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Early Mobilization and Affecting Factors After Open Heart Surgery: A Cross-Sectional Descriptive Study

Açık Kalp Ameliyatı Sonrası Erken Mobilizasyon ve Etkileyen Faktörler: Tanımlayıcı- Kesitsel Çalışma

ABSTRACT

Objective: This cross-sectional study was conducted to examine the mobilization process of patients undergoing open heart surgery following admission to the intensive care unit, as well as the factors influencing this process.

Method: The study included 75 patients. Data were collected using a form consisting of three sections: the first with 24 questions on the patients' sociodemographic and clinical characteristics; the second covering hemodynamic parameters before and after mobilization; and the third utilizing the Intensive Care Unit Mobilization Scale. The study was reported in accordance with the STROBE checklist.

Results: Patients were found to stand for the first time during the postoperative period on the second to third day. Mobilization was initiated on the second postoperative day, typically as bedside stepping, with 61.3% of patients participating in this activity. There was a statistically significant difference between the type of mobilization and the presence of a drain. A relationship was observed between the mobilization process and variables such as body mass index, hemoglobin level, fatigue, and readiness for mobilization.

Conclusion: The study determined that mobilization after open heart surgery occurred at a moderate level and was associated with variables specific to the patients' clinical conditions.

Keywords: Cardiac surgery, early mobilization, intensive care, nurse, postoperative patient

ÖZET

Amaç: Bu kesitsel çalışma, açık kalp ameliyatı geçiren hastaların yoğun bakım ünitesine kabul sonrası mobilizasyon sürecini ve bu süreci etkileyen faktörleri ortaya koymak amacıyla yapıldı.

Yöntem: Bu çalışma 75 hastanın katılımıyla gerçekleştirildi. Araştırmanın toplanmasında hastaların sosyodemografik ve klinik durumuna ilişkin 24 soruluk birinci bölüm, mobilizasyon öncesi ve sonrası hemodinamik parametrelerin yer aldığı ikinci bölüm ve Yoğun Bakım Ünitesi Mobilizasyon Ölçeğinin yer aldığı üçüncü bölümden oluşan veri toplama formu kullanıldı. Çalışma STROBE kontrol listesi kullanılarak rapor edildi.

Bulgular: Hastaların ilk ayağa kalkmanın postoperatif 2. ila 3. günde gerçekleştirildiği, ameliyat sonrası 2. günde mobilizasyonun yatak kenarında adımlama şeklinde gerçekleştirildiği ve %61,3'ünün yatak kenarında adımladığı belirlendi. Hastaların mobilizasyon türü ile dren varlığı arasında istatistiksel yönden anlamlı fark olduğu saptandı. Hastaların mobilizasyon süreci ile beden kitle indeksi, hemoglobin, yorgunluk ve mobilizasyona hazır oluş değişkenleri arasında ilişki olduğu belirlendi.

Sonuç: Açık kalp ameliyatı sonrası hastaların mobilizasyonunun orta düzeyde olduğu ve hastaların klinik durumlarına özgü değişkenleri arasında ilişki olduğu belirlenmiştir.

Anahtar Kelimeler: Kalp cerrahisi, erken mobilizasyon, yoğun bakım, hemşire, ameliyat sonrası hasta

ORIGINAL ARTICLE
KLİNİK ÇALIŞMA

This study was presented at the 5th International 13th National Congress of Turkish Surgical and Operating Room Nurses Congress as oral declaration.

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Introduction

Heart diseases among middle-aged and older adults account for 45% of deaths in Europe and 40% in Türkiye.[1] In a study on the prevalence of chronic diseases and associated risk factors in Türkiye, heart-related diseases were found to have a prevalence of 12.7%.[2] Open heart surgery is a procedure typically performed to treat cardiovascular conditions. It is commonly indicated for coronary artery disease, valvular heart disease,

aortic aneurysm or dissection, congenital heart defects, and cardiac neoplasms. The frequency of open heart surgery varies depending on the prevalence of the underlying conditions.

Patients undergoing open heart surgery—a major surgical intervention—are admitted to the intensive care unit (ICU) to ensure a safe recovery, support respiratory and circulatory functions, manage fluids to maintain cardiac and renal function, and detect and manage potential complications at an early stage.[3] These patients may remain on bed rest for 2 to 3 days. During this period, prolonged immobility can lead to adverse effects such as venous stasis, thromboembolism, orthostatic hypotension, urinary retention, and constipation. To prevent these complications, it is recommended to reduce hospital stay duration, manage pain effectively, strengthen muscles, and improve joint mobility. Achieving these goals requires early mobilization within the first 24 hours, depending on the patient's clinical condition, and encouraging patients to stand as soon as possible, as early mobilization is also associated with increased satisfaction with care.[4,5]

Patients admitted to cardiovascular intensive care units (CICUs) after open heart surgery are closely monitored postoperatively, with their cardiorespiratory functions supported and their recovery facilitated. The care provided in the intensive care unit includes preparing necessary materials, monitoring the patient's general condition and vital signs, performing breathing exercises, assessing and managing pain, monitoring fluid–electrolyte balance and hemodynamic parameters, dressing surgical wounds, assisting patients in getting up as early as possible, and promoting mobility in bed. In this process, the patient's overall condition and tolerance to mobilization should be evaluated when planning the mobilization process.

