

ORIGINAL ARTICLE

Admissions to the Coronary Care Unit (CCU): Comparison With International Data

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KEY WORDS: prevalence of cardiac disease; acute myocardial infarction; heart failure; coronary care unit

ABBREVIATIONS:
CCU = cardiac care unit

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ABSTRACT

BACKGROUND: Cardiovascular diseases constitute the cardinal cause of death in the industrialized world, although a decrease in their mortality has been achieved during the last few years. Cardiac emergencies pose a significant hazard for the patient's life and need to be managed in a coronary care unit (CCU), which can provide intensive monitoring and safety to perform advanced invasive and non-invasive therapeutic maneuvers. Based on data derived from patients admitted to the CCU of our institution, we present a comparison against international data, in terms of the patients' basic epidemiological features.

PATIENTS AND METHODS: Epidemiological data from the patients admitted to the CCU of Evagelismos Hospital during the year 2007 were recorded and analyzed. Comparison with data available in the literature regarding CCU admissions in European and American hospitals was also performed.

RESULTS: In the CCU of our institution 529 patients were admitted and managed by the staff of the first department of cardiology in the year 2007. Forty-four per cent of them had suffered an ST-elevation acute myocardial infarction, 18% were admitted due to a non-ST-elevation myocardial infarction or unstable angina, 21% because of significant arrhythmias and in 17% the reason of admission was decompensated heart failure and/or pulmonary edema. The mean length of stay was 2.36 days. We found our data in agreement with other European reports although certain differences were noted in comparison with registries from the US, where heart failure prevails in admission diagnoses and there is a slightly longer duration of stay in the CCU.

CONCLUSION: The characteristics of the patients admitted in the CCU of a large Greek tertiary medical center are similar to those of the average European patients. On the other hand, CCU patients in the US have a somewhat different profile, which may in part reflect differences in the organization and delivery of health care services.

INTRODUCTION

In the beginning of the 20th century, cardiac diseases were responsible for less than

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10% of deaths worldwide. At the end of the same century, this percentage had risen to 45% in the developed countries, 55% in the economically emerging societies, while in the developing societies heart diseases accounted for 25% of all deaths. Interestingly, in the United States a 2.7% per year reduction of cardiac mortality was achieved during the past decade. It should be underlined however, that the rate of reduction was not uniform all over the country. In Europe, great variation exists among various countries regarding the magnitude and the time trend of mortality from cardiovascular disease. Eastern European countries present higher mortality rates than the westerners and the same is true for northerners compared to southerners. In Greece, according to the National Statistics Service, cardiac diseases constituted the leading cause of death over the past decade.¹

The cardiac care unit (CCU) of "Evangelismos" hospital in Athens, Greece accommodates more than 1000 patients with emergent cardiac conditions each year, which are medically managed by the personnel of the first and second departments of cardiology. Based on data derived from this population, we present a comparison against international data, in terms of the patients' basic epidemiological features.

PATIENTS AND METHODS

During the year 2007, 529 patients, the medical care of whom was rendered by the staff of the first Department of Cardiology, were hospitalized in the coronary care unit (CCU) of "Evangelismos" Hospital in Athens. Recorded variables comprised age, gender, admission diagnosis, hospitalization duration and final outcome. In order to be compared with recordings from other countries, our data were divided into three categories with respect to admission diagnosis, age-gender and days of hospitalization. The comparison was made with data from relevant studies conducted in Norway and USA and published in official medical journals.

RESULTS

In terms of admission diagnosis, 117 patients were listed as acute myocardial infarction, 56 patients as acute pulmonary edema, 49 patients as non-ST elevation myocardial infarction, 46 patients as unstable angina pectoris, 46 patients as atrio-ventricular block, 44 patients as heart failure, 39 patients as atrial fibrillation, 17 patients as ventricular tachycardia, 16 patients as electrical storm, 14 patients as valvular heart disease, 12 patients as heart attack or cardiogenic shock, 11 patients as chest pain, 9 patients as cardiomyopathy, 8 patients as dyspnea - orthopnea, 7 patients as pericarditis, 6 patients as syncope, 4 patients as digitalis intoxication, 4 patients as endocarditis, 4 patients as electrocution and 3 patients as aortic aneurysm.

Nine patients were admitted for non-cardiac disorders. Finally, 8 patients were admitted for intravenous administration of levosimendan due to intractable heart failure.

In order to accomplish a more accurate comparison with other countries' data, we finally maintained and evaluated the following cardiac diagnoses: acute myocardial infarction, non-ST elevation acute coronary syndrome, cardiac arrhythmias and heart failure.

