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Original article

Prognosis and Management of Acute Coronary Syndrome in Spain in 2012: The DIOCLES Study

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ABSTRACT

Introduction and objectives: To identify the current mortality and management of patients admitted for suspected acute coronary syndrome in Spain. The last available registry (2004-2005) reported an in-hospital mortality of 5.7%.

Methods: The study included patients consecutively admitted between January and June 2012 at 44 hospitals selected at random. Information was collected on clinical course at admission and on events at 6 months.

Results: A total of 2557 patients admitted with suspected acute coronary syndrome were included: 788 (30.8%) with ST-segment elevation, 1602 (62.7%) without ST-segment elevation, and 167 (6.5%) with unclassified acute coronary syndrome. In-hospital mortality was 4.1% (6.6%, 2.4%, and 7.8% respectively), significantly lower than that observed for 2004-2005. Reperfusion treatment (most commonly, primary percutaneous coronary intervention) was administered to 85.7% of patients with ST-segment elevation attended within 12 h. The median time from first medical contact to thrombolysis was 40 min and to balloon inflation, 120 min. Among patients without ST-segment elevation, coronary angiography was performed in 80.6%, percutaneous intervention in 52.0%, and surgery was indicated in 6.4%. Secondary prevention treatments at discharge was prescribed more often than in earlier registries. In patients alive at discharge (follow-up available for 97.1%), 6-month mortality was 3.8%.

Conclusions: Mortality among patients with acute coronary syndrome in Spain was lower than that reported in the most recent published studies, in parallel with a more frequent use of the main treatments recommended.

Pronóstico y manejo del síndrome coronario agudo en España en 2012: estudio DIOCLES

Palabras clave:
Angina inestable
Infarto de miocardio
Pronóstico
Registro
Supervivencia

RESUMEN

Introducción y objetivos: Conocer la mortalidad y el manejo actuales de los pacientes ingresados por sospecha de síndrome coronario agudo en España. El último registro disponible (2004-2005) reportó una mortalidad hospitalaria del 5,7%.

Métodos: Se incluyó a los pacientes ingresados consecutivamente de enero a junio de 2012 en 44 hospitales seleccionados al azar. Se recogió la evolución en el ingreso y los eventos a 6 meses.

Resultados: Se incluyó a 2.557 pacientes ingresados con sospecha de síndrome coronario agudo: 788 (30,8%) con elevación del segmento ST, 1.602 (62,7%) sin elevación del segmento ST y 167 (6,5%) con síndrome coronario agudo inclasificable. La mortalidad hospitalaria fue del 4,1% (el 6,6, el 2,4 y el 7,8% respectivamente), significativamente menor que la registrada en 2004-2005. Se realizó tratamiento de

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◇ The Appendix contains a list of the participating investigators.

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reperfusión (más frecuentemente intervención coronaria percutánea primaria) en el 85,7% de los pacientes con elevación del segmento ST atendidos en < 12 h. La mediana del tiempo desde el primer contacto médico hasta la trombolisis fue 40 min y hasta el inflado del balón, 120 min. Al 80,6% de los pacientes sin elevación del segmento ST, se les realizó coronariografía; al 52,0%, intervención percutánea, y al 6,4%, se le indicó cirugía. La prescripción de tratamientos de prevención secundaria al alta aumentó respecto a registros previos. La mortalidad a 6 meses entre los pacientes dados de alta con vida (seguimiento disponible en el 97,1%) fue del 3,8%.

Conclusiones: La mortalidad de los pacientes con síndrome coronario agudo en España ha disminuido respecto a los últimos datos disponibles, en paralelo a un uso más frecuente de los principales tratamientos recomendados.

Abbreviations

ACS: acute coronary syndrome
NSTEACS: non–ST-segment elevation elevation acute coronary syndrome
PCI: percutaneous coronary intervention
STEACS: ST-segment elevation acute coronary syndrome

INTRODUCTION

Acute coronary syndrome (ACS) is the main complication of ischemic heart disease and has considerable health impact.[1,2] In Spain, several ACS registries[3–7] have investigated the prognosis and management of the condition and its clinical course over time.[8]

The MASCARA study[7] included patients from 2004 to 2005 and is the last of these large registries. Since then, ACS management has seen several changes, such as the widespread use of reperfusion therapies for ST-segment elevation ACS (STEACS) or primary percutaneous coronary intervention (PCI) as a reperfusion technique, the introduction of new drugs, or the popularization of radial access for coronary angiography. These changes have been included in the clinical practice guidelines[9,10] and explain the rationale for collecting up-to-date information on the prognosis and management of ACS.

