Long-term assessment of coronary care unit patient profile and outcomes: analyses of the 12-years patient records

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Background/aim: The aim of this study was to determine the patient profile, treatment, and outcomes of a coronary care unit (CCU) by retrospective screening of 12-year patient records.

Materials and methods: The data of 13,463 patients admitted to the CCU of a tertiary referral hospital between 1 January 1997 and 30 June 2008 were collected. The patients were assessed with respect to demographics, admission diagnosis, treatment, and outcomes.

Results: The mean age of patients was 61 ± 13 years (66.7%, male). While the diagnosis of acute coronary syndrome (ACS) accounted for 65%, the rate of ST elevation myocardial infarction (STEMI) was 43.4%. Thrombolytic therapy was administered to 48.7% of the patients with STEMI. Systolic heart failure was the most frequent disease (11.9%) among the non-ACS diagnoses. The mortality rate of the CCU was 12.7% on average; it increased gradually after 2005 when the CCU became a general intensive care unit.

Conclusion: This study is one of the largest comprehensive analyses of patient profile and outcomes of a CCU. Despite advances in the diagnosis and treatment of cardiac emergencies, the mortality rate of the CCU was high. Serving as a general intensive care unit, the absence of a coronary angiography laboratory and lower use of thrombolytic therapy for STEMI might be responsible factors.

Key words: Coronary care units, demographic analyses, patient outcome, acute coronary syndrome, mortality

1. Introduction

Along with medical and technical developments, coronary care units (CCUs), established over the last 40 years, have emerged as one of the most important advances in the care of patients with acute coronary syndrome (ACS) and other cardiac emergencies (1,2). The key feature of these units is their ability to provide nonstop services 24 hours a day with experienced staff and advanced facilities. As CCUs became widespread, the mortality rates decreased from 30% to 5% approximately (1,3,4). Apart from ACS, cardiac diseases with hemodynamic instability and conduction disorders are also treated in these units (5–8).

The purpose of this study was to provide a comprehensive evaluation of the patient profile, treatment, and outcomes of patients admitted to the CCU of a tertiary referral hospital by retrospective screening of 12-year patient records.

2. Methods

We examined 13,463 consecutive admissions to the CCU from 1 January 1997 through 30 June 2008. The resulting data were obtained by screening the inpatient registration database of the CCU retrospectively. Patient demographics, main admission diagnosis, cardiovascular therapies, length of CCU stay, mortality rates, and discharge status from the CCU (transfer to a clinic, other intensive care units, or to another institution for coronary angiography) were recorded.

The cases were classified as ST elevation myocardial infarction (STEMI), non-ST elevation myocardial infarction (NSTEMI), and unstable angina pectoris (UAP) under the diagnosis of ACS. On the other hand, non-ACS diagnoses were classified as systolic heart failure, respiratory/cardiac arrest, AV block, bradycardia, atrial fibrillation, supraventricular tachycardia (SVT), ventricular tachycardia/ventricular fibrillation (VT/VF), and drug intoxication.

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2.1. Statistical analysis

Statistical analysis was performed using SPSS for Windows version 15.0 (SPSS Inc., Chicago, IL, USA). Normally distributed continuous data were expressed as mean ± standard deviation (SD) and categorical variables as percentages. Normally distributed independent variables of groups were evaluated by Student's t-test, whereas abnormally distributed independent variables were evaluated by the Mann–Whitney U test. Chi square and Fisher exact tests were used for the comparison of categorical data. Data were assessed at 95% confidence interval and a P value of <0.05 was considered statistically significant.

3. Results

The mean age of the patients was 61 ± 13 years and the mean length of stay in the CCU was 2.3 ± 1.7 days (Table 1). During the entire follow-up, the majority of the patients were male (66.7%); female patients were higher only in the drug intoxication group (Figure 1).

