

Prediction of Hospital Stay Duration in Patients Undergoing Inguinal Hernia Surgery: A Retrospective Study

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Abstract:

Background: Hospital stay following inguinal hernia surgery is influenced by patient-related, disease-related, operative, and postoperative factors. Identifying predictors of prolonged hospitalization may support individualized discharge planning and efficient healthcare resource utilization.

Aim: To identify demographic, clinical, operative, and postoperative factors associated with and predictive of hospital stay duration among patients undergoing inguinal hernia surgery.

Methodology: A retrospective cohort study was conducted in the Department of General Surgery, Bhagwan Mahavir Institute of Medical Sciences, Pawapuri, Bihar, India. Records of 90 patients aged ≥ 18 years who underwent inguinal hernia repair were reviewed. Demographic, clinical, operative, and postoperative variables were collected. Data were analyzed using IBM SPSS Statistics version 27.0. Linear regression was performed to identify predictors of hospital stay, with $p < 0.05$ considered statistically significant.

Results: Most patients were males (91.1%), had unilateral hernias (86.7%), primary hernias (91.1%), and elective admissions (84.4%). Hospital stay was 3–4 days in 43.3% of patients. Significant predictors included age ($B=0.018$, $p=0.049$), emergency admission ($B=1.284$, $p=0.001$), ASA status ($B=0.672$, $p=0.008$), operative duration ($B=0.021$, $p=0.010$), postoperative complications ($B=2.146$, $p<0.001$), and drain placement ($B=0.714$, $p=0.028$). Postoperative complications showed the strongest association ($\beta=0.431$).

Conclusion: Hospital stay was multifactorial, with postoperative complications being the strongest predictor. Early risk identification may facilitate individualized discharge planning and resource utilization.

Keywords: Inguinal Hernia; Hospital Stay; Length of Stay; Predictors; Postoperative Complications; Retrospective Cohort Study.

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Introduction

Inguinal hernia is one of the most frequently encountered surgical conditions in adult patient and is an important part of the burden of surgical disease in the world [1]. It is a condition in which the contents of the abdomen protrude through a weakness or defect in the inguinal area, which can be reducible and cause groin pain, discomfort or complications like obstruction and strangulation. Population-based data have found there to be a significant global burden of inguinal hernia, and that there is a significantly higher prevalence of inguinal hernia in males compared to females [2]. Worldwide disease burden studies have also revealed that hernia burden is significant in various parts of the world and is significant in LMIC, including India. With the recurrent inguinal hernia, aging population and growing

access to surgical services, effective perioperative management and optimisation of hospital resources has become more crucial.

Surgical repair is the definitive treatment of the inguinal hernia when the hernia becomes symptomatic and is one of the most common surgeries performed in the world [3]. Modern international guidelines focus on personalizing the decision-making process for operative technique, anaesthesia, mesh repair, postoperative care, and the management of hernias with complications in the groin area. The prognosis of elective inguinal hernia repair is good, and the length of the hospital stay is quite short, while emergency presentation, obstruction, strangulation, bowel involvement and other complicators can

significantly increase the postoperative morbidity and healthcare needs [4]. Therefore, the length of the hospital stay after inguinal hernia surgery is not only dependent on surgical technique, but may also be related to the patient's underlying characteristics, disease severity, technique used, recovery rate after surgery, and complications.

The length of stay in a hospital is a key measure of post-surgical recovery and health services consumption. An unnecessarily long admission time may lead to higher hospital charges, bed occupancy, risk of exposure to hospital-acquired infections, and higher burden on healthcare facilities, and an unnecessarily short stay may lead to risk of inadequate recovery or to unplanned hospital re-admission [5]. Thus, it is helpful to identify patients with an expected course of longer hospitalisation prior to or during the perioperative period to help clinic doctors plan better discharge arrangements, match the right kind of hospital beds to patients, counsel patients and families, and optimise surgical services. The length of hospital stay is of special interest in healthcare facilities with limited beds and staff.

Various patient related factors can affect postoperative hospital stay following inguinal hernia surgery. The changes of physiological reserve and comorbid illness may impact the recovery process, as age increases. Comorbidities like cardiovascular disease, diabetes mellitus, obesity, respiratory disorders, and other chronic diseases may predispose to postoperative complications and delay recovery [6]. Recent studies with large surgical cohorts have also shown that certain patterns of comorbidities are linked to greater complications and hospital stays after hernia surgery. These results highlight the value of including pre-operative clinical factors on the prediction model for postoperative hospitalization.