As shown in Fig. 1, for the year 2007 the most frequent admission diagnosis in our CCU was acute myocardial infarction. According to a recent study conducted in the USA which included data from all hospitals of the country, heart failure was the most frequent CCU admission diagnosis (Fig. 2).² As it has been reported in the literature, variability exists among European countries regarding the frequency distribution of CCU admitting diagnoses. Recent statistical data for the

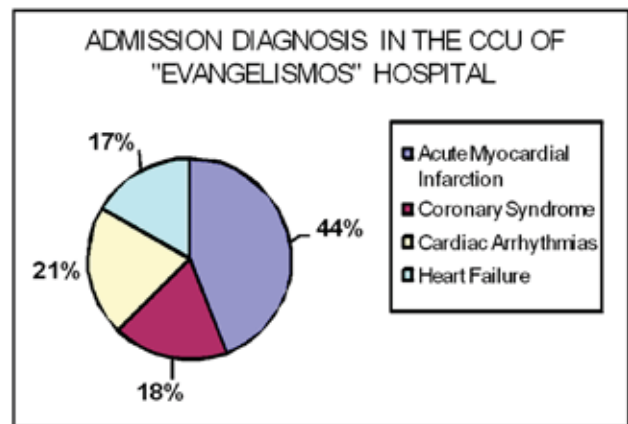


FIGURE 1. Distribution of admission diagnosis in the CCU of "Evangelismos" Hospital.

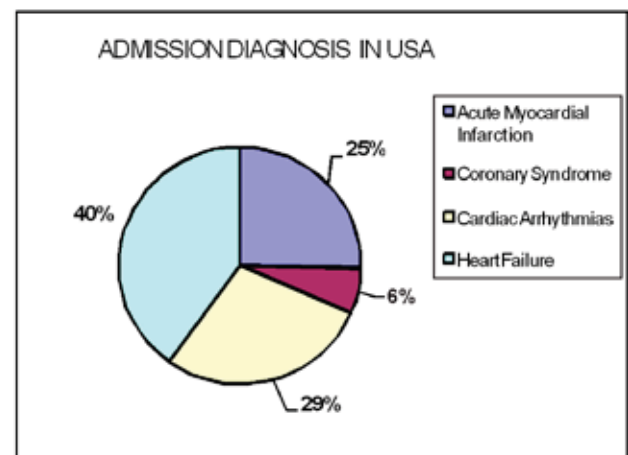


FIGURE 2. Admission diagnosis in USA.

most frequently recorded cardiac diagnoses from hospitals in Norway are presented in Fig. 3.³

Comparing the statistical data from USA and Norway with ours in terms of the admission diagnosis, we can clearly see that we are closer to the Norwegian data. The most frequent admission diagnosis is acute myocardial infarction with similar percentages. On the contrary, USA recordings differ significantly, with heart failure being the most frequent CCU admission diagnosis, while in the two European countries this clinical entity is represented by the lowest percentage (Fig. 4).

With regards to age and gender distribution, according to the literature cardiac diseases are mostly prevalent among middle-aged individuals with a sharp increase in their incidence after the fourth - fifth decade of life.⁴ Moreover, the difference between the two genders regarding the age distribution of cardiac diseases has been well recognized. Table 1 shows the distribution of patients hospitalized in our CCU with regards to the four main cardiac diagnoses as well as their gender and age. It can be clearly seen that cardiac disease appears in women 15-20 years later than in men. Nevertheless, for both

genders, the highest incidence is noted between the fifth and sixth decade of life. The proportion of men to women was 3 to 1 in our sample, and this finding strengthens the prevailing opinion that women are somehow more protected against cardiovascular disease (Fig. 5). Similar age and gender distributions can be derived from the US statistical data confirming that in the United States, the appearance of cardiac disease prevails in the middle-aged individuals and is more frequent in men as well.

The duration of hospitalization is a piece of information of cardinal importance due to both its medical and financial consequences. Cardiac disease constitutes an important cause of morbidity for the population and absorbs a high percentage of the allocated economic resources of countries' health system. The average length of stay in our CCU for the year 2007 was 2.36 days (Fig. 6). If we comparatively examine the average

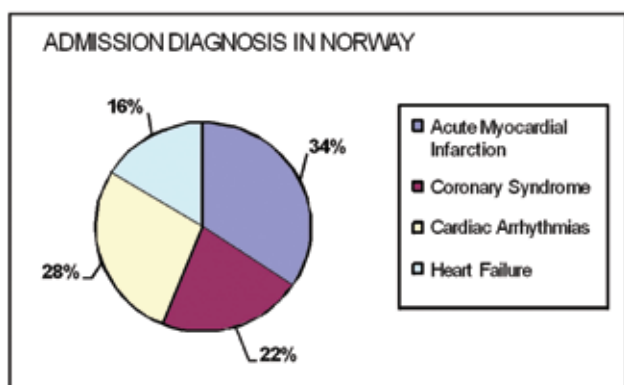


FIGURE 3. Admission diagnosis in Norway.

