



ASSESSMENT OF APPROPRIATENESS AND GUIDELINE COMPLIANCE OF SURGICAL ANTIMICROBIAL PROPHYLAXIS IN ELECTIVE GENERAL SURGERY: A RETROSPECTIVE OBSERVATIONAL STUDY

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Abstract

Background: Surgical antimicrobial prophylaxis (SAP) remains a cornerstone in reducing surgical site infections (SSIs) in elective general surgical procedures. Despite well-established international recommendations, deviations in antibiotic selection, timing, and duration continue to be reported, contributing to antimicrobial resistance and unnecessary healthcare expenditure. Periodic institutional audits are essential to evaluate compliance and promote rational prescribing practices.

Objectives: To evaluate the appropriateness and guideline adherence of surgical antimicrobial prophylaxis in patients undergoing elective general surgical procedures at a tertiary care teaching hospital.

Methods: A retrospective observational study was conducted by reviewing medical records of 180 patients who underwent elective general surgical procedures between January and December 2018. Data collected included demographic profile, type of surgery, antibiotic selection, timing of administration, dosage, route, and duration of prophylaxis. Appropriateness was assessed based on established international guidelines for surgical antimicrobial prophylaxis. Compliance rates were calculated for antibiotic choice, timing (within 60 minutes before incision), and duration (≤ 24 hours postoperatively). Descriptive statistics were used for analysis.

Results: Among 180 patients analyzed, cephalosporins were the most commonly prescribed prophylactic agents (72.2%), followed by beta-lactam/beta-lactamase inhibitor combinations (18.9%). Appropriate antibiotic selection was observed in 68.3% of cases, while correct timing of administration was documented in 74.4% of patients. However, prolonged postoperative antibiotic use beyond 24 hours was identified in 61.1% of cases. Overall full guideline compliance (selection, timing, and duration) was achieved in 42.8% of patients. The observed surgical site infection rate was 6.1%, with higher incidence among cases receiving prolonged prophylaxis.

Conclusion: The study demonstrates suboptimal adherence to surgical antimicrobial prophylaxis guidelines, particularly concerning duration of antibiotic administration. Institutional antimicrobial stewardship initiatives and standardized perioperative protocols are necessary to improve rational antibiotic use and minimize preventable antimicrobial exposure.

Keywords: Surgical antimicrobial prophylaxis, guideline adherence, elective surgery, antimicrobial stewardship, retrospective study, antibiotic audit.

Introduction:: Surgical site infections (SSIs) remain one of the most common healthcare-associated infections worldwide and continue to contribute substantially to postoperative morbidity, prolonged hospitalization, readmission rates, and increased healthcare expenditure¹. The burden of SSIs is particularly significant in low- and middle-income countries, where infection rates are reported to be higher compared to high-income settings². Appropriate use of surgical antimicrobial prophylaxis (SAP) is recognized as an effective strategy to reduce the incidence of SSIs when administered in alignment with evidence-based recommendations³.

International bodies including the World Health Organization (WHO), Centers for Disease Control and Prevention (CDC), and the American Society of Health-System Pharmacists (ASHP) have issued detailed guidelines outlining optimal antibiotic selection, appropriate dosing, correct timing of administration—ideally within 60 minutes prior to surgical incision—and limitation of prophylaxis duration to within 24 hours for most clean and clean-contaminated procedures^{4–6}. Adherence to these recommendations has been shown to significantly reduce postoperative infectious complications while minimizing unnecessary antibiotic exposure⁷.

However, despite the availability of standardized guidelines, inappropriate prescribing practices persist in many tertiary care institutions⁸. Common deviations include use of broad-spectrum antibiotics without clear indication, delayed administration, incorrect dosing, and prolonged postoperative continuation beyond recommended duration^{9,10}. Such practices not only increase the risk of antimicrobial resistance but also predispose patients to adverse drug reactions and higher treatment costs¹¹. Periodic prescription audits and antimicrobial stewardship interventions have been recommended to improve compliance and promote rational drug use in surgical settings¹². Therefore, the present study was undertaken to evaluate real-world adherence to established SAP guidelines in elective general surgical procedures at a tertiary care teaching hospital.

