

Acute ST-segment Elevation Myocardial Infarction in Argentina. Data from the continuous ARGEN-IAM-ST registry

Infarto agudo de miocardio con elevación del segmento ST en la Argentina. Datos del registro continuo ARGEN-IAM-ST

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ABSTRACT

Background: The National ST-segment elevation Acute Myocardial Infarction (ARGEN-AMI-ST) registry carried out in 2015 provided data on the reality of AMI in Argentina.

Objective: The aim of this study was to present an updated report of the ARGEN-AMI-ST registry.

Methods: This was a national, prospective, multicenter study. After the first phase of the ARGEN-AMI-ST survey, centers were invited to continue with the AMI registry including patients with up to 36-hour electrocardiographic STEMI evolution

Results: The analyzed population comprised 2,464 patients assisted in 78 centers. Mean age was 60±12 years and 80% were men. Preventable risk factors were: 45% smoking, 58% hypertension, 24% diabetes, 41% dyslipidemia and 11% history of coronary heart disease. Eighty-eight percent of patients underwent reperfusion, and among them, 21% received thrombolytics and 89% percutaneous coronary intervention. The delay from onset of symptoms to admission was 130 minutes (IQR 25-75: 60-305); physicians reported delays to treatment in 49% of cases, with an impact on total ischemic times (TIT). In-hospital mortality was 8.7%. In the multivariate analysis, being treated in a center with hemodynamic availability was not independently associated with survival.

Conclusions: Current data from the continuous AMI registry in Argentina are similar to those shown in the 2015 survey. Delays to treatment are important, especially due to the delay in patient consultation, which greatly impacts on TIT.

Key words: Myocardial infarction - ST segment elevation myocardial infarction - Epidemiology - Coronary balloon angioplasty - Reperfusion

RESUMEN

Introducción: A través del Registro Nacional de Infarto Agudo de Miocardio (IAM) con Elevación del ST (ARGEN IAM-ST) realizado en 2015 se conocieron datos de la realidad del IAM en Argentina; en esta ocasión, se presenta un reporte actual.

Materiales y métodos: Estudio prospectivo multicéntrico, con alcance nacional. Luego de la primera fase de la encuesta ARGEN-IAM-ST, se invitó a los centros a continuar con el registro de IAM. Se incluyeron pacientes con IAM con elevación del segmento ST en el electrocardiograma de hasta 36 horas de evolución.

Resultados: La población analizada abarcó 2464 pacientes asistidos en 78 centros. La media de edad fue 60 ± 12 años y el 80% fue de género masculino. Los factores de riesgo prevenibles se distribuyeron del siguiente modo: tabaquismo 45%, hipertensión arterial 58%, diabetes 24% y dislipidemia 41%. El 11% tuvo antecedente de enfermedad coronaria. El 88% recibió reperfusión; el 21% de estos pacientes recibieron trombolíticos y al 89% se le realizó angioplastia. La demora desde el inicio de los síntomas hasta la admisión fue de 130 minutos (RIC 25-75: 60-305); los médicos reportaron demoras hasta el tratamiento en el 49% de los casos, con impacto en los tiempos totales de isquemia (TTI). La mortalidad intrahospitalaria fue del 8,7%. En el análisis multivariado, ser tratado en un centro con hemodinamia no se asoció de forma independiente con la supervivencia.

Conclusiones: Los datos actuales del registro continuo de IAM en la Argentina son similares a los que mostró la encuesta de 2015. Las demoras hasta el tratamiento son importantes, especialmente por el tiempo de demora en la consulta de los pacientes, lo que impacta en gran medida en los TTI.

Palabras claves: Infarto de miocardio - Infarto de miocardio con elevación del ST -Epidemiología - Angioplastia coronaria con balón - Reperfusión

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INTRODUCTION

Cardiovascular diseases are the main cause of worldwide morbidity and mortality and have a special effect in developing countries. For this reason, multiple strategies and programs have been developed with the purpose of preventing and treating these pathologies, and thus reduce their consequences. (1)

Cardiovascular scientific societies in Argentina, i.e. the Argentine Society of Cardiology (SAC) and the Argentine Federation of Cardiology (FAC), have a long history of registries and educational programs to improve cardiovascular care. In order to know the necessary measures and their results in medical practice, it is relevant to have registries on the prevalence and/or incidence of events, with the aim of managing resources and allow their equitable distribution. (2)

ST-segment elevation acute myocardial infarction (STEMI) is one of the pathologies to which these resources are destined, since its attention and timely treatment reduce cardiovascular mortality and short and long-term complications, with a clear benefit in the general population.