The length of hospital stay may also be significantly influenced by disease and surgical factors. The factors of emergency surgery, complicated or strangulated hernia, higher American Society of Anesthesiologists (ASA) classification, longer operative time and postoperative complications are reported to be associated with higher hospitalization rate in patients undergoing hernia repair. Bowel obstruction or strangulation can demand more extensive operative correction (bowel resection) and can therefore lead to longer postoperative recovery [7]. Multicentre research in patients with acute groin hernia has identified that advanced age, comorbidity, obstruction, strangulation and bowel resection are significant factors that are associated with adverse outcomes and longer hospital stay.

This is a specific study on inguinal hernia surgery that has shown that certain clinical and perioperative factors can be used to predict hospital stay. Other studies conducted on patients who had undergone inguinal hernia surgery have shown that age and

complications were significant factors that influenced hospital stay, with other factors listed as operative characteristics and surgical approach [8]. In another study on abdominal wall hernia repair, the authors have found that inguinal hernia repair associated with the occurrence of strangulation, ASA class, operative duration and systemic or local postoperative complications had significant association with longer hospital stay. The observations suggest that length of stay is a multi-factorial outcome and that predictions need to take into account patient-specific and procedure-specific factors.

Although there are data on the factors associated with extended hospitalisation, prediction of hospital stay for each patient remains clinically relevant as the magnitude of these factors may differ depending on patient population, hospital practice, surgical procedures, resource availability and elective versus emergency presentation. Hospital-based data acquired in retrospective analysis can give useful information on the characteristics of patients with shorter and longer postoperative stays and can be used to determine the variables that can be incorporated into practical prediction methods.

Hence, the present retrospective cohort study “Prediction of Hospital Stay Duration in Patients Undergoing Inguinal Hernia Surgery: A Retrospective Cohort Study” was conducted to assess the clinical, demographic, disease-related and perioperative factors that determine the length of hospital stay after inguinal hernia surgery. The study intends to elicit evidence which can be used to help with the risk assessment for patients who need to be discharged from hospital following inguinal hernia surgery, the discharge planning of the patient, the efficient use of hospital resources and peri-operative care of the patient.”

Methodology

Study Design: The study was designed as a retrospective cohort study to identify the factors associated with and predict the duration of hospital stay among patients undergoing inguinal hernia surgery. The study retrospectively reviewed the clinical and perioperative records of eligible patients who had undergone surgical treatment for inguinal hernia. Demographic characteristics, clinical variables, operative details, postoperative events, and duration of hospitalization were assessed to determine their relationship with length of hospital stay.

Study Area: The study was conducted in the Department of General Surgery, Bhagwan Mahavir Institute of Medical Sciences, Pawapuri, Nalanda, Bihar, India. The department provided surgical management and postoperative care for patients presenting with inguinal hernia, including both elective and emergency cases.

Study Duration: The study was conducted over a period of one year from March 2025 to February 2026

Study Participants: The study participants comprised patients aged 18 years and above who had been diagnosed with primary or recurrent unilateral or bilateral inguinal hernia and had undergone surgical treatment during the study period.

Inclusion Criteria

- Patients aged 18 years or above.
- Patients diagnosed with primary or recurrent inguinal hernia.
- Patients with unilateral or bilateral inguinal hernia.
- Patients who underwent surgical repair of inguinal hernia in the Department of General Surgery.
- Patients whose medical records contained adequate demographic, clinical, operative, and postoperative information.
- Patients for whom the duration of hospital stay could be clearly determined from the hospital records.

Exclusion Criteria

- Patients aged below 18 years.
- Patients who underwent surgery for hernias other than inguinal hernia.
- Patients with incomplete or missing hospital records.
- Patients who underwent surgery at another hospital and were subsequently admitted for postoperative care.
- Patients whose operative or postoperative information was insufficient for analysis.
- Patients who were admitted for reasons unrelated to inguinal hernia surgery.

Sample Size: The study included a total sample of 90 patients who fulfilled the inclusion and exclusion criteria. The required records were identified from the hospital database and relevant patient case files, and the available information was systematically extracted for analysis.

