debridement is essential. Better managed in ICU. Patients with tetanus will not develop immunity. Vaccinate the patient before discharge.

Condition	Primary therapy	Alternative therapy	Comments
Typhus	doxycycline 100mg po 12 hourly for 7-10 days	chloramphenicol 500mg po or IV 6 hourly for 7-10 days or azithromycin 500mg po single dose	Azithromycin 500mg po single dose in pregnancy. Chloramphenicol is not effective for ehrlichiosis.

[2] For aminoglycosides- refer page 2

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Urinary tract infections (UTI) in adults

- Urine cultures should be collected before starting antibiotics and continuation of antibiotic therapy should be guided by culture and ABST results. Urine culture is preferable even in acute uncomplicated cystitis in females.
- All males with UTI should be investigated to exclude underlying abnormalities.
- Patients should be advised on proper collection of urine samples.
- It is important to indicate the type of specimen on the request form for specimens other than mid stream urine samples (eg. from an indwelling urinary catheter, in-out urinary catheter, urine from renal pelvis, ureter, suprapubic etc.).

Condition	Primary therapy	Alternative therapy	Comments
Acute Uncomplicated Cystitis in non-pregnant women	nitrofurantoin50mg po 6 hourly for 7 days or norfloxacin 400mg po 12 hourly for 3 – 5 days or cefuroxime 250mg po 12 hourly for 3-5 days or co-trimoxazole 960mg po 12 hourly for 3 days	co-amoxiclav 625mg po 8 hourly for 3-5 days	Do not use nitrofurantoin if CrCl < 60 ml/min. Use of multiple antibiotics for empirical therapy is not recommended. Amoxicillin or ampicillin should not be used as empirical treatment due to high prevalence of resistance. Avoid ciprofloxacin and levofloxacin.

Condition	Primary therapy	Alternative therapy	Comments
Acute Uncomplicated Pyelonephritis in non-pregnant women			Urine culture is mandatory in pyelonephritis.
• Outpatient setting	co-amoxiclav 625mg po 8 hourly for 14 days	ciprofloxacin 500mg po 12 hourly for 7 -14 days	
• Inpatient	co-amoxiclav 1.2g IV 8 hourly +/- [2]gentamicin 5mg/kg IV once daily	ceftriaxone 1g IV once daily or cefotaxime 1g IV 8 hourly	Following clinical improvement, oral therapy can be initiated and continued to complete 14 days of antimicrobial therapy. Oral therapy is best guided by the culture and ABST results. A follow-up urine culture 48 hours after completion of treatment is advised.

Condition	Primary therapy	Alternative therapy	Comments
Complicated UTI			
1. Complicated cystitis	norfloxacin 400mg po 12 hourly for 7 days or cefuroxime 250 mg po 12 hourly for 7 days or co-amoxiclav 1.2g IV 8 hourly for 7 days		Complicated UTI is found in patients with anatomical, metabolic and functional abnormalities and in compromised patients. (eg. obstruction to flow of urine, upper urinary tract obstruction, stasis, reflux, neurogenic bladder, urolithasis, diabetes, etc.)
2. Complicated pyelonephritis and men with UTI			If the patient is haemodynamically unstable, refer severe sepsis /septic shock guideline.
• Patients with no exposure to antibiotics or not been hospitalized within past 3 months:	co-amoxiclav 1.2g IV 8 hourly	ciprofloxacin 400mg IV 12 hourly	
• If patient has been exposed to antibiotics or hospitalized within past 3 months:	ceftazidime 1-2g IV 8 hourly +/- [2]amikacin 15mg/kg IV once daily	piperacillin – tazobactam 4.5g IV 8 hourly or ticarcillin-clavulanic acid 3.2g IV 8 hourly	

