ORIGINAL ARTICLE

Short-term Prognostic Factors in Elderly Patients Seen in Emergency Departments for Acute Heart Failure

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Introduction and objectives. To investigate factors associated with short-term mortality in elderly patients seen in emergency departments for an episode of acute heart failure.

Methods. A prospective, non-interventional, multicenter, cohort study was carried out in patients aged 65 years and older who were treated in the emergency department of one of 8 tertiary hospitals in Spain. Twenty-eight independent variables that could influence mortality at 30 days were assessed. They covered epidemiological and clinical factors and daily functioning. Data were obtained by reviewing medical records or by interviewing the patient or a relative. Multivariate logistic regression analysis was performed.

Results. The study included 623 patients, 42 of whom (6.7%) died within 30 days of visiting the emergency department. Four variables were significantly associated with higher mortality: functional dependence at baseline (ie, Barthel index ≤60; odds ratio [OR] =2.9; 95% confidence interval [CI], 1.2-6.5), New York Heart Association class III-IV (OR=3; 95% CI, 1.3-7), systolic blood pressure <100 mm Hg (OR=4.8; 95% CI, 1.6-14.5) and blood sodium <135 mEq/L (OR=4.2; 95% CI, 1.8-9.6).

Conclusions. Several factors evaluated on initial assessment in the emergency department, including the level of functional dependence, were found to determine a poor short-term prognosis in elderly patients who present with an episode of acute heart failure.

Key words: *Acute heart failure. Elderly. Prognostic factors.*

Factores pronósticos a corto plazo en los ancianos atendidos en urgencias por insuficiencia cardiaca aguda

Introducción y objetivos. Investigar los factores asociados a la mortalidad a corto plazo en los pacientes ancianos que acuden a urgencias por un episodio de insuficiencia cardiaca aguda.

Métodos. Estudio de cohortes, analítico-prospectivo, multicéntrico y sin intervención. Se incluyó a pacientes de 65 o más años atendidos en 8 servicios de urgencias de hospitales terciarios españoles. Se analizaron 28 variables independientes (epidemiológicas, clínicas y funcionales) que pudieran influir en la mortalidad a 30 días. Los datos se obtuvieron mediante la consulta de la historia clínica o la entrevista con el paciente o su familia. Se realizó un estudio multivariable mediante regresión logística.

Resultados. Se incluyó a 623 pacientes, de los que 42 (6,7%) habían fallecido a los 30 días de la consulta en urgencias. Cuatro variables se asociaron de forma significativa con la mortalidad: la dependencia funcional basal (índice de Barthel ≤/60, odds ratio [OR] = 2,9; intervalo de confianza [IC] del 95%, 1,2-6,5), clases III y IV de la NYHA (OR = 3; IC del 95%, 1,3-7), presión arterial sistólica < 100 mmHg (OR = 4,8; IC del 95%, 1,6-14,5) y natremia < 135 mEq/l (OR = 4,2; IC del 95%, 1,8-9,6).

Conclusiones. Existen diversos factores disponibles tras una primera valoración en urgencias, entre ellos la dependencia funcional del paciente, que determinan un mal pronóstico a corto plazo del paciente anciano que consulta por un episodio de insuficiencia cardiaca aguda.

Palabras clave: Insuficiencia cardiaca aguda. Anciano. Factores pronósticos. Dependencia funcional. Servicios de urgencias.

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ABBREVIATIONS

ACE: angiotensin converting enzyme (inhibitors).
AHF: acute heart failure.
ED: emergency department.
NYHA: New York Heart Association.

INTRODUCTION

Prevalence of heart failure among patients aged >70 is put at 7%-18%.[1] So it is not surprising that acute heart failure (AHF) should be one of the most frequent motives for attending emergency departments (EDs) and the principle cause of hospitalization in elderly patients.[2] Moreover, 96% of these admissions are through ED and only 4% are scheduled,[3] so EDs have an especially important contribution to make on this issue.

