Standard Treatment Guidelines (STG) on Antibiotic Use in Common Infectious Diseases of Bangladesh

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CHAPTER 1

Introduction to this guideline

1.1. Introduction

Antibiotic Resistance is a growing global public health threat that is imposing serious effects on management of the infectious diseases. The World Health Organization (WHO) and other international bodies identified antibiotic resistance as the biggest emerging threat for the globe, another pandemic. A National Strategy for Antimicrobial Resistance Containment (ARC) in Bangladesh was developed and approved by the National Steering Committee (NSC) and the National Technical Committee (NTC) with further recommendation of developing a National Action Plan (NAP). The causative microbes of common infectious diseases of Bangladesh are resistant to antibiotics, which include acute respiratory infection (ARI), gastrointestinal infection, tuberculosis (TB), urinary tract infections (UTI), neonatal infections (sepsis), ear infections (otitis media), typhoid fever, and skin & soft tissue infections (SSTIs). Due to lack of standard culture facility, diagnosis and treatment of common infections are mostly empirical. Consequently, the information that we need to design evidence-based intervention to contain antibiotic resistance is currently unavailable in Bangladesh. On this backdrop, Bangladesh has planned to develop a national standard treatment guideline for use of antibiotic.

1.1.1. Goal:

To prevent inappropriate use of antibiotic.

1.1.2. The Objectives:

1.1.2.1. To recommend treatment for common clinical infections requiring antibiotic therapy

1.1.2.2. To promote “AWaRe” classification and approach at all level before prescribing an antibiotic

1.1.2.3. To promote rational use of antibiotics

1.1.2.4. To serve as a tool of antimicrobial stewardship in the hospitals

Methodology:

Introduction:

Bangladesh has developed a national strategy for Antimicrobial Resistance Containment (ARC). Based on the strategy, a national action plan has been formulated that has emphasized an integrated approach during implementation, ie; one health approach. The overall aim of the STG was to create a clinical practice guideline with recommendations for common infectious diseases to improve antimicrobial prescribing empirically using an evidence based approach. On this backdrop, initiative has been taken to formulate a guideline on antimicrobial use, the pertinent scientific literature on those topics as systemically searched and summarized.

Group member selection and meeting process:

CDC is leading the initiative and an introductory meeting was arranged. A work group was appointed and assembled to be responsible for the development of the guideline. The work group consisted of domain experts, including individuals with expertise in infectious disease, internal medicine, critical care medicine, paediatrics, surgery, otolaryngology, ophthalmology, orthopaedics, obstetrics & gynaecology, microbiology, pharmacology and epidemiology. The working group members of this guideline are listed at the beginning of this report. USAID, MTaPs was closely collaborated with CDC throughout the process. Biweekly meeting of the core working group was held both virtually and physically for the topic discussion, guideline development process and consensus development.

Evidence selection, appraisal and presentation:

We first defined the topics, goals and objectives for the guideline and the core working group performed literature searches, articles screening and summarized the evidence. After reviewing all the articles, evidence profiles and data from related resources, a list of commonly occurring infectious diseases of Bangladesh was selected and a template to collect data was prepared and the template was disseminated to the potential sources. The disease pattern of the country was reviewed to identify the important infectious diseases based on their burden. Microbial sensitivity pattern was collected from available authentic sources. A template of summary tables was categorized by the preferred and alternative antibiotics for empirical treatment incorporating the AWaRe classification of antibiotics with the likely causative agents. In the case of combination treatment, the AWaRe classification was labelled beside the antibiotics. A consultative workshop on STG development was held on 5th October 2020 and the proposed

template was shared with the key stakeholders. An evidence-based guideline incorporating available sensitivity data of Bangladesh and using pre-existing guidelines, a proposed STG was drafted including empiric judgment along with the feedback from the core working group. The last version was developed on 6th January 2021 and the draft was sent to the professional associations for their opinions. Then workshop on the finalization of this guideline was arranged on 19th September 2021 and collected expert feedback through "Delphi technique". CDC staff then independently reviewed the tables of evidence prepared by the subject matter experts, individual comments from the participants and professional organizations, and existing guidelines from other organizations.

Recommended preferred regimens should be used empirically and alternative regimens can be considered in instances of notable drug allergy or other medical contraindications to the preferred regimens. The treatment can be adjusted according to the culture sensitivity report where the laboratory facilities are available.

Scope of this guideline:

This guideline is going to be used for empirical antimicrobial treatment before getting culture sensitivity result or in hospitals where regular microbiology testing is not available.

The hospitals where microbiology testing is available should develop their own protocol for empirical antibiotic therapy using their institutional antibiogram.

For infectious diseases where separate national guidelines are available, those guidelines should be preferred over this guideline.

1.2. Principles of Antibiotic Therapy and Rational Antibiotic Prescribing

Infections remain a common cause of presentation to the outpatient department (OPD) and inpatient (IPD) admissions to the hospital. Antibiotics are widely being prescribed to treat infections, both in the community and hospital setting. Selection of an appropriate antibiotic can be challenging to the clinician. Consequently, understanding the basic principles of antibiotic therapy is important to ensure optimal outcome and to reduce selective pressure on antibiotics, which may be associated with the development of antibiotic resistance. The available evidence suggests that, when antibiotic use is warranted, choosing the therapy most likely to achieve clinical cure and treating for the shortest length of time to achieve clinical and microbiological efficacy. It will result in a lower incidence of retreatment and lower incidence of antibiotic resistance. The rational use of medicines has been defined by the WHO as requiring that patients receive medications appropriate to their clinical needs, in doses that meet

their own requirements, for an adequate time, and at the lowest cost to them and their community.

A thorough clinical assessment of the patient is imperative to ascertain the underlying reason. Where appropriate and clinically indicated, the initial assessment should be supported by relevant laboratory investigations (blood, urine, sputum, wound swab) to establish a definitive microbiological diagnosis and to determine the susceptibility of the organism to various antibiotics. The routine use of antibiotics to treat fever (less than 5 days) is inappropriate, as not all fever is caused by infection and antibiotics are only indicated for bacterial infections. Antibiotics should not be prescribed when bacterial infections are unlikely, such as for common cold, coughs and bronchiolitis and others.

1.2.1. Steps of Rational Antibiotic Use

1.2.1.1. Step 1: Clinical Diagnosis

Making a clinical diagnosis is often not given enough importance leading us to advice series of laboratory investigations. A clinical diagnosis most often helps us to predict causative pathogens fitting in to a clinical syndrome which would tailor the correct antibiotic rather than blindly relying on fever, procalcitonin levels, WBC counts, cultures or radiology to make a diagnosis of infection. Our thought process here should be:

- Diagnosis of infection
- Is it an infection?
- A risk assessment of how likely is it that the patient has an infection?
- What are the possible non-infectious mimics?
- Have we taken the appropriate cultures to confirm the final diagnosis?

1.2.1.2. Step 2: Limiting empiric antibiotic therapy

Limiting empiric antibiotic therapy to moderate or severely ill patients. Generally, empiric antibiotic therapy is recommended for a selected group of patients as described below after taking appropriate cultures.

- Febrile neutropenia
- Severe sepsis and septic shock
- Community acquired pneumonia
- Ventilator associated pneumonia
- Aspiration and suppurative pneumonia

- Enteric fever
- Bacterial meningitis

Hence, it is important to start smart and then focus, i.e., evaluate if empiric therapy can be justified or de-escalated and then make a plan with regard to the duration of therapy.

1.2.1.3. Step 3: Know your microbes

Approach includes

- Identify the clinical syndrome
- Elucidate possible sources of infection
- Predict possible microbial pathogens
- Predict the local resistance pattern based on institutional antibiogram (if available)

1.2.1.4. Step 4: Choose the appropriate antibiotic

Approach includes

- Based on possible resistant patterns and the spectrum of the antibiotic
- Use the correct dose, route and duration
- Ensure chosen antibiotic has adequate tissue penetration at the site of infection
- Optimize pharmacokinetics/pharmacodynamics parameters according to co-morbidities

1.2.1.5. Step 5: De-escalation/modification

- Modify empiric broad spectrum antibiotics depending on culture and antibiotic susceptibility result and patient status. Approach includes:
  - the empiric antibiotic(s) that were started are stopped
  - or reduced in number (e.g. combination therapy to a single agent)
  - and/or narrowed in spectrum (broad spectrum to narrow spectrum)
  - switching to new agent based on susceptibility result
- Stop polymyxins and glycopeptides if no carbapenem resistant organisms (CRO) or methicillin resistant Staphylococcus aureus (MRSA) identified on cultures
- Avoid double or redundant Gram-negative or Gram-positive or anaerobic coverage

- Discontinue antibiotics if a non-infectious mimic identified
- Change IV to oral antibiotics
- De-escalation is safe in all patients including febrile neutropenia and septic shock and reduces mortality and length of hospital stay.

1.2.1.6. Step 6: No antibiotics in the following clinical situations

- Respiratory tract syndromes:
  - Viral pharyngitis
  - Viral rhinosinusitis
  - Viral bronchitis/bronchiolitis
  - Non-infectious cardio-pulmonary syndromes misdiagnosed as pneumonia
- Skin and Soft Tissue Infections:
  - Subcutaneous abscesses
  - Lower extremity stasis dermatitis
- Asymptomatic bacteriuria and pyuria including in catheterized patients
- Microbial colonization and culture contamination (Check culture report for colony count and others)

1.3. AWaRe Classification of Antibiotics

The 2019 WHO AWaRe Classification Database was developed on 1st October 2019 according to the recommendation of the WHO Expert Committee on Selection and Use of Essential Medicines. It includes details of 180 antibiotics classified as Access (A), Watch (Wa) or Reserve (Re), their pharmacological classes, Anatomical Therapeutic Chemical (ATC) codes and WHO Essential Medicines List status. It is intended to be used as a uniform and interactive tool for countries to better support antibiotic monitoring and optimal use.

Improving use of antibiotics through antibiotic stewardship is one of the key interventions necessary to curb the further emergence and spread of antimicrobial resistance (AMR). It is also important for ensuring appropriate treatment.

For that reason, WHO in 2017 introduced the Access, Watch, Reserve ("AWaRe") classification of antibiotics in its Essential Medicines List. The classification is a tool

for antibiotic stewardship at local, national and global levels with the aim of reducing antimicrobial resistance.

1.3.1. ACCESS GROUP ANTIBIOTICS

This group includes antibiotics that have activity against a wide range of commonly encountered susceptible pathogens while also showing lower resistance potential than antibiotics in the other groups. There 48 antibiotics in this group according to WHO. These antibiotics are preferable than other groups of antibiotics.

1.3.2. WATCH GROUP ANTIBIOTICS

This group includes antibiotics that have higher resistance potential and includes most of the highest priority agents among the critically important antimicrobials for human medicine and/or antibiotics that are at relatively high risk of selection of bacterial resistance. Antibiotics in Watch group should be used cautiously when access group of antibiotics are not appropriate for that infection.

1.3.3. RESERVE GROUP ANTIBIOTICS

This group includes antibiotics and antibiotic classes that should be reserved for treatment of confirmed or suspected infections due to multi-drug-resistant organisms. Antibiotics in Reserve group should be treated as “last resort” options, which should be accessible, but their use should be tailored to highly specific patients and settings, when all alternatives have failed or are not suitable. These medicines could be protected and prioritized as key targets of national and international stewardship programs involving monitoring and utilization reporting, to preserve their effectiveness.

1.3.4. Measuring antibiotic consumption

By quantifying the use of antibiotics in each of the AWaRe categories (relative or absolute) allows some inference about the overall quality of antibiotic use in a given country. Countries should first compare national / regional antibiotic use using absolute consumption data, and then relative use according to AWaRe categories. The combination of both absolute and relative consumption by category allows simple benchmarking (e.g. an overuse of Watch antibiotics can become immediately apparent and a reduction in Watch antibiotics can be identified as a target for

antibiotic stewardship interventions) and assessment of trends over time (to evaluate the impact of interventions).

1.3.5. Improving use of antibiotics for universal health coverage

Access to quality, safe and affordable medicines and health products is a key contribution to Universal Health Coverage (UHC) and the triple billion target set by WHO's 13th General Program of Work (GPW). Within the 13th GPW is an indicator, based on AWaRe, which specifies a country-level target of at least 60% of antibiotic consumption being from medicines in the Access Group. This indicator was included to monitor access to essential medicines and progress towards UHC.

Chapter 2

2.0. Antibiotic Prescribing with Misconception

The doctor may have following misconceptions while prescribing the drug:

2.1. Newer drugs are always better drugs

There is a limited knowledge of new antibiotic at the time of marketing and therefore, caution should be exercised while prescribing a new antibiotic. The exact therapeutic status and adverse effect profile of a new drug are evident only after several years of its use in population.

A new antibiotic is not the answer to all the infections. Tigecycline is not effective against *Pseudomonas*. Daptomycin is not an effective drug for management of Pneumonia caused by MRSA. Teicoplanin is effective against MRSA infection, but not against Methicillin sensitive staphylococci infection, it is an inferior drug in comparison to Cloxacillin.

2.2. Expensive drugs are always better than cheap drugs

This is also not true. Uncomplicated UTI responds very well to Cotrimoxazole, Norfloxacin, Ciprofloxacin, Ofloxacin, Cephalexin and Nitrofurantoin while third generation Cephalosporins and newer aminoglycoside antibiotics should be reserved for complicated UTI. Expensive higher class of antibiotics offer no advantage over cheap Cefazolin in prophylaxis of surgical site infection.

2.3. Polypharmacy is always better

More the numbers of drugs in prescription, better will be the therapeutic effect is a wrong notion. Empirical polypharmacy is only indicated in polymicrobial infections (like intra-abdominal abscess, lung abscess) and in life threatening infections (like meningitis, septicemia etc.). Fixed dose combination is also indicated in case of Tuberculosis and Leprosy.

2.4. Fixed dose drug combinations (FDCs) are always better

Though the market is flooded with too many FDCs, but only few drugs have scientific justification for combining the ingredients. Antibacterial FDCs are enlisted in National and WHO Essential Medicine List like Sulfamethoxazole-Trimethoprim, Amoxicillin – clavulanic acid, Piperacillin – Tazobactam and Ceftazidime – Avibactam.

Unjustified Polypharmacy (such as Cefuroxime and Clavulanic acid) and use of irrational FDCs lead to increased cost of therapy, increased risk of Adverse Drug Reactions (ADR)s and difficulty in assessment of its causality, problems of drug interaction and risk of multiple drug resistant infections.

Since the updated National Drug Policy 2016, the government of Bangladesh (GoB) has developed three major policy documents/guidelines with direct implications on the prevention and control of AMR in human sector: i) Pharmacovigilance and Adverse Drug Reaction (ADR) Policy 2017 for monitoring the sale and dispensing of drugs without prescription; ii) Standard Treatment Guideline (STG) for appropriate use of antibiotic in the sub-districts; and iii) a guideline for antimicrobial stewardship developed by the country's premiere medical university.

CHAPTER 3

Issues to be considered during use of this Guideline

In this Antibiotic Guideline, recommendations are made as simple format, however the following issues are important to be considered while using this guideline:

- Consider this antibiotic guideline according to the patient care setting and the type of infection
- Identify the patient type (Type 1, Type 2, Type 3, Type 4 as mentioned below) as per Antibiotic Guideline for a given infection type in a given patient care setting.
- Physician may use his/her discretion, though the selection of antibiotic should be rational.
- Selecting appropriate antibiotic after getting the culture sensitivity report considering the aware classification.

3.1. Setting

3.1.1 Outdoor Patient Department (OPD)

3.1.2 Indoor Patient Department (IPD)

3.2. Categories of infections

3.2.1. Blood Stream Infections (BSI);

3.2.2. Urinary Tract Infections (UTI);

3.2.3. Respiratory Infections (RI);

3.2.4. Skin and Soft tissue Infections (SSTI);

3.2.5. Sexually Transmitted Infections (STI)

3.3. Patient Risk Stratification

3.3.1. Patient Type 1 (CAI):

3.3.1.1. No contact with health care system

3.3.1.2. No prior antibiotic treatment in last 90 days

3.3.1.3. Patient young with no co-morbid conditions

3.3.2. Patient Type 2 (HCAI):

3.3.2.1. Recent contact with health care system (e.g., recent hospital admission, nursing home, CAPD) without/minimal invasive procedures

3.3.2.2. Antibiotic therapy in last 90 days

3.3.2.3. Patient old (> 65 years) with few co-morbidities

3.3.3. Patient Type 3 (NI)

3.3.3.1. Hospitalization >5 days and or infections following invasive procedures

3.3.3.2. Recent & multiple antibiotic therapies

3.3.3.3. Patient with multiple Co-morbidities e.g.: cystic fibrosis, structural lung disease, advanced AIDS, neutropenia, other severe immunodeficiency

3.3.4. Patient Type 4 (NI)

3.3.4.1. Type 3 patient with fever despite antibiotic therapy (>5 days) with no obvious source / after appropriate source control

3.3.4.2. ± severe sepsis/septic shock

3.3.4.3. PLUS ≥ 1 of the following factors (but not limited to) for invasive fungal infections: TPN, Hemodialysis, Immunodeficiency of variable origin, Major Abdominal surgery, Multi-focal candida colonization, Diabetes

3.4. Sending the Sample

If laboratory facilities are available, send respective cultures before starting empiric/presumptive antibiotic therapy. Clinicians are expected to send sample for culture and sensitivity before starting empiric/presumptive antibiotic therapy.