Based on the patient's condition, patients and their relatives should be informed about progressive mobilization techniques such as turning in bed, foot and leg exercises, deep breathing and coughing exercises, sitting up in bed, standing, and walking. The mobilization process should be planned accordingly, and patient evaluations should be conducted before, during, and after mobilization.[6] Early postoperative mobilization is a key component of nursing care.[4,7] A review of the literature revealed no studies specifically examining the initial ambulation processes of patients undergoing open heart surgery. This study aims to emphasize the importance of nursing care in the early mobilization period following open heart surgery, raise awareness among nurses on this topic, and contribute to the development of algorithms for early mobilization after surgery.

The purpose of this study is to determine the mobilization process and the factors affecting this process in patients who undergo open heart surgery and are admitted to the cardiovascular surgery intensive care unit after surgery.

The research questions are as follows:

- In patients who undergo open heart surgery and are admitted to the cardiovascular surgery intensive care unit after surgery, when does the first postoperative ambulation occur?
- In patients who undergo open heart surgery and are admitted to the cardiovascular surgery intensive care unit after surgery, what methods are used for early postoperative mobilization?
- In patients who undergo open heart surgery and are admitted to the cardiovascular surgery intensive care unit after surgery, what parameters may affect early postoperative mobilization?
- In patients who undergo open heart surgery and are admitted to the cardiovascular surgery intensive care unit after surgery, what is the effect of the first ambulation on hemodynamic parameters?

MAIN POINTS

- The benefits of early mobilization for patients in cardiovascular surgery intensive care units are well established. In this study, the mobilization status of patients undergoing cardiovascular surgery in the intensive care unit was determined to be "moderate."
- The first mobilization was observed to occur as "stepping at the edge of the bed" on the second postoperative day. It is important that mobilization is initiated as early as possible and progressed gradually, in accordance with the patient's clinical characteristics—particularly for intensive care patients undergoing cardiovascular surgery. Valid and reliable measurement tools should be used to monitor the mobilization process.
- Body mass index, hemoglobin level, fatigue, and readiness for mobilization were found to affect the mobilization process. Nurses can enhance patient care by developing mobilization algorithms that take these variables into account when managing the mobilization process in intensive care patients.

Patients and Methods

Study Design

This study was conducted as a descriptive and cross-sectional study between January and June 2023. The STROBE checklist was used to report the study.[8] It was carried out in the cardiovascular surgery intensive care unit of a university hospital located in western Türkiye. The study was registered on January 5, 2024, at https://clinicaltrials.gov/ (ID: NCT06193447).

Participants

The participants were patients who underwent open heart surgery at the aforementioned university hospital in Türkiye. Inclusion criteria included being over 18 years of age and staying in the cardiovascular intensive care unit for 24 hours or more. Exclusion criteria were a diagnosed psychiatric disorder, active bleeding, arrhythmia, and a pain intensity score of 4 or higher according to the Visual Analog Scale (VAS). In previous studies on mobilization, patients reporting moderate or severe pain scores were excluded, as pain was considered an obstacle to mobilization.[6,9]

Sample Size and Allocations

According to data obtained from the hospital's Statistics Unit, 240 patients (160 males, 80 females) underwent open heart surgery between October 15, 2021, and October 15, 2022. Based on a referenced study, when the level of statistical significance (α) was set at 5%, the effect size was d=1.10, and the statistical power was set at 95% (1–β), the required sample size was calculated to be 66.[9] When stratified by gender, 22 female patients and 44 male patients were needed to form the sample. To account for

potential dropouts, it was decided to increase the sample size by 10%. As a result, 73 patients were planned to be included in the study (Figure 1).[10,11] The study was ultimately conducted with the participation of 75 patients.

Data Collection Procedures and Instruments

The study data were collected by the researcher (ZB) through face-to-face interviews with the patients between 14:00 and 16:00 on Mondays, Wednesdays, and Fridays, in order to avoid disrupting the daily operations of the nurses and the institution. Before data collection, patients were informed about the study. Verbal and written informed consent was obtained from those who agreed to participate.

After patients were admitted to the intensive care unit, the researcher assessed whether there were any patients eligible for mobilization, and if so, applied the data collection form. A four-part data collection form, developed based on a review of the relevant literature, was used.[6,11]

The first section, titled "Patient Introduction Form," includes nine questions on the patient's sociodemographic characteristics. The second section, "Clinical Status of the Patient," consists of sixteen questions assessing the patient's clinical status (e.g., hemoglobin level, time of first oral intake, time of first flatulence). The third section, "Hemodynamic Changes at the End of the Mobilization Process," addresses changes in hemodynamic parameters following the patient's first ambulation. This section includes questions on pulse, systolic and diastolic blood pressure, and oxygen saturation.

