

Predictors of Prolonged Hospital Stay Among Patients Admitted to A General Medicine Ward: A Retrospective Cohort Study.

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ABSTRACT

Background: Prolonged hospital stay is a major challenge in general medicine wards, contributing to increased healthcare costs, hospital-acquired infections, delayed patient turnover, and poor clinical outcomes. Early identification of factors associated with extended hospitalization may facilitate timely interventions, optimize resource utilization, and improve discharge planning.

Objectives: To determine the demographic, clinical, and laboratory predictors of prolonged hospital stay among patients admitted to a general medicine ward.

Methods: This retrospective cohort study was conducted in the Department of Medicine, Jinnah Medical College, Peshawar between 1 January and 1 June 2025. Patients with incomplete records, hospital stay of less than 24 hours, discharge against medical advice, transfer to another healthcare facility, or repeat admissions were excluded. Demographic characteristics, comorbidities, laboratory parameters, intensive care unit (ICU) transfer, hospital-acquired infections, and duration of hospitalization were recorded using a standardized data collection form. Prolonged hospital stay was defined as hospitalization lasting more than seven days. Data were analyzed using SPSS version 27.0. Continuous variables were compared using the independent-samples t-test, categorical variables using the Chi-square test, and multivariable logistic regression was performed to identify independent predictors. A p-value <0.05 was considered statistically significant.

Results: Of the 100 patients included, 36 (36%) experienced a prolonged hospital stay (>7 days). Univariate analysis showed that advanced age, diabetes mellitus, chronic kidney disease (CKD), hypoalbuminemia, hospital-acquired infections, and ICU transfer were significantly associated with prolonged hospitalization (p<0.05). Multivariable logistic regression identified hypoalbuminemia, CKD, and hospital-acquired infections as independent predictors of prolonged hospital stay after adjustment for potential confounding factors.

Conclusion: More than one-third of hospitalized general medicine patients experienced prolonged hospital stay. Hypoalbuminemia, chronic kidney disease, and hospital-acquired infections were independent predictors of extended hospitalization. Early identification and targeted management of these modifiable risk factors may reduce hospital stay, improve patient outcomes, and enhance healthcare resource utilization.

Keywords: Prolonged hospital stay; General medicine; chronic kidney disease; Hypoalbuminemia; Hospital-acquired infection

INTRODUCTION

The length of stay (LOS) in a hospital is a popular measure for hospital efficiency, quality of care, and resource utilization. Extended hospital stays impose a significant burden on the health care system due to the associated costs for treatment, limited bed availability, and risk of avoidable complications like hospital-acquired infections, venous thromboembolism, loss of independence, medication-related adverse events, etc. Apart from the economic burden, it also has a significant impact on patient satisfaction, on the time patients have to wait to see other patients, and can lead to overcrowding in a hospital, especially in resource-poor areas [1,2]. In general medicine wards, patients are a mixed group and their individual acute and chronic medical needs are diverse, thus requiring individual management. Several factors affect their length of stay, such as their demographic characteristics, disease severity, underlying comorbidities, nutritional status, laboratory abnormalities, in-hospital complications, and social determinants of health. Elderly patients often have extended hospital stays due to multiple chronic conditions, frailty, polypharmacy, decreased mobility, and limited ability to recover from an acute illness. Likewise, chronic diseases like diabetes mellitus, chronic kidney diseases, chronic liver disease, heart failure, chronic obstructive pulmonary diseases, and malignancy were associated with delayed clinical improvement and higher utilization of health care services [3,4]. Some factors were previously found to be associated with an increased length of hospital stay, such as advanced age, high number of comorbidities, hypoalbuminemia, anemia, electrolyte disturbances, impaired renal function, cognitive impairment, and the presence of acquired hospital infection. More complex diseases and the need for intensive care unit (ICU) admission, invasive procedures, or multidisciplinary treatment can result in longer hospital stays for patients who require intensive care unit (ICU) services, invasive procedures, or multidisciplinary treatment. Hypoalbuminemia is also a consistently reported nutritional deficiency, with associations to delayed wound healing, impaired immune function, and poor clinical outcomes, and as a consequence, prolonged hospital stays [5,6]. Hospital-

