ORIGINAL ARTICLES

Factors associated with short-term mortality after emergency department care of residents living in aged care homes: findings from the multicenter Caregency study

F. Javier Afonso-Argilés[1,2], Mercè Comas Serrano[3-5], Marta Blázquez-Andión[6], Xavier Castells Oliveres[3-5], Isabel Cirera Lorenzo[7], Dolors García Pérez[8], J. María Gómez Roldán[9], Teresa Pujadas Lafarga[9], Xavier Ichart Tomás[10], Mireia Puig-Campmany[6], Miguel A. Rizzi[6], Alba Sinfreu Pujol[8], Isabel Tejero Cano[11], Ana B. Vena Martínez[12], Héctor Villanueva Sánchez[7], Anna Renom-Guiteras[4,5,11]

Objectives. To evaluate short-term mortality in people transferred from aged care homes for treatment in a hospital emergency department (ED) and to analyze factors associated with mortality.

Methods. Multicenter study of a random sample of retrospective data of patients treated in 5 EDs in Catalonia in 2017. The patients were over the age of 65 years and lived in residential care facilities. In addition to short-term mortality (in the ED or within 30 days of discharge), we analyzed sociodemographic characteristics, prior functional and cognitive status, multimorbidity, triage level on arrival, length of stay in the ED, and hospital admission. Odds ratios (ORs) for factors associated with short-term mortality were calculated by multivariate regression analysis.

Results. A total of 2444 ED admissions were analyzed. The patients' mean (SD) age was 85.9 (7.1) years, and 67.7% were women. Short-term mortality (in 15.5%) was associated with age >90 years (OR, 1.50; 95% CI, 1.5-1.95 years), a Charlson index >2 (OR, 1.47; 95% CI, 1.14-1.90), and dependency assessed as moderate (OR, 1.50; 95% CI, 1.03-2.20) or severe (OR, 2.56; 95% CI, 1.84-3.55). Other associated factors were a higher level of urgency on triage, duration of ED stay, and hospital admission.

Conclusions. Aged residents with the characteristics associated with short-term mortality could benefit from interventions for potentially avoiding unnecessary transfers to an ED, and from the implementation of comprehensive geriatric care within the ED. This could be useful to support good quality of care at the end of life.

Keywords: Aged. Hospitalization. Homes for the aged. Emergency health services. Mortality.

Factores asociados con mortalidad a corto plazo en personas que viven en residencias atendidas en servicios de urgencias: resultados del estudio multicéntrico Caregency

Objetivo. Evaluar la frecuencia y los factores asociados con la mortalidad a corto plazo de personas que viven en residencias tras ingreso en urgencias.

Método. Análisis retrospectivo multicéntrico de una muestra aleatoria de admisiones de personas ≥ 65 años que viven en residencias en cinco servicios de urgencias de Cataluña, a lo largo de 2017. Se analizaron características sociodemográficas, el estado funcional y cognitivo previo, multimorbilidad, nivel de triaje de las urgencias, duración de la estancia en urgencias, hospitalización y mortalidad a corto plazo (en urgencias o en los 30 días posteriores al alta). Se utilizó un análisis de regresión multivariante para investigar los factores asociados con la mortalidad a corto plazo.

Resultados. Se analizaron 2.444 admisiones en urgencias, con una edad media de 85,9 (DE 7,1) años, 67,7% mujeres. La mortalidad a corto plazo (15,5%) se asoció con una edad > 90 años (OR 1,50; IC 95%: 1,5-1,95), un índice de Charlson > 2 (OR 1,47; IC 95%: 1,14-1,90), y un grado de dependencia moderado (OR 1,50; IC 95%: 1,03-2,20) y grave (OR 2,56; IC 95%: 1,84-3,55). También se asoció con un mayor nivel de triaje de la urgencia, duración de la estancia en urgencias e ingreso en planta de hospitalización.

Conclusiones. Los ancianos residentes con las características descritas podrían beneficiarse especialmente de intervenciones dirigidas a la prevención de traslados potencialmente innecesarios a urgencias y a la implementación de una atención integral geriátrica dentro de los servicios de urgencias, a fin de garantizar una buena calidad de los cuidados en fases finales de la vida.

Palabras clave: Anciano. Hospitalización. Residencia. Urgencias. Mortalidad.

