

FACTORS CONTRIBUTING PROLONGED HOSPITAL STAY IN POST-SURGICAL PATIENTS: A COMPREHENSIVE ANALYSIS

Adeela Faryad¹, Misbah Sarwar², Ayeza Rafique³, Sadaf Mushtaq⁴, Asia Jahanzeb⁵

¹Sheikha Fatima Institute of Nursing and Health Science Lahore,
Email: adeelafaryad842@gmail.com

²Lecturer / Nursing Instructor Sheikha Fatima Institute of Nursing and Health Science Lahore
Email: misbahhanif2014@gmail.com

³Sheikha Fatima Institute of Nursing and Health Science Lahore,
Email: ayezarafique12345@gmail.com

⁴Sheikha Fatima Institute of Nursing and Health Science Lahore,
Email: sadafmushtaq832@gmail.com

⁵Lecturer Sheikha Fatima Institute of Nursing and Health Science Lahore
Email: microbiology4thyear@gmail.com

ARTICLE INFO:

Keywords:

Postoperative Pain , Surgery,
Surgical Wards , Icu ,Ccu ,
Hospital Duration

Corresponding Author:

Adeela Faryad, Sheikha
Fatima Institute of Nursing and
Health Science Lahore,
Email:
adeelafaryad842@gmail.com

Article History:

Published : 11 August 2025

ABSTRACT

Background of study: Hospital patients after surgery face a major challenge for healthcare facilities and patient recovery outcomes because of extended hospital durations. Knowledge about hospital stay duration determinants enables healthcare providers to build specific interventions which support patient healing and make better use of hospital resources.

Objective of study: The main objective was to analyze the factors linked with increased hospital stay among the post-operative patients.

Material & Methodology: This descriptive cross-sectional study was conducted in different surgical wards of Sheikh Zayed Hospital, Lahore. Different surgical patients fulfilling criteria for this study were sampled through convenience methods. The investigators excluded patients who did not provide complete data along with those in requiring emergency surgery. Clinical Performa recorded all surgical patient demographic information alongside clinical features and operative data to study factors contributing to prolonged hospitalization. The researchers analyzed their gathered data through version 23.00 of the SPSS software package. Researchers measured the scores from each factor and evaluated their links and statistical connections with the patients' hospital stay duration.

Results: Analysis of 160 participants showed prolonged hospitalization among 18.75% of patients. Patient demographics revealed 13% within

the 31-35 age bracket followed by 15.6% of subjects aged 50-55 years with female patients representing 46% of the study group and males comprising 54% of participants. The hospital stay duration for patients with complications reached 12.6 days and the difference was statistically significant ($P < 0.001$). Postoperative complications along with delayed wound healing, comorbidities, ICU stay, increased operative time, complex surgery ≥ 100 minutes, preoperative anemia, patient age rise, and severe postoperative pain were shown to cause longer hospital stays for patients. Postoperative complications resulted in a prolonged hospital stay by +13.2 days in cases of wound breakdown and +14.3 days when HAP developed and +13.8 days when pain intensified. The relationship between surgical site infection and extended hospital stay showed strong correlation based on the comorbidity score of 6.0 while previous hospital admission scored 5.0 and surgical site infection scored 8.0. The severity score for Hospital-acquired pneumonia reached 9.0 making it a critical risk factor. Medical patients who experienced pain at level three or higher demonstrated prolonged hospital stays for discharge readiness.

Conclusion: The research established important risk factors including patient age combined with existing health conditions and surgical postoperative problems alongside patient-reported pain levels and hospital-acquired infections and intensive care requirements. Hospital stay duration prediction becomes more accurate through both structured risk assessment structures and classification systems that identify high-risk patients.

INTRODUCTION

Hospital stay represents length of stay (LOS) of patient's hospital admission day until discharge. (Elsamna et al.,2021). Healthcare administrators use LOS as their main tool to assess service quality as well as hospital resource management and treatment costs. Hospital-acquired infections and elevated mortality together with increased hospital expenditure become more likely as the duration of hospitalization extends beyond typical periods (Aiken et al.,2020). The Normal Length of Stay (NLOS) occurs when patient hospitalization durations remain shorter than expected values for their specific procedure or condition yet Prolonged Length of Stay (PLOS) exceeds normal duration typically by six days and above (Doctoroff & Herzig 2020).