Short- and long-term mortality after an episode of AHF have been widely studied in hospitalized patients and the suggested factors associated with greater risk of death in this context include advanced age, male gender, low blood pressure at admission, diminished left ventricular function, kidney dysfunction and anemia, hyponatremia, and raised glycemia or plasma troponin levels.[4-14] However, in ED it is not as easy to identify at-risk patients with poor short-term prognosis as it is with patients in a stable situation. In part, this may be due to the frequently substantial pressure on ED professionals to attend patients,[15,16] leading them to opt for the most direct medical action possible and omit whatever is not indispensable for diagnosis and treatment. Among others, patient functional dependence is an issue that has been given little consideration to date and is rarely quantified in ED despite it being known to have a direct influence on prognosis in numerous conditions.[17-19] Consequently, our objective was to determine which factors, identifiable when patients are first seen in ED and including functional status, associate with short-term mortality. To achieve this, we conducted a follow-up study of a cohort of elderly patients attending EDs for AHF.

METHODS

EAHFE Cohort and EAHFE-mortality Substudy

The Emergency Acute Heart Failure Epidemiology (EAHFE) project is a descriptive, cross-sectional, non-interventional, multicenter study of all patients attended for AHF between April 15, 2007 and May 15, 2007 in the ED at 10 Spanish tertiary hospitals.[20] Eight of these centers (Hospital Clínico San Carlos, Madrid; Hospital General, Alicante; Hospital Dr. Negrín, Las Palmas de Gran Canaria; Hospital Universitario La Fe, Valencia; Hospital Universitario de Bellvitge, L'Hospitalet de Llobregat; Hospital Universitario, Salamanca; Hospital Clínic, Barcelona; and Hospital Marqués de Valdecilla, Santander) participated in the longitudinal EAHFE-mortality substudy, which involved the subsequent contact with all patients included to determine their situation at 30 days after presenting at the ED. Final clinical diagnosis of AHF was made using Framingham diagnostic criteria,[21] based on presence of symptoms (dyspnea, orthopnea, paroxysmal nocturnal dyspnea), signs (third sound, pulmonary crepitations, jugular vein pressure >4 cm, sinus tachycardia at rest, edema, hepatomegaly, hepatojugular reflux), and radiological data of pulmonary congestion, following European Society of Cardiology AHF guidelines for 2005.[22]

Inclusion of Patients

In the present analysis, we included all EAHFE cohort patients aged ≥65 attending the 8 hospitals mentioned. In all patients, AHF was diagnosed using clinical criteria and treatment was administered according to the European Society of Cardiology protocol.[22] We required no specific therapeutic intervention beyond the clinical treatment indicated by the physician attending. Nor did we require any intervention with regard to admission or discharge direct from ED, which remained at the criteria of the medical team attending. Patients were excluded if the Barthel index score of functional dependence at baseline (defined as 30 days prior to presenting at ED) had not been recorded or follow-up contact was not authorized or impossible. Patients were informed of the protocol and they authorized follow-up contact, which took place at 31-60 days following presentation at the ED when medical records provided insufficient information.

Independent Variables

We recorded data on 28 variables we considered might contribute to prognosis of

patients with AHF. All data were available after patients were first seen by the ED physician: 2 epidemiologic variables (age and gender); 13 pathologic antecedents (high blood pressure, diabetes mellitus, dyslipidemia, current smoking, ischemic heart disease, valvular heart disease, atrial fibrillation, peripheral vascular disease, kidney failure, cerebrovascular disease, chronic pneumopathy, dementia, and previous decompensated HF); 5 references to baseline clinical condition (Barthel index[23]; Charlson comorbidity index[24]; baseline heart disease according to the New York Heart Association [NYHA] classification[25]; beta-blockers; angiotensin converting enzyme inhibitors [ACE inhibitors], or angiotensin II antagonists [ARA-II]); and 8 clinical variables determined in ED (heart rate; respiratory rate; systolic blood pressure; baseline saturation of oxygen on arrival at ED measured by pulse oximetry; hemoglobin; glycemia; blood sodium; and plasma creatinine). The Barthel index measures a patient's functional capacity for basic daily activities through information obtained from their normal carer, with scores ranging from 0 (total dependence) to 100 points (independent patients). The Charlson index determines the existence of comorbidity and is a reliable prognostic marker in a broad range of conditions with scores from 0 (absence of comorbidity) upwards; comorbidity increases as the score rises.