The fourth section includes the "Intensive Care Unit Mobilization Scale" (ICUMS), which was developed by Hodgson et al.[12] The Turkish validity and reliability study of the scale was conducted by İbrahimoğlu et al.[13] The ICUMS provides a structured method for collecting mobility data in intensive care units. It assists healthcare professionals in monitoring the recovery process and enables researchers to objectively measure patients' mobility levels. The scale consists of 11 items, scored from 0 (immobility—patient lying in bed and performing only passive exercises) to 10 (independent ambulation), with classification and explanations for each level.

Risk of Bias

Blinding was not performed in this study. However, the researcher who collected the data and the researcher who conducted the statistical analysis worked independently of each other.

Statistical Analysis

The data obtained in the study were analyzed using the Statistical Package for Social Sciences (SPSS for Windows 22.0, IBM Corp., Armonk, NY, USA). The results were evaluated at a significance level of α <0.05 with a 95% confidence interval. Frequency, percentage, mean, and standard deviation analyses were conducted during the descriptive analysis phase. The mean score of the ICUMS used in this study was evaluated by calculating Skewness and Kurtosis values to determine whether it followed a normal distribution based on independent variables. These values were found to be between –2 and +2, which is considered acceptable for normal distribution according to the literature.[14] Parametric tests were used to compare means in the statistical analysis.

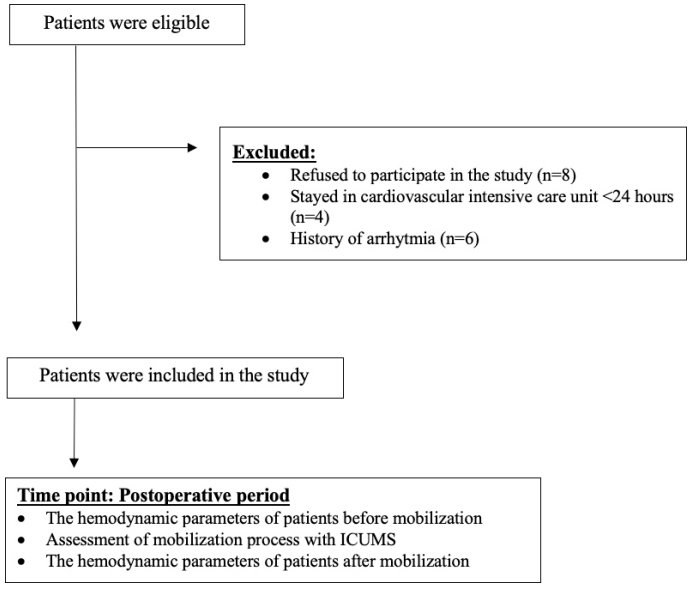

Figure 1. Flowchart and monitoring of the study.

Ethical Considerations

Ethics committee approval was obtained from the Aydın Adnan Menderes University Rectorate, Faculty of Nursing, Non-Interventional Clinical Research Ethics Committee (Approval No: 294391; Date: January 4, 2023). In addition, permission to use the scale and institutional permission were secured for the study. After patients were informed about the purpose and benefits of the study, both verbal and written informed consent were obtained from those who voluntarily agreed to participate. The study was conducted in accordance with the Declaration of Helsinki.

Results

Seventy-five patients were enrolled in the study, and all completed it.

Sample Characteristics

When the sociodemographic data of the patients were analyzed, the mean age was 64.60±9.59 years. It was found that 62.7% of the patients were primary school graduates, 68% had no history of smoking, and 84% had at least one chronic disease.

Regarding clinical conditions, 73.3% of the patients had not received any preoperative education, 89.3% had a drain in place, and all patients had at least one catheter. It was also determined that 64% of the patients did not receive analgesics before their first ambulation.

Additional findings included a mean hemoglobin level of 9.63±1.42, a reported mean pain level during the first ambulation of 1.60±1.36, a fatigue level of 4±2.65, and a comfort level of 91±2.84. The mean readiness score during the first ambulation was 6.88±2.44. The average Body Mass Index (BMI) was 27.36±4.85, and the mean length of stay in the intensive care unit was 4.25±2.13 days.

In terms of perceived obstacles during the first ambulation in the postoperative period, 28% of patients reported fear of falling, 24% reported pain, and 20% reported weakness. Among common

Table 1. Sociodemographic, clinical and surgical characteristics of the patients (n=75)