Author Affiliations:
[1]Geriatrics Service, Fundació Sanitària Mollet, Barcelona, Spain.
[2]Ph.D. student, Universitat Autònoma de Barcelona, Barcelona, Spain. D. student at the Universitat Autònoma de Barcelona, Barcelona, Spain.
[3]Epidemiology and Evaluation Service, Institut Hospital del Mar d'Investigacions Mèdiques (IMIM), Parc de Salut Mar, Barcelona, Spain.
[4]Member of the Research Network on Chronicity, Primary Care and Health Promotion (RICAPPS), Madrid, Spain.
[5]Member of the Research Network on Health Services in Chronic Diseases (REDISSEC), Madrid, Spain.
[6]Emergency Department, Hospital de la Santa Creu i Sant Pau, Barcelona, Spain.
[7]Emergency Department, Hospital Universitari Parc de Salut Mar, Barcelona, Spain.
[8]Emergency Department, Fundació Althaia, Xarxa Assistencial Universitaria de Manresa, Barcelona, Spain.
[9]Geriatrics and Palliative Care Service, Badalona Serveis Assistencials, Barcelona, Spain.
[10]Emergency Department, Hospital Universitari Arnau de Vilanova, Lleida, Spain.
[11]Geriatrics Service, Hospital Universitario Parc de Salut Mar, Barcelona, Spain.
[12]Geriatrics Service, Hospital Universitari Arnau de Vilanova, Lleida, Spain.

Author Contributions:
All authors have confirmed their authorship in the author responsibilities document, publication agreement and assignment of rights to EMERGENCIAS.

Corresponding Author:
F. Javier Afonso-Argilés
Servicio de Geriatría
Fundació Sanitària Mollet
08100 Mollet del Vallès,
Barcelona, Spain.

Email:
f.afonso@fsm.cat

Article information:
Received: 19-5-2022
Accepted: 5-7-2022
Online: 21-9-2022

Editor in Charge:
Agustín Julián-Jiménez

Introduction

Between 30% and 60% of people living in residential care (RC) visit the emergency department (ED) within a year, with an incidence of admissions of up to 2.2 per resident per year.[1] It has been estimated that 8% of all people over 65 years of age who visit the ED come from RCs.[2] Despite the benefits, the potential risks associated with emergency department (ED) admissions experienced by older people are significant,[3,4] and include functional impairment,5 Despite the benefits, the risks potentially associated with emergency department admissions (EDA) experienced by the elderly are significant,[3,4] and include functional impairment,[5] delirium,[6] nosocomial infections,[7] pressure ulcers,[8] and mortality.[4]

Short-term mortality after EDA may not only represent an adverse outcome of potentially inappropriate transfers to the ED,[4] but also indicate a potentially inappropriate hospitalization event per se,[9] which could have been avoided with the establishment of an advance care plan in the RC.[10,11] On the other hand, the study of short-term mortality after EDA may alert to which residents may benefit from early access to palliative care and the provision of quality end-of-life care in the hospital.

Recent studies have evaluated factors associated with short-term mortality in the general geriatric population visiting the ED.[11-13] Advanced frailty[12] or geriatric-specific conditions (disability, polypharmacy, and comorbidity) of elderly ED attendees have been associated with increased mortality within 30 days of ED discharge.[14] However, there is a paucity of studies in the literature evaluating factors associated with short-term mortality in the general geriatric population visiting the ED. However, there is a paucity of studies in the literature assessing factors associated with short-term mortality in the RC population after EDA; a population that usually presents to the ED with increased severity, clinical complexity and need for hospitalization.[15] In this sense, the aim of our study was to assess the frequency of short-term mortality in elderly people living in RC and referred to the ED, and to investigate which factors are associated with it.

Methods

The Caregency study is a multicenter retrospective observational multicenter study covering the period between January 1 and December 31, 2017. It included people aged 65 years or older living in CR who were seen for any type of acute medical or non-medical illness in the EDs of five university hospitals in Catalonia. These hospitals provide health coverage to 10 517 CR places,[16] either in urban or rural areas.

Using electronic records, all visits by residents aged 65 years or older from RCs to EDs in 2017 were identified. The study sample was randomly selected for further analysis. This ensured data analysis across all seasonal periods.

Using a data collection sheet, a trained team of medical or nursing professionals from each participating hospital collected the study variables by reviewing the participants' electronic medical record (EMR) and the Minimum Basic Emergency Data Set.

The sociodemographic characteristics of the residents admitted to the ED were collected. For age, the cutoff point > 90 years was used to represent the oldest elderly.[17] Functional status was assessed with the standardized Barthel index (BI) score (range 0-100) in the previous 3 months, if available in the EMR.[18] A lower score indicates higher dependency. In addition, the following BI categories were used: no dependency (BI $\geq$ 95), mild dependency (61-95), moderate (41-60), or severe $\leq$ 40).[19] If the BI value was not available, the research team extracted information on the "dependency level" (no dependency, mild, moderate, or severe dependency) indicated in the resident's EMR, if available. Subsequently, a new variable was created to define the resident's "combined dependency level," which combined the BI categories with those of the "dependency level" variable, the four resulting categories being: combined-non-dependency (BI $\geq$ 95 or "no dependency"), combined-mild (BI 61-95 or "mild"), combined-moderate (BI 41-60 or "moderate"), or combined-severe (BI $\leq$ 40 or "severe").

