



ANTIBIOTIC STEWARDSHIP IN SURGERY: A RETROSPECTIVE AUDIT OF PROPHYLACTIC PRACTICES AT A TERTIARY CARE HOSPITAL.

PRESENTED BY:

Dr. Tabassum Jahan Khan

Batch: HoM – 28

Roll No: 1729

GUIDED BY:

Dr. Arindam Das



Introduction

- **Antimicrobial resistance (AMR)** is a major global health threat, causing ~5 million deaths annually; could rise to 10 million by 2050 without action.
- **Inappropriate and prolonged antibiotic use** in hospitals drives AMR, especially in surgical and immunocompromised patients.
- **Antimicrobial Stewardship Programs (ASPs)** promote appropriate antimicrobial use, improve outcomes, and limit resistance, with SAP as a key component
- **Surgical Antimicrobial Prophylaxis (SAP)** aims to prevent surgical site infections (SSIs).
- **Non-adherence to SAP protocols** increases AMR, patient complications, and healthcare costs.

Research Background:

- India faces a particularly severe risk of AMR due to its substantial burden of infectious diseases and the widespread, often unregulated, access to antibiotics without prescription.
- Healthcare institutions, especially tertiary care hospitals like, play a pivotal role in combating AMR through effective Antimicrobial Stewardship Programs (ASP).
- These programs are designed to monitor and optimize antimicrobial prescribing practices, ensuring that patients receive the right drug, at the right dose, for the right duration. Within this framework, Surgical Antimicrobial Prophylaxis (SAP) is a critical component aimed at preventing postoperative infections while minimizing unnecessary antibiotic exposure.

Study Objectives:



Primary Objectives:

- To analyze the usage pattern of restricted antimicrobials at EHCC Hospital.
- To assess the compliance of surgical antimicrobial prophylaxis (SAP) protocols as per the institutional and national guidelines.
- To evaluate the appropriateness of antimicrobial prescriptions based on the Antimicrobial Stewardship Program (ASP) guidelines.

Secondary Objectives:

- To identify common deviations from recommended ASP and SAP protocols in clinical practice.
- To assess department-wise or specialty-wise variation in restricted antimicrobial usage.
- To determine the frequency and causes of inappropriate antimicrobial prescribing.



Problem Statement

Inappropriate use of restricted antimicrobials persists at EHCC Hospital, particularly in high-risk areas like transplant and surgical units, undermining ASP effectiveness and increasing multidrug-resistant organism emergence.



Study Scope

Retrospective evaluation of antimicrobial prescribing from March to May 2025 at a Tertiary care Hospital, focusing on restricted antimicrobial audit forms and SAP documentation in key departments.



Significance

This study identifies compliance gaps, highlights inappropriate use, and recommends strategies to improve antimicrobial stewardship, contributing to patient safety and national AMR efforts.

Review of Literature :

Author / Source	Study Focus	Key Findings / Conclusion
Bratzler DW et al., 2013	Clinical practice guidelines for SAP	Emphasized that appropriate selection, timing, and duration of SAP significantly reduce SSIs; misuse contributes to AMR and other complications.
WHO Global Action Plan on AMR, 2015	Global strategies to tackle AMR	Highlighted the critical role of antimicrobial stewardship, surveillance, and rational prescribing in combating AMR globally; stressed the need for hospital-based ASPs.
ICMR Antimicrobial Stewardship Guidelines, 2022	National guidance for ASP implementation in India	Provided detailed recommendations for antimicrobial usage monitoring, emphasizing SAP compliance as a key ASP objective to curb AMR in Indian healthcare settings.
Karanika S et al., 2016 (Meta-analysis)	Effectiveness of ASPs in hospitals	Found that ASP implementation leads to significant reductions in inappropriate antimicrobial use, duration of therapy, and healthcare-associated infections without adversely affecting patient outcomes.
Gandra S et al., 2017	Antimicrobial use and AMR trends in India	Reported high levels of irrational antimicrobial use in Indian hospitals contributing to escalating AMR; highlighted the urgent need for robust ASPs.
Allegranzi B et al., 2016	Global incidence and prevention of SSIs	Identified that SSIs are a significant cause of postoperative morbidity and mortality, largely preventable through strict adherence to SAP protocols.