3.5. Evaluation and decision about antibiotic therapy

Once the culture sensitivity report is available, consider the following steps:

3.5.1. The empiric/presumptive antibiotic therapy may be continued

3.5.2. The empiric/presumptive antibiotic therapy may be deescalated

3.5.3. The empiric/presumptive antibiotic therapy may be escalated

3.6. Operational definitions for De-escalation and Escalation for patient receiving empiric antibacterial agents

3.6.1. De-escalation:

- Withdrawal of one or more antimicrobial agent from empirical therapy
- Withdrawal of at least one antimicrobial agent plus addition of narrow spectrum antimicrobial agents
- Stopping empirical therapy and switching to narrow spectrum antimicrobial agent

3.6.2. Escalation:

- Addition of one or more antimicrobial agent to empiric antimicrobial therapy
- Switching from narrow spectrum to broad-spectrum antimicrobial agents
- Withdrawal of one or more antimicrobial agent from empirical therapy, but addition of one or more broad-spectrum antimicrobial agent to antimicrobial therapy

3.7. Intrinsic antibiotic resistance:

- Intrinsic antibiotic resistance is a naturally occurring phenomenon that is independent of previous antibiotic exposure and is not caused by a horizontal gene transfer. This phenomenon is also known as inherent resistance or innate resistance.
- In addition to the intrinsic resistance mediated by the bacterial outer membrane and active efflux, studies have shown that a surprising number of additional genes and genetic loci also contribute to this phenotype.
- Therapeutic failure often occurs due to treatment with antibiotic for this intrinsic resistance.

CHAPTER 4

Antibiotic Stewardship

4.1. Introduction

Inappropriate and overuse of antibiotic contributes to the emergence of resistant bacteria, which in turn making infectious diseases untreatable. The development and widespread use of antibiotic agents has been among the most important public health interventions in the last century. Soon after the widespread use of antimicrobials in medicine, human pathogens expressing resistance to these agents were isolated. Antimicrobial stewardship (AMS) programs have been pursuing this goal for decades globally. These programs focus on ensuring the proper use of antimicrobials to provide the best patient outcomes, lessen the risk of adverse effects, promote cost-effectiveness and reduce or stabilize levels of resistance.

The terms used to refer to antimicrobial stewardships programs may vary considerably, antibiotic policies, antibiotic management programs, antibiotic control programs and other terms may be used more or less interchangeably. These terms generally refer to an overarching program to change and direct antimicrobial use at a health care institution, which may employ any of a number of individual strategies. The variety of activities that can be considered antimicrobial stewardship under the broadest definition are large. Reduction in total or targeted antimicrobial use, increase in appropriate drug use, improvement in susceptibility profiles of hospital pathogens, and improvement in clinical markers (such as reduced length of stay) are now being increasingly targeted as outcomes by antimicrobial stewardship programs.

4.2. Context

On 7 April 2011, on the occasion of World Health Day, World Health Organization (WHO) introduced a policy package to combat antimicrobial resistance, which lists critical actions by all stakeholders to stimulate change. At the sixty-seventh World Health Assembly (WHA) in May 2014, Member States approved a resolution, WHA

67.25, requesting WHO to draft a global action plan on antimicrobial resistance. At the Sixty-eight World Health Assembly in May 2015, the World Health Assembly endorsed a global action plan to tackle antimicrobial resistance, including antibiotic resistance, the most urgent drug resistance trend. The goal of the draft global action plan is to ensure, for as long as possible, continuity of successful treatment and prevention of infectious diseases, with effective and safe medicines that are quality assured, used in a responsible way, and accessible to all who need them.

To achieve this goal, the global action plan sets out five strategic objectives:

- To improve awareness and understanding of antimicrobial resistance;
- To strengthen knowledge through surveillance and research;
- To reduce the incidence of infection;
- To optimize the use of antimicrobial agents; and

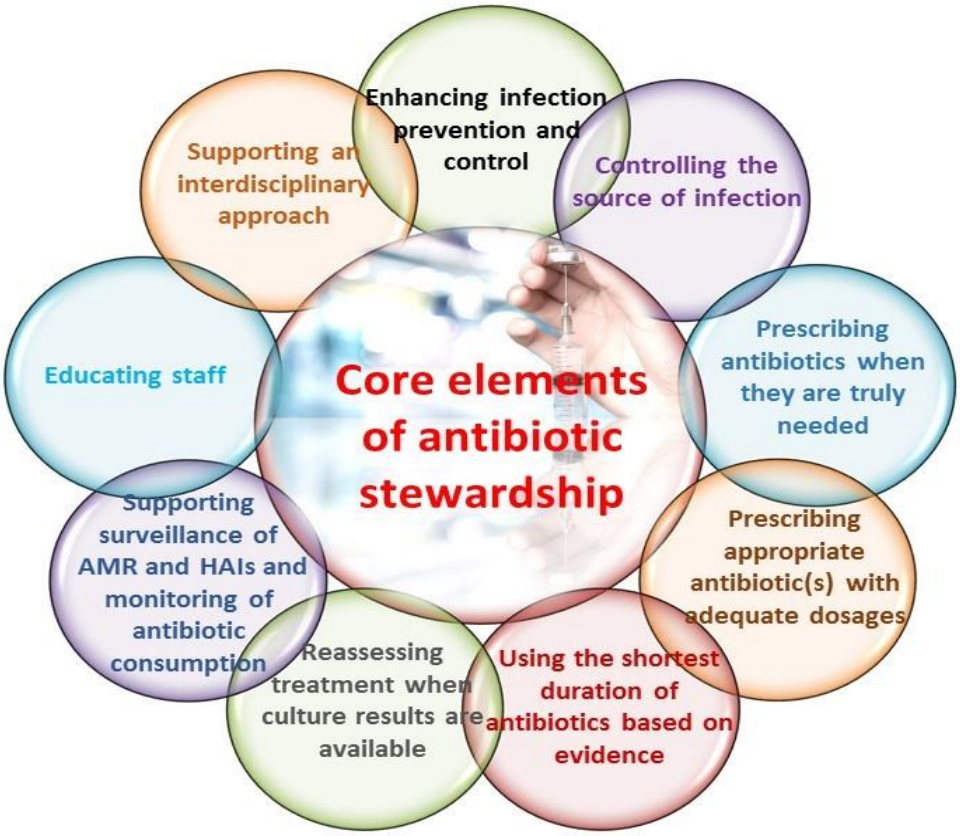
Develop the economic case for sustainable investment that takes account of the needs of all countries, and increase investment in new medicines, diagnostic tools, vaccines and other interventions.

4.3. Association between Antimicrobial Use and Resistance

In order to attenuate antimicrobial resistance, it is necessary to have a precise understanding of the relationship between antimicrobial use and resistance. The spectrum of requisite knowledge stretches from the in vitro interactions between antimicrobial molecules and their microbial targets, to the individual risks associated with administering an antimicrobial to a given patient, to the ecologic level where the aggregate use of antimicrobial use are studied using hospital wide or nationwide data. The nature of these drug-organism relationships is likely to be highly variable depending on the drug-microbe combination of interest, although some common themes may emerge. Despite thousands of scientific investigations on the subject, we are only beginning to understand many of these complex relationships, especially at an ecologic level.

Reference: (National Antimicrobial Stewardship Quality Improvement (QI) Framework, MOHFW 2019)

Core elements of Antimicrobial Stewardship:



CHAPTER 5

Acute Fever

5.1. Outline

The clinicians should ensure appropriate antimicrobial treatment in acute fever (fever<7 days). In case of children less than 5 years sign and symptoms should be checked cautiously and according to IMCI management should be done. Patients more than 5 years of age with acute fever should be treated with Paracetamol for Day 1-3. At the same time investigations (CBC with ESR, Urine RME, CXR P/A view, Blood C/S, tests for Dengue/ Malaria if needed) related with the clinical features should be done on Day 4-5. Empirical antibiotics can be prescribed on Day 6-7 with further investigations and modify the antibiotics according to the culture sensitivity report when available.

5.2. Some general principles

5.2.1. Antibiotic use will need to be classified with respect to type of patient's status (high- and low-risk according to patient risk stratification mentioned above) and the patient's place in the treatment pathway (untreated, treated, and posttreatment).

5.2.2. The choice of medication may vary depending on differences in the case mix of patients, various medicines (of same or different class) listed in the formulary or clinical practice guidelines (such as this guideline).

5.2.3. Timely use of diagnostic tests or documentation of symptoms supporting the presence of infection would be best. Sample for culture (two sets of blood cultures and other appropriate samples as clinically indicated e.g. normally sterile body fluids, deep pus etc.) should be taken before starting empiric antibiotic treatment if possible.

5.2.4. Empiric antibiotic treatment for common infections should be limited to conditions where early initiation of antibiotics has been shown to be beneficial, e.g. severe sepsis and septic shock, acute bacterial meningitis, community acquired pneumonia, necrotizing fasciitis, etc.

5.2.5. Re-assessment of the situation within 48 hours based on the test results and examination of the patient is required. If needed, the medicine's dosage and duration can be adjusted or the antibiotic regimen should be de-escalated (to the narrowest spectrum, least toxic and least expensive antibiotic) based upon patient response and culture and susceptibility reports.

5.3. Diagnostic Investigations (where facilities are available and according to physician's discretion)

5.3.1. Rapid Diagnostic Test (RDT): if needed according to condition (e.g. dengue outbreak, malaria outbreak etc.) following specific guidelines.

5.3.2. Complete blood count: Anemia, leucopenia /leukocytosis, elevated hematocrit or thrombocytopenia are all helpful in diagnosis.

5.3.3. Diagnostic blood cultures (at least two sets) are to be drawn prior to the start of empiric antibiotics.

5.3.4. Liver enzymes and bilirubin

5.3.5. Urinalysis – white blood cells, proteinuria and hematuria.

5.3.6. Chest X-ray (if chest findings are present, to rule out early pneumonia or TB)

5.3.7. Ultrasonography of abdomen if fever persists to rule out hepatic, renal or intraabdominal sources of infection.

5.3.8. Within 96 hours of onset of fever, antigen based serological tests are likely to be positive whereas antibody tests are generally positive after at least 5-7 days of illness.

5.3.9. Investigations on special situations:

5.3.9.1. Dengue rapid NS1 antigen

5.3.9.2. IgM ELISA for Dengue,

5.3.9.3. RT PCR or antigen test for SARS-COV-2

5.4. Principles of empiric therapy

5.4.1. Supportive: Acetaminophen 500 mg every 6 hours round the clock is advisable, accompanied by tepid sponging for fever >103˚F. Replace fluid and electrolytes as required.

5.4.2. No antibiotics are required for the majority of patients with acute febrile illness without an obvious clinical diagnosis.

5.4.3. Start antibiotics for a presumed bacterial infection promptly, but adjust the medicine's dosage and duration, switch to a new medicine, or end antibiotic therapy when results do not support or justify the need to continue.

5.4.4. Reassess the situation within 48 hours based on test results and patient status.

5.4.5. Corticosteroids are not recommended in the treatment of acute undifferentiated fever.

5.4.6. In patients with fever and thrombocytopenia, platelet transfusions are not recommended in general (see national clinical management guideline of Dengue).

5.5. Outcome

In most cases of fever, patient may either recover spontaneously or a diagnosis is reached after repeated clinical evaluation and investigations. If no diagnosis is reached in up to 3 weeks, patient is said to be having fever of unknown origin (FUO) and should be managed accordingly.

5.6. Patient education

5.6.1. Self-medication and over-medication should be avoided

5.6.2. Avoid injectable paracetamol/NSAIDs

5.6.3. Antibiotics should be taken only on advice of a physician.

5.6.4. Avoid covering the patient with high fever with blanket, etc.

5.6.5. Plenty of fluids should be taken. Stay in cool environment. Washing/sponging of face and limbs should be done repeatedly.

CHAPTER 6

6.1. Respiratory tract infection

6.1.1. Indications for antibiotic therapy in URTI:

6.1.1.1. Persistent symptoms of acute rhinosinusitis lasting for ≥ 10 days without clinical improvement;

6.1.1.2. Severe symptoms or signs including high fever, purulent nasal drainage or facial pain lasting for at least 3 –4 consecutive days at the beginning of the illness;

6.1.1.3. Onset with *worsening* symptoms or signs characterized by the new onset of fever, headache, or increase in nasal discharge following a typical viral upper respiratory infection (URI) that lasted 5–6 days and were initially improving ("double-sickening").

6.1.2. Patient Risk Stratification

6.1.2.1. **Patient Type 1 (CAI):**

6.1.2.1.1. Patient No contact with health care system

6.1.2.1.2. No prior antibiotic treatment in last 90 days

6.1.2.1.3. Patient young with no co-morbid conditions

6.1.2.2. **Type 2 (HCAI):**

6.1.2.2.1. Recent contact with health care system (e.g. recent hospital admission, nursing home, CAPD) without/minimal invasive procedures

6.1.2.2.2. Antibiotic therapy in last 90 days

6.1.2.2.3. Patient old (> 65 years) with few co-morbidities

Table 6.1: Pneumonia (Adult)

<table>
<tr><th>Likely causative agent</th><th>Preferred Antimicrobial</th><th>Alternative Antimicrobial</th></tr>
<tr><td rowspan="4">Community acquired:
Streptococcus pneumonia
Mycoplasma pneumonia
Legionella pneumophila
Haemophilus influenzae
Staphylococcus aureus
Chlamydia pneumonia
Chlamydia psittaci
Coxiella burnetii
Klebsiella pneumoniae
Actinomyces

CURB-65 scoring:
Confusion
Urea>7mmol/20mg/dl
Respiratory rate>30 min
Blood pressure (Systolic<90 mmHg or diastolic<60mmHg)
Age>65 years
(1 for each feature present, total score 3 or more is treated as severe pneumonia. Score less than 3 is treated as uncomplicated pneumonia)

Duration of treatment:
7-14 days</td><td colspan="2">Uncomplicated case</td></tr>
<tr><td>• Amoxicillin/Clavulanate (500 mg/125 mg) 8 hourly daily
or,
Amoxicillin/Clavulanate (875 mg/125 mg) 12 hourly (Access)
or,
• Clarithromycin (500 mg) BD orally (Watch)
or,
• Erythromycin (500 mg) orally 6 hourly (Watch)
or,
• Vancomycin (15 mg/kg) every 12 hours, adjust based on levels) (Watch)</td><td>• Cefpodoxime (200 mg) 12 hourly daily (Watch)
or,
• Cefuroxime (500 mg) 12 hourly (Watch)
or,
• Flucloxacillin (1-2 gm) IV 6 hourly (for S. aureus)
Plus
Clarithromycin (500 mg) BD IV daily (Watch)
or,
• Ceftriaxone (1 to 2 gm) IV daily Plus
Clarithromycin (500 mg) BD /Azithromycin (500 mg) OD (Watch)
or,
• Rifampicin (600 gm) 12 hourly for atypical bacteria (Watch)</td></tr>
<tr><td>Severe case</td><td></td></tr>
<tr><td>• Amoxicillin/Clavulanate (1.2 gm) IV 8 hourly daily (Access)
Plus
Clarithromycin (500 mg) IV 12 hourly (Watch)</td><td>•Amoxicillin (1gm) IV 6 hourly
Plus
Flucloxacillin (0.5 to 1 gm) IV 6 hourly (Access)

Watch:
• Ceftriaxone (1 to 2 Gm) IV or, Cefuroxime (1.5 gm) IV 8 hourly
Plus
Erythromycin (500 mg) IV 6 hourly</td></tr>
<tr><td>Hospital acquired:
Pseudomonas aeruginosa
Klebsiella pneumoniae
Escherichia coli
Staphylococcus aureus
Acinetobacter</td><td>• Ceftazidime (1gm) IV 8 hourly or,
Ceftriaxone (1 to 2 gm) IV 12 hourly (Watch)
Plus
Levofloxacin (500mg) OD or, Moxifloxacin (400mg) OD (Watch)
or,
• Vancomycin (1gm) IV 8-12 hourly (Watch)</td><td>• Meropenem (1gm) IV 8 hourly (Watch)
Plus
Levofloxacin (500mg) OD or, Moxifloxacin (400mg) OD (Watch)
Or,
Piperacillin-Tazobactam (4.5 g) IV 6 hourly (Watch)
Plus</td></tr>
</table>

		Levofloxacin (500mg) OD or, Moxifloxacin (400mg) OD (Watch) **Or,** **Watch:** • **Meropenem (1 g) IV 8 hourly or,** **Imipenem (500 mg) IV 6 hourly or,** • **Cefepime (2 g) IV 8 hourly or,** • **Ceftazidime (2 g) IV 8 hourly**
	Reserve	**Reserve**
	• **Linezolid (600 mg) IV 12 hourly**	• **Aztreonam (1 g) IV 8-12 hourly or,** • **Colistimethate Sodium (2.5 mg /kg/day) 2-4 divided dose or,** • **Tigecycline (100 mg) IV stat and then 50 mg IV 12 hourly or,** • **Ticoplanin (6mg/kg) IV stat followed by 3 mg/kg daily. or,** • **Polymixin B (15000-25000 U/kg) IV 12 hourly**