Cognitive status in the previous 3 months was assessed according to the information obtained in the EHR for that time period. Thus, information was collected on the presence of cognitive impairment and dementia (in this case, investigators were asked to specify whether the severity of dementia was mild, moderate or severe, if this information was available). Multimorbidity was assessed with the Charlson Comorbidity Index (CCI) score, with higher scores indicating a greater burden of comorbid disease.[20] Participants with CCI of 2 or less were considered to have "low comorbidity," while those with CCI of more than 2 as "moderate-high comorbidity."[21,22] The MAT-SET (Andorran Triage Model-Spanish Triage System) scale was used to assess the priority level of the resident's urgency on arrival at the ED with the triage categories contemplated by the scale (I-V).[23] In addition, the length of stay in the ED was evaluated, establishing a cut-off point of 6 hours, based on that described in the literature as a prolonged stay in the ED.[24] The main diagnoses of the visit were coded using ICD-9-CM. Subsequently, the variable "diagnostic group" was created according to the modified clinical classification software[25] for grouping. Regarding the destination after ED discharge, return to the RC, admission to other hospital services or intermediate care units and "mortality during the EDA" were recorded. In addition, "mortality 30 days after ED discharge" was identified. Short-term mortality" was those cases with "mortality during the EDA" or "mortality 30 days after ED discharge". Finally, readmission to the emergency department within 30 days of discharge was evaluated.

EDA characteristics, including mortality frequency, were described by mean and standard deviation (SD)

for continuous variables and absolute number and percentage for discrete variables.

A sample size was calculated to estimate the incidence of short-term mortality. According to the literature on short-term mortality (between 12% and 29%),[26] a 20% mortality was expected for our population. 246 individuals per hospital were needed to estimate a 20% proportion of short-term mortality with an accuracy of 5% and 95% confidence. An important characteristic to be considered was functional status, which was expected to be missing in 45% of the episodes. The sample size corresponded to 448 per hospital.

Two multivariate logistic regression models were performed to determine predictors of mortality. In the first model, the dependent variable was "short-term mortality" (i.e., "mortality during the EDA" or "mortality 30 days after ED discharge"), and the independent variables corresponded to the baseline characteristics of the residents (age, gender, CCI, combined level of dependency, severity of dementia). In the second model, the dependent variable was "mortality 30 days after ED discharge", and the independent variables analyzed were EDA characteristics and outcomes (triage score, hospital or intermediate care ward admission, ED stay). Variables were chosen based on a literature review and clinically relevant prognostic value. Independent variables were tested for multicollinearity when included in the models. The model with the set of variables that obtained the best fit is shown. The results are presented as odds ratios with a 95% confidence interval. All analyses considered a significance level of 0.05 (bilateral) and were performed with IBM SPSS Statistics version 25 (IBM Corporation, Chicago, IL, USA).

Results

A total of 12 580 admissions were identified from individuals living in RC in the five EDs throughout 2017. From these, a final random sample of 2444 EDAs, corresponding to 1982 residents, was obtained. The characteristics of the residents who were seen in the ED and their evolution during admission are shown in Table 1 and Table 2.

The frequency of "mortality during the EDA" and "mortality 30 days after ED discharge" was 2.7% and 12.7% respectively: with a short-term mortality of 15.5% among residents. Table 3 describes the most frequent diagnostic groups and the short-term mortality associated with each diagnostic group in residents after being seen in the emergency department. Respiratory infections, pneumological diseases not clearly infectious (e.g., bronchoaspiration) and cardiological diseases were the diagnostic groups with the highest short-term mortality, with percentages of 24.8%, 12.1% and 11.9% respectively.

Multivariate statistical analysis (Table 4) of the baseline characteristics of residents involved in the EDA identified advanced age > 90 years (OR 1.50; 95% CI 1.15-1.95), CCI score > 2 (OR 1.47; 95% CI 1.14-1.90) and moderate and severe degrees of dependence (OR 1.50; 95% CI 1.03-2.20) and (OR 2.56; 95% CI 1.84-3.55), respectively, as factors associated with short-term mortality. The variable "presence and severity of dementia" was initially included in the model, but as expected by the research team, collinearity was observed with the variable "level of dependence". As the magnitude of the effect of "level of dependence" was larger, and the number of missing data for "presence and severity of dementia" considerably reduced the sample for the model, "presence and severity of dementia" was excluded from the final model.

Multivariate statistical analysis (Table 5) of baseline characteristics and EDA results identified age > 90 years (OR 1.53; 95% CI: 1.10-2.14), a high degree of dependency (OR 2.30; 95% CI: 1.55-3.40), a triage level of I-II (OR 4.76; 95% CI: 1.71-4.45), the need for hospitalization in different admission units (OR 3.00; 95% CI: 2.08-4.31) and an ED stay > 6 hours (OR 1.94; 95% CI:1.35-2.78) as variables associated with an increased risk of 30-day mortality.

