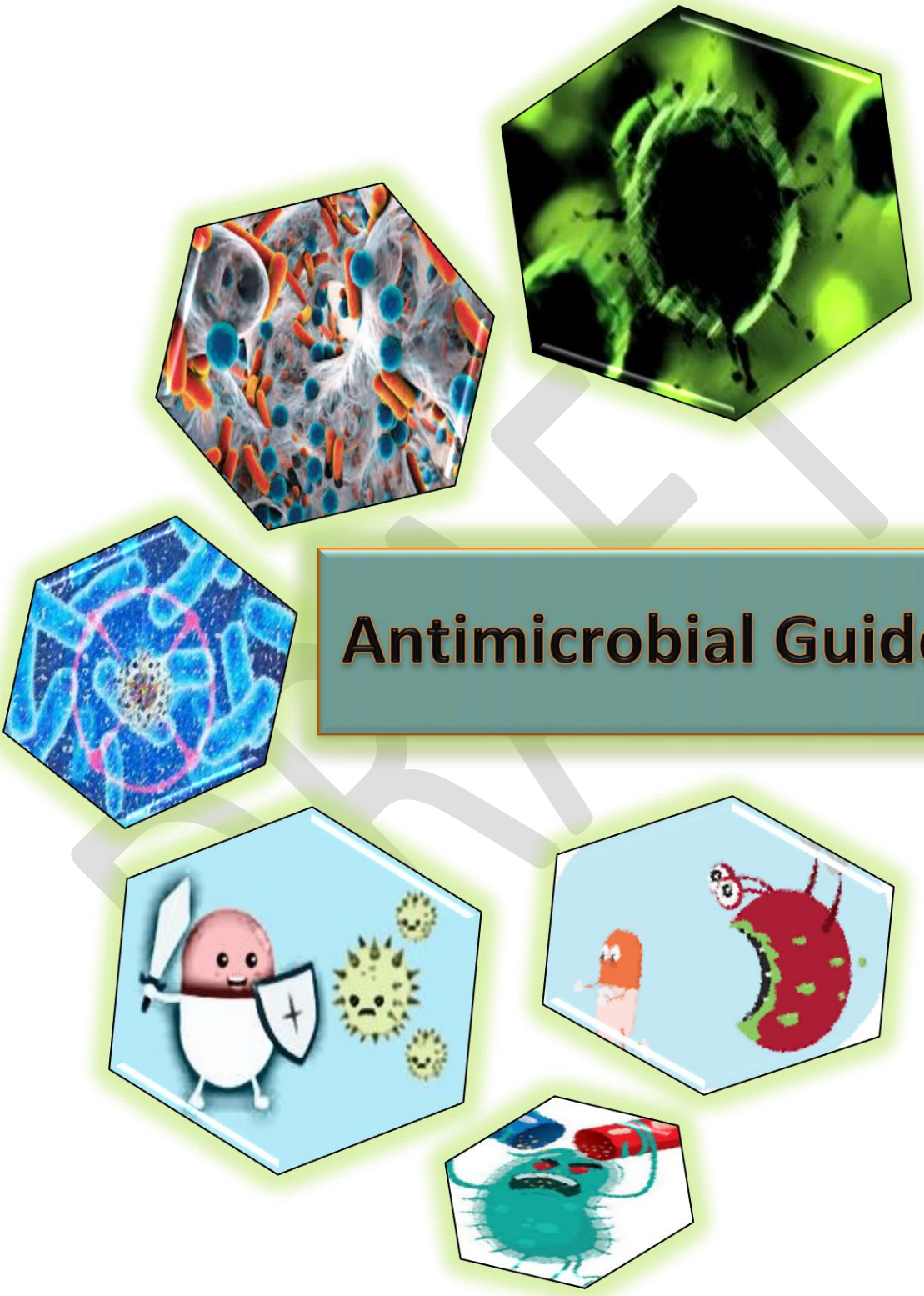


Antimicrobial Guidelines

Department of Medical Health and Family Welfare
Government of Uttar Pradesh

CONTENT

Introduction

Antimicrobial resistance is a broader term, encompassing resistance to drugs to treat infections caused by other microbes as well, such as parasites (e.g. malaria), viruses (e.g. HIV) and fungi (e.g. Candida). Antimicrobial resistance has been observed and reported with practically all the newly discovered antimicrobial molecules to date. Antimicrobial resistance makes the treatment of patients difficult, costly and sometimes impossible.

The emergence of antimicrobial resistance in pathogens has become a matter of great public health concern. Antimicrobial resistance is well recognized as a global threat to human health. Infections caused by antimicrobial-resistant micro-organisms in hospitals are associated with increased morbidity, mortality and healthcare costs.

Antimicrobial Resistance

Antimicrobial resistance occurs when microorganisms such as bacteria, viruses, fungi, and parasites change in ways that render the medications used to cure the infections they cause ineffective. Antimicrobial resistance is the broader term for resistance in different types of microorganisms and encompasses resistance to antibacterial, antiviral, antiparasitic and antifungal drugs.