Acute coronary syndrome accounted for 65% of all CCU admissions. In this group, the proportions of STEMI and NSTEMI/UAP were 43.4% and 21.6%, respectively. While the annual rate of patients with STEMI decreased over the years, the rate of patients with NSTEMI/UAP increased, as demonstrated in Table 2.

Table 1. The annual distribution of admissions, mean age of the patients, and length of stay in coronary care unit.

Year	Admissions	Age	LOS in CCU
1997	904	59 ± 12.2	2.8 ± 1.7
1998	975	59 ± 12.7	2.5 ± 1.5
1999	985	60 ± 12.3	2.5 ± 1.7
2000	1051	61 ± 11.6	2.3 ± 1.4
2001	955	61 ± 11.8	2.4 ± 1.6
2002	1215	60 ± 12.3	2.3 ± 1.5
2003	1251	61 ± 12.4	2.3 ± 1.6
2004	1389	61 ± 13.0	2.0 ± 1.7
2005	1294	61 ± 14.2	2.1 ± 1.6
2006	1379	62 ± 14.7	2.2 ± 2.0
2007	1407	62 ± 15.0	2.0 ± 1.9
2008	658	65 ± 14.0	2.2 ± 1.5
Total	13,463	61 ± 13.2	2.3 ± 1.7

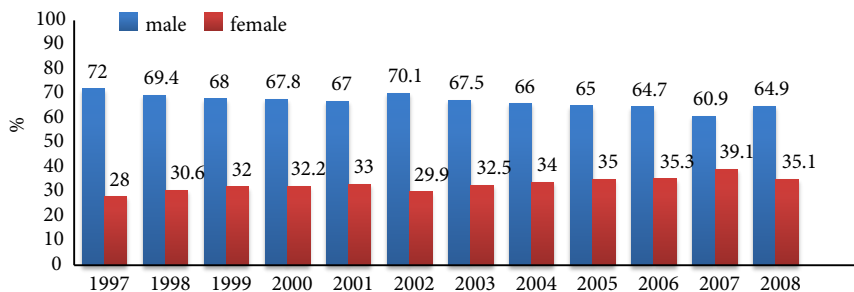CCU, coronary care unit; LOS, length of stay (days)

Figure 1. The annual distribution of patients according to sex.

Table 2. The annual distribution of the patients for acute coronary syndrome.

Year	ACS (%)	STEMI (%)	NSTEMI/UAP (%)
1997	75.3	59.6	15.7
1998	73.9	57.8	16.1
1999	70.8	54.2	16.6
2000	73.0	52.8	20.2
2001	66.9	50.6	16.3
2002	72.9	50.4	22.5
2003	74.9	47.8	27.1
2004	71.9	40.7	31.2
2005	58.4	32.9	25.5
2006	45.9	28.7	17.2
2007	41.8	22.2	19.6
2008	63.8	34.5	29.3
TOTAL	65.0	43.4	21.6

ACS, Acute coronary syndrome; NSTEMI, non-ST elevation myocardial infarction; STEMI, ST elevation myocardial infarction; UAP, Unstable angina pectoris

Among the non-ACS diagnoses, systolic heart failure (11.9%) was the most frequent, followed by respiratory/cardiac arrest (4.6%), AV block (3.7%), atrial fibrillation (2.3%), VT/VF (2.1%), drug intoxication (1.9%), bradycardia (1.8%), and SVT (1.4%).

Thrombolytic therapy with streptokinase (STK) (38.9%), tissue plasminogen activator (tPA) (9.2%), and urokinase (0.6%) was administered to 48.7% of patients with STEMI. During the study period STK was the most administered agent compared to other thrombolytics, and was increasingly used especially after 2003. Urokinase was administered in 1998 and 1999.

When the discharge status of patients from the CCU were examined, as shown in Figure 2, referral rates to other intensive care units or to other institutions for coronary angiography were found to have increased significantly over the years.