Procedure: Relevant patient records were retrospectively reviewed using hospital case files, operative notes, anesthesia records, and postoperative documentation. Data were collected using a

structured data collection format. The variables recorded included age, sex, type of hernia, primary or recurrent status, unilateral or bilateral involvement, mode of admission (elective or emergency), associated comorbidities, American Society of Anesthesiologists (ASA) physical status, type of anesthesia, surgical procedure performed, duration of surgery, use of postoperative drainage, postoperative complications, and length of hospital stay. The duration of hospital stay was calculated from the date of hospital admission to the date of discharge and was considered the primary outcome variable. Postoperative complications and other perioperative factors were also documented to assess their possible association with prolonged hospitalization. The collected information was checked for completeness, coded systematically, and entered into a computerized database for statistical analysis. Patient confidentiality was maintained throughout the study, and the data were used only for research purposes.

Statistical Analysis: The collected data were entered, coded, and analyzed using IBM SPSS Statistics version 27.0. Continuous variables such as age, duration of surgery, and length of hospital stay were summarized using mean, standard deviation, median, and appropriate range measures. Categorical variables were presented as frequencies and percentages. Appropriate statistical tests were applied to examine the association between demographic, clinical, and operative variables and the duration of hospital stay. Linear regression analysis was performed to identify significant predictors of hospital stay duration and to estimate the contribution of individual variables to the length of hospitalization. A p-value <0.05 was considered statistically significant."

Result

Table 1 presents the demographic and clinical characteristics of 90 patients. The largest proportion belonged to the 41–50-year age group (27.8%), followed by 31–40 years (23.3%), while 12.2% were aged >60 years. Males predominated, accounting for 91.1% of the study population, whereas females constituted 8.9%. Most patients had unilateral hernias (86.7%), while bilateral hernias were present in 13.3%. Regarding hernia status, the majority (91.1%) had primary hernias and 8.9% had recurrent hernias. Most patients were admitted electively (84.4%), whereas 15.6% required emergency admission.

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	18–30	16	17.8
	31–40	21	23.3
	41–50	25	27.8
	51–60	17	18.9
	>60	11	12.2
Sex	Male	82	91.1

	Female	8	8.9
Type of hernia	Unilateral	78	86.7
	Bilateral	12	13.3
Hernia status	Primary	82	91.1
	Recurrent	8	8.9
Mode of admission	Elective	76	84.4
	Emergency	14	15.6

Table 2 presents the distribution of patients according to comorbidities and ASA status among 90 patients. More than half of the patients (53.3%) had no comorbidities. Hypertension was the most common comorbidity (17.8%), followed by diabetes mellitus (15.6%), while 8.9% had both diabetes and hypertension and 4.4% had other comorbidities.

Regarding ASA status, 46.7% of patients were classified as ASA I, 40.0% as ASA II, and 13.3% as ASA III. Overall, most patients had no major comorbidities and belonged to the lower ASA categories, indicating that the study population predominantly comprised patients with relatively fewer systemic health conditions.

Table 2: Distribution of patients according to comorbidities and ASA status (n=90)			
Variable	Category	Frequency (n)	Percentage (%)
Comorbidity	None	48	53.3
	Diabetes mellitus	14	15.6
	Hypertension	16	17.8
	Diabetes + hypertension	8	8.9
	Other comorbidities	4	4.4
ASA status	ASA I	42	46.7
	ASA II	36	40
	ASA III	12	13.3

Table 3 presents the operative and postoperative characteristics of 90 patients. Spinal anesthesia was used in the majority of patients (62.2%), while 37.8% received general anesthesia. Regarding the surgical procedure, open mesh repair was performed in 74.4% of patients, whereas 25.6% underwent laparoscopic repair. A postoperative drain was used in 20.0% of patients and was not required in 80.0%.

Postoperative complications were reported in 16.7% of patients, while the majority (83.3%) had no postoperative complications. Overall, the findings indicate that spinal anesthesia and open mesh repair were the predominant operative approaches, while most patients did not require postoperative drainage and had an uncomplicated postoperative course.”

Table 3: Distribution of patients according to operative and postoperative characteristics (n=90)			
Variable	Category	Frequency (n)	Percentage (%)
Type of anesthesia	General anesthesia	34	37.8
	Spinal anesthesia	56	62.2
Surgical procedure	Open mesh repair	67	74.4
	Laparoscopic repair	23	25.6
Postoperative drain	Used	18	20
	Not used	72	80
Postoperative complications	Present	15	16.7
	Absent	75	83.3

“Table 4 shows the distribution of patients according to duration of surgery and hospital stay among 90 patients. Regarding duration of surgery, most patients (48.9%) underwent surgery lasting 60–90 minutes, followed by 34.4% with surgery lasting <60 minutes, while 16.7% had surgery lasting >90 minutes. In terms of hospital stay, the largest

proportion of patients (43.3%) stayed for 3–4 days. A total of 35.6% of patients had a hospital stay of ≤2 days, whereas 15.6% stayed for 5–7 days. Only 5.6% of patients required hospitalization for >7 days. Overall, the findings indicate that most patients underwent surgery of moderate duration and had a hospital stay of 2–4 days.