Table 6.2: Aspiration pneumonia

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Streptococcus pneumoniae Staphylococcus aureus Haemophilus influenza Anaerobes (eg- Peptostreptococcus Fusobacterium Prevotella spp. Streptococcus milleri group Klebsiella pneumoniae **Duration: 10-14 days**	*Access*	*Access*
	• **Amoxycillin/Clavulunate (1.2 gm) IV 8 hourly** **Plus** **Metronidazole (500 mg) IV 8 hourly**	
	Watch	*Watch*
	• **Ceftriaxone (2 gm) IV 12 hourly (Watch)** **or, Meropenem (1 gm) IV 8 hourly (Watch)** **Plus** **Metronidazole (500 mg) IV 8 hourly (Access)**	• **Ceftriaxone (2 gm) IV 12 hourly (Watch)** **or, Meropenem (1 gm) IV 8 hourly (Watch)** **Plus** **Clindamycin (600mg) IV 8hourly (Access)** **or,** **Vancomycin (1 g) IV 8 hourly (Watch)**
	Reserve	*Reserve*
		• **Linezolid (600 mg) IV 12 hourly** **Duration 7-14 days**
Nosocomial Oral anaerobes as mentioned above Klebsiella pneumoniae Escherichia coli MRSA Pseudomonas aeruginosa Enterobacter spp.	• **Ceftriaxone (1gm) IV 12 hourly (Watch)** **Plus** **Clindamycin (300mg) IV 6 to 8 hourly (Access)** **Or,** • **Carbapenem (1 gm) IV 8 hourly (Watch)** **Plus** • **Clindamycin (300mg) IV 6 to 8 hourly (Access)**	**Watch:** • **Piperacillin-Tazobactam (4.5 g) IV 6 hourly** **Plus/or** • **Vancomycin (1gm) IV 8 hourly** **Reserve:** • **Linezolid (600 mg) IV 12 hourly for 7-14 days**

Table 6.3: Upper respiratory tract infection

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Streptococcus pyogenes *Streptococcus pneumonia* *Haemophilus influenzae* *Moraxella catarrhalis* *Staphylococcus aureus* Gram-negative bacilli (eg.*Enterobacteriaceae spp*) Anaerobes (*Bacteroides, Fusobacterium, Peptostreptococcus*) **Duration:** 5-7 days **Note:** ***Levofloxacin has a higher activity against *Mycobacterium tuberculosis* and is preferred over the other fluoroquinolones as second-line anti tubercular therapy. So, this drug should not be used empirically**.	*Access*	*Access*
	• **Amoxicillin-Clavulanate (500 mg/125 mg) orally TDS for 7-10 days**	• **Doxycycline (100 mg) orally BD or 200 mg orally OD**
	Watch	*Watch*
	• **Cefixime (200mg) orally BD for 7-10 days** **Plus** **Clindamycin (Access) may be used as second-line therapy** **or,** • **Azithromycin (500mg) orally OD for 5 days**	• **Cefuroxime (500mg) orally BD for 10 days** **or,** • ***Levofloxacin (500 mg) orally OD for 7-10 days** **or,** • **Moxifloxacin (400 mg) orally OD for 7-10 days** **or,** • **Ceftriaxone (1–2 g) IV 12 to 24 hourly** **or,** • **Cefotaxime (2 g) IV 4 to 6 hourly** **or,** • **Cefepime (2 g) 8 hourly** **or,** • **Ceftazidime (2 g) 8 hourly** **Duration: 7-10 days**
	Reserve	*Reserve*

CHAPTER 7

CNS Infections

7.1. Meningitis

Table 7.1: Bacterial Meningitis

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Streptococcus pneumoniae *Neisseria meningitidis* *Haemophilus influenzae* *S. agalactiae* *Listeria monocytogens* ***Note:*** *In tubercular meningitis treatment should continue according to National guideline.* ***Note:*** *In viral meningitis, Injection Acyclovir can be used in case of Herpes infection, otherwise usually self- limiting.* **Adjunctive treatment:** *Dexamethasone 0.15 mg/kg IV 6 hourly for 2-4 days*	*Access*	*Access*
	• **Penicillin G 20MU IV 4 hourly** • **Gentamicin 1mg/kg IV 8 hourly for 14 days** **Or,** • **Amikacin 0.5- 1 gram IV 8-12 hourly** **Duration: 14 days**	**Age >50 years & Suspected Listeria monocytogens infection (immunosuppression, diabetic, alcoholic, brain-stem signs):** • **Ampicillin 2 gm IV 12 hourly** **Or,** • **Co-trimoxazole (5mg/kg) IV 12 hourly**
	Watch	*Watch*
	• **Ceftriaxone (2gm) 12 hourly IV for 14 days** **Or,** • **Cefotaxime (2gm) IV 6 hourly** **Patients with a clear history of anaphylaxis to Beta lactams:** • **Vancomycin (1gm) IV 12 hourly** **Plus** • **Chloramphenicol (25mg/kg) IV 6 hourly (Access)**	• **Vancomycin 25 mg/kg loading dose followed by 30 mg/kg/d IV in 2-3 equally divided doses.** **Plus** • **Ceftriaxone (2gm) IV 12 hourly for 14 days** **or,** **Cefotaxime (2gm) IV 6 hourly** **or,** **Cefepime (2gm) IV 8 hourly** **or,** **Meropenem (1gm) IV 8 Hourly for 14 days**
	Reserve	*Reserve*
		• **Linezolid (600mg) IV 12 hourly**

Table 7.2: Meningitis [Post neurosurgery or Penetrating head trauma]

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Staphylococcus epidermidis, Staphylococcus aureus, Propionibacterium acnes, Pseudomonas aeruginosa, Acinetobacter Baumanii **Duration:** 14 days	*Access*	*Access*
	Watch	*Watch*
	• **Meropenem (1 gm) IV 8 hourly Plus** • **Vancomycin 25 mg/kg loading dose followed by 30 per/kg per 24 hourly IV in 2-3 equally divided doses.**	
	Reserve	*Reserve*

Table 7.3: Meningitis [with basilar skull fractures]

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
S. pneumoniae *H. influenza*	*Access*	*Access*
	Watch	*Watch*
	• **Ceftriaxone (1 to 2gm) IV 12 hourly for 14 days**	
	Reserve	*Reserve*

Table: 7.4 Brain Abscess, Subdural Empyema

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Streptococci, Bacteroides, Enterobacteriaceae, S. aureus **Duration: 4-8 weeks (except Gentamycin)**	*Access*	*Access*
	• **Amoxicillin (500 mg) IV 8 hourly** **Plus** **Gentamicin (5mg/kg/day) IV 2-3 divided doses** **Plus** **Metronidazole (1 gm) IV 8 hourly**	
	Watch	*Watch*
	• **Ceftriaxone (2gm) IV 12 hourly for 14 days** **or,** **Cefotaxime (2 gm) IV 4 to 6 hourly** **Plus** **Metronidazole (1 gm) IV 8 hourly (Access)** **Or,** • **Meropenem (1 gm) IV 8 hourly (Reserve)** **Plus** **Vancomycin 25 mg/kg loading dose followed by 30 per/kg/day IV in 2-3 equally divided doses.**	**For Pseudomonas:** • **Vancomycin 25 mg/kg loading dose followed by 30 per/kg/day IV in 2-3 equally divided doses. (For S. aureus)** **Or,** **Ceftazidime 6gm/day IV 8 hourly** **Plus** **Metronidazole (1 gm) IV 8 hourly (Access)**
	Reserve	*Reserve*
		• **Rifampicin (600 mg) 12 hourly** **or,** • **Linezolide (600 mg) 12 hourly** **or,** • **Colistin(25mg/hourly) 8 hourly**

Chapter 8

Infections of Cardiovascular System

8.1 Infective Endocarditis

8.1.1 Clinical information

8.1.1.1 Acute endocarditis:

Severe febrile illness, prominent and changing heart murmur, clinical stigmata of chronic endocarditis absent, history of skin infection, abscess, vascular access site infection, rapid valve damage or cardiac abscess formation, IV drug abuse.

8.1.1.2 Sub-acute endocarditis:

Persistent fever, unusual tiredness, night sweats, weight loss, valve dysfunction, clinical stigmata of chronic endocarditis present.

Table 8.1: Acute Endocarditis

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
MSSA (Methicillin sensitive Staphylococcus aureus) MRSA (Methicillin Resistant *Staphylococcus aureus)* ***Duration:** change the antibiotics according to the culture sensitivity and continue treatment for 4-6 weeks*	*Access*	*Access*
	For MSSA: • **Flucloxacillin or, Cloxacillin (2 g) IV 6 hourly for 4-6 weeks**	
	Watch	*Watch*
	For MRSA: • **Vancomycin (1gm) IV 12 hourly Plus Gentamicin 1mg/kg twice daily IV (Access)**	
	Reserve	*Reserve*
		For MSSA, CA-MRSA, HA MRSA: • **Daptomycin 6 mg/kg/day (for Right-sided IE) or, 8-10mg/kg/day (for left- sided IE)**

Table 8.2: Subacute Endocarditis

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Streptococcus viridans Other *Streptococci* *Enterococci* *HACEK microorganisms (Haemophilus species, Actinobacillus species, Cardiobacterium hominis Eikenella corrodens Kingella species)* ***Duration:*** *change the antibiotics according to the culture sensitivity and continue treatment for 4-6 weeks*	*Access*	*Access*
	• Amoxicillin (2gm) IV 4 hourly **Plus/Minus** **Gentamicin 1mg/kg IV 12 hourly for 4-6 weeks** **or,** **• Flucloxacillin 2gm 6 houly IV for 4 weeks** **or,** **• Penicillin G 20MU IV 4 hourly divided doses**	**• Benzylpenicillin (1.2- 2.4 gm) IV 4 hourly** **Plus** **• Gentamicin (1mg/kg) IV 12 hourly for 4-6 weeks** **or,** **• Ampicillin-Sulbactam (2gm) 6 hourly IV for 4 weeks**
	Watch	*Watch*
	If true penicillin allergy: **• Vancomycin (1gm) 12 hourly IV (Watch)** **Plus** **Gentamicin (1mg/kg) IV 12 hourly (Access)** **or,** **• Ceftriaxone 2 g IV once daily (If penicillin allergy)**	**Methicillin resistant:** **• Vancomycin (1gm) IV 12 hourly** **Plus** **Rifampicin (300-600 mg) 12 hourly orally** **or,** **• Teicoplanin 12mg/kg IV 12 hourly in 3 doses followed by 6 - 12 mg once daily IV depending on severity**
	Reserve	*Reserve*
		• Daptomycin 6 mg/kg/day (for Right-sided IE) Or 8-10 mg/kg/day (for left- sided IE)

Table 8.3: Prosthetic valve (early ≤1 y)

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Note: Antibiotics dosages recommended are for patients with normal renal function	*Access*	*Access*
	Watch	*Watch*
	• **Vancomycin (1gm) IV 12 hourly for 6 weeks** **Plus** **Rifampicin (300-600 mg) orally 12 hourly for 6 weeks** **Plus** **Gentamicin (1mg/kg) IV 12 hourly (Access) for 2 weeks**	• **Vancomycin (15 mg/kg) 12 hourly IV for 6 weeks** **Plus** **Rifampicin (300 mg) orally 8 hourly for 6 weeks** **Plus** **Cefepime (2gm) 8 hourly IV for 6 weeks** **Plus** **Gentamicin (1mg/kg) IV 8 hourly (Access) for 2 weeks**
	Reserve	*Reserve*

Table 8.4: Prosthetic valve (late>1 y)

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Note: Antibiotics dosages recommended are for patients with normal renal function	*Access*	*Access*
	• **Ampicillin (2gm) IV 4 hourly** **Plus/Minus** • **Gentamicin (1mg/kg) IM or IV 8 hourly for 4-6 weeks**	
	Watch	*Watch*
	• **Ceftriaxone (2 gm) IV once daily for 6 weeks** **Plus** **Gentamicin (1mg/kg) IV 8 hourly for 2 weeks** **Plus/Minus** **Doxycycline (100mg) 12 hourly orally for 6 weeks**	• **Vancomycin 25 mg/kg loading dose followed by 30 per/kg/day IV in 2-3 equally divided doses**
	Reserve	*Reserve*

Chapter 9

Infections of Gastrointestinal System

Antibiotic therapy is not required in most patients with acute gastroenteritis. Empirical antibiotics can be necessary in certain situations (eg: diarrhea with fever, bloody diarrhea, persistent symptoms >1 week, immunocompromised patients).

Table 9.1: Infectious Gastroenteritis

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Escherichia coli (enteroaggregative, enterotoxigenic, enteroinvasive), Shigella, Typhi and Non typhoidal *Salmonella, Campylobacter, Vibrio cholerae, Entamoeba histolytica, Giardia, Blastocystis, Cyclospora, Cystoisospora, Cryptosporidium* **Note:** If protozoal infection suspected: Metronidazole, 400- 500 mg 8 hourly for 7-10 days.	*Access*	*Access*
	Watch	*Watch*
	• **Azithromycin (500 mg) 2 tab stat, then 1 tab once daily orally for 3 to 5 days** **If severe, then** • **Ceftriaxone (2g to 4g) IV once daily for 5 days**	• **Erythromycin (500 mg) four times per day for 3 to 5 days or,** • **Vancomycin (125 mg) four times per day for 10 days or,** • **Ciprofloxacin (500mg) BD orally for 3 days or,** • **Nitazoxanide (500mg) BD orally for 3 days**
	Reserve	*Reserve*

Table 9.2: Uncomplicated Typhoid Fever

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Salmonella typhi *Salmonella paratyphi* **Note:** All strains are highly resistant to Ciprofloxacin, so after culture sensitivity Ciprofloxacin use will be beneficial. **Widal test is of little value in the diagnosis of enteric fever.**	*Access*	*Access*
		• **Cotrimoxazole (960 mg) BD for 14 days** **Majority of strains are nalidixic acid resistant**
	Watch	*Watch*
	Outpatients: • **Cefixime (20mg/kg/day) in two divided doses for 14 days** **or,** **Azithromycin (500 mg) orally BD for 7 days** **Inpatients:** • **Ceftriaxone (1 gm) IV 12 hourly for 10-14 days** **Plus/ Minus** **Azithromycin (500 mg) orally BD for 7 days** **(Ceftriaxone to be changed to oral Cefixime when patient is afebrile to finish total duration of 14 days)**	**Outpatients:** • **Azithromycin (500 mg) orally BD for 7 days** **or,** • **Ciprofloxacin (500mg) orally BD for 14 days**
	Reserve	*Reserve*

Table 9.3: Typhoid Fever [Chronic carrier state > 1 year]

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Salmonella typhi *Salmonella paratyphi*	*Access*	*Access*
	Watch	*Watch*
	• **Cefixime (400 mg) 12 hourly orally** **Or,** • **Ceftriaxone (1 gm) IV 12 hourly or 2 gm IV once daily**	• **Azithromycin (500 mg) 2 tab orally stat, followed by 500mg once daily orally for 7-10 days.**
	Reserve	*Reserve*

Table 9.4: Typhoid Fever [Severe infection or suspected resistant organism]

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Salmonella typhi *S. paratyphi*	*Access*	*Access*
	Watch	*Watch*
	• **Meropenem: 1gm IV 8hourly for 10 – 14 days**	• **Ertapenem: 1gm IV once daily for 10 – 14 days** • **Imipenem: 500mg IV 6 hourly for 10 - 14 days**
	Reserve	*Reserve*

Chapter 10

Infections of the Urinary Tract

Table 10.1: Urinary Tract Infection

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
A) Symptomatic uncomplicated cystitis (Female, 10 or more pus cell in urinalysis, presence of symptoms, positive urine culture): *Escherichia coli* *Klebsiella* *Pseudomonas* *Enterococcus* *Staphylococcus saprophyticus* *Staphylococcus aureus* *Enterobacter* *Acinetobacter* *Citrobacter* *Candida albicans*	*Access*	*Access*
	• **Nitrofurantoin (100mg) 12 hourly orally for 5-7 days** **Or,** • **Cotrimoxazole (960 mg) 1 DS tablet 12 hourly orally for 3-5 days**	
	Watch	*Watch*
		• **Cefuroxime (250-500 mg) 12 hourly orally for 3-5 days** **Or,** • **Cephalexin (500mg) 12 hourly orally for 3-5 days** **Or,** • **Ciprofloxacin (250-500 mg) 12 hourly orally for 3-5 days** **(Alternative agents should be avoided if possible. If patient has an allergy/contraindication to the above antibiotics of access group then watch group can be used)**
	Reserve	*Reserve*

Table 10.2: Urinary Tract Infection

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
B) Symptomatic complicated cystitis: (1 more of the following): Male, Pyelonephritis, Antibiotic use in previous 1 year, History of infection with MDR organism, Immune-compromised, Functional or anatomic abnormality, sepsis *Escherichia coli* *Klebsiella* *Pseudomonas aeruginosa* *Enterococcus* **Duration:** 7-10 days (if pyelonephritis, then 10-14 days)	*Access*	*Access*
	Outpatient: • **Cotrimoxazole (960 mg) 1 DS tablet 12 hourly orally** **Or,** • **Nitrofurantoin (100mg) 12 hourly orally** **Inpatient:** • **Amoxicillin-Clavulanic (1.2gm) IV 8 hourly**	• **Amikacin (500mg) 12 hourly IV daily**
	Watch	*Watch*
	Inpatient: • **Ceftriaxone (1gm) IV 12 hourly** **Or,** • **Ceftazidime (1gm) IV 8 hourly** **Outpatient:** • **Cefuroxime (500mg) 12 hourly orally** **Or,** • **Ciprofloxacin (500mg) 12 hourly orally**	**Inpatient:** • **Meropenem (1 gm) IV 8 hourly** **Or,** • **Piperacillin –Tazobactam (4.5 gm) IV 6 hourly**
	Reserve	*Reserve*

