Infectious Disease

Rational Use of Antibiotics

Definition and Importance

- The rational use of antibiotics refers to the appropriate, justified, and evidence-based prescribing of antibiotics to achieve the best clinical outcomes while minimizing the risk of resistance, side effects, and cost.
- It means prescribing the right antibiotic, at the right dose, for the right duration, and for the right indication.
- This approach minimizes the emergence of resistant strains and avoids unnecessary exposure.

Principles and Guidelines for Rational Antibiotic Use

A. Correct Diagnosis

- Establish a definitive diagnosis before prescribing antibiotics.
- Differentiate between bacterial, viral, fungal, or parasitic infections.
- Avoid antibiotics for viral infections such as the common cold or influenza.

B. Evidence-based Prescription

- Antibiotics should be prescribed only when bacterial infection is suspected or confirmed, based on clinical signs, symptoms, and diagnostic tests.
- Do not use antibiotics as a "just in case" measure.
- Reserve antibiotics for clear, evidence-based indications.

C. Right Drug Selection

- Choose the most appropriate antibiotic based on:
  - Suspected pathogen
  - Site of infection
  - Local resistance patterns (antibiograms)
  - Patient allergies
  - Age, renal and hepatic function
  - Pregnancy or lactation status
- Use narrow-spectrum antibiotics whenever possible.
- Broad-spectrum agents should be reserved for confirmed multi-resistant or polymicrobial infections.

D. Right Dose and Duration

- Use the correct dose based on pharmacokinetics and pharmacodynamics.

- Underdosing promotes resistance; overdosing increases toxicity.
- Limit duration to the shortest effective course (e.g., 5 days for uncomplicated UTIs).
- Duration should be guided by clinical evidence and specific infection site.

E. Route of Administration

- Choose the least invasive effective route:
  - Oral antibiotics for mild/moderate infections.
  - Intravenous (IV) antibiotics for severe infections or when oral route is not feasible.
- Start with IV therapy if the infection is severe, then switch to oral when possible (IV-to-oral switch).

F. De-escalation Strategy

- Start with broad-spectrum antibiotics if needed (empiric therapy).
- Narrow the spectrum once culture and sensitivity results are available (targeted therapy).
- Discontinue antibiotics if infection is ruled out.

G. Monitor and Review Therapy

- Reassess the need for continued antibiotics after 48-72 hours.
- Monitor for clinical improvement, side effects, and lab parameters.

Diagnostic Stewardship

- Collect appropriate samples for culture and sensitivity before starting antibiotics.
- Use biomarkers (e.g., procalcitonin, C-reactive protein) to differentiate bacterial from viral infections, where appropriate.

Common Inappropriate Practices

- Using antibiotics for viral infections like the common cold or flu.
- Using higher-generation antibiotics when first-line agents are effective.
- Prolonging antibiotic treatment without indication.

Prevent Antimicrobial Resistance

- Educate healthcare providers and patients about resistance.
- Avoid misuse in agriculture and animal husbandry.
- Report and track resistance patterns locally and nationally.

Guidelines for Surgical Prophylaxis

Definition

- Surgical antibiotic prophylaxis refers to the use of antibiotics before, during, or shortly after surgery to prevent surgical site infections (SSIs), not to treat existing infections.

Objectives

- Reduce the risk of surgical site infections (SSIs).
- Minimize adverse drug reactions and resistance by avoiding unnecessary use.

Principles and Guidelines

A. Indications for Surgical Prophylaxis

- Indicated in clean-contaminated, contaminated, and certain clean surgeries.
- Not usually required in purely clean, non-implant procedures unless the patient is at high risk (e.g., prosthetic implant, immunosuppression).

B. Choice of Antibiotic

- Choose based on the type of surgery and most likely pathogens at the surgical site.
- Typically narrow-spectrum agents are used:
  - **Cefazolin** for many general surgeries (preferred for efficacy and safety).
  - **Metronidazole** added for anaerobic coverage in colorectal procedures.