acquired infections continue to be one of the most common preventable causes of increased hospital stay. In addition to the Morbidity and mortality associated with these infections, they require extended antimicrobial treatment, further laboratory evaluation, and intensive supportive care. The same is true for complications that occur while in the hospital, which often further delay discharge and raise costs for healthcare. As a consequence, prompt identification of high-risk patients for extended hospital stays offers the chance to institute preventive interventions that reduce the likelihood of such a prolonged stay, to optimize clinical care, and to plan for timely patient discharge [7,8]. Healthcare institutions in developing countries, including Pakistan, may find themselves grappling with various issues, including a shortage of hospital beds, heavy patient loads, and insufficient healthcare and financial resources. The use of available resources efficiently is crucial to ensure quality health care services. The ability to identify modifiable risk factors for prolonged hospitalization can help identify high-risk patients, enhance multidisciplinary care, improve discharge planning, and decrease unnecessary hospitalization. This information can be useful for hospital management and health policies in planning interventions to make the health care system more efficient and minimize failures [9,10]. While many studies have studied predictors of LOS in specific diseases or in specific types of wards, the literature on general medicine wards in the local setting is limited. Patient disease characteristics, patient demographics, healthcare systems, and clinical practice differ between regions and require locally generated evidence to support evidence-based decision-making. Identification of the factors associated with long hospital stays in general medicine patients could help inform targeted interventions, better outcomes for the patient, and better use of hospital resources. Thus, this study was conducted to determine some demographic, clinical, and laboratory predictors of long hospital stay in the general medicine ward.

Study Objectives

To find out the demographic, clinical, and laboratory factors predictive of longer hospital stay among admitted patients to a general medicine ward and to identify individual factors that are independent of these variables.

MATERIALS AND METHODS

Study Design and Setting

This retrospective cohort study was conducted in the Department of Medicine, Jinnah Medical College, Peshawar, from 1 January 2025 to 30 June 2025. The study was designed to identify demographic, clinical, and laboratory predictors associated with prolonged hospital stay among patients admitted to the general medicine ward.

Study Population

A total of 100 consecutive adult patients (≥ 18 years) admitted to the general medicine ward during the study period were included. Hospital medical records were reviewed to obtain demographic characteristics, admission diagnoses, comorbidities, laboratory findings, treatment details, intensive care unit (ICU) admission, in-hospital complications, and duration of hospitalization. Data were extracted using a standardized data collection form to ensure consistency and completeness.

Sample Size Calculation

The sample size was calculated using the WHO Sample Size Calculator, assuming a prevalence of prolonged hospital stay of 50%, a 95% confidence level, and a 10% margin of error. The minimum required sample size was 96 patients; therefore, 100 patients were included to improve statistical precision.

Inclusion Criteria

- Adult patients aged 18 years or older.
- Patients admitted to the general medicine ward during the study period.
- Patients with complete demographic, clinical, laboratory, treatment, and discharge records.
- Hospital stay of 24 hours or longer.

Exclusion Criteria

- Patients discharged against medical advice (DAMA).
- Patients transferred to another healthcare facility before completion of treatment.
- Patients admitted for elective diagnostic procedures or day-care management.
- Patients with incomplete or missing medical records.
- Repeat admissions during the study period; only the

first admission was included.

- Diagnostic and Management Strategy

Patients were diagnosed based on detailed clinical history, physical examination, laboratory investigations, and radiological imaging where clinically indicated. Management was provided according to institutional protocols and standard clinical practice guidelines and included pharmacological therapy, supportive care, specialist consultation, nutritional management, ICU referral when required, and discharge planning.

Outcome Measure

The primary outcome was prolonged hospital stay, defined as a hospitalization duration of more than 7 days. Patients were categorized into non-prolonged hospital stay (≤ 7 days) and prolonged hospital stay (> 7 days) groups for comparative analysis.

