Original

Coronary syndrome and other diagnosis result in under reporting of acute myocardial infarction in the Mexico Hospital, Costa Rica

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Abstract

Justification: Acute myocardial infarction is a major public health problem. In Costa Rica, it is necessary to record it accurately in order to handle this problem efficiently.

Materials and methods: Descriptive and observational study. Data from patients which were discharged from the Mexico Hospital and diagnosed with acute coronary syndrome, acute myocardial infarction, unstable angina and ischemic heart disease from August 2005 to July 2006 was compiled. The records of the MH- Biostatistics office, as well as those from a series of Units (Coronary, Intensive Care, Hemodynamics and Echocardiograms)- were analyzed.

Results: The Mexico Hospital reports 110 patients diagnosed with acute myocardial infarction. This number increased to 172 when patients discharged as cases of ACS, unstable angina or ischemic heart disease were reported also as cases of acute myocardial infarction. The final sample analyzed was 138 patients when some patients were excluded due to incomplete data. This meant that underreporting was at least 36 %. Men represented 78.1 % of the sample; the average age for both sexes was 65.2 years. Troponin was not measured in 49.3% of the patients and a quarter of them were not assessed by a cardiologist. Out of the total of patients discharged with other diagnoses, 20.3% also had AMI.

Conclusions: Acute myocardial infarction is under reported in the Mexico Hospital, and in the central offices of the Ministry of Health and of the Costa Rican Social Security System. Findings could be similar in other Costa Rican hospitals.

Key words: acute myocardial infarction, acute coronary syndrome, underreport.

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Abbreviations: CRSSS, Costa Rican Social Security System; MH, Mexico Hospital; AMI, acute myocardial infarction; STEMI, acute myocardial infarction with ST-segment elevation; NSTEMI, acute myocardial infarction without ST-segment elevation; PAHO, Pan American Health Organization; ACS, acute coronary syndrome; CU, Coronary Unit; HU, Hemodynamics Unit; ICU, Intensive Care Unit.
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While clinical descriptions related to coronary artery disease date back more than two centuries, the bond between the pathophysiological mechanisms and the relationship of the classifications based on these are known only two decades ago.

The first report of typical angina is attributed to William Heberden (1768), who described it as "the most unpleasant sensation in the chest that takes hold of patients when walking and disappears the moment they can stand still".[1] Modern definitions of the triad of Heberden retain their essential ingredients (retrosternal oppression, worsening with exertion and relieved by rest).

The term "acute coronary syndrome" (ACS) was introduced by Valentin Fuster (1985), who along with Steele and Chesebro, proposed differentiate specific pathophysiological events that

distinguish unstable angina and myocardial infarction (AMI), from the stable coronary disease. The clinical view included unstable angina entities, AMI and sudden coronary death.[2] ACS is an operation term especially useful for the initial evaluation of patients with chest pain, which includes any type of AMI –with or without ST-segment elevation and unstable angina. This syndrome continues "... subject to vertigo research. The inflammatory aspect of the pathophysiology, the diatribe between the pharmacological management and implemented, genetics, even the characterization and classification, are shown as open pathways restless thinking".[3]

The AMI is a pathological entity characterized by ischemic necrosis (coagulative) of an area of the myocardium. Its clinical definition should be based on two parameters: the actual diagnosis, generally anatomopathological, and the method (sensitive, specific and affordable) available in clinical practice for diagnosis.[4] James Herrick suggested that the presence of coronary artery thrombosis was the mechanism that originated the AMI,[5] and was also the first to propose the electrocardiographic changes in its diagnosis.[6]

The AMI caused by an occlusive thrombus may be suspected by ST segment elevation on the electrocardiogram (EKG) and other diagnostic parameters. However, several conditions simulating AMI can present that image in the EKG.[7]

In 2000, the American College of Cardiology and the European Society of Cardiology published a consensus redefining AMI, combining increases and decreases in biochemical markers of myocardial necrosis with any of the following conditions: symptoms suggestive of myocardial ischemia, electrocardiographic changes, and coronary intervention.[8] This caused a significant increase in the diagnosis of AMI and helped identify a greater number of patients with ACS who have a lot of comorbidity and worse prognosis at 6 months, rather than the previous criteria of the World Health Organization in 1979 proposed . Investigation

is needed to confirm these preliminary findings and to determine the economic implications of the new criteria.[9]

The incidence of AMI is determined in large community studies, concluding that the time trend in mortality is decreasing over time, while the incidence varies according to studies, in decline, increase or remain stable (Table 1).[10]