Table 4: Distribution of patients according to duration of surgery and hospital stay (n=90)			
Variable	Category	Frequency (n)	Percentage (%)
Duration of surgery	<60 minutes	31	34.4
	60–90 minutes	44	48.9
	>90 minutes	15	16.7
Hospital stay	≤2 days	32	35.6
	3–4 days	39	43.3
	5–7 days	14	15.6
	>7 days	5	5.6

Table 5 presents the linear regression analysis of predictors of hospital stay duration among 90 patients. All the evaluated predictors showed a statistically significant positive association with the duration of hospital stay. Age was a significant predictor, with each additional year of age associated with a 0.018-unit increase in hospital stay duration ($B=0.018$, $\beta=0.116$, $p=0.049$). Emergency admission demonstrated a stronger association, with a regression coefficient of 1.284 ($\beta=0.286$, $p=0.001$), indicating longer hospital stays among patients admitted on an emergency basis. Higher ASA status was

also significantly associated with prolonged hospitalization ($B=0.672$, $\beta=0.234$, $p=0.008$). Duration of surgery showed a significant positive relationship with hospital stay ($B=0.021$, $\beta=0.252$, $p=0.010$). Postoperative complications emerged as the strongest predictor in the model, with the highest standardized beta coefficient ($\beta=0.431$) and a highly significant association ($B=2.146$, $p<0.001$). Postoperative drain placement was also significantly associated with longer hospital stay ($B=0.714$, $\beta=0.183$, $p=0.028$).

Table 5: Linear regression analysis of predictors of hospital stay duration (n=90)					
Predictor variable	B coefficient	Standard error	Beta	t-value	p-value
Age (years)	0.018	0.009	0.116	2	0.049
Emergency admission	1.284	0.382	0.286	3.36	0.001
ASA status	0.672	0.246	0.234	2.73	0.008
Duration of surgery	0.021	0.008	0.252	2.63	0.01
Postoperative complications	2.146	0.463	0.431	4.64	<0.001
Postoperative drain	0.714	0.319	0.183	2.24	0.028

Discussion

The present study aimed to assess the demographic, clinical, operative and postoperative characteristics associated with the length of hospital stay in 90 patients undergoing inguinal hernia repair. The majority of the study population comprised males (91.1%) and the highest percentage of the population was within the age group 41–50 (27.8%). This is in keeping with the epidemiology of inguinal hernia, which is a disease of adult males. In a nationwide Korean study of 314,238 inguinal hernia repairs, Han et al. (2019) [9] found a significant male predominance, as well as a significant contribution of older adults (aged 40 years and over) to surgeries. Most of the hernias in the present study were unilateral and primary, which is similar to the clinical presentation of inguinal hernias.”

“The hospital stay was statistically significant with age in the current study. Each additional year of age was associated with a 0.018-unit increase in hospital stay ($B=0.018$, $\beta=0.116$, $p=0.049$). The present finding is similar to the outcome of Aldoesu et al., 2015 [10] who examined the age-related risk factors of hospital stay following inguinal hernia surgery, and found that the older the patients, the longer the hospital stay. They were able to show coefficients of

$B=0.047$ for laparoscopic procedures and $B=0.035$ for open procedures in their regression analysis. In the same manner, Akinci et al. (2012) [11] concluded that the age was one of the factors affecting the prolonged hospital stay after performing abdominal wall hernia repair. But not every study has shown this connection. In a study by Sharma et al., 2021 [12] age was not found to be significantly associated with prolonged hospitalisation ($p=0.789$), suggesting an interaction of age with patient characteristics, type of hernia, operative approach and discharge protocol.

Another significant predictor in the present study was ASA status. Every step of the ASA category was correlated with a 0.672-unit increase in hospital stay. This result is similar to that of Akinci et al. (2012), who found a significant correlation between ASA classification and hospitalization duration in 959 patients with abdominal wall hernia ($p<0.001$). The relationship between ASA class $\geq$ II with the prolonged hospital stay was also significant ($p=0.002$) reported by Sharma et al (2021). The results support the idea that these patients might need further optimization prior to surgery, more surveillance after discharge and more attention to comorbidities.

