

**Rajiv Gandhi Medical College and
Chhatrapati Shivaji Maharaj hospital
Kalwa Thane**

Hospital Antimicrobial policy 2019

Presumptive therapy for adult patients suspected of infection

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A. GASTROINTESTINAL & INTRA-ABDOMINAL INFECTIONS

Sr. No.	Clinical Conditions & expected pathogens	Expected pathogens	Empiric (presumptive) antibiotics/First Line
1.	Abscess- Liver pyemic	Enterobacteriaceae Enterococcus <i>B.fragilis</i> Other anaerobes	Enterococcus will not respond to cephalosporins, aminoglycosides For mild to moderate infections: Ampicillin+ sulbactam 1.5 g IV, TDS/QDS :(Enterobacteriaceae Enterococcus) + Metronidazole 500mg I.V.TID / 800mg oral TID for 2 weeks:(anaerobes) For highly severe infections: Piperacillin + tazobactam 4.5 gm IV QDS × 2 wks + Metronidazole 500mg I.V.TID / 800mg oral TID for 2 weeks Ultrasound guided drainage indicated in large abscesses, signs of imminent rupture and no response to medical treatment
	Alternatives/ Remarks		Ciprofloxacin in combination with metronidazole
2.	Abscess- Liver	<i>E. histolytica</i>	Metronidazole 750 mg PO TDS /500 mg IV TDS

	amoebic		Duration: 14 days
	Alternatives / Remarks		
3.	Acute gastroenteritis (Indoor patient)	Bacterial pathogenic <i>E.coli</i>	Suspected viral, bacterial : supportive Pathogenic E. coli: Ciprofloxacin 500mg IV BD Duration: 5-7 days (convert to oral when patient stabilizes)
	Alternatives / Remarks		
	Acute gastroenteritis (OPD patient)	Suspect Bacterial <i>V.cholerae</i>	Antibiotic is indicated to restrict transmission of infection ORS is chief therapy If patient is not tolerating IV fluids are recommended Doxycycline 100mg PO BD Duration: 5-7 days Azithromycin Oral in children (20mg/kg) and pregnant women (1g)
	Alternatives / Remarks		
4. a	Dysentery – Bacillary	Shigella spp. <i>Campylobacter jejuni</i> Pathogenic E.coli	Antibiotics are indicated when patient has severe dysentery or fever along with dysentery Ciprofloxacin 500mg PO BD Duration 5 days When faecal isolates of Salmonella, Shigella spp. Are tested only ampicillin , fluoroquinolones, trimethoprim-sulfamethoxazole should be tested
	Alternatives / Remarks		
4 b.	Dysentery Amoebic (OPD patient)	<i>E. histolytica</i>	Metronidazole 400mg Oral TDS for 7-10 days
	Alternatives / Remarks		
5.	Dysentery Unknown (OPD patient)	E.histolytica	Ciprofloxacin 500mg PO BD Duration 5 days If no response to Ciprofloxacin , add Metronidazole 400 mg PO TDS
	Alternatives / Remarks		
6.	Cholangitis	Enterobacteriaceae Anaerobes	Ampicillin – sulbactam or Piperacillin + tazobactam 4.5 gm IV QDS× 2 wks Metronidazole 500 mg IV TDS Duration: 7 days Surgical or endoscopic intervention to be considered if

			there is biliary obstruction
	Alternatives / Remarks		
7.	Cryptosporidiosis	Cryptosporidium spp	Nitazoxanide 500 mg PO BD Duration 3 days
8.	Diarrhoea	<i>C.difficile</i>	Supportive Metronidazole 500 mg PO TDS Duration:10-14 days OR Vancomycin 125 mg (children)/500 mg (adults), PO QDS Duration: 10-14 days(in seriously ill)
9.	Enteric fever	<i>Salmonella typhi</i> / <i>Salmonella Paratyphi</i> A/B/C	Ceftriaxone 2 gm IV Duration: 14 days For Salmonella and Shigella spp. First and second generation cephalosporins, cephamycin may appear active in vitro but are not effective clinically and should not be reported as susceptible
	Alternatives / Remarks		
10.	Acute cholecystitis	Enterobacteriaceae Enterococci Anaerobes	Piperacillin-tazobactam 4.5 gm TDS + Metronidazole 500 mg TDS Duration 5-7 days Surgical or endoscopic intervention to be considered if there is biliary obstruction
	Alternatives / Remarks		
11.	Spontaneous Bacterial peritonitis	Enterobacteriaceae Enterococci <i>S.pneumoniae</i> Anaerobes	Piperacillin-tazobactam 4.5 gm TDS Metronidazole 500 mg IV TDS Duration: 7 days
	Alternatives / Remarks		
12.	Perforative peritonitis	Enterobacteriaceae Enterococci <i>P.aeruginosa</i> Anaerobes	Piperacillin-Tazobactam 4.5gm IV 8 hourly Metronidazole 1 gm TDS Duration 5-7 days
	Alternative/remarks		
13.	Intra-abdominal abscess	Enterobacteriaceae Gram positive cocci Anaerobes MTB complex (rare)	For mild to moderate infections: Ampicillin+ sulbactam 1.5 g IV, TDS/QDS + Metronidazole 500mg I.V.TID / 800mg oral TID for 2 weeks For highly severe infections: Piperacillin + tazobactam 4.5 gm IV QDS × 2 wks + Metronidazole 500mg I.V.TID / 800mg oral TID for 2 weeks Antibiotics should be administered early. Drainage should be considered.

	Alternative/ Remarks		Ciprofloxacin in combination with metronidazole
14.	Gastric ulcer Disease/peptic ulcer disease <i>H.pylori</i>		PO BD PPI Pantoprazole 40 mg + Clarithromycin 500 mg + Amoxicillin 1 gm Duration: 2 weeks
15.	Liver – Hydatid Disease	<i>E.granulosus</i>	Albendazole 15 mg/kg PO BD Duration: 3-6 months PAIR (hypertonic saline, 95% efficacy)
16.	Pancreatic abscess	Enterobacteriaceae Enterococci Anaerobes	Poor pancreatic penetration: (aminoglycosides, first generation cephalosporins, cefoxitin, ampicillin) Piperacillin- tazobactam 4.5 gm IV TDS OR Meropenem 2 gm IV TDS + Metronidazole 500 mg IV TDS Duration: 10-14 days
	Alternative/ Remarks		
17.	Pancreatitis with sepsis	Enterobacteriaceae <i>P.aeruginosa</i> (occ) Enterococcus Bacteroides	Piperacillin-Tazobactam 4.5 gm IV 8 hourly empirically or Imipenem-Cilastatin 500mg IV 6hourly Or Meropenem 1gm IV 8hourly or Doripenem 500mg IV 8h Duration: 10-14 days (Depending on clinical response) In very sick patients, if required, addition of cover for yeast (fluconazole iv 800 mg loading dose day 1, followed by 400 mg 2 nd day onwards) & and for Enterococcus (vancomycin /teicoplanin) may be contemplated For 7-10 days
	Alternative/remarks		

B. Infections of ENT

Sr. No.	Clinical Conditions &	Expected pathogens	Empiric (presumptive) antibiotics/First Line
1	Acute Sinusitis	S. pneumonia H. influenzae M.catarrhalis	Amoxicillin 500 mg 8 hourly or 875 mg 12 hourly. Paediatric dosage: 40-80 mg/kg/day divided q12h
	Alternative/ Remarks		Cefpodoxime proxetil 200mg q 12h Paediatric dosage: 10 mg/kg/day divided q12h Azithromycin 500 mg daily for 3 days Paediatric dosage: 10 mg/kg daily for 3 days
2.	Streptococcal Tonsillitis	Grp A- Streptococci	amoxicillin (40 mg/kg divide twice daily) 500 mg 8 hourly OR 875 mg 12 hourly for 7-10 days
3.	Acute pharyngitis	Majority viral Suspect bacterial Grp A Strep	Treatment for viral is nonspecific and asymptomatic. For secondary bacterial infection –amoxicillin (40 mg/kg divide twice daily) 500 mg 8 hourly OR 875 mg 12 hourly for 7-10 days
	Alternative/ Remarks		Erythromycin Cephalexin 250 mg PO qid
4.	Acute epiglottitis	H. influenzae Anaerobes Polymicrobial	Co-amoxiclav 625mg PO BD Duration: 10 days + Metronidazole 500mg PO TDS Duration: 2-3 weeks
	Alternative/ Remarks		
5.	Oral Candidiasis	Candida spp.	Gentian violet for LA till improvement For severe cases Fluconazole LA and 100-200mg PO Duration: 2 weeks
6.	Ludwig's angina Vincent,s angina	Polymicrobial (oral anaerobes)	Ceftriaxone 2gm IV BD Duration: 7-10 days + Metronidazole 500 mg PO TDS Duration : 2-3 weeks
	Alternative/ Remarks		
7.	Acute otitis media	S. pneumonia H. influenzae M. catarrhalis	Amoxicillin – clavulanate 80mg/kg/d

	Alternative/ Remarks		Cefuroxime axetil Ceftriaxone IM
8.	Prophylaxis for recurrent Otitis Media		Co-amoxiclav 625 mg PO BD/375 mg PO TDS/ 1 gm PO BD depending upon age and body weight Duration: 7 days
9	Chronic Otitis media	S.aureus Enterobacteriaceae Pseudomonas spp Anaerobes	Topical antibiotics during drainage Ciprofloxacin 500mg PO BD Or Cefpodoxime 200mg PO BD Duration: 7 days
10	Otomycosis	Candida spp	Clotrimazole ear drops + Suction evacuation Malignant Otitis Externa Itraconazole 200mg BD daily Duration: 7 days
11	Otitis externa	S. aureus	Amoxicillin-clavulanate (500+125) orally twice a day for 7-10 days. Ciprofloxacin 500 mg orally twice a day for 7-10 days
12	Invasive/Necrotising otitis externa	Pseudomonas spp.	Piperacillin-tazobactam 4.5 gm IV TDS + Aminoglycosides 500mg IV OD+ Local ciprofloxacin drops Duration: 7 days 10 day regimen of fluoroquinolone otic solution such as
13	Mastoiditis	Acute- S.pneumoniae H.influenzae P.aeruginosa Chronic- polymicrobial	Amoxicillin – clavulanate 80mg/kg/d Alternative: Cefuroxime axetil Ceftriaxone IM
14.	Diphtheria	Corynebacterium diphthriae	Erythromycin 40mg/kg/day IV (MAX) or 2g/day + Penicillin G IV 300000 IU/day (< 10 kg weight)/ 600000 IU /day (>10 kg weight) + Antidiphtheria serum Duration: 14 days or Until patient able to swallow
	Alternative/ Remarks		Penicillin should be administered only after test dose Antidiphtheria serum For children: Laryngeal: 20-40000 U Nasopharyngeal: 40-60000 U Extensive disease: 60-80000 U
15.	Laryngitis	Viral(mainly) Rarely bacterial- Streptococcus Moraxella	Antibiotics are not recommended unless group A streptococcus is isolated Co-amoxiclav 625 mg PO TDS Duration: 7 days

16.	Laryngo-tracheo-bronchitis		Co-amoxiclav 625 mg PO TDS Duration: 7 days
	Alternative/ Remarks		Levofloxacin 400mg PO BD

C. Lower Respiratory tract infection

Sr. No.	Clinical Conditions	Expected pathogens	Empiric (presumptive) antibiotics/First Line
2.	Acute bronchitis	Viral ILI	symptomatic t/t Oseltamivir 75 mg PO BD Duration 5 days
3.	Acute bacterial exacerbation of COPD	Atypical bacterial pathogens Viral Occasionally Streptococci spp., Haemophilus spp., Moraxella spp	Co-amoxiclav 625mg PO TDS Or Azithromycin 500mg PO OD Duration 5-7 days
	Alternative/ Remarks		Fluroquinolones in case of severe exacerbation and comorbidity Parenteral antibiotics (Amoxicillin- clavulanate, Fluroquinolones, cephalosporins :second or third generation) indicated in cases of moderate or severe exacerbation and comorbidity, frequent exacerbator, > 3/yr, antibiotic use in last 3 months and at risk for P. aeruginosa
4.	Community acquired Pneumonia	<i>S. pneumoniae</i> , <i>Legionella</i> Enterobacteriaceae Viral(high risk)	Mild to moderate cases Amoxycillin- 500mg-1 g TDS oral. Parenteral antibiotics indicated in severe cases, associated comorbidity If IV indicated, Azithromycin 500mg IV OD + Co-amoxiclav 1.2 gm IV TDS or levofloxacin For patients with CAP in ICU COVERAGE FOR s. PNEUMONIAE AND Legionella spp. Must always be considered. Piperacillin- Tazobactam, Imipenem, Meropenem and cefepime are adequate for most S. pneumoniae and H. influenzae infections Oseltamivir in season depending on age/co-morbid condition + symptomatic