Therefore, to assess STEMI care in our country, a collaborative work between the SAC and FAC implemented the 2015 National ST-segment Elevation Acute Myocardial Infarction Survey (ARGEN-IAM-ST), whose results have already been published. (3)

Due to the importance of these data and the acceptance of the participating centers to continue with the collaboration, the project progressed with the continuous STEMI registry, thanks to which there is updated and uninterrupted information about this disease in Argentina.

METHODS

This was a national, prospective, multicenter study. After finishing the first phase of the National ST-segment Elevation Acute Myocardial Infarction (ARGEN-AMI-ST) Registry, in December 2015, the participating centers were invited to continue with the registry, adapting the case file which preserved the data considered of greater epidemiological and clinical relevance.

The previously published inclusion and exclusion criteria were maintained. (3) Data were collected on the patient's characteristics (age, gender, risk factors, history, comorbidities), clinical presentation (location of the infarction, admission Killip and Kimball and time of evolution), treatment used (antiplatelet agents, reperfusion method and adjuvant treatment) and in-hospital clinical outcome (heart failure, post-infarction angina, shock and death). Data related with delays to effective treatment were collected.

The following times and delays were considered:

- 1) Pain-consultation time: time elapsed between the onset of symptoms suggestive of coronary ischemia and first medical contact.
- 2) Time to reperfusion: time elapsed between arrival at a medical center and initiation of reperfusion treatment:
 - a) In the case of fibrinolytics:
 - Time window: time interval in minutes from the onset of symptoms to start of infusion.
 - Door-to-needle time: time interval in minutes from arrival at the institution and start of infusion.

- b) In case of percutaneous coronary intervention (PCI):
 - Time window: time interval in minutes from the onset of symptoms to balloon inflation.
 - Door-to-balloon time: time interval in minutes from arrival at the institution to balloon inflation.

Data were collected via web, in an electronic format file specially designed by the FAC Medical Teleinformatic Center (CETIFAC).

Statistical analysis

Qualitative variables are presented as frequencies and percentages, with their confidence intervals. Quantitative variables are expressed as mean \pm standard deviation (SD) or median and interquartile range (IQR 25-75), according to their distribution.

Discrete variables were analyzed using contingency tables and continuous variables using Student's t test or the Kruskal Wallis test for unpaired data or the analysis of variance (ANOVA), as appropriate. A correlation analysis was performed to evaluate associations. A p value < 0.05 was considered statistically significant. Stata/SE v13.0® was used for the statistical analysis.

The protocol was registered with ClinicalTrials.gov under the number NCT2458885.

Ethical considerations

The ARGEN IAM-ST registry protocol was approved by the Argentine Society of Cardiology Ethics Committee and that of each participating institution.

RESULTS

From January 1, 2016 to September 10, 2019, 2,464 patients attended in 78 centers in 19 Argentine provinces and the Autonomous City of Buenos Aires (42% public entities and 58% private) were included in the study. Seventy-three percent of patients corresponded exclusively to coronary care units and in 65% to centers with capacity to perform PCI.

Mean age was 60 ± 12 years and 80% were male patients. Among the total number of patients who entered the registry, only 28 (1.1%) presented with left bundle branch block.

The prevalence of preventable coronary risk factors was: 45% active smoking, 58% essential hypertension, 24% diabetes and 41% dyslipidemia. Thirteen per cent of patients had a history of coronary heart disease.

The location of infarction was anterior in 37% of cases, inferior in 38%, and lateral in 4.4%. On admission, 342 patients (13.9%) presented signs of heart failure and 7.5% of cardiogenic shock. The population characteristics are summarized in Table 1.

Reperfusion treatment

Half of the cases were admitted to an institution where they were treated, in the first instance, for AMI; the other half arrived at an institution that transferred the patient to another higher complexity center for their care according to the local organization.

Eighty-eight percent of all patients ($n=2,178$) received reperfusion; and 21% ($n=443$) of these patients (21%) were reperfused with thrombolytics. Percutane-

Table 1. General patient characteristics.

