Original Article

Predictors of 30-Day Readmission Among Patients Discharged from A General Medicine Department.

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ABSTRACT

Background: Hospital readmission within 30 days of discharge is a quality measure that is reflective of the effectiveness of the inpatient care, the discharge plan, and continuity of healthcare services. Unplanned readmissions are associated with increased healthcare expenditures, longer morbidity and more use of hospital resources. It is important to understand what factors are associated with early readmission to create strategies to tackle those issues with better patient outcomes.

Objectives: To determine the incidence of 30-day hospital readmission among patients discharged from the General Medicine Department and identify demographic and clinical factors associated with early readmission.

Methods: This prospective observational study was conducted in the Department of General Medicine, Muhammad Teaching Hospital, Peshawar, from January to June 2025.Demographic information, comorbidities, length of hospital stay, medication burden and follow up adherence were documented. To detect readmissions, patients were followed for 30 days after their discharge. Data analysis was done with SPSS software version 26.0. Data for continuous variables was presented as mean ± SD and that for categorical variables as frequencies and percentages. Logistic regression analysis was used to determine independent risk factors for readmission, which was significant at $p<0.05$.

Results: The mean age was 58.9 ± 14.7 years, and readmitted patients were significantly older than those not readmitted (65.7 ± 12.3 vs. 56.8 ± 15.1 years; p=0.011). Multiple comorbidities (p=0.019), prolonged hospital stay (p=0.004), polypharmacy (p=0.021), poor medication adherence (p=0.016) and missed follow up appointments (p=0.013) were found to be statistically significant with the risk of readmission. Advanced age, multiple comorbidities, hospital length of stay and non-adherence to medication were independent predictors identified by multivariable logistic regression.

Conclusion: The rate of readmission within 30 days after discharge was almost 25%. Discharge planning, medication counselling, and prompt outpatient follow-up Approximately one-quarter of patients experienced readmission within 30 days of discharge. Strengthening discharge planning, medication counselling, and timely outpatient follow-up may reduce preventable readmissions and improve patient outcomes.

Keywords: Readmission; General medicine; Predictors; Hospitalization.

INTRODUCTION

It is well known that hospital readmission within 30 days of discharge is a key measure of quality, patient safety, and a successful discharge plan. Unplanned readmissions lead to higher health care costs, higher morbidity, lower quality of life, and increased strain on scarce hospital resources. Avoidable readmissions are critical for healthcare systems around the world, given that they can be related to the lack of adequate inpatient care, transition to community services, medication management, or post-discharge follow-up. Therefore, predicting patients at high risk of early readmission has become a key part of improving health care delivery and optimizing clinical outcomes [1,2]. Multiple chronic illnesses are common in the patients admitted to the general medicine departments, and the treatment of these cases demands a more comprehensive medical approach. This group often has other medical conditions, such as hypertension, diabetes mellitus, chronic kidney disease, chronic obstructive pulmonary disease, heart failure, chronic liver disease, and infectious diseases. Polypharmacy is associated with multiple comorbidities, which makes treatment more complex and makes it more likely that adverse clinical events will occur after discharge. Such patients typically need a coordinated multidisciplinary approach by physicians, nurses, pharmacists, rehabilitation specialists, and primary health care providers to ensure a smooth transition from the hospital-to-home environment [3,4]. Several studies have shown the importance of advanced age as a predictor of hospital readmission. Functional decline, frailty, cognitive impairment, malnutrition, and multiple medications (polypharmacy) are common in older people and can make them more vulnerable to the effects of discharge. Elderly patients also may not have the social supports they might need, and may have trouble remembering to take medications or go for check-ups on schedule. All of these factors together lead to an increased risk of complications that result in re-hospitalization in the near term [5]. Rapid population aging combined with a lack of physical activity and better survival from once-life-threatening conditions has contributed to a significant rise in the burden of chronic diseases over the last ten years. This has led to a greater proportion of hospitals caring for medically complex patients. Routine hospital admissions may occur for multiple chronic Conditions despite good inpatient treatment. The presence of diabetes, hypertension, cardiovascular disease, chronic respiratory disease, and renal dysfunction makes discharge planning and disease management much more complex [6,7]. Hospital-related factors are also associated with readmission. A longer hospital stay can be a sign of greater disease severity or the occurrence of complications while in the hospital. Likewise, insufficient counseling at discharge and inadequate discharge medication reconciliation, lack of communication among healthcare providers, and delayed outpatient follow-up can impact patient recovery. Polypharmacy, defined as the use of 5 or more medications, also increases the risk of medication errors, adverse drug reactions, poor adherence, and drug-drug interactions, which can all lead to unplanned readmission [8,9]. One of the most significant modifiable risk factors for successful recovery after discharge is adherence to the medication regimen. Patients not comprehending medication instructions, not taking medications as prescribed, or who cannot get their medications have significantly more risk of clinical deterioration. Similarly, missed scheduled outpatient visits reduce the opportunities for early detection and intervention for complications and increase the risk of emergency department visits and re-hospitalization, which are preventable [10]. Predictors of 30-day readmission have been studied in several international studies. Still, the contribution of these risk factors differs across healthcare systems, as patient population characteristics, disease burden, health care facilities, socioeconomic status, and access to primary care differ.