	Alternative/ Remarks		
5.	Nosocomial Pneumonia VAP	Gram negative bacilli- Klebsiella, Enterobacter, <i>P. aeruginosa</i> , <i>E. coli</i> ,	Inj Piperacillin + tazobactam 4.5 gm 8 hrly + IV Levofloxacin 750mg OD + Vancomycin
7.	Empyema thoracis	<i>S. aureus</i> , <i>H. influenza</i> , Grp A Streptococcus, <i>S. pneumoniae</i> Oral anaerobes	Ceftriaxone 1gm IV BD Duration: 7 days followed by oral antibiotics Duration: 3-6 wks +/- (for oral anaerobes) Metronidazole 500mg IV TDS; Duration: 7 days In Uncomplicated cases, Co-amoxiclav 625 mg PO BD Duration: 7 days Aminoglycosides are less capable of entering the pleural space and have decreased activity in acidic anaerobic environment Pus needs to be drained through ICD with due precautions along with antibiotics For MRSA: Vancomycin (Daptomycin not indicated because of insufficient antistaphylococcal activity in the lung)
	Alternative/ Remarks		Cloxacillin 50-100 mg/kg IV 4-6 WKS OR Ampicillin 100 mg /kg/d IV 4-6 WKS OR Penicillin G 50000-1 lakh IU/kg OD
8.	Nocardia pneumonia	Nocardia spp.	Cotrimoxazole DS 2 BD Duration 3-6 weeks followed by 1 BD for 3-6 months
9.	PCP	<i>P. jirovecii</i>	Cotrimoxazole DS (800+160) PO 2 QDS Duration: 14 days + Prednisolone 40 mg BD Duration: 5 days
10	Aspiration Pneumonia	Anaerobes	Metronidazole 400 mg IV TID X 10-14 days
12	Pulmonary Tuberculosis MTBC		As per RNTCP guidelines

D. Cardiac infections

Sr. No.	Clinical Conditions & expected pathogens	Empiric (presumptive) antibiotics/First Line
1	Infective endocarditis (Native valve) <i>S. viridans</i> <i>Enterococcus</i> MSSA MRSA	I. If penicillin susceptible isolate is recovered from blood culture, Penicillin G Aqueous penicillin G 12 to 18 million units/day IV continuously or in 4 or 6 divided doses for 4 weeks + Inj Gentamicin 3 mg/kg/day IV Or IM in 3 doses Duration: 2 weeks II. Inj Ceftriaxone 2 gm IV/IM single dose Duration: 4 weeks 1 to 1.5 g IV every 6 hours + Inj Gentamicin 3 mg/kg/day IV or IM IN 3 doses Duration: 2 weeks Penicillins to be administered only after test dose. Perform blood cultures, two sets of 10ml each in adults, spaced an hour apart, from two different sites, prior to initiating therapy
2	Infective endocarditis (Prosthetic valve) MRSA MSSA	Vancomycin 15-20 mg/kg/day IV in 2 doses Duration: 6 weeks + Gentamicin (3mg/kg/day IV or IM in 3 doses) Duration: 2 weeks + Rifampicin 300 mg PO TDS Duration: 6 weeks
	Alternative/ Remarks	Inj Gentamicin is usually used for two weeks The duration of treatment is 4-6 weeks of effective antibiotics

E. Urinary tract infections

Sr. no	Clinical conditions	Expected pathogens	Empiric (presumptive) antibiotics/First Line
1.	UTI- Uncomplicated	E. coli Proteus spp. Klebsiella spp	Nitrofurantoin 100 mg BD for 7 days or Cotrimoxazole 960mg BD for 3-5 days or Ciprofloxacin 500 mg BD for 3-5 days
2.	UTI- Complicated (Patients with structural abnormalities, calculi, diabetes, recurrent UTI)	E. coli Proteus spp. Klebsiella spp	Cotrimoxazole 960mg BD for 3-5 days or Ciprofloxacin 500 mg BD for 3-5 days Or Amoxicillin-clavulanate
3	Cystitis	(E.coli, Klebsiella spp rarely proteus spp)	Cotrimoxazole 960mg BD for 3-5 days or Ciprofloxacin 500 mg BD for 3-5 days
4	Complicated (Pts with structural abnormalities, calculi, diabetes, recurrent UTI)		Oral ciprofloxacin In seriously ill patients: Piperacillin-Tazobactam 4.5g IV 6 hourly/ ceftazidime (3 to 6 g/d), cefepime (2-4 g/d), aztreonam (3-6 g/d), imipenem (2g/d), meropenem (1.5 – 3 g/d), ertapenem (1 g/d) in combination with aminoglycosides or parenteral fluoroquinolone
5	Acute Pyelonephritis	E.coli, K. pneumoniae, P. mirabilis, P. aeruginosa, S. saprophyticus, Enterococcus spp	Oral ciprofloxacin In seriously ill patients: Piperacillin-Tazobactam 4.5g IV 6 hourly/ ceftazidime (3 to 6 g/d), cefepime (2-4 g/d), aztreonam (3-6 g/d), imipenem (2g/d), meropenem (1.5 – 3 g/d), ertapenem (1 g/d) in combination with aminoglycosides or parenteral fluoroquinolone (Monitor renal function closely and rationalise according to culture report) Complete total duration of 14 days
6	Acute prostatitis	Enterobacteriaceae	Doxycycline 100 mg BD or Co-trimoxazole 960 mg BD Alternative: In severe cases, Piperacillin- Tazobactam 4.5gm IV 6 hourly or Cefoperazone- sulbactam 3gm IV 12

			hourly Or Ertapenem 1 gm IV OD or Imipenem 1g IV 8 hourly or Meropenem 1gm IV 8 hourly Get urine and prostatic massage cultures before antibiotics & switch to narrow spectrum agent based on sensitivities and then treat total for 3-4 weeks. Use Ciprofloxacin (if sensitive)
7	Acute Urethral syndrome	C.trachomatis, N. gonorrhoea, Mycoplasma hominis	

F. Central nervous system infections

Sr. No.	Clinical Conditions	Expected pathogens	Empiric (presumptive) antibiotics/First Line
1.	Acute bacterial meningitis	<i>S. pneumoniae</i> <i>N. meningitides</i> <i>H.influenzae</i>	<i>N. meningitides</i> <i>H.influenzae</i> <i>E.coli</i> : Ceftriaxone <i>S. pneumoniae</i> : Ceftriaxone + Vancomycin <i>Listeria monocytogenes</i> <i>Streptococcus agalactiae</i> : Ampicillin/ Penicillin G +/- aminoglycoside The following antimicrobial should not be routinely reported for organisms isolated from CSF as they may not be effective • Agents administered by oral route • 1st and 2nd generation cephalosporins • Clindamycin • Macrolides • Tetracyclins Fluoroquinolones
1a.	Acute bacterial meningitis Elderly, alcoholics, immune-compromized		Vancomycin + ampicillin+ cefepime/meropenem
2.	Brain abscess	<i>S. aureus</i> , anaerobes, Streptococci, Gram negative bacilli CoNS	Gram negative bacilli: Ceftriaxone 2 g/IV/BD + Metronidazole 500 mg IV TDS <i>S. aureus</i> : Methicillin sensitive: Nafcillin/oxacillin: 9-12g/QID Methicillin resistant: 30-45 mg/kg BD
	Alternative/Remarks		
3.	Neurocysticercosis	<i>Taenia solium</i>	Albendazole 400mg PO BD+ Prednisone 1mg/kg PO OD Duration 15 days
	Alternative/Remarks		
4.	Spinal epidural abscess	<i>S. aureus</i> , Streptococcus spp., anaerobes, Gram negative organisms	Meropenem 3 gm/d TDS/ IV + Vancomycin 2 gm/d, BD/ IV Duration 4-6 weeks

			Surgery(drainage) needed because antimicrobial agents do not reliably sterilize empyema
	Alternative/ Remarks		Cefepime/ ceftazidime + Metronidazole alternative to meropenem. Metronidazole need not be used for antianaerobic if meropenem is used
5.	Subdural empyema	Oral anaerobes, <i>H. influenzae</i>	Meropenem 3 gm/d TDS/ IV + + Vancomycin 2 gm/d, BD/ IV Duration: 3- 4 weeks after drainage Surgery(drainage) needed because antimicrobial agents do not reliably sterilize empyema
	Alternative/ Remarks		Cefepime/ ceftazidime + Metronidazole alternative to meropenem. Metronidazole need not be used for antianaerobic if meropenem is used
6.	Cavernous or Sagittal sinus thrombosis, Intracranial suppuration, thrombophlebitis	<i>S. aureus</i> , Grp A Streptococci, <i>H. influenzae</i>	Cefotaxime 12gm/day IV 4 hrly + Metronidazole 1500-2000mg/d 6 hrly IV + Vancomycin 2 gm/d, BD/ IV
7.	Meningitis post trauma or post neurosurgery	<i>S. epidermidis</i> <i>S. aureus</i> <i>P. acne</i> <i>P. aeruginosa</i> <i>A. baumannii</i>	Vancomycin + ceftazidime/cefepime/meropenem

G. Empirical antibiotic options for patients with severe sepsis or septic shock

	Suspected source				
	Lung	Abdomen	Skin/soft tissue	Urinary tract	Meninges
Major community acquired pathogens	S. pneumoniae, H. influenza, Legionella, Chlamydia pneumoniae	E. coli Bacteroides fragilis	Streptococcus pyogenes Staphylococcus aureus Polymicrobial	E.coli Klebsiella spp Enterobacter spp Proteus spp Enterococcus	S. pneumoniae N. meningitidis Listeria monocytogenes H. influenzae
Empirical antibiotic therapy	Moxifloxacin plus either cefotaxime or ceftriaxone	Imipenem 0.5 q6h or meropenem 1 g q8h Or Piperacillin – tazobactam 3.375 g q6h +/- aminoglycosides	Vancomycin 15 mg/kg q12h + Imipenem 0.5 q6h or meropenem 1 g q8h or Piperacillin – tazobactam 3.375 g q6h	Ciprofloxacin or levofloxacin (if gram positive cocci, use ampicillin + gentamycin)	Vancomycin 25 mg/kg q12h + ampicillin + either ceftriaxone or cefepime
Major commensal or nosocomial microorganisms	Aerobic gram negative bacilli	Aerobic gram-negative rods Anaerobes Candida spp.	Staphylococcus aureus Aerobic gram negative rods	Aerobic gram negative rods enterococci	Aerobic gram negative rods Staphylococcus
Empirical antibiotic therapy	Imipenem 0.5 q6h or meropenem 1 g q8h Or Cefepime 1-2 g q8h	Imipenem 0.5 q6h or meropenem 1 g q8h +/- aminoglycosides	Vancomycin 15 mg/kg q12h + Imipenem 0.5 q6h or meropenem 1 g q8h or Cefepime 1-2g q8h	Vancomycin 15 mg/kg q12h + Imipenem 0.5 q6h or meropenem 1 g q8h or Cefepime 1-2g q8h	Cefepime + Vancomycin

H. OBSTETRICS AND GYNAECOLOGICAL INFECTIONS

- ❑ Fluoroquinolones are contraindicated in 1st trimester.
- ❑ Cotrimoxazole is contraindicated in 1st trimester.
- ❑ Doxycycline is not recommended in nursing mothers. If need to administer doxycycline discontinuation of nursing (breast feeding) may be contemplated.

Infections	Likely organism	Primary treatment (presumptive antibiotics)	Alternate treatment
Asymptomatic Bacteriuria > 1,00,000 cfu/ ml of bacteria of same species in 2 urine cultures obtained 2-7 days apart. Treat as per sensitivity result for 7 days.	<i>E. Coli</i> , <i>K. pneumonia</i> <i>Proteus spp.</i> <i>CONS</i> <i>Enterococcus spp.</i>	Nitrofurantoin 100 mg Oral, BD for 7 days or Amoxicillin 500 mg Oral BD x 7-10 days .	Oral cephalosporins, TMP-SMX or TMP alone
Screen in 1st trimester. Can cause pyelonephritis in upto 25% of all pregnant women. 30 % Chance of recurrence after empirical therapy 1. Few direct effects, uterine hypo perfusion due to maternal anemia dehydration, may cause fetal cerebral hypo perfusion. 2. LBW, prematurity, premature labour , hypertension, preeclampsia, maternal anemia, and amnionitis. Need to document pyuria (Pus cells > 10/HPF)			
Group B streptococcal Disease, Prophylaxis and Treatment	Group B Streptococci	IV Penicillin G 5 million units. (Loading dose) then 2.5 -3 million units IV QID until delivery. or Ampicillin 2 gm IV (Loading dose) then 1 gm QID until delivery	Cefazolin 2 gm IV (Loading Dose) and then 1 gm TID Clindamycin 900 mg IV TID or vancomycin IV or teicoplanin for penicillin allergy
Prevalence very low so the prophylaxis may be required only on culture documented report Associated with high risk of pre-term labour, stillbirth, neonatal sepsis			
Chorioamnionitis	Group B streptococcus, Gram negative bacilli, chlamydiae, ureaplasma and anaerobes, usually Polymicrobial	Clindamycin/ vancomycin/ teicoplanin and cefoperazone-sulbactam If patient is not in sepsis then IV Ampicillin	--
Preterm Birth, 9-11% death rate in preterm infant's unfavorable neurologic outcome, lesser risk to term infants.			
Septic abortion	<i>Bacteroides</i> , <i>Prevotella bivia</i> , Group B, Group A Streptococcus, Enterobacteriaceae, <i>C. trachomatis</i> , <i>Clostridium perfringens</i> .	Ampicillin 500 mg QID + Metronidazole 500mg IV TDS	Ceftriaxone 2g IV OD
If patient has not taken any prior antibiotic (start antibiotic after sending cultures) If patient has been partially treated with antibiotics, send blood cultures and start Piperacillin- Tazobactam or Cefoperazone- sulbactam till the sensitivity report is available.			

