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# Mortality in myocardial infarction remains high in Argentina: The association with health insurance coverage

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ABSTRACT

*Objectives:* The present analysis included patients with myocardial infarction from the SCAR registry in Argentina. It reports how health insurance coverage influenced the outcomes.
*Methods:* Eighty-seven centers participated in a cross-sectional nation-wide multicenter survey.
*Results:* Seven hundred and fifty-eight patients were included, 476 (60.55%) with STEMI and 281(39.45%) non-STEMI (NSTEMI).
In-hospital mortality was 7.35%. Mortality was independently associated with age (OR 1.06, $CI_{95}$ 1.02–1.1, $p = 0.001$), left ventricular dysfunction (OR 7.12, $CI_{95}$ 2.5–20, $p < 0.001$), and Killip 3–4 (OR 4.86, $CI_{95}$ 1.64–14, $p = 0.004$). Treatment with ACEi (OR 0.18, $CI_{95}$ 0.06–0.48, $p < 0.005$) and beta-blockers (OR 0.22, $CI_{95}$ 0.07–0.62, $p = 0.05$) was associated with lower mortality.
In STEMI, the mean time from symptom onset to admission was 120 min (60–330) for patients arriving from home, and 240 min (120–510) for patients referred from other institutions. 285 patients underwent PCI with mean door-to-balloon time of 107 min (60–231); 92 patients received thrombolysis (mean door-to-needle time of 55 min (29–90)).
Mortality in STEMI was 8%, which was independently associated with age (OR 1.09, $CI_{95}$ 1.04–1.14, $p < 0.001$), Killip 3–4 (OR 3, $CI_{95}$ 1.24–12.8, $p = 0.02$), and inotrope requirement (OR 19, $CI_{95}$ 6–60, $p < 0.001$). Door-to-balloon time <90 min for primary PCI was independently associated with a significant reduction in mortality (OR 0.11, CI0.01–0.68, $p = 0.001$) in STEMI.
We observed significant differences in the rate of PPCI and time to reperfusion according to the insurance coverage that might have influenced the outcomes.
*Conclusions:* Outcomes in AMI were affected by insurance coverage. Efforts to improve reperfusion rates and delay to treatment are necessary.


## 1. Introduction

Coronary artery disease remains a major public health problem in Latin America, especially in Argentina [1]. The GRACE has shown worse outcomes among Latin American patients with acute myocardial infarction (AMI) compared with European and American patients [2]. Data from international registries may not be representative of the patient population in Argentina due to differing characteristics and health policies.

Insurance coverage may affect mortality and clinical outcomes in patients with AMI [3]. Little information is available on the potential of insurance systems to reduce inequalities in the treatment and outcomes of acute coronary syndromes.

The present report is a prespecified sub-analysis of patients with AMI from the global SCAR (Síndrome Coronario Agudo en Argentina) registry that included all ACS (myocardial infarction and unstable angina), performed to evaluate patient characteristics, procedural details and in-hospital outcomes. The present analysis reports how health insurance coverage influenced treatment and outcomes in Argentina.

## 2. Material and methods

The SCAR registry was conducted by the research area and the Cardiovascular Emergency Council of the Argentine Society of Cardiology (SAC). It was a cross-sectional nation-wide multicenter survey developed in Argentina. Data from patients were uploaded to a web site.

Cardiologists who participated in the registry were advised not to modify any therapeutic strategies and treatment was left to the discretion of the physician.

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The study was conducted in compliance with Good Clinical Practices, Argentine laws and Argentine data protection laws. No individual specific consent forms for the study were obtained. The protocol was reviewed and approved by an independent ethics committee and approved by internal committees in each institution.

The patients included in the analysis had a diagnosis of AMI with at least two of the following inclusion criteria: symptoms of myocardial ischemia for >20 min, ST segment changes or T wave inversion in two leads compatible with myocardial ischemia, or new left bundle branch block, or development of new abnormal Q waves, elevation of troponins or CK-MB.

ST-segment elevation myocardial infarction (STEMI) was diagnosed when ST-segment elevation ≥1 mm was observed in at least two contiguous leads in EKG, or when a new left bundle branch block or new abnormal Q waves developed.

Patients with MI >24 h, secondary angina and patients without typical angina were excluded for the present analysis.

Every medical institution affiliated to SAC was invited to participate in the registry through a mail letter. Eighty-seven centers in Argentina (academic institutions, community hospitals and private hospitals) agreed to participate. Fifty five percent of the participating centers had a Cardiology Fellow Program, 77% had a Cardiac Catheterization Laboratory for Primary Angioplasty (PCI) available 24 h a day, 7 days a week; and 74% had a Cardiovascular Surgery Service.

Patients were consecutively recruited from intensive care units (ICU) or cardiology departments. The centers were incorporated to the registry in different periods, between March and October 2011, and everyone included patients during a three month period. A computerized case record form (CRF) was filled-in for each eligible patient, and data was recorded on-line. In the case of missing data, an investigator from the SAC contacted the local investigator to obtain any missing information.

The following data were collected: cardiovascular and non-cardiovascular medical history, cardiovascular risk factors, clinical progression including symptoms on admission and Killip–Kimball class, therapeutic management, laboratory tests and in-hospital outcomes. Health insurance data was recorded: it included private insurance, "obras sociales" (OS) which are organizations that manage health coverage for people who are still working or retired, and uninsured people, who depend on health assistance at public hospitals.

