A Retrospectively Analysis of Patients Who Had Long Hospital Stay After Cardiovascular Surgery

Kardiyovasküler Cerrahi Sonrası Uzun Süreli Hastanede Kalan Hastaların Geriye Dönük Analizi

Sevim ÇELİK,[a]
Selma GÜRKAN,[b]
Ali Ekrem KÖNER,[c]
Yıldız ATILGAN,[d]
Ebru ŞEN[d]

[a]Zonguldak Karaelmas University,
Zonguldak School of Nursing, Zonguldak
[b]Division of Chief Nursery of
Intensive Care Unit,
[d]Division of Directory of Nursery,
German Hospital, İstanbul
[c]Department of Cardiovascular Surgery,
Gaziosmanpaşa University
Faculty of Medicine, Tokat

Yazışma Adresi/Correspondence:
Sevim ÇELİK
Zonguldak Karaelmas University,
Zonguldak School of Nursing,
Zonguldak,
TÜRKİYE/TURKEY
sevimakcel@yahoo.com

ABSTRACT Objective: Patients have been discharged from the hospital within four to eight days af-
ter cardiovascular surgery in recent years. The aim of this study was to determine demographic and
clinical features of patients who had long hospital stay after cardiovascular surgery. **Material and
Methods:** The study was conducted as a retrospective cohort study in a private hospital in Turkey. The
sampling group was composed of 53 of total 473 patients admitted to the hospital between January
and December 2006. Patients were hospitalized for nine days and more, and those over 18 years of
age were included into the study. The records of this study group were retrospectively investigated
to data of patients including demographic characteristics, history, laboratory values, patient diagno-
sis and surgery interventions. Data were evaluated using regression and chi-square tests. **Results:** Me-
an age rate of the patients was 59.3, 64.2% of them were male, and 90.6% had prior elective
operations. Of the patients, 67.9% were obese (BMI ≥ 30kg/m2), 62.3% had coronary artery disease,
56.6% had coronary artery bypass graft surgery, 62.3% had hypertension, and 28.3% had chronic
obstructive pulmonary disease. The mean length of hospitalization was 13.53 ± 10.16 days. The me-
an stay in the intensive care unit was 2.87 ± 2.95 days. The most complications developing postope-
ratively in patients were atrial fibrillation (47.2%), ventricular insufficiency (32.1%), renal
insufficiency (18.9%), ventricular arrhythmia (17%), pneumothorax (9.4%), cardiac tamponade
(7.5%) and respiratory problems (5.7%) **Conclusion:** The results of this study provide detailed infor-
mation regarding demographic and clinical features of patients who had long hospital stay after car-
diovascular surgery.

Key Words: Cardiovascular surgical procedures; complications; hospitalization

ÖZET Amaç: Son yıllarda, kardiyovasküler cerrahi sonrası hastalar dört ila sekiz gün içinde hasta-
neden taburcu edilmektedir. Bu çalışmanın amacı, kardiyovasküler cerrahi sonrası uzun süreli has-
tanede kalan hastaların demografik ve klinik özelliklerini belirlemektir. **Gereç ve Yöntemler:**
Çalışma, Türkiye'deki özel bir hastanede geriye dönük kohort çalışma olarak yapılmıştır. Örneklem
kapsamına Ocak ve Aralık 2006 tarihleri arasında hastaneye kabul edilen toplam 473 hastanın 53'ü
alınmıştır. Dokuz gün ve üzerinde hastanede yatan hastalar ve 18 yaşın üzerindeki hastalar örnek-
leme dahil edilmiştir. Hastaların demografik özelliklerini, öyküsünü, laboratuvar değerleri, hasta-
nın tanısını ve cerrahi girişimleri içeren kayıtları incelenmiştir.Veriler, regresyon ve ki-kare testleri
kullanılarak değerlendirilmiştir. **Bulgular:** Hastaların ortalama yaşı 59.3, %64.2'si erkektir. Hasta-
ların %90.6'sı elektif cerrahi girişim geçirmiştir. Hastaların %67.9'u (BMI ≥ 30kg/m2) obez, %62.3'ü
koroner arter hastasıdır ve %56.6'sı koroner arter bypass greft cerrahisi geçirmiştir. Hastaların
%62.3'ü hipertansiyon hastalığına ve %28.3'ü kronik obstrüktif akciğer hastalığına sahip bulun-
maktadır. Hastaların hastanede ortalama kalış süresi 13.53 ± 10.16 gündur. Hastaların yoğun ba-
kım ünitesinde kalış süresi ortalama 2.87 ± 2.95 gündur. Hastalarda ameliyat sonrası en yaygın
problemler atrial fibrilasyon (%47.2), ventriküler yetmezlik (%32.1), renal yetmezlik (%18.9), ven-
triküler aritmi (%17), pnömotoraks (%9.4), kardiyak tamponad (%7.5) ve solunum problemleriydi
(%5.7). **Sonuç:** Bu çalışma, kardiyovasküler cerrahi girişim sonrası uzun süreli hastanede kalan has-
taların demografik ve klinik özellikleri ile ilgili ayrıntılı bilgi sağlamaktadır.