AMI mortality in the United States is 25% in the three years following the event. A significant proportion of heart attack patients develop chronic congestive heart failure, with a mortality of about 20% annually in the symptomatic patients.[11] In this country, the ACS cause about 1.5 million hospitalizations annually.[12] The AMI without ST segment elevation (NSTEMI) represents a large number of events, which, a year equals, and sometimes exceeds the annual mortality that presents AMI with ST elevation (STEMI).[12]

Regarding AMI, in the national medical bibliography, to date, only a descriptive study is located, unpublished, about inpatient (Fernandez R. Descriptive Study: Short and long-term progress of acute myocardial infarction Q and non-Q. Intensive Care Unit, San Juan de Dios Hospital. September 1997-September 1999. Thesis for Postgraduate graduation in Internal Medicine. University of Costa Rica, unpublished), which analyzed the short-and long-term progress of AMI.

The goal of the study was to determine whether there is an adequate record of patients discharged with AMI, in a Class A hospital of the country.

Materials y methods

This is a descriptive and observational study, which compiles data at a point in time where the phenomena to investigate is "captured" in appearance. We observed the occurrence of the phenomenon and the factors associated with it.

Table 1. Incidence of acute myocardial infarction and ranges of fatal cases, the first year of the event in selected community studies			
Study	Period	Incidence(x 100 000 people)	Range of fatal cases
ARIC	1987-94	Women: 190, Men: 410	Women: 11% Men: 9%
Minnesota Heart Survey	1985-97	-	Women: 16% Men: 13%
Olmsted County Study	1979-98	Both genders (n=205)	Both genders 12%
Worcester Heart Attack Study	1975-95	Both genders (n=244)	Both genders 18%
Corpus Christi Study	1988-92	MA: Women (n=354) y Men (n=486) NH: Women (n=224) y Men (n=346)	Undetermined

Source: Adapted from Tables 1 and 2, Roger VL, citation 10
Abbreviations: MA (Mexican-American), NH (white non-Hispanic)

Classification of AMI is used, according to the consensus of the American College of Cardiology and the European Society of Cardiology: criteria for AMI evolved or recent (typical rise and gradual fall of troponin or more rapid rise and fall of creatine kinase MB, with at least one of the following: ischemic symptoms, development of pathological Q waves to EKG, EKG changes indicative of ischemia, coronary artery intervention) or a pathological findings of an AMI.[13]

Inclusion criteria: patients over 18 years of age, of both sexes, discharged from Mexico Hospital (MH) with diagnoses of AMI and ACS in the period of one year (August 1, 2005 to July 31, 2006). Exclusion criteria: Patients who did not meet the diagnostic criteria for determining whether an AMI what was presented, and it is erroneously coded as such. Patients with insufficient information in the medical record to meet the objectives of the study, or whose medical records, did not appear on file. Patients who had AMI episodes outside the study period. Patients hospitalized for complications of AMI which have occurred outside the study.

There were noted characteristics of continuous variables, discrete and attributes: sex, age in years (age groups for decades, for example 20-29 years), full name, medical record number, residence (province) origin, month of hospitalization, MH department where the patient was hospitalized and use of troponin.

The initial sample collection was carried out according to the records of the Biostatistics Office Mexico Hospital. Patients are recorded based there in "ischemic heart disease", the International Classification Manual of Diseases of the Pan American Health Organization, document of official use of the Costa Rican Social Security System (CRSSS).[14]

The following sources were analyzed to collect the information gathered in the Biostatistics Office: Cardiology Service: patient record of the Coronary Unit, records of echocardiograms and records of procedures of the Hemodynamics Unit, and of the Intensive Care Unit, the book of patients records.

They Ministry of Health's offices were visited (Statistical Information Unit) and the Department of Health Statistics (headquarters, CRSSS), and information was collected on the AMI received at the Mexico Hospital, for the period studied.

The investigation forms were entered in Excel, Windows environment, and the results were processed by using the Epi Info package.

The research was approved by the Medical Director of the Mexico Hospital, after analysis of the Local Committee on Bioethics and Investigation (trade-HM CLOBI 009-04-07), which endorses from the ethical and methodological development of the proposed study. The authors declare that they have no conflict of interest.

Results

From the records of the Biostatistics Office, 110 patients were obtained (n = 35 August to December 2005 and n = 75 from January to July 2006). On examination of the records of the Biostatistics Office, the Coronary Unit (CU), the Intensive Care Unit (ICU) and Hemodynamics Unit (HU), the figure rose to 172 with the diagnosis of AMI. 36% of users seen for AMI or its complications in the Mexico Hospital (before applying criteria used in this study), was not registered with the Biostatistics Office Hospital.

