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Interhospital Variability in Acute Coronary Syndrome Management in the ATHOS Study



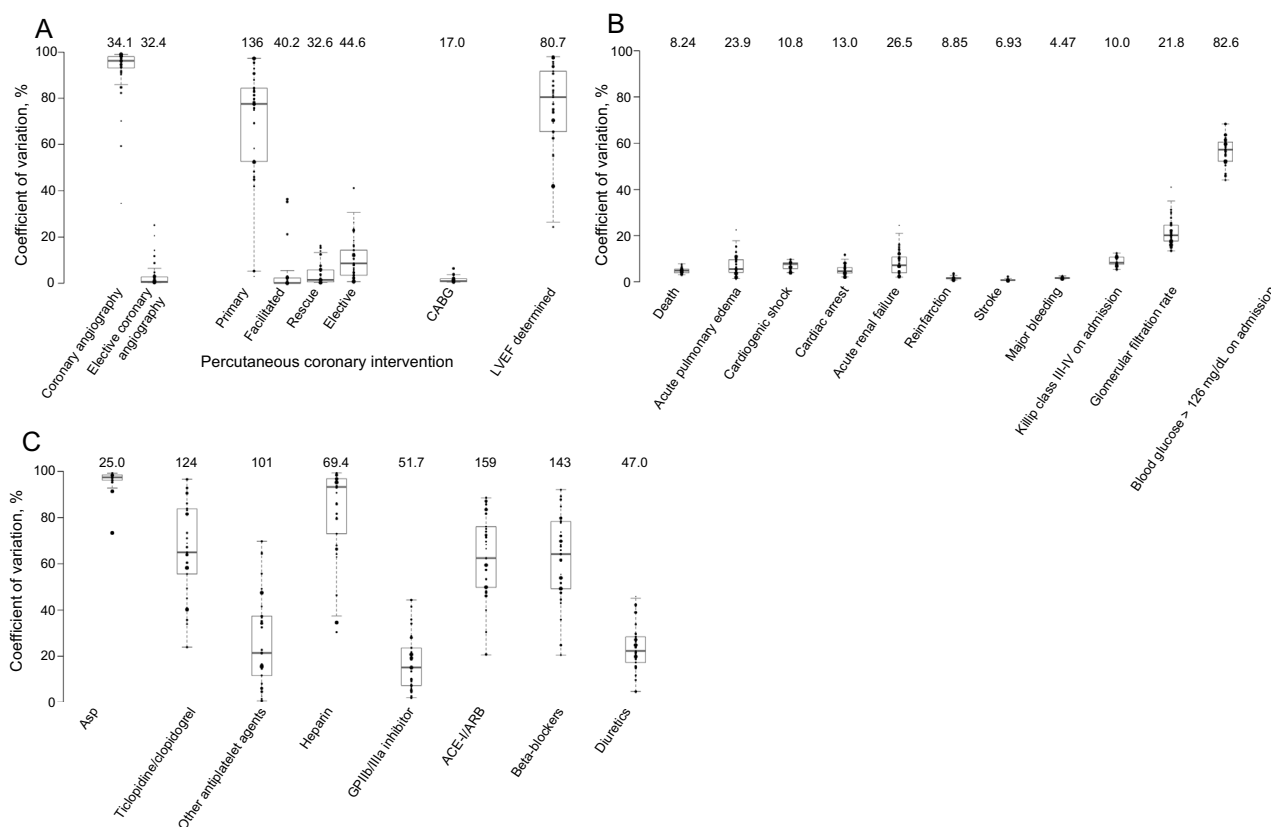
Variabilidad interhospitalaria del tratamiento del síndrome coronario agudo en el estudio ATHOS