Anahtar Kelimeler: Kardiyovasküler cerrahi prosedürler-girişimler;
komplikasyonlar; yataklı tedavi

It is estimated that every year, more than one million people throughout the world undergo cardiac surgical procedures because of cardiovascular diseases.[1,2]

Cardiovascular surgical techniques have advanced in parallel with technology. However, in spite of the developments, surgical techniques, some situations resulting from patients and health care professionals also bring several risks for the development of complications in postoperative period. So as to decrease the rate of negative patient outcomes, rapid treatment and care practices have begun being accepted as the gold standard, and patients have been discharged from the hospital within four to eight days.[1,3,4]

In previous studies, it was reported that patients with atrial fibrillation, ventricular insufficiency, sternal wound infection, respiratory insufficiency, neurologic insufficiency, undergoing complex cardiac surgical procedures and being readmitted to intensive care units (ICU), chronic illness, and advanced age after cardiac surgical procedures had longer hospital stay. [2-13]

Based on all these data, this study was conducted to investigate the demographic and clinical features of patients who had long hospital stay after cardiovascular surgery in a private hospital.

MATERIAL AND METHODS

STUDY DESİGN

The study was conducted in a private hospital in Turkey. Retrospective cohort approach was used in the study. The sample consisted of 53 of total 473 patients admitted between January and December 2006 due to a cardiovascular surgical intervention. Length of hospital stay in all patients was nine or more days. Pediatric patients were excluded from the study, and the patients solely over 18 years of age were included.

DATA COLLECTİON

Data of 53 patients participated in the study were obtained from the medical records, laboratory files and follow-up cards. The records of this study group were retrospectively reviewed to data in-

cluding the patients' demographic characteristics, obesity status as body mass index (BMI), preoperative diagnoses, presence of chronic illness, creatinine, hemoglobin and hematocrit levels, status of cigarette use, diseases present on admission, how the surgery was performed, type of the surgery, length of the surgery, anesthesia administered, extra corporal circulation (ECC), length of the stay in ICUs, length of mechanical ventilation, and complications developed postoperatively.

ROUTİNE PROCEDURES IMPLEMENTED İN THE HOSPİTAL FOR CARDİOVASCULAR SURGERY

All surgical patients admitted to the hospital were examined by a cardiologist then cardiovascular on admission, and cardiologic intervention was decided to be performed. The patients were operated on elective or emergent conditions in collaboration with an anesthesiologist. All patients stayed in ICU for at least one day. Patients were hemodynamically stable, without bleeding, and those with normal blood gas values were separated from the mechanical ventilator as early as possible. Patients with normal hemodynamic parameters were transferred to clinics in consultation with ICU nurses, and ameliorated ones were routinely discharged from the hospital within five to eight days.

DATA ANALYSİS

Descriptive statistical methods of one way analysis of variance and Chi square tests were used in order to compare demographic data and measurement results of the patients in the SPSS packet program. The results were evaluated at a confidence interval of 95% and a significance level of $p < 0.05$.

ETHİCAL PERMİSSİON

Permission was obtained from the hospital administration. Anonymity of the patients and hospital were guaranteed. Approval by an ethics committee and informed consent from patients was not deemed necessary for this retrospective analysis.