The average mortality rate in the CCU for the 12 years was 12.7%; it increased gradually after 2005. The average mortality rate was 10.3% before 2005 and 19.6% after 2005. The high mortality rates have a correlation with the rate of admissions to the CCU for respiratory/cardiac arrest in the same period (Figures 3 and 4).
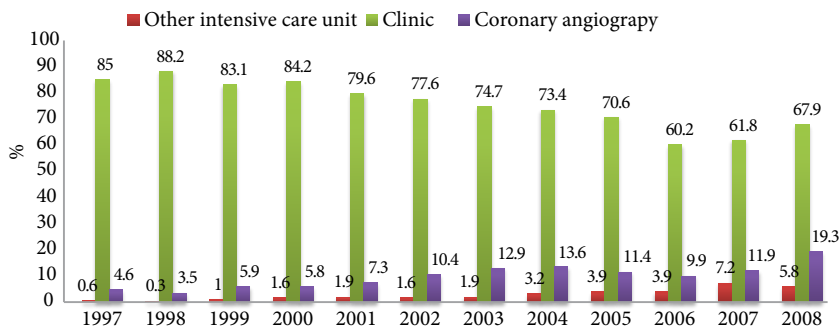

Figure 2. The discharge status of patients from coronary care unit by years (transferring to other intensive care units, clinics, or centers for coronary angiography).
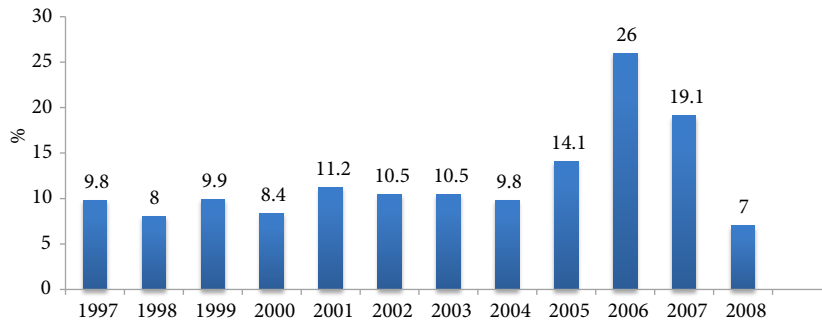
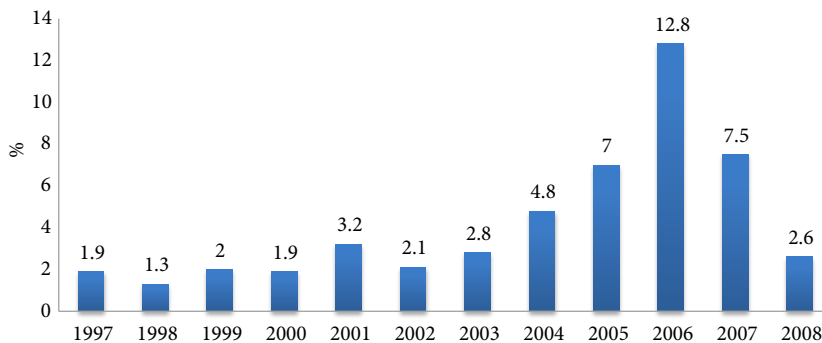**Figure 3.** The mortality rates in coronary care unit demonstrated by year.

Figure 4. The rate of admission diagnosis of patients with cardiac/respiratory arrest demonstrated by year.

4. Discussion

Our study is one of the largest comprehensive CCU evaluation studies, in which 13,463 patients were assessed over an extended period. Katz et al. (8) examined 29,275 patients admitted to the CCU of a tertiary care medical institution and reported long-term temporal trends in clinical characteristics, processes of care, and in-hospital outcomes. In the BLITZ-3 study (9), where the treatment and epidemiology of patients admitted to Italian CCUs were evaluated, 6986 patients were assessed over a 14-day period. There are few reports in our country regarding this issue; in one of them Yıldız et al. (10) reported the patient profile of 2041 patients between 1998 and 2002. When the demographic characteristics of our study population were examined, similar findings were achieved in terms of sex and mean age with previous reports (9–12).

