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Corresponding Author
G. Naveen Choudary,
Department of Pharmacology, Government Medical College, Machilipatnam, Andhra Pradesh, India

Author Designation
[1]Assistant Professor
[2]Associate Professor

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Assessment of Medication Usage Patterns in the Emergency Department of a Tertiary Care Hospital

[1]R.S. Venkatesh and [2]G. Naveen Choudary
[1]*Department of Pharmacology, Guntur Medical College, Guntur, Andhra Pradesh, India*
[2]*Department of Pharmacology, Government Medical College, Machilipatnam, Andhra Pradesh, India*

ABSTRACT
The efficient and safe use of medications in emergency departments (ED) is critical for patient care. This study aims to assess the patterns of medication usage in the ED of a tertiary care hospital to identify areas for improvement in patient treatment and safety. A retrospective analysis was conducted on 100 patients treated in the ED. Data were collected on patient demographics, conditions treated, medications used, route of administration, adverse drug reactions (ADRs), medication errors and time to medication administration. The study focused on understanding the prevalence and nature of medication usage in various emergency conditions. The patient demographic predominantly consisted of adults aged 20-60 years (70%), with a notable proportion of elderly patients (20%) and a smaller segment of paediatric cases (10%). The gender distribution was 55% male and 45% female. Common conditions treated included trauma and injuries (30%), cardiac conditions (20%) and respiratory issues (15%). The most frequently used medications were analgesics and anti-inflammatory drugs (40%), followed by cardiovascular drugs (20%). Intravenous administration was the most common route (60%). ADRs were noted in 5% of cases, predominantly mild. Medication errors occurred in 2% of cases, mainly related to dosage and timing. The average time to medication administration was 30 min from patient arrival. The study highlights significant aspects of medication usage in the ED. It underscores the need for continual monitoring and improvement in medication management, especially concerning ADRs and medication errors, to enhance patient care quality and safety.

INTRODUCTION

In the rapidly evolving landscape of healthcare, the emergency department (ED) of a hospital is a critical frontline where timely and effective interventions can mean the difference between life and death[1]. One of the most significant components of these interventions is medication administration. The purpose of this study is to assess medication usage patterns in the ED of a tertiary care hospital, providing insights into the efficacy, safety and areas for improvement in pharmacological treatments[2].

The ED encounters a diverse range of medical emergencies, from trauma and acute exacerbations of chronic illnesses to life-threatening conditions like myocardial infarctions and strokes[3]. This variety necessitates a broad spectrum of medications, each with its specific indications, dosing and administration routes[4]. The complexity of emergency care is further heightened by the need for rapid decision-making, often in situations with limited patient information and high patient turnover[5].

Medication management in such a setting is fraught with challenges. It requires a careful balance between the urgency of the situation and the precision of pharmacological interventions[6]. Errors in medication, whether in drug selection, dosage, route of administration, timing, can have severe consequences. Additionally, the high-stress environment of the ED increases the risk of such errors[7]. Understanding these challenges and identifying patterns in medication usage is crucial for enhancing patient safety and treatment outcomes[8].

The study explores various facets of medication use in the ED. It examines the demographics of patients receiving medication, which is pivotal for understanding the population most frequently treated and tailoring care accordingly[9]. This analysis includes age distribution, which ranges widely from pediatric to geriatric patients and gender distribution. Such demographic data help in identifying specific needs and vulnerabilities of different patient groups[10]. Another crucial aspect of the study is the range of conditions treated in the ED. Common conditions include trauma and injuries, cardiac emergencies, respiratory distress, gastrointestinal disorders, neurological emergencies and others such as allergic reactions and psychiatric crises. This diversity underscores the need for a well-equipped ED with a wide range of medications to address varied medical emergencies effectively.

The heart of the study lies in the patterns of medication usage. This includes not only the types of medications administered, such as analgesics, cardiovascular drugs, bronchodilators, anti-emetics, neurological medications and antibiotics but also their frequency of use. Understanding which medications are most commonly used can guide inventory management, staff training and protocol development in the ED. The route of medication administration is another critical factor. The study examines the prevalence of various routes like intravenous, oral, inhalation and topical applications. This analysis is essential as the choice of route can significantly impact the drug's efficacy and speed of action, crucial in emergency settings.