Antimicrobial resistance is closely linked to inappropriate antimicrobial use. It is estimated that 50% or more of hospital antimicrobial use is inappropriate. There is a need for increased education and awareness about antimicrobial resistance among the public and health-care professionals. One needs to develop and improve the surveillance system for antimicrobial resistance and infectious diseases in general, particularly through improved linkage of data. Nothing will work unless we improve diagnostic testing to ensure more tailored interventions and respond to the opportunities afforded by advances in genomic technologies and point of care testing.

Antimicrobial resistance occurs naturally but is facilitated by the inappropriate use of medicines, for example using antibiotics for viral infections such as cold or flu, or sharing antibiotics. Low-quality medicines, wrong prescriptions, and poor infection prevention and control also encourage the development and spread of drug resistance. Lack of government commitment to address these issues, poor surveillance and a diminishing arsenal of tools to diagnose, treat and prevent also hinder the control of antimicrobial drug resistance.

Superbugs

When the microorganisms become resistant to most antimicrobials they are often referred to as "superbugs". This is a major concern because a resistant infection may kill, can spread to others, and imposes huge costs to individuals and society.

Resistant bacteria that cause pneumonia, urinary tract infections and skin infections are just a few of the dangers we now face.

Antibiotic resistance is a naturally occurring phenomenon that can be slowed, but not stopped. Over time, bacteria adapt to the drugs that are designed to kill them and change to ensure their survival. This makes previously standard treatments for bacterial infections less effective, and in some cases, ineffective.

Hospital Acquired Infections (HAI)

HAI occur worldwide and affect both developed and resource-poor countries. Infections acquired in health care settings are among the major causes of death and increased morbidity among hospitalized patients. They are a significant burden both for the patient and for public health.

Many factors promote infection among hospitalized patients: decreased immunity among patients; the increasing variety of medical procedures and invasive techniques creating potential routes of infection; and the transmission of drug-resistant bacteria among crowded hospital populations, where poor infection control practices may facilitate transmission.

Classification

Classified into different types based on different classification modes.

- The first classification is according to the spectrum: The spectrum means the number of organisms affected by the same drug.

  Broad-Spectrum Antibiotics: The Broad-spectrum antibiotics affect several types of bacteria and fungi and it is usually used where the specific type of the microorganism is unknown.

  Narrow spectrum antibiotics: Narrow spectrum antibiotics are used only when we know the specific type of microorganism. These are more effective on specific microorganisms but less effective on others.

- The second classification is according to the type of action of antibiotics. Antibiotics can be divided into two classes based on their mechanism of action.

  Bactericidal antibodies: They kill bacteria by inhibiting cell wall synthesis. Examples include:Beta-lactam antibiotics (penicillin derivatives (penams),cephalosporins (cephems), monobactams,and carbapenems) and vancomycin. Also bactericidal are daptomycin, fluoroquinolones, metronidazole, nitrofurantoin, co-trimoxazole, telithromycin.

  Bacteriostatic antibiotics: They limit the growth of bacteria by interfering with bacterial protein production, DNA replication, or other aspects of bacterial cellular metabolism. They must work together with the immune system to remove the microorganisms from the body. However, there is not always a precise distinction between them and bactericidal antibiotics. High concentrations of some bacteriostatic agents are also bactericidal, whereas low concentrations of some bacteriocidal agents are bacteriostatic.

This group includes tetracyclines , sulfonamides, spectinomycin, trimethoprim, chloramphenicol,macrolides, and lincosamides.

- Another classification is according to the **chemical structure:**

Penicillins such as penicillin and amoxicillin

Cephalosporins such as cephalexin (Keflex)

Macrolides such as erythromycin (E-Mycin), clarithromycin (Biaxin), and azithromycin (Zithromax)

Fluoroquinolones such as ofloxacin (Cipro), levofloxacin (Levaquin), and ofloxacin (Floxin)

Sulfonamides such as co-trimoxazole (Bactrim) and trimethoprim (Proloprim)

Tetracyclines such as tetracycline (Sumycin, Panmycin) and doxycycline (Vibramycin)

Aminoglycosides such as gentamicin (Garamycin) and tobramycin (Tobrex)

Standard Usage: Presumptive Therapy for Adult Patients Suspected Of Infection

- Gastrointestinal & Intra-Abdominal Infections
- Central Nervous System Infections
- Cardiovascular Infections
- Skin & Soft Tissue Infections
- Respiratory Tract Infections
- Urinary Tract Infections
- Obstetrics and Gynaecological Infections
- Bones and Joint Infections
- Fungal Infections
- **S**urgical Antimicrobial Prophylaxis

GASTROINTESTINAL & INTRA-ABDOMINAL INFECTIONS

Condition	**Likely Causative Organisms**	**Empiric (presumptive) antibiotics/First Line**	**Alternative antibiotics/Second Line**	**Comments**
Acute Gastroenteritis	Viral, Entero-toxigenic & Entero-pathogenic E. coli	None	None	Rehydration (oral/IV) essential