Research Methodology:

Outlines the methodological framework for the study on restricted antimicrobial usage and surgical antimicrobial prophylaxis (SAP) compliance at a tertiary care hospital.

Research Questions

This study aims to answer the following key questions:

Primary Question:

What is the level of compliance and appropriateness of surgical antimicrobial prophylaxis (SAP) practices at EHCC Hospital, Jaipur?

Secondary Questions:

Which clinical departments demonstrate the highest and lowest rates of SAP compliance?

What are the most commonly prescribed antibiotics for SAP, and how appropriate are their indications based on hospital and national guidelines?

How frequently are restricted antimicrobials used without infectious disease (ID) consultation or microbiological justification?



Study Design

A retrospective observational design was utilized, drawing on secondary data from hospital records and ASP audit tools. This approach allowed for an objective assessment of real-time practices and deviations from guidelines without interfering with patient management.

Study Setting & Period

The study was conducted at, a JCI-accredited tertiary care center with a dedicated ASP team. The study period spanned three months, from March 1st to May 31st, 2025, encompassing antimicrobial audit data and SAP compliance reports.

Study Population

Two groups were included: (1) patients who received restricted antimicrobials during the study period, and (2) surgical patients for whom SAP documentation was available.



Study Approach

Purely quantitative, using descriptive statistics to analyze trends, compliance rates, and appropriateness levels based on institutional guidelines.



Sample Size & Technique

Universal sampling of 180 cases meeting inclusion criteria, eliminating selection bias.



Inclusion Criteria

- All inpatients administered restricted antimicrobials between March and May 2025.
- All surgical patients with complete SAP records (timing, choice, duration).

Exclusion Criteria

- Patients with incomplete audit forms or missing SAP details.
- SAP administered outside EHCC without proper continuation records



Data Sources

- ASP Audit Forms
- SAP Compliance Checklists
- Pharmacy dispensing logs
- Clinical notes reviewed by ASP team

Data analysis and interpretation:

Key Performance Indicators for SAP

SAP compliance was measured using four institutional key performance indicators:

1 Timely Administration

As per CDC and WHO guidelines, prophylactic antibiotics should be administered **within 60 minutes before the surgical incision** to ensure optimal tissue and serum levels at the time of the first cut.

2 Appropriate Selection

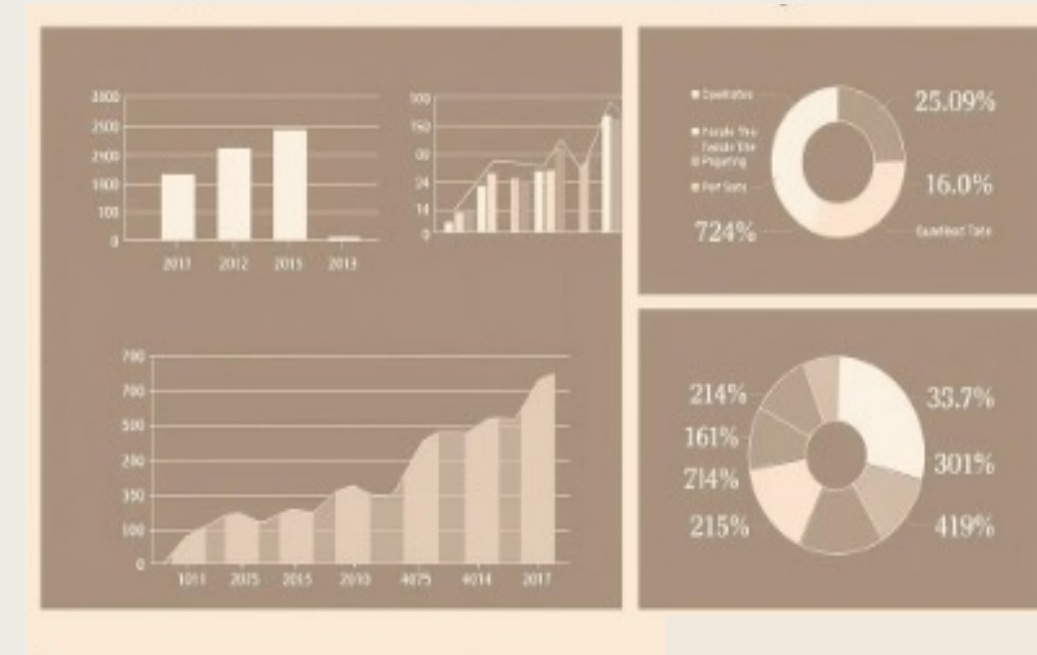
The choice of prophylactic antibiotic should be based on the **type of surgery**, expected pathogens, local antibiogram, and **allergy history**.

