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Factors Associated with Prolonged Hospital Stay Following Surgical Procedures, A Cross-sectional study

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Abstract

Background: A major healthcare problem is the length of hospital stay following surgical procedures because of the cost, use of healthcare resources, and the risk of hospital-acquired infections. This study aims to see the demographic, clinical, and perioperative factors responsible for prolonged hospital stay in surgical patients. **Methodology:** A cross-sectional, analytical study used a consecutive sampling technique for the patients (18 years and above) undergoing elective and emergency surgical procedures (n=120). A structured proforma and hospital records were used to gather demographic data, comorbidities, type and duration of surgery, and postoperative complications. These were categorized as normal or extended (>7 days) hospital stay. The data were analyzed with SPSS version 25.0 (p-value<0.05). **Results:** 37.5% of the patients (120) were admitted to the hospital for a prolonged period. Results: The mean age was 48.9 ± 14.7 years, and 56.7% were male. Long operative time (>4 hours), postoperative infection, wound complication, hospital admission in the intensive care unit, diabetes mellitus, and obesity were significantly associated with long hospital stay (p<0.05). The risk of the patients being hospitalized for a long duration was the highest in the patients with postoperative infection (OR = 3.74, 95% CI: 1.89–7.41). Other factors that were strong predictors of a prolonged surgical stay included emergency surgery (OR = 2.61) and surgery time (OR = 3.05). The regression model was statistically significant ($R^2 = 0.50$, $p < 0.001$). **Conclusion:** Prolonged hospital stay after surgical procedures is greatly influenced by patient-related and surgical factors. These are the most important predictors: postoperative infection, emergency surgery, and greater operative duration.

Keywords: Surgical procedures, hospital stay, postoperative complications, risk factors, length of stay, surgical outcomes, tertiary care hospital

Introduction

Prolonged hospitalisation following surgery is a significant health care issue as it contributes to the cost of care, the use of hospital resources, bed occupancy, and risk of hospital-acquired infections¹. Length of stay is commonly used as an indicator of surgical recovery, quality of care, and healthcare efficiency². While most patients recover within the normal post-op period, others may need longer hospital stays due to patient-related, surgical, and post-operative issues³. There are a number of demographic and clinical parameters that could affect hospital stay after surgery. The recovery period and postoperative morbidity are delayed and greater in older age, diabetes mellitus, hypertension, obesity, and in those with poor baseline health status⁴.

Perioperative factors like emergency surgery, long operative time, large surgeries, blood loss, and intensive care may also increase the likelihood of a longer hospital stay⁵. The most important contributors to long stay are postoperative complications (especially surgical site infection), wound complications, respiratory complications, and sepsis⁶. The clinical significance of identifying those factors associated with hospital stay is important, as many of these factors can be avoided or modified in the preoperative period, infection prevention, perioperative planning, and early postoperative monitoring⁷.

In tertiary care hospitals, where the number of patients and surgical demand is high, unnecessary extended hospital stay can provide better outcomes of surgery and resource utilization⁸. In tertiary care hospitals with a large inflow of patients and high surgical demand, unnecessary prolonged hospital stay can provide better surgical outcomes and utilization of resources⁹. But there is limited context-specific evidence to inform about predictors of prolonged hospital stays, demographically, clinically, and perioperatively¹⁰.

Hence, the present study was carried out to evaluate the factors that contributed to long hospital stay in patients who had undergone surgery and to determine independent factors that could predict long hospital stay.

Methodology

This cross-sectional study included the patients undergoing surgical procedures in the general surgery, orthopedic, and gynecology departments (2024 January to June 2024) from Farooq Hospitals Lahore. The selected population was the adult patients who were admitted for postoperative care during the study period and who were treated with surgery. The surgical and postoperative patients who were admitted during the study period were included in the study population. The total of 120 patients was sampled by a non-probability consecutive sampling method. Only patients over 18 years of age with complete medical records who had undergone either an elective or emergency surgical procedure were included. Patients with incomplete documentation, day-care procedures (same day discharge), trauma patients (required immediate referral to another facility), and those who refused (interview-based components) were excluded from this study.

