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**Pharmacy**

# Evaluation of Therapeutic Outcome in Hospitalised Patients – Clinical Pharmacist's Perspective

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**Abstract**

Assessment of therapeutic outcomes in hospitalized patients is important for ensuring effective treatment and supporting clinical decision-making. Main objective of the study was to evaluate therapeutic outcomes in hospitalized patients using laboratory and vital parameters, assess drug effectiveness, and identify factors influencing clinical improvement in a tertiary care teaching hospital. A prospective observational study was conducted over six months in the General Medicine department, including 100 patients. Case files data on demographics, diagnosis, prescribed medications, vital signs, and laboratory parameters were collected using a structured form and analyzed using descriptive statistics. Among the patients, 54% were female and 46% were male, with a mean age of  $44.3 \pm 13.21$  years. The most common conditions were renal disorders (17%), acute febrile illness (10%), and diabetes mellitus (9%). Most patients had a hospital stay of 4 days (37%). A total of 452 drugs were prescribed, with antibiotics (17.52%) and proton pump inhibitors (16.5%) being the most frequently used. Laboratory findings showed improvement in haemoglobin, sodium, and potassium levels, while reductions were observed in WBC count and random blood sugar. Vital parameters improved notably in blood pressure and body temperature. The observed improvements in laboratory and vital parameters indicate effective therapeutic management and highlight the importance of continuous monitoring in hospitalized patients. Pharmacist-led monitoring plays a significant role in optimizing therapy, promoting rational drug use, and enhancing patient safety, thereby improving therapeutic outcomes in hospital settings.

**Keywords:** Drug utilization, Drug effectiveness, Laboratory monitoring, Pharmacist intervention, Pharmacotherapy, Therapeutic outcomes.

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## INTRODUCTION

Therapeutic outcome evaluation is an important component of healthcare practice as it helps determine the effectiveness, safety, and appropriateness of therapeutic interventions in improving patient outcomes. It involves assessing changes in clinical symptoms, laboratory findings, physiological parameters, and quality of life following treatment. In hospitalized patients, therapeutic monitoring becomes more significant due to multiple comorbidities, polypharmacy, and the need for continuous assessment. Proper evaluation supports evidence-based clinical decisions, promotes rational drug use, reduces adverse drug reactions, and improves patient safety. Clinical pharmacists also play an important role in identifying drug-related problems and optimizing pharmacotherapy (Santos *et al.*, 2019).

Laboratory investigations are essential in evaluating treatment effectiveness because a major proportion of clinical decisions are based on laboratory findings. These investigations help monitor disease progression, assess therapeutic response, detect adverse drug reactions, and guide treatment modification. However, several medications may interfere with laboratory investigations and produce misleading results, leading to inappropriate Diagnosis and therapy. Drug–laboratory test interactions may occur either by altering biological parameters or by interfering with analytical methods used for testing (Katanic *et al.*, 2020).

Different classes of drugs are known to affect laboratory parameters and clinical interpretation. Diuretics may alter electrolyte balance and renal function tests, while corticosteroids can increase blood glucose levels and leukocyte counts. Antiviral and antifungal

agents may also affect hepatic enzymes, renal parameters, and hematological indices during prolonged therapy. Therefore, careful monitoring is necessary to differentiate drug-induced changes from actual disease progression (Shah *et al.*, 2020; Voican *et al.*, 2014).

Drug–laboratory test interactions are increasingly recognized as an important cause of diagnostic errors in healthcare settings. Certain medications may produce falsely elevated or decreased laboratory values, resulting in inappropriate therapeutic interventions. For example, cephalosporins may falsely elevate serum creatinine values, while high-dose vitamin C therapy may produce falsely elevated blood glucose readings. Such interactions highlight the importance of proper laboratory interpretation in hospitalized patients receiving multiple medications (Van Balveren *et al.*, 2017).

