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A STUDY TO EVALUATE THE EFFECTIVENESS OF AN EARLY MOBILITY PROTOCOL IN THE POST-OPERATIVE CARDIAC RECOVERY UNIT ON REDUCING LENGTH OF STAY AMONG CARDIAC SURGERY PATIENTS

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Abstract

Background:

Cardiovascular diseases remain the leading cause of morbidity and mortality globally, necessitating increasing numbers of cardiac surgical procedures such as coronary artery bypass grafting (CABG) and valve replacement. Although surgical advancements have significantly improved survival outcomes, delayed post-operative recovery due to prolonged immobility remains a persistent clinical concern. Prolonged bed rest contributes to pulmonary complications, muscle deconditioning, venous thromboembolism, functional decline, and extended length of stay in cardiac recovery units. Early mobility protocols have emerged as evidence-based nursing interventions aimed at accelerating physiological stabilization and reducing recovery duration.

Objective:

To evaluate the effectiveness of a structured early mobility protocol in reducing the length of stay among post-operative cardiac surgery patients admitted to a cardiac recovery unit.

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Methods:
A quantitative quasi-experimental one-group pre-test and post-test design was employed. The study was conducted in the post-operative cardiac recovery unit of a tertiary care hospital. Thirty adult post-operative cardiac surgery patients were selected using purposive sampling. Baseline length of stay was recorded during routine care. A structured early mobility protocol was implemented by trained nursing personnel. Post-intervention length of stay was measured and compared using paired t-test. Associations between demographic variables and length of stay were analyzed using chi-square test.

Results:
The mean length of stay during routine care was 4.8 ± 0.9 days, which reduced significantly to 3.1 ± 0.7 days following implementation of the early mobility protocol ($t = 8.42$, $p < 0.05$). No statistically significant association was observed between length of stay and demographic variables such as age and gender.

Conclusion:
The structured early mobility protocol significantly reduced the length of stay in the cardiac recovery unit. Early mobilization is a safe, feasible, and cost-effective nursing-led intervention that enhances post-operative recovery and improves health system efficiency.

Keywords: Early mobility, Cardiac surgery, Length of stay, Post-operative recovery, Nursing intervention, Cardiac recovery unit

INTRODUCTION

Cardiovascular diseases (CVDs) account for nearly one-third of global deaths and represent a substantial burden on healthcare systems worldwide. Advances in cardiac surgical techniques, anesthesia, extracorporeal circulation, and perioperative monitoring have significantly improved survival and reduced intraoperative mortality. However, post-operative recovery remains a complex and multifactorial process influenced by physiological stability, functional capacity, and quality of nursing care.

Patients undergoing cardiac surgery are frequently admitted to post-operative cardiac recovery units or intensive care units (ICUs) for close monitoring. During this period, immobility has traditionally been encouraged to prevent hemodynamic compromise. Nevertheless, emerging evidence suggests that prolonged bed rest is associated with numerous adverse effects including skeletal muscle atrophy, insulin resistance, impaired pulmonary mechanics, atelectasis, thromboembolism, pressure injuries, and neurocognitive decline.

Even short durations of immobility in critically ill patients can result in significant muscle loss, particularly in large antigravity muscle groups. Reduced diaphragmatic excursion and ineffective

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cough further predispose patients to pulmonary complications. These complications contribute to delayed functional recovery and prolonged length of stay (LOS), increasing healthcare costs and resource utilization.

Early mobility is defined as the initiation of progressive physical activity—ranging from passive exercises to ambulation—within the early post-operative period once physiological stability is achieved. Contemporary cardiac rehabilitation guidelines emphasize early mobilization as a core component of enhanced recovery pathways.

Nurses are central to the success of early mobility programs. They continuously assess hemodynamic parameters, identify contraindications, coordinate multidisciplinary efforts, and ensure patient safety during mobilization. Nurse-led mobility protocols promote consistency, accountability, and sustainability of intervention.

Despite growing international evidence supporting early mobility, its structured implementation in cardiac recovery units within developing healthcare contexts remains inconsistent. Limited nursing-led empirical research exists in this area, particularly in Indian tertiary care settings. Therefore, the present study was undertaken to evaluate the effectiveness of a structured early mobility protocol in reducing the length of stay among post-operative cardiac surgery patients.