Table 10.3: Urinary Tract Infection

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
C) Asymptomatic Bacteriuria (5-10 pus cell in urinalysis, positive urine culture and no symptoms & signs): *Escherichia coli* *Klebsiella* *Enterobacter* *Acinetobacter* *Citrobacter* *Pseudomonas aeruginosa* *Enterococcus*	*Access*	*Access*
	Antibiotics do not decrease asymptomatic bacteriuria or prevent subsequent UTI. No antibiotics unless the patient is pregnant, scheduled for urologic procedure and kidney transplant recipient. In these cases, according to sensitivity pattern initiate within 24 hours prior to procedure and until catheter removed. • **Cotrimoxazole (960 mg) 1 DS tablet 12 hourly orally** **Or,** • **Ciprofloxacin (500mg) 12 hourly orally (Watch)**	**Pregnant:** • **Amoxicillin (500mg) 12 hourly orally for 3 -7 days** **Or,** • **Nitrofurantoin (100 mg) 12 hourly orally for 5 days (If diabetic- 7days).**
D) Recurrent UTI:	*Access*	*Watch*
	• **Nitrofurantoin (50 mg) daily orally at night and continue maximum up to 6 months** **Or,** • **Co-amoxiclav (250/125 mg) orally 8 hourly for 1 month**	• **Ciprofloxacin (250mg) at night orally daily and continue maximum up to 6 months**
E) Prostatitis: **Duration:** 28 days **Note:** Beta lactams do not have adequate penetration into prostate.	*Access*	*Watch*
	• **Cotrimoxazole (960 mg) 1 DS tablet orally 12 hourly**	• **Ciprofloxacin (500mg) 12 hourly orally** **Or,** • **Levofloxacin (500mg) once daily orally**

Table 10.4: Urinary Tract Infection

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
F) Catheter related asymptomatic bacteriuria (positive urine culture in a single catheter urine sample and no symptoms & signs): *Escherichia coli* *Proteus* *Klebsiella* *Pseudomonas* *Enterococcus* *Staphylococcus saprophyticus* *Staphylococcus aureus* *Enterobacter spp.* *Candida albicans*	*Access*	*Access*
	Remove catheter. **Antibiotics do not decrease or prevent subsequent UTI.** **No antibiotics unless the patient is pregnant and scheduled for urologic procedure. In these cases, according to sensitivity pattern initiate within 24 hours prior to procedure and until catheter removed.** • **Cotrimoxazole (960 mg) 1 DS tablet 12 hourly orally** **Or,** • **Ciprofloxacin (500mg) 12 hourly orally (Watch)**	**Pregnant:** • **Amoxicillin (500mg) 12 hourly orally for 3 -7 days** **Or,** • **Nitrofurantoin (100 mg) 12 hourly orally for 5 days** **Or,** • **Cephalexin (500mg) orally 12 hourly for 3-7 days (Watch)**
	Watch	*Watch*
		• **Cefuroxime (250-500 mg) 12 hourly orally for 3-5 days** **Or,** • **Meropenem (1gm) 8 hourly IV for 7-14 days** **(In case of known or suspected extended spectrum beta lactamases producing E.coli-ESBL)**
	Reserve	*Reserve*

Table 10.4: Urinary Tract Infection

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
G) Catheter related symptomatic bacteriuria: (1 more of the following): ***Male, Pyelonephritis, Antibiotic use in previous 1 year, History of infection with MDR organism, Immune-compromised, Functional or anatomic abnormality, sepsis*** *Escherichia coli* *Proteus* *Klebsiella* *Pseudomonas* *Enterococcus* *Staphylococcus saprophyticus* *Staphylococcus aureus* *Enterobacter spp.* *Candida albicans* **Duration:** 10-14 days	*Access* **Remove catheter whenever possible.** **Outpatient:** • **Cotrimoxazole (960 mg) 1 DS tablet 12 hourly orally** **Or,** • **Nitrofurantoin (100mg) 12 hourly orally (except pyelonephritis)** **Inpatient:** • **Amoxicillin-Clavulanate (1.2gm) 8 hourly IV**	*Access* • **Amikacin (500mg) 12 hourly IV daily**
	Watch **Outpatient:** • **Ciprofloxacin (250-500mg) 12 hourly orally** **Inpatient:** • **Meropenem (1gm) 8 hourly IV for 7-14 days (In case of known or suspected extended spectrum beta lactamases producing E.coli- ESBL)**	*Watch* • **Piperacillin –Tazobactam (4.5 gm) IV 6 hourly**
	Reserve	*Reserve*

Chapter 11

Infections in the Ear, Nose and Throat (ENT)

Table 11.1: Acute Otitis Media

Antibiotics should not be routinely prescribed for uncomplicated Otitis media except for severe disease or risk of complications.

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
S pneumoniae *Beta hemolytic Streptococcus (DRSP)* *Staphylococcus aureus* *β-lactamase–producing H influenzae* *M catarrhalis*	*Access*	*Access*
	• **Cap. Amoxacillin (500 mg) orally 8 hourly for 7 days** **(In children: 30mg/kg/dose 12 hourly for 5 days)**	• **Amoxicillin/Clavulanate (500/125 mg) orally 8 hourly for 7 days** **(In children: 22.5 mg/kg/dose 12 hourly for 5 days)** **In penicillin allergy:** • **Sulfamethoxazole+Trimethoprim (20+4 mg/kg) for child 1 month or older 12 hourly for 5 days Or, (800/160 mg) orally 12 hourly for 5 days**
	Watch	*Watch*
	In penicillin allergy: • **Cefuroxime suspension (3 months to 2 years: 10mg/kg/dose and 2 years and older: 15mg/kg/dose) orally 12 hourly for 5 days Or,** • **Tablet Cefuroxime (250-500 mg) 12 hourly for 5-7 days**	
	Reserve	*Reserve*

Table 11.2: Chronic Otitis Media

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Pseudomonas aeruginosa *Escherichia coli* *Staphylococcus aureus* *Streptococcus pyogenes* *Proteus mirabilis* *Klebsiella species* *Bacteroides* *Peptostreptococcus* *Propionibacterium* ***Note:*** *Oral antibiotics should be added or changed according to culture sensitivity.*	*Access*	*Access*
	Cap. Amoxacillin (500 mg) orally 8 hourly for 10-14 days **(In children: 30mg/kg/dose 12 hourly for 7-10 days)** **Plus** **Otic antibiotic drops containing buffered neutral solutions of Gentamicin/Tetracycline: 2/3 drops 8-12 hourly for 10-14 days**	• **Amoxicillin/Clavulanate (500/125 mg) orally 8 hourly for 10-14 days** **(In children: 22.5 mg/kg/dose 12 hourly for 7-10 days)**
	Watch	*Watch*
	• **Cefuroxime (500mg) orally 12 hourly for 10- 14 days/ Cefuroxime suspension (3 months to 2 years: 10mg/kg/dose and 2 years and older: 15mg/kg/dose) orally 12 hourly for 10-14 days** **Plus** **Antibiotic ear drops containing buffered neutral solutions of Ciprofloxacin 2/3 drops 12 hourly for 10-14 days**	• **Erythromycin ear drop- 2/3 drops 12 hourly for 10-14 days**
	Reserve	*Reserve*
		• **Polymyxin B ear drop- 2/3 drops 12 hourly for 10-14 days**

Table 11.3: Pharyngitis/Tonsillitis

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Streptococcal species, *Haemophilus influenzae* *Staphylococcus aureus* *Bacteroides* species	*Access*	*Access*
	Penicillin (500 mg) orally 6 hourly for 7 days **Or,** • **Amoxicillin (500 mg) orally 8 hourly for 7- 10 days**	• **Amoxicillin-Clavulanate (500/125 mg) orally 8 hourly for 7 days**
	Watch	*Watch*
Note: In Chronic cases prefer Penicillin/Cefuroxime/ Ceftriaxone/Ciprofloxacin **Duration:** 7-10 days in acute infections and 14 days for chronic infections	• **Cefuroxime (250- 500 mg) orally 12 hourly for 7 days** **Or,** • **Ceftriaxone (1-2 gm) IV daily** **Or,** • **Levofloxacin (500 mg) orally once daily for 7 days**	• **Cefixime (400mg) orally 12 hourly for 7 days** **Or,** • **Ciprofloxacin (500 mg) orally 12 hourly (Chronic case)** **Or,** • **Cefdinir (600 mg) orally once daily for 10 days or (300 mg) orally 12 hourly for 5 to 10 days**
	Reserve	*Reserve*

Table 11.4: Acute Rhinosinusitis

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Virus *Rhinovirus* *Influenza virus* *Parainfluenza virus* *Adenovirus* *Respiratory syncytial virus* *Enterovirus* **Bacteria** *S. pneumonia* *H. influenzae* *M. catarrhalis* *S. pyogenes* *S. aureus* **Note:** • **Antibiotic should be given if persistent symptoms of high fever (39°C or more)** • **Purulent nasal discharge** • **Facial pain for 3-4 days.**	*Access*	*Access*
	• **Amoxicillin/Clavulanate (500/125 mg) orally 8 hourly** **Duration: 5-7 days**	• **Doxycycline (100 mg) orally 12 hourly for 5-7 days**
	Watch	*Watch*
	In case of penicillin hypersensitivity: • **Levofloxacin (500 mg) orally once daily** **Or,** • **Moxifloxacin (400 mg) orally once daily** **Duration: 5-7 days**	**In resistant case:** • **Cefixime (200 mg) orally 12 hourly** **Or,** • **Ceftriaxone (1-2 gm) IV 12 hourly** **Plus** **Clindamycin (300 mg) orally 6-8 hourly (Access)** **Duration: 7-10 days**
	Reserve	*Reserve*

Chapter 12

Infections in the Eye

Table 12.1: Conjunctivitis

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Gram-negative and some gram-positive bacterial coverage. *Staphylococcus aureus* *Streptococcus pneumonia* *Haemophilus influenza* • *N gonorrhoeae* *Chlamydia spp.* Note **Rare severe infections fortified aminoglycoside-cephalosporin combination therapy**	*Access*	*Access*
	Watch	*Watch*
	For moderate and severe bacterial conjunctivitis: • **Levofloxacin (0.5%) eye drop - 2/3 drops four times daily for 5–7 days** **Or,** • **Moxifloxacin (0.5%) eye drop - 2/3 drops four times daily for 5–7 days**	**Inpatient:** • **Fluoroquinolone eye drop-monotherapy treatment every 15 minutes to hourly** **Or,** • **Fortified topical Vancomycin**
	Reserve	*Reserve*

Table 12.2: Stye and Infected Chalazion

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Staphylococcus aureus **Note:** *In addition of antibiotics hot compression, lid hygiene with or without epilation of eyelashes.*	*Access*	*Access*
	Mild to moderate: **Amoxicillin/Clavulanate (500/125 mg) orally 12 hourly or (250/125 mg) orally 8 hourly for 10 days**	• **Doxycycline (100mg) orally 12 hourly for 7 days** **Or,** • **Tetracycline (250- 500 mg) orally 6 hourly for 7 days** **Plus** **Topical antibiotic (Moxifloxacin/Ciprofloxacin/ Gatifloxacin) (Watch)**
	Watch	*Watch*
	Reserve	*Reserve*

Chapter 13

Infectious Conditions in Surgery

Table 13.1: Antibiotic Prophylaxis in Surgery

Clean wound: Not a single dose of antibiotic is required.

Clean contaminated: This should be single dose per operative parenteral antibiotic. Prophylactic antibiotic administration should be initiated within one hour before the surgical incision, or within two hours if the patient is receiving vancomycin or fluoroquinolones. Second dose is only required if the wound is grossly contaminated, or the duration of surgery exceeds more than two hours.

Contaminated wound: Same treatment as clean contaminated wound, but duration should be specified.

Type of Surgery & Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Neck surgery	**Clean** **no SAP**	
Cardiac surgery	**Cefazolin (or Cefuroxime)**	**Vancomycin**
Breast surgery	**Cefazolin (or Cefuroxime)/Cephradin**	**Vancomycin**
Upper gastrointestinal tract surgery	**Cefazolin (or Cefuroxime)**	**Clindamycin** **Plus** **Gentamicin**
Hepato-pancreato-biliary surgery + Cholecystectomy*	**Cefazolin (or cefuroxime)** **Amoxicillin/ clavulanic acid** **Gentamicin/ Ciprofloxacin** **PLUS** **Metronidazole**	
Hernia surgery (If obstructed or strangulated)	**Cefazolin (or Cefuroxime))/ Ciprofloxacin**	**Vancomycin**
Appendicectomy	**Cefazolin (or Cefuroxime) PLUS Metronidazole**	**Gentamicin** **PLUS** **Metronidazole**
Colorectal surgery	**Cefazolin (or Cefuroxime) PLUS Metronidazole Amoxicillin/ clavulanic acid Gentamicin** **PLUS** **Metronidazole**	**Vancomycin**
Central vascular surgery	**Cefazolin (or Cefuroxime)**	

Peripheral vascular surgery	**Cefazolin (or Cefuroxime)**	**Vancomycin**
Orthopaedic surgery (excluding arthroscopy)	**Cefazolin (or Cefuroxime)**	**Vancomycin**
Bone fracture surgery	**Cefazolin (or Cefuroxime)**	**Vancomycin**
Prostate surgery-Nephrectomy	**Cefazolin (or cefuroxime)/ Nitrofurantoin**	
Laparoscopic nephrectomy	**no SAP**	
Laparotomy nephrectomy and partial nephrectomy:	**Cefazolin (or cefuroxime) Gentamicin**	

Table 13.2: Abscess

Abscess (Boil and abscess of skin & soft tissue):

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Staphylococcus aureus *Streptococcus pyogen* *Enterobacteriaceae* (abscesses of axilla, perineum, and groin) *Bacteroides spp* (abscesses caused by IV drug use or human bites; axilla, perineum, and groin) *Pasteurella multocida* (abscesses caused by animal bites, especially cat bites) **Note:** Surgical drainage is the mainstay of treatment.	*Access*	*Access*
	• **Amoxicillin-Clavulanate (1.2gm) IV 8 hourly for** **Plus/minus** **Metronidazole (500mg) IV** **8 hourly** **Or,** • **Amoxicillin-Clavulanate (875 mg/125 mg) orally 12 hourly for 5-7 days** **Plus /minus** **Metronidazole (400mg) orally 8 hourly for 5-7 days**	• **Doxycycline (100 mg) orally 12 hourly** **Or,** • **Co-trimoxazole (960 mg) orally 1-2 DS tablets BD for 5-7 days**
	Watch	*Watch*
	• **Ceftriaxone (1-2 gm) IV once daily** **Plus/minus** **Metronidazole (500mg) IV 8 hourly (Access)** **Or,** • **Levofloxacin (250-500 mg/day) orally for 5-7 days**	• **Meropenem (1 gm) 8 hourly IV** **Plus/minus** **Metronidazole (500mg) IV 8 hourly (Access)**
	Reserve	*Reserve*

Table 13.3: Appendicitis

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Aerobic and Anaerobic Bacteria	*Access*	*Access*
		• **Gentamicin (3-5 mg/kg/day or, (80mg) IV 8 hourly** **Or,** **Amikacin (500mg) IV 12 hourly** **Plus** **Metronidazole (500mg) IV 8 hourly**
	Watch	*Watch*
	• **Cefuroxime (750mg) IV 8 hourly** **Or,** • **Ceftriaxone (1gm) IV 12 hourly** **Or,** • **Cefoxitin (1 gm) IV 6-8 hourly** **Plus/minus** • **Metronidazole (500mg) IV 8 hourly for 5-7 days (Access)**	• **Ciprofloxacin (200mg) IV 12 hourly for 5-7 days** **Plus** • **Metronidazole (500mg) IV 8 hourly for 5-7 days (Access)** **Or,** • **Meropenem (1gm) IV 8 hourly** **Plus** • **Metronidazole (500mg) IV 8 hourly for 5-7 days (Access)**
	Reserve	*Reserve*

Table 13.4: Breast Abscess

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Staphylococcus aureus MRSA *Staphylococcus epidermidis* *Streptococc*us Enterobacteriacae (E.coli, Pseudomonas) Lactobacillus Bacteroides **Note:** **Surgical incision and drainage or needle aspiration of abscess is the mainstay of treatment**	*Access*	*Access*
	• **Flucloxacillin (500 mg) IV 6 hourly followed by orally for total 10 days** **Or,** • **Flucloxacillin (1-2 gm) IV 6 hourly** **Plus** **Clindamycin (450mg) orally 6 hourly**	• **Co-amoxiclav (500/125mg) orally 8 hourly for 7-10 days**
	Watch	*Watch*
	• **Cefuroxime (1.5gm) IV 6 hourly** **Plus** **Clindamycin (450mg) orally 6 hourly (Access)**	**In MRSA:** • **Vancomycin (15mg/kg) IV 12 hourly**
	Reserve	*Reserve*
	• **Tigecycline (100 mg) IV infusion, Then 50 mg IV infusion 12 hourly for 5-14 days**	• **Linezolid (600 mg) PO/IV 12 hourly in complicated skin & skin structure infections** **And Linezolid (400-600 mg) orally 12 hourly in uncomplicated skin & skin structure infections** **Duration: 10-14 days**

Table 13.5: Cholecystitis

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Escherichia coli *Klebsiella,* *Pseudomonas,* *Enterococcus faecalis* *Salmonella* *Bacteroides fragilis* **Note:** after conservative treatment advice for cholecystectomy after 6 weeks.	*Access*	*Access*
	Watch	*Watch*
	• **Ceftriaxone (1-2 gm) IV once daily / Cefuroxime (750mg) IV 8 hourly** **Plus/minus** **Metronidazole (500mg) IV 8 hourly (Access)**	• **Piperacillin/Tazobactam (3.375 gm) IV 6 hourly/ (4.5 gm) IV 8 hourly for non–life-threatening cases of cholecystitis** **Or,** • **Meropenem (1 gm) IV 8 hourly**
	Reserve	*Reserve*