Table 1. Characteristics of residents who visited emergency departments

	Total EDA N = 2444
Age (years) [mean (SD)]	85.9 (7.1)
Gender: Female (%)	67.7
Cognitive impairment [n (%)]**	3 (2-4)
Comorbidity index (range 0-37)* [median (Q1-Q3)]	1775 (77.9)
Missing values (n)	167
Dementia [yes, n (%)]**	1304 (53.3)
Missing values (n)	268
Severity of dementia [n (%)]	
Mild dementia	116 (10)
Moderate dementia	385 (33.4)
Severe dementia	655 (56.6)
Missing values (n)	148
Barthel index for activities of daily living (range 0-100)* [median (Q1-Q3)]	40 (15-70)
Missing values (n)	1378
Level of dependence*** [n (%)]	
Non-dependence	94 (9.2)
Mild	194 (19.0)
Moderate	350 (34.3)
Severe	382 (37.4)
Missing values (n)	358
Level of dependence combined**** [n (%)]	
Combined-no dependence	112 (5.3)
Combined-mild	503 (24.1)
Combined-moderate	547 (26.2)
Combined-severe	924 (44.3)
Missing values (n)	358

*The underlined scores are the most favorable.
**Cognitive status was assessed according to information obtained from the electronic medical record (dichotomous variable).
***Residents without Barthel index obtained.
****Combination of Barthel index and "level of dependency" variable categories: combined-no dependency (Barthel index ≥ 95 or "no dependency"), combined-mild (Barthel index 61-95 or "mild"), combined-moderate (Barthel index 41-60 or "moderate"), or combined-severe (Barthel index ≤ 40 or "severe").
EDA: emergency department admission; SD: standard deviation; Q1: first quartile; Q3: third quartile.

Table 2. Evolution of residents during admission to the emergency department

	Total EDA N = 2444
Triage level [n (%)]	
I	17 (0.8)
II	372 (17.7)
III	1061 (50.5)
IV	631 (30.0)
V	19 (0.9)
Missing values (n)	344
ED stay (hours) [mean (SD)]	11.9 (13.8)
Destination at discharge from ED [n (%)]	
Residential center	1285 (52.5)
Hospital unit	761 (31.1)
Intermediate care unit	290 (11.8)
Hospitalization at home	28 (1.1)
Palliative home care	6 (0.2)
Other	6 (0.2)
Hospital admission units after EDA [n (%)]	
Internal medicine	280 (36.7)
Acute geriatric unit	156 (20.4)
Traumatology	112 (14.7)
Short stay unit (SSU)	68 (8.9)
General surgery	31 (4)
Pneumology	24 (3.1)
Other	79 (10.3)
Missing values (n)	11
Intermediate care admission units after EDA [n (%)]	
Subacute	264 (91.0)
Mid-stay/Convalescence	5 (1.7)
Palliative care	19 (6.5)
Long medical stay	1 (0.3)
Psychogeriatric	1 (0.3)
Readmission at 30 days [n (%)]	515 (21.2)
Missing values (n)	18
Mortality during EDA [n (%)]	68 (2.7)
Mortality 30 days after ED discharge [n (%)]	311 (12.7)
Missing values (n)	28
Short-term mortality* [n (%)]	379 (15.5)

**During the EDA or 30 days after ED discharge.
EDA: emergency department admissions; SD: standard deviation; ED: emergency department.

Discussion

The present study evaluates a random subsample of 2444 EDAs corresponding to a total of 12 580 EDAs of people ≥ 65 years old who lived in RC and were cared for in five EDs in Catalonia during 2017. Residents were predominantly women, characterized by moderate levels of multimorbidity, and a relevant proportion of severe functional dependence and cognitive impairment. Half of the visits were categorized as urgent, life-threatening situations, with the main diagnoses being infections, falls, cardiac and osteoarticular diseases. The frequency of mortality among residents during their stay in the emergency room was 2.7%. This result coincides with the mortality rate of 1-5% documented by Dwyer et al,[26] and with the results published in other studies[4,27,28] but significantly lower than that observed by other authors,[5,29,30] depending on the country of study.

Table 3. Most frequent diagnostic groups and short-term mortality (mortality during the EDA or within 30 days after discharge from the emergency department) for each group

	Emergency room visits N = 2442 n (%)	Overall short-term mortality N = 379 n (%)
Respiratory infections	354 (14.5)	94 (24.8)
Other infections*	96 (3.9)	19 (5.0)
Pneumological illnesses not clearly infectious**	196 (8.0)	46 (12.1)
Cardiological diseases	208 (8.5)	45 (11.9)
Digestive diseases	166 (6.8)	35 (9.2)
Neurological diseases	115 (4.7)	20 (5.3)
Urinary tract infections	193 (7.9)	33 (8.7)
Other diseases	576 (23.6)	61 (16.1)
Fractures	206 (8.3)	12 (3.2)
Falls with no fracture	332 (13.6)	14 (3.7)

*Other infections: e.g. cholangitis, cholecystitis.
**Pneumological diseases not clearly infectious (e.g. acute bronchitis, bronchoaspiration, exacerbation of asthma, exacerbation of chronic bronchitis).

