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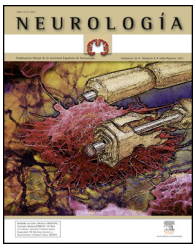

ORIGINAL ARTICLE

# Use of healthcare resources and costs of acute cardioembolic stroke management in the Region of Madrid: The CODICE Study☆,☆☆

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**KEYWORDS**
Region of Madrid;
Costs;
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**Abstract**
*Introduction:* Stroke is the main cause of admission to neurology departments and cardioembolic stroke (CS) is one of the most common subtypes of stroke.
*Methods:* A multicentre prospective observational study was performed in 5 neurology departments in public hospitals in the Region of Madrid (Spain). The objective was to estimate the use of healthcare resources and costs of acute CS management. Patients with acute CS at <48 h from onset were recruited. Patients' socio-demographic, clinical, and healthcare resource use data were collected during hospitalisation and at discharge up to 30 days after admission, including data for rehabilitation treatment after discharge.

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☆☆ Preliminary data from this study were presented at the 15th Annual European Congress of the International Society for Pharmacoeconomics and Outcomes Research (ISPOR) under the title 'Health care resource utilisation and costs of cardioembolic stroke in the region of Madrid, Spain: preliminary results of CODICE study' (Berlin, 3-7 November 2012). They were also presented at the XXXIII Health Economics Conference (Santander, 18-21 June 2013) of the Spanish Health Economics Association under the title 'Use of healthcare resources and costs of acute cardioembolic stroke management in hospitalised patients in the Region of Madrid: the CODICE study'.

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◊ The names of the members of the CODICE study research group are listed in Annex.

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*Results:* During an 8-month recruitment period, 128 patients were recruited: mean age, 75.3 ± 11.25; 46.9% women; mortality rate, 4.7%. All patients met the CS diagnostic criteria established by GEENCV-SEN, based on medical history or diagnostic tests. Fifty per cent of the patients had a history of atrial fibrillation and 18.8% presented other major cardioembolic sources. Non-valvular atrial fibrillation was the most frequent cause of CS (33.6%). Data for healthcare resource use, given a mean total hospital stay of 10.3 ± 9.3 days, are as follows: rehabilitation therapy during hospital stay (46.9%, mean 4.5 days) and after discharge (56.3%, mean 26.8 days), complications (32%), specific interventions (19.5%), and laboratory and diagnostic tests (100%). Head CT (98.4%), duplex ultrasound of supra-aortic trunks (87.5%), and electrocardiogram (85.9%) were the most frequently performed diagnostic procedures. Average total cost per patient during acute-phase management and rehabilitation was €13 139. Hospital stay (45.0%) and rehabilitation at discharge (29.2%) accounted for the largest part of resources used.
*Conclusions:* Acute CS management in the Region of Madrid consumes large amounts of resources (€13 139), mainly due to hospital stays and rehabilitation.
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**PALABRAS CLAVE**
Comunidad de Madrid;
Costes;
Ictus;
Infarto cerebral cardioembólico;
Sanidad Pública;
Utilización de recursos

**Utilización de recursos sanitarios y costes asociados al manejo de los pacientes con infarto cerebral cardioembólico agudo en la Comunidad de Madrid: Estudio CODICE**

**Resumen**
*Introducción:* El ictus es la principal causa de ingreso en los servicios de Neurología, siendo el infarto cerebral cardioembólico (ICE) de los subtipos más frecuentes.
*Métodos:* Estudio observacional, multicéntrico, prospectivo, realizado en 5 hospitales públicos de la Comunidad de Madrid, cuyo objetivo fue estimar la utilización de recursos sanitarios y costes en el manejo del ICE agudo. Se incluyeron pacientes con ICE agudo de evolución <48 h. Se registraron datos sociodemográficos, clínicos y los recursos sanitarios utilizados durante el ingreso y al alta hasta 30 días desde el ingreso, incluyendo el tratamiento rehabilitador al alta.
*Resultados:* Se seleccionaron 128 pacientes durante 8 meses, de 75,3 ± 11,25 años, siendo un 46,9% mujeres, con una mortalidad del 4,7%. El 100% cumplía los criterios diagnósticos del GEENCV-SEN por antecedentes o el estudio realizado. Como antecedentes clínicos, el 50% presentó fibrilación auricular, y el 18,8%, otras fuentes mayores embolígenas. La fibrilación auricular no valvular fue la causa más frecuente de ICE (33,6%). Consumo de recursos: estancia media, 10,3 ± 9,3 días; rehabilitación durante el ingreso, 46,9%, media 4,5 días, y al alta, 56,3%, media 26,8 días; complicaciones, 32%; intervenciones hospitalarias específicas, 19,5%; pruebas diagnósticas y analíticas sanguíneas, 100%, siendo la TAC craneal (98,4%), el dúplex TSA (87,5%) y el electrocardiograma (85,9%), las diagnósticas más frecuentes. El coste total medio por paciente en la fase aguda y rehabilitación por ICE fue de 13.139€, siendo la estancia hospitalaria (45,0%) y la rehabilitación al alta (29,2%) los recursos más importantes.
*Conclusiones:* El manejo agudo del ICE en la Comunidad de Madrid generó un importante consumo de recursos (13.139€) debido a la asistencia hospitalaria y la rehabilitación.
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## Introduction

Cardioembolic stroke (CS) is caused by partial or total occlusion of a cerebral or precerebral artery due to embolic material from the heart. They arise from 3 mechanisms: arrhythmias, release of material from abnormal valvular or myocardial surfaces, and paradoxical embolism.[1] These infarcts are normally medium- to large-sized and tend to be located in the cortex. Symptoms often present while the patient is awake. Presentation of focal neurological signs may be immediate (in minutes) or acute (in hours) with the highest level of neurological impairment at disease onset. Both presence of an emboligenic heart disease and absence of significant arterial occlusion or stenosis are necessary conditions for a diagnosis of CS.[2]

CS accounts for 14% to 30% of all cerebral infarcts.[3] According to a recent observational study conducted in Spain including more than 6000 stroke patients, 87.6% of all strokes were cerebral infarcts, 26.2% of which were cardioembolic strokes.[4–6] This type of cerebral infarct has a crude incidence rate of 28 cases per 100 000 inhabitants per year and the crude prevalence

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