Condition	Primary therapy	Alternative therapy	Comments
Catheter-Associated Urinary Tract Infections 1. Asymptomatic bacteriuria	Antibiotics not indicated		Urinary catheter should be removed or replaced if catheter had been in-situ for >7days. Treatment should be guided by ABST results. Duration - 7 days if responds promptly after change of catheter.10-14 days is recommended for those with delayed response, regardless of whether the patient remains catheterized or not.
2. Significant bacteriuria in afebrile patients with symptoms or signs	nitrofurantoin 50mg po 6 hourly for 7 days or norfloxacin 400mg po 12 hourly for 7days or cefuroxime 250mg po 12 hourly for 7 days or		
3. Significant bacteriuria in a febrile patients with other symptoms or signs	co-amoxiclav 625mg po 8 hourly for 7 days ceftazidime 1-2g IV 8 hourly	ticarcillin-clavulanic acid 3.2g IV 8 hourly or [2]amikacin15mg/kg IV once daily	

- Prostatitis – Refer guideline on Genital and sexually transmitted infections. page 47
- UTI in Pregnancy – Refer guideline on Pregnancy related infections. page 72

[2]For aminoglycosides- refer page 2

Prepared by the Sri Lanka College of Microbiologists in collaboration with Ceylon College of Physicians, The College of Surgeons of Sri Lanka and Sri Lanka Association of Urological Surgeons.

Urinary tract infections (UTI) in children

- Urine cultures should be collected before starting antibiotics. Continuation of antibiotic therapy should be guided by the ABST results.
- Parents or guardians should be advised on proper collection of the sample.
- It is important to indicate the type of specimen on the request form for specimens other than mid stream urine samples (eg. from an indwelling urinary catheter, in-out urinary catheter, urine from renal pelvis, ureter and suprapubic etc.).

Condition	Primary therapy	Alternative therapy	Comments
Afebrile UTI			Empirical therapy is not recommended. Therapy should be guided by the ABST. If an infant or child is receiving prophylactic antibiotics and develops an infection, treatment should be with a different antibiotic and not a higher dose of the same antibiotic.
Asymptomatic bacteriuria			Should not be treated with antibiotics.

Condition	Primary therapy	Alternative therapy	Comments
Catheter-Associated UTI	IV co-amoxiclav	IV cefotaxime or IV [2]gentamicin (If patient has no underlying structural urinary tract anomalies)	Urinary catheter should be removed or replaced if catheter had been in-situ for >7days. Treatment should be guided by ABST results. Duration – • 7days if responds promptly after change of catheter • 10-14 days is recommended for those with delayed response, regardless of whether the patient remains catheterized or not.
Complicated /atypical UTI (Seriously ill or septic child, evidence of obstructive uropathy, rising serum creatinine, failure to respond to appropriate antibiotic therapy within 48 hrs or non *E. coli* UTI)	IV co-amoxiclav	IV cefotaxime	Duration 10-14 days

Condition	Primary therapy	Alternative therapy	Comments
Uncomplicated Febrile UTI			
• < 3 months of age	Parenteral antibiotics: IV co-amoxiclav	IV cefuroxime or IV [2]gentamicin (if patient has no underlying structural urinary tract anomalies)	Should be referred to a paediatrician for further assessment. Duration – 7 days
≥ 3 months of age	Oral antibiotics: cefalexin or co-amoxiclavor co-trimoxazole Parenteral antibiotics: IV co-amoxiclav	IV cefuroxime or IV [2]gentamicin (if patient has no underlying structural urinary anomalies)	IV therapy could be considered if oral therapy is not tolerated. Duration – 7 days

[2] For aminoglycosides- refer page 2

Antibiotic prophylaxis may be considered in infants and children with recurrent UTI and not recommended after the first attack of UTI. Choice of antibiotics for prophylaxis should be limited to nitrofurantoin, nalidixic acid, trimethoprim, co-trimoxazole and cefalexin.

Antibiotic doses for treatment

Cefalexin:

Neonate < 7 days	20mg/kg (max 125mg) 12 hourly
Neonate 7-21 days	25mg/kg (max125mg) 8 hourly
Neonate 21-28 days	25mg/kg (max 125mg) 6 hourly
Child 1 month -1 year	125mg 12 hourly
Child 1- 5 years	125 mg 8 hourly
Child 5-12 years	250mg 8 hourly
Child 12-18 years	500mg 8 hourly

Cefotaxime:

Neonate <7 days	25mg/kg 8 hourly; dose doubled in severe infections.
Neonate 7-21 days	25mg/kg 8 hourly; dose doubled in severe infections.
Neonate 21-28 days	25mg/kg 6-8 hourly; dose doubled in severe infections.
Child 1 month-18 years	50 mg/kg every 8–12 hours; increase to every 6 hours in very severe infections (max. 12 g daily)

Antibiotic doses for treatment

Ceftriaxone:

Neonate	20-50mg/kg daily
Child 1 month- 12 years (<50kg)	50mg/kg daily up to 80mg/kg in severe infections
Child 1 month- 12 years (≥50kg)	dose as for child 12–18 years
Child 12-18 years	1g daily (2-4g daily in severe infections)

Co-amoxiclav: Oral suspension

Neonate	0.25ml/kg of 125/31 suspension 8 hourly
Child 1 month-1 year	0.25ml/kg of 125/31 suspension 8 hourly
Child 1-6 years	5 ml of 125/31 suspension 8 hourly
Child 6-12 years	10ml of 125/31 suspension 8 hourly
Child 12-18 years	375mg tablet 8 hourly

Co-amoxiclav: Intravenous injection or infusion

Neonate <7 days	30mg/kg 12 hourly
Neonate 7-28 days	30mg/kg 12 hourly
Child 1-3months	30mg/kg 12 hourly
Child 3 months -12 years	30mg/kg 6-8 hourly
Child 12- 18 years	1.2g 6-8 hourly

- All the doses are doubled in severe infections

Antibiotic doses for treatment

Co-trimoxazole:

Child 6 weeks - 6 months	120mg 12 hourly
Child 6 months -6 years	240mg 12 hourly
Child 6 – 12 years	480mg 12 hourly
Child 12-18 years	980mg 12 hourly

Gentamicin:

Child 1 month - 18 years	Once daily dose; 7mg/kg IV infusion and ideally adjust according to serum concentration
Child 1 month - 12 years	2.5mg/kg 8 hourly
Child 12 - 18 years	2mg/kg 8 hourly

Nalidixic acid:

Child 3 months - 12 years	12.5mg/kg 6 hourly
Child 12-18 years	900mg 6 hourly

Nitrofurantoin:

Child 3 months - 12 years	750µg/kg 6 hourly
Child 12-18 years	50mg 6 hourly

Antibiotic doses for prophylaxis

Cefalexin	Child 1 month -18 years	12.5mg/kg at night (max125mg)
Co-trimoxazole Calculate according to the **trimethoprim** dose since trimethoprim alone is not available.	Neonate - Child 12 years	**Trimethoprim**: 2mg/kg at night (max. 100 mg)
	Child 12 - 18 years	**Trimethoprim**:100mg at night
Nalidixic acid	Child 3 months - 12 years	15mg/kg 12 hourly
Nitrofurantoin	3 months - 12 years	1mg/kg at night
	12 - 18 years	50-100mg at night

Prepared by the Sri Lanka College of Microbiologists in collaboration with Sri Lanka College of Paediatricians

References:

1. ACC/AHA Guideline Update on Valvular Heart Disease: Focused Update on Infective Endocarditis. *Circulation*. 2008;**118**:887-896.
2. *Adult treatment of infection policy*. Imperial College Healthcare NHS. Third edition; April 2011.
3. American Heart Association Guidelines on Infective Endocarditis: Diagnosis, Antimicrobial Therapy, and Management of Complications. *Circulation* 2005;**111**:e394-e433.
4. Antibiotic Guidelines 2014-2015. Treatment Recommendations for Adult Inpatients. The Johns Hopkins Hospital Antimicrobial Stewardship Program 2014.
5. Antibiotic guidelines: Antibiotic prophylaxis in neurosurgery. Salford Royal NHS trust, UK: 2010.
6. Antibiotics and the treatment of endodontic infections. Chicago: Endodontists College of Excellence. Published for the dental professional community by the American Association of Endodontists; Summer 2006.
7. Antimicrobial guidelines. Letterkenny General Hospital, Donegal, Ireland: January 2009.
8. Antimicrobial use guidelines, Department of Microbiology, faculty of Medicine, Galle and Galle Medical Association; 2006.
9. ARSP Working Group, Sri Lanka College of Microbiologists. A multi-center laboratory study of Gram negative bacterial blood stream infections in Sri Lanka. *Ceylon Medical Journal* 2013; **58**: 56-61.
10. Athukorala GIDDAD, Fernando SSN, Chandrasiri NS, Rajapakse Mallikahewa R, Chandrasiri P, et al Is checking for antibiotic associated diarrhoea due to *Clostridium difficile* relevant to Sri Lankan hospitals? *Galle Medical Journal* 2012; 17 (**1**), 5-9.
11. Bank P.A., Freeman M.L., and the practice parameters committee of American college of Gastroenterology. Practice Guideline in Acute Pancreatitis. *Am. J of Gastroenterology* 2006;**101**, 2379-2400.
12. Batuwanthudawe R, Karunaratne K, Dassanayake M, etal. Surveillance of Invasive Pneumococcal Disease in Colombo, Sri Lanka. *Cli Infect Dis* 2009;48(supp 2):S136.
13. *BNF for children* (eBNF) 2015. London: BMJ group.
14. Bratzler DW, Dellinger EP, Olsen KM, Perl TM, Auwaerter PG et al. Clinical practice guidelines for antimicrobial prophylaxis in surgery. *American Journal of Health-System Pharmacy* 2013; **70**: 195-283.
15. Bratzler DW, Houck PM. Antimicrobial Prophylaxis for Surgery: An advisory statement from the national surgical infection prevention project. *Clinical Infectious Diseases* 2004; **38**: 1706-1715.
16. *British National Formulary*. London, British Medical Association and the Royal Pharmaceutical Society. March 2015; No 70.

17. British Thoracic Society Reports, Chronic obstructive pulmonary disease (CG101) Clinical guidelines. June 2010; 2 (**2**).
18. BSAC Guidelines for the diagnosis and antibiotic treatment of endocarditis in adults. A report of the Working Party of the British Society for Antimicrobial Chemotherapy 2011.
19. BTS Guidelines for the management of Community Acquired Pneumonia in Adults; Update 2009.
20. Calderdale and Huddersfield. NHS Foundation Trust Antibiotic Guidelines October 2007; p23.
21. CDC 2006. www.cdc.gov/nip/vaccine/mening/mcv4/mcv4_aicp.htm
22. CDC: Preventing pneumococcal disease among infants and young children. *MMWR* 2000; 49:1-38.
23. Chandrasiri N.S et al; Changing pattern of bacteraemic Salmonella serotypes and Antibiotic sensitivity in a tertiary care hospital from 2006-2009; The Bulletin of Sri Lanka College of Microbiologists 2010;17.
24. Chandrasiri NS, Athukorala GIDDAD, Ratnayake NR, Feroza MBF, Jayawardena JMDD et al. Causative organisms and demographic data of infective endocarditis in a tertiary care hospital in Sri Lanka. *The Bulletin of the Sri Lanka College of Microbiologists* Sep 2011; 9(**1**): 14.
25. Chandrasiri NS, Ratnayake NR, Karunaratne GKD, Feriza MBF, etal. Clinical Spectrum and minimum inhibitory concentration (MIC) values of invasive *Streptococcus pneumoniae* isolates (ISP) in a tertiary care hospital. The bulletin of the Sri Lanka College of microbiologists 2012.
26. Chow AW, Evans GA, Nathens AB, Ball CG, Hansen G et al. Canadian practice guidelines for surgical intra-abdominal infections. *CJIDMM.* 2010; 21(**1**): 11-37.
27. Clinical Management Guidelines, College of Optometrists UK; 2010.
28. Clinical practice guideline for the use of antimicrobial agents in neutropenic patients with cancer:update by the Infectious Disease Society of America 2010.
29. Corea E, Thevanesam V, Perera S, Jayasinghe I, Ekanayake A, et al. Melioidosis in Sri Lanka. *Sri Lankan Journal of Infectious Diseases* 2012; **1:**2-8.
30. David R. Haburchak. Vaccinations and Antibiotic Treatment Post Splenectomy-*Medscape*:(2004)
31. Davis, JM et al. Guidelines for the prevention and treatment of infections in patients with an absent or dysfunctional spleen. *British Committee for Standards in Haematology* (2011).
32. Dellinger RP, Levy MM, Rhodes A, Annane D, Gerlach H et al: Surviving Sepsis Campaign: International guidelines for management of severe sepsis and septic shock: 2012. *Crit Care Med* 2013; 36:(**2)** 580-637.
33. Diagnosis and Management of Complicated Intra-abdominal Infection in Adults and Children: Guidelines by the Surgical Infection Society and the Infectious Diseases Society of America. *Journal of Clinical Infectious Disease* 2010; **50**: 133-164.