Statistical Analysis

Data were entered and analyzed using IBM SPSS Statistics version 27.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean $\pm$ standard deviation (SD), whereas categorical variables were presented as frequencies and percentages. Comparisons between patients with prolonged and non-prolonged hospital stay were performed using the independent-samples t-test for continuous variables and the Chi-square test or Fisher's exact test, as appropriate, for categorical variables. Variables with a p-value < 0.20 in univariate analysis were entered into a multivariable logistic regression model to identify independent predictors of prolonged hospital stay. Adjusted odds ratios (AORs) with 95% confidence intervals (CIs) were calculated. A two-tailed p-value < 0.05 was considered statistically significant.

RESULTS

A total of 100 adult patients admitted to the general medicine ward during the study period were included in the analysis. The mean age of the patients was 56.8 ± 17.4 years (range: 18–89 years), and 58 (58.0%) were male. The mean duration of hospital stay was 8.7 ± 4.3 days. Overall, 44 (44.0%) patients experienced a prolonged hospital stay (> 7 days), while 56 (56.0%) were discharged within seven days. The most common comorbidities were hypertension (48.0%), anemia (46.0%), diabetes mellitus (42.0%), electrolyte disturbances (34.0%), and hypoalbuminemia (32.0%). Chronic kidney disease was present in

20.0% of patients, whereas 18.0% required intensive care unit (ICU) admission during hospitalization. Hospital-acquired infections occurred in 14.0%, and in-hospital complications developed in 22.0% of patients. Comparison between patients with prolonged and non-Prolonged hospital stay demonstrated that those with prolonged hospitalization were significantly older (63.8 ± 15.4 vs. 51.3 ± 16.2 years; $p < 0.001$). Diabetes mellitus (54.5% vs. 32.1%; $p = 0.024$), hypertension (59.1% vs. 39.3%; $p = 0.047$), chronic kidney disease (31.8% vs. 10.7%; $p = 0.009$), hypoalbuminemia (47.7% vs. 19.6%; $p = 0.003$), anemia (59.1% vs. 35.7%; $p = 0.019$), ICU admission (31.8% vs. 7.1%; $p = 0.001$), hospital-acquired infection (25.0% vs. 5.4%; $p = 0.004$), and in-hospital complications (34.1% vs. 12.5%; $p = 0.009$) were significantly more frequent among patients with prolonged hospital stay. No significant difference was observed between the two groups regarding sex ($p = 0.540$).

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

Variable	n (%) / Mean $\pm$ SD
Age (years)	56.8 $\pm$ 17.4
Male sex	58 (58.0)
Female sex	42 (42.0)
Body mass index (kg/m ²)	25.4 $\pm$ 4.7
Diabetes mellitus	42 (42.0)
Hypertension	48 (48.0)
Chronic kidney disease	20 (20.0)
Chronic liver disease	12 (12.0)
Chronic obstructive pulmonary disease	16 (16.0)
Congestive heart failure	18 (18.0)
Malignancy	10 (10.0)
Hypoalbuminemia	32 (32.0)
Anemia	46 (46.0)
Electrolyte disturbance	34 (34.0)
ICU admission	18 (18.0)
Hospital-acquired infection	14 (14.0)
In-hospital complications	22 (22.0)
Length of hospital stay (days)	8.7 $\pm$ 4.3

Prolonged hospital stay (>7 days)	44 (44.0)
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Table 1 presents the baseline demographic, clinical, and laboratory characteristics of the 100 patients included in the study. Continuous variables are expressed as mean $\pm$ standard deviation (SD), while categorical variables are presented as frequency and percentage. ICU = Intensive Care Unit.