Patient-Related Factors such as Age, gender, comorbidities, preoperative functional

status, ASA status and socioeconomic status are imperative factors that can prolonged the normal hospital stay which can further leads to a risk factor of hospital acquired infections (Jindal et al.,2023).Surgical Factors including the type of surgery, surgical complexity, and emergency versus elective admissions are also linked with hospital stay and can be exaggerated more (Healy et al.,2024).On the other hand Post-Surgical factors includes the Postoperative complications such as surgical site infections and hospital-acquired pneumonia, use of medical devices, and pain management are also linked with the patients status of either short or long hospital stay (Li et al.,2022). Prolonged hospital stays following surgery are a significant concern due to their impact on patient outcomes, hospital resource utilization, and overall healthcare costs (Elsamna et al.,2021).Reducing hospital stay lengths can

help in controlling healthcare costs and improving patient outcomes (Kesarimangalam, & Hegde,2023).

The age of patients significantly affects recovery because older adults face multiple physiological dysfunctions and existing medical conditions that create longer and more complicated rehab paths. Extended hospital stays happen when post-surgical patients experience comorbid conditions including diabetes hypertension obesity and chronic heart failure which demand more intensive monitoring along with extra medical treatment. The level of socioeconomic advantage affects how long patients stay in hospital because lower-income patients experience difficulties in obtaining timely healthcare post-treatment thus requiring longer hospitalization.

The occurrence of surgical site infections on the other hand creates two major problems: it delays the healing process and requires added treatment with antibiotics along with wound care to stop infections from spreading. Further , Hospital stays extend beyond usual periods because medical devices serve as a primary factor for treatment length. Medical equipment that includes abdominal drains ventilators and dialysis machines provides essential patient recovery support yet demands extensive supervision and skilled attention which extends treatment durations in hospitals.

Global demand for surgical and emergency care together with rising hospital treatment expenditures creates obstacles for prompt healthcare delivery and service quality attainment. Healthcare institutions along with researchers have partnered to improve resource management while minimizing hospital operational expenditures. Healthy services evaluate their performance using Post-Surgical /Length of Stay (PSLOS) as a principal measurement metric. The target LOS functions as an improvement measure for quality initiatives and has received special

attention from cost-efficiency initiatives during the past several years. The smart supervision of hospital stay duration after emergency surgical treatments creates essential advantages in resource allocation and patient care quality and budget control (Ofori-Asenso et al.,2021). Those who can accurately predict hospital stay duration will achieve better resource planning and more suitable patient treatment protocols. Surgical patients who remain in hospitals longer than expected create major difficulties for healthcare organizations that affect both medical results and resource distribution. Investigations have recognized multiple variables connected to prolonged hospital stays yet scientists lack agreement about which element exercises the strongest influence.

Samad et al. (2020) investigated factors affecting extended hospitalization periods in post-anesthesia care units (PACU) and mentioned that Pain management cases contributed to longer hospital stays, affecting 68 (6.1%) patients while postoperative ventilation resulted in increased stay for 61 (5.4 %).

A systematic analysis of factors that lead to extended hospitalization periods for postoperative patients studies three primary variables including referral origin and preoperative anemia assessments and surgical time duration and hospital infections. All variables that influence patient hospital stay should be recognized to create specific care strategies which would minimize both management challenges and avoidable hospitalizations. This research article established full understanding about post-surgical hospital stay durations so health providers can create strong mitigation strategies.

Aim of the study:

This research aims to identify all factors which extend hospital durations for post-surgical patients by examining variables

that affect hospitalization time from preoperative through postoperative periods.

Objective of the study

- 1 To investigate the postoperative factors associated with prolonged hospital stays in surgical patients.
- 2 To investigate the correlation of demographical factors with extended hospitalization periods.

The identification of these factors creates a foundation for optimal patient healthcare delivery alongside strategic resource utilization. A decrease in LOS minimizes hospital-acquired infections and medication side effects and patient complications so healthcare delivers better care at lower expenses. The research conclusions can direct both healthcare policies and practices toward creating standards that reduce hospital stays as well as optimize healthcare delivery efficiency.

Chong et al. studied postoperative hospital stays following laparoscopic cholecystectomy of gallbladder. The data showed patients had different distributions of age ($p < 0.001$), gender ($p = 0.036$), diabetes mellitus ($p = 0.011$), smoking ($p = 0.010$), ASA status ($p = 0.003$) at baseline. Research by Chong et al. (2020) determined through multivariate analysis that operation time ($p < 0.001$) together with emergency operation ($p < 0.001$) and age ($p = 0.014$) and smoking ($p = 0.022$)

A 2023 systematic review evaluated ICU stay duration elements in cardiac surgery patients while examining how insight into these variables affects clinical management of resources. The examination of studies with prediction models revealed two exceptions where actual implementation was documented. The most frequent contributors to prolonged ICU stay were older age alongside atrial fibrillation/ arrhythmia and chronic obstructive pulmonary disease (COPD) and reduced ejection fraction and renal

failure/dysfunction and emergency surgery conditions. Multiple elements determine how long cardiac surgery patients require ICU support (Ahmed et al.,2021).