Endomyometritis and Septic Pelvic Vein Phlebitis	Bacteroides, Prevotella bivirus, Group B, Group A Streptococcus, Enterobactereaceae, C. trachomatis, Clostridium perfringens	Same as above.	Same as above.
Obstetric Sepsis during pregnancy	Group A beta-haemolytic Streptococcus, E.coli, anaerobes.	• If patient is in shock and blood culture reports are pending, then start Piperacillin- Tazobactam or Cefoperazone- sulbactam till the sensitivity report is available and modify as per the report. • If patient has only fever, with no features of severe sepsis start amoxicillin clavulanate oral 625TDS/IV1.2 gm TDS Or Ceftriaxone 2gm IV OD+Metronidazole 500mg IVTDS+/-gentamicin 7mg/kg/day OD if admission needed. • MRSA cover may be required if suspected or colonized (Vancomycin/Teicoplanin)	
Obstetric Sepsis following pregnancy	S. pyogenes, E. coli, S. aureus S. pneumoniae, Meticillin-resistant S. aureus(MRSA), C. septicum & Morganella morganii.	Same as above	
Sources of sepsis outside Genital tract, Mastitis, UTI, Pneumonia, Skin and soft tissue (IV site, surgical site, drain site etc.)			
Syphilis	T. pallidum	Refer to STD program guidelines	
Tuberculosis in pregnancy	Similar to NON PREGNANT population with	Please refer RNTCP guideline WHO has advocated that, all the first line drugs are	
	some exceptions (see comment)	safe in pregnancy and can be used except streptomycin. SM causes significant ototoxicity to the fetus (Pyrazinamide not recommended by US FDA)	
1. Mother and baby should stay together and the baby should continue to breastfeed. 2. Pyridoxine supplementation is recommended for all pregnant or breastfeeding women taking isoniazid as well as to neonate who are being breast fed by mothers taking INH. 3. Late diagnosis can predispose to LBW, prematurity. 4. Very small chance of transmission of infection to fetus. 5. For DRTB management refer to PMDT 2017 guidelines			
VIRAL INFECTIONS (NO ANTIBIOTICS TO BE GIVEN)			

Influenza In pregnancy (seasonal And H1N1) The best preventive strategy is administration of single dose of killed vaccine.		Oseltamivir 75 mg Oral BD for 5 days	Nebulization with Zanamvir respules (2) 5 mg each, BD for 5 days
• Patients who have severe or progressive clinical illness should be treated with oseltamivir as soon as possible.(including pregnant women) • Treatment should be started as soon as possible. Laboratory confirmation of influenza virus infection is not necessary for the initiation of treatment and a negative laboratory test for H1N1 does not exclude the diagnosis in all patients, therefore early, empiric treatment is strongly recommended. • Zanamivir is the treatment of choice for all patients where oseltamivir resistance is demonstrated or highly suspected. Intravenous zanamivir may be considered where available. • Patients who have severe or progressive clinical illness, but who are unable to take oral medication may be treated with oseltamivir administered by nasogastric or orogastric tube (e.g. mechanically ventilated patients). • Patients who have severe or progressive clinical illness should be treated with oseltamivir as soon as possible. Consideration should be given to the use of higher doses, such as 150 mg twice daily (for adults), and longer duration of treatment depending on clinical response. • When a person with influenza virus infection is present in the immediate setting, severely immunosuppressed patients may be offered chemoprophylaxis with oseltamivir or zanamivir • Tendency for severe including premature labor & delivery. • Treatment should begin within 48 hrs of onset of symptoms. • Live (nasal Vaccine) is contraindicated in pregnancy.			
Varicella	Herpes virus -3	• >20 wks of gestation, presenting within 24 hours of the onset of the rash, Acyclovir 800mg Oral 5 times a day IV acyclovir recommended for the treatment of severe complications, • > 24 hrs from the onset of rash, antivirals are not found to be useful	
• VZIG should be offered to susceptible women < 10 days of the exposure. VZIG has no role in treatment once the rash appears. • The dose of VZIG is 125 units / 10kg not exceeding 625 units, IM. • Chickenpox during pregnancy does not justify termination without prior prenatal diagnosis as only. • A minority of fetuses infected develop fetal varicella syndrome.			

PARASITIC INFECTIONS		
Acute Toxoplasmosis in pregnancy	<i>T. gondii</i>	• <18 weeks gestation at diagnosis Spiramycin 1 gm Oral qid until 16-18 weeks/Pyrimethamine + sulphadiazine. Alternate every two weeks– If PCR Positive - • >18 weeks gestation and documented fetal infection by positive amniotic fluid PCR. • Pyrimethamine 50 mg Oral BD x 2 days then 50 mg OD+Sulphadiazine 75 mg/kg Oral x 1 dose then 50mg/kg bd+Folinic Acid (10-20 mg Oral daily) for minimum of 4 weeks or for duration of pregnancy.
Malaria In pregnancy	As per national program	

Diseases of genitourinary tract

Sr. no	Clinical conditions	Expected pathogens	Treatment
1.	Urethritis	Neisseria gonorrhoea Chlamydia trachomatis Trichomonas vaginalis Mycoplasma genitalium Herpes simplex virus Adenovirus Ureaplasma urealyticum	Ceftriaxone 125 mg IM OR Cefixime 400mg PO+ Azithromycin 1 g single oral dose Or Doxycyclin 100mg PO BD Duration: 7 DAYS
2.	Vulvovaginitis because <i>Candida spp.</i>	Candidiasis - Un -Complicated candidiasis : ✓ Infection with candida albicans ✓ Mild to moderate severity ✓ NO history of recent candidiasis ✓ No underline illness - Complicated candidiasis : ✓ recurrent infection 4 or more episodes per year ✓ severe infection ✓ caused by <i>Non albicans. Candida spp.</i> ✓ uncontrolled DM ✓ Debilitation ✓ Immunosuppression ✓ Pregnancy	Uncomplicated candidiasisTab. Fluconazole 150 mg single oral dose and any available topical antifungal agent Complicated candidiasis : culture confirmation is mandatory Vaginal preparations : Nystatin/ miconazole / cotrimazole / terconazole / tioconazole Tab . Fluconazole 150 mg daily for 7 to 14 days For recurrent infection : 6 months suppressive treatment with fluconazole 150 mg oral once a week or clotrimazole vaginal suppositories 500 mg once a week. - Complicated vulvovaginal candidiasis respond poorly to short course of treatment - Pregnant women should be treated with topical agents for at least 7 days - Oral Azole should not be used during pregnancy - Because of significant minority of healthy women are colonized with <i>Candida spp</i> treatment is not indicated for asymptomatic women who had positive vaginal culture
3	Vulvovaginitis	Trichomonas vaginalis Bacterial vaginosis	Metronidazole OR Tinidazole Single 2 gm PO Single dose regimen administered under direct observation has advantage of 100% compliance Alternatively , Metronidazole 500 mg PO twice daily for 7 days

4	Bacterial -Vulvovaginitis	Bacterial vaginosis	Metronidazole 500 mg PO twice daily for 7 days and Vaginal preparations containing 0.75 % metronidazole gel • Treat the partner.
5	Cervicitis	N. gonorrhoea, Chlamydia trachomatis or both Associated urethritis, endometritis or salpingitis may be present	Ceftriaxone 250 mg IM Single dose + Azithromycin 1 gm single dose OR Doxycycline 100mg BD x 7 day
6	Pelvic Inflammatory Disease	C. trachomatis N. gonorrhoea Mycoplasma Anaerobes G. vaginalis	Ceftriaxone 250mg IM single dose Or Cefotaxime + Doxycycline 100 mg PO BD for 14 days +/- Metronidazole 500 mg PO BD for 14 days
7	IV antibiotic regimens for treating Gynaecologic postoperative infections		Localized infection with minimal systemic findings Cefotaxime 1 g q8 Cefotetan 2g q12h Cefoxitin 2g q6h Ceftriaxone 2g then 1g q24h Ampicillin-sulbactam 3g q6h Ticarcillin/clavulanic acid 3.1g q4-6h Piperacillin tazobactam 3.375 g q6h Extensive infection with moderate to severe systemic finding Clindamycin 900 mg IV q8h + Gentamicin 2 mg/kg IV, then 1.5 mg/kg q8h +/- Ampicillin 2 g IV then 1 g IV q4h OR Ampicillin 2 g IV then 1 g IV q4h + Gentamicin 2 mg/kg IV, then 1.5 mg/kg q8h + Metronidazole 500mg IV q8h

I. PEDIATRIC INFECTIONS

Antimicrobial and dosage in paediatric infections

For Infant below 2 months age (more than 2kg):

Antibiotic	Each dose	Frequency		Route	Duration
		<7 days	>7days		
Inj. Cefotaxime + Inj. Gentamicin	50 mg/kg/dose 5 mg/kg/dose	12hrly 24hrly	8hrly 24hrly	IVI V	2-3 weeks
<i>2nd line therapy:</i> Meropenem+ Vancomycin	20mg/kg/dose 15mg/kg/dose	12 hly 12 hly	8hl y 8hl y	IV	2-3 weeks

- ☐ Treat bacterial meningitis due to Gram-negative bacilli or *Staphylococcus* sp for at least 21days.

For 2 months and above –

Inj Ceftriaxone (100mg/kg/day-2 divided dosage) for 10 -14 days

2nd line therapy: Meropenem (120 mg/kg/day in 3 div doses) + Vancomycin (60mg /kg/day in 4 div doses) for 10-14 days

- ☐ In case Ceftriaxone is not available, Inj Cefotaxime (200mg/kg/d, 3-4 divided doses) is given for the same duration.
- ☐ However if strong clinical suspicion for *Staphylococcus* infection in the form of skin boils, arthritis or flowing external wounds – Inj. Vancomycin can be added. In such situations the regimen is given for minimum period of 3 weeks.
- ☐ With confirmed meningococcal disease, treat with intravenous Ceftriaxone for 7days
- ☐ H influenzae type b meningitis is treated with intravenous Ceftriaxone for 10days
- ☐ S pneumoniae meningitis is treated with intravenous Ceftriaxone for 14days
- ☐ Bacterial meningitis due to *Staphylococcus* sp is treated for at least 21days.

Chemoprophylaxis for Meningococcal Disease Contacts (including non-vaccinated Hospital Staff): To be effective in preventing secondary cases, chemoprophylaxis must be initiated as soon as possible (i.e. not later than 48 hours after diagnosis of the case). Mass chemoprophylaxis not needed.

Drug	Dose (Adults)	Dose (Children)	Route	Duration
Rifampicin	600mg/12hr	10mg/kg/12hr	Oral	Two Days
Ciprofloxacin	500mg	-	Oral	Single Dose
Ceftriaxone	250mg	<15yr – 125mg	IM	Single Dose
Azithromycin	500mg	10mg/kg	Oral	Single Dose

1) LOWER RESPIRATORY TRACT INFECTION–

Community acquired Pneumonia is categorized in to 2 types –Severe pneumonia (those with respiratory distress) and pneumonia (those with fast breathing only, treated on OPD basis).

(a) For **Severe Pneumonia** (Children with respiratory distress requiring indoorcare)-

- Under 2 months of age:

- Inj Cefotaxime / Ceftriaxone and Gentamicin for 10days
- Over 2 months of age:
 - Inj. Ampicillin (50mg/kg/dose 6h) + Gentamicin (7.5mg/kg/day OD i.m or i.v) is used. Inj Ampicillin can be switched to Oral Amoxycillin (45mg/kg/day TDS) once child is stable and able to take oral feeds. Total treatment duration is 7-10days.
 - In case of no response in 2 days the patient is assessed for complications like empyema, or infection at any other site. In the absence of any complication, a 3rd generation Cephalosporin (Cefotaxime 50mg/kg/dose 6h or Ceftriaxone 75-100mg/kg/day in two divided doses, IV) is used and can be switched to oral Cefopodoxime (10mg/kg/day BD) once the child is able to take orally. Total treatment duration is 7-10 days.
 - In case the patient has severe sepsis/ septic shock, Inj. Piperacillin + Tazobactam (90mg/kg/dose 6h)+ MRSA cover with IV Vancomycin (15mg/kg/dose 6h) is recommended.

Whenever *Staphylococcus aureus* is suspected in children (see Text Box), the various drug options are:

It is important to have high index of suspicion for staphylococcal infection as the initial choice of antibiotic does not cover this less common but a more severe infection adequately. Staphylococcal pneumonia is suspected if any child with pneumonia has:

- Rapid progression of the disease, or
- Pneumatocele, or Pneumothorax, or Effusion on chest X-ray, or
- Large skin boils or abscess or infected scabies or
- Post-measles pneumonia, which is not responding within 48 hours to the initial therapy.

To cover for staphylococcal infection, Cloxacillin or other antistaphylococcal drug should be added to the initial regimen as discussed in the text.

- ☐ In severe pneumonia, use Inj. Cloxacillin or Inj Clindamycin may be added to the initial regime. OR
- ☐ Oral or IV Co- Amoxycylavulanic acid can be used.
- ☐ In very severe necrotizing pneumonia or for a patient in septic shock, MRSA cover should be added with IV Vancomycin 25-30 mg IV loading followed by 15-20 mg/kg 8-12 Hourly /) / Teicoplanin 12 mg/kg x3 doses followed by 6 mg/kg once a day or Linezolid (10mg/kg/dose 8h).
- ☐ The total duration for treatment for uncomplicated Staphylococcal pneumonia is 3-4 weeks.

(b) For **pneumonia** (OPD)

- Oral Amoxicillin (45mg/kg/day TDS) for a period of 5 days is recommended as the first choice. In case of non availability, one may use oral Co-trimoxazole (8mg/kg/day of TMP component BD).