RESULTS

The mean age rate for all patients was 59.83±12.03 (range 20-84) years in the retrospective cohort study. The cardiac surgical procedure was elective

for 90.6% of the patients. Of the patients, about 64.2% were male, 67.9% were obese (BMI³30kg/m²), and 43.4% were active cigarette smokers in the preoperative period. Seven and a half percent had high creatinine values, 35.8% had low hemoglobin and 58.5% had low hematocrit levels (Table 1).

Patients admitted to the hospital for a cardiac problem were also frequently found to display hypertension (62.3%), diabetes (24.5%), chronic obstructive pulmonary disease (COPD) (28.3%) and cerebrovascular insufficiency (11.3%) (Table 1). About 46.6% of COPD patients had smoked before surgery.

Prior to surgery, 62.3% of the patients had coronary artery disease (CAD), 18.8% had a valvular problem, 5.6% had CAD with another pathalogy (CAD + mitral and tricuspid valve insufficiency, thrombus in left atrium), and 5.6% had a problem with a prosthetic valve (endocarditis and prosthetic valve thrombosis) (Figure 1).

Of the patients, 56.6% were exposed to CABG surgery, 13.2% to a complex surgical procedure (Of 6 patients, 2 had CABG with mitral valve replacement, 1 CABG with Benthall, 1 CABG with left ventricular aneursmectomy, 1 CABG with carotis endarterectomy and patch plasty, 1 CABG with aortic valve replacement and aortic root enlargement.), 24.5% to a valvular replacement, 5.7% to surgery of ascending aorta (Figure 2). Patients with surgery of ascending aorta had the longest hospital stay (34 days) (p< 0.05).

Mean anesthesia time in these patients was 233.92±64.73 minutes, their mean time related to staying on pump was 89.19 ± 38.57 minutes, and mean time for the surgical procedure was 202.26 ± 63.87 minutes.

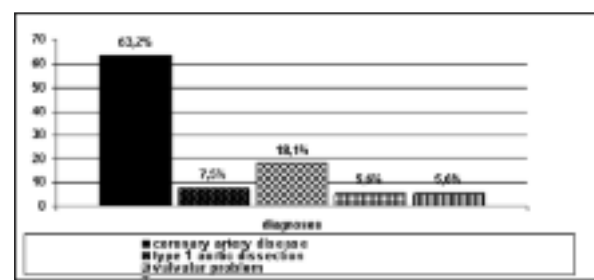The mean length of hospital stay of all patients in this study group was 13.53±10.16 (median 10.0)

TABLE 1: Characteristics of patients		
Characteristics of Patients	**n**	**%**
Female	19	35.8
Male	34	64.2
Obesity(BMI ≥ 30kg/m2)	36	67.9
Preoperative active cigarette smoking status	23	43.4
Preoperative laboratory values		
Creatinine		
Normal	49	92.5
High	4	7.5
Hemoglobin		
Normal	34	64.2
Low	19	35.8
Hemotocrit		
Normal	22	41.5
Low	31	58.5
Problems present preoperatively		
Diabetes	13	24.5
Hypertension	33	63.2
Chronic obstructive pulmonary disease	15	28.3
Cerebrovascular insufficiency	6	11.3
Peripheral artery disease	1	1.9
Cardiac insufficiency	3	5.7
Myocardial infarction	3	5.7
Type of Surgery		
Emergency	5	9.4
Elective	48	90.6
Revision	6	11.3
	Mean	**SD**
Length of mechanical ventilation (hours)	18.25	4.38
Length of time for drain (days)	2.70	1.76
Length of stay in ICU (days)	2.87	2.95
Length of stay after taken back to ICU(days)	4.70	1.10
Length of hospitalization (days)	13.53	10.16

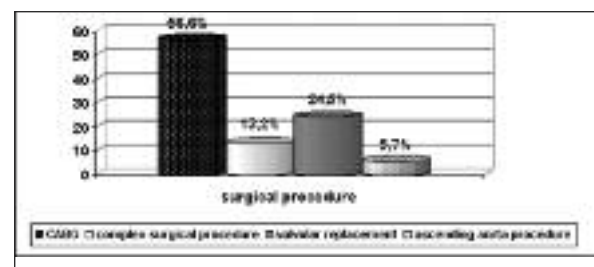**FIGURE 1:** Patient's preoperative diagnoses.

