Submitted: 23 April, 2025 Accepted: 23 June, 2025 Published: 08 October, 2025 DOI:10.22514/sv.2025.146

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ORIGINAL RESEARCH

Admission rates and outcomes of elderly patients in emergency department observation units. A Spanish multicentre study

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Abstract

Background: Emergency Department Observation Units (EDOUs) provide short-term treatment and monitoring for patients who require further evaluation. EDOUs may help reduce unnecessary hospital admissions in elderly adults, but their selection criteria and impact on outcomes remain unclear. The study, thus, aimed to identify clinical factors associated with using EDOUs in patients aged ≥65 years and to evaluate the relationship between EDOU care and short-term clinical outcomes. **Methods**: We analysed data from the Emergency Department and Elder Needs (EDEN) cohort, which included all emergency department visits by patients aged ≥65 years across 48 Spanish hospitals during seven days. We divided patients into two groups: those managed in an EDOU (EDOU group) and those managed without observation care (non-EDOU group). We examined demographic and clinical characteristics, emergency diagnoses, and 30-day outcomes. Multivariable logistic regression identified factors independently associated with EDOU use and subsequent outcomes. **Results**: Among 23,955 visits, 6393 (26.7%) involved EDOU management. Patients in the EDOU group were more likely to be ≥80 years and to present with tachypnoea, bradycardia, a Glasgow Coma Scale score <15, and anaemia. These variables showed significant independent associations with EDOU care. Compared to the non-EDOU group, the EDOU group had higher rates of hospital admission (adjusted odds Ratio (aOR) = 2.4; 95% confidence interval (CI): 2.0–2.8) and 30-day readmission (aOR = 1.6; 95% CI: 1.2–2.3), but similar rates of 30-day ED revisit, prolonged hospital stay, and mortality. Patient selection varied across centres and often lacked standardized protocols. **Conclusions**: EDOU care for elderly adults in Spanish emergency departments typically involves patients with greater clinical complexity. Although associated with higher hospital admission and readmission rates, EDOU use did not correlate with worse short-term outcomes. These findings support the need for standardized EDOU admission criteria in geriatric populations.

Keywords

Emergency department; Observation unit; Older adults; Geriatric emergency care; Hospital admission; Short-term outcomes

1. Introduction

As the global population ages, older adults account for a growing proportion of emergency department (ED) visits [1, 2]. In many countries, patients aged ≥65 represent up to 30% of ED activity [3]. These patients often present with higher risk and complexity due to functional impairment, cognitive decline, polypharmacy, and multiple chronic conditions [4, 5].

Emergency Department Observation Units (EDOUs) offer short-term clinical observation and management for patients who require further assessment before a disposition decision. These units benefit patients whose condition may evolve or need additional testing or response monitoring. EDOUs typically operate with stays under 48 hours [4] and provide an alternative to inpatient admission when discharge is not immediately safe or feasible.

EDOUs may benefit older patients by avoiding unnecessary hospitalization while offering close observation. Geriatric conditions such as falls, delirium, syncope, heart failure, or respiratory infections often fall within the scope of EDOU care [4–11]. Evidence suggests that EDOUs can improve patient flow, reduce costs, and maintain safety, particularly when combined with protocolized management [12–18].

Despite these potential advantages, few studies have examined how ED teams use EDOUs for older patients or how this decision affects outcomes [19–21]. Most prior research has focused on general adult populations or EDOU performance metrics rather than patient selection.

This study, therefore, aims to identify clinical and functional factors associated with the decision to manage patients aged ≥65 years in an EDOU. We also assess how EDOU use relates to key short-term outcomes, including hospitalization, ED revisits, and mortality. Our findings may support future development of evidence-based criteria for EDOU admission in geriatric emergency care.

2. Methods

2.1 Description of the EDEN challenge and SIESTA network

The Emergency Department and Elder Needs (EDEN) challenge originated from the Spanish Investigators on Emergency Situation TeAm (SIESTA) research network [3, 4], which includes 52 emergency departments (EDs), approximately 20% of all public EDs in Spain. Its main objective is to increase knowledge about the sociodemographic, organizational, baseline, clinical, care-related, and evolutionary aspects of patients aged 65 and older who attend Spanish EDs.

To achieve this, we created a multipurpose registry that included all patients aged ≥65 who visited participating EDs between 01 April and 07 April 2019 (seven consecutive days), regardless of the reason for consultation. This registry constitutes the EDEN cohort. Extended patient recruitment and follow-up details have been published elsewhere [22–24].