Food poisoning	S. aureus, cereus, botulinum			
Cholera	V.cholerae	Doxycycline 300mg Oral stat	Azithromycin 1gm Oral stat or Ciprofloxacin 500mg BD for 3 days	Rehydration (oral/IV) is essential
		Azithromycin Oral in children (20mg/kg) and pregnant women (1g)		Antibiotics are adjunctive therapy.
Bacterial dysentery	Shigella sp., Campylobacter, Non- typhoidal salmonellosis	Ceftriaxone 2gm IV OD for 5 days or oral cefixime 10-15 mg/kg/day x 5 days	Azithromycin 1g OD x 3days	For Campylobacter the drug of choice is azithromycin.
	Shiga toxin	Antibiotic Treatment		Antibiotic
	producing E. coli	not recommended.		use associated with development of hemolytic uremic syndrome.
Amoebic dysentery	E. histolytica	Metronidazole 400mg Oral TDS for 7-10 days	Tinidazole 2gm Oral OD for 3 days	Add diloxanide furoate 500 mg TDS for 10d
Giardiasis	Giardia lamblia	Metronidazole 250-500mg oral TID x 7-10 d	Tinidazole 2 gm oral x 1 dose	
Enteric fever	S.Typhi, S.Paratyphi A	<u>Outpatients:</u> Cefixime 20mg/kg/day for 14 days or Azithromycin 500 mg BD for 7 days. <u>Inpatients:</u> Ceftriaxone 2 g IV BDfor 2 weeks +/-Azithromycin 500 mg BD for 7 days	Cotrimoxazole 960 mg BD for 2 weeks	Majority of strains arenalidixic acid resistant. Ceftriaxone to be changed to oral cefixime when patient is afebrile to finish total duration of 14days.
Biliary tract infections (cholangitis, cholecystitis)	Enterobacteriaceae (E.coli, Klebsiella sp.)	Ceftriaxone 2gm IV OD or Piperacillin-Tazobactam 4.5gm IV 8 hourly or Cefoperazoe-Sulbactam 3gm IV 12hourly	Imipenem 500mg IV 6hourly or Meropenem 1gm IV 8hourly For 7-10 days	Surgical or endoscopic intervention to be considered if there is biliary obstruction. High

		For 7-10 days		prevalence of ESBL producing E.coli, Klebsiella sp.strains. De-escalate therapy once antibiotic susceptibility is known.
Hospital acquired diarrhea	C. difficile	Metronidazole 400 mg oral TDSfor 10 days	Severe disease:start Vancomycin 250 mg oral 6h empirically.	
Spontaneous bacterial Peritonitis	Enterobacteriaceae (E.coli, Klebsiella sp.)	Cefotaxime 1-2 gm IV TDS or Piperacillin-Tazobactam 4.5gm IV 8 hourly or Cefoperazone-Sulbactam 3gm IV 12h	Imipenem 500 mg IV	Descalate to
			6hourly or	Ertapenem 1 gm IV
			Meropenem 1gm IV	OD for 5-7 days
			8hourly	once the patient improves
Secondary peritonitis, Intra-abdominal abscess/ GI perforation	Enterobacteriaceae (E.coli, Klebsiella sp.), Bacteroides (colonic perforation), Anaerobes	Piperacillin-Tazobactam 4.5gm IV 8 hourly or Cefoperazone-Sulbactam 3gm IV 12hourly in severe infections	Imipenem 1g IV 8hourly or Meropenem 1gm IV 8hourly or Doripenem 500 mg TDS or Ertapenem 1 gm IV OD	Source control is important to reduce bacterial load. If excellent source control – for 5-7 days; other wise 2- 3 weeks suggested.
		In very sickpatients, if required, addition of cover for yeast (fluconazole iv 800 mg loading dose day 1, followed by 400 mg		
		2nd day onwards) & and for Enterococcus (vancomycin /teicoplanin) may be		

		contemplated		
Pancreatitis Mild- moderate		No antibiotics		
Post necrotizing pancreatitis: infected pseudocyst; pancreatic abscess	Entrobacteriaceae, Enterococci, S. aureus, S. epidermidis, anaerobes, Candida sp.	Piperacillin-Tazobactam 4.5 gm IV 8 hourly empirically or Cefoperazone-Sulbactam 3gm IV 8 hourly in severe infections	Imipenem-Cilastatin 500mg IV 6hourly or Meropenem 1gm IV 8hourly or Doripenem 500mg IV 8h	Duration of treatment is based on source control and clinical improvement
		In very sick patients, if required, addition of cover for yeast (fluconazole iv 800 mg loading dose day 1, followed by 400 mg 2nd day onwards) & and for Enterococcus (vancomycin /teicoplanin) may be contemplated For 7-10 days		
Diverticulitis Mild- OPD treatment	Gram-Negative Bacteria Anaerobes	Amoxycillin-Clavulanate 625mg TDS for 7 days	Ciprofloxacin + Metronidazole for 7 days	
Diverticulitis moderate	Gram- Negative	Ceftriaxone 2gm IV		BL-BLI agents
	Bacteria	OD +metronidazole		have very good
	Anaerobes	500 mg IV TDS or		anaerobic cover, so
		Piperacillin-		no need to add
		Tazobactam 4.5 gm IV		metronidazole.
		8 hourly empirically		
		or		
		Cefoperazoe-		
		Sulbactam 3gm IV 8		
		hourly		
Diverticulitis	Gram- Negative	Meropenem 1gm IV		Duration based on
Severe	Bacteria	8hrly or Imipenem		improvement
	Anaerobes	Cilastatin 500mg IV 6		
		hourly		

Liver Abscess	Polymicrobial	Amoxycillin-clavulanate/ 3rd generation cephalosporin + Metronidazole 500mg I.V.TID / 800mg oral TID for 2 weeks	Piperacillin-Tazobactam IV	Ultrasound guided drainage indicated In large abscesses, Signs of imminent rupture and no response to Medical treatment.