3 Discontinuation within 24 Hours

Extended prophylaxis (beyond 24 hours) is not recommended and offers no additional benefit, while increasing the risk of adverse effects and resistance.

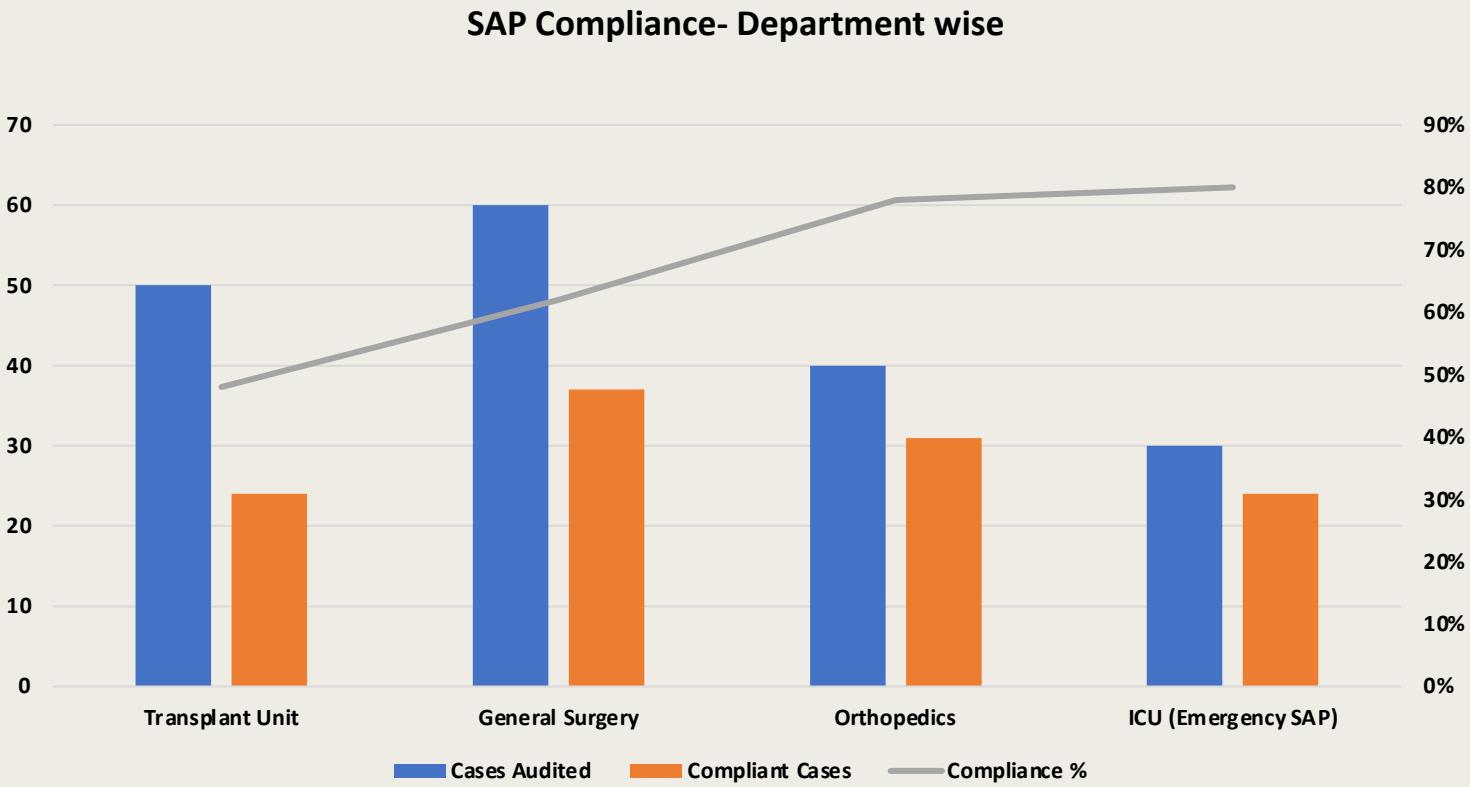
4 Complete Documentation

Thorough recording of SAP details in surgical records.