2.2 EDEN-20 study design

The present study, EDEN-20, is a secondary analysis of patients in the EDEN cohort. For this analysis, we included data from the 48 EDs with an operational Emergency Department

Observation Unit (EDOU) at the time of patient inclusion. Patients were classified into two groups: those admitted to an observation unit (EDOU group) and those who were not (non-EDOU group). Both groups included patients discharged from the ED or admitted to the hospital. The classification was based solely on whether observation unit care was used at any point during the ED stay.

In addition, we collected information about the structural and functional characteristics of each participating EDOU. These included hospital type (primary/secondary *vs.* tertiary), number of available observation beds, organizational structure (open, closed, or mixed models), and functional classification (Types I–IV). Type I units follow standardized protocols and are managed directly by ED staff; Type II units apply partial protocols or are jointly managed; Types III and IV represent more complex or less standardized observation models.

We analysed patients' sociodemographic variables, baseline functional and cognitive status, and polypharmacy. These included nine variables: age, sex, comorbidities, walking ability, cognitive impairment, mode of arrival to the ED, referral source, and presence of polypharmacy.

We considered the following comorbid conditions: arterial hypertension, dyslipidaemia, uncomplicated or complicated (organ failure) diabetes mellitus, chronic lung disease, heart failure, ischemic heart disease, chronic kidney disease, stroke, dementia, cancer with or without metastasis, peripheral vascular disease, connective tissue disease, venous thromboembolism, human immunodeficiency virus (HIV)/acquired immunodeficiency syndrome (AIDS), alcoholism, leukaemia or lymphoma, and moderate or severe chronic liver disease.

We also collected eight variables related to physical examination: hypotension, hypertension, significant tachypnoea, tachycardia, significant bradycardia, hypoxemia, fever, and Glasgow Coma Scale (GCS) score <15. In addition, we analysed 14 laboratory abnormalities: leucocytosis, leukopenia, erythrocytosis, anaemia, thrombocytosis, thrombocytopenia, hypoglycaemia, elevated serum creatinine, hypernatremia, hyponatremia, hyperkalaemia, hypokalaemia, and elevated serum lactate. We dichotomized laboratory results using common clinical cut-off points.

Given the patient acuity and presentation heterogeneity, laboratory and diagnostic testing were performed only when clinically indicated. Initial ED vital signs were similarly dichotomized using standard clinical thresholds. Fever was defined as temperature $\geq$38 °C, tachycardia as heart rate $>$120 bpm, bradycardia as $<$50 bpm, tachypnoea as respiratory rate $>$20 breaths per minute, hypoxemia as peripheral capillary oxygen saturation (SpO_2) $<$90%, hypotension as systolic blood pressure (BP) $<$90 mmHg, and hypertension as systolic BP $\geq$160 mmHg

Additionally, we analysed the most frequent primary emergency diagnoses in both study groups. These Emergency diagnoses were registered using ICD-10 codes (*10th revision of the International Statistical Classification of Diseases and Related Health Problems*). The length of stay in the ED was also registered, and was computed as the period between registration in the emergency department and the decision to discharge home or hospital admission for the non-EDOU group. In the case of the EDOU group, the time spent in this unit was also considered in the calculation.

2.3 Outcomes

We examined five short-term outcomes: (1) hospital admission following ED or EDOU management; (2) prolonged hospital stay, defined as inpatient length of stay $\geq$7 days; (3) 30-day ED revisit (only for discharged patients); (4) 30-day hospital readmission; and (5) 30-day all-cause mortality. All outcomes were obtained from electronic health records via standardized data collection protocols.

2.4 Statistical analysis

We conducted a descriptive analysis comparing the EDOU and non-EDOU groups. Categorical variables are reported as absolute frequencies and percentages, and continuous variables as medians with interquartile ranges (IQR). We used chi-square or Fisher's exact tests to compare categorical variables, and Mann-Whitney U tests for continuous variables.

We developed two multivariable logistic regression models. The first identified independent factors associated with EDOU admission. The second assessed the association between EDOU care and each of the short-term outcomes. We included in the models all variables showing significant differences in univariate analysis and those deemed clinically relevant. We report unadjusted odds ratios (OR) and adjusted OR (aOR) with respective 95% confidence intervals (CI), and consider p-values < 0.05 statistically significant. All analyses were performed using IBM SPSS Statistics version 17.0 (IBM, Armonk, NY, USA).

3. Results

Table 1 presents the structural and functional characteristics of the participating EDOUs, providing context for their utilization.

The EDEN-20 study included 23,955 ED visits across 48 Spanish hospitals. Of these, 6393 visits (26.7%) involved patients admitted to an EDOU (EDOU group), while 17,562 (73.3%) did not (non-EDOU group) (Fig. 1). The median age of all patients was 78 years (IQR: 13); 10,433 patients (43.6%) were aged 80 or older, and 55% were women.