CENTRAL NERVOUS SYSTEM INFECTIONS

Condition	Likely Causative Organisms	Empiric antibiotics (presumptive antibiotics)	Alternative antibiotics	Comments
Acute bacterial Meningitis	*S. pneumoniae, H.influenzae, Neisseria meningititidis*	Ceftriaxone 2 g IV 12hourly/ Cefotaxime 2 g IV 4-6hourly 10-14 days treatment	Chloramphenicol if patient is allergic to penicillin	Antibiotics should be started as soon as the possibility of bacterial meningitis becomes evident, ideally within 30 minutes. Do not wait for CT scan or LP results. No need to add vancomycin as primary agent, as ceftriaxone resistant *Pneumococcus* is not common in India. *Listeria* is also rare in India and so ampicillin is also not indicated Adjust therapy once pathogen and susceptibilities are known.
Meningitis-Post-neurosurgeryor Penetratinghead trauma	*Staphylococcus epidermidis, Staphylococcus aureus, Propionibacterium acnes, Pseudomonas aeruginosa,*	Meropenem 2gm IV 8 hourly AND Vancomycin 15mg/kg IV 8 hourly For 14 days.		May need intra ventricular therapy in severe cases

	Acinetobacter baumanii			
Meningitis with basilar	*S.pneumoniae,*	Ceftriaxone 2gm IV 12		Dexamethasone
skull fractures	*H. influenzae*	hourly		0.15mg/kg IV 6
		For 14 days		hourlyfor 2-4days (1st
				dose with or before
				first antibiotic dose)
Brain abscess, Subdural empyema	Streptococci, Bacteroides, Enterobacteria-ceae, *S.aureus*	Ceftriaxone 2 gm IV 12hourly or Cefotaxime 2 gm IV 4-6hourly	Meropenem 2gm IV 8hourly	Exclude TB, Nocardia, Aspergillus, Mucor If abscess <2.5cm & patient neurologically stable, await response to antibiotics. Otherwise, consider aspiration/surgical drainageand modify antibiotics as per sensitivity of aspirated/drained secretions.
		AND		
		Metronidazole 1 gm IV 12hourly		
		Duration of treatment to be decided by clinical & radiological response, minimum two months required.		

CARDIOVASCULAR INFECTIONS

Condition	**Likely causative Organism**	**Empiric antibiotics (presumptive antibiotics)**	**Alternative antibiotics**	**Comments**

Infective Endocarditis: ***Native valve (awaiting cultures) Indolent***	Viridans Streptococci, other Streptococci, Enterococci	Penicillin G 20MU IV divided doses, 4 hourly or Ampicillin 2gm iv 4h AND Gentamicin 1mg/kg im or iv 8h Duration: 4-6 weeks	Vancomycin 15mg/kg IV 12 hourly (maximum 1g 12 hourly)//teicplanin 12mg/kg IV 12 hourly x 3 doses followed by 6 - 12 mg once daily IV depending upon severity + Gentamicin 1mg/kg IM or IV 8 hourly Duration: 4-6 weeks or Daptomycin 6mg/kg IV once a day Duration: 4-6 weeks	*If patient is stable, ideally waitblood cultures.* Antibiotic choice as per sensitivity results. Guidance from Infectious disease specialist or clinical microbiologist is recommended

Infective Endocarditis: Native valve (awaiting cultures) ***In Severe Sepsis***	*S.aureus* (MSSA or MRSA) Risk for gram-negative bacilli	Vancomycin 25- 30 mg/kg loading followed by 15-20 mg/kg IV 12 hourly (maximum 1gm 12hourly)/teicoplan in 12mg/kg IV 12 hourly x 3 doses followed by 6 -12 mg once daily IV depending upon severity AND Meropenem 1gm IV 8hDuration:4-6 weeks	Daptomycin 6mg/kg IV once a day AND Meropenem 1gm IV q8h Duration: 4-6 weeks	Modify antibiotics based on culture results and complete 4-6 weeks of antibiotics

Infective Endocarditis: Prosthetic Valve awaiting Cultures		Vancomycin 15mg/kg IV 12 hourly (maximum 1gm 12 hourly)/teicoplan in 12mg/kg IV 12 hourly x 3 doses followed by 6 -12 mg once daily IV depending upon severity + Gentamicin 1mg/kg q12h IV	Daptomycin can be used in place of Vancomycin/ Teicoplanin for patients unresponsive to or intolerant of Vancomycin/Tei coplanin or with Vancomycin/Gl y copeptide-resistant isolates	Antibiotic choice as per sensitivity. Guidance from Infectious disease specialist or microbiologist is recommended.