FIGURE 2: Patient's surgical procedure.

days. In the postoperative period, all the patients were transferred to ICU. Their stay in ICU was mean 2.87 ± 2.95 days (ranging from 1 to 19 days), and the patients in ICU required mean 18.25 ± 4.38 hours (range 10-35 hours) of mechanical ventilation support. After transferring to the ward, 8 patients (15.1%) were readmitted to ICU, and these patients stayed in ICU over mean 4.70 ± 1.10 days (ranging between 1 and 8 days) and were discharged after mean 20 days from the hospital (Table 1).

Patients with a chronic illness, such as diabetes, hypertension and COPD had longer ICU stay (mean rate, 4.64 ± 2.14 days) and were readmitted to ICU ($p < 0.05$). The rate of hospital stay in patients over 65 years old was 10 days or longer; however, the difference was found to be statistically insignificant.

The most common problems developing postoperatively in patients were atrial fibrillation (47.2%), ventricular insufficiency (32.1%), renal insufficiency (18.9%), ventricular arrhythmia (17%), pneumothorax (9.4%), cardiac tamponade (7.5%) and respiratory problems (5.7%) (Figure 3).

Patients were transferred back to ICU from the ward for monitoring after revision (25%), for anuria and hypotension (37.5%), ventricular tachycardia (12.5%), cerebrovascular attack (12.5%) and respiratory insufficiency (12.5%) (Figure 4).

DISCUSSION

Rapid treatment and care practices have begun being accepted as the gold standard, and patients have been discharged from the hospital within four to eight days after cardiovascular surgery in recent years. However, routine discharge procedures take place on 8th day following cardiac surgical procedures at private hospital. In this retrospective cohort study, of the 473 patients undergoing a cardiovascular surgery, 11.2% had a prolonged hospital stay with mean 13.53 ± 10.16 days. In similar studies, it has been reported that 5-37% of patients after the performance of a cardiac surgery have prolonged hospital stay beyond 7 days up to 14 days.[4,14,15]

There is a direct correlation between demographic and the preoperative clinical features of patients undergoing a cardiovascular surgery and the length of time for recovery in the postoperative period. In several previous researches, it has been emphasized that the preoperative presence of diabetes, advanced age, decreased left ventricular ejection fraction, cerebrovascular insufficiency, renal problems, COPD, and active cigarette smoking have an effect on the developments of various risks of postoperative complications, prolonged hospital stay and increased mortality rate.[3,16-19] Our study finding is that patients had chronic illnesses such as cerebrovascular insufficiency, diabetes, hypertension and COPD, were also obese and active cigarette smoking.

In two different studies, Tamis and Steinberg,[3] and Lazar et al.[4] similarly reported that patients undergoing complex cardiac surgical procedures had longer hospital stay ranging from 13.2 to 21 days. In another study, patients undergoing valve replacement therapy had longer hospital stay than CABG patients.[20] Similarly, in our study, patient were undergone a complex surgical procedures
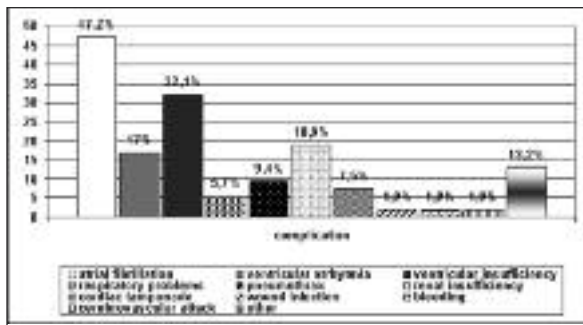

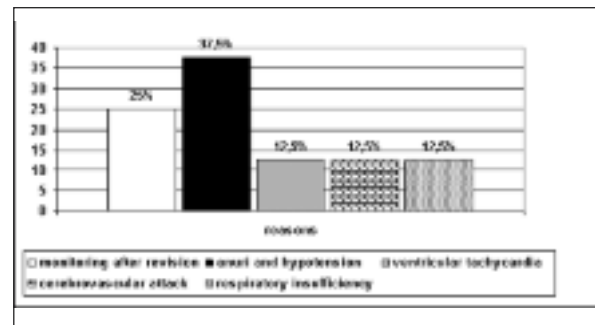**FIGURE 3:** Postoperative complications

FIGURE 4: Reasons for admission to ICUs

(CABG with valvular surgery and additional procedure).