Dependent Variable

We considered 30-day mortality as the dependent variable, determined from medical records or through contact with the patient or their family at 31-60 days after attending the ED.

Statistical Analysis

Quantitative variables are given as mean (SD) or median (interval) and qualitative variables as percentages. We used χ^2 (or the Fisher exact test if results were <5) to investigate the relation between mortality and independent variables after dichotomizing nonbinary variables. The multivariate study was conducted with a logistic regression model and we forced the introduction of all variables chosen. In multivariate analysis, the inclusion of variables depended on whether or not they were statistically significant in the univariate study. Results of the comparison are expressed as *P* values and odds ratio (OR) with 95% confidence intervals (CI), and we considered values of $P<.5$ or OR (95% CI) excluding 1, as statistically significant.

RESULTS

Of 1017 patients in the EAHFE cohort, 623 were included in the present study (Figure). Detailed clinical characteristics are in Table 1. Of these, 532 (85.4%) were admitted to conventional wards after attending ED (median length of stay, 4 [2-63] days) and 91 (14.6%) were discharged from ED observation rooms (median length of stay in ED, 1 [0-4] days). Forty-two (6.7%) patients died within 30 days of first presenting at ED with no significant differences between admissions and non-admissions to conventional wards.

The univariate study (Table 2) showed mortality associated directly with 7 variables: previous kidney failure; previous decompensated heart failure (HF); functional dependence; NYHA class III-IV; systolic blood pressure (SBP) <100 mm Hg; baseline oxygen saturation <90%; and blood sodium <135 mEq/L. However, only baseline functional dependence (Barthel index ≤60, OR=2.9; 95% CI, 1.2-6.5); NYHA class III-IV (OR=3; 95% CI, 1.3-7); SBP on arrival at ED<100 mm Hg (OR=4.8; 95% CI, 1.6-14.5); and blood sodium in ED tests <135 mEq/L (OR=4.2; 95% CI, 1.8-9.6) were statistically significant predictors of death at ≤30 days following attendance at the ED (Table 3).

DISCUSSION

Firstly, we would like to emphasize the fact that the present study offers a perspective that differs from that provided by other, similar publications in that we gathered data in ED and included all patients presenting there. Thus, we took account of the broad spectrum of decompensated HF, included mild episodes not requiring admission (14.4% of patients in our series). The universal inclusion of decompensated HF patients without distinguishing on grounds of severity avoids both the bias of only including admissions—as in studies of hospitalized decompensated HF patients[26]—and that of not including the most severe cases—as in studies of stable patients, controlled through specialized out-patient units. In fact, mortality in our study (6.7%) is comparable to that of elderly patients with AHF attended in ED (8.2%) reported elsewhere.[27]

The baseline patient situation is one of the factors that determine prognosis. Generally, we found functional dependence associated with short-term prognosis during an episode of AHF. This parameter is receiving greater importance as a prognostic factor and, although widely recognized in old people's homes and geriatric centers,[28,29] implementation and systematic data gathering in acute care hospitals and in