The median ED length of stay was 8.3 hours (IQR: 15.22) for the EDOU group and 2.7 hours (IQR: 3.24) for the non-EDOU group. A total of 1078 patients (17%) in the EDOU group had ED stays longer than 24 hours (including time in the EDOU), compared to only 226 patients (1.3%) in the non-EDOU group (OR = 16.0; 95% CI: 14.0–18.0; $p < 0.001$).

Compared to non-EDOU patients, those in the EDOU group were older (median age 81 *vs.* 77 years; $p < 0.001$), with a higher proportion aged $\geq$80 years, a greater burden of comorbidity, worse functional capacity (as measured by the Barthel Index), more frequent mobility impairment, and higher rates of cognitive decline. Patients in the EDOU group more often arrived by ambulance and were more frequently referred by a physician or from another hospital. Table 2 shows these variables along with their unadjusted ORs and statistical significance.

The same table also presents data on vital signs. The

TABLE 1. Characteristics of participating hospitals and observation units in the EDEN-20 study.

Variables	Primary/Secondary Hospitals (n = 26)	Tertiary Hospitals (n = 22)	Total (N = 48)
Number of observation beds (median (IQR))	17 (15)	38 (27)	24 (27)
Organizational structure (n (%))			
Open model	18 (69.2%)	11 (50.0%)	29 (60.4%)
Closed model	4 (15.4%)	5 (22.7%)	9 (18.8%)
Mixed model	4 (15.4%)	6 (27.3%)	10 (20.8%)
Functional classification (n (%))			
Type I	12 (46.2%)	14 (63.6%)	26 (54.2%)
Type II	12 (46.2%)	7 (31.8%)	19 (39.6%)
Type III	1 (3.8%)	1 (4.6%)	2 (4.2%)
Type IV	1 (3.8%)	0 (0.0%)	1 (2.1%)

IQR: interquartile ranges.