Table 13.6: Epididymo-Orchitis

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
E coli *Klebsiella, Chlamydia* *Staphylococcus aureus* *Neisseria gonorrhoeae*	*Access*	*Access*
	•**Doxycycline (100 mg) orally 12 hourly for 14 days**	• **Nitrofurantoin (50 mg) orally 6 hourly for 10-14 days**
	Watch	*Watch*
	• **Cefuroxime (500mg) orally 12 hourly for 14 days** **Or,** • **Azithromycin (1 gm) orally single dose**	• **Ciprofloxacin (500mg) orally 12 hourly for 14 days** **If *Neisseria gonorrhoeae:*** • **Ceftriaxone (500mg) IM single dose** **Plus** **Ciprofloxacin or,** **Doxycycline (Access) for 14 days**
	Reserve	*Reserve*

Table 13.7: Soft Tissue Infection/Cellulitis

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Methicillin-sensitive *S aureus (*MSSA) Methicillin-resistant *S aureus* (MRSA) *Streptococcus pyogen* *Enterobacteriaceae* *Bacteroides spp* *Pasteurella multocida*	*Access*	*Access*
	• **Flucloxacillin (500mg) orally 6 hourly for 7 days** **Or,** • **Amoxicillin/Clavulanate (500/125mg) orally 8 hourly/ (1.2gm) IV 8 hourly for 7-10 days** **Plus** **Metronidazole (500 mg) orally or IV 8 hourly for 5-7 days**	• **Doxycycline (100 mg) orally 12 hourly for 7 days** **Or,** • **Trimethoprim-sulfamethoxazole (160 mg/800 mg) DS orally 12 hourly for 5-7 days**
	Watch	*Watch*
	• **Ceftriaxone (1-2gm) IV 12 hourly** **Or,** **Cefuroxime (750 mg) IV 8 hourly for 7-10 days** **Plus/minus** **Metronidazole (500 mg) orally or IV 8 hourly for 5-7 days (Access)**	• **Levofloxacin (250-500 mg/day) orally for 5-7 days** **Or,** • **Vancomycin (15 mg/kg) IV 12 hourly for 5-7 days** **Or,** • **Meropenem (1gm) IV 8 hourly** **Plus** **Metronidazole (500 mg) orally or IV 8 hourly for 5-7 days (Access)**
	Reserve	*Reserve*

Table 13.8: Open fracture/ Trauma

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Streptococcus pyogen Staphylococcus aureus Clostridium tetani **Duration:** 3 days and adjust according to culture reports when available. **Note:** Tetanus vaccination status of the patient and wound criteria should be evaluated for Tetanus vaccination.	*Access*	*Access*
	Suspected contaminated wound (prone to Clostridium infection): • **Benzyl penicillin (10-12 million U) IV once daily (after skin sensitivity test)**	**In penicillin allergy:** • **Clindamycin (300mg) IV 6-8 hourly** **Or,** • **Metronidazole (500mg) IV 6-8 hourly** **Or,** • **Doxycycline (100mg) orally 12 hourly**
	Watch	*Watch*
	• **Cefazolin (1 gm) IV 8 hourly Plus Gentamicin (3-5mg/kg) IV (Access) Or,** • **Cefuroxime (750mg) IV 8 hourly Plus Gentamicin (3-5mg/kg) IV (Access)**	**In MRSA:** • **Vancomycin (15mg/kg) IV 12 hourly Or,** • **Flucloxacillin (500mg) IV 6 hourly**
	Reserve	*Reserve*

Table 13.9: Osteomyelitis

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Methicillin-sensitive *S aureus (*MSSA) Methicillin-resistant *S aureus* (MRSA) Anaerobes **Note: Blood cultures or pus samples should be taken before initiation of antibiotics and specific treatment should be started according to culture sensitivity.** **Duration:** 4-6 weeks IV antibiotics followed by oral antibiotics if favorable clinical response is achieved.	*Access*	*Access*
	• **Amikacin (500mg) IV 8 hourly for 1-2 weeks (For high risk patients suspected with gram negative organisms)** **Or,** • **Gentamicin (5-7.5mg/kg/day) IV 12 hourly for 1-2 weeks.**	**In penicillin allergy:** • **Clindamycin (40mg/kg/day) orally 6 hourly for 1-2 weeks**
	Watch	*Watch*
	• **Ceftriaxone (1-2gm) IV once daily for 1-2 weeks.** **In children:** • **Cefotaxime (100mg/kg/day) IV 8-12 hourly** **Plus** **Flucloxacillin (75-150 mg/kg/day) IV 6-8 hourly (Access)**	**In MRSA:** • **Vancomycin (500mg) IV 12 hourly** **Or, Vancomycin (15mg/kg) initially then 10mg/kg every 8 hourly in children.**
	Reserve	*Reserve*

Chapter 14

Obstetrics & Gynecological Diseases

Routine antibiotics for women are not recommended with the following conditions:

- Uncomplicated vaginal birth (vaginal birth in the absence of any specific risk factors or any clinical signs of infection)
- Episiotomy
- Meconium-stained amniotic fluid (Antibiotics is recommended only when the characteristics of liquor suggests infection)
- There is insufficient evidence for or against the use of prophylactic antibiotics to reduce infectious morbidity for manual removal of the placenta
- Available evidence does not support the use of prophylactic antibiotics to reduce infectious morbidity following elective or emergency cervical cerclages
- The evidence is not robust for the use of antibiotic prophylaxis to prevent perineal wound complications following third- or fourth-degree tears

Prophylactic antibiotics in gynecology

There are no recommendations for routine prophylactic antibiotics for the following gynecological procedures in healthy women with no risk factors:

- Insertion of intrauterine contraceptive device (IUCD)
- Patients undergoing diagnostic laparoscopy
- Patients having hysteroscopic surgery
- Hysterosalpingography (HSG) without a prior history of pelvic inflammatory disease
- Large Loop Excision of Transformation Zone (LLETZ)

Broad spectrum antibiotics should be used during major abdominal, laparoscopic or vaginal procedures.

Table 14.1: Bacterial vaginosis

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Gardnerella vaginalis *Mobiluncus spp* *Anaerobic gram negative rods (eg:* Prevotella spp *Porphyromonas spp* *Bacteroids spp* *Peptostreptococcus spp)* ***Note:*** Sexual partner should be treated concurrently	*Access*	*Access*
	• **Metronidazole (400-500 mg) orally 12 hourly for 7 days** **Or,** • **Metronidazole gel 0.75%, one full applicator (5 gm) once a day for 5 days**	• **Clindamycin (300 mg) orally 12 hourly daily for 7 days** **Or,** **Clindamycin cream 2% , one full applicator (5 gm) intravaginally at bedtime for 7 days** **Or,** • **Metronidazole (2gm) orally in a single dose** **(High dose metronidazole should be avoided in pregnancy, particularly in first trimester)** **Or,** • **Tinidazole (2gm) orally once daily for 3 days/ 1gm orally once daily for 5 days**
	Watch	*Watch*
	Reserve	*Reserve*

Table 14.2: Genital Chlamydia

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Chlamydia trachomatis	*Access*	*Access*
	• **Doxycycline (100mg) orally 12 hourly for 7 days**	
	Watch	*Watch*
		• **Azithromycin (1gm) orally single dose** **Or,** • **Levofloxacin (500mg) orally once daily for 7 days**
	Reserve	*Reserve*

Table 14.3: Trichomoniasis

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Trichomonas vaginalis **Note:** concurrent treatment for all sex partners are recommended. In pregnancy and HIV co-infected cases treatment is same.	*Access*	*Access*
	• **Metronidazole (400mg-500mg) orally 12 hourly for 7 days (For women)** **Or,** • **Metronidazole (2 gm) stat orally (For men)**	• **Tinidazole (2 gm) orally single dose *(Both men and women)***
	Watch	*Watch*
	Reserve	*Reserve*

Table 14.4: Caesarian Section Wound Infection

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Staphylococcus *Group B hemolytic streptococci* *Escherichia coli* *Pseudomonas* *Proteus mirabilis* **Note:** **In suspected or at risk MRSA cases (eg; healthcare professionals) then treatment will be changed according to culture sensitivity.**	*Access*	*Access*
	Superficial infection: • **Flucloxacillin (500mg) orally 6 hourly for 7 days** **Or,** • **Co-amoxiclav (500/125mg) orally 8 hourly for 7 days** **Deep infection:** • **Flucloxacillin (500 mg) IV 6 hourly** **Plus** **Metronidazole (500 mg) IV 8 hourly followed by oral for 7 days** **Or,** • **Co-amoxiclav (1.2 gm) IV 8 hourly** **Plus** **Gentamicin (5mg/kg/d) (max 480 mg/d) IV 8 hourly**	**Superficial infection:** **Clindamycin (300 mg) 8 hourly orally for 7 days** **Deep infection:** • **Clindamycin (900 mg) IV 8 hourly** **Plus** **Gentamicin (5mg/kg/d) (max 480 mg/d) IV 8 hourly**
	Watch	*Watch*
	Deep infection: • **Ceftriaxone (1 gm) IV 12 hourly** **Plus** **Metronidazole (500 mg) IV 8 hourly for 24 hours followed by oral for 7 days *(Access)***	**Deep infection:** • **Cefuroxime (1.5 gm) IV 6 hourly** **Plus** **Gentamicin (5mg/kg/d) (max 480 mg/d) IV 8 hourly *(Access)*** **Plus** **Metronidazole 500 mg IV 8 hourly *(Access)***
	Reserve	*Reserve*

Table 14.5: Intra partum pyrexia and Septic abortion

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Gram Positive Beta hemolytic streptococcus *Streptococcus pyogens* *Escherechia coli* *Klebsiella* *Enterobacteriace group* ***Renal function of the patient has to be assessed and dose to be adjusted accordingly**	*Access*	*Access*
	Option I: • **Co-amoxiclav (1.2gm) IV 8 hourly** **Plus** **Gentamicin(5mg/kg/day) IV (max 480mg/day) in either one single dose or in 3 divided doses** **Option II:** • **Ampicillin (2gm) IV 6 hourly** **Or,** • **Amoxicillin (1gm) IV 6-8 hourly** **Plus** **Metronidazole (500mg) IV 8 hourly** **Plus** **Gentamycin (1.5-2mg/kg) IV 8 hourly**	**If Penicillin allergy:** • **Clindamycin (600-900mg) IV 8 hourly** **Plus** **Gentamycin (1.5-2mg/kg) IV 8 hourly.**
	Watch	*Watch*
	Option III: • **Cefuroxime (1.5 gm) IV 8 hourly/ Ceftriaxone (1gm) IV 12 hourly** **Plus** **Gentamicin (5mg/kg/day) IV (max 480mg/day) in either one single dose or in 3 divided doses *(Access)*** **Plus** **Metronidazole (500mg) IV 8 hourly *(Access)***	• **Vancomycin (15 mg/kg) IV 12 hourly** **Plus** **Metronidazole (500mg) IV 8 hourly *(Access)*** **Plus** **Gentamycin (1.5-2mg/kg) IV 8 hourly *(Access)***
	Reserve	*Reserve*

Table 14.6: Pelvic inflammatory disease

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Neisseria gonorrhoea *Chlamydia trachomatis* *Mycoplasma hominis* *Bacteroids* *Streptococcus* Anaerobic *Streptococcus* *E coli* *Trichomonas vaginalis* **Note: Consider changing to oral antibiotics once the patient is clinically improved after 24-48 hours and Renal dose should be adjusted.**	*Access*	*Access*
	• **Clindamycin (900 mg) IV 8 hourly** **Plus** **Gentamycin (2mg/kg) (loading dose) followed by 1.5mg/kg IV 8 hourly (maintenance dose)**	
	Watch	*Watch*
	• **Ceftriaxone (250-500 mg) IM single dose (Mild disease)/ Ceftriaxone (2gm) IV once daily (severe disease)** **Plus** **Doxycycline (100mg) orally 12 hourly for 14 days (Access)** **With or without** **Metronidazole (500mg) orally 12 hourly for 14 days** **Or,** • **Cefotaxime (1gm) IV 12 hourly** **Plus** **Doxycycline (100mg) orally 12 hourly (Access)** **<u>Lactating woman:</u>** • **Ceftriaxone (1gm) IM stat followed by Erythromycin (500 mg) Orally 6 hourly** **Plus** **Metronidazole (400 mg) BD/TDS for 14 days *(Access)*** **<u>Pregnant woman:</u>** • **Ceftriaxone (2gm) IV once daily** **Plus** **Erythromycin (500mg) orally 6 hourly** **Plus** **Metronidazole (500mg) IV 12 hourly *(Access)***	• **Azithromycin (500mg) IV daily for 1- 2 doses, followed by orally daily for 12-14 days** **With or without** **Metronidazole (500mg) orally 12 hourly for 14 days (Access)** **Or,** • **Azithromycin (1 gm) orally once a week for two weeks** **Plus** **Ceftriaxone (250mg) IM single dose**
	Reserve	*Reserve*

Table 14.7: Mastitis (Postpartum)

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Staphylococcus aureus *MRSA (Methicillin resistant S. aureus)* *Streptococcus* *Enterobacteriacae (E. coli, Pseudomonas)* *Peptostreptococcus* *Lactobacillus* *Bacteroides* *Proppionibacterium* *Clostridiu* ***Note:*** *Breast abscess should be treated with surgical drainage or needle aspiration.* ***Duration:*** **7-10 days**	*Access*	*Access*
	Mild mastitis: • **Flucloxacillin (500mg) orally 6 hourly** **Or,** • **Amoxicillin- Clavulanate (500/125mg) orally 8 hourly** **Severe mastitis with suspected breast abscess:** • **Flucloxacillin (1-2 gm) IV 6 hourly** **Plus** **Clindamycin (450mg) orally 6 hourly**	• **Clindamycin (300-450mg) orally 6 hourly** **Or,** • **Cotrimoxazole (960mg) orally 12 hourly** **(avoid in mothers having infants ≤ 2 months)**
	Watch	*Watch*
	• **Cefuroxime (1.5 gm) IV 6 hourly** **Plus** **Clindamycin (450mg) orally 6 hourly (Access)** **Or,** • **Vancomycin (15 mg/kg) IV 12 hourly (In MRSA instead of Clindamycin)**	
	Reserve	*Reserve*

Table 14.8: Vaginal delivery and Caesarean section (prophylaxis)

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Gm–ve organism *Group B streptococcus* • **Prophylaxis (as soon as possible after normal/uncomplicated vaginal birth) needs to be balanced by patient features, childbirth setting and provider experience.** • **Routine prophylaxis is recommended in operative vaginal birth (i.e., forceps or vacuum-assisted delivery)** • **In caesarean section antibiotics are recommended to administer 30-60 minutes before skin incision in elective cases and as early as possible in emergency condition.**	*Access*	*Access*
	• **Ampicillin (2gm) I/V single dose** **(Amoxicillin-Clavulanate should be avoided as prophylaxis both in vaginal and caesarean delivery of preterm and term babies, can be used after delivery)**	**If penicillin allergy:** • **Clindamycin (300 mg) orally 12 hourly for 7 days**
	Watch	*Watch*
	• **Cefazolin (1gm) IV/IM single dose** **Or,** • **Ceftriaxone (1 gm) IV single dose**	**In penicillin allergy:** • **Azithromycin (500mg) IV single dose**
	Reserve	*Reserve*

Table 14.9: Before manual removal of placenta

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Gm +ve organism *Staphylococcus aureus* Gm –ve organism *Enterobacteriaceae*	*Access*	*Access*
	Co-amoxiclav (1.2 gm) I/V stat followed by Co-Amoxiclav (500/125mg) orally 8 hourly for 7 days	• **Clindamycin (600 mg) I/V stat** **Plus** **Gentamycin (1-1.5 mg/kg) IV 8 hourly for 24 hours followed by oral Clindamycin for 7 days** **Or,** • **Clindamycin (600 mg) I/V 8 hourly** **Plus** **Metronidazole (500mg) IV 8 hourly for 5-7 days**
	Watch	*Watch*
	• **Cefuroxime (1.5 gm) IV single dose** **Plus** **Metronidazole (400 mg) orally 8 hourly for 5-7 days (Access)**	
	Reserve	*Reserve*

Table 14.10: Before Manual Vacuum Aspiration (MVA)/ Procedure (not infected)/Assisted Vaginal Delivery

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Chlamydia *Neisseriae gonorrhea* *Anaerobes*	*Access*	*Access*
	• **Doxycycline (100 mg) orally 12 hourly daily for 5-7 days** **Plus** **Metronidazole (400 mg) orally 8 hourly for 5 days**	**After delivery:** • **Amoxycillin (500mg) orally 8 hourly** **Plus** • **Metronidazole (400mg) orally 8 hourly** **(Duration- 7 days)**
	Watch	*Watch*
	• **Azithromycin (1gm) orally stat** **Plus** **Metronidazole (400 mg) orally 8 hourly for 5 days (Access)** **Or,** • **Ceftriaxone (1 gm) IV single dose**	• **Ciprofloxacin (500mg) orally 12 hourly for 7 days** **Plus** **Metronidazole (500mg) 8 hourly for 5 days (*Access*)**
	Reserve	*Reserve*

