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EUROpean treatment & Reduction of Acute Coronary Syndromes cost analysis

The EUROTRACS Project

Consumers, Health, Agriculture and Food Executive Agency
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Deliverable N. D04-00

Title:

Estimates of in-hospital mortality in acute coronary syndrome (ACS) patients for each participating country

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EUROpean treatment & Reduction of Acute Coronary Syndromes cost analysis

The EUROTRACS Project

Deliverable N. D04-00

Title:

Estimates of in-hospital mortality in acute coronary syndrome (ACS) patients for each participating country

In this deliverable we present the in-hospital mortality figures for ACS patients, by age group, sex and country, and whether they received or not percutaneous coronary intervention (PCI).

To obtain this deliverable we have merged the databases listed in Table 1. These are all the databases that the partners agreed to contribute.

In the consortium agreement, we described deliverable 4 as follows: “Estimates of in-hospital mortality in ST elevation ACS patients by ACS intervention received (coronary angiography and percutaneous coronary intervention), age group (35-64 years, 65-74 years, 75-84 years and >84 years) and sex”. To fulfill this description taking into account current knowledge and data limitations we have decided to:

- Obtain the estimates of in-hospital mortality by proceeded PCI but not by coronary angiography (CA). This decision is based on the fact that CA estimates are going to be very similar to PCI estimates, as both interventions are equally recommended in ST elevation and non-ST elevation ACS (STEACS and NSTEACS) guidelines, and all patients receiving a PCI receive also a CA, thus adding little information to PCI estimates. Moreover, there was a higher number of missing values in the proceeded angiography variable compared to

the procedeed PCI variable. In particular, the DEASL database lacked this variable.

- Obtain in-hospital mortality estimates by country for the age groups 35-64 and ≥65 years instead of the primary defined age groups (35-64, 65-74, 75-84, ≥85 years), due to sample size constraints. To fulfill the deliverable objectives we have combined the data of all participating countries and obtained in-hospital mortality estimates for the four age groups described above.
- Obtain in-hospital mortality estimates by country for all ACS patients instead of for STEACS patients only, due to sample size constraints. To fulfill the deliverable objectives and because of the difference between STEACS and NSTEACS patients in terms of outcomes and management, we have combined the data of all participating countries and obtained in-hospital mortality estimates separately for STEACS and NSTEACS.
- Obtain in-hospital mortality estimates by country, for men and women together in addition to sex stratification, in order to provide more robust estimates.

The database used to prepare this deliverable (obtained by merging the databases listed in Table1) included 87,688 ACS patients aged >34 years. Of these, 37% had a STEACS event, 47% had a NSTEACS event, 7% had a non-classifiable ACS event and 9% of the patients had non-available information for the ACS type variable (Figure 1). Of the included patients, 32% were women, 62% were >64 years and 43% underwent a PCI during the index admission. Regarding the age structure of the included patients, the majority of women were >64 years while approximately half of the men were aged 35-64 years. In particular, the age group with a higher number of patients was the 75-84 years group in women (33%) and the 35-64 years group in men (46%).

Tables 2-4 show the estimates of in-hospital mortality by country, age group (35-64 and >64 years) and whether the patients underwent a PCI. In all countries and both age groups there was a significant decrease in in-hospital mortality in patients undergoing a PCI compared to patients who did not underwent a PCI (Table 2). This decrease occurred in men and women (Tables 3 and 4). However, when analyses were stratified by sex not all countries showed a statistically significant decrease in in-hospital mortality in patients undergoing a PCI, especially in young women. This lack

of significance was probably caused, among others, by a small sample size (France, Portugal, Greece), a higher percentage of men than of women in the component databases (68% of men in the global database), and a large difference in the percentage of patients undergoing PCI or not (Greece). In women aged 35-64 years only Germany showed a significant decrease in in-hospital mortality in patients undergoing a PCI, probably caused by the added effect of low sample size in certain countries, together with the age structure in the ACS patients, which in women were more frequently >64 years old (Table 4). An example of the sample size issue when stratifying by sex can be observed for Greek women aged 35-64 years, in this group the estimate for in-hospital mortality in the patients undergoing a PCI was 0%, which would be higher if a higher sample size were available for this group.

To provide in-hospital mortality estimates for all age groups and the more frequent ACS types we combined the data from all the participant countries. We found that in men, regardless of the age group and the ACS type (STEACS and NSTEACS), there was a significant decrease in in-hospital mortality in patients undergoing a PCI compared to patients who did not underwent a PCI (Table 5). In women, we also found a significant decrease in in-hospital mortality in patients undergoing a PCI in STEACS (Table 6). In NSTEACS, the decrease in in-hospital mortality was only significant in patients >64 years old. The 35-64 years group also showed a decrease in in-hospital mortality in patients undergoing a PCI, the lack of significance is probably due to the smaller effect and to the lower sample size in this age group.

Table 1. Combined databases for deliverable 4 analyses.