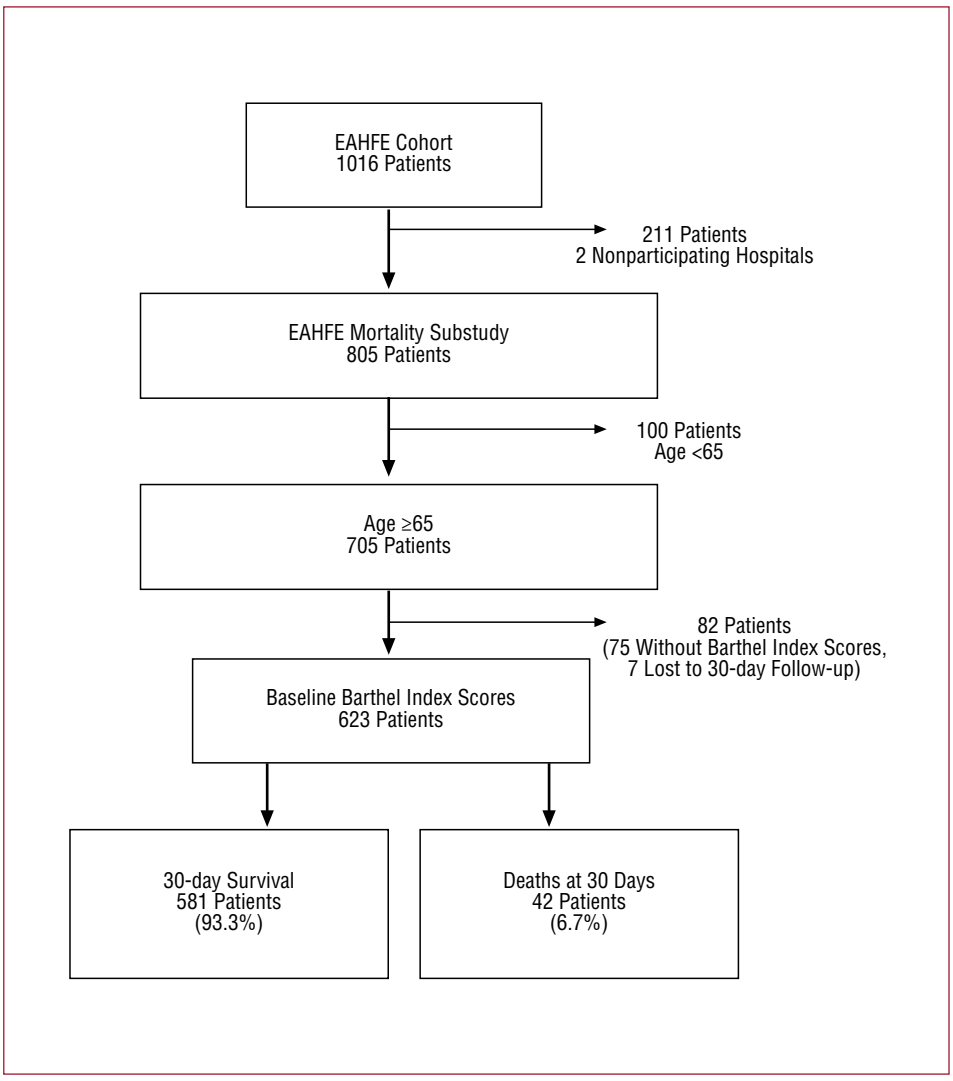

Figure. Patients included in the analysis. EAHFE indicates Emergency Acute Heart Failure Epidemiology project.

patients with acute illnesses has not become fully established. In elderly patients and patients with acute disease, when functional dependence is recorded, poor functional condition on admission has been shown to predict greater intrahospital and 6-month mortality, longer hospitalization and increased institutionalization on discharge.[30] Moreover, functional deterioration due to the acute illness itself increases the risk of mortality after discharge (at 1 month and even years later).[31-33] With particular reference to AHF, our study also shows that the baseline situation in terms of NYHA functional class is decisive, although this specific prognostic factor is more widely contrasted.[34,35] Consequently, in the context of medical activity in the ED, gathering preexisting baseline data on all patients presenting should take high priority. It will permit physicians to reach important conclusions on patient evolution and, especially in patients with AHF, devise more adequate diagnostic and therapeutic plans and, more specifically, establish measures to prevent functional deterioration.

We have found that low blood pressure and blood sodium associate with poor prognosis, coinciding with earlier studies.[8-10] However, we found a worse prognosis in patients with impaired renal function, when other authors have associated this with greater mortality on admission and higher incidence of readmission and post-discharge mortality.[11,12] Perhaps, having included patients presenting at the ED but not hospitalized has diminished the relative weight of this factor, as the previously mentioned studies only included patients admitted with AHF. However, we would emphasize that our study does not analyze long-term mortality, in which factors like anemia or glycemia[13,14] are clearly related to long-term survival.