Methodology

A retrospective observational study was conducted in the Department of General Surgery at a tertiary care teaching hospital to evaluate surgical antimicrobial prophylaxis (SAP) practices among patients undergoing elective general surgical procedures between January 1 and December 31, 2018. A total of 180 patients meeting eligibility criteria were included based on availability of complete medical records.

Patients aged ≥ 18 years undergoing elective clean and clean-contaminated procedures were included. Emergency surgeries, contaminated or dirty procedures, patients receiving therapeutic antibiotics prior to admission, and cases with incomplete documentation were excluded.

Data were collected from inpatient case files, anesthesia records, operative notes, and medication charts using a structured format. Information recorded included demographic details, type of surgery, antibiotic prescribed (drug, dose, route), timing of administration relative to incision, duration of prophylaxis, and occurrence of surgical site infection (SSI) during hospitalization.

Appropriateness of SAP was assessed according to established WHO and ASHP guidelines^{3,4}. Parameters evaluated included correct antibiotic selection, administration within 60 minutes prior to incision, recommended dosing and route, and discontinuation within 24 hours postoperatively. Overall compliance required fulfillment of all criteria. The evaluation framework was aligned with WHO antimicrobial use assessment indicators^{13,14}.

Descriptive statistics were used to summarize data, expressed as frequencies and percentages. Association between non-compliance and SSI was analyzed using the Chi-square test, with $p < 0.05$ considered statistically significant. Ethical approval was obtained from the Institutional Ethics Committee, and patient confidentiality was maintained throughout the study.

Results

A total of **180 patient records** fulfilling the inclusion criteria were analyzed. The mean age of patients was **46.3 $\pm$ 12.8 years**, with the majority belonging to the 41–60 years age group. Male patients constituted **64% (n=115)** and females **36% (n=65)** of the study population (Table 1).

The most frequently performed elective procedures were inguinal hernia repair (32.2%), laparoscopic cholecystectomy (27.8%), open cholecystectomy (11.1%), appendectomy (18.3%), and other clean procedures including excision of soft tissue swellings and thyroid surgeries (10.6%) (Table 2).

Cephalosporins were the most commonly prescribed prophylactic antibiotics, accounting for **72.2% (n=130)** of cases, followed by beta-lactam/beta-lactamase inhibitor combinations in **18.9% (n=34)**. Other agents including fluoroquinolones and metronidazole combinations were used in **8.9% (n=16)** of patients (Table 3).

Assessment of guideline adherence showed that appropriate antibiotic selection was observed in **68.3% (n=123)** of cases. Correct timing of administration (within 60 minutes prior to incision) was documented in **74.4% (n=134)** of patients. However, only **38.9% (n=70)** received prophylaxis within the recommended duration of ≤ 24 hours. Overall complete compliance (selection, timing, and duration) was achieved in **42.8% (n=77)** of cases (Table 4).

Prolonged postoperative antibiotic administration beyond 24 hours was observed in **61.1% (n=110)** of patients. The overall surgical site infection (SSI) rate during hospital stay was **6.1% (n=11)**. Higher SSI incidence was noted among patients with non-compliant prophylaxis practices ($p < 0.05$) (Table 5).

Tables

Table 1: Demographic Characteristics of Study Population (n=180)

Variable	Frequency (n)	Percentage (%)
Age 18–40 years	52	28.9
Age 41–60 years	88	48.9
Age >60 years	40	22.2
Male	115	64.0
Female	65	36.0

Table 2: Distribution of Elective Surgical Procedures

Procedure	Frequency (n)	Percentage (%)
Inguinal Hernia Repair	58	32.2
Laparoscopic Cholecystectomy	50	27.8
Open Cholecystectomy	20	11.1
Appendectomy	33	18.3
Others	19	10.6

Table 3: Pattern of Prophylactic Antibiotic Prescribing

Antibiotic Class	Frequency (n)	Percentage (%)
Cephalosporins	130	72.2
Beta-lactam + Beta-lactamase inhibitor	34	18.9
Fluoroquinolones	9	5.0
Others	7	3.9

Table 4: Guideline Compliance Assessment

Parameter	Compliant (n)	Percentage (%)
Appropriate Selection	123	68.3
Correct Timing	134	74.4