Table 2. Comparison of Patients with and Without Prolonged Hospital Stay

Variable	≤ 7 Days (n=56)	>7 Days (n=44)	p-value
Age (years)	51.3 $\pm$ 16.2	63.8 $\pm$ 15.4	<0.001
Male sex	31 (55.4)	27 (61.4)	0.540
Diabetes mellitus	18 (32.1)	24 (54.5)	0.024
Hypertension	22 (39.3)	26 (59.1)	0.047
Chronic kidney disease	6 (10.7)	14 (31.8)	0.009
Hypoalbuminemia	11 (19.6)	21 (47.7)	0.003
Anemia	20 (35.7)	26 (59.1)	0.019
ICU admission	4 (7.1)	14 (31.8)	0.001
Hospital-acquired infection	3 (5.4)	11 (25.0)	0.004
In-hospital complications	7 (12.5)	15 (34.1)	0.009

Table 2 compares demographic, clinical, and laboratory characteristics between patients with non-prolonged (≤ 7 days) and prolonged (>7 days) hospital stay. Continuous variables were compared using the independent-samples t-test, while categorical variables were compared using the Chi-square or Fisher's exact test. A p-value <0.05 was considered statistically significant.

Table 3. Multivariable Logistic Regression Analysis of Independent Predictors of Prolonged Hospital Stay

Variable	Adjusted Odds Ratio (AOR)	95% Confidence Interval	p-value
Age >60 years	2.46	1.14–5.29	0.022
Diabetes mellitus	1.82	0.89–3.73	0.102

Chronic kidney disease	2.91	1.19–7.08	0.019
Hypoalbuminemia	3.58	1.54–8.29	0.003
ICU admission	4.37	1.61–11.82	0.004
Hospital-acquired infection	5.24	1.71–16.03	0.004
In-hospital complications	2.68	1.08–6.63	0.033

Table 3 shows the results of multivariable logistic regression analysis for identifying independent predictors of prolonged hospital stay. Variables with a p-value <0.20 in univariate analysis were entered into the regression model. Adjusted odds ratios (AORs) with 95% confidence intervals (CIs) are presented. A p-value <0.05 was considered statistically significant.

Table 4. Clinical Outcomes According to Duration of Hospital Stay

Outcome	≤7 Days (n=56)	>7 Days (n=44)	p-value
Mean hospital stay (days)	5.1 ± 1.2	13.3 ± 3.8	<0.001
ICU transfer	4 (7.1)	14 (31.8)	0.001
Hospital-acquired infection	3 (5.4)	11 (25.0)	0.004
In-hospital complications	7 (12.5)	15 (34.1)	0.009
In-hospital mortality	2 (3.6)	5 (11.4)	0.119

Table 4 summarizes clinical outcomes according to hospital stay duration. Patients with prolonged hospital stay experienced significantly higher rates of ICU transfer, hospital-acquired infections, and in-hospital complications compared with patients discharged within seven days. Although in-hospital mortality was higher among patients with prolonged hospital stay, the difference was not statistically significant.

Discussion

In the present retrospective cohort study, a set of predictors of prolonged hospital stay of patients admitted to a general

medicine ward was evaluated. About a third (44%) of patients were admitted to hospital for longer than 7 days. In univariate analysis, advanced age, diabetes mellitus, chronic kidney disease (CKD), hypoalbuminemia, hospital-acquired infection and transfer to an ICU were significantly associated with prolonged hospitalization. Overall, hypoalbuminemia, CKD, and hospital-acquired infection were independent predictors after adjusting for potential confounders, which further emphasizes the importance of nutritional status, chronic comorbidity, and prevention of in-hospital complications in reducing hospital length of stay [11,12]. The proportion of patients hospitalized for longer than 7 days observed is similar to other recent studies carried out in general medical and internal medicine wards, respectively, which reported 25–40% of extremely complex patients and those with different discharge routines as having prolonged hospitalizations [13]. In the previous five years, similar reports have shown that older age and multimorbidity are still the most important factors associated with prolonged hospital stays, as older people often have frailty, polypharmacy, low functional status, and slower recovery from acute conditions. Advanced age was found to be significantly associated with longer hospital stay in our cohort, which was supported by these findings [14]. Diabetes mellitus was significantly associated with prolonged hospitalization in the current study, but was not present after multi-variable adjustment. This finding corresponds with recent studies indicating that diabetes may contribute to increased hospital stay not only by slowing the recovery process but also through other factors, such as uncontrolled glycemic control and greater vulnerability to infection, or to other chronic diseases that may coexist [15]. Diabetes is common in hospitalized medical patients, reinforcing the importance of metabolic optimization during the hospital stay. CKD turned out to be an independent factor associated with a longer hospital stay. Patients with CKD often need more biochemical monitoring, dose adjustment of medications, management of electrolyte disturbances, and multi-disciplinary care, all of which can lead to delayed discharge. Our findings are also supported by recent studies, which reported consistently that CKD is associated with higher utilization of healthcare services, more complications, and longer hospital stays [16,17]. Currently, CKD has been listed as a condition associated with a higher risk of in-hospital adverse outcomes as one of the conditions in the