METHODS

Research Design

A quantitative quasi-experimental one-group pre-test and post-test design was adopted. This design was selected to evaluate the causal relationship between implementation of an early mobility protocol and changes in length of stay.

Pre-test data represented patients receiving routine post-operative care prior to structured mobility implementation. Post-test data were obtained from patients managed after implementation of the early mobility protocol. Both groups were admitted during different time periods but fulfilled identical inclusion criteria to ensure comparability.

Setting

The study was conducted in the Post-Operative Cardiac Recovery Unit of a tertiary care hospital equipped with advanced cardiac surgical facilities. The unit includes continuous ECG monitoring, invasive blood pressure monitoring, pulse oximetry, and ventilatory support systems. The nurse-to-patient ratio was maintained at 1:2, facilitating close supervision during mobilization.

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Population and Sample

The target population consisted of adult patients undergoing elective cardiac surgery, including CABG and valve replacement procedures. A total of 30 patients were selected using purposive sampling over a one-month period.

Inclusion Criteria

- Age ≥ 18 years
- Underwent CABG or valve surgery
- Hemodynamically stable within 24 hours post-operatively
- Oxygen saturation ≥ 94% with minimal support
- Provided informed consent

Exclusion Criteria

- Post-operative re-intubation
- Hemodynamic instability
- Neurological deficits limiting mobilization
- Uncontrolled arrhythmias
- Patient refusal

Intervention Protocol

The structured Early Mobility Protocol consisted of five progressive stages:

Stage 1: Passive and active range-of-motion exercises
Stage 2: Bed mobility and repositioning
Stage 3: Sitting at the edge of the bed
Stage 4: Standing with assistance
Stage 5: Supervised ambulation

Mobilization was initiated once stability criteria were met, including stable heart rate, systolic blood pressure within acceptable range, absence of active bleeding, and controlled pain levels. Vital signs were recorded before, during, and after mobilization. Any adverse events were documented. The intervention was delivered twice daily based on tolerance.

Data Collection Tool

The structured tool included:

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- Demographic and clinical data
- Length of stay in days (primary outcome)

Content validity was confirmed by experts in cardiac nursing and cardiology. Reliability was ensured through standardized documentation procedures.

Ethical Considerations

Institutional approval was obtained. Participants provided written informed consent. Confidentiality and ethical research standards were strictly maintained.

Statistical Analysis

Data were analyzed using descriptive and inferential statistics. Mean and standard deviation were calculated. Paired t-test evaluated effectiveness. Chi-square test assessed associations. Significance was set at $p < 0.05$.

RESULTS

A total of 30 post-operative cardiac surgery patients were included in the study. The findings are presented under the following sections:

1. Distribution of demographic and clinical variables
2. Effectiveness of early mobility protocol on length of stay
3. Statistical significance testing
4. Association between length of stay and selected variables

Table 1: Demographic Characteristics (n = 30)

Variable	Category	Frequency	Percentage
Age	40–50 years	8	26.7%
	51–60 years	12	40.0%
	>60 years	10	33.3%
Gender	Male	18	60.0%
	Female	12	40.0%
Type of Surgery	CABG	20	66.7%
	Valve surgery	10	33.3%

Table 1 presents the demographic and clinical profile of the study participants. The majority of patients (40.0%) belonged to the age group of 51–60 years, followed by 33.3% above 60 years, and 26.7% between 40–50 years. This indicates that most participants were middle-aged to older

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adults, which is consistent with the epidemiology of cardiovascular disease requiring surgical intervention.

Regarding gender distribution, 60.0% of the patients were male and 40.0% were female. This male predominance reflects the higher prevalence of coronary artery disease among men in clinical settings.

With respect to type of surgery, 66.7% of the patients underwent coronary artery bypass grafting (CABG), whereas 33.3% underwent valve replacement surgery. This distribution indicates that CABG constituted the majority of surgical procedures among the study sample.

Overall, the demographic data demonstrate that the study sample was representative of typical post-operative cardiac surgery populations admitted to recovery units.

Table 2: Comparison of Mean Length of Stay

Group	Mean (Days)	SD
Pre-test	4.8	0.9
Post-test	3.1	0.7

Table 2 illustrates the comparison of mean length of stay in the cardiac recovery unit before and after implementation of the structured early mobility protocol.