Routine use of macrolide antibiotics for all cases of pneumonia is not advocated. Recent data suggests that (i) the routine addition of macrolides to children with CAP does not improve outcome (ii) selective use of macrolides would reduce their indiscriminate use and reduce antibiotic resistance.

Classically the mycoplasma pneumonia presents in an atypical fashion but literature suggests that it can sometimes be difficult to distinguish Mycoplasma pneumonia from a pyogenic pneumonia.

Macrolide antibiotics should be considered in following clinical scenarios where the likelihood of

Mycoplasma pneumonia is high:

- a. Children with a subacute presentation with prolonged low grade fever, persistent cough, chest signs out of proportion to the radiographic abnormality (usually showing perihilar streaky infiltrates).
- b. Children with CAP (acute pneumonia like presentation with radiological evidence of patchy or lobar consolidation) who also have or develop extrapulmonary manifestations like myocarditis, hemolytic anemias, glomerulonephritis, aseptic arthritis, CNS problems (aseptic meningitis, encephalitis, ataxia), etc.
- c. Non response to first line antibiotics in children who are immunized with Hib/PCV and have no suppurative complications of CAP.

In the first two conditions macrolide antibiotics can be used along with the first line therapy for CAP.

J. EMPYEMA

- **Proper drainage** :Forms the main core of treatment.
- **Antimicrobial Therapy:**
 - Anti- Staphylococcal penicillin (Cloxacillin 100-200 mg/kg/day) along with 3rd generation cephalosporin like Ceftriaxone may be used as first line drug.
 - Co-Amoxycylav is alternative first line therapy.
 - In seriously ill patients with disseminated staphylococcal disease and septic shock to cover for MRSA, Vancomycin is recommended. Vancomycin is less effective than the first line drugs for the commoner Methicillin sensitive strains of Staphylococcus aureus.
 - Children may continue to be febrile for 5-7 days after starting antibiotic therapy in the case of S. pneumoniae and H. influenzae and for 10-14 days in the case of Staphylococcus aureus. The clinical response to therapy should be assessed with parameters such as decrease in fever, normalization of lab parameters such as CBC count, CRP, decrease in drain volume, clearing in chest x-ray, improvement in the overall condition of the patient.
 - The decline in toxicity and fever are good signs of likely response. In case of complete non response after 96 hours of treatment, high spiking fever and persistent drainage, second line treatment may be instituted. Vancomycin should be substituted instead of the first line cloxacillin or co-amoxycylav.
 - All children with non response should be evaluated for presence of pus pockets in the pleural cavity by an ultrasound chest. Here the key lies in better drainage rather than in a change of antibiotics. Extraneous causes of fever should also be evaluated.

K. VENTILATOR ASSOCIATED PNEUMONIA:

Treat as per the sensitivity pattern of your ICU. General Suggestion:

Potential Pathogens	Combination antibiotic therapy
<i>Pseudomonas aeruginosa</i> Or <i>Klebsiella pneumoniae</i> (ESBL) Or <i>Acinetobacter species</i>	Beta Lactam + beta lactamase inhibitor (Piperacillin – Tazobactam) Plus Either Aminoglycoside (Amikacin, Gentamicin, or Tobramycin) OR Antipseudomonal fluoroquinolone (Cipro/ Levofloxacin)
Methicillin – resistant <i>Staphylococcus aureus</i> (MRSA)	Vancomycin or Linezolid

Second line Therapy

- Meropenem – 60 mg/kg/day I/V every 8 hrly AND Vancomycin - 40 mg/kg/day I/V every 6 - 8hrly

Third line Therapy

- Colistin base IV., 2.5 – 5 mg/kg/day I/V every 6 – 12 hrly (1mg= 30000 IU) AND Vancomycin - 40 mg/kg/day I/V every 6 - 8hrly

L. UPPER RESPIRATORY TRACT INFECTIONS

As these are mostly viral in origin, **antibiotics are not needed** barring following situations.

(a) Bacterial Pharyngotonsillitis (Group A Streptococcus)–

Any of the following Antibiotic (route)	Children (<30kg) (days)	Children (>30kg) (days)
Penicillin V (Oral)	250 mg BID x 10 days	500 mg BID x 10 days
Amoxycillin (Oral)	40 mg/kg/day x 10 days	250 mg TID, can be given BID
Benzathine Penicillin G (IM)	6 Lakh units (Single Dose)	12 Lakh units (Single Dose)

While Penicillin is the drug of choice Amoxycillin is good alternative and used widely.

If the patient is **Penicillin allergic**, the alternative drugs are

Antibiotic (route)	Dose and duration
Erythromycin (oral)	40-50 mg/kg/day BID or TID x 10 days
Azithromycin (oral)	12 mg/kg OD x 5 days
First Generation Cephalosporin (oral) (10 days) (if only, it is non Type 1 allergy to penicillin)	Cefaclor (20-40 mg/kg/d in 3 divided doses) / Cephalexin (50 mg/kg/d in 3 divided doses)

(b) Faucial diphtheria

- ⌚ Inj.Crystalline Penicillin (100,000-150,000 Units/kg/day I.V 6h) for 10 days in recommended. Alternatively, Inj.Procaine Penicillin 25,000-50,000 U/kg/day BD maximum of 12 lakh units i.m. can be used.
- ⌚ In case of penicillin allergy, Erythromycin (40-50mg/kg/day TDS/QID for 14 days or Azithromycin 10mg/kg/day OD for 5 days can be given.

(c) Acute otitis media (AOM)–

- ☐ Oral Amoxicillin (45mg/kg/day TDS/50-60mg/kg/day in two divided doses) for 7 to 10 days is recommended.
- ☐ For severe cases (Severe Otagia and/ or Temp >39°C), Co-Amoxycillin Clavulanate (45 mg/kg/day po BD) or Inj.Ceftriaxone 75 mg/kg/day OD can be used.
- ☐ In case of penicillin allergy, Cefdinir (14 mg/kg/d in 2 divided doses) can be used.
- ☐ Total duration of treatment is recommended for 7 to 10 days.

(d) Mastoiditis And Other Acute Ear Infection

- ☐ Inj. Amoxicillin-clavulanate OR 3rd Gen Cephalosporin (Ceftriaxone/cefotaxime).

(e) CSOM

- ☐ Routinely systemic antibiotic is not recommended until there is exacerbation and these are referred to ENT

(f) Acute Sinusitis with URI-

- ☐ Oral Amoxycillin (45 mg/kg/day TDS) for 7-10 days is recommended.
- For severe cases, Amoxycillin Clavulanate (45 mg/kg/day oral BD) or Inj.Ceftriaxone 75 mg/kg/day OD can be used.

(g) Ludwig's Angina

- ☐ 1st line : Clindamycin IV 8 hourly or Amoxicillin-Clavulanate IV
- ☐ 2nd line : Piperacillin-Tazobactam IV 6 hourly

(h) Pertussis

- ☐ Erythromycin for 14 days, Azithromycin for 5 days, Clarithromycin for 7 days and have similar efficacy but differ in terms of cost, duration of therapy, side effects, tolerability, likelihood of drug interaction. Considering all factors, Azithromycin in a dose of 10 mg/kg once a day for 5 days in infants less than 6 months and 10 mg/kg on day 1 and then 5 mg/kg day on 2 to 5 days is the cheapest, shortest best tolerated and most convenient option and can be safely given to infants less than 1 month (unlike all other macrolides).

M. GASTRO-INTESTINAL DISEASES

(1) Dysentery

- (a) For inpatients- Inj Ceftriaxone (100mg/kg) for 5-7days.
- (b) For OPDcases
 - Cefixime (8mg/kg/day BD) Or Azithromycin 10-20 mg/ kg (ceiling dose of 1 gm) for 5 days.
 - In case of non response after 2 antibiotics, investigate for appropriate therapy. Fluoroquinolones are not preferred due to high level of resistance in many parts of the country.

(2) Cholera

- Single dose oral azithromycin 10 mg/ kg (ceiling dose of 1 gm) or Doxycycline (50mg for less than 3 years and 100 mg for those above).

(3) Enteric Fever

- (a) For OPDcases-
 - Oral Cefixime 20 mg/kg/day (max dose of 1200) for 14 days or azithromycin 10-20 mg/kg (ceiling dose of 1 gm) for 7-10 days. Antibiotic therapy should be continued till one week post-fever defervescence.
- (b) For inpatients
 - Inj Ceftriaxone 100 mg/ kg/day and shift to oral cefixime once fever resolves. Antibiotic therapy should be continued till one week post-fever defervescence.
 - Second line:
 - a) Ofloxacin 15mg/kg/d in two divided doses for 10-14 days. Antibiotic therapy should be continued till one week post-fever defervescence.
 - b) Chloramphenicol (50- 75mg/kg/day PO) x 14days
 - c) TMP-SMX (8 mg/kg/day of TMP PO) x 14days

(4) Peritonitis

For primary peritonitis in nephrotic syndrome: Inj. Ampicillin + Aminoglycoside **OR** inj. cefotaxime for primary peritonitis in a cirrhotic, inj. cefotaxime.

(5) Liver Abscess

1 st Line	2 nd Line	
Amoxycillin-clavulanate/3 rd generation cephalosporin ± Aminoglycoside Metronidazole (30-50 mg/kg/d in 3 divided	Piperacillin-Tazobactam IV	Ultrasound guided drainage indicated in large abscesses, signs of imminent rupture and no response to medical treatment.

doses for 10-14 days) is added if Amoebic abscess suspected		
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Total duration of therapy is 4-6 weeks

N. URINARY TRACT INFECTION (UTI)

a) Uncomplicated UTI (age > 2 months with lower UTI, without any urinary tract obstruction) –

Oral Cotrimoxazole (8-10mg of TMP component)

/kg/day oral BD OR

Cefixime (8-10 mg/kg/day BD) to be given for

7-10 days OR

Co Amoxicillin+Clavulanic Acid (30-50 mg of Amoxicillin) for 7-10 days.

b) Complicated / Severe UTI (Febrile UTI, Systemic toxicity, renal angle tenderness or with any urinary structural abnormality) and **all UTI in children less than 2 months** should be treated with parenteral antibiotics.

Inj. Cefotaxime(150-200mg/kg/day8h)

OR Inj. Ceftriaxone(100mg/kg/dayOD OR Inj. Amikacin 15mg/kgOD

To be given for 10-14days

c) In Immunocompromised host/ severe systemic sepsis or as second line for complicatedUTI-

Inj. Piperacillin Tazobactam 90mg/kg/dose IV 6h) or Inj. Meropenem (20-40mg/kg/dose 8h)

To be given for 10-14 days

O. FEBRILE NEUTROPENIA

1st Line	2nd Line	3rd Line
Ceftazidime (150 mg/kg/day in 3div doses)+ Amikacin (15-20mg/kg/day in 2 or 3 div doses)	Piperacillin + Tazobactam (200- 300 mg/kg/day IV in 3-4 div doses)+ Vancomycin (40 mg/kg/day IV in 4 divided doses)	Meropenem (60 mg/kg/day in 3 div doses) + Amphotericin B (1 mg/kg/day IV for 2 weeks) or liposomal Amphotericin B 1-5 mg/kg/day, usually 3 mg/kg/day

- ☐ Patients without an identified etiology who become afebrile within first 3-5 days of therapy and are clinically well with ANC of > 200 cells/cmm can be shifted to oral antibiotics (Cefixime or Co- Amoxy- Clavulanic acid) and therapy should be continued for minimum 7 days.
- ☐ However, if fever persists or ANC remains <200 parenteral therapy should be continued with 2nd line antibiotics
- ☐ In clinically stable patients without an identified etiology but with persistent neutropenia, therapy can be stopped after 2 weeks.

Presumptive therapy for initial antimicrobial coverage in critically ill children with severe sepsis and septic shock

Antibiotics should be administered within 1 hour of the identification of severe sepsis and septic shock, if possible, after obtaining appropriate cultures. The initial empiric antibiotic therapy should include one or more drugs that have activity against the likely pathogens and that penetrate the presumed source of sepsis. Initially, broad antibiotic coverage is recommended. Following are the general rules which can help for decision making:

- I. All children with septic shock should receive coverage for methicillin-resistant *Staphylococcus aureus* (MRSA) initially at recognition of the event.
- II. Coverage for enteric organisms should be added whenever clinical features suggest genitourinary and/or gastrointestinal sources (eg, perforated appendicitis or bacterial overgrowth in a child with short gut syndrome).
- III. Treatment for *Pseudomonas* species should be included for children who are immunosuppressed or at risk for infection like those with cystic fibrosis).
- IV. When treating empirically, antibiotics which can be given by rapid intravenous bolus (eg, beta-lactam agents or cephalosporins) should be administered first followed by infusions of antibiotics, such as [vancomycin](#), that must be delivered more slowly.
- V. Ongoing antimicrobial therapy should be modified based upon culture results, including antimicrobial susceptibility and the patient's clinical course.

Suggested initial empiric antimicrobial regimens based upon patient age, immunocompetence, and previous antibiotic administration include:

1. Children >28 days of age who are normal immunocompetent patient:

- a) Ceftriaxone/Cefotaxime plus Vancomycin//Teicoplanin
- c) Consider adding an aminoglycoside (eg, [gentamicin](#)/amikacin) if possibility of genito- urinary source is likely
- d) Consider adding [piperacillin](#)-tazobactam / [clindamycin](#) / [metronidazole](#) if possibility of gastro-intestinal source

2. Children >28 days who are immunosuppressed or at risk for infection with *Pseudomonas* species:

- a) Ceftazidime or Cefepime plus Vancomycin/Teicoplanin
- b) add an aminoglycoside or carbapenem in settings if bacterial organisms with extended-spectrum beta-lactamase (ESBL) resistance are prevalent.
- c) addition of a carbapenem is favored over an aminoglycoside if the patient has received any broad-spectrum antibiotics like 3rd generation cephalosporin, aminoglycoside or fluoroquinolone within two weeks.