In Spain, the DIOCLES (*Descripción de la Cardiopatía Isquémica en el Territorio Español*) registry, sponsored by the *Sección de Cardiopatía Isquémica y Cuidados Agudos Cardiovasculares* of the *Sociedad Española de Cardiología* and the *Sociedad Española de Medicina Intensiva, Crítica y de Unidades Coronarias*, investigated in-hospital and 6-month mortality among patients admitted for suspected ACS and described their care management.

METHODS

Study Design

This multicenter, observational, cross-sectional study prospectively collected admission data and performed 6-month follow-up among patients ≥ 18 subsequently admitted for suspected ACS that was first managed at the participating site (except prehospital treatment or admission a few hours after primary PCI at another site) and who gave written consent. Consent was not required to analyze cases of in-hospital death. Patients were excluded if ACS was secondary to other processes, such as tachyarrhythmia, severe anemia, or surgery; if they had been transferred from another site where they had been admitted for ACS; and if they had recently participated in another clinical trial.

Data were collected on demographic variables, risk factors, disease history, and clinical presentation; prehospital, hospital, and discharge management; complications; and in-hospital mortality (eg, death during admission at the participating hospital). At 6 months, information was collected by a centralized phone interview or by the local investigator regarding the occurrence of death (and its cause), acute myocardial infarction, stroke, coronary revascularization or cardiovascular readmission, and the date of the event.

ACS was classified according to electrocardiographic presentation as STEACS (ST-segment elevation ≥ 1 mm in ≥ 2 contiguous leads > 20 min), NSTEACS (all other patients with electrocardiogram interpretable as signs of ischemia), and unclassified ACS (noninterpretable electrocardiogram due to left bundle-branch block, pacemaker pacing, or Wolff-Parkinson-White syndrome).

Site Selection and Schedule

In order to recruit 50 sites, 70 public or subsidized unspecialized hospitals with more than 50 beds registered in the Ministry of Health database were preselected at random. As in previous studies,[4,5,7] randomization was stratified by health care level to include 35% sites with a cardiologic or general critical care unit and interventional cardiology laboratory (type A site), 45% with a critical care unit without interventional cardiology laboratory (type B site), and 20% without a critical care unit (type C site). Two sites were included by additional invitation.

Each site with 1 or more physicians involved in ACS management was contacted and agreed to identify patients, request informed consent, enter the admission information into an online form, and send the phone contact details to a company in charge of follow-up. When phone contact was not made, the investigators were asked to obtain follow-up information from the medical records. The study was approved by a lead ethics committee, by the ethics committees of the hospitals that required it, and by the relevant government agencies in the autonomous communities involved. A total of 70 hospitals were preselected, of which 50 were included; the remaining sites were not included mainly because no local investigator was found, administrative delays were encountered, or the upper limit of 50 sites had been reached. Among these 50, 6 were later excluded due to insufficient patient inclusion, such that the final study included 44 sites (18 of type A, 21 of type B, and 5 of type C). Patient enrollment was open between 10 January and 15 June 2012; however, not all hospitals participated during the entire period because some joined late for administrative reasons and others because they had met their participation quota. The mean time for which the hospitals remained active was 3.6 (1.2) months, with no significant differences between the 3 categories.

Quality Enhancement and Control

The methodology was explained to the investigators via teleconference with slide presentations, and information letters

were sent regularly. It was predetermined that sites that stopped recruitment or had clearly insufficient enrollment (< 5 patients) would be excluded. Monitoring visits were made to 8 sites in 6 autonomous communities; these sites were chosen at random to evaluate compliance with the ethical and legal aspects, as well as data consistency in the forms and medical records or ≥ 7 of 10 predefined variables. The results were favorable in all cases. Investigators were asked for a list of patients not included and the reasons. Validation filters and rules were established in numerous variables on the form. The company in charge of database design and operation and the principal investigators for the study (JAB and AB), responsible for the statistical analysis, monitored internal data consistency during the analysis phase, consulting investigators if any inconsistencies or possible errors were detected and making any necessary corrections.

Statistical Analysis

The sample size required to estimate in-hospital patient mortality with 95% certainty and precision of ± 1% was calculated based on a predicted mortality of 5.7%, which was the mortality observed in the MASCARA registry.[7] It was assumed that 20% of patients would be nonassessable and, therefore, it was considered necessary to include 2581 patients.

The continuous variables are expressed as median [interquartile range] and the categorical variables as percentages. The Kruskal-Wallis test was used to compare continuous variables and the chi-square test to compare categorical variables. Kaplan-Meier survival curves were prepared and compared by the log rank test statistic. All analyses were performed using SPSS 13.0.