A retrospective analysis examined operational and clinical together with outcome data acquired from 1070 patients with an average age of 59 ± 9.8 years who underwent isolated coronary bypass grafting CABG surgery with cardiopulmonary bypass. Healthcare duration in the cardiac intensive care unit exceeded three nights after coronary artery bypass surgery served as the research outcome measure. The analyses revealed chronic obstructive airway disease COPD ($P = 0.005$) together with hypertension ($P = 0.006$) and diabetes mellitus ($P = 0.009$) as well as having coronary stents ($P = 0.006$) and receiving blood transfusion during surgery ($P = 0.001$) and post-operative acute kidney injury (AKI) ($P < 0.001$) and ventilation support of > 12 h ($P < 0.001$) and wound infection established significant connections to prolonged hospital /CICU stay (Li et al.,2022).

A retrospective analysis of 1200 orthopedic surgery patients provided access to preoperative and perioperative factors such as demographic data and anthropometric data and comorbidities in addition to preoperative laboratory assessments and surgical time. Hospital stay duration averaged at 3 days (IQR 3, 4) according to the collected data. Hospitalization days showed significant correlations with arterial hypertension ($p = 0.008$), diabetes mellitus ($p = 0.028$), CCI score ($p < 0.001$), ASA score ($p = 0.006$), surgical time ($p < 0.001$) and intraoperative blood loss ($p < 0.001$) through multiple univariate analysis tests. Patients who presented with lower preoperative hemoglobin levels spent less time in hospital care according to statistical analysis ($p = 0.008$). The comparison findings established an important connection between extended hospitalization duration and surgical

procedure length together with blood loss during surgery. Multiple elements determine patient inpatient duration so actively managing these variables to normalize comorbidities and optimize lab results helps decrease healthcare service demands (Papilia et al.,2022).It is concluded from the above studies that hospitals needs efforts to optimize resources should be linked to patient and surgical characteristics. More research is needed to integrate patient and surgical factors to explore the risk factors linked with length of hospital stay after postoperative management.

MATERIAL & METHODOLOGY

Study Design: The study was a descriptive cross-sectional study

Study Population: The target population was the postoperative patients admitted in different wards or postsurgical ward at Sheikhzayed hospital Lahore .

Study setting: This study was conducted in the SFINHS, Lahore

Sampling Strategy: A non-probability convenient sampling method was used to include participants.

Study duration: This study was completed in approximately 6 months after approval of synopsis

Sampling criteria:

Inclusion criteria

1. Both male and female post- surgical patients admitted in the hospital were
2. Age above 18 years
3. Post-operative Patients admitted in the gynecology, GIT ward and general surgery ward
4. Patients provided written informed consent

Exclusion criteria

Scoring and Interpretation

Factors	Score (0- 10)
Age > 65	1
Comorbidities if yes score 1	1
Previous Hospital Admissions	1

1. Incomplete questionnaire/data were excluded
2. Children or peads (< 18 years)
3. Emergency surgery
4. ICU, CCU, CICU units
5. Patients who did not provide consent

Sample size:

The sample size was determined based on previous study considering the expected prevalence of postsurgical patients with increased hospital stay as reported by 16 %. The calculated sample size was 160 by using $(N = (Z_{\alpha})^2 .p .q/ d^2$ For $\alpha = .05, z_{\alpha} = 1.96;$ for $\beta = .20, z_{\beta} =0.84)$

Data Collection procedure:

After taking ethical approval and consent. The Study was conducted at different surgical wards of the sheikh zayed hospital Lahore. The study used the structured Questionnaire to collect the data from the patients comprising the patient demographical and clinical data.

Data Analysis:

All the data was recorded and analyzed by using statistical software (e.g., SPSS version 26.00). Descriptive statistics were used to validate our study data. Qualitative data was presented in form of frequency or percentage. Quantitative data was presented in form of mean and standard deviation. various clinical and patient factors linked with increased LOS were determined via chi-square for categorical variables and t test for quantitative variables

Prolonged Hospital Stay: It is the extended period of stay /more than 7 days in hospital after surgery

Comorbidity: The presence of one or more coexisting condition like diabetes, hypertension

Surgical Site Infection	1
Hospital-Acquired Pneumonia /UTI	1
Pain Level > 3	1
Use of Medical Devices	1
Preoperative Hospitalization	1
Number of Tests Post-Surgery	1
Patient labs	1

Scoring criteria

- Total Score > 10 High risk for prolonged hospital stay
- Total Score 5-10 Moderate risk for prolonged hospital stay
- Total Score < 5 Low risk for prolonged hospital stay