Variable	n	%	95% CI
Age (mean±SD *)	60 ± 12		
Male gender	1,973	80	79-81
<i>Coronary risk factors</i>			
Hypertension	1,426	58	56-60
Don't know	120	5	4-6
Diabetes	58ke	24	22-26
Don't know	102	4	4-5
Dyslipidemia	1,006	41	39-43
Don't know	310	13	11-14
Current smoker	1,110	45	43-47
Former smoker	592	24	22-26
Family history	444	18	16-20
<i>History of coronary heart disease</i>			
Infarction	269	11	10-12
Coronary heart disease	317	13	11-14
Stable chronic angina	83	3.4	2.7-4
PCI	241	10	9-11
CABG	39	1.7	1.1-2.1
History of heart failure	53	2.1	1.6-2.8
COPD	82	3.4	2.6-4
Previous use of aspirin	525	21	20-23
<i>Infarct location</i>			
Anterior	905	37	35-39
Inferior	948	38	36-40
Lateral	110	4.4	4-5
Undefined	25	1	0.5-1.5
<i>Killip and Kimball on admission</i>			
I	1,865	76	74-77
II	342	14	12-15
III	0		
IV	184	7.5	6.5-8.5

*SD= Standard deviation. PCI: Percutaneous coronary intervention. CABG: Coronary artery bypass graft surgery. COPD: Chronic obstructive pulmonary disease. CI: Confidence Interval

ous coronary intervention was performed in the first 24 hours after AMI in 89% of cases, divided into 89% primary PCI, 8% rescue PCI, and only 3% pharmacoinvasive strategies (Table 2).

Primary PCI was successful in 96% of patients; 95% of these patients received stent implants, of which 52% were drug-eluting stents. The coronary arteries responsible for the infarction were: anterior descending (46%), right coronary (36%), circumflex (13%), diagonal (2%), left main (1%) and venous bridges (0.6 %).

In 11% of cases, reperfusion treatment was not performed, mainly due to delay in consultation.

Delays

The delay from symptom onset to admission was 130 minutes (IQR 25-75: 60-305) in the overall population. When patients were referred from one institution to another to complete their treatment, the delay to the second center was 150 minutes (IQR 25-75: 60-360),

while the delay in those who consulted in the center where they were treated directly, without the need to be transferred, was 120 minutes (IQR 25-75: 60-266); $p=.05$. More than 2/3 of the subjects were admitted within 6 hours of symptom onset.

The door-to-balloon time of the patients who underwent primary PCI was 131 minutes (IQR 25-75: 70-273), while the total time window between onset of symptoms and balloon inflation, considered as the total ischemic time (TIT), was 315 minutes (IQR 25-75: 194-600) (Table 3). Only 35% had a door-to-balloon time of less than 90 minutes.

Patients who consulted at a center with the possibility of performing PCI had a door-to-balloon time of 100 minutes (IQR 25-75: 60-174), vs. 192 minutes (IQR 25-75: 98-395) in those who had to be transferred to another center for treatment ($p=0.0001$). This had an impact on TIT: 259 minutes (IQR 25-75: 160-480) in those which were not transferred and 414 minutes (IQR 25-75: 254-748) in those which had to

be transferred, $p = <0.001$.

Following the same scheme and taking into account that the number of patients was lower, the door-to-needle time of those who were treated in the first consultation center was 60 minutes (IQR 25-75: 35-95), vs. 65 minutes (IQR 25-75: 30-130) in patients who had to be referred for fibrinolytic infusion ($p=0.2$). Moreover, no statistically significant differences were found in the total time window, with 210 minutes (IQR 25-75: 110-360) vs. 180 minutes (IQR 25-75: 120-315), $p=0.35$, respectively, for these two groups. Only 20% of patients were treated with fibrinolytics within 30 minutes of admission.

The opinion of treating physicians was sought regarding delays to treatment and they considered that there were delays in reperfusion treatment in 1,208 patients (49%), 60% in the case of primary PCI and 62% in the use of thrombolytics. They also highlighted the delay in patient consultation as one of the most important factors. In the time window of patients in whom there were delays, compared with that in whom there were no delays, there was a difference of 3 hours in the case of primary PCI and of 90 minutes for reperfusion with thrombolytics.

The medical treatment indicated, both upon admission and at discharge, is found in the Supplementary material. On admission, 97% received aspirin and at discharge clopidogrel was the most widely used P2Y12 receptor inhibitor in those treated with PCI (69%).

In-hospital evolution

Table 4 details the events that occurred during hospitalization. Of the 65 (2.6%) patients who had hemorrhages, 37% were associated with arterial punctures, but all were minimal or minor bleedings. Among major hemorrhages, 3 were brain hemorrhages. Median

hospital stay was 4 days (IQR 25-75: 3-6) and coronary unit stay was also 4 days (IQR 25-75: 2-5).