The data collected was from a structured proforma, which was developed from hospital records and patient files. Information on socio-demographic data, diabetes mellitus, hypertension, obesity, smoking, type of surgery, its duration, and complications after surgery was recorded. Other postoperative parameters, such as hospital stay, intensive care unit (ICU) admission, wound infection, and surgical site infection, were recorded as well. Hospital stay was divided into normal and prolonged (>7 days). The institutional ethics committee gave ethical approval before data collection was done. The data were kept confidential, and they were anonymized by removing patient identifiers. Written informed consent was required in the direct interaction between the patient and the health care provider.

IBM SPSS version 25.0 was used to enter and analyze the data. Descriptive statistics such as frequencies and percentages, means, and standard deviations were used to describe patient characteristics. Chi-square tests were used to evaluate relationships between categorical variables and long hospital stays. Independent sample t-test and ANOVA were used for analysis of Continuous variables, where applicable. Multivariate logistic regression analysis was used to determine the independent predictors of prolonged hospital stay, and odds ratios (OR) with a 95% confidence interval (CI) were reported. The p-value < 0.05 was taken as significant.

Results

The number of postoperative patients included in the study was 120. The age was 48.9 ± 14.7 years with mild male predominance. The average length of hospital stay was 7.6 ± 3.4 days. As a whole, 37.5% of the patients had a longer hospital stay (>than 7 days). Several demographic, surgical, and postoperative parameters were significantly associated with longer hospital stay. Table 1 shows the characteristics of patients who were included in the study and underwent an operation. Most of the subjects were middle-aged, and there were slightly more males than females, and a reasonably balanced distribution of diabetes and hypertension. The population is a representative sample of a surgical population and is moderately affected by lifestyle-related risk factors.

Table 1: Demographic and Clinical Characteristics of Postoperative Patients (n = 120)

Variable	Category	n (%)
Gender	Male	68 (56.7)
	Female	52 (43.3)
Age Group (years)	<40	30 (25.0)
	40–59	54 (45.0)
	≥60	36 (30.0)
Mean Age (years)	Mean ± SD	48.9 ± 14.7
Comorbidities	None	50 (41.7)
	Diabetes Mellitus	34 (28.3)
	Hypertension	28 (23.3)
	Both DM + HTN	8 (6.7)
Smoking Status	Yes	36 (30.0)
BMI Category	Normal	50 (41.7)
	Overweight	46 (38.3)
	Obese	24 (20.0)

The following table summarized the primary operatory/severe postoperative factors of the population studied. Elective surgeries occurred more frequently than emergency surgeries, and the top surgery performed was general surgery. Postoperative complications (infection, wound problems, admission to the intensive care unit, etc.) occurred in a large proportion of the patients and resulted in a large variation in the length of hospital stay (Table 2).

Table 2: Surgical and Postoperative Characteristics (n = 120)

Variable	Category	n (%)
Type of Surgery	General Surgery	50 (41.7)
	Orthopedic Surgery	32 (26.7)
	Gynecological Surgery	26 (21.7)
	Other	12 (10.0)
Surgery Type	Elective	76 (63.3)
	Emergency	44 (36.7)
Duration of Surgery	<2 hours	56 (46.7)
	2–4 hours	48 (40.0)
	>4 hours	16 (13.3)
Postoperative Infection	Yes	24 (20.0)
Wound Complications	Yes	20 (16.7)
ICU Admission	Yes	30 (25.0)
Mean Hospital Stay (days)	Mean ± SD	7.6 ± 3.4

There was a strong association between the length of time spent in hospital and clinical factors. All of these factors were significantly associated with prolonged hospital stay: emergency surgery, longer operative time, postoperative infections, wound complications, and admission to an ICU. This was a combination of the surgical and patient factors, as diabetes and obesity were also linked to longer hospital stays (Figure 1).