34. Dissanayake DMBT, Fernando SSN, Chandrasiri NS. The distribution and characteristics of Extended-Spectrum β-Lactamase (ESBL) producing *Escherichia coli* and *Klebsiella* species among urinary isolates in a tertiary care hospital. *Sri Lanka Journal of Infectious Diseases* 2012; **2**: 30-36.
35. EAST trauma practice guidelines; penetrating abdominal trauma (2012), open fractures (2011), chest trauma (2012).
36. Eckmann C, Dryden M, Montravers P, Kozlov R, Sganga G. Antimicrobial treatment of Complicated Intra- abdominal infections and new IDSA guideline: A commentary and an alternative European approach according to clinical definitions. *European Journal of Medical Research* 2011; **16**:115-126.
37. ECP Yuen. The use of prophylactic antibiotics in trauma. *Hong Kong Journal of Emergency Medicine* July 2004; 11(**3**).
38. e-medicine.medscape.com/article/772753-medication.
39. Ender PT and Dolan MJ. Pneumonia Associated with Near-Drowning. *CID.* 1997; **25**: 896-907.
40. Enzler MJ, Berberi E, Osmon DR. Antimicrobial Prophylaxis in Adults, Mayo Clin Proc. July 2011;86(**7**):686-701.doi:10.4065/mcp.2011.2012.www.mayoclinicproceedings.com.
41. Fatal Bacterial Infections Associated with Platelet Transfusions - United States, 2004. *MMWR*2005; 54**(07)**:168-170.
42. Freifeld AG, Bow EJ, Sepkowitz KA, Boeckh MJ, Ito JI, et al. Clinical Practice Guideline for the use of antimicrobial agents in neutropenic patients with cancer 2010 Update by the Infectious Diseases Society of America. Clinical Infectious Diseases 2011; 52: e 56- e 91.
43. Gilbert DN, Chambers HF, Eliopoulos GM, Saag MS et.al: *The Sanford guide to antimicrobial therapy.* 43rd Ed. Sperryville, VA: 2014.
44. Gould FK, Denning DW, Ellott TSJ et al. Guidelines for the diagnosis and antibiotic treatment of endocarditis in adults: a report of the working party of the British society for antimicrobial chemotherapy. *Journal of Antimicrobial Chemotherapy*; 10:1093 -1114.
45. Green Top Guideline No 44. (2006 with Minor Amendments in 2010) Preterm Prelabour Rupture of Membranes. Royal College of Obstetricians & Gynaecologists.
46. Guidelines from the National Institute for Health and Clinical Excellence (NICE) in the UK – Diagnosis and management of community and hospital acquired pneumonia in adults. December 2014.
47. Guidelines on prevention, diagnosis, and treatment of infective endocarditis. *European Heart Journal* 2009; 30, 2369-2413.
48. Herzog T, Chromik AM, Uhl W. Treatment of Complicated Intra-abdominal infections in the era of Multidrug resistant bacteria. *Euro Journal of Medical Research.* 2010; **15:**525-532.