Antibiotics play a major role in the management of infectious diseases, and their effectiveness depends on factors such as pharmacokinetic and pharmacodynamic properties, microbial sensitivity, duration of therapy, and patient-related factors including renal and hepatic function. Appropriate antibiotic selection and monitoring are essential to achieve favorable therapeutic outcomes while minimizing adverse effects and antimicrobial resistance. Antimicrobial stewardship programs have significantly contributed to improving antibiotic utilization and therapeutic outcomes in hospitals through rational prescribing and monitoring practices (Kiffer *et al.*, 2011; Patel *et al.*, 2019).

Evaluation of therapeutic effectiveness requires both clinical and laboratory assessment. Clinical improvement may include reduction in fever, improvement in symptoms, and overall recovery, while laboratory parameters such as white blood cell count, blood glucose levels, electrolyte values, and culture reports provide additional evidence regarding treatment response. Regular monitoring of laboratory and vital parameters also helps identify complications, detect adverse drug reactions, and guide therapeutic decisions. (Patel *et al.*, 2019; Katanic *et al.*, 2020).

Several factors influence therapeutic outcomes in hospitalized patients, including adverse drug reactions, electrolyte imbalance, nephrotoxicity, hepatotoxicity, and drug interactions. Medications such as diuretics, ACE inhibitors, antidepressants, and antidiabetic agents may significantly affect electrolyte levels, renal function, liver function, and hematological parameters (Shah *et al.*, 2020; Ahemad *et al.*, 2023). In recent years, health information technology and clinical decision support systems have also gained importance in improving medication monitoring and laboratory interpretation (Fischer *et al.*, 2010; Van Balveren *et al.*, 2017).

Despite advancements in therapeutic monitoring, challenges such as inadequate laboratory monitoring, poor adherence to guidelines, and lack of awareness regarding drug–laboratory interactions continue to affect patient management. Patients receiving multiple medications are at greater risk of adverse drug reactions and therapeutic failure due to unrecognized drug interactions. Clinical pharmacists play a vital role in addressing these challenges through therapeutic drug monitoring, medication review, patient Counseling, and optimization of pharmacotherapy, thereby contributing to improved therapeutic outcomes and quality of patient care (Santos *et al.*, 2019).

The study entitled “Evaluation of Therapeutic Outcome in Hospitalised Patients – Clinical Pharmacist’s Perspective” was planned with the objectives to assess the effectiveness of therapeutic interventions in improving patient outcomes, to evaluate the impact of medications on laboratory investigations, and to identify factors influencing therapeutic outcomes in hospitalized patients. The study also aimed to assess changes in laboratory and vital parameters following treatment and to emphasize the role of clinical pharmacists in rational drug use and medication management. In addition, the study intended to improve the quality of life of patients through continuous monitoring of treatment response and to promote safe, rational, and cost-effective patient care in a tertiary care teaching hospital.

## MATERIALS AND METHODS

**Study Design:** Prospective observational - study.

**Study Site:** Navodaya Medical College Hospital & Research Centre, Raichur.

**Sample Size:** 100 patients

**Study Period:** 6 months (February 2025 – August 2025)

**Data Collection:** Data was collected using structured data entry form.

### Inclusion Criteria

- Patients admitted in General Medicine Department irrespective of age, gender, diagnosis or treatment.
- Patients examined with laboratory investigations (follow-up).

### Exclusion Criteria

- Patients admitted in Pediatrics, Emergency, Obstetrics and Gynecology, Orthopedics, Surgery Department.
- Patients attending Outpatient Department (OPD).

### Designing of Data Entry Form

A data entry form for incorporating patient details was designed. The form contains provisions to

enter the details such as Name, Age, Height & weight, Gender, IP No., Date of admission, any known allergy, social history, ward/department name, patients Address, other investigations, diagnosis, prescribed drugs, dose, route of administration, frequency and lastly duration.