In addition, a short-term mortality (i.e., during the EDA or within 30 days after discharge from the ED) of 15.5% was identified. This result also coincides with those of international studies such as that obtained by Kirsebom et al.[31] who observed a 15% mortality in RC residents one month after transfer to the emergency department, and that of Dwyer et al.[26] who described a 12-29% mortality one month after discharge also in a sample of residents. In addition, among the diagnoses associated with higher short-term mortality, infectious, cardiologic, and digestive diseases stand out in the present study, similar to that reported by Graverholt et al.[32]

Our results show that age > 90 years, high comorbidity, and severe functional dependence are associated with an increased likelihood of short-term mortality after EDA. To the best of our knowledge, these results, which a priori might be expected, have not been previously published in older persons living in RC. Previous studies have evaluated baseline characteristics that may be associated with an increased risk of mortality in older persons after EDA, and have identified an association with male sex, older age[33] and the presence of geriatric conditions such as polypharmacy, frailty, or cognitive impairment.[12] Also, Tanderup et al,[14] in a cohort of community-dwelling older persons, observed that severe functional dependence and comorbidity were associated with an increased risk of mortality. More recently, Garcia-Gollarte et al,[34] in a prospective, longitudinal, observational study of 531 residents aged 65 years or older, identified both advanced age (≥ 80 years) and a high degree of functional and cognitive impairment as independent risk factors for mortality. However, their study focused on mortality at 6, 12, and 15 months after EDA.

In addition, our study shows that a higher level of triage (priority), the need for hospitalization and an E-SU greater than 6 hours were also associated with

Table 4. Multivariate analysis of baseline characteristics of emergency department admissions (EDA) associated with short-term mortality (mortality during EDA or 30 days after ED discharge)

Variable	Visits with known vital status (N = 2416)	Visits with deceased patient (N = 379) n (%)*	Unadjusted odds ratio (CI 95%) (N = 2416)	Adjusted odds ratio (CI 95%) (N = 2061)
Age (years)				
≤ 90	1732	235 (13.6)	1 (reference)	1 (reference)
> 90	684	144 (21.1)	1.69 (1.35-2.13)	1.50 (1.15-1.95)
Gender				
Female	1636	242 (14.8)	1 (reference)	1 (reference)
Male	780	137 (17.6)	1.22 (0.97-1.54)	1.26 (0.97-1.65)
Charlson Comorbidity Index (range 0-37)				
≤ 2	1055	131 (12.4)	1 (reference)	1 (reference)
> 2	1353	247 (18.3)	1.57 (1.25-1.98)	1.47 (1.14-1.90)
Presence and severity of dementia				**
No dementia or mild dementia	982	113 (11.5)	1 (reference)	
Moderate dementia	382	52 (13.6)	1.21 (0.85-1.72)	
Severe dementia	643	137 (21.3)	2.08 (1.58-2.73)	
Level of combined dependence				
Combined-no or mild dependence	611	53 (8.7)	1 (reference)	1 (reference)
Combined-moderate	542	70 (12.9)	1.56 (1.07-2.27)	1.50 (1.03-2.20)
Combined-severe	912	182 (20.0)	2.62 (1.89-3.63)	2.56 (1.84-3.55)

*Corresponds to the number of residents who died in the emergency department or in the following 30 days.
**Variable excluded from the final model due to the existence of collinearity with the degree of dependency.

Table 5. Multivariate analysis of characteristics and outcomes of emergency department admissions associated with mortality 30 days after ED discharge

Variable	Visits with known vital status at 30 days (N = 2376)	Deceased patient visits (N = 311) n (%)*	Unadjusted Odds ratio (CI 95%) (N = 2376)	Adjusted Odds ratio (CI 95%) (N = 1655)
Age (years)				
≤ 90	1685	188 (11.2)	1 (reference)	1 (reference)
> 90	663	123 (18.6)	1.81 (1.41-2.32)	1.53 (1.10-2.14)
Gender				
Female	1600	206 (12.9)	1 (reference)	1 (reference)
Male	748	105 (14.0)	1.10 (0.85-1.42)	1.05 (0.75-1.49)
Charlson Comorbidity Index (range 0-37)				
≤ 2	1029	105 (10.2)	1 (reference)	1 (reference)
> 2	1312	206 (15.7)	1.63 (1.27-2.10)	1.36 (0.98-1.88)
Presence and severity of dementia				**
No dementia or mild dementia	961	92 (9.6)	1 (reference)	
Moderate dementia	372	42 (11.3)	1.20 (0.81-1.76)	
Severe dementia	617	111 (1.0)	2.07 (1.53-2.78)	
Level of combined dependence				
Combined-no or mild dependence	608	50 (8.2)	1 (reference)	1 (reference)
Combined-moderate	520	48 (9.2)	1.13 (0.75-1.71)	0.91 (0.56-1.47)
Combined-severe	873	153 (16.4)	2.18 (1.55-3.07)	2.30 (1.55-3.40)
Triage level (range)				
I-II	359	88 (24.5)	3.70 (2.55-5.37)	4.76 (1.71-4.45)
III	1022	133 (13.0)	1.70 (1.21-2.39)	1.37 (0.89-2.12)
IV-V	645	52 (8.1)	1 (reference)	1 (reference)
Hospitalization* **				
Yes	1046	228 (21.8)	4.09 (3.13-5.34)	3.00 (2.08-4.31)
No	1302	83 (6.4)	1 (reference)	1 (reference)
ED stay (E-SU)				
≤ 6 hours	1045	73 (7.0)	1 (reference)	1 (reference)
> 6 hours	1208	214 (17.7)	2.86 (2.16-3.79)	1.94 (1.35-2.78)