SKIN & SOFT TISSUE INFECTIONS

Condition	Likely Causative Organisms	Empiric antibiotics (presumptive antibiotics)	Alternative antibiotics	Comments
Cellulitis	*Streptococcus pyogenes*(common), *S.aureus*	Amoxicillin-Clavulanate 1.2gm IV TDS/625 mg oral TDS or Ceftriaxone 2gm IV OD	Clindamycin 600-900mg IV TDS	Treat for 5-7 days.
Furunculosis	*S.aureus*	Amoxicillin-Clavulanate 1.2gm IV/Oral 625 TDS or Ceftriaxone 2gm IV OD Duration – 5-7 days	Clindamycin 600-900mg IV TDS	Get pus cultures before starting antibiotics

Necrotizing fasciitis	*Streptococcus pyogenes, S. aureus*, anaerobes, Enterobacteriaceae (polymicrobial)	Piperacillin-Tazobactam 4.5gm IV 6hourly or Cefoperazone-Sulbactam 3gm IV 12hourly AND Clindamycin 600-900mg IV 8 hourly Duration depends on the progress	Imipenem 1g IV8hourly or Meropenem 1gm IV 8hourly AND Clindamycin 600-900mg IV TDS/linezolid 600 mg IV BD/daptomycin 6mg/kg/day	Early surgical intervention crucial

RESPIRATORY TRACT INFECTIONS

Condition	Likely Causative Organisms	Empiric antibiotics (presumptive antibiotics)	Alternative antibiotics	Comments
Community acquired Pneumonia	*S. pneumoniae*, *H.influenza*e, Legionella, *E.coli*, *Klebsiella sp.*, *S.aureus*	Mild to moderate cases Amoxycillin-500mg-1 g TDS oral. If IV indicated, amoxycillin-clavulanate 1.2 g IV TDS or Ceftriaxone 2g IV OD For Severe cases Amoxycillin-clavulanate 1.2 g IV TDS OrCeftriaxone 2g IV OD Duration 5-8 days	Piperacillin-Tazobactam 4.5gm IV 6 hourly or Imipenem 1g IV 6hourly or Cefoperazone-Sulbactam 3gm IV 12 hourly	If MRSA is a concern, add Linezolid 600mg IV/Oral BD If atypical pneumonia suspected, Doxycycline 100mg bd or Azithromycin 500 mg oral/IV OD
Lung abscess, Empyema	*S. pneumoniae*, *E.coli*, *Klebsiella sp.*, *Pseudomonas aeruginosa*, *S.aureus*, anaerobes	Piperacillin-Tazobactam 4.5gm IV 6hourly or Cefoperazone-Sulbactam 3gm IV 12 hourly	ADD Clindamycin 600-900mg IV 8hourly	3-4 weeks treatment required

Acute pharyngitis	Viral	None required		As most cases are viral no antimicrobial therapy required
	Group A ß-hemolytic Streptococci (GABHS), Group C, G Streptococcus,	Oral Penicillin v 500mg BD or Amoxicillin 500 mg Oral TDS for 10 days	In case of penicillin allergy: Azithromycin 500mg OD for 5 days or Benzathine penicillin 12 lac units IM stat	*Antibiotics are recommended to reduce transmission rates and prevention of long term sequaelae such as rheumatic fever*
Ludwig's angina Vincent's angina	Polymicrobial (Cover oral anaerobes)	Clindamycin 600 mg IV 8 hourly or Amoxicillin-Clavulanate 1.2gm IV	Piperacillin-Tazobactam 4.5gm IV 6 hourly	Duration based on improvement
Acute bacterial rhinosinusitis	Viral, *S. pneumoniae, H.influenzae, M. catarrhalis*	Amoxicillin-clavulanate 1gm oral BD for 7 days	Moxifloxacin 400mg OD for 5-7days	
Acute bronchitis	Viral	Antibiotics not required	-	-
Acute bacterial exacerbation of COPD	*S. pneumoniae H. influenzae M. catarrhalis*	Amoxicillin-clavulanate 1gm oral BD for 7 days	Azithromycin 500 mg oral OD × 3 days	

URINARY TRACT INFECTIONS

Asymptomatic bacteriuria NOT to be treated except pregnant women and immunocompromised patients. All cases of dysuria may not be UTI. Refer to Obstetrics and gynaecology infections for treatment of asymptomatic bacteriuira in pregnant women.