The admission diagnosis of ACS (65%), mainly STEMI (43.4%), was the most common in our study. The Expanded GRACE study (11) enrolled 31,982 patients with ACS and 30% of patients were diagnosed with STEMI, 31% with NSTEMI, 26% with UAP, and the remaining 12% with another cardiac/noncardiac final diagnosis. Zobel et al. (13) reported the mortality and morbidity of the CCU in a university hospital. They found 29.8% of all patients were suffering from STEMI, 9.2% from NSTEMI, and 4.5%

from UAP. According to the data of the TUMAR study (14) conducted in our country, 220,000 patients with MI were hospitalized each year; STEMI constituted 100,000 (45.4%) of these hospitalizations. Another study in our country revealed that 79% of all admissions to a tertiary center CCU were for ACS, while STEMI accounted for 47% and NSTEMI for 32% (10).

Thrombolytic therapy was the only available reperfusion option for patients with STEMI because there was no coronary angiography laboratory in the hospital at that time. On average 48.7% of these patients received thrombolytic therapy. The first GRACE study, which covered between April 1999 and December 2000 with 11,543 patients, revealed a 65% rate of reperfusion therapy (thrombolytic or primary percutaneous therapy) in patients with STEMI (15). Recent large-scale studies also reported a reperfusion therapy of 60%–68% in these patients (9,11,16). STK (38.9%) was the most administered thrombolytic agent in our study, while tPA was used only for 9.2%, and urokinase was administered in 1998 and 1999, when the drug was available in this country. Although the relative differences of reperfusion success rates were known between thrombolytic agents, STK was used at a high rate because it was the most available thrombolytic agent in hospitals.

Despite the advances in the diagnosis and treatment of ACS and non-ACS cardiac emergencies in our country, the mortality rate of 12.7% was noticeably higher than that in studies conducted in other countries. In BLITZ-3 the mortality rate of CCU was 3.3%, while it was 5.6%–8% in other large-scale studies (8,9,12). There are very limited data regarding the mortality rate of CCU in this country. Yıldız et al. (10) found a rate of 9% in their study conducted in 2002.

We attribute the high mortality rate of the CCU primarily due to serving as a general intensive care unit because of the renovations within the hospital in 2006. The CCU was also a unit of the Department of Internal Medicine during the study period and besides cardiac emergencies, severe metabolic disturbances, acute respiratory failure, and drug intoxications were treated when necessary. Furthermore, during the same period of high mortality we observed an increased number of admissions with cardiac/respiratory arrest, suggesting a low rate of successful treatment of these patients. Finally, thrombolytic therapy was the only reperfusion option for patients with STEMI because there was no coronary angiography unit in the hospital and no invasive interventions could be performed. The patients who needed coronary angiography were transferred to other centers, after their acute treatment. Although cardiovascular disease was the most common cause of

mortality in this country during the period of our study, there were still few centers where revascularization could be performed in the early stages of ACS.

There are several limitations of this study. Firstly, the concomitant diseases of the patients were lacking in this report, because mostly the main admission diagnosis had been recorded in the inpatient registration database of the CCU. Therefore, data regarding coexisting diseases were inadequate to be reported here. Secondly, we demonstrated the overall mortality rate of the CCU, not the mortality rates for each admission diagnosis separately. Finally, our study represents the evaluation of a single, tertiary care center during the study period, and so our results may not be generalized to other hospitals in this country.

In conclusion, we performed a comprehensive, retrospective, and annual evaluation of a tertiary care center CCU. Despite advances in diagnosis and treatment of ACS and other cardiac emergencies, the overall mortality rate of the CCU was high in our study. The possible explanations were the CCU's serving as a general intensive care unit, the low rate of successful treatment for patients with arrest, the absence of a coronary angiography unit, and the use of thrombolytic agents at lower rates. We suggest comparative studies with multicenter data including the years in which coronary revascularization has become a widely available option in routine practice.

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