Table 14.11: Prophylaxis before Hysterectomy/ Any Major Surgery

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Prophylaxis Common pathogen *Gram positive* *Staphylococcus* *Gram negative* *Enterococci* *Anaerobes* *Bacteroides* ******Note:* **Renal dose should be adjusted.**	*Access*	*Access*
		• **Clindamycin (600-900 mg) IV 8 hourly** **Plus** **Gentamycin (2mg/kg/d) IV 8 hourly**
	Watch	*Watch*
	• **Ceftriaxone (2 gm) IV 12 hourly for 7-10 days**	• **Cefazolin (1gm) (if >80 kg 2gm) IV 12 hourly** **Plus** **Metronidazole (500 mg) IV 8 hourly for 24 hours followed by oral Metronidazole for 7 days (*Access*)** **Or,** • **Ciprofloxacin (500mg) 12 hourly** **Plus** **Metronidazole (500 mg) IV 8 hourly for 24 hours followed by oral total 7 days (*Access*)**
	Reserve	*Reserve*

Table 14.12: Puerperal Pyrexia and Sepsis

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Beta hemolytic group B Streptococcus *E.coli* *Enterobactericae* **Treatment Duration:** **7-10 days (The empirical treatment should be rationalized once cultures are available)**	*Access*	*Access*
	• **Ampicillin (1gm) IV 6 hourly Plus Gentamycin (5mg/kg/day) IV (max 480mg/day) 8 hourly** **Or,** • **Ampicillin (1gm) IV 6 hourly Plus Gentamycin (5mg/kg/day) IV (max 480mg/day) 8 hourly Plus Metronidazole (500mg) IV 8 hourly**	• **Clindamycin (900 mg) IV 8 hourly Plus Gentamycin (5mg/kg/day) IV 8 hourly (max 480mg/day)**
	Watch	*Watch*
	• **Cefotaxime (1gm) IV 8 hourly** **Or,** • **Ceftriaxone (1gm) IV 12 hourly** **Or,** • **Cefuroxime (1.5 gm) IV 8-12 hourly** **Plus** **Gentamycin (5mg/kg/day) IV 8 hourly (max 480mg/day) *(Access)* Plus Metronidazole (500mg) IV 8 hourly *(Access)***	**In MRSA:** • **Vancomycin (500mg) IV 12 hourly (Max 2gm/dose) Plus Gentamycin (5mg/kg/day) IV (max 480mg/day) 8 hourly *(Access)* Plus Metronidazole (500mg) IV 8 hourly *(Access)*** **Patient with septic shock:** • **Meropenem (1 gm) IV 8 hourly Plus Gentamycin (5mg/kg/day) IV 8 hourly (max 480mg/day) (Access) Plus Metronidazole (500mg) IV 8 hourly (Access)**
	Reserve	*Reserve*

Table 14.13: Urinary Tract Infections in Pregnancy

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Asymptomatic Bacteriuria *E coli* *Klebsiella pneumoniae* *Enterococcus* *Staphylococcus saprophyticus* *Streptococcus agalctiae*	*Access*	*Access*
	Amoxicillin-Clavulanate (500/125 mg) orally 8 hourly for 7- 10 days	• **Nitrofurantoin (50-100 mg) orally 6 hourly for 7-10 days** ****In pyelonephritis:** • **Co-amoxiclav (1.2gm) IV 8 hourly for**
	Watch	*Watch*
	Cefuroxime (500 mg) orally 12 hourly for 7 days	****In pyelonephritis:** • **Ceftriaxone (1-2gm) IV once daily for 7-14 days** **Or,** **Cefotaxime (1gm) IV 8 hourly for 7-14 days**
	Reserve	*Reserve*
		• **Fosfomycin (3gm) orally single dose**

Table 14.14: Chorioamnionitis (including septic miscarriage)

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
E.coli *Group B Streptococcus* *Group A Streptococcus* *Klebsiella* **Note:** In Chorioamnionitis, early delivery should be done under antibiotic coverage. **Duration:** antibiotics should be continued according to the severity of the patient.	*Access*	*Access*
	• **Co-amoxiclav (1.2gm) IV 8 hourly** **Plus** **Gentamicin (5mg/kg/day) IV (max 480mg/day) in either one single dose or in 3 divided doses**	• **Amoxicillin (1g) IV 6 hourly** **Plus** **Gentamicin (5mg/kg/day) IV (max 480mg/day) in either one single dose or in 3 divided doses** **Plus** **Metronidazole (500mg) IV 8 hourly**
	Watch	**Watch**
	If mild penicillin allergy: • **Cefazolin (500mg-1gm) IV 8 hourly**	**Severe penicillin allergy:** • **Vancomycin (1gm) IV 12 hourly**
	Reserve	*Reserve*

Table 14.15: Preterm premature rupture of membrane (PPROM)

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Prophylaxis *Group B streptococcus* *Ecoli* *Bacteroides* *anaerobes* **Note:** A single course of Corticosteroid is recommended as early as 24 weeks- 34 weeks of gestation. Delivery should be done after proper evaluation.	*Access*	*Access*
	• **Ampicillin (2gm) I/V 6 hourly for 48 hours followed by Amoxicillin (500 mg) orally 8 hourly** **Plus** **Erythromycin (250mg) orally 6 hourly for additional 5 days (Watch)** **(Duration : Total 7 days)**	**If penicillin allergic:** • **Clindamycin (600mg) I/V 8 hourly for 7 days**
	Watch	*Watch*
	• **Erythromycin (250-500 mg) orally 6 hourly** **Or,** • **Clarithromycin (500mg) orally once daily** **(Given only if the woman is ≥ 20 weeks' gestation. Duration: 10 days)**	**If Erythromycin is poorly tolerated or unavailable:** • **Azithromycin (1gm) single dose**
	Reserve	*Reserve*

Chapter 15

Infections in Pediatrics

Table 15.1: Acute Glomerulonephritis (Post-Streptococcal)

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Group A Beta hemolytic Streptococci **Note:** Antibiotic treatment does not alter the course of the diseases rather prevents the spread of the bacteria to the contacts	*Access*	*Access*
	• **Phenoxymethyl penicillin (15mg/kg/day) orally 6 hourly for 10 days.**	
	Watch	*Watch*
		• **Erythromycin (20-50 mg/kg/day) orally 6 hourly for 10 days**
	Reserve	*Reserve*

Table 15.2: Bacterial Meningitis in Children and Young infant

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Neisseria meningitides *Streptococcus pneumonia* *Haemophilus influenzae* *Escherichia coli* *Pseudomonas aeruginosa* *Unidentifiable pathogen* **Duration of antibiotic: (after culture sensitivity)** *Neisseria meningitides-7 days* *Streptococcus pneumonia-10-14 days* *Haemophilus influenjae-7-10 days* *Escherichia coli-3 weeks* *Pseudomonas aeruginosa-3 weeks* *Unidentifiable pathogen-7-10 days*	*Access*	*Access*
		• **Ampicillin (200-300 mg/kg/day) IV 6 hourly** **Plus** **Amikacin (15-20 mg/kg/day) IV 8-12 hourly** **Or,** **Gentamicin (7.5 mg/kg/day) IV 8 hourly**
	Watch	*Watch*
	• **Ceftriaxone (100 mg/kg/day) IV in two divided doses (12 hourly)** **Or,** **Cefotaxime (200-300 mg/kg/day) IV 8 hourly** **Plus** **Vancomycin (45-60 mg/kg/day) IV 6 hourly** ***Early onset meningitis in neonates:** • **Cefotaxime/Ceftazidime IV for 21 days + Gentamicin IV (Access) for 10 days (Doses as mentioned above)** ***Late onset meningitis in neonates:** • **Vancomycin+ Cefotaxime for 21 days (Doses as mentioned above)**	• **Meropenem (120 mg/kg/day) IV 8 hourly**
	Reserve	*Reserve*

Table 15.3: Infective Endocarditis

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Common: Native Valve or Other Cardiac Lesions *Streptococcus mutans* *S. sanguinis* *S. mitis* *Staphylococcus aureus* *Streptococcus bovis* *S. faecalis* **Uncommon: Native Valve or Other Cardiac Lesions** *Streptococcus pneumoniae* *Haemophilus influenzae* *Coagulase-negative staphylococci* **Note:** *Empirical therapy after appropriate blood cultures are drawn but before the identifiable agent is recovered may be initiated with vancomycin plus gentamicin.*	*Access*	*Access*
	• **Benzyl penicillin (200,000 U/kg/day) IV in 4-6 equally divided doses 6 weeks** **Plus** **Gentamicin (3 mg/kg/day) IV/IM 8 hourly for 2 weeks**	
	Watch	*Watch*
	• **Vancomycin (40 mg/kg/day) IV in 2-3 equally divided doses (for 4-6 weeks)** **Plus** **Gentamicin (3mg/kg/day) IV in 3 divided doses for 5-7 days (Access)**	• **Ceftriaxone (100 mg/kg/day) IV once daily for 2 weeks** **Plus** **Gentamicin (3mg/kg/day) IV in 3 divided doses for 5-7 days (Access)** **Or,** • **Cefazolin (100 mg/kg/day) IV 8 hourly for 6 weeks** **Plus** **Gentamycin (3 mg/kg/day) IV in 3 divided doses for 5 days**
	Reserve	*Reserve*

Table 15.4: Neonatal Sepsis

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Group B streptococcus, *Haemophilus influenzae* *Escherichia coli,* *Listeria monocytogenes,* *Staphylococcus aureus* *Pseudomonas aeruginosa* *Mycoplasma* ● 1st Line: Ampicillin + Gentamicin ● 2nd Line: Ceftazidime + Amikacin ● In meningitis: Cefotaxime + Amikacin or Meropenem + Amikacin **Duration of Antibiotic therapy:** ● Risk factor positive (clinically well, culture negative, septic screen negative) (stop after the results are available): 2-3 days ● Risk factor positive, screen positive (clinically well, culture negative): 5-7 days ● Clinically sepsis (screen negative): 7-10 days ● Clinically sepsis, screen positive (Culture negative): 7-10 days ● Blood culture positive (no meningitis): 7-14 days ● Meningitis (with or without positive blood/CSF culture): 21 days	*Access* **Early onset:** • **Ampicillin, (50mg/kg/dose) IV,** **Age:**0-7days:12 hourly, >7 days: 8 hourly **Plus** **Gentamicin, IV (5 mg/kg/dose)** **Weight:**>1000gm:once daily <1000gm: 36 hourly **Or,** • **Amikacin (7.5mg/kg/dose) IV 12 hourly** *Watch* **Late onset:** • **Ceftazidime, IV (50mg/kg/dose)** 0-7days:12hrly >7days:8hrly **Or,** • **Cefepime, IV (50mg/kg/dose) 12hourly** Infuse over 30 minutes **Or,** • **Cefotaxime, IV (50mg/kg/dose)** Age:0-7days:12hrly >7days:8hrly **Plus** •**Gentamicin, IV (5 mg/kg/dose), Weight:**>1000gm:once daily <1000gm: 36 hourly **Or,** •**Amikacin, IV (7.5mg/kg/dose)** 12 hourly	*Access* *Watch* **Early onset:** • **Piperacillin+ Tazobactum, IV (50-100mg/kg/dose) 12hrly** (piperacillin component) Infuse over 30 minutes **Late onset:** • **Piperacillin+ Tazobactum, IV (50-100mg/kg/dose) 12hrly** (piperacillin component) Infuse over 30 minutes **Plus/minus** **Vancomycin, IV (10mg/kg/dose)** Age: 0-14days:12hrly >14days:8hrly, Always infuse over 1 hour **If condition deteriorated:** • **Ciprofloxacin, IV (7.5-10mg/kg/dose) 12hrly,** Infuse over 30 minutes **Or,** • **Meropenem, IV (20mg/kg/dose)** Age: 0-14days:12hrly >14days:8hrly, Infuse over 30 minutes

		Or, • **Imipenem, IV (20mg/kg/dose) 12 hourly** Infuse over 30 minutes
	Reserve	*Reserve*
		• **Colistin, IV (15000- 25000 unit/kg/dose) 8 hourly**

Table 15.5: Pneumonia (child)

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Nosocomial: *Escherichia coli* *Streptococcus Pneumoniae* *Haemophilus influenzae* *Pseudomonas* *Klebsiella* *Staphylococcus aureus* Community acquired: *≥5 years: Mycoplasma* *Chlarnydia* < 5 years: *Streptococcus Pneumoniae* **Duration of antibiotic:** Mild case- 7days Severe case: 10- 14 days Azythromycin-5 days Staphylococcus aureus- 4-6 weeks Inj. / oral route depends on severity	*Access*	*Access*
	• **Amoxicillin (75-100mg/kg/day) IV 8-12 hourly** **Or,** • **Ampicillin (200mg/kg/day) IV 6 hourly** **In Staphylococcus aureus:** • **Flucloxacillin (12.5-25 mg/kg/day) IV/ orally 6 hourly**	• **Amoxicillin-Clavulanate (45-90mg/kg/day) orally 8-12 hourly** **In Staphylococcus aureus:** • **Clindamycin (10-40 mg/kg/day) IV 8 hourly**
	Watch	*Watch*
	Mild case: • **Cefixime (8mg/kg/day) orally 12 hourly** **Severe case:** • **Ceftriaxone (50-75 mg/kg/day) IV 12-24 hourly** **Or,** • **Cefotaxime (50mg/kg/dose) IV 8 hourly** **Or,** • **Azithromycin (10mg/kg/day) orally for day 1 then (5mg/kg/day) orally for 4 days**	**In Staphylococcus aureus:** • **Cephalexin (25-50mg/kg/day) orally 12hourly (Mild case)** **Or,** • **Vancomycin (15mg/kg/dose) IV 6 hourly** **Or,** • **Clarithromycin(15 mg/kg/day) orally 12 hourly** **Or,** • **Levofloxacin orally** **≤5 years: (20mg/kg/day) 12hrly** **>5 years: (10mg/kg/day) 12hrly** **Or,** • **Moxifloxacin (400mg) orally once daily**
	Reserve	*Reserve*

15.6. Rheumatic Fever (RF)

Primary Prevention

Appropriate antibiotic therapy of acute pharyngitis due to *Group A streptococci* (GAS) prevents first attacks of acute RF.

Secondary Prevention

Secondary prevention is directed at preventing acute GAS pharyngitis in patients at substantial risk of recurrent acute RF which should begin as soon as the diagnosis of acute RF has been made and immediately after a full course of antibiotic therapy has been completed.

Table 15.6: Rheumatic Fever (RF)

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Group A streptococci **Duration (Secondary prevention):** ● Rheumatic fever without carditis: Five years or until 21 year of age, whichever is longer ●Rheumatic fever with carditis but without residual heart disease (no valvular disease): Ten years or until 21 year of age, whichever is longer ●Rheumatic fever with carditis and residual heart disease (persistent valvular disease): Ten years or until 40 year of age, whichever is longer; sometimes lifelong prophylaxis	*Access*	*Access*
	Acute Cases: • **Penicillin G benzathine, IM, 600,000 IU for children weighing ≤60 lb and 1.2 million IU for children >60 lb, Single dose** **Or,** • **Penicillin V (50mg/kg/day) orally 6 hourly for 10 days**	**Secondary prevention:** • **Penicillin G benzathine, IM, 600,000 IU for children weighing ≤60 lb and 1.2 million IU for children >60 lb, 3-4 weeks interval** **Or,** • **Penicillin V (250mg) orally 12 hourly**
	Watch	*Watch*
	For People Who Are Allergic to Penicillin and Sulfonamide Drugs: • **Erythromycin (40-50 mg/kg/day) orally 6 hourly for 7-10 days** **Or,** • **Azithromycin (500mg) orally daily for 5 days**	
	Reserve	*Reserve*

Table 15.7: Skin Infection Cellulitis

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Organism of unknown susceptibility **Note:** Inj. / oral route depends on severity of the disease	*Access*	*Access*
	• **Cloxacillin (50-100 mg/kg) 6 hourly for 7-10 days** **Or,** • **Flucloxacillin (12.5-25 mg/kg/day) 6 hourly 7-10 days**	• **Clindamycin (10-40 mg/kg/day) 8 hourly for 2-4 weeks** •
	Watch	*Watch*
		• **Cephalexin (50 mg/kg/day) orally 12 hourly for 7-10 days**
	Reserve	*Reserve*

Table 15.8: Omphalitis

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Staphylococcus aureus Group A Streptococcus Escherichia coli Proteus Klebsiella **Note:** Inj. / oral route depends on severity of the disease	*Access*	*Access*
	• **Flucloxacillin (12.5-25 mg/kg/day) IV 6 hourly** **Plus** **Gentamicin (3-5 mg/kg/day) IV 8 hourly** **(Duration: 7-10 days)**	• **Clindamycin (10-40 mg/kg/day) IV 8 hourly for 2 weeks** **Or,** • **Metronidazole (1.5ml/kg) IV 8 hourly for 7 days (anaerobes)**
	Watch	*Watch*
	Reserve	*Reserve*