### Ethical Considerations

The study was approved by Institutional Ethical Committee of Navodaya Medical College Hospital & Research Centre by using Ethical Clearance Certificate.

### Data Collection

Data were collected prospectively from patients admitted to the General Medicine Department of Navodaya Medical College Hospital & Research Centre using a structured data collection form. The collected information included demographic details (age and gender), clinical characteristics (diagnosis and presenting complaints), laboratory parameters, vital signs, and details of prescribed medications such as drug name, dose, route, frequency, and duration. Data were obtained from patient case records and treatment charts during the hospital stay. Patients were monitored throughout hospitalization, and relevant clinical, laboratory, and therapeutic data were recorded systematically.

### Outcome Measures

The primary outcome of the study was to evaluate therapeutic outcomes in hospitalized patients based on changes in laboratory and vital parameters.

The secondary outcomes included assessment of demographic characteristics, diagnosis-wise distribution, length of hospital stay, and drug utilization patterns. Changes in laboratory parameters (such as hemoglobin, white blood cell count, electrolytes, and blood glucose levels) and vital parameters (including blood pressure and body temperature) were analyzed to assess clinical improvement.

### Statistical Analysis

Data collected were analyzed using descriptive statistics namely total numbers, percentage and mean. Microsoft word and excel have been used to generate graphs, tables etc.

## RESULTS

The Socio-Demographic characteristics of the study participants shows that majority of patients belonged to the 41–50 years age group with a mean age of 44.3 years with SD of 13.21 years. A slight female predominance was observed, with females accounting for 54% and males 46%, with male to female ratio of 0.85:1. Details were depicted in table 1.

**Table 1: Socio-Demographic Characteristics of Study Participants (n=100)**

| Sl. No                | Characteristics (Gender)            | No of Patients                   | Percentage (%) |
|-----------------------|-------------------------------------|----------------------------------|----------------|
| 1                     | Male                                | 46                               | 46             |
| 2                     | Female                              | 54                               | 54             |
| Total                 |                                     | 100                              | 100            |
| Male to Female ratio  |                                     | 0.85:1                           |                |
| Sl. No                | Characteristics (Age Group (Years)) | No of Patients                   | Percentage (%) |
| 1.                    | 0-10                                | 0                                | 0              |
| 2.                    | 11-20                               | 0                                | 0              |
| 3.                    | 21-30                               | 14                               | 14             |
| 4.                    | 31-40                               | 28                               | 28             |
| 5.                    | 41-50                               | 33                               | 33             |
| 6.                    | 51-60                               | 11                               | 11             |
| 7.                    | 61-70                               | 9                                | 9              |
| 8.                    | 71-80                               | 5                                | 5              |
| Total                 |                                     | 100                              | 100            |
| Mean Age - 44.3 years |                                     | Standard Deviation - 13.21 years |                |

As shown in figure 1, diagnosis-wise distribution of patients, renal disorders were the most

commonly observed condition (17%), followed by acute febrile illness (10%) and diabetes mellitus (9%).