Study Objectives

To estimate the readmission rate within 30 days for patients discharged from a general medicine department, and to identify factors associated with early readmission that are independent of each other.

MATERIALS AND METHODS

Study Design & Setting

This prospective observational study was conducted in the Department of Medicine, Muhammad Teaching Hospital, Peshawar, from January 2025 to June 2025.

Participants

Adult patients (≥18 years) discharged alive from the General Medicine Department during the study period were considered eligible. Patients with complete clinical records who consented to 30-day follow-up through outpatient visits or telephone contact were included. Patients discharged against medical advice, transferred to another healthcare facility, those who died during the index hospitalization, those with incomplete medical records, or those lost to follow-up within 30 days were excluded.

Sample Size Calculation

The sample size was calculated using the WHO Sample Size Calculator based on an anticipated 30-day readmission prevalence of 20%, a 95% confidence level, and an absolute precision of 8%. The minimum required sample size was 96 patients. To compensate for potential losses during follow-up, 100 patients were enrolled.

INCLUSION CRITERIA

- Adult patients ≥18 years of age.
- Patients who were discharged alive from the General Medicine Department.
- Patients with full medical records and discharge notes.
- Informed consent for 30-day follow-up.
- Patients who can be followed up after discharge by telephone or at an outpatient clinic.

EXCLUSION CRITERIA

- Patients who leave the hospital without treatment or without the physician's consent.
- Patients referred to other health care providers.
- Patients who died while hospitalized during the index hospitalization.
- Those with partial records.
- Patients who did not follow up for 30 days after discharge.

Diagnostic & Management Strategy

Patients underwent detailed history taking, physical examination, and appropriate laboratory and radiological Investigations according to their clinical condition. Management was provided according to institutional protocols and current evidence-based clinical guidelines. Before discharge, all patients received medication reconciliation, discharge counseling, and follow-up instructions. Patients were followed for 30 days through scheduled outpatient visits or standardized telephone interviews to identify hospital readmissions.

STATISTICAL ANALYSIS

Data were analyzed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Variables with a p-value <0.20 on univariate analysis were entered into the multivariable logistic regression model to identify independent predictors of 30-day readmission. Adjusted odds ratios (AORs) with 95% confidence intervals (CIs) were calculated. A p-value <0.05 was considered statistically significant.

RESULTS

A total of 100 patients were included in the study, comprising 57 males (57%) and 43 females (43%). The overall mean age was 58.9 ± 14.7 years (range: 19–87 years). During the 30-day follow-up period, 24 patients (24%) required readmission, whereas 76 patients (76%) remained free from rehospitalization. Readmitted patients were significantly older than non-readmitted patients (65.7 ± 12.3 years vs. 56.8 ± 15.1 years; p=0.011). Hypertension (56%), diabetes mellitus (44%), chronic kidney disease (22%), congestive heart failure (18%), and chronic obstructive pulmonary disease (17%) were the most common comorbidities. Patients with three or more chronic illnesses had a significantly higher readmission rate than those with fewer comorbidities (45.8% vs. 21.1%; p=0.019). The mean duration of hospital stay was significantly longer among readmitted patients (7.5 ± 2.6 days) than among non-readmitted patients (5.2 ± 2.1 days; p=0.004). Polypharmacy involving five or more medications was observed in 62.5% of readmitted patients compared with 35.5% of those not readmitted (p=0.021). Poor medication adherence (p=0.016) and missed scheduled follow-up visits (p=0.013) were also significantly associated with early readmission. Multivariable logistic regression identified advanced age, multiple comorbidities, prolonged hospitalization, and poor medication adherence as independent predictors of 30-day hospital readmission.