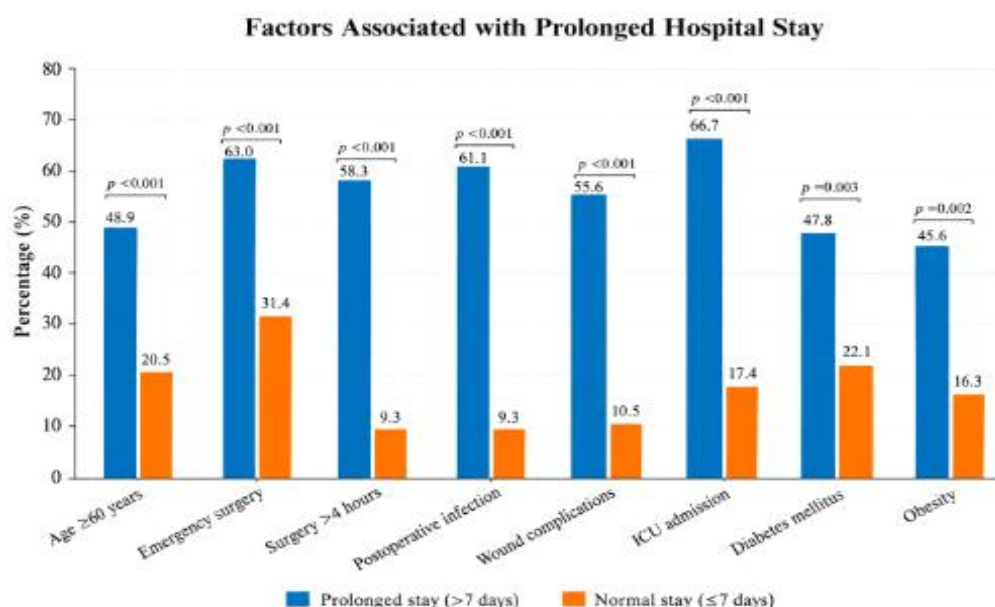


Figure 1: Comparison of significant factors between patients with prolonged hospital stay (>7 days) and normal hospital stay (≤7 days) following surgical procedures.

This model finds out predictors that are independent of the length of hospital stay following surgery. Postoperative infection was most associated with long operating room time, and emergency surgery was also associated (Table 3). In both situations, intraoperative and postoperative complications are important factors that significantly contribute to the risk of long hospital stay, as confirmed by the model.

Table 3: Logistic Regression Analysis for Prolonged Hospital Stay

Predictor	OR	95% CI	p-value
Postoperative Infection	3.74	1.89–7.41	<0.001
Emergency Surgery	2.61	1.38–4.92	0.003
Surgery >4 hours	3.05	1.41–6.58	0.004
ICU Admission	2.49	1.29–4.80	0.006
Diabetes Mellitus	1.82	1.01–3.29	0.045

Postoperative infection represents the strongest predictor of an extended hospitalization, followed closely by a surgical duration exceeding 4 hours (Figure 2). All evaluated variables—including emergency surgery, ICU admission, and diabetes mellitus—demonstrate statistically significant positive associations with a prolonged stay ($p < 0.05$).

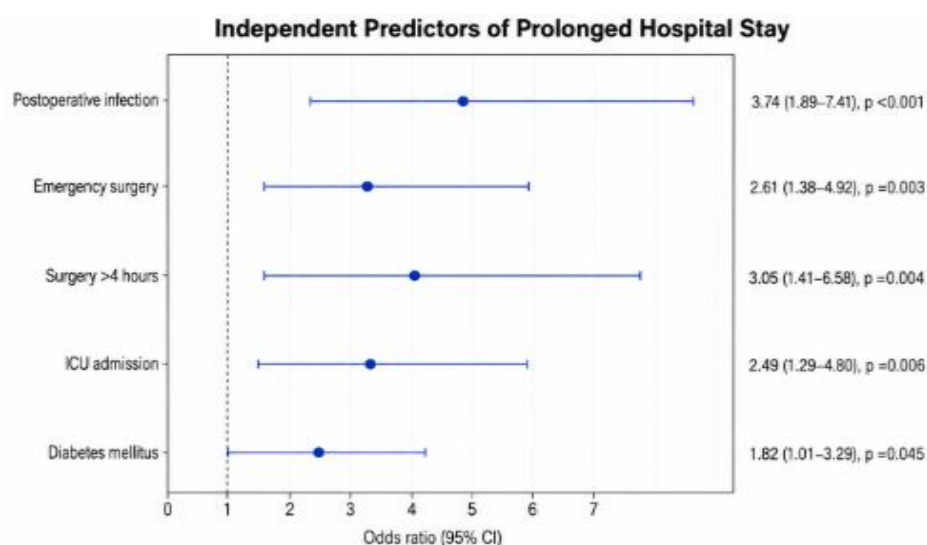


Figure 2: Logistic regression analysis showing independent predictors of prolonged hospital stay following surgical procedures.

