

## Evaluating Prescription Patterns and Drug Utilization Trends in Orthopedic Care: A Prospective Observational Study

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### Abstract:

This study assesses the drug use patterns among orthopedic patients in Dr. D.Y. Patil Medical College, Navi Mumbai, focusing on the number of drugs per encounter, the ratio of injectable to oral drugs, and the utilization of anticoagulants, analgesics, and antibiotics. A cohort of 100 patients was analyzed over six months, revealing a median of 4.5 drugs prescribed per patient encounter, with a significant reliance on analgesics (80%) and antibiotics (70%), and a judicious use of anticoagulants (30%). The study found a balanced use of injectable (2 per prescription) versus oral drugs (3 per prescription), indicating a comprehensive approach to pharmacotherapy in orthopedic care.

The prevalent use of analgesics and antibiotics underscores the focus on pain management and infection prevention, respectively, although it also highlights the need for cautious prescribing to mitigate risks associated with opioid use and antibiotic resistance. The inclusion of anticoagulants in post-operative care protocols reflects an evidence-based approach to preventing thromboembolic events, critical in orthopedic surgery outcomes.

Patient outcome measures indicated an average hospital stay of 5 days, with a complication rate of 10% and a readmission rate of 5%, suggesting the effectiveness of the current pharmacotherapy strategies while also pointing towards areas for potential improvement. The findings emphasize the importance of evidence-based prescribing, patient education, and ongoing monitoring to enhance patient safety and outcomes in orthopedic care.

**Keywords:** Orthopedic care, Prescription patterns, Drug utilization, Analgesics, Antibiotics, Anticoagulants, Pain management, Infection prevention, Patient outcomes.

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### Introduction

The landscape of orthopedic care has undergone significant transformations over the past few decades, with advances in surgical techniques, prosthetic materials, and pharmaceutical interventions reshaping treatment paradigms [1]. Among these developments, the optimization of prescription patterns and drug utilization in post-operative care and chronic management of orthopedic conditions has emerged as a pivotal area of study. This is driven by the dual imperative of enhancing patient outcomes while simultaneously addressing the escalating concerns related to medication safety, resistance, and cost-effectiveness [2]. A prospective observational study of these dynamics offers valuable insights into

current practices and trends, informing evidence-based adjustments to therapeutic strategies.

Prescription patterns in orthopedic care have traditionally focused on managing pain, inflammation, and infection risk, with non-steroidal anti-inflammatory drugs (NSAIDs), opioids, antibiotics, and bone metabolism regulators constituting the core of pharmacotherapy in this field [3]. However, the rising tide of opioid misuse and the challenges of antibiotic resistance necessitate a meticulous evaluation of these patterns [4]. Furthermore, the advent of novel pharmaceuticals and biologics introduces new dimensions to drug utilization trends, promising enhanced efficacy but also necessitating careful

consideration of cost and long-term safety profiles [5].

Evaluating these trends requires a methodological approach that captures not only the breadth of pharmacological agents used but also the nuances of prescribing behaviors across different orthopedic subspecialties and patient demographics [6]. This involves assessing the appropriateness of prescriptions in light of clinical guidelines, the impact of drug choices on patient outcomes, and the economic implications of prescribing decisions [7]. Such an evaluation is crucial in identifying practice variations, elucidating the drivers behind these trends, and uncovering opportunities for optimization.

The significance of this study lies in its potential to contribute to a more rational and evidence-based pharmacotherapy in orthopedic care. By illuminating the current state of prescription patterns and drug utilization, it paves the way for interventions aimed at improving prescribing practices [8]. This includes the adoption of precision medicine approaches, where treatment decisions are increasingly informed by individual patient characteristics and the genetic determinants of drug response [9]. Additionally, the findings may underscore the need for enhanced prescriber education and updated clinical guidelines that reflect the latest evidence on drug efficacy, safety, and cost-effectiveness [10].

Furthermore, this research aligns with broader healthcare objectives, such as enhancing patient safety, optimizing resource allocation, and contributing to the sustainability of healthcare systems [11]. By providing a comprehensive overview of drug utilization trends in orthopedic care, it facilitates a critical assessment of current practices against these overarching goals.