The limitations of our study include the fact that most of the variables recorded are clinical

TABLE 1. **Clinical and Epidemiologic Characteristics of Patients Included in the Analysis**

Variables	Total (n=623)
Epidemiologic	
Age, years	80 (7)
Men	285 (45.9)
Pathologic antecedents	
High blood pressure	506 (81.2)
Diabetes mellitus	268 (43)
Dyslipidemia	205 (32.9)
Current smoking	61 (9.8)
Ischemic heart disease	210 (33.7)
Valvular heart disease	115 (18.5)
Atrial fibrillation	276 (44.3)
Peripheral vascular disease	41 (6.6)
Moderate-severe kidney failure	
(Creatinine >2.5 mg/dL)	64 (10.3)
Cerebrovascular disease	46 (7.4)
Chronic pneumopathy	137 (22)
Dementia	39 (6.3)
Previous episodes of heart failure	447 (71.7)
Baseline clinical situation	
Baseline Barthel index, points	82 (23)
Charlson comorbidity index (points)	2.5 (2.1)
Baseline NYHA functional class	
I	142 (23.1)
II	283 (45.9)
III	176 (28.6)
IV	15 (2.4)
Beta-blockers, yes/no	138 (22.2)
ACE inhibitors or ARA-II, yes/no	335 (53.8)
Clinical situation in ED	
Heart rate, beats/min	91 (26)
Respiratory rate, breaths/min	24 (7)
Systolic blood pressure, mm Hg	142 (30)
Baseline oxygen saturation, %	92 (7)
Hemoglobin, g/L	118 (49)
Glycemia, mg/dL	131 (85)
Blood sodium, mEq/L	138 (10)
Creatinine, mg/dL	1.3 (0.9)

ARA-II indicates angiotensin II receptor antagonists; ACE, angiotensin converting enzyme; NYHA, New York Heart Association.
Data are given as n (%) or mean (SD).

and other frequently used variables associated with prognosis—e.g. troponin, NT-proBNP, or BNP—were not included either because data were not immediately available in some participating centers or because many ED protocols omit them. Moreover, we included no nutritional or anthropometric variables that could have added information about the fragility of the elderly patient. Secondly, diagnosis was based on the Framingham diagnostic criteria, which have been validated for chronic heart failure and with a substantial percentage of patients for whom we had

TABLE 2. **Univariate Analysis of the Effect of the Different Independent Variables on Mortality at 30 Days After Decompensated Heart Failure**

Variables	Mortality n (%)	*P*
Epidemiologic		
Age >80 years		.49
Yes	23 (7.6)	
No	19 (5.9)	
Men		.94
Yes	20 (7)	
No	22 (6.5)	
Pathologic antecedents		
High blood pressure		.14
Yes	30 (5.9)	
No	12 (10.3)	
Diabetes mellitus		1
Yes	18 (6.7)	
No	24 (6.8)	
Dyslipidemia		.65
Yes	12 (5.9)	
No	30 (7.2)	
Current smoking		1
Yes	4 (6.6)	
No	38 (6.8)	
Ischemic heart disease		1
Yes	14 (6.7)	
No	28 (6.8)	
Valvular heart disease		.61
Yes	6 (5.2)	
No	36 (7.1)	
Atrial fibrillation		1
Yes	19 (6.9)	
No	23 (6.6)	
Peripheral vascular disease		.18
Yes	5 (12.2)	
No	37 (6.4)	
Moderate-severe kidney failure		<.5
Yes	9 (14.1)	
No	33 (5.9)	
Cerebrovascular disease		.22
Yes	5 (10.9)	
No	37 (6.4)	
Chronic pneumopathy		.5
Yes	7 (5.1)	
No	35 (7.2)	
Dementia		.74
Yes	3 (7.7)	
No	39 (6.7)	
Previous decompensated HF		<.5
Yes	37 (8.3)	
No	5 (2.8)	
Baseline clinical situation		
Functional dependence (Barthel index <60)		<.01
Yes	19 (15.8)	
No	23 (4.6)	
Charlson index >2		.69
Yes	13 (6.1)	
No	15 (4.9)	