Table 1. Baseline Demographic and Clinical Characteristics of the Study Population (N = 100)

Variable	Frequency (%) / Mean ± SD
Total patients	100
Age (years), Mean ± SD	58.9 ± 14.7
Male	57 (57.0)
Female	43 (43.0)
Hypertension	56 (56.0)
Diabetes mellitus	44 (44.0)
Chronic kidney disease	22 (22.0)
Congestive heart failure	18 (18.0)
Chronic obstructive pulmonary disease	17 (17.0)
Ischemic heart disease	20 (20.0)
Polypharmacy (≥5 medications)	42 (42.0)
Mean hospital stays (days)	5.8 ± 2.4

Table 1 presents the baseline demographic characteristics, common comorbidities, medication burden, and hospitalization profile of the 100 patients included in the study.

Table 2. Comparison of Characteristics between Readmitted and Non-Readmitted Patients

Variable	Readmitted (n=24)	Not Readmitted (n=76)	p-value
Age (years), Mean ± SD	65.7 ± 12.3	56.8 ± 15.1	0.011
Male, n (%)	15 (62.5)	42 (55.3)	0.531
Hypertension	18 (75.0)	38 (50.0)	0.031
Diabetes mellitus	15 (62.5)	29 (38.2)	0.041
Chronic kidney disease	9 (37.5)	13 (17.1)	0.038
≥3 Comorbidities	11 (45.8)	16 (21.1)	0.019
Hospital stays (days), Mean ± SD	7.5 ± 2.6	5.2 ± 2.1	0.004
Polypharmacy	15 (62.5)	27 (35.5)	0.021
Poor medication adherence	10 (41.7)	14 (18.4)	0.016
Missed follow-up visit	9 (37.5)	12 (15.8)	0.013

Table 2 compares demographic and clinical variables between patients who were readmitted within 30 days and those who were not. P-values were calculated using the independent t-test or Chi-square test as appropriate.

Table 3. Univariate Analysis of Factors Associated with 30-Day Readmission

Variable	Odds Ratio (OR)	95% Confidence Interval	p-value
Age ≥65 years	2.89	1.18–7.08	0.020
Hypertension	2.48	1.03–5.98	0.043
Diabetes mellitus	2.69	1.10–6.55	0.029
Chronic kidney disease	2.91	1.08–7.83	0.034
≥3 Comorbidities	3.16	1.28–7.80	0.013
Hospital stay >7 days	3.54	1.38–9.05	0.008
Polypharmacy	3.03	1.21–7.56	0.018
Poor medication adherence	3.20	1.24–8.23	0.016
Missed follow-up	3.18	1.19–8.47	0.021

Table 3 demonstrates the association between individual clinical variables and 30-day readmission using univariate logistic regression analysis.

Table 4. Multivariable Logistic Regression Analysis of Independent Predictors of 30-Day Readmission

Predictor	Adjusted Odds Ratio (AOR)	95% Confidence Interval	p-value
Age ≥65 years	2.42	1.01–5.81	0.047
≥3 Comorbidities	2.83	1.12–7.16	0.028
Hospital stay >7 days	2.97	1.15–7.64	0.024
Polypharmacy	2.21	0.91–5.34	0.081
Poor medication adherence	3.12	1.19–8.16	0.021
Missed follow- up	2.08	0.81–5.37	0.127

Table 4 presents the multivariable logistic regression model identifying independent predictors of 30-day hospital readmission after adjusting for potential confounding variables. Variables with $p<0.05$ were considered statistically significant.

Discussion

The present study aimed to assess the predictors of 30-day readmission for patients admitted to a general medicine department, and determined that the readmission rate was 24%. This result is in keeping with current studies, which have found that there are still substantial rates of early readmission (20 to 25% of medically ill patients) despite efforts to improve discharge planning and transitional care. More recent systematic evidence has also confirmed that 30-day readmission rates are in the range of 20–25% for patients hospitalized for medical conditions