Variables	n (%)	Variables	n (%)
Gender		Presence of drain	
Female	33.3 (25)	No	10.7 (8)
Male	66.7 (50)	Yes*	89.3 (67)
Education status		Mediastinal drain	85.3 (64)
Illiterate	14.7 (11)	Pericardial drain	60 (45)
Literate	4 (3)	Right thorax drain	17.3 (13)
Primary school	62.7 (47)	Left thorax drain	49.3 (37)
High school	6.7 (5)	Presence of catheter	
University	12 (9)	No	-
Marital status		Yes*	100 (75)
Married	86.7 (65)	Central venous catheter	85.3 (64)
Single	13.3 (10)	Arterial catheter	93.3 (70)
Smoking		Urinary catheter	100 (75)
Yes	17.3 (13)	Peripheral venous catheter	41.3 (31)
Recently quit	14.7 (11)	Nasogastric catheter	5.3 (4)
No	68 (51)	Analgesic application status before mobilization	
Alcohol using		No	64 (48)
Yes	8 (6)	Yes*	36 (27)
Recently quit	6.7 (5)	Opioid	28 (21)
No	85.3 (64)	Non-opioid	8 (6)
Chronic disease		Perceived barriers to first standing up after surgery*	
None	16 (12)	Unwillingness	9.3 (7)
Yes*	84 (63)	Weakness	20 (15)
Hypertension	70.7 (53)	Tiredness	14.7 (11)
Diabetes mellitus	21 (21)	Pain	24 (18)
COPD	4 (3)	Fear of falling	28 (21)
Vasculopathy	1.3 (1)	Sleep	1.3 (1)
Chronic renal failure	1.3 (1)	Presence of invasive interventions (catheter and drain)	2.7 (2)
Stroke	1.3 (1)	Conditions that occur in the patient during the first standing period*	
Infarction	22.7 (17)	Pain	58.7 (44)
Other (bronchitis, gout, epilepsy, osteoporosis, rheumatism, generalized anxiety disorder etc.)	29.4 (22)	Presence of recurrent surgical procedures	6.7 (5)
Medical diagnosis*		Feeling tired/weak	22.7 (17)
Aortic stenosis (AS)	12 (9)	Nausea	9.3 (7)
Atrial septal defect (ASD)	4 (3)	dizziness	53.3 (40)
Aortic insufficiency (AR)	18.5 (14)	Not wanting to stand up	9.3 (7)
Coronary artery disease (CAD)	46.6 (35)	Bleeding	100 (75)
Valve insufficiencies (VI)	19.8 (15)	Hypotension	21.3 (16)
Status of receiving education in the preoperative period		**Variables**	**Maen±SD (Min–Max)**
No	73.3 (55)	Age	64.60±9.59 (30–84)
Yes*	26.7 (20)	BMI	27.36±4.85 (18.42–39.11)
Early mobilization	8 (6)	Hemoglobin level	9.63±1.42 (6.9–13.1)
Post-surgery nutrition	1.3 (1)	Time to start first oral intake in the postoperative period (hour)	26.79±19.73 (15–120)
Pain management	4 (3)	Time to first stand up in the postoperative period (hours)	30.79±23.47 (14–145)
Length of hospital stay	18.7 (14)	First outburst of gas in the postoperative period (hours)	32.11±11 (3–60)
Deep breathing exercise	13.3 (10)	Passage of flatus in the postoperative period (hours)	114.92±39.54 (16–200)
Triflo training	12 (9)	Pain	1.60±1.36 (0–3)
Diet		Fatigue	4±2.65 (1–8)
Oral	93.3 (70)	Comfort	5.91±2.84 (1–10)
Enteral	4 (3)	The state of feeling ready to stand up	6.88±2.44 (2–10)
Parenteral	2.7 (2)	Length of stay in intensive care stay (days)	4.25±2.13 (3–18)

%: Percent; n: Number of patients; SD: Standard deviation; Min: Minimum; Max: Maximum; BMI: Body mass index; *: Multiple answers provided.

Table 2. Mobilization classification of the patients according to ICUMS (n=75)

Variables	% (n)
ICUMS classificationb	
Sitting by the bed	13.3 (10)
Moving from bed to chair	25.3 (19)
Stepping in place (at the bedside)	61.3 (46)
ICUMS score averagea, Maen±SD (Min–Max)	**5.09±1.18 (3–6)**

%: Percent; n: Number of patients; ICUMS: SIntensive Care Unit Mobilization Scale; SD: Standard deviation; Min: Minimum; Max: Maximum.

Table 3. Changes in the patients' hemodynamic parameters during the mobilization process (n=75)

Hemodynamic parameter	Before mobilization Mean±SD	After mobilization Mean±SD	Test statistic and P
Hearth rate	87.23±11.47	90.18±11.85	t=0.688, p=0.493
SBP	113.72±14.77	116.56±25.62	t=-1.053, p=0.296
DBP	57.13±10.92	59.88±14.98	t=-1.476, p=0.144
SaO_2	96.53±2.46	95.20±3.7	t=**4.962**, p<0.001

SBP: Sistolic blood pressure; DBS: Diastolic blood pressure; SaO_2: Oxygen saturation; SD: Standart deviation; Independent t Test; P<0.01.

