



# Enfermedades Infecciosas y Microbiología Clínica

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Original article

## Short-term prognostic factors in the elderly patients seen in emergency departments due to infections<sup>☆</sup>



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### ABSTRACT

**Objectives:** To analyse factors associated with short-term mortality in elderly patients seen in emergency departments (ED) for an episode of infectious disease.

**Materials and methods:** A prospective, observational, multicentre, analytical study was carried out on patients aged 75 years and older who were treated in the ED of one of the eight participating hospitals. An assessment was made of 26 independent variables that could influence mortality at 30 days. They covered epidemiological, comorbidity, functional, clinical and analytical factors. Multivariate logistic regression analysis was performed.

**Results:** The study included 488 consecutive patients, 92 (18.9%) of whom died within 30 days of visiting the ED. Three variables were significantly associated with higher mortality: severe functional dependence, with Barthel index  $\leq 60$  [odds ratio (OR) 8.92; 95% confidence interval (CI): 4.98–15.98,  $p=0.003$ ], systolic blood pressure  $<90$  mmHg [OR 7.34; 95% CI: 4.39–12.26,  $p=0.005$ ] and serum lactate  $>4$  mmol/l [OR 21.14; 95% CI: 8.94–49.97,  $p=0.001$ ]. The area under the curve for the model was 0.971 (95% CI: 0.951–0.991;  $p<0.001$ ).

**Conclusions:** Several factors evaluated in an initial assessment in the ED, including the level of functional dependence, systolic blood pressure and, especially, serum lactate, were found to determine a poor short-term prognosis in the elderly patients who presented with an episode of an infectious disease.

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## Factores pronósticos a corto plazo en los ancianos atendidos en urgencias por infección

### RESUMEN

**Objetivos:** Analizar los factores asociados a la mortalidad a corto plazo en los pacientes ancianos que acuden al servicio de urgencias (SU) por un episodio de infección.

#### Palabras clave:

Mortalidad

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Servicios de urgencias  
Factores pronósticos  
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**Material y métodos:** Estudio observacional, prospectivo, multicéntrico y analítico. Se incluyó consecutivamente a pacientes de 75 o más años atendidos en 8 servicios de SU por un proceso infeccioso. Se analizaron 26 variables independientes (epidemiológicas, de comorbilidad, funcionales, clínicas y analíticas) que pudieran influir en la mortalidad a corto plazo (30 días). Se realizó un estudio multivariable mediante regresión logística.

**Resultados:** Se incluyó a 488 pacientes, de los que 92 (18,9%) habían fallecido a los 30 días tras su consulta en el SU. Tres variables se asociaron de forma significativa con la mortalidad: la dependencia funcional basal grave con índice de Barthel  $\leq 60$  (*odds ratio* [OR] 8,92; intervalo de confianza [IC] del 95%: 4,98–15,98,  $p=0,003$ ), la existencia de una presión arterial sistólica (PAS)  $<90$  mmHg (OR 7,34; IC 95%: 4,39–12,26,  $p=0,005$ ) y lactato sérico  $>4$  mmol/l (OR 21,14; IC 95%: 8,94–49,97,  $p=0,001$ ). El área bajo la curva-ROC del modelo fue 0,971 (IC 95%: 0,951–0,991;  $p<0,001$ ).

**Conclusiones:** Existen varios factores disponibles tras una primera atención en el SU—entre ellos la valoración funcional, la PAS y, el más importante, el lactato sérico—que determinan un mal pronóstico a corto plazo del paciente anciano que consulta por un proceso infeccioso.

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## Introduction

The number of patients over 75 years of age who attend emergency departments (EDs) due to infection has increased significantly over the last 10 years (from 24.8% to 31.7%;  $p<0.001$ ),<sup>1</sup> as has the severity of the condition and short-term mortality (30 days).<sup>1–3</sup> Suspecting and confirming infection in the ED is particularly important in elderly patients owing to their susceptibility to infection and infection severity, especially given that the clinical manifestations of infection are often nonspecific and variable.<sup>4</sup> This hinders the early detection of infection in these patients and results in a false diagnosis and subsequent erroneous patient referral, inappropriate complementary and analytical tests,<sup>5</sup> the administration of unnecessary antimicrobials in more than 50% of cases or their delayed administration when their correct and early administration is vital for a positive patient outcome.<sup>6–8</sup> Immunosenescence leads to immune cell function deterioration and diminished humoral immune function, as well as a chronic proinflammatory state that alters the production of cytokines, chemokines and some biomarkers.<sup>4</sup>