SAP Compliance- Department wise :

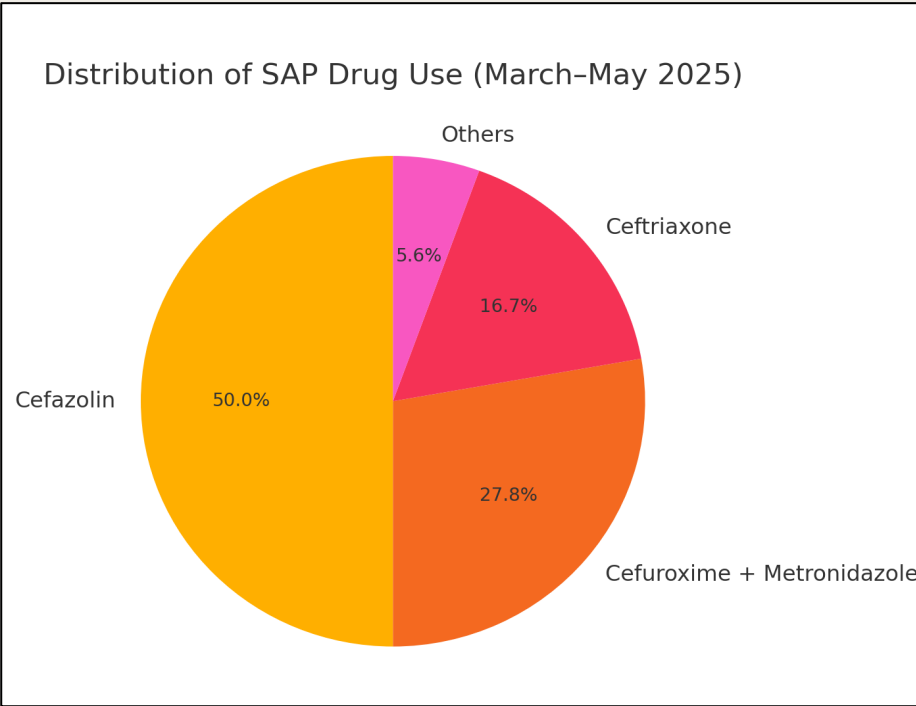
Department	Cases Audited	Compliant Cases	Compliance %
Transplant Unit	50	24	48%
General Surgery	60	37	62%
Orthopedics	40	31	78%
ICU (Emergency SAP)	30	24	80%
Total	180	115	64%



The total number of SAP cases audited was **180**, distributed among four key hospital departments. The **overall compliance rate** for SAP practices was **64%**. The **ICU showed the highest compliance at 80%**, likely reflecting stricter protocols in emergency settings. Orthopaedics also demonstrated good compliance (78%), while the **Transplant Unit had the lowest compliance (48%)**, suggesting room for improvement in this specialized department.

Distribution of SAP drugs used at EHCC (March-May)