Table 4. Comparison of patients' ICUMS score by dependent variables (n=75)

Variables		ICUMS score Mean±SD	Test statistic ve P
Smoking*	Yes	5.46±1.05	F=0.806, p=0.451
	Recently quit	4.91±1.30	
	No	5.04±1.2	
Status of receiving education in the preoperative period**	Yes	5.10±1.16	t=-0.029, p=0.977
	No	5.09±1.20	
Presence of drain**	Yes	5.22±1.11	**t=-2.889, p=0.005**
	No	4±1.30	
Variables	**Mean±SD**	**ICUMS score Mean±SD**	**Test statistic ve P**
BMI***	27.36±4.85	5.09±1.19	**r=-0.260, p=0.024**
Hemoglobin***	9.63±1.42	5.09±1.19	**r=0.389, p=0.010**
Level of pain***	1.60±1.36	5.09±1.19	r=0.073, p=0.532
Level of fatigue***	4±2.66	5.09±1.19	**r=-0.454, p<0.001**
Level of comfort***	5.91±2.84	5.09±1.19	r=0.187, p=0.109
The state of feeling ready to stand up***	6.88±2.44	5.09±1.19	**r=0.316, p=0.006**
Variables	**Mean±SD**	**First ambulation time Mean±SD**	**Test statistic ve P**
First oral feeding time	26.79±19.73	30.79±23.47	**r=0.948, p<0.001**
First passage of flatus	32.11±11	30.79±23.47	**r=0.358, p=0.002**

ICUMS: SIntensive Care Unit Mobilization Scale; *: Chi-Square Test; **: Independent Sample t Test; ***: Pearson correlation test; SD: Standart deviation.

problems experienced during the first ambulation process, 58.7% of patients reported pain, while 53.3% reported dizziness (Table 1).

Primary Outcomes: Patients' Mobilization Process in CICU

It was found that 61.3% of the patients stepped to the edge of the bed during their first ambulation. The mean score on the ICUMS was 5.09±1.187 (Table 2). Based on this finding, it can be concluded that patients demonstrated a moderate level of participation in the mobilization process.

Secondary Outcomes: Patients' Outcomes

The hemodynamic parameters measured before and after mobilization are shown in Table 3. Among these parameters, only oxygen saturation (SaO_2) showed a statistically significant change. Oxygen saturation levels were lower after mobilization (p<0.001).

Variables Related to the Mobilization Process

A statistically significant difference was found between the mean ICUMS scores and the presence of a drain. A very weak negative correlation was observed between the ICUMS scores and BMI (r=–0.260, p=0.024), and a weak negative correlation was found with fatigue (r=-0.454, p<0.001) (Table 4).

A very weak positive correlation was identified between ICUMS scores and hemoglobin levels (r=0.389, p=0.01), and a weak positive correlation with the patients' sense of readiness to mobilize (r=0.316, p=0.006). Additionally, the time to first ambulation showed a statistically significant positive correlation with both the time to first oral intake (r=0.948, p<0.001) and the time to first flatulence (r=0.358, p=0.002).

Discussion

Ensuring that patients undergoing open heart surgery ambulate as early as possible during the postoperative period in the intensive care unit and begin mobilization gradually should be considered a priority in patient care. It was found that the first ambulation of patients occurred between the second and third postoperative days, that early postoperative mobilization was most frequently performed as stepping to the edge of the bed, and that mobilization levels were moderate overall.

The majority of patients in this study had not received any preoperative education, and among those who did, very few had received training specifically on exercises to facilitate postoperative mobilization or on the mobilization process itself. Dığın and Karabiber[15] reported that 83% of patients undergoing cardiac surgery received training on the perioperative process. Doğu[16] found that 69% of patients received preoperative education, while 37% were trained in exercises to support postoperative recovery and ambulation. These findings differ from the results of the current study.

According to the literature, reasons why nurses may not provide adequate patient education include heavy workloads, time management challenges, and a lack of belief in the importance of patient education. Similarly, the results of this study may be influenced by nurses' negative perceptions regarding the necessity of preoperative patient training. Furthermore, organizational challenges—such as staffing shortages, limited access to equipment, budget constraints, and a lack of clear protocols—as well as systemic deficiencies in healthcare services, are also believed to negatively impact the mobilization process of patients.

It was determined that the majority of patients participating in the study were fed orally. Considering the studies on mobilization, it is recommended to assess the patient's nutritional status and strengthen the nutritional process.[17–19] It can be inferred that the oral diet of the patients in this study facilitated the mobilization process and increased their readiness for mobilization.

Fear of falling and pain were identified as two major obstacles perceived by patients during their first ambulation. Schallom et al.[18] reported that safety was a significant concern during the mobilization of patients in the intensive care unit. Similarly, in the study by Mohan et al.,[19] 32% of participants cited invasive procedures, and 16% cited the timing of ICU entry and exit—particularly during evening hours—as barriers to mobilization. Wang et al.[17] also identified excessive workload (76.8%), inadequate equipment and devices (50.2%), and lack of written protocols or guidelines (50.2%) as major barriers. Following open heart surgery, patients often undergo multiple invasive procedures, and the presence of several attached devices may contribute to sensations of pain and fear of falling. Administering pain treatment before mobilization, waiting 30 minutes before beginning mobilization, taking necessary precautions during mobilization, informing the patient, teaching exercises that facilitate ambulation, and supervising their practice may be essential steps in intensive care units.