The challenge for emergency departments is to detect elderly patients at high vital risk and/or with severe infection (sepsis, severe sepsis or septic shock [SS]) as early as possible (from triage or the initial patient assessment), based purely on the patient's past medical history, physical examination and complementary tests that emergency departments usually have available.<sup>5,6</sup>

In terms of objective tools to assist clinicians in establishing a prognosis and identifying the severity of the infection, the functional geriatric assessment (Lawton IADL scale or the Barthel index), comorbidities (Charlson index) and a reduced level of consciousness,<sup>6</sup> as well as biomarkers and serum lactate, have come to the fore in recent years and are used by a growing number of EDs.<sup>9</sup> Serum lactate, considered the best marker of hypoperfusion and tissue hypoxia, is included in all the emergency department assessment guidelines for patients with sepsis, severe sepsis and SS.<sup>9,10</sup> Patients with concentrations  $>2$  mmol/l should be closely and clinically monitored as it is an independent predictor of poor clinical progression, mortality and severity of severe sepsis and SS.<sup>9,10</sup> However, few studies have been conducted specifically in patients  $>75$  years of age.<sup>11</sup>

In light of the above, the aim of this study was to determine which identifiable factors that are generally used in the initial emergency department assessment, including baseline and functional status, are related to short-term mortality in elderly patients ( $\geq 75$  years) diagnosed with infection.

## Methods

A descriptive, multi-centre, analytical and observational study conducted at the 8 emergency departments of the participating investigators (*Annex*), belonging to the INFURG-SEMES (Emergency Department Infections Study Group of the Spanish Society of Emergency Medicine) network of centres. Patients  $\geq 75$  years of age who completed 30 days of follow-up with a diagnosis of infection were consecutively enrolled by chance (when the investigators were on duty) upon clinical diagnosis of the infection in the EDs. The variables were recorded on an encrypted electronic case report form (online). The various criteria, definitions and parameters were defined in advance by the INFURG-SEMES scientific committee and were agreed by the investigators. The study was approved by the Hospital Universitario de Basurto Independent Ethics Committee and met the ethical standards of all the participating centres. All the encrypted data were kept strictly confidential. Patients or family members were informed both orally and in writing, and informed consent was required prior to enrolment. The study did not involve any therapeutic procedure or have any clinical implications.

Unadjusted 30-day mortality was considered a dependent variable. Independent variables that were deemed to be able to support the prognosis during the patient's initial assessment in the ED were chosen, as detailed in *Table 1*: demographic variables (age, gender), comorbidity (Charlson index<sup>12</sup> and dichotomised index  $\geq 3$ ), functional variables (Barthel index<sup>13</sup> and dichotomised index  $\leq 60$ ), clinical variables (altered level of consciousness, systolic blood pressure [SBP] and SBP  $<90$  mmHg, sepsis, severe sepsis or septic shock criteria and their defining variables according to the 2001 International Sepsis Definitions Conference<sup>14</sup>) and analytical variables (kidney failure if urea  $>50$  mg/dl or Cr  $>1.2$  mg/dl), leucocyte count, concentration of serum lactate (mmol/l), C-reactive protein (CRP) and procalcitonin (PCT). Serum lactate 5–20 mg/dl (0.55–2.22 mmol/l), PCT  $<0.5$  ng/ml and CRP 0–18 mg/l were adopted as normal reference values as agreed between the participating centres for patients  $\geq 75$  years, and these were dichotomised in accordance with the recommendations of a recent review.<sup>9</sup>

For the statistical analysis, means and their standard deviations (SD) were used for quantitative variables, and percentages for qualitative variables. The chi-square test, Fisher's exact test, Student's *t* test or Mann–Whitney *U* test were used, as applicable, to investigate the correlation between mortality and the independent variables (and the dichotomised variables). The groups were stratified beforehand by the centres variable to check homogeneity. A multivariate logistic regression analysis was conducted

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