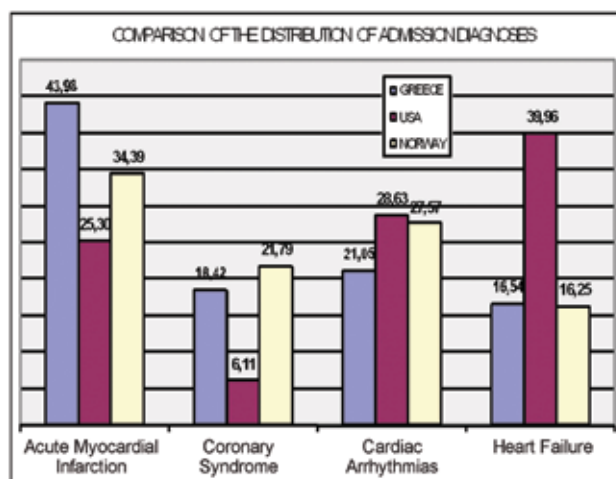


FIGURE 4. Comparison of the distribution of the 4 main cardiac diagnoses.

TABLE 1. Age and gender distribution for the 4 main diagnoses in the cardiac care unit (CCU)

| Diagnosis | Gender | Age | | | | | | |
|--|--------|-----|---------|---------|---------|---------|---------|-----|
| | | <30 | 30 - 39 | 40 - 49 | 50 - 59 | 60 - 69 | 70 - 79 | ≥80 |
| Acute Myocardial Infarction | Men | 1 | 3 | 10 | 22 | 22 | 20 | 5 |
| | Women | 0 | 0 | 4 | 3 | 7 | 14 | 7 |
| Non-ST-elevation Acute Coronary Syndrome | Men | 0 | 1 | 3 | 5 | 12 | 10 | 5 |
| | Women | 0 | 0 | 0 | 1 | 2 | 8 | 2 |
| Cardiac Arrhythmias | Men | 0 | 0 | 1 | 12 | 8 | 14 | 3 |
| | Women | 0 | 0 | 0 | 2 | 6 | 5 | 5 |
| Heart Failure | Men | 0 | 0 | 0 | 3 | 15 | 15 | 2 |
| | Women | 0 | 0 | 2 | 0 | 0 | 4 | 3 |

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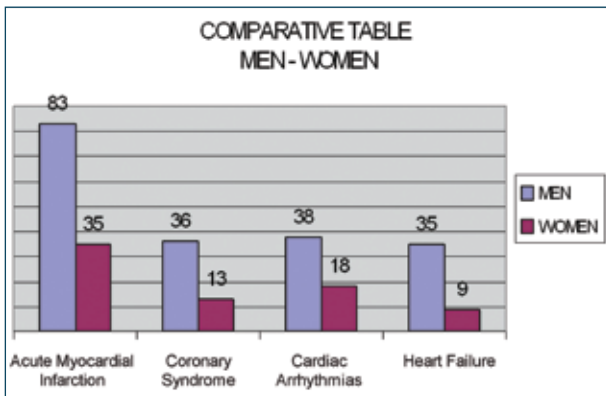


FIGURE 5. Men vs women in the 4 categories of cardiac disease.

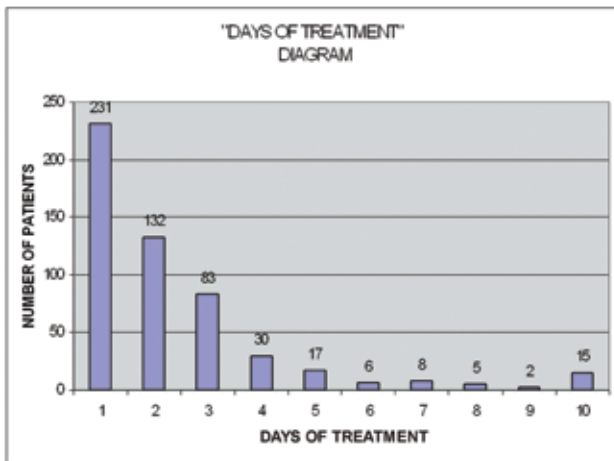


FIGURE 6. Days of hospitalization in our CCU.

number of days of treatment for patients in our CCU and in the USA, for the 4 main cardiac diseases under consideration, we realize that an average difference of 2 days exists (Fig. 7). The patients admitted to the CCU of "Evangelismos" Hospital seem to stay in the hospital 2 days less than the ones in the USA. This could be due to the widely used primary angioplasty for the treatment of acute myocardial infarction in our hospital. Ninety-nine out of the 118 patients (83.89%) hospitalized with acute myocardial infarction during the year 2007 were submitted to primary angioplasty. Nevertheless, we should keep in mind that we compare data from one cardiac care unit with those derived from a whole country where the availability of primary angioplasty is probably not homogenous.