RESULTS

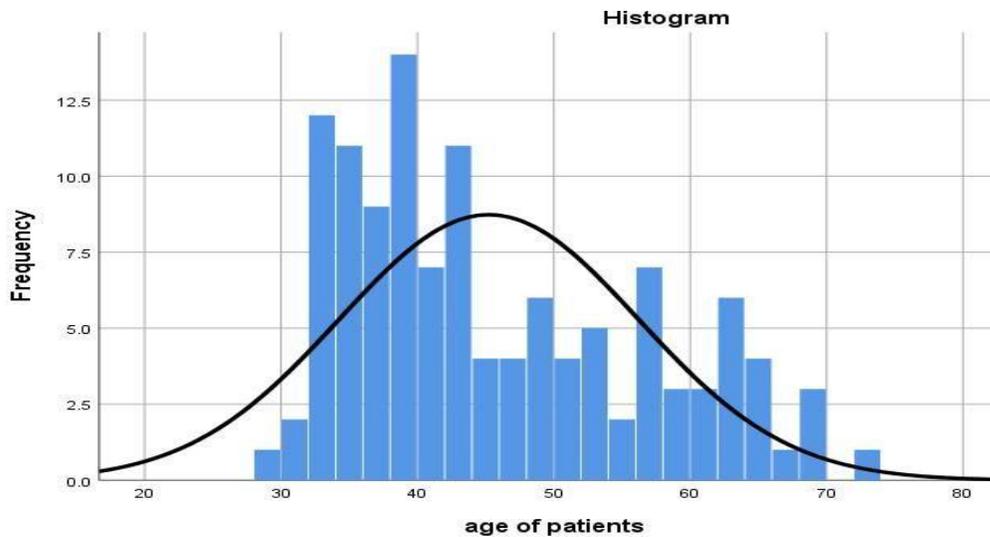
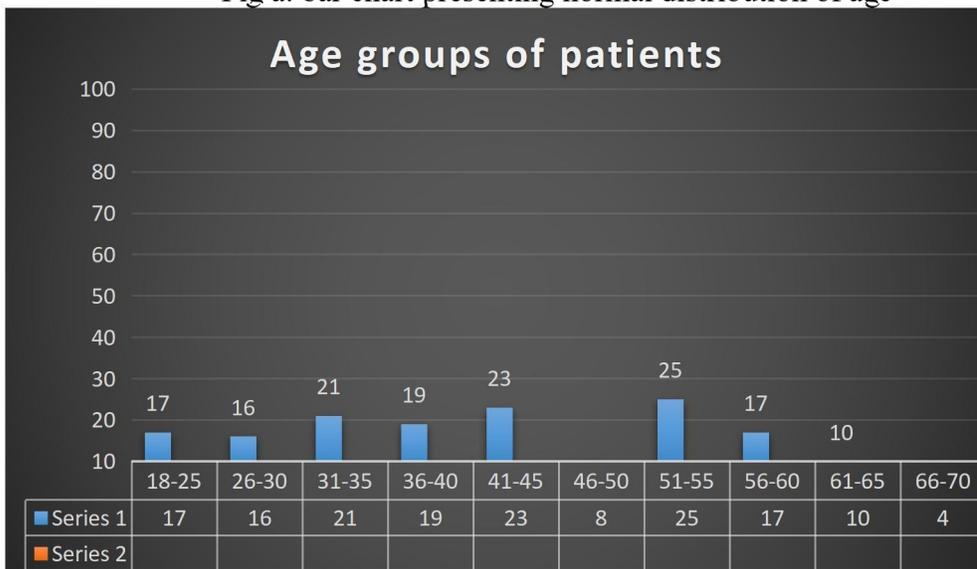


Fig a: bar chart presenting normal distribution of age



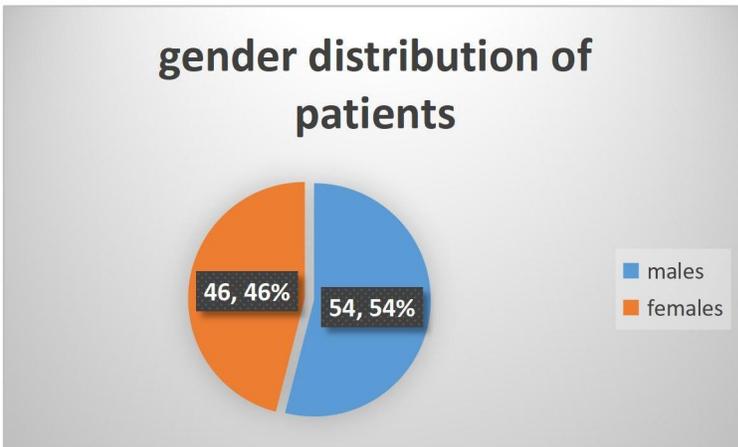


Figure c: pie chart presenting gender distribution

Common surgical procedures s

Surgeries	Type of surgery	n	%	Surgical duration
General surgeries				<100 mint
Appendectomy	Simple	18	11.25%	
Hernia	Moderate	15	9.37	
Cholecystectomy	Simple	13	8.1	
GIT surgery		11	6.8	
Orthopedics				>110 mint
Knee replacements	Moderate	10	6.25	
Hip replacements	Moderate	19	12	
Spinal	Complex	6	3.75	
Neurosurgery	Complex surgery	14	8.75	>110 mint
Gynecologic Surgery				<110 min
Hysterectomy	Moderate surgery	24	15	
Cesarean Section (C-Section)		30	18.75	