in general [11]. In our study, we found advanced age to be an independent predictor for readmission. Patients who were readmitted were older than those who weren't, indicating elderly patients are at higher risk for poor post-discharge outcomes. This elevated risk may be attributable to physiologic changes associated with aging, frailty, and a decline in functional status, cognitive impairment, and the presence of multiple chronic conditions. This has been confirmed in other recent cohort studies and systematic reviews, all of which have found that older age is one of the most consistent risk factors for early readmission in general medical patients [12,13]. There was also a significant association with 30-day readmission for multiple other comorbidities. There was a significant difference between the likelihood of rehospitalization amongst patients with 3 or more chronic diseases and those with fewer chronic diseases. Many chronic conditions are common, including hypertension, diabetes mellitus, chronic kidney disease, chronic heart failure, and chronic obstructive pulmonary disease, which make therapy more complex and the risk of exacerbation greater when the patient leaves the hospital. More recent studies have also shown that multimorbidity is one of the best predictors of unplanned hospital readmission due to greater clinical instability and utilization of health services [14,15]. Our results also showed that extended hospital length of stay was an independent predictor of early readmission. Shorter hospital stays may be indicative of less. Severe disease, fewer complications during the hospital stay, or faster clinical recovery, which makes patients more vulnerable post-discharge. Similar findings have been reported with recent predictive model studies, which have consistently included length of stay in hospital as one of the strongest variables associated with 30-day readmission risk [16].In the current study, polypharmacy and poor medication adherence were significant factors associated with readmission. Poor adherence to medications was an independent risk factor for readmission even after adjusting for potential confounding factors; however, polypharmacy was associated with readmission on univariate analysis. Polypharmacy poses a risk of adverse drug reactions, medication errors and/or medication noncompliance, especially for older people with multiple chronic conditions. Recent studies have also shown that optimizing medication reconciliation and increasing adherence to these medications through pharmacist-led interventions can significantly decrease avoidable readmissions [17,18]. In the current study, failure to attend outpatient follow-up visits was found to be significantly associated with readmission. Post-discharge review can be used promptly to detect symptom deterioration, optimize treatment, reinforce medication adherence, and address patient concerns before clinical deterioration. Recent systematic review and meta-analysis of the literature showed a 20% decrease in 30-day readmissions with early outpatient follow-up, highlighting the significance of structured transitional care after hospital discharge [19]. The general trend of predictors that we have observed in our study matches that found in modern international studies. A variety of factors, such as advanced age, multimorbidity, longer hospital stays, medication-related issues, and poor continuity of care, have been repeatedly identified as the most important factors influencing readmission in different health care systems. However, differences in socioeconomic characteristics, access to health services, caregiver support, and post-hospitalization practices across institutions can account for differences in readmission rates reported across countries [20,21]. The findings of this study have significant clinical implications. Early identification of high-risk patients enables personalized discharge planning, extensive medication counseling, interdisciplinary care coordination, and early outpatient follow-up.

LIMITATIONS

This study has a few drawbacks. It was carried out in one tertiary care hospital, and the number of patients included was quite small (100), so the results of the study are not universally applicable. Long-term results were not measured during the 30-day follow-up period, and other factors, such as socioeconomic status, health literacy, and caregiver support, were not fully evaluated, which could impact readmission risk.

CONCLUSION

Thirty-day hospital readmissions continue to be a frequent problem in the general medicine department. Advanced age, presence of multiple comorbidities, longer hospital stay, and low medication adherence were important independent predictors. Preventable readmissions and patient outcomes could be significantly reduced and outcomes improved by early risk stratification, comprehensive discharge

planning, medication reconciliation, and timely post-discharge follow-up.

Disclaimer: Nil

Conflict of Interest: Nil

Funding Disclosure: Nil

Ethical Approval

Ethical approval was obtained from the Institutional Review Board of Muhammad Teaching Hospital, Peshawar (Approval No. MTH/244/2024/05) before commencement of the study. Written informed consent was obtained from all participants before enrollment. Patient confidentiality and anonymity were strictly maintained throughout the study. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki (2013 revision).

Authors' Contributions ICMJE-compliant

Shehzad Rehman: Conceived and designed the study, supervised data collection, interpreted the findings, drafted the manuscript, critically revised the manuscript, and approved the final version.

Junaid Jamil Khattak: Contributed to study design, patient recruitment, data collection, statistical analysis, interpretation of results, manuscript editing, and approved the final version.

Zakir Khan: Participated in patient recruitment, data acquisition, literature review, manuscript preparation, critical revision, and approved the final version.

All authors meet the International Committee of Medical Journal **Editors (ICMJE) authorship criteria,** have read and approved the final manuscript, and agree to be accountable for all aspects of the work.

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