Condition	Likely Causative Organisms	Empiric antibiotics (presumptive antibiotics)	Alternative antibiotics	Comments
Acute uncomplicated Cystitis	*E.coli*, *Staphylococcus saphrophyticus*(in sexually activeyoungwomen), *Klebsiella pneumoniae*	Nitrofurantoin 100 mg BD for 7 days or Cotrimoxazole 960mg BD for 3-5 days or Ciprofloxacin 500 mg BD for 3-5 days	Cefuroxime 250 mg BD for 3-5 days	Get urine cultures before antibiotics & modify therapy based on sensitivities.
Acute uncomplicated Pyelonephritis	*E.coli*, *Staphylococcus saphrophyticus* (in sexually active young women), *Klebsiella pneumoniae, Proteus mirabilis*	Amikacin 1 g OD IM/IV or Gentamicin 7 mg/kg/day OD (Monitor renal function closely and rationalise according to culture report) Complete total duration of 14 days	Piperacillin-Tazobactam 4.5g IV 6 hourly or Cefoperazone-Sulbactam 3g IV 12 hourly or Ertapenem 1 g IV OD	Urine culture and susceptibilities need to be collected before starting antimicrobial treatment to guide treatment.

Complicated Pyelonephritis	*Escherichia coli, Klebsiella pneumonia, Proteus mirabilis, Pseudomonas aeruginosa, Enterococcus* sp. Frequently multi-drug resistant organisms are present	Piperacillin-Tazobactam 4.5gm IV 6 hourly or Amikacin 1 g OD IV or Cefoperazone-Sulbactam 3gm IV 12 hourly	Imipenem 1g IV 8 hourly or Meropenem 1gm IV 8 hourly	Get urine cultures before antibiotics & switch to a narrow spectrum agent based on sensitivities. Treat for 10- 14 days. De-escalate to Ertapenem 1 gm IV OD, if Imipenem/meropenem initiated. Monitor renal function if aminoglycoside is used.
Acute prostatitis	Enterobacteriaceae (*E.coli, Klebsiella sp*.)	Doxycline 100 mg BD or Co-trimoxazole 960 mg BD.	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 massagecultures before antibiotics & switch to narrow spectrum agent based on sensitivities and then treat total for 3-4 weeks. Use Ciprofloxacin (if sensitive)

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 may be contemplated.

Infections	**Likely organism**	**Primary treatment (presumptive antibiotics)**	**Alternate treatment**	**Remarks**
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.		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 pylonephritis 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	Prevalance very low so the prophylaxis may be required only on culture documented report Associated with high risk of pre-term labour,still birth,neonatal sepsis
Chorioamnionitis	Group B streptococcus, Gram negative bacilli, chlamydiae, ureaplasma and anaerobes, usually Polymicrobial		Clindamycin/ vancomycin/ teicoplanin and cefoperazone-sulbactum If patient is not in sepsis then IV Ampicillin	Preterm Birth, 9-11% death rate in preterm infant's unfavourable neurologic outcome, lesser risk to term infants.
Septic abortion	Bacteroides, *Prevotella bivius*, Group B, Group A Streptococcus, Enterobactereaceae, *C. trachomatis, Clostridium perfringens.*	Ampicillin 500 mg QID + Metronidazole 500mg IV TDS if patient has not taken any prior antibiotic (start antibiotic after sending cultures) If patient has been	Ceftriaxone 2g IV OD	

		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 bivius, Group B, Group A Streptococcus, Enterobactereaceae, *C. trachomatis*, *Clostridium perfringens*		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/IV 1.2 gm TDS Or Ceftriaxone 2gm IV OD+ Metronidazole 500mg IV TDS +/-gentamicin 7mg/kg/day OD if admission needed. MRSA cover may be required if suspected or colonized (Vancomycin/ Teicolaninp)		

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.)	
Syphillis				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		Very small chance of transmission of infection to fetus.

	some exceptions (see comment and chapter 8)	safe in pregnancy and can be used except streptomycin. SM causes significant ototoxicity to the fetus (Pyrazinamide not recommended by US FDA) Mother and baby should stay together and the baby should continue to breastfeed. 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.	Late diagnosis can predispose to LBW, prematurity.

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	Tendency for severe including premature labor &delivery. Treatment should begin within 48 hrs of onset of symptoms. Higher doses commonly used in non pregnant population (150 mg) are not recommended in pregnancy due to safety concerns. 4. Chemoprophylaxis can be used in significant	Direct fetal infection rare Preterm delivery and pregnancy loss.

			exposures. 5. Live (nasal Vaccine) is contraindicated in pregnancy.	
Varicella	>20 wks of gestation, presenting within 24 hours of the onset of the rash, Aciclovir 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		<18 weeks gestation at diagnosis Spiramycin 1 gm Oral qid until 16-18 weeks/Pyrimathamine + sulphadizine. Alternate every two weeks–	

		If PCR Positive - >18 weeks gestation and documented fetal infection by positive amniotic fluid PCR. Pyremethamine 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		
GENITAL TRACT INFECTIONS			
Candidiasis	Candida species	Fluconazole oral 150 mg single dose For milder cases- Intravaginal agents as creams or suppositories clotrimazole, miconazole, nystatin. Intravaginal azoles, single dose to 7-14 days.	Non-pregnant- If recurrent candidiasis, (4 or more episodes/year) 6 months suppressive treatment with fluconazole 150 mg oral once a week or clotrimazole vaginal suppositories 500 mg once a week.
Bacterial vaginosis	Polymicrobial	Metronidazole500mg Oral BD x 7 days Or metronidazole vaginal gel 1 HS x 5 days Or Tinidazole 2 g orally	Treat the partner.