*Corresponds to the number of residents who died in the emergency department or in the following 30 days.
**Variable excluded from the final model due to the existence of multicollinearity with the level of dependency.
***Includes admission to hospital or intermediate care wards.

short-term mortality. These results are in line with previous studies in the elderly. High levels of triage were associated with an increased risk of mortality among the elderly in the study by Arendts et al.[33] In addition, Street et al.[35] in a retrospective cohort study involving 33 926 emergency department attendances of persons aged 65 years or older, observed that E-SU of more than 4 hours increased the risk of in-hospital mortality, and the factors associated with an increased risk of E-SU were older age, living in RC, EDA at night, or triage category, among others. Finally, Guion et al.[5] in a prospective study including 1037 residents, identified advanced age, a high level of triage and a greater number of hospitalizations in the last month as risk factors for mortality 7 days after the EDA.

Thus, the results of the present study suggest that, on the one hand, elderly, moderately and severely dependent, and highly multimorbid persons living in RCs who visit the ED could especially benefit from interventions aimed at developing a comprehensive care plan in advance, and from the reorientation of community health resources offered to RCs to avoid potentially avoidable transfers to the ED in situations of extreme fragility. In response to this, interventions aimed at reducing hospital admissions from RCs have been implemented, such as the structuring and standardization of clinical practice, the incorporation of geriatric teams specialized in RCs, the implementation of advance directives with the resident and family, the increase in health care support from primary care or proactive communication between the residential health care team and the ED.[4,36] Despite some positive effects in this population, such as a decrease in hospitalization in the last month of life or in-hospital death,[37] more evidence is needed to support these initiatives. On the other hand, our study suggests that residents with the aforementioned characteristics, but also those with a higher level of triage, stay in the ED and need for admission to the hospital ward, may require special consideration by the health care teams during the ED and hospitalization. In this regard, different interventions have also been described in the literature that could contribute to improving the care of older persons admitted to the ED, including joint work between the emergency health team and geriatricians[38] or even the creation of an "acute frailty zone" with a differentiated model of care within the ED.[39]

The present study adds evidence on factors associated with short-term mortality after EDA for a particularly vulnerable population, RC residents. Of interest is the fact that certain variables identified are variables included in predictive models of end-of-life in the general population after ED stay.[40,41] However, the development of a predictive model was not the aim here.

This study has limitations. Its retrospective design is prone to measurement error and missing data. However, the data were carefully obtained from each participant's medical records by a group of trained investigators who were medical or nursing professionals from each participating hospital. In addition, the variable "combined dependency level" used in the study was not previously validated. However, this variable allowed us to unify information from validated tests (BI), often with missing values, with the information on functional dependence reflected in the clinical history.

For its part, the strengths of the present study are its multicenter design, and the large sample size that allowed the performance of two multivariate logistic regression models to determine predictors of short-term mortality after in the study population, from two perspectives: first, considering the baseline characteristics of the residents as potential predictors and, second, considering the characteristics and outcomes of the ED stay (e.g., level of triage, hospital admission, length of stay).

As conclusions we can say that residents over 90 years of age, with high multimorbidity, moderate to severe functional impairment, with serious diseases at the time of admission to the ED, as well as with a longer length of stay in these units and requiring admission to inpatient wards, may have a higher risk of mortality during their stay or in the first 30 days after discharge from the ED. These residents may benefit from interventions or new approaches to care aimed at either avoiding inappropriate ED admissions or receiving comprehensive end-of-life care in either the residential or hospital setting.

Conflict of Interests Disclosure: None reported.

Funding/Support: The authors declare that they have no financial support for this article.

Ethical responsibilities: All authors have confirmed the maintenance of confidentiality and respect for patient rights in the document of author responsibilities, publication agreement, and assignment of rights to EMERGENCIAS. All the information obtained was treated anonymously and the confidentiality of the data was guaranteed. All the Research Ethics Committees of the collaborating centers approved the project in accordance with their regulations.