RESULTS

Baseline Characteristics and Clinical Presentation

The study included 44 sites in 13 autonomous communities (all except for Balearic Islands, Canary Islands, Castile-LaMancha, and La Rioja, which are not represented because no hospitals in these communities were selected at random or due to administrative delays). A total of 3059 patients were assessed, and 502 of these were excluded for the reasons described in Figure 1. Therefore, the study included 2557 patients: 788 (30.8%) with an admission diagnosis of STEACS, 1602 (62.7%) with NSTEACS, and 167 (6.5%) with unclassified ACS.

Table 1 summarizes the baseline data according to type of ACS. When compared to patients with STEACS, patients with NSTEACS or unclassified ACS were older, were more likely to be women, had a higher prevalence of cardiovascular risk factors except for

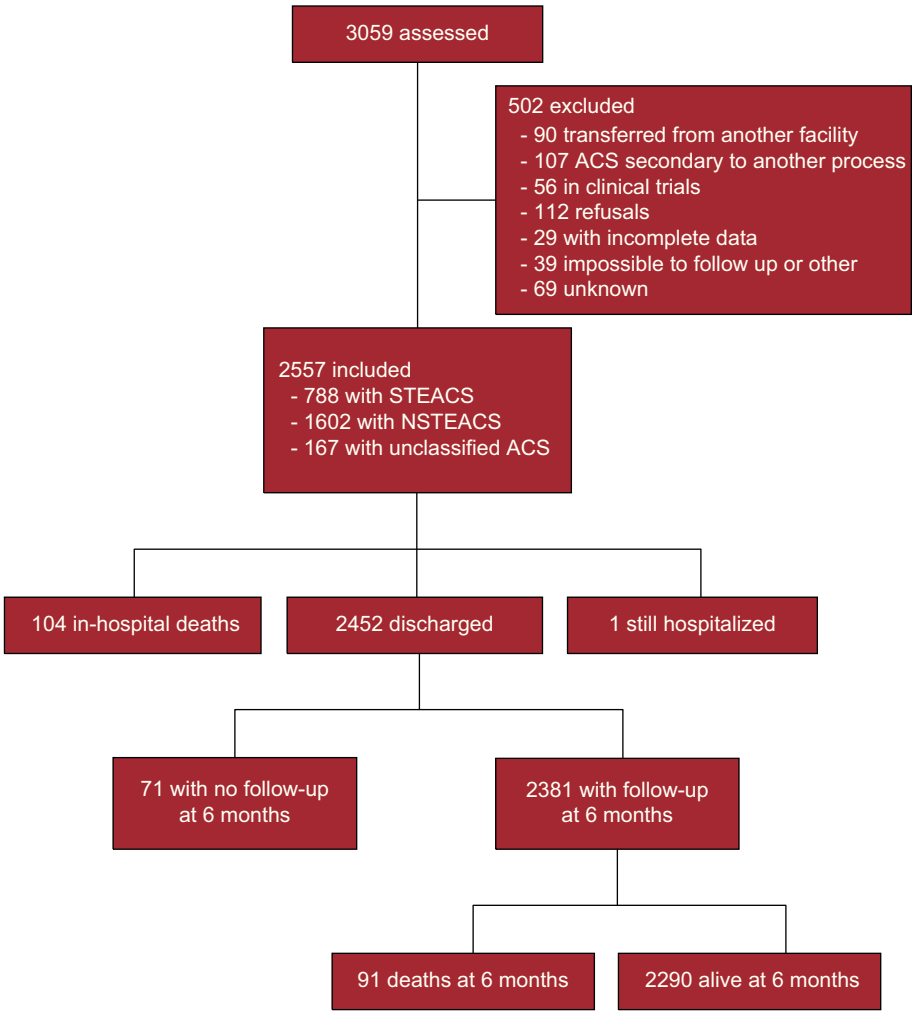

Figure 1. Patient inclusion and follow-up flow chart. ACS, acute coronary syndrome; NSTEACS, non–ST-segment elevation acute coronary syndrome; STEACS, ST-segment elevation acute coronary syndrome.

Table 1
Demographic and Clinical Characteristics According to Diagnosis on Admission