49. John G. Bartlett. *Johns Hopkins Antibiotic Guide: Diagnosis & Treatment of Infectious Diseases,* Second Edition. Jones & Bartlett Publishers. 2010.
50. John M. Davies, Michael P. N. Lewis, Jennie Wimperis, Imran Rafi, Shamez Ladhani and Paula H. B. Bolton-Maggs. Review of guidelines for the prevention and treatment of infection in patients with an absent or dysfunctional spleen.*Br J Haematol* 2011;155(3):308-17.
51. Kalpana Gupta et al. International Clinical Practice Guidelines for the Treatment of Acute Uncomplicated Cystitis and Pyelonephritis in Women: A 2010 Update by the Infectious Diseases Society of America and the European Society for Microbiology and Infectious Diseases. *Clinical Infectious Diseases* 2011; 52(**5**):e103–e120.
52. Karunaratne GKD, Kathriarachchi K, Corea EM Hospital based study of invasive *Haemophillus influenzae* disease over a four year period at the Lady Ridgeway Hospital. The bulletin of the Sri Lanka College of Microbiologists 2012.
53. Kim ES, Chung MH, Kang JS. Treatment of Scrub Typhus during Pregnancy: Review of Korean Patients. *Infection and chemotherapy*. 2008; 40(**2**): 30-32.
54. Laterre PF, Colardyn F, Delmée M, De Waele J, Legrand JC, et al; Antimicrobial therapy for intra-abdominal infections: guidelines from the Infectious Disease Advisory Board (IDAB) *Acta Chir Belg* 2006;106**(1)**:2-21.
55. Lew D.P., Waldwogel F.A., Osteomyelitis. *Lancet* 2004;**364**:369-379.
56. Lindsay E et al. Infectious Diseases Society of America Guidelines for the Diagnosis and Treatment of Asymptomatic Bacteriuria in Adults. *Clinical Infectious Diseases* 2005; 40:643–654.
57. Local prevalence data and resistance patterns of microorganisms at the National Cancer Institute of Sri Lanka from 2006 – 2012.
58. Lynch AM, Kapila R. Overwhelming postsplenectomy infection. Infectious Disease Clinics of North America;10:(4)1996,693–707.
59. Mackway-Jones K. Towards evidence based emergency medicine: Best BETS from Manchester Royal Infirmary. *Emerg Med J*. 2010;**27**: 393-394.
60. Mandell GL, Bennett JE, Dolin R. *Mandell, Bennett, Dolin's Principles and Practice of Infectious Diseases*. 2010. 7th Ed: New York, Elsevier Churchill Livingstone.
61. Mandell LA, Wunderink RG, Anzueto A, et al. Infectious Diseases Society of America/American Thoracic Society consensus guidelines on the management of community-acquired pneumonia in adults. *Clin Infect Dis* 2007; 44 Suppl 2:S27.
62. Meningococcal conjugate vaccine (MCV-4): AICP Recommendation. National Infection Prevention.
63. Meningococcal polysaccharide vaccine. Drug Shortage Bulletin. ASHP. 2006 May 22. www.ashp.org

64. Micek ST, Welch EC, Khan J, Pervez M, Doherty JA. et al. Empiric combination antibiotic therapy is associated with improved outcome against sepsis due to gram-negative bacteria: a retrospective analysis. *Antimicrobial agents and chemotherapy* 2010; 1742–1748.
65. Michel H, Julia C, Nickie C, Penny F, et al. British Thoracic Society guidelines for the management of community- acquired pneumonia in children: update 2011. *Thorax*2011:66ii1:ii23.
66. Narenthiran S. Echocardiography on subacute bacterial endocarditis. *Ceylon Medical Journal* 1985;30;125-129.
67. National Institute for Health and Clinical Excellence (NICE) clinical guideline 74. Surgical site infection-Prevention and treatment of surgical site infection. London (United Kingdom): October 2008.
68. National Institute for Health and Clinical Excellence clinical guideline 102. Bacterial meningitis and meningococcal septicaemia. 2010.
69. Palasanthiran P, Starr M and Jones C. Management of Perinatal Infections. Sydney NSW, Australian Society for Infectious Diseases 2002.
70. Piyasiri DLB, Chandrasiri P .Prospective study of patients with Infective endocarditis. The *Bulletin of the Sri Lanka College of Microbiologists* Sep 2011; 9(**1**): 22-23.
71. Prevention and treatment of cancer related infections, National Comprehensive Cancer Network (NCCN) guidelines version 2.2015.
72. Prevention of Infective Endocarditis: Guidelines From the American Heart Association. *Circulation*. 2007;116:1736-1754.
73. Russell JA. Management of sepsis, *NEJM* (2006);**355**:1699-1713.
74. Rybak MJ1, Lomaestro BM, Rotschafer JC, MoelleringJr RC, Craig WA et al. Vancomycin therapeutic guidelines: a summary of consensus recommendations from the infectious diseases Society of America, the American Society of Health-System Pharmacists, and the Society of Infectious Diseases Pharmacists. *Clin Infect Dis.* 2009 Aug 1;49(**3**):325-7. doi: 10.1086/600877.
75. Sandra L. Moffett. Overwhelming postsplenectomy infection. Managing patients at risk. *JAAPA* July 2009;22(7):36-40.
76. Sanford JP. The Sanford Guide to Antimicrobial Therapy.44th edition. Sperryville (VA): Antimicrobial Therapy Inc, 2014.
77. Sartelli ,Viale P, Catena F, Ansaloni L, Moore E et al. WSES guidelines for management of intra-abdominal infections. *World Journal of Emergency Surgery* 2013, 8:3.
78. Scottish Intercollegiate Guidelines Network (SIGN). Antibiotic prophylaxis in surgery. A national clinical guideline. Edinburgh (Scotland): July 2008.
79. Sheldon and Kapla. Pyogenic liver abscess. *Text book of paediatric infectious disease* 5thed: 679-682.