3. Children who cannot receive penicillin or who have recently received broad-spectrum antibiotics:

- a) Vancomycin/Teicoplanin plus Meropenem*

* Alternatives to Meropenam

- i) Aztreonam OR
- ii) Ciprofloxacin plus Clindamycin

4. Patients at increased risk of fungal infection (immunocompromised with persistent fever on broad spectrum antibiotics) or with an identified fungal source.

Add the following antifungals to the antimicrobial regimen

- a) Liposomal Amphotericin B or
- b) an echinocandin (eg, caspofungin, micafungin)

5. Patients with risk factors for rickettsial infection (eg, travel to or reside in an endemic region): Add a tetracycline antibiotic (eg, doxycycline) to the antimicrobial regimen

The empiric drug choice should be in accordance with the ongoing epidemic and endemic infections eg,

H1N1, methicillin-resistant *S. aureus*, chloroquine-resistant malaria, penicillin-resistant pneumococci.

Control of the Infection Source

The source of the infection should be located and treated early and aggressively. Conditions requiring debridement or drainage include necrotizing pneumonia, necrotizing fasciitis, gangrenous myonecrosis, empyema, and abscesses. Perforated viscus requires repair and peritoneal washout. If intravascular access devices are a possible source of severe sepsis or septic shock, they should be removed promptly after other vascular access has been established.

Duration of antibiotic therapy for sepsis

It will depend on the foci of infection, immune status of the patient and response to the antibiotics. If there are no complications the duration of therapy is 7-10 days. Longer courses may be appropriate in patients who have a slow clinical response, undrainable focus of infection, bacteremia with *S. aureus*; some fungal and viral infections or immunologic

deficiencies, including neutropenia. Use of procalcitonin levels or similar biomarkers may assist the clinician in the discontinuation of empiric antibiotics in patients.

P. Management of Central line/long line catheter-Related Infections -

1. Empirical coverage if suspecting gram-negative bacilli

Choice should be based on local antimicrobial susceptibility and the severity of disease (a fourth-generation cephalosporin, carbapenem, or β -lactam/ β -lactamase combination, with or without an aminoglycoside).

2. Empirical antimicrobial therapy if suspecting MRSA

- for health care settings with an elevated prevalence of MRSA- Vancomycin is recommended
- for institutions in which the most of MRSA isolates have vancomycin minimum inhibitory concentration (MIC) values ≥ 12 mg/mL- Daptomycin, should be used.
- Linezolid should not be used for empirical therapy.

3. Empirical combination antibiotic coverage for MDR gram-negative bacilli, such as *Pseudomonas aeruginosa*, should be used when CRBSI is suspected in

- Neutropenic patients
- severely ill patients with sepsis
- patients known to be colonized with such pathogens, until the culture and susceptibility data are available and de-escalation of the antibiotic regimen can be done.

4. Empirical therapy for suspected CRBSI involving femoral catheters in critically ill patients should include coverage for gram-positive pathogens, gram-negative bacilli and *Candida* species.

5. Empirical therapy if catheter-related candidemia is suspected*-

- Echinocandin
- Fluconazole can be used in patients without azole exposure in the previous 3 months in health care settings where the risk of *Candida krusei* or *Candida glabrata* infection is very low.

*It should be suspected in septic patients with any of the following risk factors: total parenteral nutrition, prolonged use of broad-spectrum antibiotics, hematologic malignancy, receipt of bone marrow or solid-organ transplant, femoral catheterization, or colonization due to *Candida* species at multiple sites.

6. Antibiotic lock therapy should be used for catheter salvage; however, if antibiotic lock therapy cannot be used, systemic antibiotics should be administered through the colonized catheter.

Duration of antimicrobial therapy

- **Uncomplicated Short term central venous or arterial catheter related blood stream infection**

a. Coagulase negative staph:

i) treat for 5-7 days, if the catheter is removed

ii) treat for 10-14 days, if the catheter is retained

b. Staph aureus :- treat for more than 14 days

c. Enterococcus :- treat for 7-14 days

d. Gram negative bacilli :- treat for 7-14 days

e. Candida sp. :- treat for 14 days after the first negative blood culture,

1. Remove the catheter 2. Treat with systemic antibiotics
--

- **Complicated Short term central venous or arterial catheter related bloodstream infection**

Four to 6 weeks of antibiotic therapy should be administered to patients with persistent fungemia or bacteremia after catheter removal (i.e., occurring more than 72

hours after catheter removal), and to patients who are found to have infective endocarditis or suppurative thrombophlebitis, and to pediatric patients with osteomyelitis.

- **Brain abscess**

Inj Ceftriaxone + Vancomycin OR Inj Teicoplanin + Metronidazole,

Drain pus, rationalize antibiotics according to culture and sensitivity and continue for 3 to 4 week.

- **Osteomyelitis –**

Co-Amoxy clavulanic + Gentamicin

- **Septic arthritis**

1st line Inj Co-Amoxy clavulanic + Gentamicin

2nd line Inj Ceftriaxone//cefotaxime +/-Vancomycin

- **Tetanus –** Inj Crystalline Penicillin (2 lac IU /kg/ d /12 hourly) or Inj Metronidazole (mg/kg/d).

- **Acute endocarditis –** Inj Crystalline Penicillin/ampicillin + Gentamicin for 3-4 weeks is given which is tailored depending upon culture & sensitivity report.

- **Malaria -** As per National Malaria Control Program guidelines.

- **Tuberculosis in children : Refer to RNTCP guidelines**

- **Acute rheumatic fever (arf)**

Antibiotic	Dose	Route	Frequency	Duration
Primary prophylaxis for rheumatic fever (Treatment of group A streptococcal tonsillo-pharyngitis) The primary goal of treating an ARF attack is to eradicate streptococcal organisms and bacterial antigens from the pharyngeal region. The antibiotic therapy is very effective if started within 9 days after onset of symptoms to prevent rheumatic fever specially carditis.				
Benzathine Penicillin G* [After sensitivity testing] According to weight of the child	weight $\geq$ 27 kg :- 1.2 million units weight < 27 kg :- 0.6 million units	Deep intramuscular injection	Only once Single dose	Single dose
Alternative antibiotics				
Azithromycin	12.5 mg/kg/day divided	Oral	OD	5 days
Amoxicillin	25–50mg/kg/day divided Adult dose 750-1500 mg/day	Oral	TDS	10 days
Cephalexin	15-20 mg/kg/dose	Oral	BD	10 days
Erythromycin	250 mg #OR 40 mg/kg/day divided	Oral	QID	10 days
Penicillin-V	250 mg Adult dose 500mg	Oral	QID	10 days
Secondary prophylaxis for rheumatic fever It involves continuous administration of antibiotics in patients with a previous attack of RF and/or rheumatic heart disease. It is mandatory for all patients who have had an attack of RF, whether or not they have residual rheumatic valvular heart disease.				
Benzathine Penicillin G	Same as above	same	same	Every 3-4 weeks
Penicillin V	Same	same	BD	See below
Sulfadiazine (patients allergic to penicillin)	weight >27 kg:- 0.5 g weight $\geq$ 27 kg:- 1 g	oral	OD	See below
Erythromycin (patients allergic to penicillin & sulfadiazine)	Same	same	BD	See below

*Contraindicated in penicillin allergy

maximum dose-500mg; contraindicated in liver disorders; can be given in patients with penicillin allergy; do not use if high rates of group A streptococcal macrolide resistance prevalent.

Duration for secondary prophylaxis:

It depends on the presence of carditis during the acute episode.

1. NO carditis: continue for 5 years after last attack or 18 years of age [whichever is longer]
2. Carditis present (healed carditis or mild mitral regurgitation): continue for 10 years after last attack or 25 years of age [whichever is longer]
3. Carditis present (established heart disease or following valve surgery or balloon mitral valvotomy): continue lifelong
4. Expert consultation should be sought if want to discontinue after 40 years of age instead of

life-long prophylaxis as recurrence beyond this age is minimal.

- **Paediatric surgical cases**

Clean Surgery	Clean Surgery likely to be contaminated	Contaminated/dirty Surgery or Peritonitis
Surgeries like Uncomplicated Hernia, cyst excision, hydrocoele - No Pre-operative prophylaxis needed For all other surgeries under this group: Inj Ceftriaxone 50 – 75 mg/kg/day I.V or I/M single dose half an hour before surgery	For GI surgeries Inj Ceftriaxone 50 – 75 mg/kg/day, I.V or I/M 12 hly doses AND Metronidazole 20 – 30 mg/kg/day I/V every 8 hrly Given for 48hrs only. Urinary tract surgeries Inj Ceftriaxone 50 – 75 mg/kg/day I.V or I/M 12hrly doses Do not continue beyond 48hrs of surgery	All surgeries under this group Inj Ceftriaxone 50 – 75 mg/kg/day, I.V or I/M 12hrly doses AND Metronidazole 20 – 30 mg/kg/day I/V every 8 hrly AND Gentamicin 7.5mg/kg/d 24hrly IV or IM 2nd Line Piperacillin + Tazobactam (200-300 mg/kg/day IV in 3-4 div doses) + Vancomycin (40 mg/kg/day IV in 4 divided doses)

Cellulitis/ Abscesses	Cloxacillin(50-100 mg/kg/d)in 3-4 divided doses OR Co- Amoxy-Clav OR Cefazolin (50 mg/Kg/d in 6-8 h doses)	Clindamycin (20-40mg/Kg/d in 6-8 hly doses)	Treat for 5-7 days.
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- **Neonatal infections**

- a. **Septicemia or pneumonia**

1. In asymptomatic babies at high risk of sepsis eg. presence of foul smelling liquor or two or more risk factors listed below warrants the initiation of antibiotic therapy.

Risk factors for Early onset sepsis are :

- (a) Maternal fever (Temperature $\geq 38^{\circ}\text{C}$) before delivery or during labor
 - (b) Membranes ruptured for more than 24 hours before delivery.
 - (c) More than three vaginal examinations during labor.
 - (d) Low birth weight (<2500 gms) or preterm babies.
 - (e) Prolonged and difficult delivery with instrumentation.
 - (f) Perinatal asphyxia. (Apgar < 4 at 1 min of age)
 - (g) Meconium stained liquor.
2. A sepsis screen should be done in such infants. If two sepsis screens (NNF protocols) done at 12 hours interval or a single sepsis screen is negative and infant remains asymptomatic at 48 -72 hours, the antibiotics may be discontinued.

Antibiotic	Each dose	Frequency		Route	Duration(Days)
		< 7 days	> 7 days		
Inj. Ampicillin And Inj. Gentamicin	50 mg/kg/dose	12 hrly	8 hrly	IV	7-10
	5-7.5 mg/kg/dose	24 hrly	24 hrly	IV	7-10

- o In cases with severe sepsis (Sclerema/ Shock / suspicion of meningitis) Inj Cefotaxime 200 mg/kg/day IV in 4 divided doses)
+ Amikacin (15mg/kg/d) is recommended
- o If sepsis is suspected to be healthcare associated or if the not responding 48-72 hours of initial therapy or if there is documented resistance then change to injection Piperacillin- Tazobactam (200-300 mg/kg/day IV in 3-4 div doses) and Amikacin.
- o Vancomycin can be added to the regime if staphylococcus is suspected.

- b. **Neonatal meningitis**

	Antibiotic	Dose	Frequency		Route	Duration (Weeks)
			< 7 days	> 7 days		
First Line	Inj. Ampicillin and Inj. Gentamicin	100 mg/kg/dose	12 hrly	8 hrly	IV	3
		5-7.5 mg/kg/d	5 mg/kg/d 24 hrly	7.5 mg/kg/d 24 hrly	IV	3
Second Line	Inj. Cefotaxime and Inj. Gentamicin	50mg/kg/dose	12 hrly	8 hrly	IV	3
		5-7.5mg/kg/d	5 mg/kg/d 24 hrly	7.5 mg/kg/d 24 hrly	IV	3

J. Surgical antimicrobial prophylaxis

- To be administered within 1 hr before the surgical incision.
- Single dose is recommended. Consider for second intra-operative dose in prolonged surgery based on the choice of antibiotic used for prophylaxis.
- Prophylaxis should **not** be given beyond surgery duration (except for cardiothoracic surgery, up to 48 hours permissible)
- Choice of the prophylaxis should be based on the local antibiogram.