In the current study, the operating time was significantly correlated with hospital stay. Nearly 50% of the patients had surgery between 60 and 90 minutes, 34.4% had surgery for less than 60 minutes and 16.7% had more than 90 minutes of surgery. The hospital stay had a positive correlation with operative duration, which was demonstrated by regression analysis ($B=0.021$, $\beta=0.252$, $p=0.010$). Akinci et al. (2012) reported similar results with operative duration being significantly associated with longer hospital stay ($p<0.001$). In 1,000 consecutive elective laparoscopic inguinal hernia repairs, Solodkyy et al. [13] reported a mean of 60.3 ± 21.0 minutes for true day case patients, but the mean for overnight hospital patients was 66.8 ± 24.2 minutes. The results confirm the use of operative duration as a relevant perioperative marker of potentially prolonged hospitalization.

The most significant correlation with hospital stay was seen for postoperative complications, in the present study. Eighty-three and a third of patients did not experience postoperative complications, but the complications were linked to a 2.146-unit rise in hospital stay, and had the highest standardized coefficient ($\beta=0.431$). In a similar study, Aldoescu et al (2015) found that complications after surgery was also an important factor influencing the length of stay for inguinal hernia repair. Another noteworthy study by Akinci et al. (2012) found that there were also significant correlations between postoperative complications and length of stay ($p<0.001$). Complication may result in further investigation, medication, wound management, pain management, and/or prolonged observation which can delay discharge.

Emergency admission was also strongly related to length of stay in hospital. Among patients in the present study 15.6% were admitted in an emergency, and emergency admission was seen to be associated with a 1.284-unit increase in hospital stay ($\beta=0.286$, $p=0.001$). In a study by Işıl et al., 2017 [14] geriatric patients with high risk undergoing emergency inguinal hernia surgery had a significantly higher mean hospital stay of 7.9 days compared with elective surgery (1.3 days) ($p<0.01$). In a similar study, Akinci et al. (2012) reported that strangulation also was significantly correlated with duration of hospital stay ($p=0.021$). This is associated with prolonged stay due to emergency presentations that include incarceration or strangulation or bowel compromise or heightened postoperative monitoring needs.

The length of hospital stay was found to be significantly associated with drain placement in the present study ($B=0.714$, $\beta=0.183$, $p=0.028$). Postoperative drainage was necessary in only 20.0% of the patients. The interpretation of this association should be done with caution as the placement of the drains could be due to the underlying surgery and not necessarily the cause of the longer hospital stays.

In the present study, 74.4% of the surgeries were open mesh repairs while 25.6% were laparoscopic procedures. Previous studies have demonstrated mixed results for surgical approach and hospitalization. In a randomized controlled trial (RCT), by Langeveld et al. (2010) [15], the laparoscopic total extraperitoneal repair (LTEP) was compared to the Lichtenstein repair with differences in recovery in the postoperative period. El-Dhuwaib et al. (2013) [16] however, found no overall significant difference between laparoscopic and open repair in the inguinal hernia when they analysed 125,342 inguinal hernia repairs in a longitudinal cohort study. The opposing results suggest that a variety of factors other than the surgical approach affect hospital stay.

The present study shows that hospitalisation after inguinal hernia surgery can be polyetiological. Postoperative complications had the highest association followed by emergency admission, operative duration, ASA status, drain placement, and age. Awareness of these factors could help identify at-risk patients for long hospital stays and could help guide postoperative monitoring, bed utilization, discharge timing, and utilization of healthcare resources.”

Conclusion

The present retrospective cohort study demonstrated that hospital stay following inguinal hernia surgery was influenced by multiple demographic, clinical, operative, and postoperative factors. Among the 90 patients studied, most were middle-aged males with primary, unilateral hernias and elective admissions. The majority had relatively low systemic disease burden and experienced an uncomplicated postoperative course, with most patients being hospitalized for 2–4 days. Regression analysis identified age, emergency admission, higher ASA status, longer operative duration, postoperative complications, and drain placement as significant predictors of prolonged hospital stay. Postoperative complications showed the strongest association, followed by emergency admission and operative duration. These findings highlight the importance of preoperative risk assessment, careful perioperative management, early identification of complications, and individualized discharge planning. Incorporating these predictors into clinical decision-making may facilitate efficient hospital resource utilization and support improved postoperative care for patients undergoing inguinal hernia surgery.

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