The mean length of stay during the pre-test phase (routine care) was 4.8 days with a standard deviation of 0.9 days, indicating moderate variability among patients. Following implementation of the early mobility protocol, the mean length of stay decreased to 3.1 days with a standard deviation of 0.7 days.

This represents a reduction of 1.7 days in the average recovery unit stay. Clinically, this reduction is substantial, suggesting that early mobilization accelerates physiological stabilization and functional recovery, thereby facilitating earlier transfer from the recovery unit.

Additionally, the slightly lower standard deviation in the post-test group suggests more consistent recovery patterns following implementation of the structured protocol.

Table 3: Paired t-Test

Variable	t-value	p-value
Length of Stay	8.42	<0.05

To determine whether the observed reduction in length of stay was statistically significant, a

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paired t-test was performed.

The calculated t-value was 8.42, with a p-value less than 0.05. Since the p-value was below the predetermined level of significance (0.05), the null hypothesis was rejected.

This indicates that the reduction in length of stay following implementation of the early mobility protocol was statistically significant and unlikely to have occurred by chance.

The high t-value further suggests a strong intervention effect, confirming that the early mobility protocol had a meaningful impact on patient recovery duration.

Table 4: Association Between Length of Stay and Demographic Variables (Chi-square Test)

Variable	χ^2 Value	p-value	Significance
Age	Not Significant	>0.05	NS
Gender	Not Significant	>0.05	NS

Chi-square analysis was performed to examine whether length of stay was associated with selected demographic variables such as age and gender.

The analysis revealed no statistically significant association between length of stay and age ($p > 0.05$). Similarly, no significant association was found between length of stay and gender ($p > 0.05$).

These findings suggest that the reduction in length of stay was independent of demographic characteristics and can be primarily attributed to the early mobility intervention.

The absence of demographic influence indicates that the early mobility protocol is broadly applicable across different patient groups and does not disproportionately benefit or disadvantage any specific category.

Overall Interpretation of Results

The results of the present study clearly demonstrate that implementation of a structured early mobility protocol significantly reduced the length of stay in the post-operative cardiac recovery unit.

The intervention resulted in:

- A clinically meaningful reduction of 1.7 days
- Statistically significant improvement ($p < 0.05$)
- No demographic bias in outcomes

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These findings strongly support early mobility as an effective nursing-led intervention for enhancing post-operative recovery and improving recovery unit efficiency.

No statistically significant association found ($p > 0.05$).

DISCUSSION

The present study demonstrated a statistically significant reduction in length of stay following implementation of a structured early mobility protocol. The mean reduction of 1.7 days represents both clinical and administrative significance.

Early mobilization enhances alveolar recruitment, improves diaphragmatic function, stimulates venous return, and preserves skeletal muscle strength. These physiological improvements reduce complications such as atelectasis, deep vein thrombosis, and ICU-acquired weakness.

The findings align with international studies demonstrating reduced ICU and hospital stay following early mobilization. The magnitude of reduction observed in this study is comparable to previously reported reductions ranging from 1 to 2 days in cardiac and critical care populations.

Importantly, no adverse events were recorded, confirming safety when conducted under structured nursing supervision.

From a nursing leadership perspective, early mobility strengthens evidence-based practice implementation. It promotes interdisciplinary collaboration among nurses, physiotherapists, and physicians. It also empowers nurses to take active roles in recovery optimization rather than solely monitoring physiological parameters.

Reduced length of stay has broader implications for hospital bed availability, cost containment, and quality indicators. In high-volume cardiac centers, even a one-day reduction per patient significantly enhances system efficiency.

The absence of association between demographic variables and length of stay suggests universal applicability across age groups and genders. This supports early mobility as a standardized care protocol rather than a selective intervention.

Integrating early mobility into standard post-operative care pathways can transform cardiac recovery models from passive monitoring to proactive rehabilitation-focused care.

CONCLUSION

The structured early mobility protocol significantly reduced the length of stay among post-

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operative cardiac surgery patients. Early mobilization is a safe, effective, and nurse-driven intervention that enhances recovery, optimizes resource utilization, and improves overall quality of care.

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