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TABLE 2. **Univariate Analysis of the Effect of the Different Independent Variables on Mortality at 30 Days After Decompensated Heart Failure** *(Continued)*

Variables	Mortality, n (%)	*P*
Baseline clinical situation		
NYHA baseline level III or IV		<.01
Yes	25 (13)	
No	17 (4)	
Beta-blockers		.49
Yes	7 (5.1)	
No	35 (7.2)	
ACE inhibitors or ARA-II		1
Yes	23 (6.9)	
No	19 (6.6)	
Clinical situation in ED		
Tachycardia >100 lat/min		.24
Yes	14 (8.8)	
No	25 (5.7)	
Tachypnea >20 breaths/min		.33
Yes	21 (8)	
No	13 (5.4)	
Systolic blood pressure <100 mm Hg		<.1
Yes	7 (21.2)	
No	34 (6)	
Baseline oxygen saturation <90%		.001
Yes	18 (12.8)	
No	18 (4.4)	
Anemia		.18
Yes	28 (8.2)	
No	14 (5.1)	
Glycemia >200 mg/dL		.42
Yes	8 (11.3)	
No	34 (7.7)	
Blood sodium <135 mEq/L		.001
Yes	16 (17)	
No	26 (6.2)	
Creatinine >2 mg/dL		.11
Yes	9 (11.8)	
No	33 (6.1)	

ARA-II indicates angiotensin II receptor antagonists; ACE, angiotensin converting enzyme; NYHA, New York Heart Association.

no evaluation of ventricular function. However, despite these 2 limitations, we reiterate the fact that all variables included are quickly available to physicians in all EDs, so our results could be extrapolated (and applied) to most centers today. Thirdly, we only considered functional condition as indicated by the Barthel index and, although it can be measured with other tools, this is currently the most widely used instrument to determine functional situation.[36] Estimating functional dependence retrospectively may not be a particularly precise reflection of reality, although we believe that it is sufficiently close to the baseline functional situation of patients. Fourthly, mortality has been low and therefore the number of events has been low, too. This may reduce the statistical significance of our study as a low number of events (42 deaths, 6.7% of the series) can produce extreme and unstable estimates. Finally, as we said earlier, including all patients—not just admissions—may constitute a bias as we did not analyze a homogeneous group; however, we think the heterogeneity of our sample adds value to the series, as it is a faithful reflection of the patients attended in the ED, which is precisely what we set out to analyze.[37] The exclusion of 75 (10.6%) patients for whom we had no Barthel index data may well have biased our results if mortality in these patients was different. We have been unable to corroborate this as they were excluded from the follow-up for this very reason.

CONCLUSIONS

We conclude that our study shows the importance of determining the the baseline situation of elderly patients attended in the ED for an episode of AHF because this enables us to determine short-term prognosis and take decisions on treatment, admission, and follow-up.

TABLE 3. **Multivariate Study of the Effect of the Different Independent Variables on Mortality at 30 Days After Decompensated Heart Failure**

	OR* (95% CI)	*P*
Moderate-severe kidney failure	1.6 (1-2.7)	.06
Antecedents of decompensated HF	2 (0.6-6.5)	.26
Functional dependence (Barthel index <60)	2.9 (1.2-6.5)	.01
Baseline NYHA level III or IV	3 (1.3-7)	.01
Systolic blood pressure in ED <100 mm Hg	4.8 (1.6-14.5)	<.1
Baseline oxygen saturation in ED <90%	1.9 (0.9-4)	.11
Blood sodium in ED <135 mEq/L (yes/no)	4.2 (1.8-9.6)	.001

CI indicates confidence interval; NYHA, New York Heart Association.
*The reference category to calculate odds ratio (OR) is that of the patients without considering their condition.

