Patterns of Inpatient Care and Readmission Rates (30-day, 3-month and 1-year) in Myocardial Infarction in Spain. Differences Between STEMI and NSTEMI

Patrones de atención hospitalaria y tasas de reingreso (a 30 días, a 3 meses y a 1 año) en infarto de miocardio en España. Diferencias entre IAMCEST e IAMSEST

To the Editor,

A significant number of patients with acute myocardial infarction (AMI) are readmitted after hospital discharge, which produces a major impact on health care costs.[1] Because some of these readmissions can be a sign of deficient inpatient care[2] and many could potentially be preventable, a better understanding of them is worthwhile.[3] In fact, readmission rates are a significant component of current quality improvement strategies.

In a previous study, we analyzed cardiac disease readmission rates after AMI based on the discharge data set of the Spanish national health system.[4] In this letter, we present a subanalysis focused on differences in readmission rates between ST-segment elevation myocardial infarction (STEMI) and non–ST-elevation acute myocardial infarction (NSTEMI).

The methodology has been described in our previous publication.[4] In brief, through the minimum basic data set of hospital discharges of the Spanish national health system, a total of 33 538 patients with at least 1-year of follow-up were identified: 18 189 patients (54.2%) with STEMI (codes 410.*1, except 410.71) and 15 349 patients (48.5%) with NSTEMI (code 410.71 for NSTEMI). Hospital risk standardized readmission rates were calculated using a multilevel model.

The patients' characteristics are displayed in Table 1. Readmission rates were 4.7% at 30 days, 8.1% at 3 months and 18.1% at 1 year for STEMI and 6.3% at 30 days, 10.8% at 3 months and 22.7% at 1 year for NSTEMI ($P < .001$ for all comparisons). The risk standardized readmission rates at 30 days, 3 months, and 1 year were slightly lower in patients with STEMI than in those with NSTEMI (17.3% ± 4.7% vs 18.5% ± 4.7% at 1 year; $P < .001$). At 1 year, mortality from cardiac disease (1.5% vs 2.7%; $P < .001$) and the risk of developing heart failure (24.8% vs 28.8%; $P < .001$) were also lower in STEMI than in NSTEMI patients.

Significant differences in readmission rates among the different types of hospitals were observed both in STEMI and NSTEMI patients, with lower rates in hospitals treating more patients (> 204 AMI discharges) (25% vs 19% for STEMI; 31,5% vs 29% for NSTEMI, at 1 year; $P < .001$) and with a cardiac catheterization laboratory (only for STEMI).

Table 1
Baseline Characteristics of STEMI and NSTEMI Patients and Differences Between Them

	Overall		STEMI		NSTEMI		*P*
Factor	N (33 538)	%	n (18 189)	% (54.2)	n (15 349)	% (45.8)	
Men	23 885	71.2	13 409	73.7	10 476	68.3	<.0001
Age, mean ± standard deviation	67.4 ± 13.6		65.5 ± 13.8		69.5 ± 13.2		<.001
Angina pectoris/old myocardial infarction	1900	5.7	740	4.1	1160	7.6	<.0001
Congestive heart failure	7582	22.6	3890	21.4	3692	24.1	<.0001
Coronary atherosclerosis/other chronic ischemic heart disease	25 242	75.3	14 076	77.4	11 166	72.7	<.0001
Acute coronary syndrome	1897	5.7	1339	7.4	558	3.6	<.0001
Specified arrhythmias	8609	25.7	4604	25.3	4005	26.1	<.0001
Valvular or rheumatic heart disease	4606	13.7	2224	12.2	2382	15.5	<.0001
Cerebrovascular disease	795	2.4	356	2.0	439	2.9	<.0001
Stroke	179	0.5	109	0.6	70	0.5	.01
Vascular or circulatory disease	3383	10.1	1633	9.0	1750	11.4	<.0001
Hemiplegia, paraplegia, paralysis, functional disability	788	2.3	366	2.0	422	2.7	<.0001
Diabetes mellitus or diabetes mellitus complications	10 441	31.1	4952	27.2	5489	35.8	<.0001
Renal failure	4063	12.1	1723	9.5	2340	15.2	<.0001
End-stage renal disease or dialysis	154	0.5	47	0.3	107	0.7	<.0001
Other urinary tract disorders	593	1.8	294	1.6	299	1.9	.02
Chronic obstructive pulmonary disease	2721	8.1	1311	7.2	1410	9.2	<.0001
Pneumonia	545	1.6	284	1.6	261	1.7	.3
Asthma	577	1.7	297	1.6	280	1.8	.2
Fluid, electrolyte, and acid-base disorders	866	2.6	393	2.2	473	3.1	<.0001
History of infection	1220	3.6	640	3.5	580	3.8	.2
Metastatic cancer or acute leukemia	163	0.5	85	0.5	78	0.5	.6
Cancer	979	2.9	445	2.4	534	3.5	<.0001
Iron deficiency or other anemias and blood disease	2451	7.3	1047	5.8	1404	9.1	<.0001
Decubitus ulcer or chronic skin ulcer	177	0.5	79	0.4	98	0.6	.01
Dementia or other specified brain disorders	1029	3.1	514	2.8	515	3.4	.005
Protein-calorie malnutrition	75	0.2	27	0.1	48	0.3	.002
Anterior myocardial infarction	788	2.3	651	3.6	137	0.9	<.0001
Other location myocardial infarction	534	1.6	487	2.7	47	0.3	<.0001

NSTEMI, non–ST-elevation acute myocardial infarction; STEMI, ST-segment elevation myocardial infarction.