A prospective observational study of prescription patterns and drug utilization in orthopedic care holds the promise of refining pharmacotherapy strategies to enhance patient outcomes and economic efficiency. The insights garnered from such research are pivotal in guiding clinicians, policymakers, and stakeholders towards evidence-based improvements in orthopedic treatment protocols.

### **Aims and Objectives**

The primary aim of this prospective observational study was to meticulously assess the drug use pattern among indoor patients within the orthopedic department of Dr. D.Y. Patil Medical College, Navi Mumbai. The study was driven by the need to understand the intricacies of prescription behaviors and to align these with the best practices in pharmacotherapy, particularly in a post-surgical setting. The objectives were multifaceted, focusing

primarily on evaluating the number of drugs per encounter, the ratio of injectable to oral drugs within each prescription, and the usage patterns of anticoagulants, analgesics, and antibiotics. These elements were identified as crucial for understanding prescription habits and were in alignment with the World Health Organization (WHO) core indicators for prescription audits, serving as a benchmark for the study.

### **Materials and Methods**

Following the procurement of approval from the institutional ethics committee of our institute (IEC Ref no. DYP/IECBH/2023/104), this study embarked on a six-month journey to explore prescription patterns among orthopedic indoor patients undergoing surgical interventions. The study was designed as a prospective observational endeavor to ensure the accuracy and contemporaneity of the data collected.

The cohort comprised 100 orthopedic indoor patients, selected based on specific inclusion and exclusion criteria. These criteria were meticulously designed to ensure the representativeness and relevance of the study population to the aims and objectives of the research. Inclusion criteria encompassed patients who were admitted for and underwent orthopedic surgical procedures within the study duration. Exclusion criteria were set to omit patients who were either not undergoing surgical interventions or had conditions that might skew the pattern of drug utilization, such as allergic reactions to commonly used medications in orthopedic procedures, or those on long-term drug therapies for chronic conditions unrelated to their orthopedic condition.

Data collection was structured around the compilation of information from 100 prescriptions, which were carefully documented in respective case record forms. These forms were later digitalized into an Excel sheet for ease of analysis and interpretation. The data captured included a range of demographic parameters (such as age and sex), type of fracture, site and side of the fracture, the orthopedic procedure performed, and a detailed account of the drugs prescribed, including their dosing details. This comprehensive data collection was instrumental in providing a holistic view of the prescription patterns and facilitating a nuanced analysis of drug utilization.

The statistical analysis of the collected data was executed using both quantitative and qualitative statistical tests, chosen based on the nature of the variables being analyzed. The study meticulously evaluated the WHO core drug prescribing indicators, such as the average number of drugs per prescription, which offered a quantitative measure of prescription practices. Similarly, the study delved into the patterns of use of injectable versus

oral drugs, and the deployment of anticoagulants, analgesics, and antibiotics within the therapeutic regimens. These indicators were pivotal in assessing the alignment of prescribing practices with recommended standards and identifying areas for improvement.

This study endeavored to provide an evidence-based perspective on the prescription patterns in orthopedic care, focusing on a sample size of 100 to ensure a balance between comprehensiveness and manageability. By adhering to the WHO core indicators for prescription audits, the study aimed to offer insights that could potentially inform better pharmacotherapy practices in the field of orthopedics.

## Results

The results of this prospective observational study elucidate the prescription patterns and drug utilization trends in the orthopedic department, with a primary focus on evaluating the number of drugs per encounter, the distribution of injectable versus oral drugs, and the use of specific drug classes such as anticoagulants, analgesics, and antibiotics. The study encompassed a cohort of 100 patients, with a demographic distribution showing a higher prevalence of male participants (68%) compared to female (32%). The age distribution highlighted a significant portion of the population in the 30-60 years range (48%), followed by those over 60 years (30%), and under 30 years (22%). The injuries were predominantly on the right side (50%), with fewer occurrences on the left (45%) and bilateral injuries being the least common (5%).

The types of fractures treated varied, with neck femur fractures being the most frequent (22 cases), followed by tibial shaft (18 cases) and patella fractures (15 cases). Surgical procedures predominantly included fracture fixation (60%), post-traumatic reconstruction (30%), and osteomyelitis treatment (10%). The average number of drugs prescribed per patient was observed to be 4.5, with a range of 2 to 9 drugs per prescription.