In-hospital mortality was 8.7% ($n=214$, most of them for cardiac causes (81%). We observed that there was a strong correlation ($r=0.71$) between longer time to consultation and mortality (Figure 1).

The mortality of patients admitted with heart failure was 15%, of those admitted with cardiogenic shock 57% and of those admitted without signs of heart failure 2.6%. The mortality of patients treated with thrombolytics was 9%, vs. 7.5% in those treated with PCI, without statistically significant differences ($p=0.15$). A relationship was also observed between the number of hours from the onset of symptoms to institutional admission and the proportion of patients with severe left ventricular ejection fraction (LVEF) impairment, qualitatively measured during hospitalization: 0-3 hours, 9.5%; 3-6 hours, 11.5%; 6-12 hours, 16%, 12-24 hours, 19%; and more than 24 hours, 21% ($p=0.02$).

In the multivariate logistic regression analysis, the independent variables significantly associated with mortality were age, female gender, presence of cardiogenic shock on admission, and lack of reperfusion. The fact that the patient was treated in a center with hemodynamics was not associated with a decrease in mortality (see Supplementary material).

DISCUSSION

The continuous ARGEN-AMI-ST registry included almost 2,500 patients, and although the number of participating centers and provinces was reduced, the levels of complexity of the involved institutions was similar to those of the 2015 national survey. (3)

The analysis shows reperfusion rates of almost 90%, a high use of primary PCI, and, despite the fact

Reperfusion	n	%	95% CI
Reperused	2,178	88	87-90
Fibrinolytics	518	21	19-23
Angioplasties performed in the first 24 hours	1,938	89	87-90
Primary PCI	1,718	89	
Rescue PCI	149	8	
Pharmacoinvasive PCI	67	3	

PCI: Percutaneous coronary intervention. CI: Confidence interval

Table 2. Reperfusion

Time	Median (min)	IQR 25-75%
Onset of pain-consultation	101	50-240
Onset of pain-hospital admission	130	60-305
First medical contact-first ECG	10	1-10
Door-needle	60	33-120
Door-needle window	190	115-330
Door-balloon	131	70 -273
Door-balloon window	315	194-600

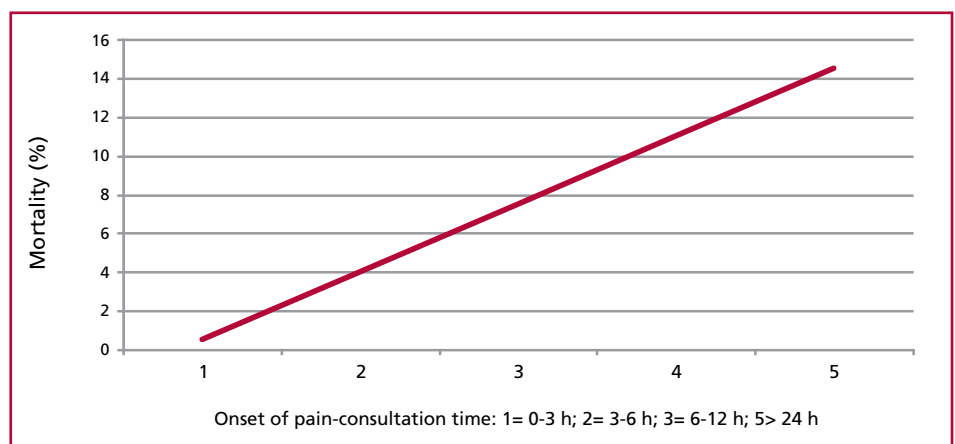
IQR: Interquartile range

Table 3. Time (in minutes)

Table 4. In-hospital events

Events	n	%	95% CI
Overall mortality	214	8.7	8-10
Cardiovascular mortality	174	7	6-8
Post-infarction angina	60	2.4	1.9-3
Reinfarction	33	1.3	0.9-1.9
Stroke	24	1	0.6-1.4
Atrial fibrillation	98	4	3-5
Cardiac arrest	235	9.5	8.4-10
<i>Rhythm at cardiac arrest</i>			
Ventricular fibrillation/tachycardia	132	56	
Pulseless electrical activity	33	14	
Asystole	53	23	
Not documented	17	7	
Hemorrhage	65	2.6	2-3.3
Mild	34	52	
Moderate	14	22	
Major	17	26	
Heart failure during evolution	289	12	10-13
Cardiogenic shock	220	9	8-10
Mechanical complications	28	1.1	0.7-1.6
Septal defect	17	60	
Mitral regurgitation	9	32	
External cardiac rupture	2	7	