34 patients were excluded for: complications of AMI occurred outside the study period (n = 18); AMI occurred outside the study period (n = 7), absence of criteria for diagnosis of AMI despite being discharged as such (n = 5), lack of file or lack of codification in Hospital Archives and Biostatistics, despite registering in ICU (n = 2), poor coding (n = 1), lack of file and inability to contact the patient or family (n=1).

By comparing these records with those recorded in the Biostatistics Office, ICU, CU and HU, had found that patients with AMI were discharged under other diagnoses (ACS, coronary artery disease, ischemic heart disease, unstable angina), by which were not officially listed in the records of the CRSSS (Biostatistics Office of the MH and CRSSS headquarters) nor in the Ministry of Health, as AMI.

Of the patients who then were characterized (n = 138), they were located at the following locations within the hospital: Biostatistics (n = 64), Biostatistics and Coronary Unit (n = 31), Coronary Unit only (n = 23), Intensive Care Unit (n = 17) and HU (n = 3). The percentage of patients discharged with other diagnoses and bearers of AMI, which occurred in the study period was 20.3% after applying the exclusion criteria.

A sample was then characterized of 138 users: 108 men (78.1%) and 30 women (21.9%). The average age of the sample was 65.2 years (60.8 for men and 65.2 for women). The ages of most heart attack patients were 50 to 59 years and ≥ 70 years (both with 29%) (Table 2).

The Cardiology Department responded to 76.8% of the sample. Almost a quarter of patients with AMI or its complications were not assessed in the cardiology (Table 3).

No troponin test was performed on 49.3% of the sample. Of those conducted, 46.3% reported positive of men and 40% of women. We found several measurements of troponin, quantitative and qualitative. For various reasons (lack of reagent, mostly), almost 50% of patients was not determined in this test, crucial for diagnosis, along with other parameters of AMI. Among patients with positive troponin reports (n = 62), 28% of men died and 50% of women. Among patients

who did not undergo troponin testing (n = 68), 23.5% of men died and 47% of women (Table 4)

Discussion

At an international level, it has been reported that at least a fifth of AMI are not recognized clinically, because of atypical symptoms (especially in the elderly) or absence of chest pain.

Table 2. Patients hospitalized for acute myocardial infarction, by sex and age group. Mexico Hospital, August 2005 to July 2006.

Absolute numbers

Age (years)	Men	Women
10-19	1	0
20-29	1	0
30-39	3	1
40-49	13	5
50-59	36	4
60-69	26	8
70 and older	28	12
TOTAL	108	30

Source: Archives Section, Mexico Hospital

Table 3. Patients with the diagnosis of acute myocardial infarction, according to discharge service. Mexico Hospital, August 2005 to July 2006.

Absolute numbers

Department	Total
Cardiology	106
Thoracic Surgery	7
Internal Medicine	9
Intensive CareUnit	7
Other departments	9
Total	138

Source: Biostatistics Office and Medical
* Other departments (Surgery, Urology, Neurology and Nephrology)

Table 4. Patients hospitalized for acute myocardial infarction, according to use of troponin and deceased. Mexico Hospital, August 2005 to July 2006.

Absolute numbers

Troponin	Men	Women
Positive	50	12
Deceased	14	6
Normal or negative	7	1
Deceased	2	0
Test not conducted	51	17
Deceased	12	8

Source: Medical Records, File Section, MH

Also, the silent AMI can occur in the elderly, diabetics and postoperative patients. The elders infarcted with positive troponin tend to not be treated properly. Sometimes the AMI can be seen only in retrospect, when identifying a complication such as peripheral embolization of mural thrombus or development of congestive heart failure, or mitral regurgitation syncope de novo. [15-17]

Many AMI are not identified clinically or its diagnosis is delayed, hurting the appropriate approach. At least a quarter of IMA will not be recognized clinically. Prevalence, predisposing factors and prognosis are similar to those that are recognized, such as morbimortality. 18 Failure to diagnose AMI has been associated with a poor quality of care from admission until discharge, and with a high hospital mortality.[19,20]

Roughly speaking, about a third of patients admitted with AMI in the Mexico Hospital, not discharged as such, which may even be higher the figure, that shows an underreporting impacting both medically and financially, and is a phenomenon that may occur in other hospitals in the country, although not known whether the same magnitude.