	STEACS (n = 788)	NSTEACS (n = 1602)	Unclassified ACS (n = 167)	*P*
Age, y	65 [53-76]	68 [58-77]	77 [68-82]	< .001
Women, %	23.9	25.7	33.9	.027
Body mass index	27.1 [24.8-29.8]	27.9 [25.5-30.8]	26.6 [24.7-30.5]	< .001
Cardiovascular risk factors, %				
Active smoking	40.8	24.1	9.1	< .001
Hypertension	53.5	70.5	78.2	< .001
Diabetes mellitus	22.3	33.9	43.6	< .001
Dyslipidemia	47.8	60.5	59.8	< .001
History and comorbidities, %				
History of angina > 1 month	7.6	26.8	31.1	< .001
History of infarction	9.1	26.8	32.1	< .001
Heart failure	1.8	6.3	23.0	< .001
Stroke	4.7	7.8	9.1	.012
Peripheral vascular disease	5.2	10.1	15.2	< .001
Severe renal failure*	2.7	6.0	10.3	< .001
Significant lung disease	9.3	13.0	14.5	.018
History of angioplasty	6.8	22.7	24.4	< .001
History of coronary surgery	0.3	6.3	9.1	< .001
Prior drug therapy, %				
Acetylsalicylic acid	21.5	48.6	52.1	< .001
$P2Y_{12}$ inhibitors	8.8	19.1	19.4	< .001
Other antiplatelets	1.1	2.3	1.8	.149
Vitamin-K inhibitors	3.2	7.7	16.4	< .001
Beta-blockers	15.6	38.8	43.6	< .001
ACE inhibitors/ARB	35.3	54.6	63.4	< .001
Statins	31.7	53.8	59.8	< .001

ACEI, angiotensin-converting enzyme; ACS, acute coronary syndrome; ARB, angiotensin receptor blockers; NSTEACS, non–ST-segment elevation acute coronary syndrome; STEACS, ST-segment elevation acute coronary syndrome.
Unless otherwise indicated, data are expressed as median [interquartile range].
* Plasma creatinine ≥ 2 mg/dL or dialysis or history of renal transplantation.

smoking, comorbidities, and history of ischemic heart disease, and were more frequent users of cardiovascular drugs.

Table 2 summarizes the data on initial care and on arrival to the hospital. Patients with STEACS took less time to seek care, and three quarters were brought to the hospital by ambulance, whereas most patients in the other groups came on their own. Killip class IV status was more common in STEACS patients. The GRACE (Global Registry of Acute Coronary Events) score[9] was higher in those patients than in patients with NSTEACS and was particularly high in those with unclassified ACS.

In-hospital Management and Course

Table 3 illustrates patient treatment. A total of 80% of those with suspected STEACS (82% when excluding patients in whom ACS was not confirmed) received reperfusion, which was primary PCI in approximately 2 of 3 of patients. The median times between first medical contact and thrombolytic administration or balloon inflation were 40 min and 120 min, respectively. In 41% of cases, the thrombolytic therapy was administered in the critical care unit. Almost all patients received dual antiplatelet therapy and statins; anticoagulant use was somewhat lower, and glycoprotein IIb/IIIa inhibitor use was much lower and almost only seen in the STEACS subgroup.

Ventricular function on admission was measured in 89% of patients, and coronary angiography was performed in 84%; radial access was most common. Revascularization with PCI was performed in 61%, and coronary surgery was indicated in 5% (Table 4). Complications were relatively rare and generally more frequent in the STEACS subgroup, and the use of special techniques was uncommon (Table 5). A total of 104 (4.1%) patients died during hospitalization. Figure 2 illustrates in-hospital mortality in the 3 subgroups, as well as in patients with STEACS according to the reperfusion treatment received.

The discharge diagnosis confirmed ACS in 91.0% of patients (acute myocardial infarction in 69.2% and unstable angina in 21.8%), chest pain in 6.2%, and other diagnoses in 2.8%. In-hospital mortality according to discharge diagnosis was 5.2% in acute myocardial infarction, 0.4% in unstable angina, and 4.3% in the rest. One patient was still hospitalized at 6 months after inclusion. All other survivors were discharged home (94.8%), to another hospital (4.3%), or to another department in the same hospital (0.9%). Table 6 summarizes the treatments at discharge.

6-month Follow-up

Follow-up on vital status at 6 months was available for 2381 (97.1%) of the 2452 patients discharged alive. Among those patients, mortality in that period was 3.8% (67.1% for cardiovascular cause). At 6 months, the rate of (re)infarction was 1.2% (2135 patients with the relevant data); that of stroke, 0.5%

Table 2
Early Care According to Admission Diagnosis

	STEACS (n = 788)	NSTEACS (n = 1602)	Unclassified ACS (n = 167)	*P*
Time from pain to first medical contact, min	90 [45-193]	125 [60-330]	149 [60-418]	< .001
Mode of arrival to hospital, %				< .001
Own means	24.6	41.9	40.6	
Ambulance	74.0	55.4	58.8	
In-hospital	1.4	2.7	0.6	
Initial heart rate, bpm	74 [61-90]	75 [65-89]	76 [64-92]	.025
Initial systolic blood pressure, mmHg	131 [115-152]	140 [125-160]	140 [124-159]	< .001
Initial Killip class, %				< .001
I	82.4	88.4	67.7	
II	9.8	6.8	16.8	
III	2.8	4.2	13.2	
IV	5.0	0.6	2.4	
Positive markers, %	97.0	68.8	79.0	< .001
Initial blood glucose, mg/dL	134 [109-173]	120 [100-160]	138 [108-220]	< .001
Initial creatinine > 1.2 mg/dL, %	16.4	20.8	33.7	< .001
GRACE score (n = 2395)	147 [123-171]	125 [102-153]	167 [140-194]	< .001
GRACE risk (n = 2395), %				< .001
Low (1-108)	10.5	30.2	4.1	
Medium (109-140)	33.3	34.1	20.7	
High (141-372)	56.2	35.8	75.2	