To the Editor,

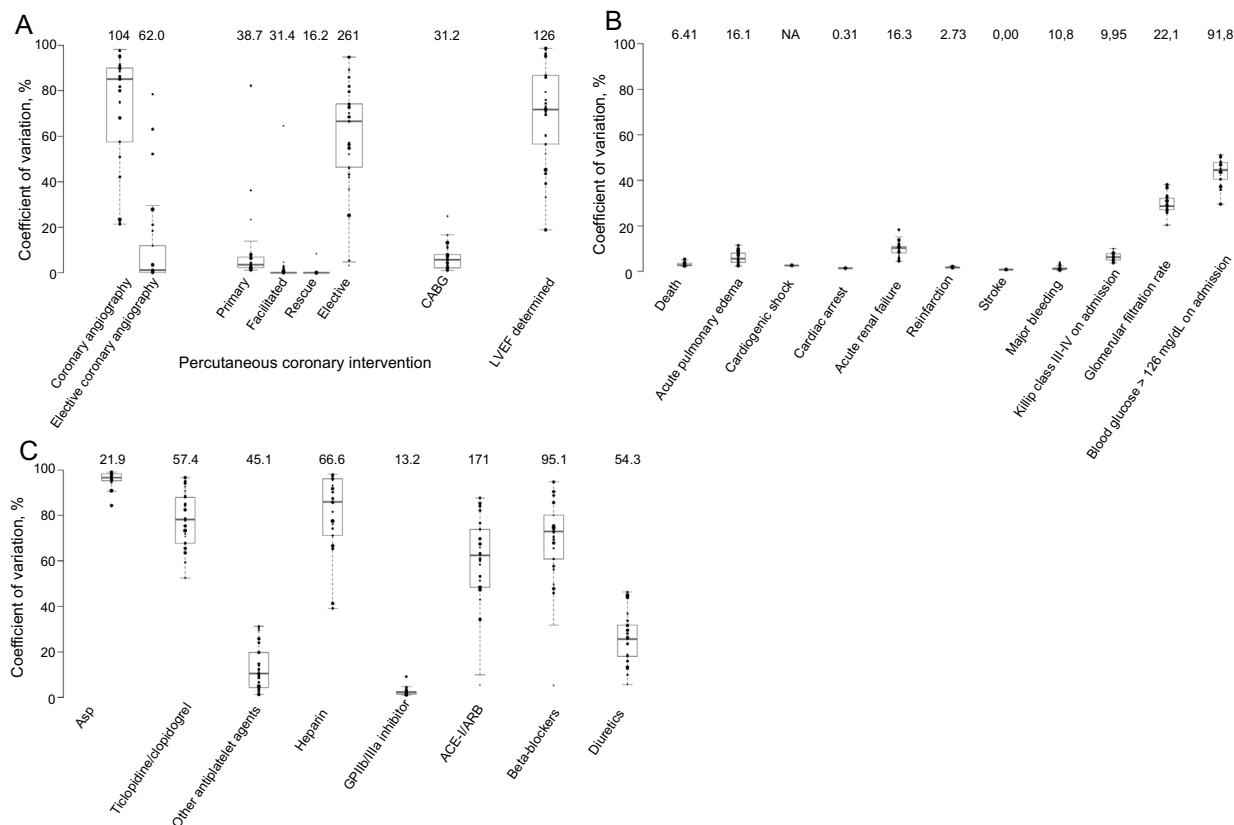
Acute coronary syndrome (ACS) has high morbidity and mortality and health care costs. Interhospital variability in its treatment<sup>1</sup> can affect outcomes.<sup>2,3</sup>

The aim of the ATHOS study (*ATención HOspitalaria del Síndrome coronario*; in English, In-hospital Treatment of Coronary Syndrome) was to determine the interhospital variability in ACS treatment.

Of the 44 hospitals invited to participate, 31 contributed data on 250 patients admitted consecutively between 2014 and 2016. Twenty four of these hospitals contributed data on an additional 50 patients who had biological samples. Sociodemographic variables were recorded, as were variables on cardiovascular risk, treatment, and severity (death, reinfarction, acute pulmonary edema, and cardiogenic shock).