It was found that most patients in the study had drains, and all had catheters. Benjamin et al.[20] reported that patients had an average of 8.6 tubes or lines. This finding is consistent with the literature. The use of invasive procedures is common after open heart surgery and may be perceived as a barrier to early postoperative mobilization, potentially complicating the process.[21] Additionally, anemia can adversely affect postoperative mobilization. Low hemoglobin levels, as seen in anemia, impair oxygen transport to tissues, leading to fatigue, weakness, and shortness of breath.[19,20] These symptoms can reduce the patient's tolerance to physical activity, delay mobilization, and prolong the recovery process.

It was determined that the patients' feelings of fatigue during the mobilization process were slightly below the moderate level, while their comfort levels and sense of readiness for first ambulation were at a good level. It has been reported that the postoperative mobilization process may be influenced by fatigue, comfort, and readiness. The development of clinical practice guidelines aimed at enhancing early postoperative mobilization has been shown to contribute positively to the mobilization process.[22,23] The absence of algorithms or evidence-based practice guidelines that incorporate these variables may be one of the reasons why early postoperative mobilization is not achieved at the desired level.

When the hemoglobin levels of the patients in this study were examined, it was found that they were mildly anemic. The incidence of anemia in patients undergoing cardiac surgery is reported to be between 26% and 30%.[24] Studies in the literature also emphasize that anemia is common in cardiac conditions.[18,25,26] The findings of this study are consistent with the existing literature. Since both the presence and severity of anemia are likely to influence the mobilization process, it is considered essential to take patients' anemia status into account during the planning, implementation, and evaluation stages of the mobilization process.

The average length of stay in the intensive care unit for the patients in this study was four days. Saraçoğlu et al.[24] reported that most patients were hospitalized for only one day. In the study by İbrahimoğlu et al.,[3] the duration of intensive care unit stay was reported to be 56 hours. The findings of the current study differ from those in the literature. This discrepancy may be attributed to differences in patients' mobilization levels and their tolerance to activity. Increased activity and early ambulation—both considered as part of discharge criteria—can support patients' functional status, promote participation in self-care, and reduce the length of stay in the intensive care unit.[18,25,26]

It was found that the mobilization of patients in this study was performed mainly in the form of stepping in place and was assessed at a moderate level. Mohan et al.[19] reported that, prior to any intervention, more than half of the patients maintained mobilization while in bed; however, following mobilization efforts, half progressed to sitting or standing at the edge of the bed. dos Santos Moraes et al.[27] stated that more than half of the patients had a "high" level of mobilization. The findings of the present study differ from these reports in the literature.

Despite the well-documented benefits of early mobilization, the low scores observed on the mobilization scale in this study suggest that more effort is needed to enhance mobilization practices. This may be due to the lack of use of a formal mobility scale or the absence of a standardized mobilization protocol.

When the hemodynamic parameters of the patients before and after mobilization were examined, a statistically significant decrease was observed in SaO_2 values. Gözüküçük and Kula Şahin[23] reported a decrease in oxygen saturation and an increase in systolic blood pressure before and after mobilization. Şenduran et al.[28] found no significant changes in any hemodynamic parameters. In contrast, Genç et al.,[29] in a study involving obese patients, reported that mobilization increased oxygen saturation, heart rate, and respiratory rate. Cassina et al.[30] stated that mobilization had no effect on pulse rate or oxygen saturation, whereas Yava et al.[31] found a statistically significant increase in systolic blood pressure, diastolic blood pressure, and pulse rate before and after mobilization in patients undergoing cardiac surgery. The findings of the present study differ from those in the literature. This discrepancy may be related to variations in cardiac function or the clinical characteristics of the patients. Patients may experience rapid breathing and lower oxygen saturation during and after ambulation due to low hemoglobin levels.

A statistically significant positive correlation was also observed between the time of first ambulation and the time of initiating oral feeding. It is possible that patients felt more prepared for mobilization after transitioning to oral feeding.

When the relationship between BMI and ICUMS scores was analyzed, a very weak but statistically significant negative correlation was observed. İbrahimoğlu et al.[3] reported no significant relationship between BMI and mobilization level. The findings of this study differ from those in the literature, which may be attributed to the fact that the patients' BMI values were close to the normal range. BMI is considered an important variable that may influence a patient's ability and level of mobilization. Therefore, it is recommended that additional research be conducted on this subject, including meta-analyses, to better understand the relationship.

A weak negative correlation was also found between the mean ICUMS score and fatigue. Fatigue—frequently encountered in patients during the perioperative period and often associated with anxiety due to surgical stress—is a factor that may reduce patient motivation for mobilization.[32-34] Accordingly, nursing interventions can be planned to address the effects of fatigue on the mobilization process and to support its reduction.