80. Shirtliff M.E., Mader J.T., Acute septic arthritis. *Clinical Microbiology reviews* 2002 Oct; 527-544.
81. Solomkin JS, Mazuski JE, Bradley JS, Rodvold KA, Goldstein EJC et al. Diagnosis and Management of Complicated Intra-abdominal Infection in Adults and Children: Guidelines by the Surgical Infection Society and the Infectious Diseases Society of America. *Journal of Clinical Infectious Disease* (2010); **50**: 133-164.
82. Surgical antibiotic prophylaxis National Best Practice Guidelines compiled by the Sri Lanka College of microbiologists for the Ministry of Health, 2007.
83. The Management of Community-Acquired Pneumonia in Infants and Children Older Than 3 Months of Age: Clinical Practice Guidelines by the Pediatric Infectious Diseases Society and the Infectious Diseases Society of America. 2011.
84. Therapeutic guidelines: Antibiotic. Therapeutic Guidelines Limited; Melbourne. 2015 (Version 15).
85. Thomas M. Hooton et al. Diagnosis, Prevention, and Treatment of Catheter Associated Urinary Tract Infection in Adults: 2009 International Clinical Practice Guidelines from the Infectious Diseases Society of America. *Clinical Infectious Diseases* 2010; 50:625–663.
86. Trauma orthopaedic antibiotic guidelines for adults. University Hospitals of Leicester, UK: January 2011.
87. Tunkel, A.R. Hartman, B.J. Kaplan, S.L. Kaufman, B.A. Roos, K.L. Scheld, W.M. &Whitley, R.J. Practice Guidelines for the Management of Bacterial Meningitis. *Clinical Infectious Diseases*2004;**39:** 1267-1284.
88. Urinary tract infection in children diagnosis, treatment and long-term management. Clinical Guideline NHS/NICE August 2007.
89. Vestbo J, Suzanne S. Hurd and Roberto Rodriguez-Roisin. The 2011 revision of the global strategy for the diagnosis, management and prevention of COPD (GOLD). *The Clinical Respiratory Journal* October 2012; 6:4, 208–214.
90. Vindya Gunasekera. Evidence based management of childhood urinary tract infections. *Sri Lanka Journal of Child Health* 2010; **39**: 104-109.
91. Watson NA, Denton M. Antibiotic prescribing in critical care: specific indications. *JICS*2008;9**(1)**:30-36.
92. Wiebe CB and Putnins EE. The Periodontal Disease Classification System of the American Academy of Periodontology-An Update. *J Can Dent Assoc* 2000; 66:594-7.
93. World Leading Experts. Febrile neutropenia. Antibiotic Essentials 2008; 7: 123.
94. Zimmerli W, Trampuz A, Ochsner P. Prosthetic Joint Infections, *NEJM* 2004,351:1645-1654

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