ACS database: years	Group-country	n
EURHOBOP: 2009-2012	AEPMCV-France HMGU-Germany HCC-UOA-Greece DEASL-Italy IMIM-PSMAR-Spain	10,264
Ausburg registry: 2005-2011	HMGU-Germany	3,973
Lazio registry: 2008-2013	DEASL-Italy	44,855
EURHOBOP_Portugal extended database: 2009-2011	FMUP-Portugal	3,009
REGICOR: 2000-2009	IMIM-PSMAR-Spain	11,035
MASCARA: 2004-2005	IMIM-PSMAR-Spain	7,127
Ravena registry: 2011-2014	ESREFO-Italy	1,512
European Heart Survey I: 2000-2001	ESREFO-Italy ESC	2,476
European Heart Survey II: 2004	ESREFO-Italy ESC	1,597
National MI registry from Greece	HCC-UOA-Greece	1,840

Figure 1. Flow-chart of the database used for deliverable 4 analyses by country and ACS type. Number of patients before and after including the National MI Registry from Greece.

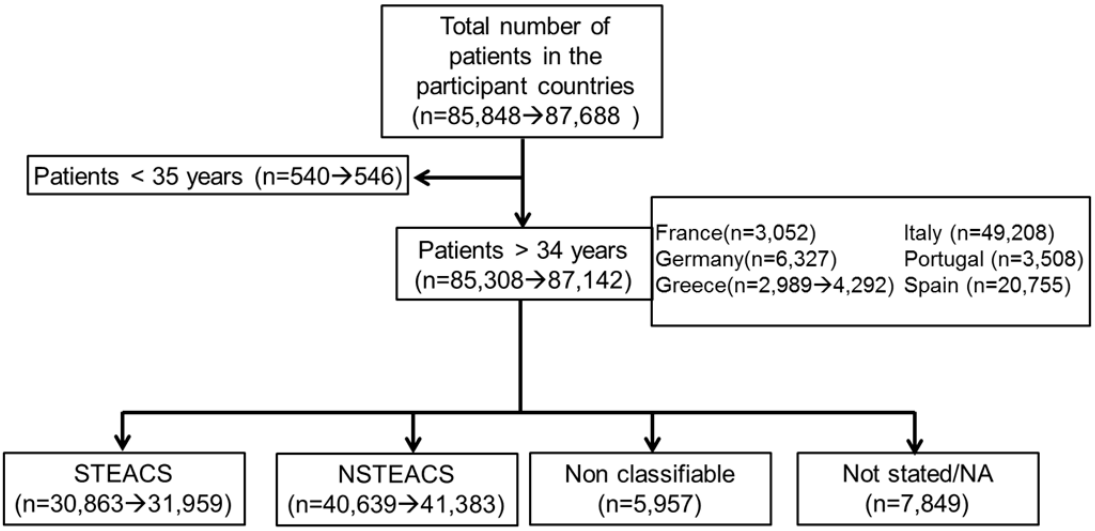

Table 2. In-hospital mortality estimates in ACS patients by age group, proceeded PCI and country.

Both sexes	35-64 years			≥ 65 years		
	No PCI	PCI	p-value	No PCI	PCI	p-value
France	3.13% (n=415)	1.19% (n=1088)	0.018	7.71% (n=545)	4.38% (n=1004)	0.009
Germany	8.38% (n=871)	2.22% (n=2112)	<0.001	15.18% (n=1383)	4.95% (n=1959)	<0.001
Greece	2.07% (n=1304)	0.17% (n=584)	0.003	9.07% (n=2040)	1.92% (n=363)	<0.001
Italy	3.48% (n=6142)	1.46% (n=10527)	<0.001	15.55% (n=19202)	5.96% (n=12809)	<0.001
Portugal	4.46% (n=560)	1.81% (n=829)	0.006	14.05% (n=1381)	4.61% (n=738)	<0.001
Spain	4.81% (n=3035)	1.35% (n=2886)	<0.001	11.68% (n=6136)	3.53% (n=2746)	<0.001

Difference between in-hospital mortality estimates by proceeded PCI has been analyzed by the Pearson's Chi-squared test with Yates' continuity correction.

Table 3. In-hospital mortality estimates in ACS patients by age group, proceeded PCI and country, in men.

Men	35-64 years			≥ 65 years		
	No PCI	PCI	p-value	No PCI	PCI	p-value
France	2.72% (n=331) (1.4-5.2%)	1.27% (n=941) (0.7-2.2%)	0.128	7.06% (n=340) (4.8-10.5%)	4.26% (n=680) (3.0-6.1%)	0.081
Germany	7.36% (n=666) (5.6-9.7%)	2.27% (n=1716) (1.7-3.1%)	<0.001	16.00% (n=825) (13.5-19.0%)	4.82% (n=1308) (3.8-6.2%)	<0.001

Greece	2.09% (n=1100) (1.4-3.1%)	0.20% (n=506) (0.0-1.1%)	<0.001	8.01% (n=1323) (6.6-9.7%)	1.42% (n=282) (0.6-3.6%)	<0.001
Italy	3.51% (n=4645) (3.0-4.1%)	1.30% (n=8934) (1.1-1.6%)	<0.001	14.77% (n=9960) (14.0-15.5%)	5.01% (n=8276) (4.6-5.5%)	<0.001
Portugal	4.48% (n=446) (2.9-6.9%)	1.58% (n=695) (0.9-2.8%)	0.059	13.46% (n=743) (11.1-16.4%)	3.64% (n=467) (2.3-5.8%)	<0.001
Spain	4.80% (n=2500) (4.0-5.7%)	1.20% (n=2427) (0.8-1.7%)	<0.001	11.53% (n=3745) (10.5-12.7%)	3.04% (n=1943) (2.4-3.9%)	<0.001

Difference between in-hospital mortality estimates by proceeded PCI has been analyzed by the Pearson's Chi-squared test with Yates' continuity correction.