SURGERY	MEDICATION
Breast	Inj.Cefazolin 2gm or Inj.Cefuroxime 1.5gm IV stat
Gastroduodenal & biliary	Inj.Cefaperazone- Sulbactam 2gm IV stat & BD for 24hrs(maximum)
ERCP	Inj.Piperacillin-Tazobactam 4.5gm or Inj.Cefaperazone- Sulbactam 2gm IV stat
Cardiothoracic	Inj.Cefuroxime 1.5gm IV stat & BD for 48hrs
Colonic surgery	Inj.Cefaperazone- Sulbactam 2gm IV stat & BD for 24hrs(maximum)
Abdominal surgery (hernia)	Inj.Cefazolin 2gm or Inj.Cefuroxime 1.5gm IV stat
Head & Neck/ ENT	Inj.Cefazolin 2gm IV stat
Neurosurgery	Inj.Cefazolin 2gm or Inj.Cefuroxime 1.5gm IV stat
Obstetrics & Gynecology	Inj.Cefuroxime 1.5gm IV stat
Orthopaedic	Inj.Cefuroxime 1.5gm IV stat & BD for 24 hrs(maximum) or Inj.Cefazolin 2gm IV stat Open reduction of closed fracture with internal fixation- Inj.Cefuroxime 1.5gm IV stat and q 12h or Inj.Cefazolin 2gm IV stat and q 12h for 24 hrs
Trauma	Inj.Cefuroxime 1.5gm IV stat and q 12h (for 24 hrs) or Inj.Ceftriaxone 2gm IV OD
Urologic procedures	Antibiotics only to patients with documented bacteriuria
Trans- rectal prostatic surgery	Inj.Cefaperazone- Sulbactam 2gm IV stat

- Bone and joint infections

Sr. No.	Clinical Conditions	expected pathogens	Empiric (presumptive) antibiotics/First Line
1.	Acute Osteomyelitis	<i>S.aureus</i> Grp A Strep Gram negative bacilli	S.aureus: Nafcillin sodium or oxacillin sodium 1.5- 2 g IV Q 4hrly for 4-6 wks or Cefazolin 1-2 gmIV q 8 hr for 4-6 wks MRSA: Vancomycin 15 mg/kg IV q12 hr for 4-6 wks or Daptomycin 6mg/kg IV q24 hr Grp A Streptococci/ Enterococci: Aq. Penicillin G 20X10⁶ unit/24 hr IV either continuously or in 6 equally divided daily doses for 4-6 weeks or ceftriaxone 1-2 g IV or IM q24 hr for 4-6 weeks or Cefazolin 1-2 gm IV q 8hr for 4-6 weeks or Ampicillin sodium 12 g/24 hr IV either continuously or in a 6 equally divided daily doses. Enterobacteriaceae: Ceftriaxone 1-2 g IV q24 hr for 4-6 weeks Pseudomonas aeruginosa: Cefepime 2g IV q12 hr for 4-6 weeks
	Alternative/ Remarks		Short duration therapy have a high relapse rate. It takes 6 weeks for the debrided bone to be covered by vascularized soft tissue, hence total duration Of 4-6 weeks of treatment is advocated
2.	Chronic Osteomyelitis	<i>S. aureus</i> Enterobacteriaceae <i>Pseudomonas</i>	Same as above. Surgical debridement should be considered in patients with large paravertebral abscess, when an epidural abscess is compressing the spinal cord, when medical management fails, or when spine is medically unstable.
	Alternative/ Remarks		
3	Septic Arthritis	<i>S. aureus</i> (<3 months) Enterobacteriaceae Grp B Streptococcus <i>N. gonorrhoeae</i> (3 months- 14 yrs)	Gram positive cocci: Vancomycin 15-20 mg/kg daily administered q 8-12 hrs Gram negative cocci: Ceftriaxone 1 g q24 hrs Gram negative rods: Ceftazidime 2 g q8 hrs or Cefepime 2g q12 hrs or Piperacillin-tazobactam 4.5 g q 6hrs or a carbapenem (Imipenem 500 mg q 6 hr, Meropenem 1 g q 8hrs or Doripenem 500mg q8hr) Significant Penicillin/cephalosporin allergy: Aztreonam 2g q8hrs/Fluroquinolones (Ciprofloxacin 400mg IV q 12 hrs or levofloxacin

			750 mg IV q24 hrs)
	Alternative/ Remarks		Antimicrobial therapy for native joint bacterial arthritis should be initiated without delay to limit articular destruction. Initial antibiotic selection is dictated by synovial fluid gram stain or probable infecting pathogens or both as determined by the clinical presentation. IV antimicrobials usually are continued for 2 to 4 weeks.
4	Open injuries	Gram negative rods <i>S. aureus</i>	Cefuroxime 1.5 gm IV BD + Amikacin 750 mg IV OD + Metronidazole 500 mg TDS Continued for 7 to 10 days as per wound healing status Switch to oral Co-amoxiclav BD Duration : 5 days
5	Prosthetic Joint infection	Grp A, B, G & viridans Streptococci <i>S. aureus</i> CoNS Enterococcus Gram negative bacilli	Treatment involves complete removal of all foreign materials. Protocol incorporates standardized antimicrobial therapy with a two stage surgical method- removing the prosthesis and cement in the first stage followed by 6 weeks course of bacteriocidal antibiotic therapy chosen on the basis of susceptibility testing. Empirical antimicrobial therapy: Vancomycin 15 mg/kg IV QDS + Gentamicin 1 mg/kg IV TDS Or Amikacin 750 mg IV OD
	Alternative/ Remarks		
6	Bursitis	<i>S. aureus</i>	Treatment includes antibiotic and daily aspiration of the bursa until sterile fluid is obtained. Antimicrobial selection should be based on bursal aspirate, gram stain. Oral antimicrobials with antistaphylococcal activity are initially indicated for mild cases. High prevalence of CA-MRSA in many localities clindamycin, trimethoprim/ sulfamethoxazole, minocycline are appropriate choices. For more severe cases or patients with chronic illness or immunosuppressive IV antimicrobials should be selected. Duration of treatment: 10-14 days
7	Gas Gangrene	Clostridia	Surgical debridement is primary therapy Hyperbaric oxygen debated Antibiotics Penicillin + Clindamycin Or In Penicillin allergic patients, Clindamycin + Metronidazole Clindamycin 900mg IV TDS Penicillin G 24 million units/day divide 4-6 hrly IV

			Metronidazole 500mg IV TDS Duration: 2-4 weeks depending on patient's response
	Alternative/ Remarks		Penicillin to be administered only after test dose. A combination of penicillin and metronidazole may be antagonistic and is not recommended. Ceftriaxone 2 gm IV BD Or Erythromycin 1 gm QDS IV (not by bolus)

- Ophthalmic infections**

Sr. No.	Clinical Conditions &	expected pathogens	Antimicrobial of choice Dose/ Route/ Frequency/ Duration
1	Blepharitis (anterior and posterior)	S.aureus, S. epidermidis, non-infective causes	Oral tetracycline Gentle eyelid scrub twice daily with baby shampoo with addition of bacitracin ointment to lid margin
2.	Hordeolum (stye)	S. aureus	Warm compresses Topical bacitracin or erythromycin ointment
3.	Purulent conjunctivitis	Viral Adenovirus Bacterial- Chlamydia, S. aureus, N. gonorrhoeae, S. pneumoniae, H. influenzae	Topical Moxifloxacin 0.5% 1 hourly to QDS Duration: approx. 1 week. Gatifloxacin eye drops 4 times /day for 1 wk 1. Lid hygiene 2. Protective glasses
4.	Inclusion Conjunctivitis	Chlamydia	Systemic tetracycline 250 mg PO QDS or doxycycline 100mg PO BD; (Avoid in pregnant women and in children) or erythromycin 250mg PO BD for 3 weeks
5.	Orbital Cellulitis	S. pneumonia H. influenzae M. catarrhalis S.aureus Anaerobes Grp A Streptococci Gram negative bacilli Post trauma	Immediate surgical drainage Ampicillin-sulbactam 1.5 to 3 gm IV TDS+ Metronidazole 500 mg IV TDS infusion Duration: 7 -14 days If MRSA is suspected, add Vancomycin 1 gm (15mg/ kg) IV BD to the above regimen. Start organism specific treatment after culture sensitivity report. Consider fungal culture also.
6.	Corneal ulcer/ keratitis	Viral HSV Varicella Zoster	Viral- Topical Acyclovir 0.3% e/o 5 times a day + Acyclovir 400mg PO 5 times if accompanied by iritis Duration: 3 weeks Acyclovir 400mg PO BD in recurrent herpetic eye disease

7.	Eye infections in contact lens users	Acanthamoeba spp/ Pseudomonas	PHMB (0.02%) hourly + Chlorhexidine (0.02%) Duration: 2 days, then tapered. Pseudomonas keratitis – topical and systemic antibiotics Tobramycin 1.3% Duration: 15 days
8.	Dacrocystitis	H.influenzae S.aureus S. pyogenes P. aeruginosa	Antibiotic therapy (Ampicillin-sulbactam) Incision and drainage
9.	Endophthalmitis	S. epidermidis S.aureus Streptococcus spp Enterococcus spp. Gram negative bacilli Anaerobes	Intravitreal Antibiotics Vancomycin 1 mg in 0.1ml Ceftazidime/ Cefazolin 2.25 mg in 0.1 ml sterile water or normal saline If patient fails to improve repeat by 24- 48 hrs vitrectomy with repeat antibiotics is indicated Systemic + topical antibiotics Vancomycin 1 gm IV BD + Amikacin 240 mg IV TDS or Vancomycin + ceftazidime 2 gm IV TDS
10	Retinitis	HSV Varicella Zoster virus	High dose IV Acyclovir (10mg/kg every 8 hrs with normal renal function) for 1 to 2 weeks followed by valacyclovir or famciclovir for 6 weeks to several months
11	Iridocyclitis		Steroid e/d Prednisolone 0.5% start one hrly with tapering + Homatropine 2% e/d BD Duration: approximately 5 days
12	Uveitis	Infectious Traumatic Immune mediated Viral Herpes simplex	Topical Steroids Oral acyclovir (400mg twice daily)

K. Treatment of Multi-Drug Resistant Bacterial Pathogens

1. Methicillin- Resistant *S. aureus*(MRSA)

- a. These organisms are considered resistant to all penicillins, cephalosporins and macrolides.
- b. Though MRSA strains may be reported as susceptible to Fluoroquinolones, aminoglycosides, chloramphenicol and doxycycline in-vitro, these drugs are NOT to be used alone or as initial treatment for serious MRSA infections.
- c. Rifampicin use should be avoided in diseases other than Mycobacterial diseases.
- d. The drug of choice for treatment of infections due to MRSA is the glycopeptides i.e Vancomycin and Teicoplanin.
- e. Linezolid can be used to treat skin and soft tissue infections caused by MRSA.
- f. Mupirocin local application (intranasally bid x 5 days) for eradicating nasal carriage.
- g. Daptomycin: Daptomycin is an intravenous antibiotic approved to be used for the treatment of complicated skin infections and *Staphylococcus aureus* bacteraemia. Daptomycin should NOT be used for treatment of pneumonia due to its inactivation by surfactant.

2. Vancomycin Resistant Enterococcus(VRE)

Enterococci are a therapeutic challenge because of their intrinsic resistance to many antibiotics. The acquisition of resistance to vancomycin by enterococci has seriously affected the treatment and infection control of these organisms.

The treatment for VRE should be based on infection severity and in-vitro susceptibility of the strain to other antibiotics.

- **Linezolid:** Linezolid is the only drug specifically approved for the treatment of VRE-blood stream infections. Linezolid may be particularly useful in patients who require oral or outpatient therapy (when intravenous therapy is undesirable), who are intolerant to glycopeptides, or who have impaired renal function. Linezolid is a bacteriostatic agent; furthermore, linezolid toxicity when administered for prolonged courses may limit its use in VRE endocarditis.
- **Ampicillin:** Isolates that remain relatively susceptible to penicillin or ampicillin may be treated with high doses of these agents.
- **Daptomycin:** Not approved for treatment of VRE infection. Not approved for treatment of endocarditis. Limited clinical information for VRE, but bactericidal activity makes consideration of this agent as sole therapy in serious infections. However, emergence of resistance during therapy has been reported.
- **Doxycycline:** Not a first line therapy. For susceptible isolates, not for bacteremia or endocarditis. It should not be used as monotherapy.
- **Nitrofurantoin:** Uncomplicated UTIs have been treated successfully with nitrofurantoin.
- **Fosfomycin:** For urinary tract infections (cystitis) with isolates susceptible to fosfomycin.
- **Chloramphenicol:** For chloramphenicol-susceptible isolates of *E. faecium* and *E. faecalis*. Not a first-line therapy and it should not be used as monotherapy.
- **Gentamicin or streptomycin:** To be used in combination with ampicillin for the treatment of enterococcal endocarditis caused by organisms susceptible in vitro to either agent; streptomycin is used when gentamicin cannot be used because of resistance.
- **Tigecycline:** Tigecycline has *in vitro* activity against a broad spectrum of Gram-positive and -negative bacteria, anaerobes as well as multidrug-resistant pathogens such as MRSA and VRE. However, there is not much clinical data regarding its use for treatment of VRE infections.

3. Extended Spectrum Beta-Lactamases (ESBL) Producing Enterobacteriaceae.

- a. ESBLs are plasmid mediated β -lactamases that confer resistance to broad spectrum β -lactam antibiotics including third and fourth generation cephalosporins, aztreonam, and extended spectrum penicillins. These plasmids often encode mutations which confer resistance to other broad spectrum agents including aminoglycosides, co-trimoxazole and fluoroquinolones, resulting in organism resistant to most broad spectrum antibiotics.
- b. A major problem with ESBLs is their capacity to cause therapeutic failure with cephalosporins and aztreonam when host organism appears to be susceptible to these agents in laboratory tests. Hence, CLSI recommends that **laboratories should report ESBL producing isolates as resistant to all penicillins, cephalosporins (including cefepime and cefpirome), and aztreonam irrespective of *in-vitro* test results.**
- c. The emergence of ESBL producing enterobacteriaceae is related to indiscriminate use of third generation cephalosporins.
- d. The carbapenems (Ertapenem, Meropenem and Imipenem) are currently considered the drug of choice for serious infections caused by these pathogens. Piperacillin–Tazobactam and Cefoperazone- Sulbactam may be considered options in mild infections and when ESBL producers are demonstrably susceptible *in-vitro*.