### 2.1. Statistical analyses

For quantitative variables, means, standard deviations, interquartile range (IQR), as well as minimum and maximum values were calculated. Discrete variables were presented as percentages. Comparisons were made with chi-square or Fisher's exact tests for discrete variables, and by unpaired T test, Mann–Whitney U test or Wilcoxon signed-rank test for continuous variables.

There are no official data about the incidence of myocardial infarction in Argentina. Considering the 2010 census with 40.117.096 residents in Argentina [4] and estimating 10/10.000 the incidence of MI from previous studies, we calculated 800 cases, with alpha error of 0.05.

Multiple logistic regression analyses were performed for predictors of in-hospital outcomes. Variables included in the final multivariate models compromised those with a significance level <0.01 n the univariate analyses, unless otherwise stated. A statistical analysis was performed with STATA 9.0 (STATA Corporation, College Station, TX®).

## 3. Results

Seven hundred and fifty-eight patients were included, 476 (60.55%) with STEMI and 281 (39.45%) non-STEMI. Demographics for the population are shown in Table 1.

Most patients (72.8%) arrived from their home, and 27.2% were referred from other hospitals for the following reasons: Hospital complexity (16%), insurance coverage (3.95%), medical decision (2.24%), family decision (1.31%), other (1.03%). Although the median time from symptom onset to admission was 135 min (60–345), there was a mean delay of 242 min (120–510) when patients were referred from other institution.

**Table 1**
Demographic characteristics.

| | MI (all) | STEMI |
|---|---|---|
| Age (median ± SD) | 61.9 ± 12.4 | 61 ± 12.3 |
| Male (%) | 76.6 | 75 |
| BMI (median ± SD) | 27.9 ± 4.62 | 27.9 ± 4.62 |
| Diabetes (%) | 22.2 | 20 |
| DBT on insulin (%) | 14 | 11 |
| Current smoker (%) | 37.7 | 42 |
| Former smoker (%) | 24.1 | 22 |
| Hypercholesterolemia (%) | 43.3 | 51 |
| Hypertension (%) | 66.7 | 63 |
| Chronic stable angina (%) | 8.4 | 7 |
| Myocardial infarction (%) | 18.3 | 13 |
| Percutaneous angioplasty (%) | 14.7 | 10 |
| CABG (%) | 5.12 | 2 |
| Heart failure (%) | 5.25 | 3 |
| Chronic pulmonary disease (%) | 6.32 | 6.11 |
| Unstable angina (%) | 9.17 | 5 |
| Stroke (%) | 2.9 | 3 |
| HIV (%) | 2.11 | 1.3 |
| Neoplasm (%) | 4 | 2.9 |
| Coronary obstruction >50% (%) | 25 | 18% |
| Chronic renal failure (%) | 3.78 | 2.36 |
| Peptic ulcer (%) | 2.86 | 3.24 |
| Bleeding (%) | 2.71 | 2.14 |
| ASA/clopidogrel (%) | 36 | 29 |
| ACE/ARA II | 41 | 39.3 |
| Statins (%) | 23.6 | 18 |
| Beta-blockers (%) | 31.6 | 25.2 |
| Health insurance coverage (%) | | |
| –Uninsured | 17 | 20 |
| –OS | 56 | 56 |
| –Private insurance | 27 | 24 |

Angina 24 h before the admission was present in 30.7% of patients, and the majority (80.7%) were on Killip class I on admission, while 8% were on Killip 3/4.

Sixty three percent received anticoagulation therapy, 99% non-STEMI and 36% STEMI (low molecular weight heparin in 58% of patients), for an average of three days (2–5 days). Ninety nine percent of patients were treated with aspirin, 86% with clopidogrel and 11% with prasugrel. Antiaggregation therapy was started in the ICU in 55% of patients, in the emergency department in 27%, immediately before PCI in 12%, and after PCI in 6%. The median loading dose of clopidogrel was 300 mg (IR 300–600) and the maintenance dose 75 mg Q.D.

The mean hospital stay was 5 days (4.5–7) and mean ICU stay was 4 days [3–5].

In-hospital mortality was 7.35%, 85% due to cardiac complications. The variables associated with mortality are shown in Table 2.

In a multivariate model, mortality was independently associated with age (OR 1.06, $CI_{95}$ 1.02–1.1, $p = 0.001$), moderate or severe left ventricular dysfunction (OR 7.12, $CI_{95}$ 2.5–20, $p < 0.001$), Killip 3–4 (OR 4.86, $CI_{95}$ 1.64–14,$p = 0.004$). Treatment with ACEi (OR 0.18, $CI_{95}$ 0.06–0.48, $p < 0.005$) and beta-blockers (OR 0.22, $CI_{95}$ 0.07–0.62, $p = 0.05$) were independently associated with lower in-hospital mortality.

STEMI was observed in 476 patients on admission. The demographic characteristics for these patients are shown in Table 1. Compared to non-STEMI, patients with STEMI were younger ($p = 0.01$), and prior hospitalization for UA or HF was more frequent in NSTEMI than in STEMI patients (15% vs. 5.6% for UA, $p = 0.013$; and 9 vs. 3%, for HF $p = 0.01$, respectively).