		ODx 3 days Or 2% Clindamycin Vaginal cream 5 gm HS x 5 days	
Trichimoniasis	Trichomonas vaginalis	Metronidazole 2 gm single dose or 500 mg Oral BD X 7 days or Tinidazole 2 gm Oral single doseFor treatment failure – retreat with Metronidazole 500 mg Oral BD X 7 Days, if 2nd failure Metronidazole 2 gm Oral OD X 3- 5 days	Treat sexual partner with metronidazole 2 gm single dose
Cervicitis **/Urethritis** **Mucopurulent gonoccocal**	Polymicrobial	Ceftriaxone 250 mg IM Single dose + Azithromycin 1 gm single dose OR Doxycycline 100mg BD x 7 day	
Pelvic Inflammatory Disease (Salpingitis & **tubo-ovarian abscess)**	*S. aureus*, Enterobacteriacae, gonococci, gardenella	Outpatient treatment Ceftriaxone 250 mg IM/IV single dose plus +/- Metronidazole 500 mg BD x 14 days Plus Doxycycline 100 mg BD x 14 Days Inpatient Treatment Clindamycin +ceftriaxone till patient admitted then change to OPD treatment	Drainage of tubo-ovarian abscess wherever indicated Evaluate and treat sex partner
Mastitis without abscess	*S. aureus*	Amoxycillin clavulunate/Cephalexin 500 mg QID/ OR Ceftriaxone 2 gm OD OR MRSA- based on sensitivities Add Clindamycin 300 QID or Vancomycin I gm IV 12 hourly /teicoplanin 12mg/kg IV 12 hourly x 3 doses followed by 6 once daily IV	

Mastitis with abscess		Drainage with antibiotic cover for MRSA Clindamycin 300 QID or Vancomycin 15mg/kg IV 12 hourly (maximum 1gm 12 hourly)/teicoplanin 12mg/kg IV 12 hourly x 3 doses followed by 6 mg once daily IV	

BONES AND JOINT INFECTIONS

Condition	Likely causative Organisms	Empiric antibiotics	Alternative antibiotics	Comments
Acute osteomyelitis OR Septic arthritis	*S.aureus, Streptococcus pyogenes* Enterobacteriaceae	Ceftriaxone 2g IV OD Followed by Oral therapy by Cloxacillin 500mg q 8h Or Cephalexin 500mg q 6h	Piperacillin-tazobactam 4.5gm IV q 6h or Cefoperazone-sulbactam 3gm IV q 12h AND Clindamycin 600- 900mg IV TDS	Treat based on culture of blood/synovial fluid/bone biopsy Orthopedic Consultation is essential for surgical debridement Duration: 4-6 weeks (From initiation or last major debridement)
Chronic Osteomyelitis OR Chronic synovitis		No empiric therapy		Definitive treatmentguided by bone/synovial biopsy culture. **Treat for 6 weeks minimum** Investigate for TB, Nocardia, fungi. Extensive surgical debridement. Total duration of treatment depends on

				the joint and the organism. Choose antibiotic based on sensitivity.
Prosthetic joint infection	Coagulase negative staphylococci, *Staphylococcus aureus*,Streptococci Gram-negative bacilli, *Enterococcus*, Anaerobes	Ceftriaxone 2g IV OD. Add Vancomycin1gm IV BD or Teicoplanin 800mg x 3 doses followed by 400mg Once daily		4 weeks

FUNGAL INFECTIONS

Routine antifungal prophylactic therapy in critically ill patients is NOT recommended. Fungal therapy is usually started based on positive cultures or systemic evidence of fungal infection. It is advised to take paired cultures if fungal infection is suspected. Evidence includes persistent sepsis / SIRS despite broad spectrum antibiotic (exclude sepsis, abscess, drug fever, DVT etc). Treat according to identification and antifungal sensitivity of Candida isolate.

Fluconazole IV/oral 800 mg OD first day (12mg/kg) and then 400 mg OD (6mg/kg from second day) if fluconazole naïve or sensitive

Or

2nd line Liposomal Amphotericin B (for *Candida krusei* and *C.glabrata* as inherently resistant to Fluconazole.) **or Caspofungin** (As Caspofungin is inherently inactive against Zygomycetes, Cryptococcus, Fusarium and Trichosporon Spp) Liposomal Amphotericin B IV 3mg/kg OD or Caspofungin dose: IV 70mg on Day 1 (loading), 50mg OD (<80kg) or 70mg OD (if >80kg) thereafter.Moderate to severe hepatic dysfunction: reduce the subsequent daily dose to 35mg OD. Check for drug interactions.

To be decided by Microbiologist/ID physician based on patient's hepatic / renal functions/Severity of infection /drug interactions e.g. rifampicin, carbamazepine, phenytoin, efavirenz, nevirapine, cyclosporin, dexamethasone, tacrolimus etc.

SURGICAL ANTIMICROBIAL PROPHYLAXIS

To be administered within 1 hr before the surgical incision.