4. Carbapenem- Resistant Enterobacteriaceae (CRE)

a) Mechanism of resistance:

- i. **Combinations of ESBL or AmpC and porin loss:** Porin loss is often unstable and may impose a fitness cost, meaning that these strains rarely spread. Ertapenem is particularly affected.
- ii. **Acquired carbapenemases**

b) Treatment:

- i. Most carbapenemase producers are extremely drug resistant: being resistant to β -lactam antibiotics, aminoglycosides, and β -lactam– β -lactam inhibitor combinations.
- ii. **Polymyxins, tigecycline & fosfomycin** are the agents with most frequent *in vitro* activity, but all have limitations. Dosage will vary with the patient and infection site, but should be on the principle of 'highest safe' rather than 'minimum potentially effective'; durations should be as standard for the infection type.
- iii. **Colistin** - Case reports of successful use in a range of infections due to carbapenemase producers.
- iv. **Tigecycline:** Active *in-vitro* vs. most carbapenem-resistant *E. coli*. Licensed for complicated skin and soft-tissue infections and complicated intraabdominal infections. Case reports of success in various infections with carbapenemase producers. Low blood concentrations; off-label use should be cautious for blood stream infections, unsuitable in urinary infections as only 22% excreted in urine. Excess deaths in some trials, especially ventilator associated pneumonia (not a licensed indication).
- v. **Others:** a few isolates are susceptible to other antibiotics including e.g. chloramphenicol, ciprofloxacin and co-trimoxazole. Most producers, however, are resistant to these drugs.

Recommended measures to control spread of Multi-drug resistant organisms (MDRO) :

- i. Improved laboratory detection and reporting of MDRO
- ii. Enhanced infection surveillance and control in ICUs
- iii. Prevent spread by barrier precautions : Gowns and gloves
- iv. Hand Washing
- v. Restricted use of 3rd generation cephalosporins

L. Guidelines For Optimizing Use Of Key Antimicrobials

A. Antimicrobial Prescribing: Good Practice

1. Send for the appropriate investigations in all suspected infections as recommended. These are the minimum required for diagnosis, prognosis and follow up of these infections.
2. All attempts shall be made to send microbiological samples prior to initiating antimicrobial therapy. Rapid tests, such as Gram stain, can help determine therapeutic choices when decision on empiric therapy is required.
3. Differentiation between contamination, colonization and infection is important to prevent overuse of antimicrobials. Use hospital guidelines based on local antibiograms when choosing antimicrobial therapy whenever possible. If alternatives to those recommended as used, reasons in the case records should be documented.
4. Prescribing antibiotics just in case an infection is present is rarely justified. Where patients are in hospital close observation is usually a better option till the diagnosis is made.
5. **Choice of antibiotics:** This depends on antibiotic susceptibility of the causative organism. There are some infections, which can be treated by one of several drugs. The choice can be based on Toxicity, Efficacy, Rapidity of action, Pharmacokinetics and Cost. ***Use the most effective, least toxic and least expensive antibiotic for the precise duration of time needed to cure or prevent infection. Pathogens specific guidance in hospital policy is encouraged.*** Before prescribing consider the following:
 - a. Which organism is likely to cause the disease?
 - b. What is the clinical diagnosis and what other steps should be taken to reach diagnostic precision?
 - c. Which antimicrobial agents are available and active against the presumed cause of the illness? Is their range of antimicrobial activity appropriate and what information is available about the likelihood of drug resistance?
 - d. Check for factors, which will affect choice of drug and dose, e.g., renal function, interactions, allergy, pregnancy and lactation.
 - e. Check that the appropriate dose is prescribed. If uncertain, contact Infectious Diseases Physician or clinical microbiologist. Alternatively, check in the formulary.
 - f. What is the duration of treatment?
 - g. Is treatment working?
6. **Clinical Diagnosis:** The antibiotic treatment chosen must be based on presumptive diagnosis made on some assumption regarding the nature of disease. The treating doctor may not have difficulty in choosing the appropriate antibiotic to treat a disease caused by a single microorganisms e.g scarlet fever, typhoid, anthrax, as microbiological diagnosis is implicit in clinical diagnosis. However, diseases such as pneumonia, meningitis and urinary tract infection can be caused by spectrum of bacterial species and doctor may be wrong if he has to guess which antimicrobial agent to use. In such instances one should seek a bacteriological diagnosis.
7. **Empiric Therapy** – If the causative agent is not known and where delay in initiating therapy would be life threatening or risk serious morbidity, antimicrobial therapy based on a clinically defined infection is justified and the following points should be taken into consideration:
 - a. Do not rush to treat.
 - b. Collect the necessary specimens before commencing therapy.
 - c. Cover all possible microbial causes.
 - d. Try to attain synergy.
 - e. Consider possible interaction with other drugs.
 - f. Accuracy of diagnosis should be reviewed regularly and treatment altered/stopped when microbiological results become available.
 - g. Use less costly drugs where possible.
8. The need for antimicrobial therapy should be reviewed on a daily basis. For most infections 5 – 7 days of antimicrobial therapy is sufficient (simple UTI can be adequately treated with 3 days of antibiotic).

9. All IV antibiotics may only be given for 48 – 72 hours without review and consideration of oral alternatives. New microbiological or other information (e.g. fever defervescence for at least 24h, marked clinical improvement; low CRP) should at this stage often permit a switch to oral antibiotic(s), or switch to an IV narrow spectrum alternative, or cessation of antibiotics (no infection present).
10. Once culture reports are available, the physician should step down to the narrowest spectrum, most efficacious and most cost effective option. If there is no step down available, the reason shall be documented and is subjected to clinical audit.
11. Some guiding principles for de-escalation/Escalation:
 - a. If ESBL +ve: drug choice is monotherapy with carbapenems. Preferably choose group I carbapenem. Piperacillin –Tazobactam and Cefoperazone –Sulbactam can be used if in-vitro sensitive and for mild infections.
 - b. Vancomycin should be used only for confirmed MRSA infections and not in MSSA infections.
 - c. In case of Pan drug resistant Pseudomonas /Acinetobacter spp. combination therapy using colistin along with beta-lactams (using PK/PD principles) should be discussed with microbiologist /physician.
12. . **Treatment with antibiotic combinations:** In order to avoid antagonism between drugs and undesirable side effects of several antibiotics it is advisable to use a single drug where ever possible. There are situations however, when the use of antibiotic combination is desirable. The situations are:
 - a. A temporary expedient during the investigation of an obscure illness.
 - b. To prevent the development of bacterial resistance in long term therapy e.g treatment of tuberculosis.
 - c. To achieve synergistic effect, e.g. in treating infective endocarditis.
 - d. Mixed infection, when one drug is not effective against the pathogen.
 - e. To permit a reduction of the dose of potentially toxic drug.

The choice of the drug should be that they act synergistically. The following combinations are synergistic

1. Aminoglycoside and beta–lactam antibiotic.
 2. Beta –lactam antibiotic and beta–lactamase inhibitor.
 3. Beta –lactam antibiotic and Glycopeptide (vancomycin/teicoplanin)
 4. Sulphamethoxazole and Trimethoprim.
14. **Is Treatment working?:** Where treatment is apparently failing, advice from an ID physician/clinical microbiologist should normally be sought rather than blindly changing to an alternative choice of antimicrobial agent.
- Antimicrobial drug therapy cannot be considered in isolation and other aspects of therapy must be taken into account in judging the effect of treatment. Even an appropriate antibiotic may be ineffective unless pus is drained, septic shock treated and hypoxia and anemia corrected. There are several conditions in which chemotherapy alone cannot eliminate an infection. Obstructive lesions can cause infection to recur, unless they can be dealt with surgically. Also, chemotherapy cannot obviate the necessity for draining an abscess or removing sequestra or calculi. Failure of treatment can also be due to a super-added infection, e.g. phlebitis, development of resistance during therapy or poor tissue penetration.
13. **Laboratory control of the effects of treatment:** Whether treatment has been successful or not is best judged by clinical criteria, but it is useful to know whether the infecting organism has been eliminated. Repeated cultures are, therefore sometimes indicated.

B. Reserve Antimicrobials

These reserve antimicrobials will be made available following a recommendation from the Microbiology Department as per culture report or if included in an antimicrobial policy for a clinical specialty that has been agreed with antibiotic management team. They are held in reserve to maintain their effectiveness in treating certain difficult infections by reducing the spread of microbial resistance and to encourage cost effective prescribing. Before a reserve antibiotic is issued to the ward, the pharmacist is instructed to ascertain the indication and if this falls outside the approved policy, to request that the prescriber consult the ID Physician/clinical microbiologist.

The following criteria has been proposed to protect the Carbapenems and Linezolid from overuse –

1. Severe sepsis as defined by more than one organ failure of new onset and/or elevated serum lactate.
2. Clinical failure of other classes of antibiotics over 48 hours in terms of worsening inflammatory markers, unresolving fever and new/worsening hemodynamic instability.
3. Underlying severe immuno-suppression – Neutropenia, immuno-suppressive therapy, Diabetic Ketoacidosis (DKA) etc.
4. The organism is susceptible to only carbapenems / linezolid, as per culture report.

The following criteria has been proposed for initiating Colistin –

1. Pan-resistant organism as per culture report with evidence of invasive disease – fever/ leucocytosis/elevated procalcitonin (PCT) or culture from a sterile site.
2. Clinical failure of all other classes of antibiotics over 72 hours.

The following criteria has been proposed for initiating Rifampicin –

1. Empiric or proven TB as a part of ATT (4 drug regimen)
Rifampicin should not be prescribed for any treatment other than for Mycobacteria and for chemoprophylaxis of meningococcal meningitis in clinically indicated population

Rifampicin should not be prescribed alone as an anti-bacterial.

The following criteria has been proposed for initiating Aminoglycosides –

- I. The focus of infection is not lung or an anaerobic abscess.
- II. Only as a part of initial empiric regimen of a combination therapy – shall step down to single drug after culture report.
- III. Other safer drug options have been ruled out in a culture report.

C. Hypersensitivity

All patients should be asked about drug allergies. This is the responsibility of the doctor caring the patient. If a patient reports a drug allergy clarify whether this is an allergy or drug intolerance. In some cases there will be an overlap between drug allergy and drug intolerance.

- Clinical features suggestive of drug allergy:
One or more symptoms developed during or following drug administration including difficulty breathing, swelling, itching, rash, and anaphylaxis, swelling of the lips, loss of consciousness, seizures or congestion involving mucous membranes of eyes, nose and mouth.
- Clinical features suggestive of drug intolerance:
One or more symptoms developed during or following drug administration including gastrointestinal symptoms e.g. nausea, vomiting, diarrhoea, abdominal pain and feeling faint.

If patients are unable to give an allergy history, the doctor caring the patient should take reasonable steps to contact someone who can provide a reliable allergy history. It is the prime responsibility of the prescribing doctor to ensure that:

- i. The allergy box on the patient's drug chart is completed, when a new prescription chart is written or transcribed. If no allergy - specify "No known allergy". The box should be signed and dated. If allergy history cannot be obtained, then specify "history not available." Under no circumstances should the allergy box be left blank. A pharmacist or nurse may complete the allergy box if the allergy status is documented in the clerking in notes.
- ii. The allergy box is completed before prescribing a new drug, except in exceptional circumstances. If patients have a suspected drug allergy then the drug and suspected reaction. Should be documented in the clerking-in notes and the drug chart.

Alert Antimicrobials

To Prevent and Control the Emergence and Spread of Antimicrobial-Resistant Micro-organisms in Hospitals” one major strategic goal is to “define guidelines for use of key antibiotics”, (“Alert” antibiotics) targeted in these guidelines are **ciprofloxacin, ceftazidime, cefotaxime, ceftriaxone, vancomycin (or teicoplanin), imipenem, levofloxacin, meropenem, moxifloxacin, piperacillin-tazobactam, linezolid (oral/IV), voriconazole, caspofungin, valganciclovir, ertapenem and newer preparations of amphotericin.**

Collectively, these are among the drugs most frequently prescribed irrationally which is largely responsible for the current escalation of antibiotic costs. They also account for a significant proportion of serious antibiotic toxicity including *Clostridium difficile* diarrhoea and CNS toxicity/seizures as well as the emergence of major antimicrobial resistance. Safer, cheaper and equally effective alternatives are often available which allow such agents to be kept in reserve for occasions when there are clear cut microbiological indications. It is critical, therefore, that these Alert antibiotics be prescribed only on the recommendation of senior medical staff or after discussion with the on-call Clinical Microbiologist or ID physician.

M. Alert Antibiotics And Their Indications

1. CIPROFLOXACIN, INTRAVENOUS

Oral ciprofloxacin is well absorbed and this is therefore the preferred route of administration.

Intravenous therapy is only indicated in the following situations:

- When the patient is unable to swallow or the oral route is otherwise compromised.
- In serious sepsis (e.g. nosocomial pneumonia in ITU) when the recommended dose is 400mg 8hourly.