Additionally, a weak positive correlation was observed between the mean ICUMS score and patients' readiness to mobilize. The mobilization process in ICU patients should be assessed as a progressive continuum, based on each patient's readiness and capacity to tolerate mobilization strategies and activities in order to prevent complications.[23]

Limitations of the Study

This study has certain limitations. First, as a cross-sectional study, the results are time-dependent and may vary over different periods. Second, the number of patients who participated in the study was relatively low; future studies should aim to include a larger sample size. Third, the study was conducted exclusively with patients who underwent cardiovascular surgery. Since the participants were limited to patients admitted to the intensive care unit following cardiac surgery, the findings cannot be generalized to all patient populations.

Conclusion

This study revealed that the mobilization process of patients was at a moderate level. Mobilization was associated with a clinically significant decrease in oxygen saturation. Additionally, a relationship was identified between ICUMS scores and variables such as body mass index, hemoglobin level, fatigue, and readiness to mobilize.

Relevance for Clinical Practice: Nursing Interventions to Increase Early Mobilization

The results of this study indicate that the mobilization processes of patients undergoing cardiovascular surgery should be more actively supported by nurses during their stay in the intensive care unit. Additionally, the findings suggest that variables such as patients' BMI, hemoglobin levels, fatigue, and readiness for mobilization may influence the mobilization process.

However, the concept of early postoperative mobilization still lacks a clear and universally accepted definition, and the process must be tailored individually by a multidisciplinary team. Given the clinical benefits of early mobilization, it is particularly important for nurses to develop and apply evidence-based practices during the planning, implementation, and evaluation phases of the mobilization process.

At this stage, nurses should assess patients' readiness and suitability for mobilization, plan a gradual mobilization strategy, teach exercises—such as breathing techniques and the use of devices like the Triflow—to facilitate mobilization, provide relevant training, and motivate patients to participate actively in their recovery. Protocols, algorithms, and checklists incorporating current evidence-based practices can be developed to enhance early postoperative mobilization.[34] In addition, it is recommended to organize training programs to support the early mobilization process, involve patient relatives in educational efforts, and conduct studies that demonstrate the impact of early mobilization on patient outcomes.