Lower readmission rates were noted in STEMI patients treated with percutaneous coronary intervention (PCI) in their index episode (Table 2), as well as in NSTEMI patients (7.2% at 30 days, 13.4% at 3 months, and 27.5% at 1 year with PCI, and 7.4% at 30 days, 14.2% at 3 months, and 28.7% at 1 year without revascularization treatment ($P < .001$, for all comparisons). A significant difference was observed between the risk standardized readmission rates depending on the medical unit responsible for attending the AMI, with cardiac units (5.4% at 30 days, 9.1% at 3 months, and 20.1% at 1 year for STEMI and 7.2% at 30 days, 13.5% at 3 months, and 27.8% at 1 year for NSTEMI) having fewer readmissions than other medical services (6.1% at 30 days, 10.2% at 3 months, and 23.2% at 1 year for STEMI and 7.7% at 30 days, 14.9% at 3 months, and 29.3% at 1 year for NSTEMI; $P < .001$, for all comparisons).

We analyzed only those readmissions related to cardiac disease instead of all-cause readmissions in order to focus more on those most related to the index admission, as suggested by Southern et al.[5]

This study has several limitations. Despite being a retrospective analysis, the use of administrative records to estimate outcomes in health services has been validated, and it is currently applied by other authors. The model developed by Medicare & Medicaid Services was used in this study. With respect to the adjustment models, there are confounding factors that are impossible to identify, but which may have a significant impact. Nevertheless, the models used in this study compare favorably against models published elsewhere in terms of their predictive capacity.

This study demonstrates that, within the Spanish national health system, the probability of readmission in the short- and mid-term and the presence of death and heart failure at 1 year are higher after NSTEMI than after STEMI. Furthermore, readmission rates in both types of AMI were associated with some characteristics of the hospital, as well as with discharge from the cardiology unit and the performance of PCI during the index hospitalization. Significant interregional and interhospital differences in managing AMI have been observed in Spain.[6] Whereas patients with STEMI usually undergo emergent revascularization, the therapeutic strategy in NSTEMI is extremely variable and, in most cases, patients do not undergo coronary angiography at the times recommended in the guidelines. Our findings may suggest that NSTEMI patients can also benefit from the use of care networks that favor PCI and the participation of cardiology services with sufficiently large caseloads.

Table 2
Readmission Rates by Type of Treatment Received in STEMI

	Treatment	STEMI			
		N	Mean	SD	*P*
30-day RSRR	None	5044	5.87	1.77	< .001[a]
	PCI[b]	11 392	5.38	1.58	
	Fibrinolysis	520	6.31	1.73	
	Both[b]	1233	5.52	1.46	
3-month RSRR	None	5044	9.77	2.63	< .001[a]
	PCI[b]	11 392	8.97	2.36	
	Fibrinolysis	520	10.63	3.06	
	Both[b]	1233	9.09	2.27	
1-year RSRR	None	5044	22.72	7.41	< .001[a]
	PCI[b]	11 392	19.57	5.52	
	Fibrinolysis	520	25.56	8.52	
	Both[b]	1233	20.47	6.64	

PCI, percutaneous coronary intervention; RSRR, risk standardized readmission rates; SD, standard deviation; STEMI, ST-segment elevation myocardial infarction.
[a] Chi-square.
[b] Bonferroni: in multiple comparisons all differences < .05 except comparisons between PCI and both (nonsignificant).

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Luis Rodríguez-Padial,[a,*] Francisco J. Elola,[b] Cristina Fernández-Pérez,[b] José L. Bernal,[b,c] Vicente Bertomeu,[b,d] and Andrés Iñiguez[e]

[a]*Servicio de Cardiología, Complejo Hospitalario Universitario de Toledo, Toledo, Spain*
[b]*Fundación Instituto para la Mejora de la Asistencia Sanitaria, Madrid, Spain*
[c]*Servicio de Gestión, Hospital 12 de Octubre, Madrid, Spain*
[d]*Servicio de Cardiología, Hospital San Juan, Universidad Miguel Hernández, San Juan de Alicante, Alicante, Spain*
[e]*Servicio de Cardiología, Complejo Hospitalario de Vigo, Vigo, Pontevedra, Spain*

*Corresponding author:
E-mail address: lrpadial@gmail.com (L. Rodríguez-Padial).

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