Reported cases of AMI by the Ministry of Health (January to November 2006) were 278 at the national level; 28.7% belonged to the province of San José and 18.3% to the one of Alajuela. [21] a significant undercount, since only in the Mexico Hospital, main reception center for AMI cases of these provinces, at least 50% of that figure was discharged. AMI cases registered by the Department of Health Statistics (CRSSS) were 1162 (n = 105, 9% of MH), during 2005 and 2006 (n = 88, 7.3% of MH) in 2006. This means that officially, the CRSSS reported between August 2005 and July 2006, less than 60% of patients were hospitalized for AMI in Mexico Hospital Reported cases of AMI by the Ministry of Health (January to November 2006) were 278 at the national level, 28.7% belonged to the province of San José and 18.3% to the foregoing evidence Alajuela. [21] This

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Since 2003, a decree exists declaring the AMI as an obligated reportable disease (Article 9),[23] so it's necessary to elaborate studies to know the true incidence and prevalence of AMI in Costa Rica. At the moment, any number that is provided implies significant underreporting in both the Ministry of Health as the CRSSS.

It is necessary to standardize the diagnosis of AMI in all levels of care and multidisciplinary teams. The definition of AMI proposed by the entities mentioned above could be generalized in Costa Rica, as a first step in the analysis and better patient care with AMI. [13][24]

What explains the difference between the 110 patients registered in the Biostatistics Office Mexico Hospital, the 172 collected later and the 138 finally registered users? In discharge diagnoses, doctors noted "acute coronary syndrome", "coronary artery disease", "ischemic heart disease" or other types of angina, in services where these patients were admitted (Cardiology, Internal Medicine, Thoracic Surgery, Intensive Care Unit, etc.).

In analyzing the registration form with officials of the Biostatistics Office, it was determined that, in accordance with the Manual of International Statistical Classification of Diseases and Related Health Problems of PAHO,[14] there are no codes to classify "acute coronary syndrome", as noted mostly within I-20 (angina pectoris) and I-25 (chronic ischemic heart disease). In addition, many doctors do not list "acute myocardial infarction" among discharge diagnoses. The staff of Biostatistics has not been informed that there are patients with AMI under these diagnoses, and are modified, as it must, to that manual.

In record sources consulted in the Mexico Hospital, there is no reliable record that specifies how many hospitalizations were due to the event per se, as a result of some of its complications, to subject a user to revascularization surgery ("bypass"), or percutaneous coronary intervention.

Regarding the number of patients without troponin test requested, is known internationally that the markers of myocardial ischemia are not always available for routine use.[25] Additionally, troponin T may rise for various cardiovascular, pulmonary, gastrointestinal and kidney causes, as was found in an English study, according to which, 38% corresponded to patients without ACS but with elevated levels of troponin.[26]

It is recommended that medical and administrative authorities of the Mexico Hospital involved in the clinical management and biostatistics of the AMI analyze and correct these deficiencies, a suggestion which is extensive to the medical and administrative dependencies of the headquarters of the CRSSS and the Ministry of Health. It is essential to coordinate information with the Biostatistics Office and collecting the record books of the thrombolyzed patients in the Emergency Medical Department.

It is not advisable to accept discharge diagnoses in the Biostatistics Office, in which it is listed as only "acute coronary syndrome", without knowing whether or not it is an AMI, being recent or old. It must be specified if it's a hospitalization for AMI per se, one of its complications, or to one of the procedures to treat this event, as all are recorded in different codes. It must be emphasized that it's listed at discharge, if a patient had an AMI or not to and collaborate to not list discharge diagnoses only with initials.

The Pan American Health Organization should be aware of this, in an attempt to consider whether the absence of ACS in the disease groups listed in the Manual of International Classification of Diseases, is a phenomenon of repercussion in other Costa Rican hospitals and other countries.

In summary, listing as discharge diagnosis, ACS, unstable angina or ischemic heart disease, without specifying whether it's an AMI or not, it shows a lack of diagnostic clarity, which becomes a matter of medical and administrative repercussion, and limits dealing with appropriate statistical incidence and prevalence of this condition, in the hospital studied.

It is recommended to create a standardized and uniform management of patients admitted with AMI in Costa Rican hospitals, and develop technical, administrative and academic, multidisciplinary participation involving CRSSS authorities, the Ministry of Health and PAHO to discuss what's mentioned above.

As for the limitations of the study, despite efforts to quantify all inpatients with a diagnosis of AMI, it was unable to completely review other diagnostic groups that could have included this condition, for example: dyspnea study, thoracic pain study. The implications of the estimate of total users per year for AMI hospitalized in the Mexico Hospital should be the subject of another study. The number of patients is not large enough sample to obtain statistically significant results in many of the variables and associations studied. The findings in the Mexico Hospital do not necessarily reflect the same magnitude of underreporting in other Costa Rican hospitals.

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