A declining trend in in-hospital cardiac mortality has been internationally recognized. During the year 2007, 43 patients (8.12%) out of the 529 patients hospitalized in the CCU of "Evangelismos" Hospital succumbed to their disease. Eight of

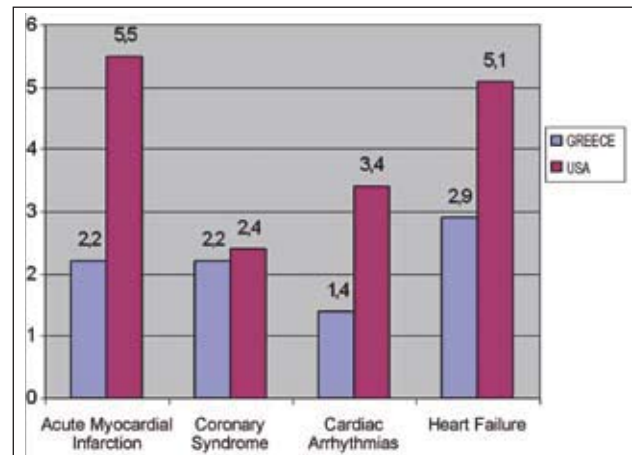


FIGURE 7. Average duration of hospitalization. Comparison with US data.

them (18.6%) were women. All deceased patients were older than 50 years of age and the majority were between 70 with 80 years old.

DISCUSSION

During the last decade some variability has been observed in terms of cardiac morbidity and mortality in various populations. Studying and comparing epidemiological data from these populations is important since it can add more insight into the pathogenesis of cardiac disease. We analyzed data derived from a sample of 529 patients admitted in the First Department of Cardiology of "Evangelismos" Hospital and hospitalized in the CCU. From the analysis it became clear that no important differences in comparison to international data exist in the rates of morbidity and mortality.

At the CCU of "Evangelismos" hospital and in hospitals of Norway, the most frequent admission diagnosis is acute myocardial infarction. In hospitals of the USA, the most frequent admission diagnosis is heart failure, while at "Evangelismos" hospital this diagnosis carries the smallest percentage among the admission diagnoses. Since the Greek population endorses the dietary and lifestyle standards of the Western way of life, heart failure prevalence should not be significantly different compared to that in the US. The low CCU bed availability in our country, however, may often require several patients with heart failure but relatively stable haemodynamically to be admitted to the common medical ward instead of the more intensively monitored environment of the CCU.

No significant difference arises in relation to age and gender. All studies reveal that heart diseases most frequently appear between the fifth and sixth decade of life and are more commonly encountered in men.

Of note, the average length of in-hospital stay in our Unit was shorter than the mean of all USA cardiac care facilities. In the USA, the duration of hospitalization was twice greater. A shorter stay in CCU of "Evangelismos" hospital is probably accomplished through the early invasive treatment of acute myocardial infarction and other heart diseases. It should be pointed out however that the statistical data from the US represent the whole of the health care system, which may be characterized by variable accessibility to catheterization laboratories and other advanced interventional cardiology facilities. Moreover, the diagnosis of heart failure which is more frequent in the US CCUs, carries an inherent trend for longer in-hospital stay. The reduced hospitalization duration is considered highly beneficial in terms of medical care as well as financial management. The timely discharge of patients decreases the risk for "in-hospital" infections and leads to the minimization of health expenses. The significance of cost reduction is now widely recognized. Tosteson et al. analyzed data from several emergency departments throughout the US and concluded that patients presenting with chest pain should be admitted to CCU if they have a moderate (21% or greater) probability of acute myocardial infarction in order to maintain cost-effectiveness in CCU performance. In a practical point of view, patients with ECG changes suggestive of myocardial ischemia or recent myocardial infarction fulfill the above-mentioned criterion and are considered candidates for admission in the CCU.⁵

In conclusion, our department hospitalized over 500 patients in the CCU during 2007. The mean length of stay was 2.36 days and in nearly half of the patients, the index event was myocardial infarction. Our results are in accordance with other European statistical data but differ from US registries with regards to the duration of stay and the admission diagnosis. These differences however are thought to be due to data derivation from non-homogenous sources representing the total of the US health services and probably the slightly different admission criteria necessitated by the availability of CCU facilities. Nevertheless, in order to derive safer conclusions, data from several years have to be collected, analyzed and compared with similar registries carried out in more coronary care units distributed throughout our country.

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