**Figure 1.** Box plot of the age- and sex-adjusted interhospital coefficient of variation in patients with ST elevation acute coronary syndrome or with unclassifiable changes on the admission electrocardiogram. The size of each dot is proportional to the sample size in each hospital for each management option. A: procedures and investigations. B: incidence of complications during hospital stay and prognostic factors. C: drug therapy. ACE-I/ARB, angiotensin converting enzyme inhibitors/angiotensin-II receptor blockers; Asp, aspirin; CABG, coronary artery bypass grafting; GPIIb/IIIa: glycoprotein IIb/IIIa inhibitors; LVEF, left ventricular ejection fraction.



**Figure 2.** Box plot of the age- and sex-adjusted interhospital coefficient of variation in patients with non-ST-elevation acute coronary syndrome. The size of each dot is proportional to the sample size in each hospital for each management option. A: procedures and investigations. B: incidence of complications during hospital stay and prognostic factors. C: drug therapy. ACE-I/ARB, angiotensin converting enzyme inhibitors/angiotensin-II receptor blockers; Asp, aspirin; CABG, coronary artery bypass grafting; GPIIb/IIIa: glycoprotein IIb/IIIa inhibitors; LVEF, left ventricular ejection fraction.

Interhospital variability in ACS treatment was assessed using the coefficient of variation (CV) weighted by the number of patients in the hospital: standard deviation divided by the mean of the logistic transformation of the percentage use of procedures in each hospital, using empirical estimates in a random effects logistic regression model. A CV > 100% was considered excessive.

Of the participating hospitals, 77.4% were university hospitals; 83.9% had a catheterization laboratory; 93.5% had an intensive care or coronary care unit, and 51.6% had cardiac surgery facilities.

The study included 8142 patients with ACS and a discharge diagnosis of AMI or unstable angina (UA): 3246 (39.9%) had no ST-segment elevation (NSTEMACS), 4557 (56.0) had ST-segment elevation (STEMACS), and 339 (4.2%) were unclassifiable. Of the 7107 patients with AMI, this occurred after STEACS in 65.7%. The other 1035 patients (12.7%) had a diagnosis of UA.

Patient characteristics are shown in Table 1, Table 2, Table 3 and Table 4 of the [supplementary data](#).

Figure 1 shows the CV for patients with STEACS/unclassifiable ACS: the CV was > 100% for primary percutaneous coronary intervention (PCI) (Figure 1A) and use of angiotensin converting enzyme inhibitors or angiotensin II receptor blockers (ACE-I/ARB), beta-blockers, and P2Y<sub>12</sub> platelet inhibitors (Figure 1C). Details of the distribution of the data are presented in Table 5 of the [supplementary data](#).

Figure 2 shows the CV for NSTEMACS: > 100% for coronary angiography during hospital stay (Figure 2A), PCI during hospital stay, ACE-I/ARB use, and determination of left ventricular ejection fraction (LVEF) (Figure 2C). Details of the distribution of data are presented in Table 6 of the [supplementary data](#).

The use of beta-blockers and ACE-I/ARBs increased by more than 10 percentage points, and the newer antiplatelet agents were used in 21.4% of patients.

In-hospital mortality from AMI after STEACS has dropped from 18.5% in 1978, 9.5% in 1995, and 10.3% in 2000 to 5.6% in 2005, 5.2% in 2012 to 4.7% in 2016.<sup>2-5</sup> A contributing factor to this lower mortality has been that 82% of patients with STEACS received PCI (compared with 53% in 2012 when 27% were still treated with thrombolysis, the current figure being 12%). The introduction of the Infarct Code has also reduced complications by improving access to PCI,<sup>6</sup> although the complication rate is very similar among hospitals.

There remains substantial interhospital variability in terms of LVEF assessment, coronary angiography, elective PCI, and ACE-I/ARB use in NSTEMACS, and in primary PCI, antiplatelet agents besides aspirin, ACE-I/ARB, and beta-blocker use in STEACS and unclassifiable ACS; this does not translate to an appreciable variability in treatment outcomes in patients with ACS.

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## APPENDIX. SUPPLEMENTARY DATA

Supplementary data associated with this article can be found in the online version, at <https://doi.org/10.1016/j.rec.2018.09.016>.

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