Table 15.9: Upper Respiratory Tract Infection

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
1. Pharyngotonsillitis *Group A Beta hemolytic Streptococcus* *Haemophilus influenza* *Neisseria gonorrhoeae* *Mycoplasma* *Chlamydia pneumoniae*	*Access*	*Access*
	• **Amoxicillin (30-50 mg/kg/day) orally 8 hourly for 7 days** **Or,** • **Penicillin V (125-250 mg) orally 12 hourly for 10 days**	
	Watch	*Watch*
	• **Cephradine (30-50 mg/kg/day) orally 8 hourly for 7- 10 days**	**In Penicillin allergic cases or per cultures:** • **Erythromycin (30-50 mg/kg/day) orally 6-8 hourly for 7-10 days** **Or,** • **Azithromycin (10mg/kg/day) once daily for 1day, then (5mg/kg/day) once daily for 4 days.**
	Reserve	*Reserve*
2. Acute Otitis media *Streptococcus pneumoniae* *Haemophilus influenzae* *Group A Streptococcus* *Moraxella catarrhalis* *Staphylococcus aureus*	*Access*	*Access*
	• **Amoxicillin (50-90 mg/kg/day) orally 12 hourly for 10 days**	• **Amoxicillin-Clavulanate (45-90mg/kg/day) orally 8-12 hourly for 10 days**
	Watch	*Watch*
	• **Azithromycin (10mg/kg/day) once daily for 1day, then (5mg/kg/day) once daily for 4 days** **Or,** • **Ceftriaxone (50 mg/kg/day) IV 12 hourly for 5 days**	• **Cefpodoxime (10 mg/kg/day) orally 12 hourly for 10 days** **Or,** • **Levofloxacin orally (≤5 years: 20mg/kg/day once daily; >5 years: 10mg/kg/day once daily for 7-10 days)**

	Reserve	*Reserve*

Table 15.10: Urinary tract infection

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Acute cystitis *Escherichia coli* *Klebsiella* *Proteus* *Enterococcus* *Pseudomonas aeruginosa* *Staphylococcus saprophyticus* *Group B streptococcus* *Staphylococcus* **Note:** **Antibiotics should be changed according to the culture sensitivity while available.**	*Access*	*Access*
	• **Cotrimoxazole (6-12 mg/kg/day Trimethoprim) orally 12 hourly for 7 days** **Or,** • **Amoxicillin (50 mg/kg/day) orally 8 hourly for 7 days**	• **Nitrofurantoin (5-7 mg/kg/day) orally 6-8 hourly for 7 days** **Or,** • **Co-amoxiclav (30mg/kg/dose) orally 8 hourly for 7 days**
	Watch	*Watch*
		• **Ciprofloxacin (20-30mg/kg/day) orally 12 hourly for 5-7 days**
	Reserve	*Reserve*
Acute pyelonephritis *Escherichia coli* *Klebsiella* *Proteus* *Enterococcus* *Pseudomonas* *Staphylococcus saprophyticus* *Group B streptococcus* *Staphylococcus* **Duration: 10-14 days**	*Access*	*Access*
	• **Ampicillin (50-100 mg/kg/day) IV 6 hourly** **Plus** **Amikacin (15-20 mg/kg/day) IV 8 hourly** **Or,** **Gentamicin (5 mg/kg/day) IV 8 hourly**	
	Watch	*Watch*
	• **Cefixime (8-10 mg/kg/day) orally 12 hourly** **Or,** • **Ceftriaxone (50 mg/kg/day) IV once daily** **Or,** • **Cefotaxime (100-150 mg/kg/day) IV 6-8 hourly** **Or,** • **Ceftazidime (150 mg/kg/day) IV 8 hourly** **Or,** • **Cephalexin (25-50mg/kg/day) orally 12 hourly**	• **Ciprofloxacin (8-30 mg/kg/day) orally 12 hourly** **Or,** • **Levofloxacin orally (≤5 years: 20mg/kg/day once daily; >5 years:10mg/kg/day once daily)** **Or,** • **Cefepime (100mg/kg/day) IV 12 hourly**
	Reserve	*Reserve*

Table 15.11: Infectious Gastroenteritis

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Bacteria *Escherichia coli (enteroadherent, enterotoxigenic, enteropathogenic), Shigella, Salmonella Typhi Nontyphoidal Salmonella, Campylobacter jejuni, Vibrio cholerae, Yersinia enterocolitica* ***Protozoa*** *Entamoeba histolytica, Giardia, Cyclospora, Cystoisospora, Cryptosporidium* .	*Access*	*Access*
	• **Metronidazole (30-40 mg/kg/day) orally 8 hourly for 7- 10 days**	• **Cotrimoxazole (6-12 mg/kg/day Trimethoprim) orally 12 hourly for 7-10 days**
	Watch	*Watch*
	• **Cefixime (10 mg/kg/day) orally 8 hourly for 7 days** **Or,** • **Azithromycin (10mg/kg/day) for 1st day, then (5mg/kg/day) orally once daily for 5 days**	• **Erythromycin (30-50 mg/kg/day) orally 6 hourly for 5 days** **Or,** • **Ciprofloxacin (20-30 mg/kg/day) orally 12 hourly for 7-10 days** **Or,** • **Ceftriaxone (50-100 mg/kg/day) IV single dose for 7 days**
	Reserve	*Reserve*

Table 15.12: Enteric Fever

Likely causative agent	Preferred Antimicrobial	Alternative Antimicrobial
Salmonella typhi *S. paratyphi*	*Access*	*Access*
		• **Cotrimoxazole (960 mg) orally/ (8-10mg/kg/day, Trimethoprim) 12 hourly for 14 days**
	Watch	*Watch*
	• **Cefixime (20mg/kg/day) orally in 12 hourly for 10-14 days** **Or,** • **Ceftriaxone (80-100 mg/kg/day) IV once daily for 10-14 days** **Or,** • **Cefotaxime (100 mg/kg/day) IV 8 hourly for 10-14 days**	• **Azithromycin (10mg/kg/day) orally once daily for 7 days** **Or,** • **Ciprofloxacin (20-30 mg/kg/day) orally 12 hourly for 7-10 days**
	Reserve	*Reserve*

Annex 1

Representative specimen collection before starting therapy

It is important to collect adequate and representatives' specimens from all potentially infected sites prior to the initiation of the antibiotic therapy. Appropriate antibiotic therapy is based on definitive identification of pathogens, which usually requires culture. Once antibiotic therapy has been started, cultures often are rendered sterile, even though viable organisms may remain in the host. It is also important to avoid or minimize contamination by surface contaminants and commensals when collecting specimens.

Monitoring therapeutic response

In many patients, it could be difficult to monitor therapeutic response on clinical grounds alone. However, the subsidence of fever, the return of well-being, and the disappearance of both local and systemic signs of infection in the patient, all signify an appropriate response. Therefore, no further formal monitoring is necessary in most cases.

An apparent failure to respond clinically may be due to either ineffectiveness of antibiotics (resistance or inappropriate route of administration) or to other reasons e.g. a localized infection that requires a surgical drainage, or a superinfection etc. Careful reassessment is necessary when considering changes of antibiotic therapy.

In certain situations, measurement of antibiotic activity may be useful in predicting clinical response, e.g. determination of serum bactericidal activity (Schlichter test) in cases of infective endocarditis.

Assays for drugs with narrow therapeutic: toxic ratio

For antibiotics such as the aminoglycosides and vancomycin, the measurement of their concentration in serum/plasma or other body fluids is often useful to avoid excessive level which are associated with toxicity yet ensure that adequate (therapeutic) levels are achieved. In addition, we often need to consider the renal and hepatic status of the patient while prescribing.

COLLECTION OF SAMPLES FOR CULTURE

URINE SAMPLE

Collection:

1. **Male:** Cleaning the urethral meatus with plain tap water (free skin retracted), allow to dry and at least 30 ml of mid-stream urine (MSU) should be collected in a sterile container. It is better to collect the first MSU passed at the beginning of the day.
2. **Female:** The vulva is cleaned by cotton plug soaked with water. Labia is separated and morning mid-stream urine (MSU) should be collected in a wide mouth sterile container.
3. **Children:**
   (a) Sterile adhesive bag.
   (b) Suprapubic tap: Tap by fingers on the suprapubic region 1 hour after feed (one tap per second) for 10 seconds. 1-minute interval repeat the procedure.
4. **Suprapubic aspiration:** Occasionally necessary in acute retention of urine or unconscious patient.
5. **Urethral catheterization:** Rarely used in children or unconscious patients. Fresh sterile catheter should be used. Urine sample should be collected directly from the catheter, never from collecting bag.
6. **Ureteric catheterization:** In operation theatre during urological surgery/examination, when necessary.
7. **Genitourinary tuberculosis:** 3 consecutive early morning urine specimen (EMU) or 24 hours urine in a container containing 1% boric acid.

Transport:

All specimens should be processed in the laboratory within 2 hours of collection; if delay is unavoidable more than two hours use one of the following.

a) Refrigerate the urine at 4˚C in the same container.
b) Collect and transport in a container with boric acid (0.1g/10 ml of urine).

Any way delay should not be longer than 18 hours after collection.

STOOL SAMPLE

Administration of drugs or antidiarrheal substances (mineral oil, barium, bismuth, magnesium, antibiotics) should be terminated at least one week before stool collection.

- Stool container should be
    a) Clean, dry, leak proof, disinfectant free and wide necked container.
    b) A light plastic box or an especially designed glass jar attached spoon with the stopper.
- Amount of stool that is to be collected
    a) About a spoonful specimen is sufficient
    b) Transfer a portion of stool that contain mucous, pus, blood, if present.
- Send the specimen to the lab as early as possible.

Specimens that cannot be cultured within 2 hours of collection should be placed in Cary-Blair transport medium and refrigerated immediately.

Procedure of transport:

i. With the help of a cotton swab, a portion of stool is taken.
ii. Insert the swab in the container of sterile Cary – Blair transport medium.
iii. Breaking of the swab stick to allow the bottle top to be replaced lightly.

For infants or other patients [if necessary 'Rectal Swab' may be collected]

Moisten the swab with normal saline and introduce the swab into rectum (one inch into the anal canal) and keep for 10 seconds, turn the swab several times with circular movement. Care should be taken to avoid unnecessary contamination of specimen with bacteria from anal skin.

Precaution

i. Avoid contaminating the faeces with urine or water
    a) Never store in the incubator
    b) Never store in the refrigerator

THROAT SWAB

Swab should be collected in the morning before any mouthwash, food or drink. Mouth of the patient should be widely opened, neck flexed. Hold the head fixed. Keep the tongue down with a tongue depressor. Oral cavity should be properly illuminated with good light source. A sterile cotton swab (supplied from dept.) is rubbed vigorously over one tonsil, then uvula, other tonsil, the posterior wall of the pharynx and over any other inflamed area. Care should be taken not to touch the tongue, buccal surface or lips. Place the swab stick in the sterile container tube. It is preferable to take two swabs from the same patient. Specimen should be dispatched to the laboratory as soon as possible.

WOUND SWAB

Sample should be collected from the base of the ulcer or nodule following removal of overlying debris or surgical biopsy of deep tissues without contact with the superficial layer of the lesion. If possible two swabs should be collected. Specimens should be placed in a sterile container capped properly and send to the laboratory as early as possible.

SPUTUM COLLECTION

Patient instruction

- Collect early morning specimen before breakfast or mouthwash.
- Rinse mouth with water before collection
- Remember that saliva and nasopharyngeal discharge are not sputum.
- Collect only the exudative material brought up from lungs after a deep production cough in a dry wide necked leak-proof container.
- Send the container as early as possible. Never refrigerate such sample.

If pulmonary tuberculosis is suspected

- Collect a series of two early morning sputum samples on successive days.
- If not possible the 1st sample at spot and 2nd early morning sample.
- If a patient produces very little sputum, 24-48 hours pooled specimen is needed to yield a positive culture.

CSF

Collection and transport

- Approximately 5-10 ml of CSF (in adult patient) should be collected in two sterile tubes (Screw-Capped).

Collect about 1 ml of CSF in tube No. 1 (for culture) and rest of the portion in tube No. 2 (for other tests).

- The specimen should be delivered to laboratory immediately.
- Do not refrigerate the sample.
- If tuberculous meningitis is suspected, 3rd tube is kept in the refrigeration undisturbed to see whether a pellicle or coagulum forms.

CERVICAL SWAB/HVS

Genital specimen for women

- All specimens should be collected during pelvic examination using a speculum.
- The speculum should be moistened with warm water before use, but antiseptics or gynecological exploration should not be used.
- After inserting the speculum, cervical speculum should be wiped off with a cotton wool ball.
- A sampling swab should then be introduced into the cervical canal and rotated for at least 10 seconds before withdrawal.
- Specimen should be transported in Amies and Stuart transport media.
- For urethral discharge and genital ulcer the patient should be referred to Microbiology Department.

METHODS OF COLLECTION OF BLOOD CULTURE

- Asepsis of blood culture bottle top.
  - Timing of sample collection:
    a) At spike of febrile illness
    b) Before antibiotic use
    c) If antibiotic already started blood should be collected just before next dose of antibiotic.
  - Optimal volume of blood culture:
    a) For adult minimum 5-10 ml
    b) For children 1-3 ml
    c) For neonate 1 ml
  - After collection immediately inoculate blood into culture bottle (Bed side inoculation) and send to laboratory within one hour.

Annex 2

AWaRe Classification

Access group antibiotics

This group includes antibiotics that have activity against a wide range of commonly encountered susceptible pathogens while also showing lower resistance potential than antibiotics in the other groups. Selected Access group antibiotics are recommended as essential first or second choice empiric treatment options for infectious syndromes reviewed by the EML Expert Committee and are listed as individual medicines on the Model Lists of Essential Medicines to improve access and promote appropriate use.

	Antibiotic	**Class**
1.	Amikacin	Aminoglycosides
2.	Amoxicillin	Penicillins
3.	Amoxicillin/clavulanic Acid	Beta lactam - beta lactamase inhibitor
4.	Ampicillin	Penicillins
5.	Benzylpenicillin	Penicillins
6.	Cefadroxil	First-generation cephalosporins
7.	Cefalexin	First-generation cephalosporins
8.	Cefazolin	First-generation cephalosporins
9.	Cefradine	First-generation cephalosporins
10.	Chloramphenicol	Amphenicols
11.	Clindamycin	Lincosamides
12.	Cloxacillin	Penicillins
13.	Doxycycline	Tetracyclines
14.	Flucloxacillin	Penicillins
15.	Gentamicin	Aminoglycosides
16.	Mecillinam	Penicillins
17.	Metronidazole (IV)	Imidazoles
18.	Metronidazole (oral)	Imidazoles
19.	Nitrofurantoin	Nitrofurantoin
20.	Oxacillin	Penicillins
21.	Phenoxymethylpenicillin	Penicillins
22.	Pivmecillinam	Penicillins
23.	Procaine benzylpenicillin	Penicillins

24.	Spectinomycin	Aminocyclitols
25.	Sulfadiazine/trimethoprim	Trimethoprim - sulfonamide combinations
26.	Sulfamethizole/trimethoprim	Trimethoprim - sulfonamide combinations
27.	Sulfamethoxazole/trimethoprim	Trimethoprim - sulfonamide combinations
28.	Tetracycline	Tetracyclines

Watch group Antibiotics

This group includes antibiotic classes that have higher resistance potential and includes most of the highest priority agents among the Critically Important Antimicrobials for Human Medicine1 and/or antibiotics that are at relatively high risk of selection of bacterial resistance. These medicines should be prioritized as key targets of stewardship programs and monitoring. Selected Watch group antibiotics are recommended as essential first or second choice empiric treatment options for a limited number of specific infectious syndromes and are listed as individual medicines on the WHO Model Lists of Essential Medicines.

	Antibiotic	**Class**
1.	Azithromycin	Macrolides
2.	Cefaclor	Second-generation cephalosporins
3.	Cefamandole	Second-generation cephalosporins
4.	Cefepime	Fourth-generation cephalosporins
5.	Cefixime	Third-generation cephalosporins
6.	Cefotaxime	Third-generation cephalosporins
7.	Cefpodoxime proxetil	Third-generation cephalosporins
8.	Ceftazidime	Third-generation cephalosporins
9.	Ceftibuten	Third-generation cephalosporins
10.	Ceftriaxone	Third-generation cephalosporins
11.	Cefuroxime	Second-generation cephalosporins
12.	Ciprofloxacin	Fluoroquinolones
13.	Clarithromycin	Macrolides
14.	Erythromycin	Macrolides
15.	Fosfomycin (oral)	Phosphonics
16.	Fusidic Acid	Steroid antibacterials
17.	Gatifloxacin	Fluoroquinolones
18.	Gemifloxacin	Fluoroquinolones
19.	Imipenem/cilastatin	Carbapenems
20.	Kanamycin	Aminoglycosides
21.	Levofloxacin	Fluoroquinolones
22.	Lomefloxacin	Fluoroquinolones
23.	Minocycline (oral)	Tetracyclines
24.	Moxifloxacin	Fluoroquinolones
25.	Neomycin	Aminoglycosides
26.	Netilmicin	Aminoglycosides
27.	Norfloxacin	Fluoroquinolones
28.	Ofloxacin	Fluoroquinolones
29.	Pefloxacin	Fluoroquinolones

30.	Piperacillin	Penicillins
31.	Piperacillin/tazobactam	Beta lactam - beta lactamase inhibitor (anti-pseudomonal)
32.	Rifampicin	Rifamycins
33.	Rifamycin	Rifamycins
34.	Rifaximin	Rifamycins
35.	Roxithromycin	Macrolides
36.	Sparfloxacin	Fluoroquinolones
37.	Spiramycin	Macrolides
38.	Streptomycin	Aminoglycosides
39.	Tobramycin	Aminoglycosides
40.	Vancomycin (IV)	Glycopeptides
41.	Vancomycin (oral)	Glycopeptides

Reserve group antibiotics

"This group includes antibiotics and antibiotic classes that should be reserved for treatment of confirmed or suspected infections due to multi-drug-resistant organisms. Reserve group antibiotics should be treated as “last resort” options.