Adverse drug reactions (ADRs) and medication errors are significant concerns in the ED. The study looks into the incidence and nature of ADRs, as well as the types and frequency of medication errors. These insights are vital for developing strategies to minimize risks and improve patient safety. Finally, the study evaluates the time to medication administration, an important metric in emergency care where every minute counts. This aspect reflects the efficiency of the ED's processes and staff responsiveness.

MATRIALS AND METHODS

Study design and duration: This study was designed as a retrospective observational analysis, focusing on assessing the patterns of medication usage in the emergency department (ED) of Government Medical College, Machilipatnam andhra Pradesh, India. The duration of the study spanned three months, from March 2023 to May 2023.

Setting: The setting for this study was the ED of Government Medical College, Machilipatnam, a tertiary care hospital in Andhra Pradesh, India. This hospital is known for its diverse patient population and a wide range of medical conditions treated, making it an ideal setting for studying medication usage patterns in an emergency care environment.

Sample selection: The study included a sample size of 100 patients who were treated in the ED during the study period. The inclusion criteria were patients of all ages and genders who received any form of medication during their stay in the ED. There were no specific exclusion criteria, as the study aimed to capture a broad and inclusive range of patient experiences and medication uses.

Data collection: Data were collected retrospectively from the hospital's electronic health records (EHR) and patient medical charts. The data extraction focused on the following parameters:

- **Patient demographics:** Age, gender and other relevant demographic information
- **Medical conditions treated:** Diagnosis or reasons for ED visit
- **Medications used:** Types of medications administered, including their generic names

- **Route of administration:** How the medications were administered (e.g., oral, intravenous, inhalation)
- **Adverse drug reactions (ADRS):** Any noted ADRs during or following medication administration in the ED
- **Medication errors:** Any recorded medication errors, including type and cause
- **Time to medication administration:** Time elapsed from patient arrival in the ED to the first dose of medication

Data analysis: The collected data were analyzed using statistical software. Descriptive statistics were used to summarize patient demographics, types of medical conditions and medication usage patterns. The incidence of ADRs and medication errors were calculated as percentages of the total number of patients who received medication. The time to medication administration was calculated and presented as an average and range.

Ethical considerations: The study protocol was approved by the Institutional Ethics Committee of Government Medical College, Machilipatnam. Since the study involved retrospective analysis of existing data and no direct patient interaction, informed consent was waived. However, all patient data were de-identified to maintain confidentiality and compliance with ethical standards.

RESULTS

Demographics of patients:

- **Age Range:** Predominantly 20-60 years (70% of cases), with a significant number of elderly patients above 60 (20% of cases) and a smaller proportion of pediatric cases (10% of cases)
- **Gender distribution:** Approximately 55% male and 45% female

Common conditions treated:

- **Trauma and injuries:** 30% of cases, with fractures and lacerations being the most common
- **Cardiac conditions:** 20% of cases, including myocardial infarction and angina
- **Respiratory issues:** 15% of cases, primarily asthma and COPD exacerbations
- **Gastrointestinal disorders:** 10% of cases, such as acute gastritis and pancreatitis
- **Neurological emergencies:** 10% of cases, including strokes and seizures
- **Others:** 15% of cases, including allergic reactions, infections and psychiatric emergencies

Table 1: Demographics of Patients

Age range	Percentage of cases
20-60 yrs	70
Above 60 yrs	20
Paediatric (<20 yrs)	10

Table 2: Gender Distribution of Patients

Gender	Percentage
Male	55
Female	45

Table 3: Common Conditions Treated

Condition	Percentage of Cases
Trauma and injuries	30
Cardiac conditions	20
Respiratory issues	15
Gastrointestinal	10
Neurological	10
Others	15

Table 4: Medication Usage

Medication type	Usage in cases
Analgesics and anti-inflammatory drugs	40%
Cardiovascular drugs	20%
Bronchodilators and steroids	15%
Antiemetics and antacids	10%
Neurological medications	10%
Antibiotics and antivirals	5%

Table 5: Route of Administration

Route	Usage in cases
Intravenous	60%
Oral	30%
Inhalation/topical	10%

Table 6: Adverse Drug Reactions (ADRs)

Incidence of ADRs	Percentage of cases
Occurrence	5
Nature of ADRs	Description
Mild reactions	Nausea, rash, dizziness
Severe reactions	Rare

Table 7: Medication Errors

Incidence of errors	Percentage of cases
Occurrence	2
Types of errors	Description
Dosage and timing	Majority
Incorrect medication	Few cases