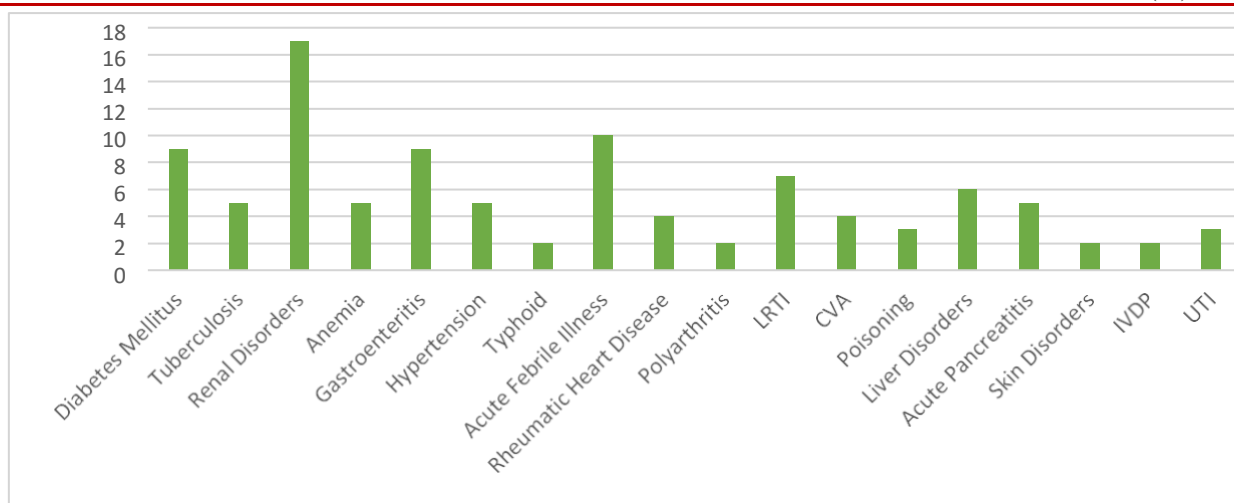


**Fig. 1: Diagnosis Wise Distribution (n=100)**

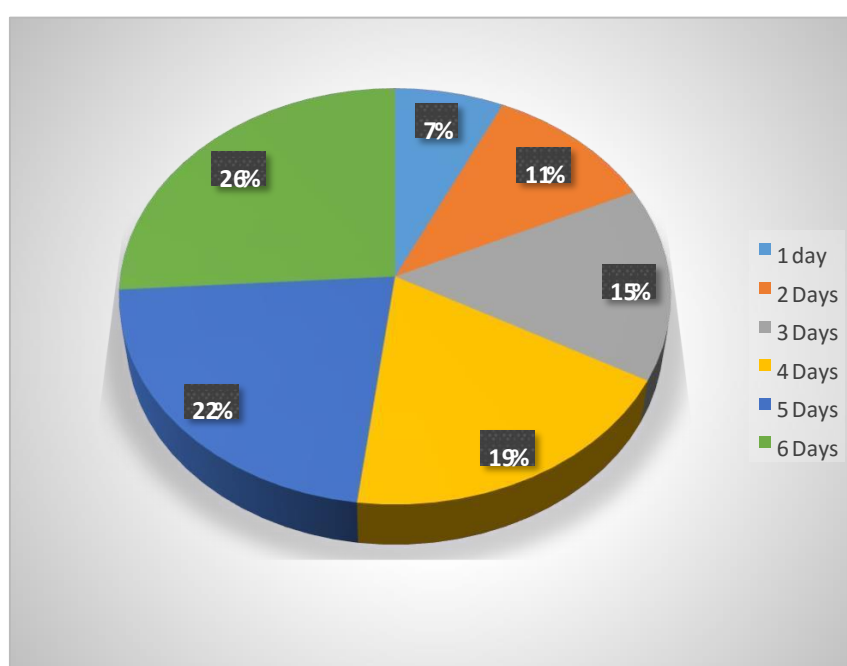


**Fig. 2: Shows the distribution of patients based on duration of hospital stay. The majority of patients had a hospital stay of 4 days (37%), with an average hospital stay of 4.12 days**

**Fig 2: Length of Stay in Hospital (n=100)**

As shown in table 2, a total of 452 drugs were prescribed, among which antibiotics (17.52%) were

the most frequently used, followed by proton pump inhibitors (16.5%).