Common indications for ciprofloxacin in the Antibiotic Policy, either alone or in combination, are as follows:

- second line therapy in exacerbation of chronic bronchitis
- pyelonephritis
- acute inflammatory infective diarrhoeas
- serious infected diabetic ulcers infected burn wounds with coliforms or *Pseudomonas* infection present
- treatment of documented or presumed gram-ve bacilli resistant to penicillins or cephalosporins or when the patient is allergic (**history of anaphylactic reaction or rash**) to these agents
- selected haematology patients requiring prophylaxis
- severe acute pelvic inflammatory disease

2. CEFTAZIDIME

Limited use only. Main indication is documented or suspected *Pseudomonas aeruginosa* infection. Other indications currently listed in the Antibiotic Policy are as follows:

- Second line agent in neutropenic patients with septicaemia or pneumonia
- Empiric therapy of CAPD associated peritonitis (not children), 1g IV stat then 125mg/litre in each bag
- Empiric therapy of post operative, post traumatic or shunt associated meningitis
- Empiric therapy of infective exacerbation of cystic fibrosis

3. PIPERACILLIN -TAZOBACTAM

Currently listed in the antibiotic policy for the following:

- Pneumonia or septicaemia in neutropenic patients (+Gentamicin)
- As a single agent (or in combination with Gentamicin) for treatment of sepsis which has not responded to first line treatment or if it is not appropriate for gentamicin to be added to first-line therapy.

4. CEFTRIAXONE

IV Ceftriaxone is currently listed in the antibiotic policy for the following:

- Epiglottitis,
- Brain abscess,
- Bacterial meningitis,

- Pyelonephritis in children,
- Empiric therapy of septicaemia in children,
- In ascites for treatment of sub-acute bacterial peritonitis,
- Skin and soft tissue infections managed via out-patients or the home IV antibiotic programme,
- Acute septic monoarthritis if penicillin allergic,
- Spontaneous bacterial peritonitis.

5. **APPROPRIATE USE OF CARBAPENEMS**

- Very high rates (60-75%) of resistance to 3rd and 4th generation cephalosporins {due to extended spectrum beta- lactamases (ESBL) production} observed in *E. coli* and *Klebsiella* species..
- This pattern of resistance although seen primarily among nosocomially acquired infections, is also seen isolates of *E. coli* and *Klebsiella* species isolated from community acquired infections.
- These strains of bacteria are frequently resistant to other major classes of antibiotics (fluoroquinolones, β -lactam + β - lactamase inhibitor (BL + BLI) combinations and aminoglycosides)
- Carbapenems (imipenem, meropenem and ertapenem), beta-lactam antibiotics with exceptionally broad spectrum of activity, are **the only class** of antimicrobials which remain effective against ESBL-producing isolates of *E. coli* and *Klebsiella* species
- Imipenem is susceptible to degradation by the enzyme dehydropeptidase-1 (DHP-1) located in renal tubules and requires coadministration with a DHP-1 inhibitor cilastatin. Meropenem and ertapenem are administered without a DHP-1 inhibitor.

Indications for carbapenem use:

1. Infections [e.g., bacteremia, pyelonephritis, intra-abdominal infections (peritonitis, cholangitis, abscesses), nosocomial pneumonia etc.] confirmed (by appropriate culture and susceptibility studies) to be caused by Gram-negative bacteria (*E. coli*, *Klebsiella* spp., *Enterobacter* spp., *Pseudomonas aeruginosa*, other non-fermenting Gram-negative bacilli) **resistant to other classes** of antimicrobials and **susceptible only to carbapenems in-vitro**
2. Initial empiric treatment for severe, life-threatening infections (associated with multi-organ dysfunction, septic shock) caused by Gram-negative bacteria.
 - Febrile neutropenia
 - Ventilator associated / nosocomial pneumonia
 - Pyelonephritis / complicated urinary tract infections
 - Complicated intra-abdominal infections

Once the culture and susceptibility reports are available, choose the most appropriate antibiotic based on spectrum of activity, toxicity and cost ('de-escalation').

Indications for Ertapenem use:

Ertapenem has excellent in-vitro and in-vivo activity against ESBL producing Enterobacteriaceae, but lacks activity against *Pseudomonas aeruginosa*, and is therefore **not** considered appropriate for the treatment of conditions like febrile neutropenia and serious nosocomial infections. Ertapenem does not select Carbapenem-resistant *Pseudomonas aeruginosa* (at least in the short-term). Its use should be restricted to severe Gram-negative or polymicrobial community acquired infections confirmed to be caused by susceptible bacterial pathogens. Hence, this drug may be recommended as the initial choice for ESBL producing strains of *E. coli* and *Klebsiella* spp..

Indication of Meropenem and Imipenem

Meropenem and Imipenem regarded as third line agents and are reserved for:

- serious infections due to multiple resistant strains (e.g. ESBL)
- empiric use in the seriously ill patient in either ITU or Haematology
- the treatment of infective exacerbations in Cystic fibrosis (CF)
- severe acute necrotising pancreatitis
- Outside these clinical settings it should only be used after consultation with a Clinical Microbiologist or

ID physician.

Unlike imipenem, meropenem has not been associated with CNS toxicity. Also, it is administered by convenient IV bolus injection. Clinicians must be aware that mechanism of resistance to meropenem and imipenem are different and hence in-vitro test for one carbapenem cannot be used to interpret the other.

Dose

Imipenem*: 500 mg

i.v. Q6H Meropenem:

1 g i.v. Q8H

Ertapenem: 1gm i.v.

/i.m. Q24H

***Note Anti-infective sub-committee recommends use at a more frequent dosing interval. They believe that optimum plasma concentrations are more reliably maintained with 6-hourly dosing.**

6. LINEZOLID (IV AND ORAL FORMS)

Linezolid should only be prescribed after consulting an ID specialist or clinical microbiologist and a mandatory order form completed.

- Restricted indications including infections due to proven glycopeptide-insensitive *Staphylococcus aureus* or vancomycin-resistant enterococcus (currently uncommon).
- To enable IV/oral switch from IV vancomycin (used for MRSA or MRSE) to oral linezolid (when patient's discharge is possible and continuation treatment using combination rifampicin /trimethoprim is inappropriate).
- May be an option in surgical site infections (e.g. large bowel surgery, vascular surgery, etc).
- Poor IV access and a glycopeptide is indicated.
- Use in out-patient home parenteral antibiotic therapy for skin and soft tissue infections as an alternative to IV teicoplanin.
- Rare cases of proven hypersensitivity/allergy to the glycopeptides.

7. VANCOMYCIN

Vancomycin is the drug of choice for **in-patient** treatment of the following infections.

- Serious (e.g. bacteraemia, osteomyelitis) coagulase negative staphylococcal and MRSA infections and penicillin resistant enterococcal infections
- Empiric therapy in febrile neutropenic patients not responding to first line therapy
- Continuous ambulatory peritoneal dialysis (CAPD) associated peritonitis
- Prosthetic valve endocarditis

8. TEICOPLANIN

Teicoplanin is a suitable alternative to vancomycin for all indications for Vancomycin except meningitis:

- patients receiving **out-patient/home** parenteral therapy with glycopeptides after loading dosages
- inability to tolerate vancomycin
- oncology/haematology patients
- Rare cases of vancomycin resistant and teicoplanin sensitive strains.

N. Comments & interpretations of culture & antimicrobial susceptibility test (AMST) report

1. Interpretative criteria for AMST is as per updated CLSI guidelines
2. Repeat appropriately collected specimen and confirm the pathogenicity of following isolates.
 - a. Skin commensal /colonizers like *Micrococcus* spp; CONS; *Diphtheroid* spp; *Bacillus* spp; *Candida* spp. etc. isolated
 - b. Organisms colonizing hospital environment, like *Staphylococcus* spp, *Enterobacteriaceae* (isolated from non enteric samples), *Non fermenters* like *Acinetobacter* spp. *Pseudomonas* spp and others multi resistant organisms (MDR) like Methicillin resistant *Staphylococcus* spp. (MRSA & MRCONS) Vancomycin resistant

Enterococcus spp (VRE) ,Vancomycin intermediate resistant *Staphylococcus* (VISA), Vancomycin resistant *Staphylococcus spp*;(VRS) Metallobetalactamses (MBL).

3. In case MDR pathogens, follow the hospital infection control measures like
 - a. Isolating the patient in isolated room /one corner of ward.
 - b. Strict monitoring and practice of hand hygiene before and after touching the patient, before and after touching hospital environmental surfaces &, before doing any aseptic procedure.
 - c. Always follow 6 steps of hand washing with alcohol based hand rubs/soap and water if hand rub not available.
 - d. Follow barrier nursing practices
 - e. Strictly follow universal safety precautions. In case of suspected air borne pathogens (TB / swine flu) follow extended universal safety precaution (USP + air born infection precaution like using N 95 respirator)
4. ESBL strain means Extended spectrum beta lactamases which is an enzyme secreted by Gram negative organisms. These strains are resistant to All penicillins, 1st 2nd&3rd generation Cephalosporins & aztreonam.MBL means Gram negative organism resistant to Carbapenems
5. **MRSA /MR CONS** means staphylococcus spp. resistant to all Penicillins, Beta lactam+ beta lactamase inhibitor, 1st 2nd&3rd generation cephalosporins , (Except anti MRSA cephalosporins)all penems.
6. Rifampicin is reserve anti tuberculosis drug hence should not be used unless indicated. If at all rifampicin is used then should be used in combination with other antibiotic. Similarly fluoroquinolones should be used judiciously as it is used to treat MDR TB. Linezolid is reserve drug for treating VRE/VISA/VRS,Hence linezolid should be avoided for treating MRSA.
7. Infective endocarditis with Penicillin sensitive strain of *Enterococcus spp.* high level aminoglycosides sensitive strain (HLAS) can be treated with penicillin +aminoglycosides. Penicillin resistant strain of *Enterococcus spp.* HLAS strains can be treated with vancomycin +aminoglycosides.
8. Prolonged therapy with antimicrobial may develop resistance hence repeat culture and AMST is warranted in following scenario
 - a. *Enterobacter*, *Citrobacter* , *serratia spp.* during prolonged therapy with 3rd generation cephalosporins.
 - b. *P.aeruginosa* may develop resistance during prolonged therapy with all antimicrobial agents. For serious infection with *P.aeruginosa* high dose therapy/multidrug therapy is indicated. Monotherapy associated with clinical failure
 - c. *Staphylococcus spp* during prolonged therapy with quinolones.
9. 1st & 2nd generation cephalosporins are not recommended for treating salmonellosis/shigellosis. Aminoglycosides are not recommended for treating salmonellosis. Drug of extra intestinal salmonellosis is 3rd generation cephalosporins (ceftriaxone).Only Nalidixic acid susceptible strain of salmonella should be treated with fluoroquinolones.
10. Organisms that are susceptible to tetracycline are susceptible to doxycycline and minocycline.
11. Clindamycin, Chloromphenicol, Macrolides, Minocycline are not routinely used for treating UTI. Nitrofurantoin, Cephalosporins, Fluoroquinolones(Norfloxacin,Levofloxacin),penicillins which are secreted in urine are recommended.
12. Significant colony count:
 - a. For appropriately collected urine specimen using semi quantitative method for different clinical scenario :Asymptomatic patient $\geq 10^5$ CFU /ml; Pregnant women $\geq 10^4$ CFU /ml ; Pyelonephritis patient or patient with pyuria $\geq 10^3$ CFU /ml; Cystitis ,Catheterized patient $\geq 10^2$ CFU /ml; (consider lower colony count if patient is on antibiotics)
 - b. For Central line associated blood stream infection using semi quantitative method (roll over technique) is ≥ 15 CFU /ml
 - c. For Endotracheal aspirate if collected using Mini BAL technique $\geq 10^3$ CFU /ml.
13. **Intrinsic resistance:**
 - a. All Gram positive organism are inherently resistant to Colistin , polymyxin B, Aztreonam , Nalidixic acid.
 - b. All Gram negative organisms are inherently resistant to Macrolides ,Glycopeptides Clindamycin & Linezolid
 - c. All non fermenter are inherently resistant to 1st and 2nd generation of Cephalosporins.
 - d. *Enterococcus spp* is inherently resistant to all Cephalosporins , Cotrimoxazole, Clindamycin, Aminoglycosides, (except high level aminoglycosides sensitive strains).

- e. *Proteus spp. Providentia spp. and Morganella morganii* inheritantly resistant to colistin ,polymyxin B , tetracycline and nitrofurantoin .
- f. In *Enterobacteriaceae* there is no intrinsic resistance to 3rd generation cephalosporins ,cefepime,Ticarcillin +clavunate,Piperacillin+tazobactam and carbapenems.
- g. There is no intrinsic resistance for *E.coli, Proteus mirabilis,Salmonella spp and Shigella spp* to β lactam antibiotics.
- h. Most of *Enterobacteriaceae* except *E.coli; Proteus mirabilis;Salmonella spp & Shigella spp*.are inheritantly resistant to Ampicillin.
- i. *Citrobacter freundii, Enterobacter spp,, Morganella morganii, Proteus vulgaris, ;Proteus penneri, Serratia marcescens* are inheritantly resistant to 1st & 2nd generation cephalosporins.
- j. *Providentia spp. Hafnia alvei & Yersinia enterocolitica* are resistant to only 1st gen. cephalosporins only .
- k. *Citobacter spp; Enterobacter spp;Hafnia alvei & Serratia marcescens*are inheritantly resistant to Amicillin ,Augmentin & Ampicillin +sulbactam . *Citrobacter koseri* in addition is resistance to Piperacillin
- l. Ticarcillin is inheritantly resistant for *Citrobacter koseri;Escherichia hermannii;Klebsiella pneumonia;Yersinia enterocolitica* .