Selected Reserve group antibiotics are listed as individual medicines on the WHO Model Lists of Essential Medicines when they have a favorable risk-benefit profile and proven activity against “Critical Priority” or “High Priority” pathogens identified by the WHO Priority Pathogens List1, notably carbapenem resistant Enterobacteriaceae. These antibiotics should be accessible, but their use should be tailored to highly specific patients and settings, when all alternatives have failed or are not suitable.

These medicines could be protected and prioritized as key targets of national and international stewardship programs involving monitoring and utilization reporting, to preserve their effectiveness."

	Antibiotic	**Class**
1.	Aztreonam	Monobactams
2.	Colistin	Polymyxins
3.	Fosfomycin (IV)	Phosphonics
4.	Linezolid	Oxazolidinones
5.	Minocycline (IV)	Tetracyclines
6.	Polymyxin B	Polymyxins
7.	Tedizolid	Oxazolidinones
8.	Tigecycline	Glycylcyclines

Note: Only the antibiotics which are available in Bangladesh are included in this classification.

Annex 3

Antibiotic in Pregnancy and Lactation

Types of Antibiotics	FDA Pregnancy category	Compatibility with Breastfeeding (Reference: Therapeutic Goods Administration;TGA)
Amikacin	D	Compatible, may cause diarrhea in infant
Amoxycillin	B	Compatible; may cause diarrhea in infant
Amoxycillin / Clavulanate	B	Compatible; may cause diarrhea in infant
Ampicillin	B	Compatible; may cause diarrhea in infant
Ampicillin / Sulbactam	-	No data available
Azithromycin	B	Compatible; may cause diarrhea in infant
Bacampicillin	B	No data available
Benzathine Penicillin	B	Compatible; may cause diarrhea in infant
Benzylpenicillin	B	Compatible; may cause diarrhea in infant
Cefaclor	B	Compatible; may cause diarrhea in infant
Cefepime	B	Compatible; may cause diarrhea in infant
Cefoperazone	B	Infant risk cannot be ruled out
Cefotaxime	B	Compatible; may cause diarrhea in infant
Ceftazidime	B	Compatible; may cause diarrhea in infant
Ceftriaxone	B	Compatible; may cause diarrhea in infant
Cefuroxime Axetil	B	Compatible; may cause diarrhea in infant
Cephalexin Monohydrate	B	Compatible; may cause diarrhea in infant
Chloramphenicol	C	oral or IV use: avoid Topical use; compatible
Ciprofloxacin	C	Compatible; may cause diarrhea in infant
Clarithromycin	C	Compatible; may cause diarrhea in infant
Types of Antibiotics	**FDA Pregnancy category**	**Compatibility with Breastfeeding (Reference: Therapeutic Goods Administration;TGA)**

Clindamycin	B	Compatible; may cause diarrhea in infant
Clotrimazole	B	Compatible
Cloxacillin	B	Compatible; may cause diarrhea in infant
Doxycycline	D	Compatible for short courses (eg 10 days) if alternative drug not appropriate; may cause diarrhea in infant
Ertapenem	B	Compatible; may cause diarrhea in infant
Erythromycin	B	Compatible; may cause diarrhea in infant
Fusidate sodium	C	Compatible; may cause diarrhea in infant
Gentamicin	C (Ophthalmic / Otic/Aural / Topical/Cutaneous) D (parenteral)	Compatible; may cause diarrhea in infant
Imipenem / Cilastatin	C	Compatible; may cause diarrhea in infant
Kanamycin	D	No data available
Levofloxacin	C	Compatible; may cause diarrhea in infant
Linezolid	C	Caution, insufficient data; may cause diarrhea in infant
Meropenem	B	Compatible; may cause diarrhea in infant
Metronidazole	B	Compatible; may cause diarrhea in infant
Minocycline	D	Avoid, Possibility of staining infant's teeth with prolonged courses
Nitrofurantoin	B	Compatible; may cause diarrhea in infant
Ofloxacin	C	Compatible
Phenoxymethyl penicillin	B	Compatible; may cause diarrhea in infant
Piperacillin / Tazobactam	Piperacilin –B, Tazobactam -unknown	Compatible; may cause diarrhea in infant
Procaine Benzylpenicillin	B	Compatible; may cause diarrhea in infant
Sulphamethoxazole / Trimethoprim	D	Compatible in infants older than one month; may cause diarrhea in infant
Types of Antibiotics	**FDA Pregnancy category**	**Compatibility with Breastfeeding (Reference: Therapeutic Goods Administration; TGA)**

Tetracycline	D	Compatible for short courses (eg 10 days) if alternative drug not appropriate; may cause diarrhea in infant
Trimethoprim	C	Compatible
Vancomycin	C	Compatible; may cause diarrhea in infant

FDA Pregnancy Categories

Category	Description
A	Controlled studies of pregnant women show no risk in first trimester
B	Animal studies show no risk, or animals show risk unconfirmed in humans
C	Animal studies show risk, caution is advised, benefits may outweigh risks
D	Evidence of risk to human fetus, benefits may outweigh risks in serious conditions

Definitions for compatibility with breastfeeding:

Compatible—there are sufficient data available to demonstrate an acceptably low relative infant dose and/or no significant plasma concentrations and/or no adverse effects in breastfed infants.

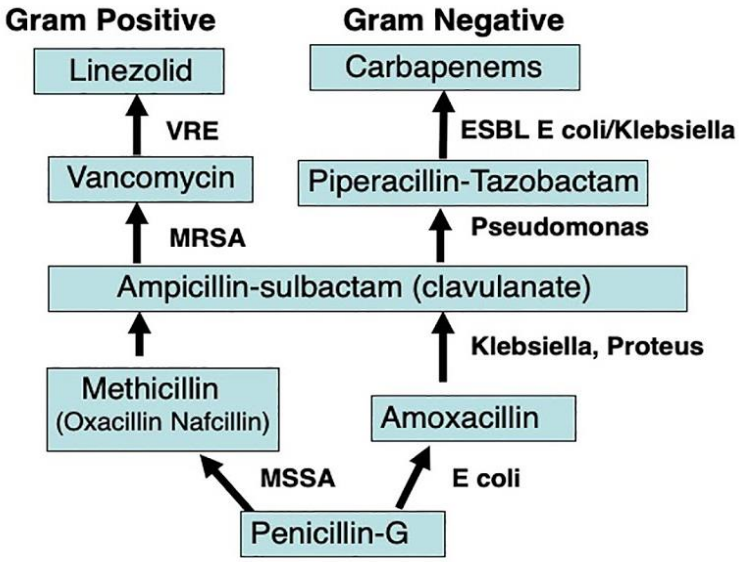
Caution—there are insufficient data showing low relative infant dose and/or no significant plasma concentrations and/or no adverse effects in breastfed infants.

Avoid, insufficient data—there are no data on transfer into milk, or on plasma concentrations or adverse effects in the breastfed infant.

Avoid—significant plasma concentrations in exposed infants, or adverse effects in breastfed infants reported or predictable from the properties of the molecule.

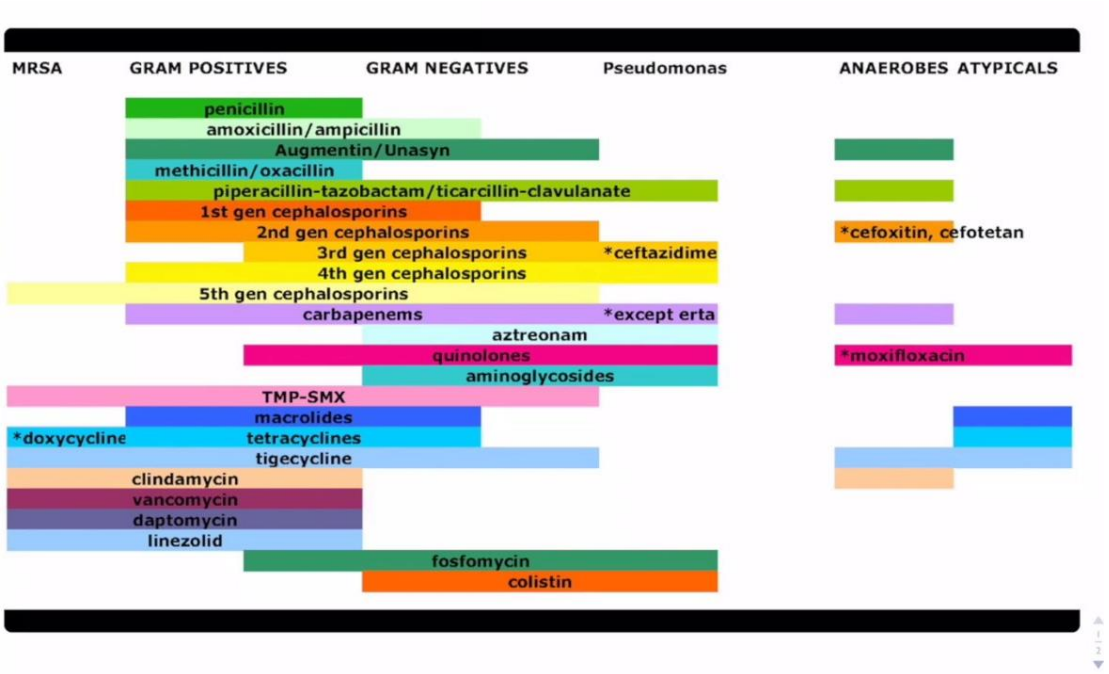
Annex 4

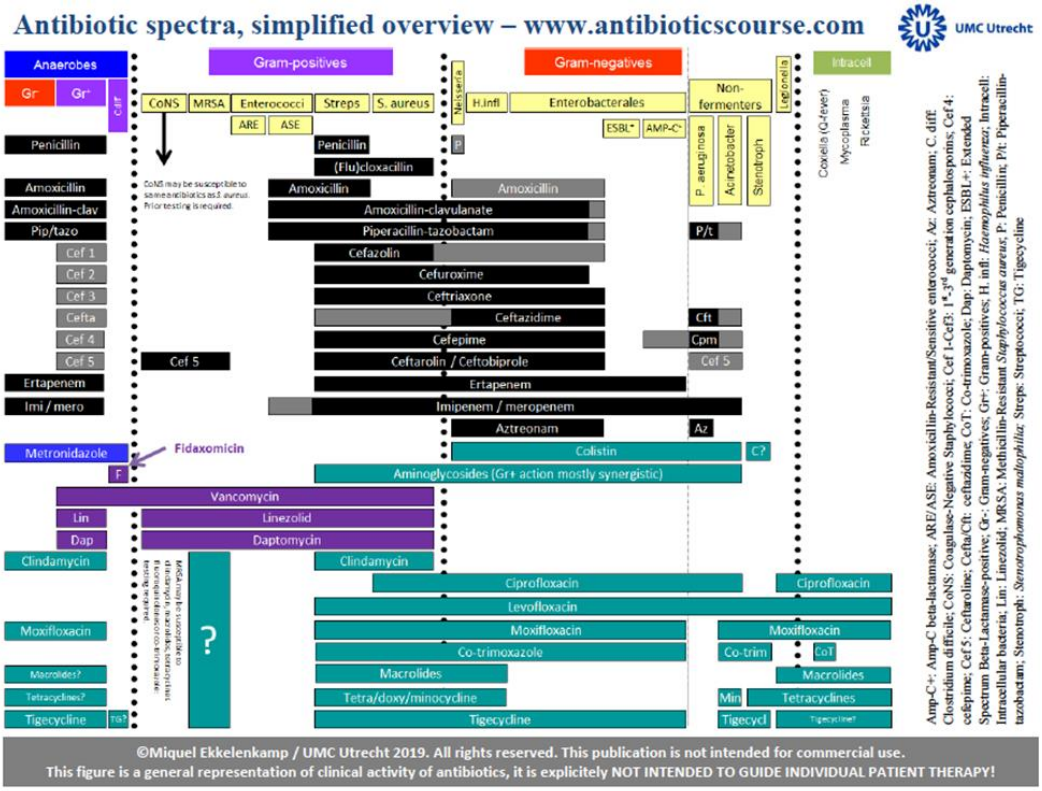
The Antibiotic Ladder



Annex 5

Antibiotic Coverage





Annex 6

Common Intrinsic antibiotic resistance:

1. Enterobacterales:

Enterobacterales are intrinsically resistant to-

Benzylpenicillin	Glycopeptides	Fusidic Acid
Macrolides	Lincosamides	Streptogramins
Rifampicin	Linezolid	Lipoglycopeptides

Following members of Enterobacterales are also resistant to following antibiotics:

Rule No	Organism	Ampicillin/Amoxicilli	Amoxicilin-Clavulanic acid	Ampicillin-sulbactam	Ticarcillin	Cefazolin, Cefalexin,	Cefoxitin	Cefuroxime	Tetracyclines	Tigecycline	Polymyxin B, Colistin	Fosfomycin	Nitrofurantoin
1.1	*Klebsiella pneumoniae* complex	R			R								
1.2	*Klebsiella oxytoca*	R			R								
1.3	*Proteus mirabilis*								R	R	R		R
1.4	*Proteus vulgaris*	R				R		R	R	R	R		R
1.5	*Serratia marcescens*	R	R	R		R	R	R	R		R		R
1.6	*Yersinia enterocolitica*	R	R	R	R	R	R						

R= Resiatant

1. Azithromycin is effective in vivo for the treatment of typhoid fever and erythromycin may be used to treat travellers' diarrhea.

2. For *Salmonella spp* and *Shigella spp* aminoglycoside, 1st and 2nd Generation Cephalosporines and Cephamycines may appear active in vitro but not effective clinically and should not report as susceptible.

2. Non-fermentative Gram-negative bacteria:

Non-fermentative Gram-negative bacteria are generally intrinsically resistant to-

Benzylpenicillin	1st Generation Cephalosporins	2nd Generation Cephalosporins	Glycopeptides
Fusidic Acid	Macrolides	Lincosamides	Streptogramins
Rifampicin	Lipoglycopeptides	Linezolid	

Some members of non-fermentative Gram-negative bacteria are also intrinsically resistant to-

Rule no	Organisms	Ampicillin/Amoxicillin	Amoxicillin-Clavulanic acid	Ampicillin-sulbactam	Ticarcillin	Ticarcillin-clavulanic acid	Piperacillin	Pineracillin-tazobactam	Cefotaxime/ Ceftriaxone	Ceftazidime	Cefepime	Aztreonam	Ertapenem	Imipenem	Meropenem	Ciprofloxacin	Chloramphenicol	Aminoglycosides	Trimethoprim	Fosfomycin	Tetracyclines	Tigecycline	Polymyxin B/Colistin
2.1	Acinetobacter	R	R	1					R			R	R						R	R	2	3	
2.2	Burkholderia cepacia complex	R	R	R	R	R	R	R	R			R	R			R	R	R	R	R			R
2.3	Pseudomonas aeruginosa	R	R	R					R				R				R	4	R		R	R	

R = resistant

1 *Acinetobacter baumannii* may appear to be susceptible to ampicillin-sulbactam due to activity of sulbactam with this species.

2,3 *Acinetobacter* is intrinsically resistant to tetracycline and doxycycline but not to minocycline and tigecycline.

4 *Pseudomonas aeruginosa* is intrinsically resistant to kanamycin and neomycin due to low level APH(3')-IIb activity.

3. Intrinsic resistance in Gram-negative bacteria other than Enterobacterales and non-fermentative Gram-negative bacteria:

Gram-negative bacteria other than Enterobacteriaceae and non-fermentative Gram-negative bacteria listed are intrinsically resistant to -

Glycopeptides	Lincosamides
Lipoglycopeptides	Linezolid

Some members of this group also resistant to-

Rule No	Organisms	Fusidic acid	Streptogramins	Trimethoprim	Nalidixic acid
3.1	*Haemophilus influenzae*	R	R		
3.2	*Moraxella catarrhalis*			R	
3.3	*Neisseria spp.*			R	
3.4	*Campylobacter jejuni*	R	R	R	

R = resistant

4. Intrinsic resistance in Gram-positive bacteria:

Gram-positive bacteria are intrinsically resistant to-

aztreonam	temocillin
polymyxin B/colistin	nalidixic acid

Other members of this group are also resistant to-

Rule no	Organism	Fusidic acid	Ceftazidime	Cephalosporins (except ceftazidime)	Aminoglycosides	Macrolides	Clindamycin	Quinupristin- dalfopristin	Vancomycin	Teicoplanin	Fosfomycin	Novobiocin	Sulfonamides
4.1	*Staphylococcus saprophyticus*	R	R								R	R	
4.2	Other coagulase-negative staphylococci and *Staphylococcus aureus*		R										
4.3	*Streptococcus spp*	R	R		R[1]								
4.4	*Enterococcus faecalis*	R	R	R	R[1]	R	R	R					R
4.5	*Enterococcus faecium*	R	R	R	R[1,2]	R							R
4.6	*Corynebacterium spp*										R		
4.7	*Listeria monocytogenes*		R	R									

R = resistant

1 Low-level resistance (LLR) to aminoglycosides
2 In addition to LLR to aminoglycosides, Enterococcus faecium produces a chromosomal AAC(6')-I enzyme that is responsible for the loss of synergism between aminoglycosides (except gentamicin, amikacin and streptomycin) and penicillins or glycopeptides.

5. Anaerobes:

Rule 5: Intrinsic resistance in anaerobes. Anaerobes are also intrinsically resistant to aztreonam, aminoglycosides, polymyxin B/colistin and nalidixic acid.

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