ACS, acute coronary syndrome; GRACE, Global Registry of Acute Coronary Events; NSTEACS, non–ST-segment elevation acute coronary syndrome; STEACS, ST-segment elevation acute coronary syndrome.
Unless otherwise indicated, data are expressed as median [interquartile range].

(2133 patients with data); that of readmission for cardiovascular conditions, 8.7% (2323 patients with data), and that of revascularization, 2.4% (2101 patients with data). At 30 days, mortality was 4.8% (8.0%, 3.2%, and 8.1% in the 3 diagnostic subgroups, respectively; $P < .001$). Figure 3 illustrates the total mortality (in-hospital and out-of-hospital) and the combined variable of mortality or rehospitalization for cardiovascular cause during the first 6 months since the index episode in the 3 subgroups.

Table 3
Reperfusion and Hospital Drug Therapy Strategies According to Admission Diagnosis

	STEACS (n = 788)	NSTEACS (n = 1602)	Unclassified ACS (n = 167)	*P*
Reperfusion treatment, % (all/< 12 h)				—
No	19.9/14.3	—	—	
Thrombolysis	26.8/28.8	—	—	
Primary PCI	53.3/56.8	—	—	
Thrombolysis administration site, % (all/< 12 h)				—
Out-of-hospital	30.1/33.5	—	—	
Emergency room	28.7/29.6	—	—	
ICU/CCU	41.1/33.9	—	—	
Time from FMC to thrombolysis, min (all/< 12 h)	40 [20-84]/39 [20-80]	—	—	—
Rescue PCI in thrombolysis, % (all/< 12 h)	32.9/34.1	—	—	—
Time from FMC to primary PCI balloon, min (all/< 12 h)	120 [84-167]/119 [85-161]	—	—	—
Drug therapy on admission, %				
Acetylsalicylic acid	98.0	97.6	95.7	.241
$P2Y_{12}$ inhibitors	97.8	91.2	83.6	< .001
Glycoprotein IIb/IIIa inhibitors	22.3	4.3	6.1	< .001
Parenteral anticoagulants, %	82.7	83.4	82.8	.898
Beta-blockers	79.1	81.5	74.4	.054
Intravenous diuretics	23.5	25.7	46.1	< .001
Inotropics/vasoactives	11.6	3.2	7.3	< .001
Statins	94.8	94.8	91.4	.188

ACS, acute coronary syndrome; FMC: first medical contact; ICU/CCU, intensive care unit/coronary care unit; NSTEACS, non–ST-segment elevation acute coronary syndrome; PCI, percutaneous coronary intervention; STEACS, ST-segment elevation acute coronary syndrome.
Unless otherwise indicated, data are expressed as median [interquartile range].

Table 4
In-hospital Examinations and Revascularization Procedures According to Admission Diagnosis

	STEACS (n = 788)	NSTEACS (n = 1602)	Unclassified ACS (n = 167)	*P*
Stress test, %	4.7	18.4	13.3	< .001
LVEF determination, %	92.6	88.3	84.1	< .001
LVEF, % (n = 2249)				< .001
Preserved (> 50%)	54.9	77.3	35.5	
Mildly decreased (41-50%)	23.3	11.6	25.4	
Moderately decreased (31-40%)	15.2	7.1	21.7	
Severely decreased (≤ 30%)	6.7	4.0	17.4	
Coronary angiography on admission, %	94.0	80.6	69.7	< .001
Time to coronary angiography, days	0 [0-1]	3 [1-5]	2 [1-5]	< .001
Radial access in coronary angiography, %	71.9	78.0	69.0	< .001
Extent of coronary disease, %				< .001
No significant lesions (≥ 50%)	5.0	15.4	18.3	
Disease in 1 to 2 vessels	74.5	54.2	53.9	
Disease in common trunk or 3 vessels	20.5	30.4	27.8	
PCI, %	83.4	52.0	36.8	< .001
Stent implantation, %	80.4	52.0	36.8	< .001
Drug-eluting stent implantation,[a] *%*	49.5	62.3	63.2	< .001
Surgical revascularization indicated,[b] *%*	2.2	6.4	3.8	< .001

ACS, acute coronary syndrome; LVEF, left ventricular ejection fraction; NSTEACS, non–ST-segment elevation acute coronary syndrome; PCI, percutaneous coronary intervention; STEACS, ST-segment elevation acute coronary syndrome.
Unless otherwise indicated, data are expressed as median [interquartile range].
[a] Refers to patients with a stent.
[b] In 43% of cases, surgery was scheduled to be done after discharge.