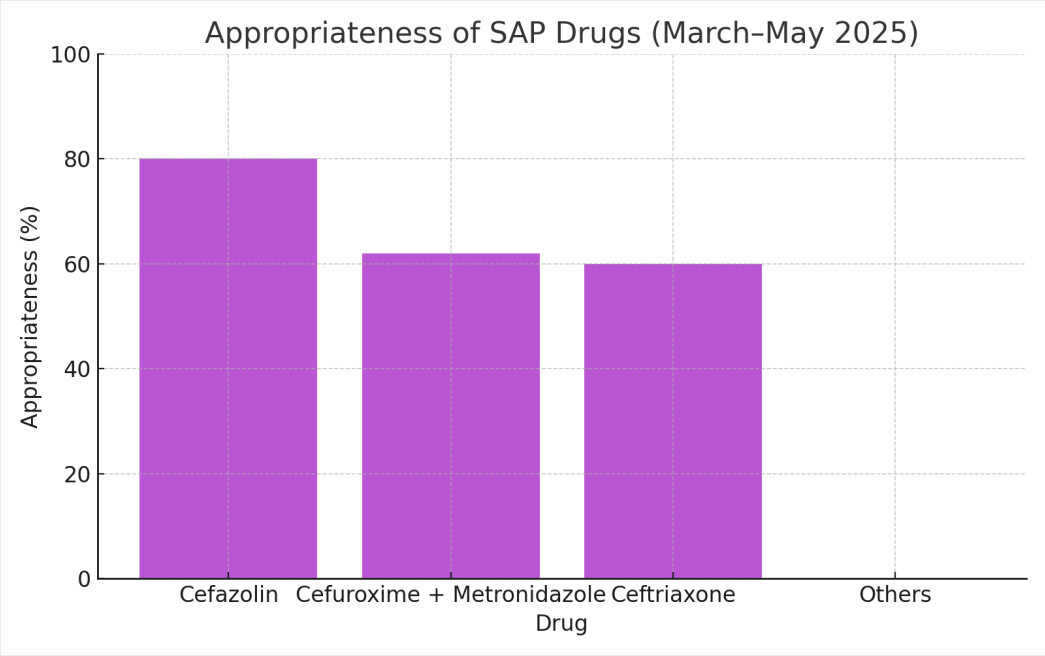
SAP Antibiotic	Number of Uses	Percentage (%)
Cefazolin	90	50.0%
Cefuroxime + Metronidazole	50	27.8%
Ceftriaxone	30	16.7%
Others (Amikacin and Piperacillin-Tazobactam)	10	5.6%
Total	180	100%



- **Cefazolin** was the most frequently used SAP antibiotic, accounting for **50% (90 out of 180)** of total cases.
- **Cefuroxime + Metronidazole** was used in **27.8% (50 cases)**, likely for surgeries requiring anaerobic coverage.
- **Ceftriaxone** was administered in **16.7% (30 cases)**, indicating the use of a broader-spectrum antibiotic than typically recommended.
- **Other antibiotics** (Amikacin and Piperacillin-Tazobactam) made up **5.6% (10 cases)**, showing limited but notable use of high-end antibiotics for prophylaxis.
- Overall, **72.8%** of SAP antibiotic use (Cefazolin + Cefuroxime/Metronidazole) aligns with standard guidelines.
- Use of **broad-spectrum agents (Ceftriaxone and Others)** in **22.3% of cases** reflect **non-compliance** or overuse, signaling a need for stricter ASP enforcement.

Antibiotic Appropriateness Analysis:

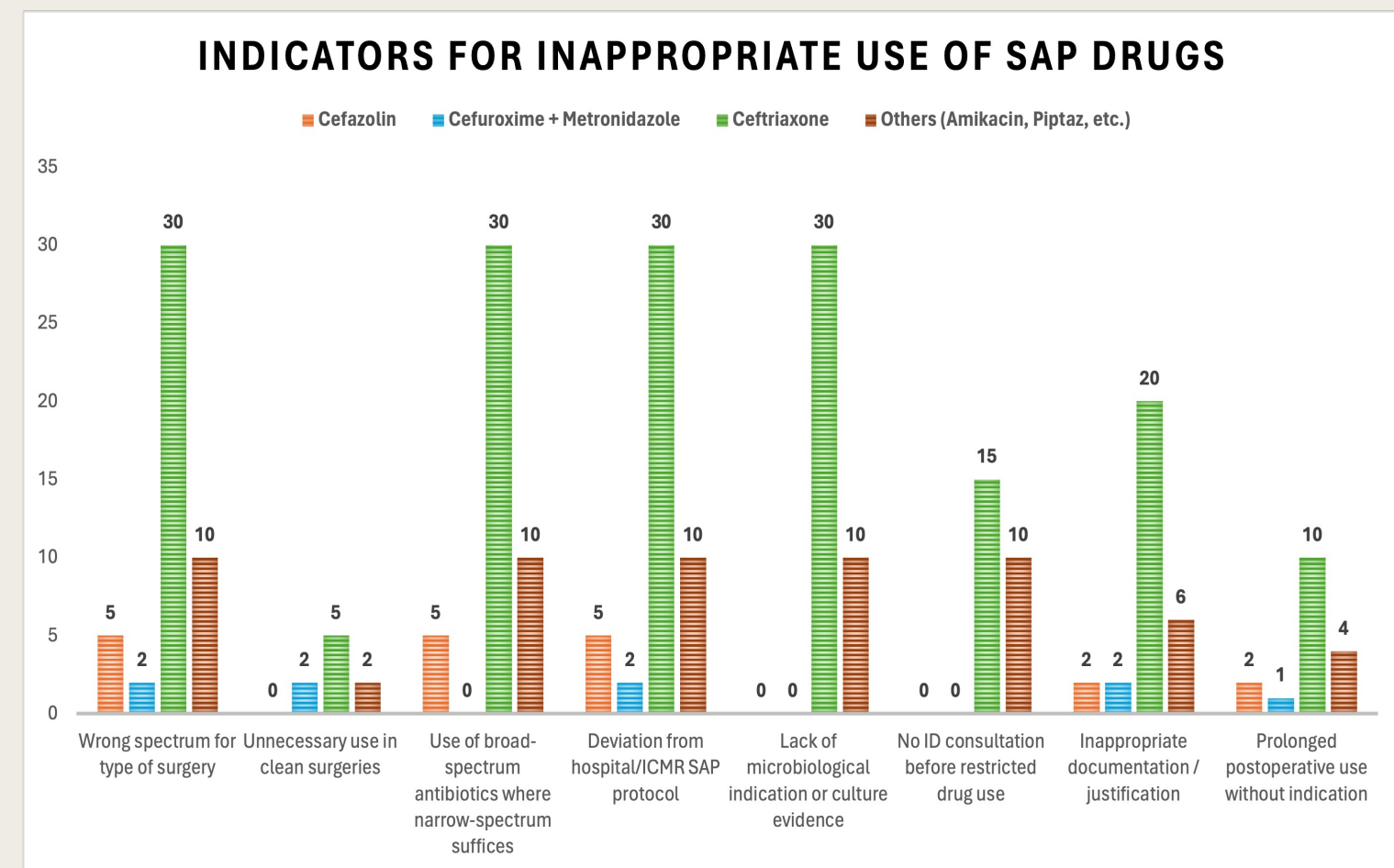
Antibiotic	Indicated Surgeries	Total Use	Appropriate Use	Appropriateness %
Cefazolin	General Surgery, Orthopedics (Clean)	90	72	80%
Cefuroxime + Metronidazole	Transplants, GI surgeries	50	31	62%
Ceftriaxone	Emergency/ICU cases (broad-spectrum)	30	18	60%
Others (e.g., Amikacin, Piperacillin-Tazobactam)	Off-guideline use	10	0	0%
Total	—	180	121	68%



The data reveals that **Cefazolin**, the first-line antibiotic for clean surgeries, **had the highest appropriateness rate at 80%**. The combination of **Cefuroxime + Metronidazole**, commonly prescribed in transplant and abdominal surgeries, was appropriate in **62%** of cases. Use of **Ceftriaxone** in emergency and ICU settings showed moderate appropriateness at **60%**, reflecting some flexibility in urgent care protocols. Notably, a small proportion of SAP prescriptions (**10 cases, 5.6%**) involved **broad-spectrum antibiotics like Amikacin and Piperacillin-Tazobactam, which were not in line with guidelines and had 0% appropriateness**. This indicates potential overuse or misuse of broad-spectrum agents, raising concerns about antimicrobial resistance and hospital stewardship practices.

Indicators for Inappropriate Use of SAP Drugs (March–May 2025)

Inappropriateness Indicator	Cefazolin	Cefuroxime + Metronidazole	Ceftriaxone	Others (Amikacin, Piptaz, etc.)	Total Cases
Wrong spectrum for type of surgery	5	2	30	10	47
Unnecessary use in clean surgeries	0	2	5	2	9
Use of broad-spectrum antibiotics where narrow-spectrum suffices	5	0	30	10	45
Deviation from hospital/ICMR SAP protocol	5	2	30	10	47
Lack of microbiological indication or culture evidence	0	0	30	10	40
No ID consultation before restricted drug use	0	0	15	10	25
Inappropriate documentation / justification	2	2	20	6	30
Prolonged postoperative use without indication	2	1	10	4	17



Analysis of Inappropriate Use:

Wrong Spectrum

47 cases, including 30 for Ceftriaxone and 10 for restricted drugs.

Broad-Spectrum Overuse

45 cases where narrow-spectrum would suffice, primarily Ceftriaxone and restricted drugs.