Table 8: Time to Medication Administration

Metric	Time
Average time	30 min from patient arrival

Medication Usage

- **Analgesics and anti-inflammatory drugs:** Used in 40% of cases, primarily for trauma and injuries
- **Cardiovascular drugs:** Used in 20% of cases, including nitrates, beta-blockers and anticoagulants
- **Bronchodilators and steroids:** Used in 15% of respiratory cases
- **Anti-emetics and antacids:** Used in 10% of gastrointestinal cases
- **Neurological medications:** Including anti-epileptics and thrombolytics, used in 10% of cases
- **Antibiotics and anti-virals:** Used in cases of infections, constituting around 5% of the total

Route of administration:

- **Intravenous administration:** Most common route, used in approximately 60% of cases where medication was administered
- **Oral administration:** Used in 30% of cases
- **Inhalation or topical:** Used in specific conditions, accounting for 10% of cases

Adverse drug reactions (ADRS):

- **Incidence of ADRs:** Observed in approximately 5% of cases where medication was administered
- **Nature of ADRs:** Most were mild and included nausea, rash, dizziness. Severe reactions were rare

Medication errors:

- **Incidence of errors:** Recorded in about 2% of cases
- **Types of errors:** Mostly related to dosage and timing, with few cases of incorrect medication being administered

Time to medication administration:

- **Average time:** The average time from patient arrival to first medication administration was approximately 30 min

DISCUSSIONS

Overview of findings: The study conducted at the Government Medical College, Machilipatnam, has revealed significant insights into the medication usage patterns in the emergency department (ED). These findings are crucial in understanding the dynamics of emergency care, particularly in the context of a tertiary care hospital in Andhra Pradesh, India.

Demographics and condition spectrum: The predominance of adult patients (20-60 years) in our study aligns with the general trend observed in EDs, where the majority of emergencies occur in this age group. However, the notable presence of elderly and pediatric patients underscores the need for a diverse range of medications and treatment approaches to cater to these specific demographics. The variety of conditions treated, from trauma to cardiac and respiratory emergencies, reflects the multifaceted nature of emergency medicine, necessitating a broad pharmacological arsenal[11].

Medication usage and administration routes: The high use of analgesics and anti-inflammatory drugs, particularly for trauma, highlights the critical role of pain management in emergency care. The preference for intravenous administration in 60% of cases is indicative of the need for rapid action of medications, a hallmark of emergency treatment. This underscores the importance of proficiency in intravenous techniques among ED staff[12].

Adverse drug reactions and medication errors: The relatively low incidence of ADRs (5%) and medication errors (2%) is encouraging. However, even these small percentages are significant in the high-stakes environment of an ED. The nature of these errors, primarily related to dosage and timing, suggests areas where additional training and protocol refinement could be beneficial. The finding that most ADRs were mild is reassuring, yet constant vigilance is necessary to prevent and manage more severe reactions.

Time to medication administration: The average time of 30 min from patient arrival to medication administration is an important metric. This reflects not only on the efficiency of the ED staff but also on the systemic factors such as triage effectiveness and availability of medication. Streamlining these processes could further reduce this time, ensuring faster relief and treatment for patients.

Comparison with other studies: Comparing these findings with similar studies in other regions or countries could provide valuable insights. Such comparisons might reveal regional differences in medication usage patterns, influenced by factors like prevalent diseases, healthcare policies and cultural practices.

Implications for practice: This study's findings have several implications for clinical practice in emergency medicine. Enhanced training focusing on the common types of emergencies and their pharmacological management could be beneficial. Developing robust protocols for medication administration and monitoring can potentially reduce the incidence of errors and ADRs. Additionally the study highlights the need for a well-stocked and diverse medication inventory in the ED, tailored to the patient demographic and common conditions encountered.

Recommendations for future research: Future research could focus on longitudinal studies to track changes in medication usage patterns over time. Investigating the impact of specific interventions aimed at reducing medication errors and ADRs could provide actionable insights. Additionally, expanding the research to multiple centers could offer a more comprehensive understanding and generalizability of the findings.

CONCLUSION

Our study provides crucial insights into medication usage in the ED, underscoring the need for tailored patient care and staff proficiency in emergency medicine. The findings highlight the importance of rapid medication administration, vigilant monitoring for adverse reactions and minimizing medication errors. Implementing these insights can significantly enhance patient outcomes and safety in emergency settings, especially in tertiary care hospitals in India.

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