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References

1. Wilkins E, Wilson L, Wickramasinghe K, et al. European Cardiovascular Disease Statistics. European Heart Network; 2017. Accessed May 5, 2024. http://www.ehnheart.org/images/CVD-statistics-report-August-2017.pdf
2. T.C. Sağlık Bakanlığı Türkiye Halk Sağlığı Kurumu. Türkiye Kalp ve Damar Hastalıkları Önleme ve Kontrol Programı, Eylem Planı (2015-2020). Accessed May 2, 2024. https://tkd.org.tr/TKDData/Uploads/files/Turkiye-kalp-ve-damar-hastaliklari-onleme-ve-kontrol-programi.pdf
3. İbrahimoğlu Ö, Gezer N, Öğütlü Ö. Mobilization levels of cardiac surgery patients in the early postoperative period. *Dubai Med J*. 2023;6(1):20-27. [CrossRef]
4. Kavlak T. Determination of Preoperative Respiratory, Bed Exercise and Mobilization Training Effects on Postoperative Pain and Mobilization Level [Dissertation]. Sağlık Bilimleri Üniversitesi; 2017.
5. Lordello GGG, Gama GGG, Rosier GL, de Carvalho Viana PAD, Correira LC, Ritt LEF. Effects of cycle ergometer use in early mobilization following cardiac surgery: a randomized controlled trial. *Clin Rehabil*. 2020;34(4):450-459. [CrossRef]
6. Yayla A, Özer N. Effects of early mobilization protocol performed after cardiac surgery on patient care outcomes. *Int J Nurs Pract*. 2019;25(6):e12705. [CrossRef]
7. Bulut A. Determination of Factors Affecting Early Mobilisation of Patients Who Have Undergone Knee and Hip Arthroplasty [Dissertation]. Bursa Uludağ University; 2019.
8. von Elm E, Altman DG, Egger M, et al. The strengthening the reporting of observational studies in epidemiology (STROBE) statement: guidelines for reporting observational studies. *Int J Surg*. 2018;12(12):1495-1499. [CrossRef]
9. Mahmudova R, Donmez Y. Investigation of the factors affecting the standing conditions of patients after surgery. *Turk Klin J Nurs Sci*. 2019;11(1):1-6. [CrossRef]
10. Cohen J. *Statistical Power Analysis for the Behavioral Sciences*. 2nd ed. Routledge; 1988.
11. Faul F, Erdfelder E, Lang AG, Buchner A. G*Power 3: a flexible statistical power analysis program for the social, behavioral and biomedical sciences. *Behav Res Methods*. 2007;39(2):175-191. [CrossRef]
12. Hodgson C, Needham D, Haines K, et al. Feasibility and inter-rater reliability of the ICU Mobility Scale. *Heart Lung*. 2014;43(1):19-24. [CrossRef]
13. İbrahimoğlu Ö, Saray Kılıç H, Açıkgöz G. The Turkish adaptation, validity and reliability of Intensive Care Unit Mobility Scale: a methodological study. *Turk Klin J Nurs Sci*. 2022;14(1):20-25. [CrossRef]
14. Ghasemi A, Zhediasl S. Normality tests for statistical analysis: a guide for non-statisticians. *Int J Endocrinol Metab*. 2012;10(2):486-674. [CrossRef]
15. Dığın F, Karabiber M. Determination of anxiety and depression levels and affecting factors in patients who will have coronary artery bypass graft surgery. *Gevher Nesibe J Med Health Sci*. 2023;8(4):1070-1078.
16. Doğu Ö. Meeting the needs of education and training in patients with planned surgery preparation psychological effects of individual patient-Sakarya sample. *Düzce Univ Sağlık Bilim Enstit Derg*. 2013;3(3):10-13.
17. Wang J, Xiao Q, Zhang C, Jia Y, Shi C. Intensive care unit nurses' knowledge, attitudes, and perceived barriers regarding early mobilization of patients. *Nurs Crit Care*. 2020;25(6):339-345. [CrossRef]
18. Schallom M, Tymkew H, Vyers K, et al. Implementation of an interdisciplinary AACN early mobility protocol. *Crit Care Nurse*. 2020;40(4):7-17. [CrossRef]
19. Mohan S, Patodia S, Kumaravel S, Venkataraman R, Vijayaraghavan BKT. Improving mobility in critically ill patients in a tertiary care ICU: opportunities and challenges. *Indian J Crit Care Med*. 2021;25(1):34-42. [CrossRef]
20. Benjamin E, Roddy L, Giuliano KK. Management of patient tubes and lines during early mobility in the intensive care unit. *Hum Factors Healthc*. 2022;2:1-6. [CrossRef]
21. Freeman R, Koerner E. Instituting a standardized mobility aid in the cardiovascular intensive care unit. *Crit Care Nurs Q*. 2018;41(3):289-296. [CrossRef]
22. Volmann KM. Understanding critically ill patients' hemodynamic response to mobilization: using the evidence to make it safe and feasible. *Crit Care Nurs Q*. 2013;36(1):17-27. [CrossRef]
23. Gözüküçük R, Kula Şahin S. The Effect of Using Guide for Early Standing in the Surgical Intensive Care Unit on Bowel Movements, Hemodynamic Measurement, Comfort and Fatigue Level. [Master's Thesis]. İstinye Üniversitesi Sağlık Bilimleri Enstitüsü; 2021.
24. Saraçoğlu A, Ezelsoy M, Saraçoğlu K. The impact of preoperative anemia in patients undergoing cardiac surgery. *Kocaeli Med J*. 2020;9(3):93-99. [CrossRef]
25. Schujmann DS, Gomes TT, Lunardi AC, et al. Impact of a progressive mobility program on the functional status, respiratory, and muscular systems of ICU patients: a randomized and controlled trial. *Crit Care Med*. 2020;48(4):491-497. [CrossRef]
26. Tymkew H, Sledge JA, Vyers K, Arroyo C, Schallom M. One year post-discharge outcomes after implementation of an ICU early mobility protocol. *Dimens Crit Care Nurs*. 2022;41(4):209-215. [CrossRef]
27. dos Santos Moraes TL, de Farias JMF, Rezende BS, et al. Limited mobility to the bed reduces the chances of discharge and increases the chances of death in the ICU. *Clin Pract*. 2021;12(1):8-16. [CrossRef]
28. Şenduran M, Genç A, Akan M, Günerli A. Effects of mobilization on hemodynamic and respiratory responses in critically ill patients. *Fizyoter Rehabil*. 2012;23(1):3-9.
29. Genç A, Özyürek S, Koca U, Günerli A. Respiratory and hemodynamic responses to mobilization of critically ill obese patients. *Cardiopulm Phys Ther J*. 2012;23(1):14-18. [CrossRef]
30. Cassina T, Putzu A, Santambrogio L, Villa M, Licker MJ. Hemodynamic challenge to early mobilization after cardiac surgery: a pilot study. *Ann Card Anaesth*. 2016;19(3):425-432. [CrossRef]
31. Yava A, Koyuncu A, Pusat N, Yıldırım V, Demirkılıç U. Invasive and noninvasive procedures performed in the cardiac surgical intensive care and postoperative pain. *GKDA Derg*. 2013;19(4):184-190. [CrossRef]
32. Sidar A, Dedeli Ö, İşkesen Aİ. The relationship between anxiety, pain distress and pain severity before and after open heart surgery in patients. *Yoğun Bakım Derg*. 2013;4:1-8. [CrossRef]
33. Akbari M, Celik SS. The effects of discharge training and counseling on post-discharge problems in patients undergoing coronary artery bypass graft surgery. *Iran J Nurs Midwifery Res*. 2015;20(4):442-449. [CrossRef]
34. Linke CA, Chapman LB, Berger LJ, et al. Early mobilization in the ICU: a collaborative, integrated approach. *Crit Care Explor*. 2020;2(4):1-8. [CrossRef]