**Table 2: Categories of Drugs Prescribed (n=452)**

| Sl. No | Class of Drugs    | No of Patients | Percentage (%) |
|--------|-------------------|----------------|----------------|
| 1      | Antibiotic        | 78             | 17.52          |
| 2      | Antipyretic       | 46             | 10.1           |
| 3      | Antiemetic        | 48             | 10.61          |
| 4      | PPI               | 75             | 16.5           |
| 5      | Anti-TB           | 6              | 1.32           |
| 6      | Anti-Hypertensive | 31             | 6.8            |
| 7      | Anti-Diabetic     | 16             | 3.53           |
| 8      | Bronchodilators   | 23             | 5.08           |
| 9      | Analgesic         | 19             | 4.20           |
| 10     | Anti-Coagulant    | 4              | 0.88           |
| 11     | Mucolytics        | 9              | 1.99           |

| Sl. No | Class of Drugs          | No of Patients | Percentage (%) |
|--------|-------------------------|----------------|----------------|
| 12     | Vitamin supplement      | 47             | 10.3           |
| 13     | Electrolyte replenisher | 35             | 7.74           |
| 14     | Antifungal              | 5              | 1.10           |
| 15     | Anticonvulsant          | 6              | 1.32           |
| 16     | Antihyperlipidemic      | 4              | 0.88           |
| Total  |                         | 452            | 100            |

Table 3 shows increase in laboratory parameters during hospitalization.

**Table 3: Increases in Lab Parameters after Treatment (n=53)**

| Sl. No | Lab Parameters | No of Patients with Increased Lab Parameters | Percentage (%) |
|--------|----------------|----------------------------------------------|----------------|
| 1      | Hb             | 34                                           | 64.15          |
| 2      | RBC            | 2                                            | 3.77           |
| 3      | WBC            | 1                                            | 1.88           |
| 4      | Platelet       | 4                                            | 7.54           |
| 5      | ESR            | 0                                            | 0              |
| 6      | Urea           | 0                                            | 0              |
| 7      | Creatinine     | 0                                            | 0              |
| 8      | Uric acid      | 1                                            | 1.88           |
| 9      | Na             | 6                                            | 11.32          |
| 10     | K              | 5                                            | 9.43           |
| 11     | Cl             | 0                                            | 0              |
| 12     | AST            | 0                                            | 0              |
| 13     | ALT            | 0                                            | 0              |
| 14     | D. Bilirubin   | 0                                            | 0              |
| 15     | T. Bilirubin   | 0                                            | 0              |
| 16     | LDL            | 0                                            | 0              |
| 17     | RBS            | 0                                            | 0              |
| 18     | HbA1c          | 0                                            | 0              |
| Total  |                | 53                                           | 100            |

Table 4 represents the laboratory parameters that showed a decrease among patients during

hospitalization. A reduction in WBC count and random blood sugar levels were observed.

**Table 4: Decreases in Lab Parameters after Treatment (n=111)**

| Sl. No | Lab Parameters | No of Patients with Decreased Lab Parameters | Percentage (%) |
|--------|----------------|----------------------------------------------|----------------|
| 1      | Hb             | 0                                            | 0              |
| 2      | RBC            | 1                                            | 0.9            |
| 3      | WBC            | 48                                           | 43.24          |
| 4      | Platelet       | 1                                            | 0.9            |
| 5      | ESR            | 6                                            | 5.40           |
| 6      | Urea           | 1                                            | 0.9            |
| 7      | Creatinine     | 10                                           | 9.00           |
| 8      | Uric acid      | 3                                            | 2.70           |
| 9      | Na             | 0                                            | 0              |
| 10     | K              | 4                                            | 3.60           |
| 11     | Cl             | 9                                            | 8.10           |
| 12     | AST            | 5                                            | 4.50           |
| 13     | ALT            | 1                                            | 0.9            |
| 14     | D. Bilirubin   | 1                                            | 0.9            |
| 15     | T. Bilirubin   | 1                                            | 0.9            |
| 16     | LDL            | 2                                            | 1.80           |
| 17     | RBS            | 14                                           | 12.61          |
| 18     | HbA1c          | 4                                            | 3.60           |
| Total  |                | 111                                          | 100            |

Table 5 shows the patients who demonstrated an increase in certain vital parameters after treatment. An increase in blood pressure were observed in 9 patients

(90%), while an increase in respiratory rate was noted in 1 patient (10%).