DISCUSSION

In this registry, the in-hospital mortality of patients admitted to Spanish hospitals for suspected ACS was 4.1%, a significantly lower figure than that reported in the last registry available.[7] Additionally, an increase was observed in the use of recommended treatments, such as reperfusion in STEACS, coronary angiography and revascularization in NSTEACS, and secondary-prevention therapies at discharge.

Table 5
Complications, Special Techniques, and Duration of Hospital Stay According to Diagnosis on Admission

	STEACS (n = 788)	NSTEACS (n = 1602)	Unclassified ACS (n = 167)	*P*
Complications, %				
Angina	4.5	5.5	6.1	.503
(Re)infarction	3.5	2.6	4.2	.342
Stroke	1.7	0.9	0.0	.081
Cardiogenic shock	8.7	2.0	6.1	< .001
Severe hemorrhage	3.6	2.8	2.4	.537
Cardiac arrest	5.2	0.9	1.2	< .001
Advanced atrioventricular block	6.3	1.3	5.5	< .001
Ventricular fibrillation or tachycardia	7.7	1.4	1.2	< .001
Paroxysmal atrial fibrillation	7.3	4.0	6.1	.003
Techniques, %				
Hemodiafiltration/hemodialysis	1.4	1.0	1.2	.685
Intra-aortic balloon counterpulsation	3.6	0.9	1.2	< .001
Pulmonary artery catheterization	2.8	1.3	1.2	.020
Noninvasive mechanical ventilation	5.6	3.2	4.8	.017
Noninvasive ventilation support	1.3	1.4	3.0	.233
Temporary pacemaker	2.0	0.6	0.6	.003
ICU/CCU stay, days	3 [2-4]	0 [0-3]	1 [0-3]	< .001
Hospital stay, days	7 [6-9]	7 [5-10]	8 [6-11]	.010

ACS, acute coronary syndrome; ICU/CCU, intensive care unit/coronary care unit; NSTEACS, non–ST-segment elevation acute coronary syndrome; STEACS, ST-segment elevation acute coronary syndrome.
Unless otherwise indicated, data are expressed as median [interquartile range].

Table 6
Treatment at Discharge According to Diagnosis on Admission

	STEACS (n = 788)	NSTEACS (n = 1602)	Unclassified ACS (n = 167)	*P*
Acetylsalicylic acid	97.3	91.7	89.6	< .001
$P2Y_{12}$ inhibitors	92.1	72.2	64.3	< .001
Anticoagulants	9.4	12.0	20.8	.002
Beta-blockers	88.0	78.1	76.6	< .001
Calcium blockers	4.6	21.5	18.2	< .001
Nitrates	17.3	33.5	36.4	< .001
ACE inhibitors/ARB	79.3	71.8	76.0	.001
Antialdosterones	13.1	6.6	16.2	< .001
Statins	96.3	91.4	92.2	< .001
Other cholesterol-lowering agents	5.0	8.0	5.8	.029
Proton pump inhibitors	79.1	73.4	73.4	.011

ACE, angiotensin-converting enzyme; ACS, acute coronary syndrome; ARB, angiotensin receptor blockers; NSTEACS, non–ST-segment elevation acute coronary syndrome; STEACS, ST-segment elevation acute coronary syndrome.
Data are expressed as %.

Comparison With Previous Studies

Unlike other studies[3,4,7] that required confirmation of ACS, our study included all patients admitted with suspected ACS. This provided information on the percentage of final diagnoses other than ACS (9% in all), but made it hard to compare between studies. However, the population characteristics are very similar to those of earlier studies, with a higher mean age than observed in