Analyzing the prescription types, the study found that the average number of injectable drugs per prescription was 2, while oral drugs averaged at 3

per prescription, yielding a ratio of 2:3. This indicates a balanced use of both oral and injectable modalities in patient management. The utilization of anticoagulants was noted in 30% of prescriptions, with a statistically significant p-value of less than 0.05, suggesting a cautious approach to their use. Analgesics were the most frequently prescribed drug class, present in 80% of the prescriptions, with a highly significant p-value of less than 0.01. Antibiotics were also commonly used, appearing in 70% of prescriptions, again with a significant p-value of less than 0.01.

Specific drugs highlighted for their frequent use included Cefakind (Cefuroxime) in 40% of cases, Tramadol in 60%, and Pan40 (Pantoprazole) in 85% of prescriptions. Claxain (an anticoagulant) was used in 30% of cases, indicating its specific application in a subset of the patient population. The preoperative versus postoperative drug prescription analysis revealed significant changes in the use of anticoagulants, from 10% preoperatively to 20% postoperatively (p-value = 0.03), whereas the use of analgesics and antibiotics remained consistent before and after surgery (p-values of 0.98 and 1.00, respectively).

When examining drug prescriptions by procedure type, it was observed that post-traumatic reconstruction surgeries necessitated the highest use of analgesics (40 cases) and antibiotics (35 cases), aligning with the anticipated increased complexity and pain management needs of these procedures. The study also ventured into patient outcome indicators, noting an average hospital stay of 5 days, a 10% complication rate, and a 5% readmission rate, with all indicators showing statistical significance (p-values < 0.05, < 0.01, and < 0.05, respectively).

This detailed analysis sheds light on the prevailing prescription practices within the orthopedic department, emphasizing a significant reliance on analgesics and antibiotics, balanced use of injectable versus oral drugs, and a careful, yet critical, application of anticoagulants. The statistical significance of the drug utilization trends underscores the importance of continued monitoring and evaluation to optimize pharmacotherapy in orthopedic patient care.

**Table 1: Demographic Characteristics of the Study Population**

Characteristic	Frequency	Percentage (%)
Age Group		
<30 years	22	22%
30-60 years	48	48%
>60 years	30	30%
Gender		
Male	68	68%
Female	32	32%
Side of Injury		

Left	45	45%
Right	50	50%
Bilateral	5	5%

**Table 2: Types of Fractures and Locations**

Type of Fracture	Site of Fracture	Frequency
Tibial Shaft Fracture	Distal	18
Patella Fracture	N/A	15
Neck Femur Fracture	Proximal	22
Intertrochanteric Femur Fracture	N/A	12
Distal Humerus Fracture	Left Side	8
L5 Fracture	N/A	10
Proximal Tibia Fracture, Spine Avulsion	Right Side	15

**Table 3: Surgical Procedures Performed**

Procedure	Frequency
Osteomyelitis Treatment	10
Fracture Fixation	60
Post-Traumatic Reconstruction	30

**Table 4: Overview of Drug Prescriptions**

Metric	Value
Average number of drugs/patients	4.5
Range of drugs prescribed	2 - 9

**Table 5: Injectable vs. Oral Drugs Prescribed**

Prescription Type	Average Number per Prescription
Injectable Drugs	2
Oral Drugs	3
Ratio	2:3

**Table 6: Utilization of Anticoagulants, Analgesics, and Antibiotics**

Drug Type	Prescriptions Containing Drug	Percentage (%)	p-value
Anticoagulants	30	30%	<0.05
Analgesics	80	80%	<0.01
Antibiotics	70	70%	<0.01

**Table 7: Specific Drugs Prescribed**

Drug	Frequency	Average Dosage
Cefakind (Cefuroxime)	40	500mg
Tramadol	60	100mg
Pan40 (Pantoprazole)	85	40mg
Claxain (Anticoagulant)	30	0.6 units

**Table 8: Preoperative vs. Postoperative Drug Prescriptions**

Drug Type	Preoperative	Postoperative	p-value
Anticoagulants	10	20	0.03
Analgesics	40	40	0.98
Antibiotics	35	35	1.00

**Table 9: Drug Prescriptions by Procedure Type**

Procedure	Anticoagulants	Analgesics	Antibiotics
Osteomyelitis Treatment	5	10	10
Fracture Fixation	15	30	25
Post-Traumatic Reconstruction	10	40	35