It is the standard procedure for patients undergoing cardiac surgical procedures to be transferred to ICUs postoperatively. However, Heimrath et al. [5] stated that staying in ICU for more than 48 hours after CABG surgery plays a significant role in the possibility of the patients' need to be readmitted to ICUs and in prolonging hospital stay. They also reported that mean length of hospital stay in these patients was 11 days (ranging from 7 to 18 days). Among the findings of the current study, it was determined that patients who had stayed more than 48 h in ICUs were experienced longer stays more than 9 days in the hospital. Bardell et al.[8] also determined that the most frequent reasons why patients are readmitted to ICU are respiratory insufficiency, cardiac problems, such as cardiac arrest, arrhythmia, bleeding, hypotension, and sepsis. It was determined that the findings that 15.1% of the patients were readmitted to ICU were in parallel with those in the study performed by Bardell et al.[8] Similarly, in our study, patients with a chronic illness, such as diabetes, hypertension and COPD had longer ICU stay (mean rate, 4.64 ± 2.14 days) and were readmitted to ICU (p< 0.05).

In the current study, the most complications developing postoperatively in patients were atrial fibrillation, ventricular insufficiency, respiratory problems, and renal insufficiency. In recent studies, the most common problems, such as atrial fibrillation, arrhythmia, respiratory insufficiency, renal insufficiency, prolonged mechanical ventilation, pneumonia, cerebrovascular attack, wound infection, sepsis, endocarditis, renal insufficiency, neurologic disorders, and myocardial infarction were determined to be influential in hospital staying of the patients for longer than seven days and in mortality rate in the postoperative period.[2,3,12,14,21,22] In a study by Tamis and Steinberg [3] with 216 CABG patients, the most common postoperative complication was atrial fibrillation, and only this complication caused hospital stay of the patients to become longer by 3.2 +/- 1.7 days, meaning average 9 days longer hospital stay. In researches in the literature related to the causes of complications developing in the postoperative period, attention has been focused on the roles played by the factors, such as advanced age, stroke, infection, and hemodynamic instability.[3,10,12,18,19,23]

CONCLUSION

The results of this study provide detailed information regarding demographic and clinical features of patients who had long hospital stay after cardiovascular surgery. The results can have a positive effect on early recognition of complications and initiation of treatment and care interventions without delay and shortening length of hospital stay.

REFERENCES

1. McSweeney ME, Garwood S, Levin J, Marino MR, Wang SX, Kardatzke D, et al. Adverse gastrointestinal complications after cardiopulmonary bypass: Can outcome be predicted from preoperative risk factors ?. Anesth Analg 2004; 98(6): 1610-17.

2. Naughton C, Prowroznyk A, Feneck R. Reasons for prolonged hospital stays following physician's own decision heart surgery. British Journal of Nursing 1999; 8(16):1085-7.

3. Tamis JE, Steinberg JS. Atrial fibrillation independently prolongs hospital stay after coronary artery bypass surgery. Clin Cardiol 2000; 23(3): 155-9.

4. Lazar HL, Fitzgerald C, Gross S, Heeren T, Aldea GS, Shemin RJ. Determinants of length of stay after coronary artery bypass graft surgery. Circulation 1995; 92(9): 20-24.

5. Heimrath OP, Buth KJ, Legare JF. Long-term outcomes in patients requiring stay of more than 48 hours in the intensive care unit following coronary bypass surgery. Journal of Critical Care 2007; 22(2): 153-58.

6. Fujii H, Kitazawa Y, Saito F, Tsuda M, Yabuki T, Kajimoto S. Return to home early days after acute aortic dissection surgery. Minerva Chi 2006; 61(6): 509-14.