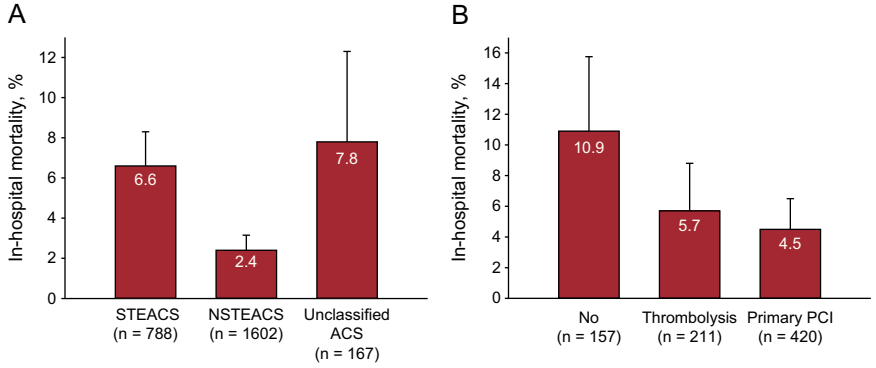

Figure 2. A, in-hospital mortality in all 3 patient categories. B, in-hospital mortality in the STEACS subgroup, according to reperfusion treatment received. The error bars illustrate the upper limit of the 95% confidence interval. ACS, acute coronary syndrome; NSTEACS, non–ST-segment elevation acute coronary syndrome; PCI, percutaneous coronary intervention; STEACS, ST-segment elevation acute coronary syndrome.

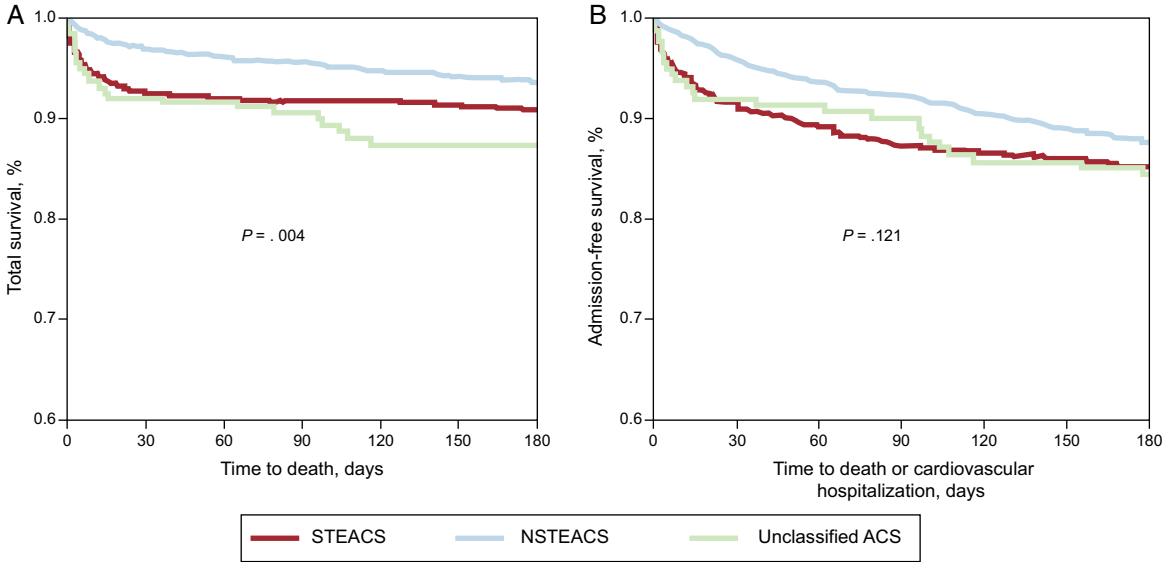

Figure 3. Six-month survival curves since admission in all 3 subgroups. A, total survival. Five patients who died during this period are not included, as the date of death is unknown. B, hospitalization-free survival. ACS, acute coronary syndrome; NSTEACS, non–ST-segment elevation acute coronary syndrome; STEACS, ST-segment elevation acute coronary syndrome.

PRIAMHO II *(Proyecto de Registro de Infarto Agudo de Miocardio HOspitalario)* and slightly lower than in the DESCARTES *(Descripción del Estado de los Síndromes Coronarios Agudos en un Registro Temporal ESpañol)* and MASCARA *(Manejo del Síndrome Coronario Agudo. Registro Actualizado)* studies, as well as a similar prevalence of diabetes mellitus and other cardiovascular risk factors and lower prevalence of previous infarction. The percentage of patients with positive markers was similar to that observed in the MASCARA registry, as was the percentage of patients in Killip class IV, although that of patients with less severe grades of heart failure on admission was lower. The inclusion of patients without confirmed ACS is unlikely to have influenced the total mortality of the study, as it was almost identical in patients in whom ACS was not finally confirmed as in the rest.

The in-hospital mortality observed in this study was significantly lower than that recorded in the MASCARA registry,[7] the last analogous study conducted in Spain (4.1% vs 5.7%; $P < .001$). The mortality rates in the first 6 months are also lower in the 3 subgroups, although the published data[7] do not allow the statistical significance of the differences between the 2 studies to be calculated.

As in the MASCARA study,[7] patients with unclassified ACS were older and had a poorer risk profile and higher incidences of in-hospital and 6-month complications than the rest.