Table 4. In-hospital mortality estimates in ACS patients by age group, proceeded PCI and country, in women.

Women	**35-64 years**			**≥ 65 years**		
	No PCI	PCI	p-value	No PCI	PCI	p-value
France	4.76% (n=84) (1,9-12,2%)	0.68% (n=147) (0,2-3,8%)	0.114	8.78% (n=205) (5,6-13,9%)	4.63% (n=324) (2,8-7,6%)	0.082
Germany	11.71% (n=205) (7,9-17,4%)	2.02% (n=396) (1,0-4,0%)	<0.001	13.98% (n=558) (11,2-17,4%)	5.22% (n=651) (3,7-7,3%)	<0.001
Greece	1.96% (n=204) (0,8-5,0%)	0.00% (n=78) (0,0-4,7%)	0.494	11.02% (n=717) (8,8-13,7%)	3.70% (n=81) (1,3-10,8%)	0.063
Italy	3.41% (n=1497) (2,6-4,5%)	2.38% (n=1593) (1,7-3,3%)	0.112	16.39% (n=9242) (15,6-17,2%)	7.70% (n=4533) (6,9-8,6%)	<0.001
Portugal	4.39% (n=114) (1,9-10,2%)	2.98% (n=134) (1,2-7,6%)	0.805	14.73% (n=638) (12,0-18,0%)	6.27% (n=271) (3,9 10,0%)	<0.001
Spain	4.86% (n=535) (3,3-7,1%)	2.32% (n=388) (1,2-4,4%)	0.067	11.92% (n=2390) (10,6-13,4%)	4.74% (n=802) (3,5-6,5%)	<0.001

Difference between in- mortality estimates by proceeded PCI has been analyzed by the Pearson's Chi-squared test with Yates' continuity correction.

Table 5. In-hospital mortality estimates in ACS patients by ACS type, age group and proceeded PCI in men.

Men	STEACS			NSTEACS		
	No PCI	PCI	p-value	No PCI	PCI	p-value
35-64 years	5.00% (n=3340)	1.8% (n=8648)	<0.001	1.99% (n=5234)	0.54% (n=5520)	<0.001
65-74 years	12.16% (n=1892)	4.94% (n=3603)	<0.001	5.66% (n=4554)	1.51% (n=3312)	<0.001
75-84 years	20.52% (n=1740)	8.99% (n=1991)	<0.001	9.01% (n=4185)	2.33% (n=2149)	<0.001
≥ 85 years	36.28% (n=747)	17.18% (n=419)	<0.001	18.10% (n=1713)	4.76% (n=399)	<0.001

Difference between in-hospital mortality estimates by proceeded PCI has been analyzed by the Pearson's Chi-squared test with Yates' continuity correction.

Table 6. In-hospital mortality estimates in ACS patients by ACS type, age group and proceeded PCI in women.

Women	STEACS			NSTEACS		
	No PCI	PCI	p-value	No PCI	PCI	p-value
35-64 years	5.25% (n=781)	2.60% (n=1500)	0.002	2.04% (n=1615)	1.64% (n=1039)	0.544
65-74 years	12.12% (n=858)	6.74% (n=1246)	<0.001	4.11% (n=2383)	1.02% (n=1371)	<0.001
75-84 years	23.29% (n=1520)	11.92% (n=1334)	<0.001	7.59% (n=3687)	1.83% (n=1308)	<0.001
≥ 85 years	33.51% (n=1283)	21.91% (n=541)	<0.001	16.58% (n=2431)	5.56% (n=342)	<0.001

Difference between in-hospital mortality estimates by proceeded PCI has been analyzed by the Pearson's Chi-squared test with Yates' continuity correction.

Interpretation of the results

There are differences in in-hospital mortality between PCI and non-PCI patients in most countries and age subgroups. There is an important intercountry variability in in-hospital mortality. Germany carries the highest burden in these unadjusted figures,

and Greece the lowest. The 95% confidence intervals of all mortality rates indicate that only Germany and Greece do have significantly higher and lower in-hospital mortality in ACS patients, respectively. This applies to PCI and Non-PCI patients of all age groups. In women Germany does not differ from France in the younger age group, and in the older Germany, Italy and Portugal carry similar in-hospital mortality rates. This variability requires proper adjustment for potential confounders in the models that are to be developed in the assessment of the effect of PCI on survival by subgroup of age.