This table presents a classification of different surgeries conducted hospital in conjunction with their complexity levels, the number of cases performed (n), and their rate representation (%). Complicated surgeries were found to be related with expanded operation /surgical duration that can be a risk factor of increased hospital duration.

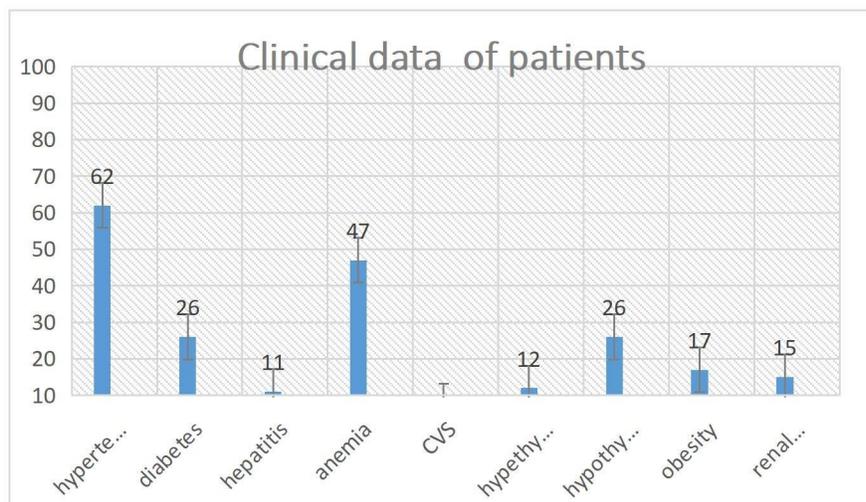


Table 4.4 frequency of hypertension among the patients

Hypertension	Frequency n	Percentage %
Yes	62	38.7
No	98	61.25

Table 4.5 frequency of Diabetes among the patients

Diabetes (uncomplicated)	Frequency n	Percentage %
Yes	26	16.25
No	134	80.8

Table 4.6 frequency of Hepatitis among the drug addicts

Comorbid conditions	Frequency n	Percentage %
Hepatitis confirmation from the lab test/hospital record)	11	6.8 %
Deficiency anemia	47	29.3%
CVS disease	7	4.3%
Hyperthyroidism	12	7.5 %
Obesity	26	16.25%