Article not commissioned by the Editorial Committee and with external peer review.

References

1 Brucksch A, Hoffmann F, Allers K. Age and sex differences in emergency department visits of nursing home residents: a systematic review. BMC Geriatr. 2018;18:1-10.
2 Wolters A, Santos F, Lloyd T, Lilburne C, Steventon A. Emergency admissions to hospital from care homes: how often and what for? The Health Fundation. 2019. p. 1-36. (Consultado 21 Junio 2022). Disponible en: https://www.health.org.uk/publications/reports/emergency-admissions-to-hospital-from-care-homes
3 Schnitker L, Martin-Khan M, Beattie E, Gray L. Negative health outcomes and adverse events in older people attending emergency departments: A systematic review. Australas Emerg Nurs J. 2011;14:141-62.
4 Lemoyne SE, Herbots HH, De Blick D, Remmen R, Monsieurs KG, Van Bogaert P. Appropriateness of transferring nursing home residents to emergency departments: a systematic review. BMC Geriatr. 2019;19:1-9.
5 Guion V, De Souto Barreto P, Rolland Y. Nursing Home Residents' Functional Trajectories and Mortality After a Transfer to the Emergency Department. J Am Med Dir Assoc. 2021;22:393-398.e3.
6 Bo M, Bonetto M, Bottignole G, Porrino P, Coppo E, Tibaldi M, et al. Length of Stay in the Emergency Department and Occurrence of Delirium in Older Medical Patients. J Am Geriatr Soc. 2016;64:1114-9.
7 Goto T, Yoshida K, Tsugawa Y, Camargo CA, Hasegawa K. Infectious Disease-Related Emergency Department Visits of Elderly Adults in the United States, 2011-2012. J Am Geriatr Soc. 2016;64:31-6.
8 Han D, Kang B, Kim J, Jo YH, Lee JH, Hwang JE, et al. Prolonged stay