Single dose is recommended. Consider for second intra-operative dosein prolong 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-Tazobactum 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

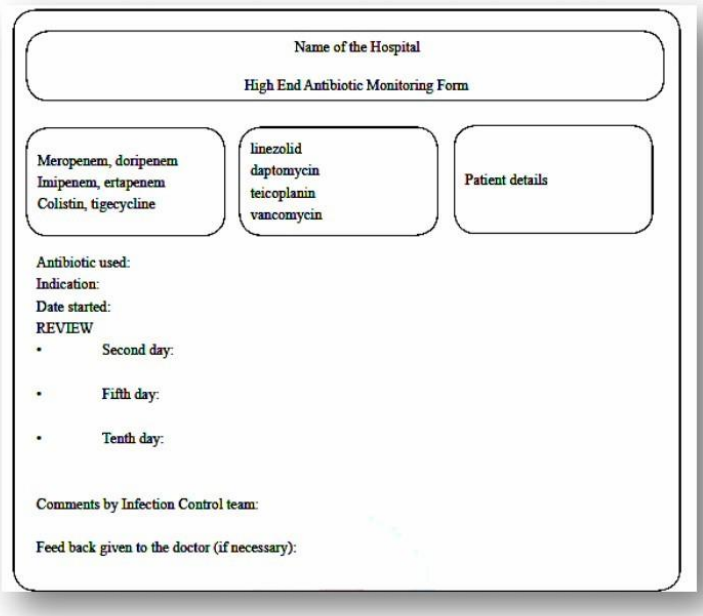
Good Practices

Send for the appropriate investigations in all these infections as recommended. These are the minimum required for diagnosis, prognosis and follow up of these infections.

- All antibiotic initiations would be done after sending appropriate cultures. Rapid tests, such as Gram stain, can help determine therapeutic choices when empiric therapy is required.
- Change in antibiotic would be done after sending fresh cultures
- Follow the Hospital policy when choosing antimicrobial therapy whenever possible. If alternatives as chosen, document the reason in the case records.
- Check for factors which will affect drug choice & dose, e.g., renal function, interactions, allergy. Check that the appropriate dose is prescribed. If uncertain, contact Infectious disease physician, Pharmacy, or check in the formulary.
- The need for antimicrobial therapy should be reviewed on a daily basis. For most infections 5 – 7 days of antimicrobial therapy is sufficient (simple UTIs can be adequately treated with 3 days of antibiotic).
- 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).
- Once culture reports are available, the physician shall step down to the narrowest spectrum, most efficacious and most cost-effective option. If there is no step down availed, the reason shall be documented and is subjected to clinical audit.
- Differentiation between contamination, colonization and infection is important to prevent overuse of antibiotics.

Monitoring Sheets

High-end Antibiotic Monitoring Sheet



Name of the Hospital

High End Antibiotic Monitoring Form

Meropenem, doripenem
Imipenem, ertapenem
Colistin, tigecycline

linezolid
daptomycin
teicoplanin
vancomycin

Patient details

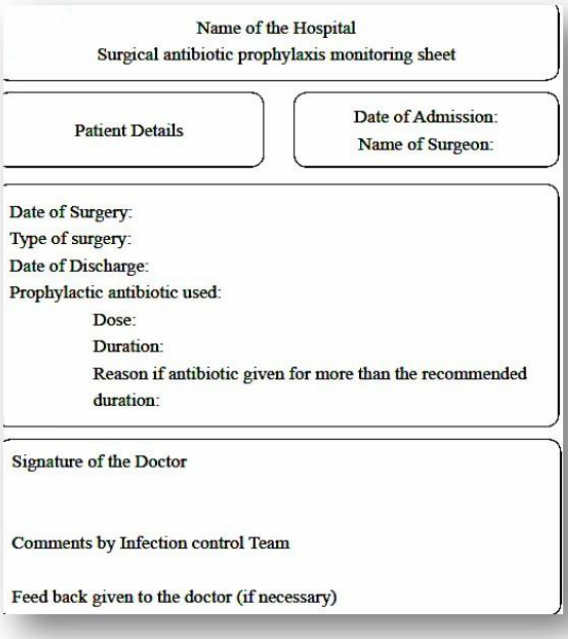
Antibiotic used:
Indication:
Date started:
REVIEW

- Second day:
- Fifth day:
- Tenth day:

Comments by Infection Control team:

Feed back given to the doctor (if necessary):

Surgical Prophylaxis Monitoring Sheet



Name of the Hospital
Surgical antibiotic prophylaxis monitoring sheet

Patient Details

Date of Admission:
Name of Surgeon:

Date of Surgery:
Type of surgery:
Date of Discharge:
Prophylactic antibiotic used:
Dose:
Duration:
Reason if antibiotic given for more than the recommended duration:

Signature of the Doctor

Comments by Infection control Team

Feed back given to the doctor (if necessary)

References

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National Treatment Guidelines for Antimicrobial Use in Infectious Diseases. (2016). NATIONAL CENTRE FOR DISEASE CONTROL. Retrieved from file:///G:/Desktop/antibiotics/AMR_guideline7001495889.pdf

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