Hypothyroidism	17	10.6%
Renal disease	15	9.3%

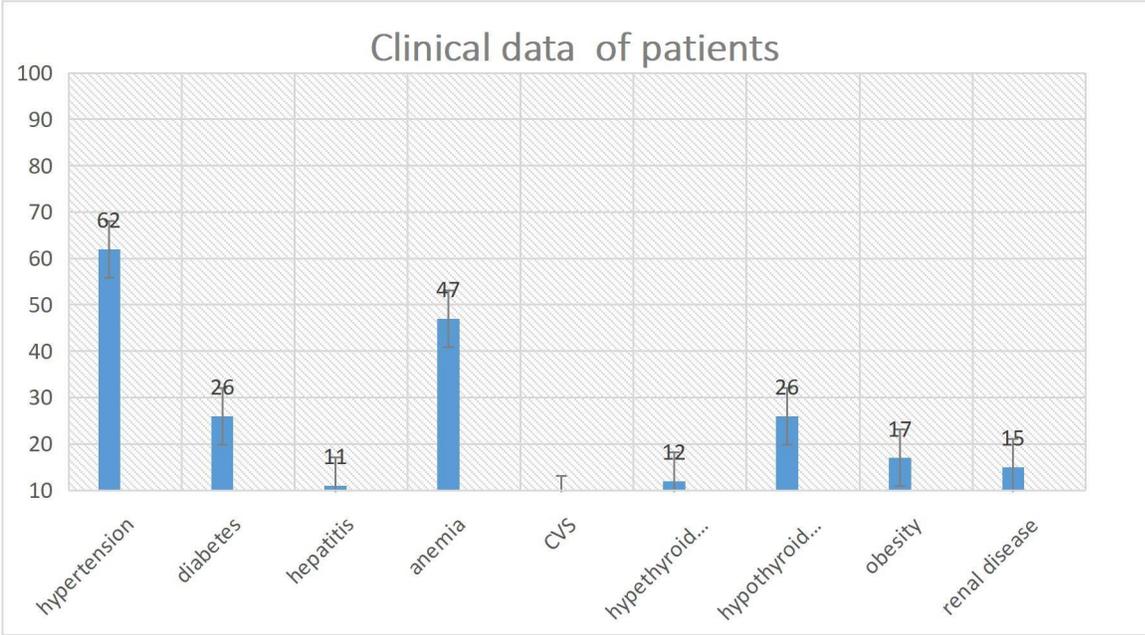


Fig g: clinical comorbidity of patients

Contributing Factors

Factor	Percentage of Patients Affected	Average Additional Days of Stay
Postoperative Complications (Infections, Bleeding)	40%	+5 days
Delayed Wound Healing	30%	+4 days
Underlying Chronic Conditions (Diabetes, Hypertension)	45%	+3 days
Need for Intensive Care Unit (ICU) Admission	25%	+7 days
Inadequate Postoperative Pain Management	35%	+3 days
Postoperative Respiratory Issues	20%	+5 days
Psychological Factors (Anxiety, Depression)	15%	+4 days
Lack of Post-Surgical Mobility	30%	+4 days
Hospital-Acquired Infections	10%	+6 days
Social & Economic Barriers (Delayed	20%	+3 days

Postoperative complications, underlying chronic conditions, ICU admission, and delayed wound healing. Most Affected Age Group was 50+ experienced longer stays due to slower recovery and pre-existing conditions. Anxiety and depression contributed to increased hospitalization due to delayed healing and motivation to mobilize post-surgery.

Table 4.8 Association of the Contributing Factors with prolonged hospital stay

Factor	Yes	chi-square (χ^2) test Value	P value
Increased Age	27 (16.8%)	4.95	0.002
Postoperative Complications	43(26.8%)	6.15	0.001
Delayed Wound Healing	25(15.6%)	6.84	0.001
Co-morbid conditions	73 (45.6%)	7.82	0.0004
Intensive Care Unit (ICU)	35(21.8%)	5.28	0.001
Postoperative Pain level	68(42.5%)	7.23	0.02
Postoperative Respiratory Issues	57 (35.6%)	5.82	0.003
Psychological Factors	73 (46%)	4.54	0.01
Lack of Post-Surgical Mobility	22 (14%)	6.41	0.001
Hospital-Acquired Infections	46(29%)	7.82	0.0001
Post- surgical laboratory tests	61 (38%)	5.36	0.001

This table presents the association of various contributing factors with prolonged hospital stay, using the chi-square (χ^2) test and corresponding p-values to assess statistical significance. demographical factors and comorbid conditions were significantly associated with the increased hospital duration.

Table 4.9 Association of the Contributing Factors with prolonged hospital stay

	Hospital duration	S.D	MEDIAN days	Independent t test Value	P value
Patients with complications	12.6 days	3.2	12		<0.001
Patients without complications	7 days	2.5	7	6.48	

This table examines the association between complications and prolonged hospital stay using

statistical analysis. Patients without complications had a significantly shorter average stay of 7 days. The independent t-test value of 6.48 and a p-value of <0.001 indicate a statistically significant difference between the two groups

Table 4.10 Relationship between hospital stay duration and Study variables.

Variables	Pearson correlation	Interpretation
Age versus hospital stay	$r = +0.47$	Moderate positive correlation
BMI versus hospital stay	$r = +0.30$	Weak positive correlation
Pain levels versus hospital stay	$r = +0.49$	Moderate positive relationship
Laboratory test values /Hemoglobin levels versus hospital stay	$r = -0.52$	Moderate negative correlation

Age and hospital stay duration show a moderate positive correlation, suggesting that older patients tend to stay longer due to slower recovery. BMI and hospital stay duration show a weak positive correlation, indicating that higher BMI slightly increases hospital stay (possibly due to obesity-related complications). Hemoglobin levels and hospital stay show a moderate negative correlation, meaning patients with lower hemoglobin levels tend to have longer hospital stays, likely due to anemia-related recovery delays.

Table 4.12 Scoring System for Prolonged Hospital Stay Risk

Each contributing factor was assigned a score. The **total score** determines the patient's risk level.

Factors	Mean Score
Age > 65	3.0
Comorbidities	6.0
Previous Hospital Admissions	5.0
Surgical Site Infection	8.0
Hospital-Acquired Pneumonia	9.0
Pain Level > 3	8.0
Use of Medical Devices	7.0
Number of Tests Post-Surgery	9.0

This table outlines a scoring system used to assess the risk of prolonged hospital stay based on various contributing factors.

Table 4.13 Risk Interpretation Based on Total Score

Total Score	Risk Level	Interpretation
>10	High Risk	Patients are very likely to experience prolonged hospital stay. Intensive post-surgical monitoring required.
5 - 10	Moderate Risk	Patients have a moderate chance of prolonged stay. Preemptive interventions may reduce hospitalization duration.
<5	Low Risk	Patients are at low risk for prolonged stay. Expected recovery period within the normal range.