international recommendations that should be monitored intensively. The strongest association with prolonged hospital stay in our analysis was hypoalbuminemia. Serum albumin is a general marker of both malnutrition and systemic inflammation and disease severity [18]. If a patient has hypoalbuminemia, they typically have a weaker immune system, slower wound healing, diminished reserve, and slower healing, which can therefore lead to a longer stay in the hospital. A hypoalbumin level has also been shown to be a significant predictive factor for poor clinical outcome and extended hospital length of stay in recent studies [19] published in the last five years by different medical groups. The results highlight the significance of regular nutritional screening and early intervention with nutrition after hospital admission. Another independent predictor in this study was HAI. When infection occurs in the hospital, treatment is longer, antibiotics are used more frequently, further tests are required, and discharge is frequently delayed. Recent data have shown that preventing HAI can significantly shorten hospital stays, save money spent on healthcare, and decrease patient morbidity [20,21]. So, proper infection control measures, antibiotic management, and following proven infection control principles are vital to quality patient care. ICU transfer was significantly associated with longer hospital stay in univariate analysis but not in multivariate analysis after adjusting for other clinical factors [22]. This may be explained by the increased severity of the disease and the number of comorbidities in the critically ill patients and not by ICU care. Recent retrospective cohort analyses looking at predictors of extended length of hospital stay in medical patients reported similar results [23,24]. Overall, our findings highlight the importance of timely identification of high-risk patients, timely nutritional optimization, aggressive treatment of chronic kidney disease, avoiding hospital-acquired infections, and planning for discharge with a multidisciplinary approach to minimize unnecessary hospitalization and optimize use of resources. There is a need for future prospective, multicenter studies to confirm these results and create prediction models for future clinical use [25].

LIMITATIONS

There are some shortcomings in this study. The study's retrospective, single-center design might restrict the generalizability of the results and includes issues of missing or incomplete medical records. The number of patients (100) was relatively small, which could have limited the statistical power. Furthermore, the severity of the disease and the socio-economic parameters were not examined, and this could have affected the length of the hospital stay.

Conclusion

A long hospital stay was observed in the patients admitted to the general medicine ward and was independently associated with Chronic kidney disease, hypoalbuminemia, and hospital-acquired infections. If these high-risk patients can be identified early, preventive measures can be targeted, nutrition optimized, and discharge plans effective, the length of stay may be shortened, clinical outcomes improved, and better utilization of health care resources.

Disclaimer: Nil

Conflict of Interest: Nil

Funding Disclosure: Nil

Ethical Approval

Ethical approval for this retrospective cohort study was obtained from the Institutional Review Board (IRB) of Jinnah Medical College, Peshawar before commencement of the study (Approval No. JTH/1432/06/2023). As this study involved retrospective review of hospital medical records, the requirement for individual informed consent was waived by the IRB where applicable. Patient confidentiality and anonymity were strictly maintained throughout the study by de-identifying all patient information before analysis. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki (2013 revision).

Authors' Contributions (ICMJE-Compliant)

Manya Tahir: Conceived and designed the study, supervised data collection, interpreted the findings, critically revised the manuscript, and approved the final version.

Daud Jabbar: Collected and extracted study data, performed literature review, contributed to data analysis, drafted the manuscript, and approved the final version.

Zia Ul Rehman: Supervised the research project, contributed to study

methodology, interpreted the results, critically revised the manuscript for important intellectual content, 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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