**Table 5: Increases in Vital Parameters after Treatment (n=10)**

| Sl. No | Parameters     | No of Patients with Increased Vital Parameters | Percentage (%) |
|--------|----------------|------------------------------------------------|----------------|
| 1      | Blood Pressure | 9                                              | 90             |
| 2      | Body Temp.     | 0                                              | 0              |
| 3      | Resp. Rate     | 1                                              | 10             |
| 4      | Pulse Rate     | 0                                              | 0              |
|        | Total          | 10                                             | 100            |

Table 6 shows the decreases in vital parameters during hospitalization. A reduction in blood pressure and

body temperature was observed, indicating improvement in the clinical condition of patients.

**Table 6: Decreases in Vital Parameters after Treatment (n=41)**

| Sl. No | Parameters     | No of Patients with Decreased Vital Parameters | Percentage (%) |
|--------|----------------|------------------------------------------------|----------------|
| 1      | Blood Pressure | 28                                             | 68.29          |
| 2      | Body Temp.     | 11                                             | 26.82          |
| 3      | Resp. Rate     | 1                                              | 2.43           |
| 4      | Pulse Rate     | 1                                              | 2.43           |
|        | Total          | 41                                             | 100            |

## DISCUSSIONS

The present study evaluated therapeutic outcomes in hospitalized patients by assessing demographic characteristics, diagnosis pattern, drug utilization, and changes in laboratory and vital parameters following treatment. The findings suggest that continuous therapeutic monitoring and appropriate pharmacotherapy contributed to improvement in the clinical condition of hospitalized patients.

The demographic characteristics of the study participants showed a slight female predominance, with females accounting for 54% and males 46% of the study population (Table 1). Similar findings have been reported in hospital-based studies where female patients demonstrated comparatively higher healthcare utilization and medication adherence. The majority of patients belonged to the 41–50 years age group, with a mean age of  $44.3 \pm 13.21$  years. This finding is consistent with studies conducted by Santos *et al.* (2019), which reported a higher prevalence of hospitalization among middle-aged adults due to chronic diseases and associated comorbidities. Middle-aged patients are more susceptible to hospitalization because of increasing prevalence of diabetes mellitus, hypertension, renal disorders, and lifestyle related complications.

The diagnosis-wise distribution revealed that renal disorders were the most commonly observed condition, followed by acute febrile illness and diabetes mellitus (Fig. 1). Similar observations were reported by Shah *et al.* (2020), who found that renal impairment and electrolyte abnormalities were common among hospitalized patients with chronic comorbid conditions. The high prevalence of renal disorders in the present study may be associated with underlying diabetes and

hypertension, which are major contributors to renal dysfunction. Acute febrile illnesses were also frequently observed due to the burden of infectious diseases among hospitalized patients.

The assessment of hospital stay demonstrated that most patients had a relatively short duration of hospitalization, with an average stay of 4.12 days (Fig. 2). Comparable findings were observed by Fischer *et al.* (2010), who reported that timely diagnosis, effective pharmacotherapy, and continuous monitoring contributed to shorter hospital stay and better therapeutic outcomes. Reduced duration of hospitalization is clinically significant because it decreases healthcare costs, minimizes the risk of hospital-acquired infections, and improves patient quality of life.

The drug utilization pattern showed that antibiotics were the most frequently prescribed class of drugs, followed by proton pump inhibitors (Table 2). This finding is consistent with Patel *et al.* (2019), who reported extensive antibiotic utilization among hospitalized patients due to the high prevalence of infectious conditions and empirical antimicrobial therapy. Proton pump inhibitors were commonly prescribed for stress ulcer prophylaxis and gastroprotection among patients receiving multiple medications. The frequent use of supportive medications such as antipyretics, antiemetics, vitamin supplements, and electrolyte replenishers also indicates the need for symptomatic management and correction of nutritional and electrolyte imbalance. These findings highlight the importance of rational prescribing and periodic medication review to minimize polypharmacy and adverse drug reactions.