CI: Confidence interval

Fig. 1. Correlation between hours until the time of admission and death (correlation coefficient=0.71)

that half of the patients had to be transferred to higher complexity centers, only 3% received a pharmacoinvasive reperfusion strategy and 8% salvage PCI. Overall mortality was 8.7%, with very similar levels to those of previous surveys and registries published by centers with cardiology residencies. (4,5) Mortality is higher than that of some international registries, such as the French registry, but similar to public registries of that country and lower than that of United States registries. (6)

Although a high percentage of patients consulted with less than 6 hours of symptom evolution, the number of those who received treatment with door-to-balloon and door-to-needle times according to the

recommendations of clinical practice guidelines is not enough. This point requires great cooperation and organization to reverse the situation, since, we have seen in the registry the logical relationship indicating that the longer the time to reperfusion the higher the mortality and the higher the proportion of patients living with severe EF impairment, regardless of the reperfusion method used; so, if reperfusion were administered in a timely manner, such complications would be avoided.

The studies that analyzed the strategy of administering thrombolytics in the first receiving center versus transfer for primary PCI showed no benefit when the time of symptom evolution was less than 3 hours,

but transfer was beneficial with longer times, especially in terms of incidence of reinfarction and stroke. (7) However, the door-to-balloon times in these studies were very low and very difficult to translate into real life; consequently, taking these figures into account, a high number of patients could benefit from the use of fibrinolytics before referral. (8)

In more than 60% of infarctions, physicians detected delays in treatment, mainly attributed to a delay in patient consultation and the need to refer to another center for PCI. This aspect could be verified, since TIT for PCI was higher in this group. Thus, there is evident need to implement better population strategies to promote early consultation. Another key point is education and the provision of adequate means for early diagnosis and treatment at the place of consultation, or through a network system, before the eventual referral to more complex centers.

The analysis of the independent predictive variables of mortality coincides with the literature and with sub-studies previously carried out by authors of the ARGEN-AMI-ST registry. (9-11) This year (2020) marks the fifth anniversary of the ARGEN-IAM-ST registry, the longest so far in Argentina. This registry fulfills one of its main objectives: to provide permanent information on AMI, and due to its significant morbidity and mortality, to discuss its care and improve the quality of the recommendations proposed by scientific societies through their clinical practice guidelines and consensuses. (12)

Limitations

The continuous registry has some structural differences with the initial survey, because although it presents a higher number of cases, which currently positions it as the Argentine AMI registry with the greatest scope, this was obtained over a longer period and with just under 30% of the centers that participated in the first ARGEN-AMI-ST registry. This means that most of the cases are concentrated in large institutions, both public and private, and there could be a bias in less complex centers. On the other hand, the lack of data auditing in the centers, due to absence of financial support, could raise questions about data registration. Nevertheless, the participating institutions maintain a high degree of commitment with the registry, and even more so, with this important cardiovascular disease.

CONCLUSIONS

Current data from the continuous AMI registry in Argentina show results similar to those of the 2015 survey, with a high reperfusion rate (88%) and an in-hospital mortality of 8.7%. Similar to the previous survey, treatment delays are still significant, especially in the time of patient consultation and referral to other centers, with great influence on TIT.

In this second report we can observe a consistent situation of AMI in Argentina, which allows us to work on the goals proposed by scientific societies to improve the quality of care.

Conflicts of interest

None declared.

(See authors' conflicts of interest forms on the website/ Supplementary material)