No ID Consultation

25 cases, notably 15 for Ceftriaxone and 10 for restricted drugs.

Prolonged Postoperative Use

17 cases, especially with broad-spectrum drugs.

Ceftriaxone is the most inappropriately used antibiotic, with 30 instances across multiple deviation indicators. Restricted drugs were frequently used without ID consultation or microbiological indication.

Documentation and justification were poor across all categories, particularly for Ceftriaxone (20 cases) and other restricted drugs (6 cases).

Overall Restricted Antimicrobial Utilization Trends



A retrospective review of pharmacy dispensing logs from March to May 2025 revealed 649 prescriptions for high-end restricted antimicrobials. Tedizolid, Colistin, and Polymyxin-B were the most frequently prescribed, often for post-surgical, transplant, and ICU patients.

Of these, 68% (441 prescriptions) were appropriate, while 32% (208 prescriptions) were inappropriate, often due to empirical therapy without culture support, extended durations, or inadequate documentation.

The dominance of Tedizolid, Colistin, and Polymyxin-B indicates a heavy reliance on last-resort antimicrobials. This trend is often driven by poor infection control or complications arising from inadequate SAP adherence.

Frequent prescriptions of glycopeptides and glycyclcyclines (Teicoplanin, Eravacycline) suggest resistance concerns in gram-positive and anaerobic organisms.

These insights underscore the urgent need for comprehensive stewardship strategies combining protocol enforcement, diagnostic support, and prescriber education.



Implications of SAP Non-Compliance



Antimicrobial Resistance (AMR)

Inappropriate use of broad-spectrum and high-end antimicrobials accelerates AMR development.



Increased Length of Hospital Stay (LOS)

Suboptimal SAP increases SSIs, drug toxicity, and reoperations, prolonging hospitalization.



Increased Incidence of SSIs

Deviations in timing, choice, or dosage compromise prophylaxis effectiveness.



Financial Burden

Unnecessary use of expensive restricted drugs and prolonged hospitalization increase costs.



Compromised Patient Safety

High-end antimicrobials have significant side effects and polypharmacy risks.

Results & Discussion : SAP Compliance and Antibiotic Choice

Compliance Patterns

Overall SAP compliance was 64%. The ICU showed the highest compliance at 80%, while the Transplant Unit had the lowest at 48%, indicating a need for targeted interventions.



This pattern aligns with findings by van Kasteren et al. (2003), who reported that variation in **SAP practices across departments and procedures is common**, often due to differences in awareness, perceived risks, and institutional culture regarding antimicrobial use. Similarly, a multi-centre study in India by Taneja et al. (2022) noted that **tertiary hospitals often show variable compliance rates ranging from 30% to 85%** depending on the department and type of surgery.

Antibiotic Appropriateness

Cefazolin, the most common SAP drug, had an 80% appropriateness rate. However, broad-spectrum antibiotics like Ceftriaxone (40% inappropriate) and restricted agents like Amikacin and Piperacillin-Tazobactam (100% inappropriate) were misused, often without microbiological support.



This reflects a global issue: **A review in The Lancet Infectious Diseases (2022) found that up to 50% of antimicrobial use in hospitals is inappropriate**, often driven by empirical practices, diagnostic uncertainty, and lack of stewardship enforcement

Root causes identified:



Gap in Education and Training:

Junior residents and surgeons often default to broad-spectrum antibiotics due to insufficient training on SAP guidelines.



Lack of Documentation:

A recurring theme was incomplete or missing justification for antibiotic use. This hinders audit trails and corrective actions.



Non-Involvement of ASP Teams:

Many prescriptions of restricted antibiotics were made without involving the Infectious Disease team or ASP committee, despite existing policies.

Recommendations for Improvement



Strengthen ASP Protocol Enforcement

Mandate ID consultation and ASP team sign-off for restricted drug prescriptions.



Implement Digital SAP Checklists

Embed them in EMRs for real-time compliance tracking and integrate protocols into electronic prescription systems.



Conduct Monthly SAP Audits

Implement transparent departmental reporting and real-time clinical pharmacist auditing in critical care units.



Enhance Training

Organize workshops and e-learning modules on SAP protocols for all surgical and prescribing staff.



Integrate Diagnostic Stewardship

Ensure culture testing before high-end antibiotic use.

THANK YOU