Discussion

The purpose of this study was to explore the demographic, clinical, surgical, and postoperative factors that may be associated with an increased hospital length of stay in patients undergoing surgical procedures. The results revealed that 37.5% of the patients stayed in the hospital for over seven days. Emergency surgery, longer operation time (>4 hours), postoperative infection, wound complications, admission to an intensive care unit, diabetes mellitus, and obesity were significantly associated with a longer hospital stay ¹¹. Logistic regression analysis revealed that postoperative infection was most strongly associated with the postoperative outcome, followed by the operative duration and emergency surgery

¹². These results are clinically relevant as extended hospital stays cause the health care cost, bed occupancy, risk of hospital-acquired infections, and burden on tertiary services ¹³.

In this study, the percentage of patients who stayed in the hospital long after surgery reflects the significant impact of delayed postoperative recovery. Similarly, patient and procedure-related factors have also been found to affect length of stay following surgery ¹⁴. In this study, a longer hospital stay was significantly related to older age. This is likely due to physiological reserve, slower wound healing, numerous comorbidities, and susceptibility to post-operative complications in older patients ¹⁵. Furthermore, diabetes mellitus and obesity were linked with longer hospital stays, corroborating previous reports that metabolic disorders can prolong hospital stays and are associated with increased postoperative morbidity ^{16,17}. Sub-optimal glycemic control can impact immune function and healing ¹⁸. Obesity can cause greater technical difficulty in surgery, length of surgery, and a higher incidence of wound-related complications ¹⁹.

Emergency surgery was also significantly associated with prolonged hospital stay and was an independent predictor in regression analysis ²⁰. Severe disease, poor preoperative optimization, hemodynamic instability, or infection at admission may be present in patients undergoing emergency surgery. These factors can enhance the chance of complications and delay discharge ²¹. Elective surgery, on the other hand, offers the opportunity to a more thorough pre-assessment, management of co-morbidities, anesthetic planning and preparation, which may decrease length of stay ²². Another good predictor of extended hospital stays was an operative time > four hours. The longer the surgical time, the greater the complexity of surgery, difficult anatomy, complications encountered during surgery, more tissue handling, and blood loss ²³. In the current study, recovery time was significantly longer for those patients with lengthy operative times, indicating that operative complexity plays an important role in recovery time ²⁴.

In this study, the most significant association was between postoperative infection and longer stay. This is not an unexpected finding as infection will delay wound healing, and may necessitate further antibiotic treatment, repeat investigation, wound care, and re-intervention in some cases ²⁵. Longer hospitalisation was also significantly associated with wound complications ²⁶. To minimize postoperative length of stay, proper antibiotic prophylaxis, aseptic surgical technique, glycemic control, and early recognition of infection may be employed ²⁷. ICU admission was also strongly linked to longer hospital stays. Patients in the ICU typically have more severe postoperative instability, extensive surgery, complications, and/or multiple comorbidities ²⁸. This study underlines the need for perioperative risk stratification, early monitoring, and postoperative multidisciplinary care, especially as it is associated with prolonged stay.

Some limitations to this study should be noted. This is a cross-sectional study, results were obtained from a single tertiary care hospital, which may be limiting the generalizability of the findings. Various surgical specialties were included in the study, and the risk factors for each procedure were not evaluated individually. Future multicenter studies with larger samples and analysis of procedures are recommended.

Conclusion

This study is confirmatory about the fact that hospital stay is prolonged after surgical procedures and both the patient's and peri-operative factors have an impact on it. Postoperative infection, emergency surgery, surgery time > 4 hours, intensive care unit admission, and diabetes mellitus were significant independent factors, with the strongest association being that of postoperative infection. The clinical approach to reducing hospital stay focuses on preventing infection, optimizing preoperatively, careful surgical planning, and early postoperative monitoring. The procedure-specific factors and long-term surgical outcomes should be further assessed in larger patient populations in future multicenter studies.

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