REFERENCES

- Ibanez B, James S, Agewall S, et al. 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation: The Task Force for the management of acute myocardial infarction in patients presenting with ST-segment elevation of the European Society of Cardiology (ESC). *Eur Heart J* 2018;39:119-77. <https://doi.org/10.1093/eurheartj/ehx393>
- Bhatnagar P, Wickramasinghe K, Williams J, Rayner M, Townsend N. The epidemiology of cardiovascular disease in the UK 2014. *Heart* 2015;101:1182-9. <https://doi.org/10.1136/heartjnl-2015-307516>
- Gagliardi JA, Charask A, Perna E, D'Imperio H, Bono J, Castillo Costa Y y cols. National Survey of ST-Segment Elevation Acute Myocardial Infarction in Argentina (ARGEN-IAM-ST). *Rev Argent Cardiol* 2016;84:524-33. <https://doi.org/10.7775/rac.es.v84.i6.9508>
- Higa CC, D'Imperio H, Blanco P, Charask A, Cohen Arazi H, Novo F, cols; On Behalf of the investigators of the SCAR and ARGEN-IAM-ST registries. Comparación de dos registros argentinos de infarto de miocardio: SCAR 2011 y ARGEN-IAM ST 2015. *Rev Argent Cardiol* 2019;87:19-25.
- Pérez GE, Costabel JC, González N, Zaidel E, Altamirano M, Schiavone M, cols; Investigadores del Consejo Argentino de Residentes de Cardiología (CONAREC). Infarto agudo de miocardio en la República Argentina. Registro CONAREC XVII. *Rev Argent Cardiol* 2013;81:390-9. <https://doi.org/10.7775/rac.es.v81.i5.1391>
- Massoullie G, Wintzer-Wehekind J, Chenaf C, Mulliez A, Pereira B, Authier N, et al. Prognosis and management of myocardial infarction: Comparisons between the French FAST-MI 2010 registry and the French public health database. *Arch Cardiovasc Dis* 2016;109:303-10. <https://doi.org/10.1016/j.acvd.2016.01.012>
- Widimský P. Long distance transport for primary angioplasty vs immediate thrombolysis in acute myocardial infarction Final results of the randomized national multicentre trial—PRAGUE-2. *Eur Heart J* 2003;24:94-104. [https://doi.org/10.1016/S0195-668X\(02\)00468-2](https://doi.org/10.1016/S0195-668X(02)00468-2)
- Andersen HR, Nielsen TT, Vesterlund T, Grande P, Abildgaard U, Thyssen P, et al. Danish multicenter randomized study on fibrinolytic therapy versus acute coronary angioplasty in acute myocardial infarction: rationale and design of the danish trial in acute myocardial infarction-2 (DANAMI-2). *Am Heart J* 2003;146:234-41. [https://doi.org/10.1016/S0002-8703\(03\)00316-8](https://doi.org/10.1016/S0002-8703(03)00316-8)
- Castillo Costa YB, Caccavo A, Charask A, Moreno K, Cassano C, Gagliardi JA. Características de los pacientes mayores de 75 años en el Registro ARGEN-IAM-ST. *Rev Argent Cardiol* 2019;87:48-52. <https://doi.org/10.7775/rac.es.v87.i1.12558>
- Macín SM, Sueldo M, Perna ER, Tajer CD, Cerezo GH, Struminger M y cols. Características clínicas y evolución hospitalaria de mujeres con Infarto agudo de miocardio en el Registro Nacional de Infarto SAC-FAC. *Rev Fed Arg Cardiol* 2018;47:125-9.
- Charask AA, Castillo Costa YB, D'Imperio H, Perna ER, Zapata G, Tajer CD y cols. Pacientes con infarto agudo de miocardio con elevación del ST trasladados a centros con hemodinamia. Encuesta Nacional de Infarto Agudo de Miocardio con Elevación del ST en la República Argentina (ARGEN-IAM-ST). *Rev Argent Cardiol* 2017;85:90-102.
- Blanco P, Borracci RA, Giorgi M, Higa C, Botto F, Juan Gagliardi J, por los Investigadores del Área de Investigación SAC y el Consejo de Emergencias SAC. Años de vida perdidos por infarto agudo de miocardio en la Argentina entre 1991 y 2005. *Rev Argent Cardiol* 2008;76:442-9.

SUPPLEMENTARY MATERIAL**APPENDIX****List of participating centers and responsible investigators**