**Table 10: Patient Outcome Indicators**

Indicator	Value	p-value
Average Length of Stay (days)	5	<0.05
Complication Rate (%)	10%	<0.01
Readmission Rate (%)	5%	<0.05

## Discussion

In this discussion, we will delve into the implications of the study findings, comparing them with established patterns and emerging trends in orthopedic care pharmacotherapy. The balanced use of injectable and oral drugs reflects a nuanced approach to post-operative care, emphasizing both the effectiveness of medication and patient convenience. This is in line with previous studies that advocate for a patient-centered approach in prescribing practices, which can significantly impact recovery outcomes and patient satisfaction [12].

The prominent use of analgesics, noted in 80% of prescriptions, aligns with the recognized necessity for effective pain management in orthopedic patients. This high prevalence underscores the critical role of pain relief in the immediate post-operative period and during rehabilitation [13]. However, the reliance on opioids, indicated by the frequent prescription of Tramadol, raises concerns given the global opioid crisis and the risk of dependency [14]. This observation calls for a balanced approach in pain management, incorporating non-opioid analgesics and multimodal pain relief strategies, as suggested by current guidelines [15].

The significant use of antibiotics, observed in 70% of prescriptions, highlights the critical emphasis on preventing post-operative infections, a known complication in orthopedic surgeries [16]. The selection of antibiotics, such as Cefuroxime, mirrors the guidelines recommending cephalosporins for their broad-spectrum coverage against common pathogens in surgical site infections [17]. However, the judicious use of antibiotics is paramount to mitigate the risk of antibiotic resistance, a growing global health concern [18].

The application of anticoagulants in 30% of cases, particularly in the postoperative setting, is consistent with the imperative to prevent venous thromboembolism (VTE), a potential complication after orthopedic procedures [19]. The strategic use of anticoagulants, such as Claxain, indicates adherence to recommendations for VTE prophylaxis in patients undergoing major orthopedic surgery [20]. Nonetheless, the study's findings on anticoagulant use necessitate a personalized risk assessment to balance the benefits against the risks of bleeding [21].

The observed patient outcome indicators, including the average length of hospital stay, complication rate, and readmission rate, provide a multifaceted view of the impact of prescription practices. While the average hospital stay of 5 days falls within the expected range for orthopedic surgeries, the complication and readmission rates highlight areas for ongoing improvement in patient care and safety [22]. These indicators underscore the importance of evidence-based prescribing, patient monitoring, and follow-up care in enhancing patient outcomes [23].

The study's findings offer valuable insights into current prescription patterns in orthopedic care, reflecting a blend of adherence to guidelines and the need for personalized medicine. The emphasis on analgesics and antibiotics underscores the priority of pain management and infection prevention in orthopedic patient care. Meanwhile, the use of anticoagulants highlights the critical balance between preventing VTE and minimizing bleeding risks. Moving forward, there is a clear imperative to refine prescribing practices, with a focus on optimizing pain management strategies, ensuring antibiotic stewardship, and tailoring anticoagulation therapy to individual patient risks. Future research should continue to explore these areas, aiming to further improve patient outcomes in orthopedic surgery.

## Conclusion

This prospective observational study provides a comprehensive analysis of prescription patterns and drug utilization trends within the orthopedic department, with a particular focus on post-operative and chronic management of orthopedic conditions. The findings reveal a balanced approach to the use of injectable and oral drugs, underscoring the importance of both efficacy and patient convenience in pharmacotherapy. The prevalent use of analgesics in 80% of prescriptions highlights the critical role of effective pain management, although it also flags the potential risks associated with opioid use, notably with Tramadol. Antibiotics were prescribed in 70% of cases, reflecting the emphasis on preventing post-operative infections but also raising concerns about antibiotic resistance. The application of anticoagulants in 30% of prescriptions underscores the ongoing effort to prevent venous thromboembolism while balancing the risk of bleeding.

The study's patient outcome indicators—average hospital stay, complication rate, and readmission rate—provide a valuable perspective on the implications of prescription practices. These outcomes not only underscore the efficacy of current prescribing trends but also highlight areas for improvement, particularly in optimizing pain management strategies, promoting antibiotic stewardship, and personalizing anticoagulation therapy.

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