C. Timing of Administration

- The first dose should be administered within **60 minutes before the surgical incision**.
- For antibiotics with longer infusion times (e.g., **vancomycin**), administration should begin **within 60–120 minutes prior to incision** due to infusion requirements.
- For agents like **cefazolin**, administration should ideally be within **30 minutes** before incision.

D. Single Dose Preferred

- A single preoperative dose is sufficient in most cases.
- Additional intraoperative dosing may be required if:
  - The surgery is **prolonged** (>2–4 hours).
  - There is **significant blood loss**.
  - Repeat dosing is based on the antibiotic's **half-life**.

E. Duration of Prophylaxis

- **Postoperative prophylaxis should not exceed 24 hours**.
- Prolonged use does not reduce SSIs and increases the risk of:
  - Antimicrobial resistance

- Adverse effects
- Complications such as **Clostridium difficile** infection

F. Special Considerations

- Adjust antibiotic dosage in patients with **renal or hepatic impairment**.
- Consider **patient allergies** (e.g., penicillin allergy) when selecting antibiotics.
- Clearly **document the antibiotic choice, dose, and timing** in the surgical records.

Procedure-Specific Recommendations

- **Clean surgeries** (e.g., hernia repair without prosthesis): Prophylaxis may not be needed.
- **Clean-contaminated surgeries** (e.g., GI tract procedures): Prophylaxis is recommended.
- **Contaminated or dirty surgeries**: Require **therapeutic antibiotics**, not prophylaxis.

Tuberculosis (TB)

Introduction

- Tuberculosis is a chronic infectious disease caused primarily by *Mycobacterium tuberculosis*, an acid-fast bacillus.
- It most commonly affects the lungs (pulmonary TB) but can also affect other organs (extrapulmonary TB).
- TB remains a major global health problem, especially in developing countries.
- It is a notifiable disease and requires long-term multi-drug therapy to prevent resistance and relapse.
- Treatment is highly structured and primarily follows national programs such as the NTEP (India) or WHO DOTS strategy.

Epidemiology

- **Globally**: In 2023, ~10.6 million people fell ill with TB and ~1.3 million deaths occurred.
- **India**: Accounts for ~27% of global TB burden (highest globally).
- **Transmission**: Airborne droplets from coughing/sneezing.
- **High-risk groups**: HIV-positive individuals, malnourished patients, diabetics, healthcare workers, prisoners, slum populations.

Etiopathogenesis

- **Causative Agent**: *Mycobacterium tuberculosis* (aerobic, acid-fast bacillus).
- **Pathogenesis**:
  - Inhaled droplets reach alveoli.
  - Bacteria engulfed by **alveolar macrophages** → survive and replicate.

- Formation of **granulomas (tubercles)** to contain infection.
- Reactivation occurs in **immunocompromised** states → active TB.
- Latent TB infection (LTBI) may persist for years.

Clinical Features / Symptoms

Pulmonary TB

- Persistent cough (>2–3 weeks)
- Hemoptysis (blood in sputum)
- Fever, chills, night sweats
- Weight loss (cachexia)
- Chest pain, breathlessness

Extrapulmonary TB

- **Lymphadenitis** (most common): cervical lymph nodes
- **Meningitis**: headache, neck stiffness
- **Pleural TB**: pleuritic chest pain
- **Spinal TB (Pott's disease)**: back pain, kyphosis
- **Genitourinary TB**: hematuria, infertility

Diagnosis & Investigations

Category	Test
Screening	Chest X-ray, Mantoux (Tuberculin skin test)
Microbiological	Sputum AFB smear (Ziehl-Neelsen stain), CBNAAT/GenXpert (detects rifampicin resistance), Culture (MGIT)
Molecular	Line Probe Assay (LPA), NAAT
Extrapulmonary	Biopsy, CSF analysis, FNAC, imaging
Latent TB	Interferon-gamma release assay (IGRA)

Treatment Goals / Therapeutic Objectives

- Achieve clinical cure and bacteriological eradication.
- Prevent relapse, resistance, and complications.
- Promote treatment adherence and completion of full regimen.
- Ensure community safety by reducing transmission.

Non-Pharmacological Therapy

- **Isolation** during the early contagious period.

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