ST-segment Elevation Acute Coronary Syndrome Management

In total, 31% of patients had STEACS, somewhat lower than in the MASCARA registry (38%). Although this subgroup is relatively small and does not allow categorical conclusions to be drawn, several aspects are worth mentioning. First of all, the median time to first medical contact was 90 min, only slightly shorter than in previous studies (96 min in MASCARA). Secondly, probably in relation to the widespread use of regional STEACS protocols, most of these patients were brought to the hospital by ambulance and the rate of reperfused patients exceeded 80% (and 85% of those seen in < 12 h), percentages higher than those observed in earlier studies, in which the reperfusion rate was 60% to 72%,[3,4,7] and similar to those described in contemporary series in neighboring countries.[11] Unlike previous studies, primary PCI was the preferred reperfusion procedure and was used approximately twice as often as thrombolysis (1:8 ratio in PRIAMHO II and 1:2 in MASCARA). As expected, mortality was higher in patients who were not reperfused than in those who were.

Some aspects of reperfusion treatment warrant a comment. The clinical practice guidelines[10] recommend that thrombolysis be administered within 30 min after the first medical contact. Although our study found slightly lower times than those reported in previous studies (median, 40 min. vs 48 min. in PRIAMHO II), they are still inadequate. Prehospital thrombolysis is recommended whenever possible,[10] but was only used in a third of patients. A positive aspect is the use of rescue PCI, which was higher than that observed in the MASCARA registry[7] and comparable to that of other contemporary series.[12] Regarding primary PCI, the time from first medical contact to PCI was > 120 min (the limit allowed by the guidelines for all patients with STEACS[10]) in half the patients. Trending of this variable was not possible because previous studies collected door-to-balloon time.[4,7] However, the data indicate that patient care should be improved by streamlining transfers to the interventional cardiology laboratory or offering thrombolysis to patients with long transfers.[10]

Non–ST-segment Elevation Acute Coronary Syndrome Management

As in the MASCARA study,[7] NSTEACS was the most common presentation. The present study observed an increase in the percentage of patients who received $P2Y_{12}$ receptor inhibitors while hospitalized (from 42% to 91%), parallel with a decrease in the use of glycoprotein IIb/IIIa inhibitors (from 21% to 4%, respectively). Patients with coronary angiography on admission rose from 63% to 81%, respectively, although most were not done on an urgent basis. In our study, the radial approach was frequently used for coronary angiography in all clinical presentations, which could have contributed to the relatively low incidence of complications. The PCI rate also increased compared with the MASCARA study (34% vs 52%), whereas surgical revascularization rates were similar and remained relatively low with regard to the prevalence of common trunk or triple-vessel disease. All clinical presentations showed a significant increase in the indication of acetylsalicylic acid, $P2Y_{12}$ receptor inhibitors beta-blockers, renin-angiotensin system inhibitors, and statins at discharge compared with earlier studies,[4,7] which may have contributed to the lower 6-month mortality observed in this study.

Limitations

The DIOCLES registry is smaller than the latest ACS registries for Spain.[4,7] Although total in-hospital mortality can be estimated with the expected confidence intervals, mortality in the various subgroups or other events cannot be estimated accurately. The main limitation of the primary endpoint was the lack of strict monitoring of the comprehensiveness of inclusions. An inclusion bias toward less serious cases could have led to an underestimation of mortality.[13] For several reasons, however, we do not believe that this factor has significantly influenced the results, as sites with clearly insufficient inclusion were excluded and the proportion of excluded patients compared with the total seems appropriate and was generally homogeneous. Additionally, in-hospital mortality was similar at sites that included more patients (first quartile of the number of inclusions) than in the rest (4.5% vs 3.6%, nonsignificant differences). Lastly, it seems plausible and consistent with recent observations in neighboring countries, which have shown 30-day mortality levels in STEACS as low as 4.4%[14] or 8.6%,[15] that the decrease in mortality compared with that observed in the MASCARA registry is partly explained by the improvement in key health care variables, such as the percentage of patients who received reperfusion therapy or invasive management.

The proportion of patients with available follow-up for the mortality variable is high and greater than in previous studies,[4,7] which minimized any potential information bias due to the fact that fewer follow-up data were available for nonsurvivors. However, the proportion of patients with information on other 6-month follow-up variables is lower (as is the case for reliability, considering that most information was obtained by phone interview), which should be considered when the results are interpreted. This may have strongly influenced the low incidence of revascularization seen in follow-up, although these data could also be explained in part by the high revascularization rate on admission and by technical advances in PCI.

CONCLUSIONS

The mortality of patients with ACS in Spain has dropped compared with the mortality reported by the last available registry, in keeping with a more frequent use of recommended treatments, such as reperfusion, revascularization, and secondary prevention measures. Several aspects, particularly time to reperfusion in STEACS, are less than optimal.

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CONFLICT OF INTERESTS

None declared.

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