

# In-Hospital Mortality in Stroke Patients

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According to data from the World Health Organization (WHO), acute cerebrovascular disease or stroke is the third leading cause of death in the Western world, the first major cause of physical disability in adults, and the second cause of dementia in this population.<sup>1</sup> Fifteen million persons worldwide experience stroke per year and another 5 million have permanent disability as a consequence of stroke, which implies significant repercussions on their families and society.<sup>2</sup> About 59 million people worldwide died during 2007, and stroke was the cause of death in 10% of them. One-third of the overall mortality due to vascular disease is attributed to stroke. Moreover, because it is the most important cause of morbidity and mortality at long-term in Europe, stroke generates a tremendous economic burden. It ranks second in the burden of disease in Europe and represents 6.8% of the disability-adjusted life years (DALY); Alzheimer disease and other dementias occupy the fifth position (3%), and traffic accidents the seventh (2.5%).<sup>3</sup>

Stroke is now the second most common cause of death in Europe, following ischemic heart disease. According to data from the Instituto Nacional de Estadística (INE, National Statistics Institute), acute cerebrovascular disease was the second-ranking cause of death in the Spanish population (32 887 cases, both sexes) and the leading cause of death in women (19 038 cases) in 2006.<sup>4</sup> The distribution of stroke as a cause of death varies between the various autonomous communities of Spain. In some communities, such as Galicia and Extremadura, it is the leading cause of death in both sexes. As occurs in ischemic heart disease, there is a marked gradient from north to south: in the southern half of Spain there is a higher rate than the country average, whereas in the north the rate

is below the average. Nevertheless, Spain ranks among the countries with lower mortality due to this cause in both men and women compared with northern European countries, such as the Netherlands, Switzerland, Ireland, and the Nordic countries.<sup>2</sup>

Despite the decreasing trend in mortality from this cause over the last 20 years, which is related to detection and control of the main associated risk factors and important advances in the diagnosis and treatment of stroke in the acute phase, it is predicted that the impact of this condition will increase in the next years. The WHO has estimated a 27% increase in the incidence of stroke between 2000 and 2025.

Mean in-hospital mortality due to stroke ranges from 8 to 14%. Several factors are known to be associated with a higher risk of death following stroke, such as age, initial severity of the episode, sex, race, prior functional status, hyperthermia, hyperglycemia, excessively high or low blood pressure values, atrial fibrillation (AF), heart failure, coronary disease, and arterial stenosis or occlusion found in the early arterial study following stroke.<sup>6-10</sup> However, there is very little available information about the influence of these risk factors as related to the specific etiopathogenic subtype of stroke.

In contrast to other vascular diseases, stroke has a varying form of presentation and a diverse etiopathogenesis. The associated risk factors and short- and long-term prognosis also vary according to the subtype of stroke. This situation makes it difficult to obtain reliable data about factors associated with an increased risk of death that are valid for all affected patients.

In the study by Arboix et al,<sup>11</sup> published in this issue of *Revista Española de Cardiología*, the prognostic value of the cardiovascular risk profile to predict in-hospital death is examined in a series of 2704 consecutive patients with cerebral infarction recorded in the stroke registry of Hospital del Sagrat Cor in Barcelona. As was expected, each stroke subtype presented an intrinsic vascular profile. In addition, the authors found differences when patients were divided into age groups. In the oldest age groups, cardioembolic stroke predominated, and the main risk factors were hypertension (HT) and AF, whereas in the youngest groups, atherothrombotic stroke was the most prevalent.

In-hospital mortality was 12.9%, a value within the margins of most published series. The authors reported

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a gradual decrease in in-hospital mortality since 1986, again coinciding with the trends observed in most Western countries. The risk factors and clinical characteristics associated with mortality were congestive heart disease (CHD), AF, chronic obstructive pulmonary disease, and a history of stroke. However, the most important and novel finding of the study by Arboix et al<sup>11</sup> was the fact that the profile of vascular risk factors related with in-hospital mortality was different for each etiological subtype; that is, each subtype of cerebral infarction presented a characteristic, differentiated vascular risk profile. In the multivariate analysis, the variables independently associated with a higher risk of in-hospital mortality were CHD, AF, and age in atherothrombotic infarction, peripheral arterial disease, previous cerebral infarction, CHD and age in cardioembolic infarction, and HT and age in cerebral infarction of uncertain cause.

Thanks to the large number of related studies published in the last decade, we now have sufficient scientific evidence to affirm that the type of care provided in the acute phase of this condition is the main factor affecting the evolution of the patients. The necessary and essential multidisciplinary approach in a complex disease such as stroke should not be undervalued; nonetheless, it is clear that the care offered by neurologists specialized in cerebrovascular disease improves the evolution of stroke patients and results in cost reductions.<sup>12,13</sup> In a study conducted in 18 Spanish hospitals, assessment by a neurologist within the first 6 hours after symptom onset was associated with a 5-fold lower risk of poor evolution.<sup>14</sup> The PRACTIC study,<sup>15</sup> carried out in 2005 with the participation of 88 Spanish hospitals, demonstrated that neurological care significantly lowered in-hospital mortality and complications following stroke, and increased the percentage of patients with an outcome allowing an independent life-style. These favorable results persisted after 6 months and patients who had received neurological care had better functional status and a lower probability of experiencing recurrent stroke or another vascular episode. These findings again demonstrate the need for specialized, emergency care in stroke.

The results from Spain are similar to the findings from other countries. In a study including more than 38 000 stroke patients in the United States, 90-day mortality was 16% in patients treated by a neurologist, 23% in those attended by an internal medicine specialist, and 25% in those treated by a family doctor. These differences were statistically significant after taking into account the severity of stroke and the comorbid conditions.<sup>16</sup> Another study performed in 29 hospitals in the United States and including 10 880 stroke patients showed that centers with expert neurologists in cardiovascular disease, written protocols, and the indication for treatment with tissue plasminogen activator (tPA) limited to neurologists, presented the lowest values for in-hospital mortality and duration of hospital stay.<sup>17</sup> Similarly, in a study with 104 participating hospitals, the German Stroke Registers

Study Group reported better results with fibrinolysis in hospitals with a neurology department and a stroke unit receiving more than 100 ischemic stroke patients and performing more than 5 fibrinolysis treatments per year. In contrast, centers without experience in fibrinolysis showed an excess (3-fold higher) of in-hospital mortality.<sup>18</sup> Specialized attention is also beneficial to stroke patients who do not require fibrinolytic treatment, and these comprise the great majority of patients with this condition.<sup>19</sup>

Hospitalization of patients in a stroke unit decreases mortality by 17% and mortality or functional dependence by 25%. The number of patients necessary to treat (NNT) to avert a death is 33, and to avert a dependent status, 20. The benefits were seen to persist after adjusting by age, sex, and severity of the neurological deficit at admittance<sup>20</sup> and in the various etiological subtypes of stroke.<sup>21</sup> Recent studies have demonstrated that the benefits associated with stroke unit hospitalization in clinical practice are similar to those seen in clinical trials.<sup>22</sup> Stroke unit care is associated with a decrease in the probability of death or disability in all the patient subgroups, except those with impaired consciousness.<sup>23</sup> Thus, the objective that all health systems should strive to attain is stroke unit hospitalization for all patients in the acute phase of the condition.

The development of healthcare approaches for stroke patients that allow fast access to specialized neurological care in a stroke unit, availability of effective treatment, and improved knowledge of factors associated with a higher risk of death should contribute to decreasing the considerable social and healthcare burden of stroke.

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