This scoring system provides a structured approach to estimating the likelihood of prolonged hospital stay. Higher scores indicate increased risk, guiding clinical teams in allocating resources efficiently. Patients scoring above 10 are highly likely to experience a prolonged hospital stay. Patients with less score of 5 are at a low risk for prolonged hospitalization. This risk interpretation system helps healthcare providers assess patient recovery likelihood, allowing them to allocate resources effectively and design individualized care plans to optimize hospital stay duration.

DISCUSSION

Prolonged hospital stay of postoperative patients poses a significant challenge to both healthcare institutions and patient outcomes. Prolonged hospital stays not only increase medical costs, but also increase the risk of complications such as infection, reduced mobility, and psychological distress (Doctoroff & Herzig, 2020). We conducted a comprehensive analysis of the associations between postoperative complications and

postoperative length of stay in a broad surgical population. age, postoperative complications, delayed wound healing, co-morbid conditions, ICU admission, postoperative pain level, respiratory issues, hospital-acquired infections and complicated surgeries were the identified factors. Among the, co-morbid conditions, hospital-acquired infections, and postoperative pain level show the strongest statistical significance (p-value ≤ 0.02), indicating a notable impact on prolonged hospitalization.

The presence of postoperative complications, delayed wound healing, ICU admission, psychological factors, and mobility restrictions also demonstrate statistically significant associations (p-value ≤ 0.01), highlighting their role in extended hospital stays. These are in concordance with the previous study (Ibrahim et al.,2021). The findings suggest that a combination of physiological, psychological, and environmental factors contribute to prolonged recovery periods, emphasizing the need for comprehensive patient care, early intervention

strategies, and preventive measures to reduce hospital stay durations.

Assessing the length of hospital stay of surgical patients admitted to the surgical ward is one of the most useful approaches to assess the quality of surgical treatment of patients. In current study, 31.5% of the patients experienced prolonged LoS. This finding is consistent with previous studies conducted locally, but some discrepancy may be due to advances in the healthcare system and the fact that specialized healthcare professionals provide the majority of care in developed countries, which is difficult to implement in low- and middle-income countries (Amari et al., 2024).

26% of the patients in study had postoperative complications among diverse surgeries due to various factors such as existing comorbid conditions, particularly diabetes. The increase in postoperative LOS varied or depends on different complications wound disruption was related with the high increases in LOS. These findings are consistent with the research conducted by Hurisa et al. that that have found associations between postoperative complications and length of stay in various subsets of surgeries (Hurisa et al.,2024).

Patient health factors led to an increase in the duration of treatment and examination, which in turn led to an increase in their hospital stay. This finding is supported by previous study that reported patients with anemic or underweight state were more likely to have prolonged LoS (Hanan et al.,2024).This may be related to delayed response to wound healing, which in turn leads to longer treatment duration and longer hospital stay .Another considerable factor was the operation time , duration of Surgery was an important risk factor , time ≥ 110 minutes were linked to prolonged LoS than those with normal operation time of ≤ 70 minutes. This result is supported by several previous studies conducted in Japan, China

and the USA (Barak et al.,2022; Patel et al.,2021).

Conclusion

This study found that a significant proportion of long-term hospitalizations occurred among patients in surgical wards. Postoperative complications, anemia, operation time ≥ 110 minutes, and nosocomial pneumonia were associated with prolonged hospital stay. The analysis highlighted key factors such as age, comorbidities, postoperative complications, pain severity, nosocomial infections, and the need for intensive care. Structured scoring systems and risk classification approaches offer a valuable method for identifying patients at higher risk for hospitalization. Recognizing these factors allows healthcare providers to implement targeted interventions, optimize patient care, and improve recovery outcomes. Additionally, standard safety checklists and infection prevention measures should be used to improve the quality of care.

Limitations of the Study

The findings are based on a specific patient population, and the results may not be fully generalizable to broader patient groups with different demographics or healthcare systems. Differences in hospital protocols, staffing, and available resources may affect hospital stay duration, making it challenging to apply findings universally.

Recommendations

1. Routinely perform risk scoring on patients before and after surgery to predict prolonged hospital stay and necessary interventions.
2. High-risk patients, especially those with comorbidities or a history of complications, must be monitored to minimize adverse events.
3. Infection prevention strategies must be monitored to reduce surgical site infections and nosocomial infections.