REFERENCES

1. McMurray JJ, Stewart S. Epidemiology, aetiology and prognosis of heart failure. Heart. 2000;83:596-602.
2. Rodríguez-Artalejo J, Banegas-Banegas JR, Guallar-Castillón P. Epidemiología de la insuficiencia cardiaca. Rev Esp Cardiol. 2004;57:163-70.
3. Moreno-Millán E, García-Torrecillas JM, Lea-Pereira MC. Diferencias de gestión entre los ingresos urgentes y los programados en función de los grupos relacionados de diagnóstico y la edad de los pacientes. Emergencias. 2007;19:122-8.
4. Adamopoulos C, Zannad F, Fay R, Mebazaa A, Cohen-Solal A, Guize L, et al. Ejection fraction and blood pressure are important and interactive predictors of 4-week mortality in severe acute heart failure. Eur J Heart Fail. 2007;9:935-41.
5. Sánchez-Torrijos J, Gudín-Uriel M, Nadal-Barangé M, Jacas-Osborn V, Trigo-Bautista A, Giménez-Alcalá M, et al. Valor pronóstico de las cifras de hemoglobina en el momento del alta en pacientes hospitalizados por insuficiencia cardiaca. Rev Esp Cardiol. 2006;59:1276-82.
6. Siirilä-Waris K, Lassus J, Melin J, Peuhkurinen K, Nieminen MS, Harjola VP, et al. Characteristics, outcomes, and predictors of 1-year mortality in patients hospitalized for acute heart failure. Eur Heart J. 2006;27:3011-7.
7. Rudiger A, Harjola VP, Müller A, Mattila E, Säila P, Nieminen M, Follath F. Acute heart failure: clinical presentation, one-year mortality and prognostic factors. Eur J Heart Fail. 2005;7:662-70.
8. Gheorghiade M, Abraham WT, Albert N, Greenberg BH, O'Connor CM, She L, et al. Systolic blood pressure at admission, clinical characteristics, and outcome in patients hospitalized with acute heart failure. JAMA. 2006;296: 2217-26.
9. Adams KF Jr, Uddin N, Patterson JH. Clinical predictors of in-hospital mortality in acutely decompensated heart failure-piecing together the outcome puzzle. Congest Heart Fail. 2008;14:127-34.
10. Gheorghiade M, Abraham WT, Albert NM, Gattis-Stough W, Greenberg BH, O'Connor CM, et al. Relationship between admission serum sodium concentration and clinical outcomes in patients hospitalized for heart failure: an analysis from the OPTIMIZE-HF registry. Eur Heart J. 2007;28:980-8.
11. Heywood JT, Fonarow GC, Costanzo MR, Mathur VS, Wigneswaran JR, Wynne J, et al. High prevalence of renal dysfunction and its impact on outcome in 118,465 patients hospitalized with acute decompensated heart failure: A report from the ADHERE database. J Card Fail. 2007;13:422-30.
12. Metra M, Nodari S, Parrinello G, Bordonali T, Bugatti S, Danesi R, et al. Worsening renal function in patients hospitalized for acute heart failure: Clinical implications and prognostic significance. Eur J Heart Fail. 2008;10:188-95.
13. Caramelo C, Justo S, Gil P. Anemia en la insuficiencia cardiaca: fisiopatología, patogenia, tratamiento e incognitas. Rev Esp Cardiol. 2007;60:848-60.
14. Newton JD, Squire IB. Glucose and haemoglobin in the assessment of prognosis after first hospitalization for heart failure. Heart. 2006;92:1441-6.
15. Moreno Millán E. ¿Y si adaptáramos los servicios hospitalarios de urgencias a la demanda social y no a las necesidades de salud? Emergencias. 2008;20:276-84.
16. Sánchez M, Salgado E, Miró O. Mecanismos organizativos de adaptación y supervivencia de los servicios de urgencia. Emergencias. 2008;20:48-53.
17. Davis RB, Lezzoni LL, Philips RS, Reiley P, Offman GA, Safran C. Predicting in-hospital mortality: the importance of functional status. Med Care. 1995;33:906-21.
18. Inouye SK, Peduzzi PN, Robison JT, Hughes JS, Horwitz RI, Concato J. Importance of functional measures in predicting mortality among older hospitalized patients. JAMA. 1998;279: 1187-93.