7. Orenstein A, Kachel E, Zuloff-Shani A, Paz Y, Sarig O, Haik J, et al. Treatment of deep sternal wound infections post-open heart surgery by application of activated macrophage suspension. Wound Repair and Regeneration 2005; 13(3): 237-42.

8. Bardell T, Legare JF, Buth KJ, Hirsch GM. Ali IS. ICU readmission after cardiac surgery. European Journal of Cardio-thoracic Surgery 2003; 23(3): 354-59.

9. Hoefer D, Ruttmann E, Riha M, Schobersberger W, Mayr A, Laufer G, et al. Factors influencing intensive care unit length of stay after surgery for acute aortic dissection type. A. Ann Thorac Surg 2002; 73(3): 714-8.

10. Brantman L, Howie J. Use of amiodarone to prevent atrial fibrillation after cardiac surgery. Critical Care Nurse 2006; 26(1): 48-58.

11. Auer J,Weber T,Berent R, Ng CK,Lamm G, Eber B.Postoperative atrial fibrillation independently predicts prolongation of hospital stay after cardiac surgery. J Cardiovasc. Surg. (Torino) 2005; 46(6): 583-8.

12. Hilleman DE, Hunter CB, Mohiuddin SM, Maciejewski S. Pharmacological management of atrial fibrillation following cardiac surgery. Am J Cardoivasc Drugs 2005; 5(6): 361-69.

13. McKhann GM, Grega MA, Borowicz LM, Baumgartner WA Selnes OA. Stroke and encephalopathy after cardiac surgery: an update. Stroke 2006; 37(2): 562-71.

14. Toumpoulis IK, Anagnostopoulos CE, Swistel DG, DeRose JJ. Does euroscore predict length of stay and specific postoperative complications after cardiac surgery?. Eur J Cardiothorac Surg 2005; 27(1): 128-33.

15. Peterson ED, Coombs LP, Ferguson TB, Shroyer AL, DeLong ER, Grover FL, et al. Hospital variability in length of stay after coronary artery bypass surgery: results from the Society of Thoracic Surgeon's National Cardiac Database. Ann Thorac Surg 2002; 74(2): 464-473.

16. Kandemir Ö, Büyükateş M, Turan A, Ceylan E, Kurt T, Doğan S, et al. [The results of coronary artery bypass surgery in a region with a high incidence of chronic obstructive pulmonary disease]. Türk Göğüs Kalp Damar Cerr Der 2007;15(2): 113-17.

17. Kiriş İ, Gülmen Ş, Tekin İ, Okutan H. 3Effect of diabetes mellitus on short-term morbidity and mortality in coronary artery bypass surgery8. SDÜ Tıp Fak Derg 2006; 13 (1): 16-21.

18. Halpin LS, Barnett SD.Preoperative state of mind among patients undergoing CABG: effect on length of stay and postoperative complications. J Nurs Care Qual 2005; 20(1): 73-80.

19. Okutan H, Yavuz T, Kınay O, Düver H, Ulusan V, Öcal A, et al. [Outcomes of open heart surgery in elderly patients]. Geriatri 2001; 4(4):146-51.

20. Tripp HF, Obney JA, Febinger DL, Lisagor PG, Cohen DJ. Differences in length of stay between coronary bypass and valve procedures. Mil Med 2002; 167 (2):109-12.

21. Auer J, Weber T, Berent R, Ng CK, Lamm G Eber B. Risk factors of postoperative atrial fibrillation after cardiac surgery. J Card Surg 2005; 20(5): 425-31.

22. Kızıltepe U, Eryılmaz S, Şırlak M, Yazıcıoğlu L, Kaya K, Durdu S, et al. [The use of magnesium as an antiarrthymic agent for the patients undergoing open heart surgery: the effect of blood levels]. Turkiye Klinikleri J Cardiovascular Surgery 2001;2(3):113-19.

23. Perez-Vela JL, Ramos-Gonzales A, Lopez-Almodovar LF, Renes Carreno E, Escriba-Barcena A, Rubio- Regidor M, et al. Neurologic complications in the immediate postoperative period after cardiac surgery: role of brain magnetic resonance imaging. Rev Esp Cardiol 2005; 58(9): 1014-21.

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