References

1. Amari, T., Hirukawa, C., Fukuda, T., Hidaka, Y., Makita, Y., Fukuda, K., & Yamaguchi, K. (2022). Factors affecting the length of hospital days after laparoscopic gastrectomy for elderly patients with gastric cancer. *Journal of gastrointestinal cancer*, 53(2), 472-479
2. Briggs, K., Botti, M., Phillips, N., Bowe, S., & Street, M. (2022). Patient, surgical and clinical factors associated with longer stay in the Post Anaesthesia Care Unit. *Operating Room Nurses Association of Canada Journal*, 40(3), 54-66.
3. Doctoroff, L., & Herzig, S. J. (2020). Predicting Patients at Risk for Prolonged Hospital Stays. *Medical care*, 58(9), 778-784.
4. Dharap, S. B., Barbaniya, P., & Navgale, S. (2022). Incidence and Risk Factors of Postoperative Complications in General Surgery Patients. *Cureus*, 14(11), e30975.
5. Hurisa Dadi, H., Habte, N., & Mulu, Y. (2024). Length of hospital stay and associated factors among adult surgical patients admitted to surgical wards in Amhara Regional State Comprehensive Specialized Hospitals, Ethiopia. *PloS one*, 19(8), e0296143.
6. Hannan, A., Wasif, H. M., Ali, M., Naseer, M. K., Ali, W., & Mustafa, Y. (2024). Prevalence of Post-Surgical Pain and Quality of Life After Total Knee Replacement: Post-Surgical Pain and Quality of Life After Total Knee Replacement. *Pakistan Journal of Health Sciences*, 136-141.
7. Healy, G.L., Stuart, C.M., Dyas, A.R. (2024). Association between postoperative complications and hospital length of stay: a large-scale observational study of 4,495,582 patients in the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) registry. *Patient Saf Surg* 18, 29 .
8. Ibrahim, K. S., Kheirallah, K. A., Al Manasra, A. R. A., & Megdadi, M. A. (2024). Factors affecting duration of stay in the intensive care unit after coronary artery bypass surgery and its impact on in-hospital mortality: a retrospective study. *Journal of Cardiothoracic Surgery*, 19(1), 45.
9. Javed, H., Olanrewaju, O. A., Owusu, F. A., Saleem, A., Pavani, P., Tariq, H., ... & Varrassi, G. (2023). Challenges and solutions in postoperative complications: a narrative review in general surgery. *Cureus*, 15(12).
10. Jindal, P., Patil, V., Pradhan, R., Mahajan, H. C., Rani, A., & Pabba, U. G. (2023). Update on preoperative evaluation and optimisation. *Indian journal of anaesthesia*, 67(1), 39-47.
11. Li, H., Luo, TF., Zhang, NR. et al. (2022). Factors associated with prolonged postoperative length of hospital stay after laparoscopic colorectal cancer resection: a secondary analysis of a randomized controlled trial. *BMC Surg* 22,
12. Kesarimangalam, M. H. P., & Hegde, P. M. (2023). Identification of Risk Factors Contributing to Prolonged Stay in the Post-anaesthesia Care Unit at a Tertiary Care Hospital in Abu Dhabi, United Arab Emirates. *Cureus*, 15(3), e35741.
13. Elsamna, S. T., Hasan, S., Shapiro, M. E., & Merchant, A. M. (2021). Factors Contributing to Extended Hospital Length of Stay in Emergency General Surgery†. *Journal of investigative surgery : the official journal of the Academy of Surgical Research*, 34(12), 1399-1406.

14. Ofori-Asenso, R., Liew, D., Mårtensson, J., & Jones, D. (2020). The Frequency of, and Factors Associated with Prolonged Hospitalization: A Multicentre Study in Victoria, Australia. *Journal of clinical medicine*, 9(9), 3055.

15. María Teresa Gómez Hernández, Nuria M. Novoa Valentín, Raúl Embún Flor, Gonzalo Varela Simó, Marcelo F. Jiménez López, 2023. Predictive factors of prolonged postoperative length of stay after anatomic pulmonary resection, *Cirugía Española (English Edition)*; 101, (1): 43-50.

16. Barak Corren Y, Merrill J, Wilkinson R, Cannon C, Bickel J, Reis BY. Predicting surgical department occupancy and patient length of stay in a paediatric hospital setting using machine learning: a pilot study. *BMJ Heal Care Informatics*. 2022;29.

17. Kobayashi K, Ando K, Kato F, Kanemura T, Sato K, Hachiya Y, et al. Predictors of Prolonged Length of Stay After Lumbar Interbody Fusion: A Multicenter Study. *Glob Spine J*. 2019;9:466–72.

18. Patel S, Alshami A, Douedi S, Campbell N, Hossain M, Mushtaq A, (2021). Improving hospital length of stay: Results of a retrospective cohort study. *Healthc.* ; 9:2–11.

19. Patel, P. P. (2016). Risk factors for persistent post surgical pain (PPSP): a systematic review and meta-analysis.