19. Cabré M, Serrat-Prat M, Force L, Palomera E, Pallarés R. Estado funcional como factor de riesgo de mortalidad en pacientes ancianos con neumonía. Med Clin (Barc). 2008;131:167-70.
20. Llorens P, Martín-Sánchez FJ, González-Armengol JJ, Herrero P, Jacob J, Álvarez AB, et al. Perfil clínico de los pacientes con insuficiencia cardíaca aguda en los servicios de urgencias. Datos preliminares del Estudio EAHFE (Epidemiology Acute Heart Failure Emergency). Emergencias. 2008;20:154-63.
21. Ho KKL, Anderson KM, Kannel WB, Grosssman W, Levy D. Survival after the onset of congestive heart failure in Framingham heart study subjects. Circulation. 1993;88: 107-15.
22. Nieminen MS, Bohm M, Cowie MR, Drexler H, Filippatos GS, Jondeau G, et al. Executive summary of the guidelines on the diagnosis and treatment of acute heart failure. Eur Heart J. 2005;26:384-416.
23. Mahoney FI, Barthel DW. Functional evaluation. The Barthel Index. A simple index of independence useful in scoring improvement in the rehabilitation of chronically ill. Md State Med J. 1965;14:61-5.
24. Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. J Chron Dis. 1987;40: 378-83.
25. Killip T, Kimball JT. Treatment of myocardial infarction in a coronary care unit. A two year experience with 250 patients. Am J Cardiol. 1977;39:137-45.
26. Nieminen MS, Brutsaert D, Dickstein K, Helmut D, Follath F, Harjola V, et al. Euro Heart Failure Survey II (EHFS): a survey on hospitalized acute heart failure patients: description of population. Eur Heart J. 2006;27:2725-36.
27. Ezekowitz JA, Bakal J, Kaul P, Westerhout CM, Armstrong PW. Acute heart failure in the emergency department: Short and long-term outcomes of elderly patients with heart falure. Eur J Heart Fail. 2008;10:308-14.
28. Naghton BJ, Mylotte JM, Tayara A. Outcome of nursing home-acquired pneumonia: derivation and application of a practical model to predict 30-day mortality. J Am Geriatric Soc. 2000;48:1292-9.
29. Loeb M, McGeer A, McArthur M, Walter S, Simor AE. Risk factors of pneumonia and other lower respiratory tract infections in elderly residents of long-term care facilities. Arch Intern Med. 1999;159:2058-64.
30. Alarcón T, Barcena A, González-Montalvo JI, Peñalosa C, Salgado A. Factors predictive of outcome on admission to an acute geriatric ward. Age Aging. 1999;28:429-32.
31. Ponzerro M, Maero B, Maina P, Rosato R, Ciccone G, Merletti F, et al. Risk factor for early and late mortality hospitalized older patients: the continuing importance of functional status. J Gerontol Biol Sci Med Sci. 2003;58A:M1040-54.
32. Abizanda P, León M, Romero L, Sánchez PM, Luengo C, Domínguez L, et al. La pérdida funcional al ingreso, principal variable explicativa de discapacidad y mortalidad al alta y al mes en ancianos hospitalizados. Rev Esp Geriatr Gerontol. 2007;42:201-11.
33. Ramos MR, Romero E, Mora J, Silvera LS, Rivera JM. Análisis de mortalidad tras el ingreso en una unidad de agudos

de geriatría: influencia de la dependencia funcional. Rev Esp Geriatr Gerontol. 2007;42:212-7.

34. Ahmed A. A propensity matched study of New York Heart Association class and natural history end points in heart failure. Am J Cardiol. 2007;99:549-53.
35. Ahmed A, Aronow WS. A propensity-matched study of the association of physical function and outcomes in geriatric heart failure. Arch Gerontol Geriatr. 2008;46:161-72.
36. Gómez-Pavón J, Martín-Lesende I, Baztán-Cortés JJ, Regato-Pajares P, Formiga-Pérez F, Segura-Benedito A, et al. Prevención de la dependencia en las personas mayores. Rev Clin Esp. 2008;208:36.e1-e9.
37. Mebazaa A, Salem R. Insuficiencia cardiaca aguda: ¿visión realista desde los servicios de urgencias? Emergencias. 2008;20:152-3.