Hospital Gral. de Agudos Dr. Cosme Argerich – Luciana Puente
 Instituto Cardiovascular de Rosario – Gerardo Zapata
 Hospital San Juan de Dios de La Plata – Oscar Pisana/Diego Echazarreta
 Sanatorio Güemes – Ricardo Villareal
 Clínica Santa Isabel – Víctor Mauro/Yanina Castillo Costa
 Clínica Bazterrica – Carlos Barrero/ Adrián Charask
 Sanatorio San Carlos – Matías Calandrelli
 Sanatorio Allende Nueva Córdoba – Julio Bono
 Centro Privado de Cardiología – Eduardo G. Hasbani
 Instituto de Cardiología J. F. Cabral – Stella Macín/Facundo Falcón
 Centro Modelo de Cardiología – Juan Muntaner
 Hospital El Cruce "Dr. Néstor Kirchner" – Tomás Vassia
 Hospital Luis Lagomaggiore – Jorge Piasentin
 Sanatorio Privado Gatti – Pablo Moreno
 Sanatorio Pasteur – María Pía Marturano
 Sanatorio Juan XXIII – Roberto Bernardini/Nicolás Menichini
 Hospital para la Comunidad de Arias – Joaquín Sangiorgno
 Centro de Alta Complejidad – Pablo Agüero
 Hospital Dr. Raúl F. Larcade – Gabriel Jans
 Hospital Gral. de Agudos "Juan A. Fernández" – Patricia Guitelman
 Hospital San José de Pergamino – Luis Bahamonde
 Hospital Gral. de Agudos "Dr. T. Álvarez" – Daniel H. Avayu/Marcos P. Tomasella
 Hospital Universitario Austral – Horacio Fernández
 Clínica de Cuyo – Ariel Baigorria Jayat/María Elisa de la Fuente
 Hospital Subzonal "Dr. Andrés R. Isola" – Norman Casado
 Hospital Dr. Guillermo Rawson – Adrián H. D'Ovidio
 Sanatorio de la Ciudad, Puerto Madryn – Julián Tiranti
 Hospital Artémides Zatti – José Luis Rovasio/Silvia Framarini
 Instituto de Cardiología Dr. González Sabathíé – Antonio Gentile/Mario Ciafardoni
 Hospital Español de Buenos Aires – Liliana Nicolisi
 Sanatorio Fueguino de Diagnóstico y Tratamiento – Mauro Dotto/Raúl E. Figueroa
 Hospital de San Bernardo – Augusto Barbosa
 Fundación Médica de Río Negro y Neuquén – Demetrio Thalasselis
 Instituto. Modelo de Cardiología Privado de Córdoba. – Eduardo Conci/Walter Quiroga
 Hospital Italiano de Córdoba – Fernando Gragera
 Hospital Ramón Carrillo – David Marcelo Krivich
 Hospital Córdoba – Marcos De la Vega
 Clínica y Maternidad Suizo Argentina – Juan Caros Medrano
 Hospital San Felipe San Nicolás – Raúl Alejandro Quijano
 Hospital El Carmen, Mendoza – Oscar Fernando Vidal
 Clínica Universitaria Reina Fabiola, Córdoba – Raúl Jesús Barcudi
 Clínica Pasteur SA, Neuquén – Claudio Ploger/Ana Duret
 Hospital Gral. de Agudos Dr. Zubizarreta – José María Soler
 Sanatorio San Martín, Venado Tuerto, Santa Fe – Javier Matcovik
 Sanatorio de la Trinidad, San Isidro, Bs. As. – Juan Taccari/Walter Nieto
 Hospital Italiano de Buenos Aires, CABA – José Luis Navarro Estrada/Francisco José Romeo
 Hospital Británico de Buenos Aires, CABA – Horacio Alberto Avaca/Mauro Gastón Gingins
 Hospital Mi Pueblo, Florencio Varela, Buenos Aires – Santiago Tur/Federico Bodega
 Hospital Pablo Soria – Franz Rivero Paz
 Sanatorio Allende Cerro, Córdoba – Roberto Miguel A. Colque
 Hospital Privado del Sur – Raúl Cermesoni/Marcelo Guimaraenz
 Hospital Privado de la Comunidad de Mar del Plata –Álvaro Facta
 Hospital General de Agudos Dr. Ramos Mejía – Justo Cabrales
 Hospital Luisa C. de Gandulfo – Juan Pullido
 Clínica San Martín – Pablo Maldonado