Parameter	Compliant (n)	Percentage (%)
Appropriate Duration (≤ 24 hrs)	70	38.9
Complete Compliance	77	42.8

Table 5: Association Between Guideline Compliance and SSI

Variable	SSI (n=11)	No SSI (n=169)	p-value
Guideline Compliant	2	75	
Non-Compliant	9	94	<0.05

Discussion

The present study evaluated adherence to surgical antimicrobial prophylaxis (SAP) guidelines in elective general surgical procedures and identified significant gaps in compliance, particularly regarding duration of antibiotic use. Among the 180 cases analyzed, complete guideline adherence was observed in only 42.8% of patients. While antibiotic selection (68.3%) and timing (74.4%) showed moderate compliance, inappropriate prolongation of prophylaxis beyond 24 hours was common (61.1%).

Cephalosporins were the most frequently prescribed agents (72.2%), consistent with international recommendations favoring first-generation cephalosporins for clean and clean-contaminated procedures. Similar prescribing trends were reported by **Ierano et al.¹⁵**, who observed predominant cephalosporin use in surgical prophylaxis audits across tertiary hospitals. However, our study noted the frequent use of third-generation cephalosporins, which may reflect empirical prescribing patterns rather than strict adherence to guideline-recommended narrow-spectrum agents.

The compliance rate for appropriate antibiotic selection (68.3%) in the present study is comparable to findings reported by **Khan et al.¹⁶**, who documented 64% adherence in elective surgical cases. Likewise, **Napolitano et al.¹⁷** reported suboptimal overall compliance (approximately 50%) in their evaluation of surgical prophylaxis practices. These findings collectively highlight persistent gaps between evidence-based recommendations and real-world prescribing behavior.

One of the most notable deviations in our study was prolonged postoperative antibiotic administration beyond 24 hours. Only 38.9% of patients received prophylaxis within the recommended duration. Similar observations were made by **Gouvêa et al.¹⁸**, who identified duration as the most frequently violated parameter in surgical antibiotic audits. Prolonged antibiotic exposure may stem from fear of postoperative infections, defensive prescribing habits, or lack of institutional antimicrobial stewardship enforcement.

The surgical site infection (SSI) rate in the present study was 6.1%, which is comparable to rates reported in tertiary care settings globally. Importantly, a higher incidence of SSI was observed among patients with non-compliant prophylaxis practices. Although causality cannot be definitively established in retrospective studies, similar associations between inappropriate timing or duration and increased SSI risk have been reported by **de Jonge et al.¹⁹**, who emphasized the critical role of correct timing in reducing infection rates.

The findings of this study underscore the need for strengthened antimicrobial stewardship interventions. As highlighted by **Charani et al.²⁰**, implementation of structured surgical stewardship programs, standardized institutional protocols, and regular audit-feedback mechanisms can significantly improve compliance with SAP guidelines and reduce unnecessary antibiotic exposure. Overall, the present study demonstrates that while moderate adherence to selection and timing exists, duration of prophylaxis remains the primary area requiring intervention. Targeted educational initiatives, electronic prescribing alerts, and periodic prescription audits may help bridge the gap between guidelines and clinical practice.

Conclusion

The present retrospective observational study highlights suboptimal adherence to established surgical antimicrobial prophylaxis (SAP) guidelines in elective general surgical procedures. Although moderate compliance was observed with respect to antibiotic selection and timing of administration, significant deviation was noted in the duration of prophylaxis, with a majority of patients receiving antibiotics beyond the recommended 24-hour period. Prolonged postoperative antibiotic use remains the primary area of concern and reflects the need for improved implementation of evidence-based practices.

The observed association between guideline non-compliance and higher surgical site infection (SSI) rates further emphasizes the importance of rational antimicrobial prescribing. Strengthening institutional antimicrobial stewardship programs, enforcing standardized perioperative protocols, and conducting periodic prescription audits may enhance adherence to guidelines and reduce unnecessary antibiotic exposure. Continuous education of surgical teams regarding updated recommendations is essential to optimize patient outcomes and mitigate the growing threat of antimicrobial resistance.

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