in the emergency department is an independent risk factor for hospital-acquired pressure ulcer. Int Wound J. 2020;17:259-67.
9 Allers K, Hoffmann F, Schnakenberg R. Hospitalizations of nursing home residents at the end of life: A systematic review. Palliat Med. 2019;33:1282-98.
10 Lucke JA, Mooijaart SP, Heeren P, Singler K, McNamara R, Gilbert T, et al. Providing care for older adults in the Emergency Department: expert clinical recommendations from the European Task Force on Geriatric Emergency Medicine. Eur Geriatr Med. 2022;13:309-17.
11 Obermeyer Z, Cohn B, Wilson M, Jena AB, Cutler DM. Early death after discharge from emergency departments: Analysis of national US insurance claims data. BMJ. 2017;356:1-9.
12 García-Peña C, Pérez-Zepeda MU, Robles-Jiménez LV, Sánchez-García S, Ramírez-Aldana R, Tella-Vega P. Mortality and associated risk factors for older adults admitted to the emergency department: A hospital cohort. BMC Geriatr. 2018;18:1-11.
13 Aasbrenn M, Christiansen CF, Esen BÖ, Suetta C, Nielsen FE. Mortality of older acutely admitted medical patients after early discharge from emergency departments: a nationwide cohort study. BMC Geriatr. 2021;21:1-11.
14 Tanderup A, Lassen AT, Rosholm JU, Ryg J. Disability and morbidity among older patients in the emergency department: A Danish population-based cohort study. BMJ Open. 2018;8:23803.
15 Wang HE, Shah MN, Allman RM, Kilgore M. Emergency Department Visits by Nursing Home Residents in the United States. J Am Geriatr Soc. 2011;59:1864-72.
16 Institut Català d'Assistència i Serveis Socials (ICASS). Establiments d'atenció per a la gent gran. 2021. (Consultado 21 Junio 2022). Disponible en: http://www.gencat.cat/bsf/icass/info/estatgg.htm
17 Escourrou E, Durrieu F, Chicoulaa B, Dupouy J, Oustric S, Andrieu S, et al. Cognitive, functional, physical, and nutritional status of the oldest old encountered in primary care: a systematic review. BMC Fam Pract. 2020;21:1-10.
18 Mahoney FI, Barthel DW. Functional evaluation: The Barthel index. Md State Med J. 1965;14:61-5.
19 Wu Q, Tang A, Niu S, Jin A, Liu X, Zeng L, et al. Comparison of Three Instruments for Activity Disability in Acute Ischemic Stroke Survivors. Can J Neurol Sci. 2021;48:94-104.
20 Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. J Chronic Dis. 1987;40:373-83.
21 Buntinx F, Niclaes L, Suetens C, Jans B, Mertens R, Van den Akker M. Evaluation of Charlson's comorbidity index in elderly living in nursing homes. J Clin Epidemiol. 2002;55:1144-7.
22 Aubert C, Schnipper J, Roumet M, Marques-Vidal P, Stirnemann J, Auerbach A, et al. Best Definitions of Multimorbidity to Identify Patients With High Health Care Resource Utilization. Mayo Clin Proc Inn Qual Out. 2020;4:40-9.
23 Gómez Jiménez J, Boneu Olaya F, Becerra Cremidis O, Albert Cortés E, Ferrando Garrigós J, Medina Prats M. Validación clínica de la nueva versión del Programa de Ayuda al Triaje (web_e-PAT v3) del Modelo Andorrano de Triaje (MAT) y Sistema Español de Triaje (SET). Fiabilidad, utilidad y validez en la población pediátrica y adulta. Emergencias. 2006;18:207-14.
24 Achieving the 6-Hour Target for Patients Attending Emergency Departments in Ireland. Irish Medical Organisation. 2018 p. 1-14. (Consultado 21 Junio 2022). Disponible en: https://www.imo.ie/news-media/publications/Compliance-PP.pdf
25 Clinical Classifications Software (CCS) for ICD-9-CM. Agency for Healthcare Research and Quality. (Consultado 21 Junio 2022). Disponible en: https://www.hcup-us.ahrq.gov/toolssoftware/ccs/ccs.jsp
26 Dwyer R, Gabbe B, Stoelwinder JU, Lowthian J. A systematic review of outcomes following emergency transfer to hospital for residents of aged care facilities. Age Ageing. 2014;43:759-66.
27 Morphet J, Innes K, Griffiths DL, Crawford K, Williams A. Resident transfers from aged care facilities to emergency departments: Can they be avoided? EMA - Emerg Med Australas. 2015;27:412-8.
28 Carron PN, Mabire C, Yersin B, Büla C. Nursing home residents at the Emergency Department: a 6-year retrospective analysis in a Swiss academic hospital. Intern Emerg Med. 2017;12:229-37.
29 Mitchell JS, Young I. Utilization of a UK emergency department by care home residents: a retrospective observational study. Eur J Emerg Med. 2010;17:322-4.
30 Alrawi YA, Parker RA, Harvey RC, Sultanzadeh SJ, Patel J, Mallinson R, et al. Predictors of early mortality among hospitalized nursing home residents. QJM. 2013;106:51-7.
31 Kirsebom M, Hedström M, Wadensten B, Pöder U. The frequency of and reasons for acute hospital transfers of older nursing home residents. Arch Gerontol Geriatr. 2014;58:115-20.
32 Graverholt B, Riise T, Jamtvedt G, Ranhoff AH, Krüger K, Nortvedt MW. Acute hospital admissions among nursing home residents: A population-based observational study. BMC Health Serv Res. 2011;11:126.
33 Arendts G, Dickson C, Howard K, Quine S. Transfer from residential aged care to emergency departments: an analysis of patient outcomes. Intern Med J. 2012;42:75-82.
34 García-Gollarte JF, García-Andrade MM, Santaeugenia-González SJ, Hermida JCS, Baixauli-Alacreu S, Santabalbina FJT. Risk Factors for Mortality in Nursing Home Residents: An Observational Study. Geriatrics. 2020;5:1-16.
35 Street M, Mohebbi M, Berry D, Cross A, Considine J. Influences on emergency department length of stay for older people. Eur J Emerg Med. 2018;25:242-9.
36 Graverholt B, Forsetlund L, Jamtvedt G. Reducing hospital admissions from nursing homes: a systematic review. BMC Health Serv Res. 2014;14:36.
37 Honinx E, Piers RD, Onwuteaka-Philipsen BD, Payne S, Szczerbinska K, Gambassi G, et al. Hospitalisation in the last month of life and in-hospital death of nursing home residents: a cross-sectional analysis of six European countries. BMJ Open. 2021;11:e047086.
38 Wallis M, Marsden E, Taylor A, Craswell A, Broadbent M, Barnett A, et al. The Geriatric Emergency Department Intervention model of care: A pragmatic trial. BMC Geriatr. 2018;18:1-9.
39 Puig-Campmany M, Blázquez-Andion M, Ris-Romeu J. Aprender, desaprender y reaprender para asistir ancianos en urgencias: el secreto del cambio. Emergencias. 2020;32:122-30.
40 Martín-Sánchez FJ, Perdigones J, Ferré Losa C, Llopis F, Navarro Bustos C, Borraz Ordas C, et al. 180-day risk of mortality in older patients admitted to short-stay units: the 6-Month Short-Stay Unit (6M UCE) Score. TT - Modelo de riesgo de mortalidad a 180 días en los pacientes ancianos ingresados en unidades de corta estancia: 6M UCE-SCORE. Emergencias. 2018;30:315-20.
41 Méndez-Bailón M, Iguarán-Bermúdez R, López-García L, Sánchez-Sauce B, Pérez-Mateos P, Barrado-Cuchillo J, et al. Prognostic Value of the PROFUND Index for 30-Day Mortality in Acute Heart Failure. Medicina (B Aires). 2021;57:1150.