Hospital Italiano de La Plata – Cecilia Beltrano
Hospital Iriarte – David Parisi
HIGA Gral. San Martín – Luis Medesani
HIGA Rossi – Carlos Martínez
Hospital Pirovano – Ricardo Mejail
Hospital Español de Rosario – Daniel Edgardo Miraglia
Clínica Yunes – Edgar Aguilar
Sanatorio Modelo Quilmes – Adrián Hrabar/Alberto Fernández
Sanatorio Ntra. Sra. del Rosario – Gustavo Bustamante Labarta
Hospital Teodoro J. Schestakow – Leonardo Schiavone
Hospital Dr. J. M. Valdano – Ramiro Alberto Astegiano
IOT – Oscar Ariel Vogel
Hospital Héctor Cura, Olavarría – Ernesto Ylarri
Policlínico Regional Juan D. Perón – Sandra Mugnaini
Policlínico Modelo de Cipolletti – Diego Figoni
RAPIAM (Red de Atención Prov. del IAM La Rioja) – Horacio Pomés Iparaguirre
Sanatorio Los Lapachos de Jujuy – Luis Freijo
Hospital Lamadrid de Monteros – Andrea Piredda
Clínica Del Valle – Miguel Salva
Hospital Zonal Bariloche – Germán Santamaría
Hospital de Alta Complejidad J. D. Perón – Christian Smith/Nicolás Areco
Hospital L. Molas, Santa Rosa, La Pampa – Fabián Kubaruk
Sanatorio Mitre – Hernán Cohen Arazi

Table 5. Patient distribution according to preestablished intervals from onset of symptoms to admission.

Hours to admission	n	%	Median (minutes)	IQR 25-75
0-3	1,449	61	75	40-120
>3-6	438	18	250	219-300
>6-12	295	12	500	420-600
>12-24	144	6	1,020	855-1225
>24	75	3	1,897	1,599-2,520

Table 6. Causes of delay

	n	%	95% CI
Treatment delays	1,208	49	47-51
Patient consultation	917	75	73-78
Ambulance delay	524	43	41-46
Emergency room	359	30	27-32
Medical failure in diagnosis	312	26	23-28
Hemodynamic lab delay	281	23	21-26
Administrative problems	86	7	6-9
Initial doubtful ECG	108	9	7-11
Cardiac arrest	64	5	4-7
Other reasons	87	7	6-9

Table 7. Treatments administered

Medications	On admission n=2,464			At discharge n=2,250		
	n	%	IC 95%	n	%	IC 95%
Aspirin	2,387	97	96-98	1,966	87	86-89
Clopidogrel	1,803	73	71-75	1,415	63	61-65
Prasugrel	162	6,5	5-8	152	7	6-8
Ticagrelor	410	17	15-18	363	16	15-18
GPIIb/IIIa inhibitors	134	5	4-6			
# Anticoagulant UFH	821	33	31-35			
∞ Anticoagulant LMWH	647	26	24-28			
Bivalirudin	26	1	0,6-1,5			
Betablockers	1,235	50	48-52	1,684	75	73-77
ΩACEI	1,110	45	43-47	1,279	57	56-59
ΦARBs	154	6	5-7	208	9	8-10
Statins	2,191	89	88-90	1,882	84	82-85
Anti-aldosterone agents	273	11	10-12	380	17	15-18
Acenocoumarol-warfarin	47	2	1,4-2,5	89	4	3-5

anticoagulant UFH: Anticoagulant doses of unfractionated heparin; ∞ Anticoagulant LMWH: Anticoagulant doses of low molecular weight heparin; ΩACEI: Angiotensin-converting enzyme inhibitors; ΦARBs: Angiotensin II receptor blockers.

Provinces	N° of centers	N° AMI included	%
Buenos Aires	22	527	25.0
CABA	13	613	21.9
Catamarca	1	161	6.5
Chubut	3	40	1.6
Córdoba	9	127	5.1
Corrientes	1	301	12.2
Formosa	1	17	0.7
Jujuy	3	36	1.5
La Pampa	1	1	0.0
La Rioja	1	105	4.3
Mendoza	4	47	1.9
Misiones	1	6	0.2
Neuquén	1	47	1.9
Río Negro	6	79	3.2
Salta	1	14	0.57
San Juan	1	42	1.7
Santa Fe	5	252	10.2
Santiago del Estero	1	2	0.1
Tierra del Fuego	1	2	0.1
Tucumán	3	45	1.8
Total	77	2,464	100

Table 8. Distribution of cases per province

Variabes	OR	P	95% CI
Age	1.035	0.000	1.02-1.05
Sex	0.62	0.004	0.45-0.86
Shock on admission	21	0.000	15-31
Reperfusion	0.48	0.000	0.35-0.73
Center with hemodynamic lab	0.734	0.148	0.48-1.11

Table 9. Logistic regression for predictors of mortality

Variable coding: age, continuous variable; sex: 0= female, 1= male; shock on admission: 0= without shock, 1= with shock; reperfusion: 0= did not receive, 1= received; center with hemodynamic lab: 0= no, 1= yes.