The evaluation of laboratory parameters demonstrated both increases and decreases following treatment. Improvement in hemoglobin, sodium, and potassium levels was observed among several patients (Table 3), indicating correction of anemia and electrolyte imbalance after appropriate therapeutic interventions. Similar findings were reported by Shah *et al.* (2020), who observed that careful therapeutic monitoring contributed to normalization of electrolyte disturbances among hospitalized patients. Electrolyte imbalance is commonly associated with renal disorders, dehydration, infections, and medication-related effects, and restoration of normal values indicates effective clinical management.

A reduction in white blood cell count and random blood sugar levels was observed among many patients after treatment (Table 4). Decreased WBC count may indicate resolution of infection and inflammatory conditions following antimicrobial therapy, while reduction in blood glucose levels reflects improved glycemic control among diabetic patients. Similar observations were reported by Kiffer *et al.* (2011), who emphasized the importance of laboratory monitoring in assessing therapeutic response to antimicrobial and antidiabetic therapy. Improvement in creatinine, liver enzymes, and bilirubin levels among certain patients may also suggest recovery of renal and hepatic function following treatment.

The evaluation of vital parameters demonstrated significant clinical improvement among patients during hospitalization. The increase observed in certain vital parameters among a few patients (Table 5) may represent normalization from previously low baseline values rather than worsening of clinical status. Reduction in elevated blood pressure and body temperature was observed in many patients (Table 6), indicating stabilization of the patient's clinical condition and effective therapeutic management. Similar findings were reported by Van Balveren *et al.* (2017), who observed that regular monitoring of vital parameters contributed to early identification of complications and improved treatment outcomes.

The findings of our study emphasized the importance of continuous monitoring of laboratory and vital parameters in hospitalized patients. Regular therapeutic monitoring helps evaluate treatment response, detect adverse drug reactions, prevent complications, and guide necessary therapeutic modifications. Santos *et al.* (2019) also highlighted the role of clinical pharmacists in identifying drug-related problems, optimizing pharmacotherapy, and improving patient safety through continuous medication monitoring and patient counseling. The findings further support the importance of multidisciplinary healthcare approaches in achieving better patient outcomes.

The study has certain limitations that should be considered while interpreting the findings. The study was conducted in a single tertiary care teaching hospital with a relatively small sample size, which may limit generalization of the results. The study duration was limited, and long-term therapeutic outcomes were not assessed. In addition, follow-up after discharge was not performed to evaluate sustained clinical improvement. Future studies involving larger sample sizes, multicenter settings, and longer follow-up periods may provide more comprehensive evidence regarding therapeutic outcome evaluation in hospitalized patients.

Overall, the present study demonstrated that appropriate pharmacotherapy combined with regular monitoring of laboratory and vital parameters contributed to improved therapeutic outcomes among hospitalized patients. The study also highlights the importance of individualized patient care, rational drug use, and active involvement of clinical pharmacists in improving treatment effectiveness and patient quality of life.

## CONCLUSION

The Continuous monitoring of laboratory and vital parameters plays a crucial role in evaluating therapeutic outcomes in hospitalized patients. The observed improvements in clinical parameters indicate the effectiveness of therapeutic interventions and rational drug utilization. Regular assessment of patient parameters can significantly enhance treatment outcomes and ensure patient safety. Thus, clinical monitoring should be considered an essential component of patient care in hospital settings. Pharmacist-led monitoring plays a significant role in optimizing therapy, promoting rational drug use, and enhancing patient safety, thereby improving therapeutic outcomes in hospital settings.

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**Conflict of Interest:** The authors declare that there is no conflict of interest.

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