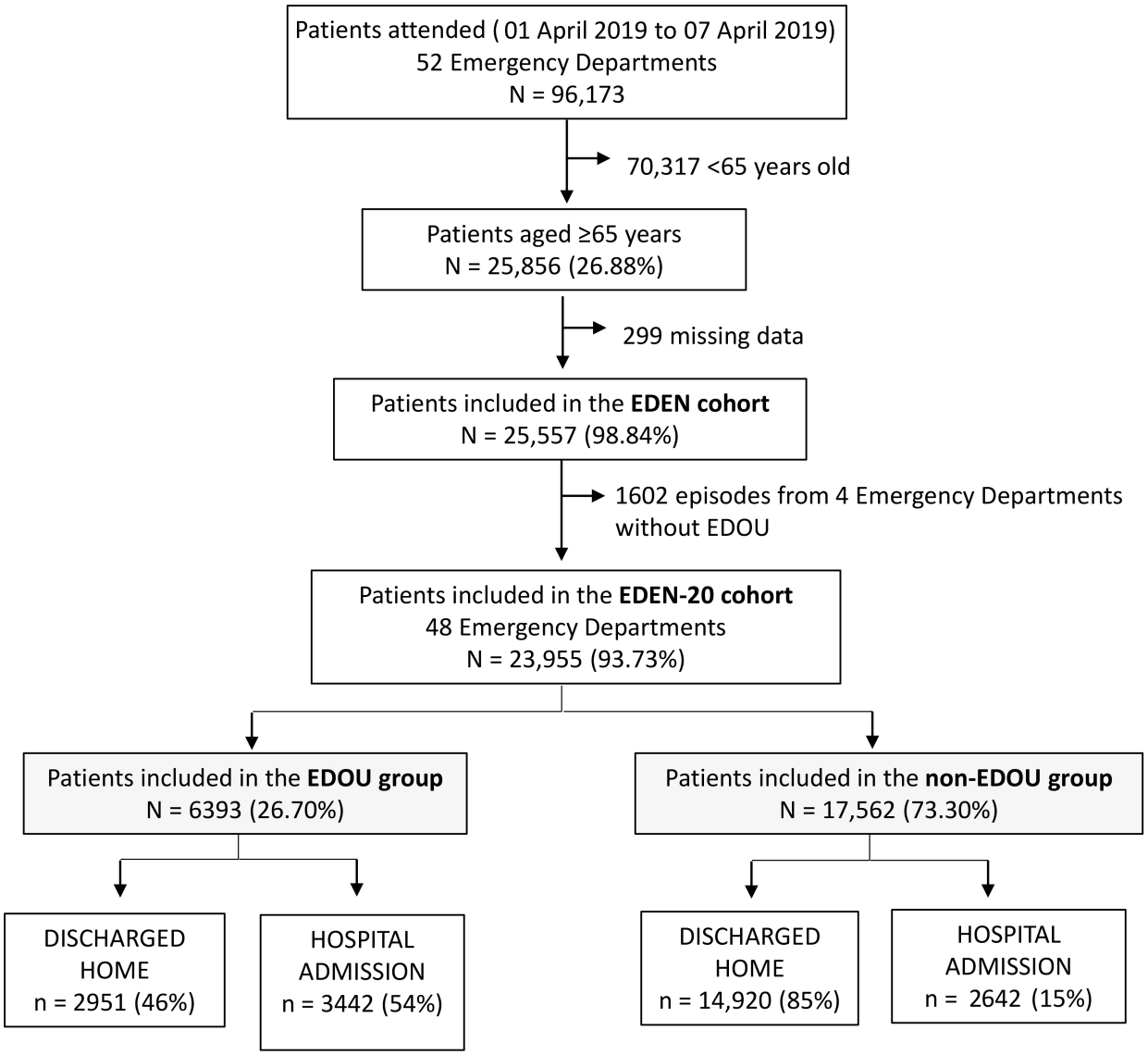

FIGURE 1. Flowchart for patient inclusion in the EDEN-20 cohort. EDOU: Emergency Department Observation Unit; EDEN: Emergency Department and Elder Needs. Note: bold text is used to highlight key cohort definitions and main outcome categories.

TABLE 2. Baseline demographics, functional and clinical characteristics among patients admitted and not admitted to Emergency Department Observation Units.

Variables	EDOU N = 6393 n (%)	Non-EDOU N = 17,562 n (%)	OR (95% CI)	*p*-value
Sociodemographic characteristics				
Age group (yr)				
<80 (reference)	2888 (45.2)	10,634 (60.6)	-	**<0.001**
≥80	3505 (54.8)	6928 (39.4)	**2.0 (1.8–2.0)**	
Sex (female)[a]	3141 (50.3)	9785 (56.9)	0.8 (0.7–0.8)	**< 0.001**
Arrival to ED				**<0.001**
Their own (reference)	3653 (57.0)	14,206 (80.9)	**3.2 (3.0–3.4)**	**<0.001**
Non-medicalized or medicalized ambulance	2740 (43.0)	3356 (19.1)		
Referred to the ED				
Own initiative of the patient or caregiver (reference)	3823 (60.0)	12,932 (74.0)	**2.0 (1.8–2.0)**	**<0.001**
Referred from primary care or by a medical specialist (other than primary care) or another hospital	2570 (40.2)	4630 (26.0)		
Baseline status				
Comorbidity presence	6128 (96.0)	15,794 (90.0)	**2.6 (2.3–3.0)**	**<0.001**
Functional capacity (by Barthel Index)				**<0.001**
Independent (100 points) (reference)	3444 (54.0)	12,550 (71.5)	-	
Mild or moderate (60–95 points)	1974 (31.0)	3680 (21.0)	**2.0 (1.8–2.1)**	**<0.001**
Severe or complete (<60 points)	975 (15.0)	1332 (7.6)	**2.4 (2.4–2.9)**	
Walking ability				**<0.001**
Alone with no help (reference)	3744 (58.6)	13,249 (75.4)	-	
Need help	1983 (31.0)	3444 (19.6)	**2.7 (2.4–3.0)**	**<0.001**
Unable to walk	666 (10.4)	869 (4.9)	**2.0 (1.9–2.2)**	
Baseline cognitive decline	1253 (19.6)	1968 (11.2)	**2.0 (1.8–2.1)**	**<0.001**
Polypharmacy (≥5 drugs)	4737 (74.1)	10,419 (59.3)	**2.0 (1.8–2.1)**	**<0.001**
Vitals at ED arrival				
Arterial hypertension (systolic arterial pressure >160 mmHg)[b]	1053 (18.3)	2251 (23.0)	**0.8 (0.7–0.8)**	**<0.001**
Arterial hypotension (systolic arterial pressure <90 mmHg)[b]	174 (3.0)	133 (1.3)	**2.3 (1.8–2.9)**	**<0.001**
Fever (≥38 °C)[c]	102 (4.5)	68 (1.6)	**2.9 (2.1–3.9)**	**<0.001**
Significant tachypnoea (>20 breaths per minute)[d]	504 (16.4)	259 (4.7)	**4.0 (3.4–4.7)**	**<0.001**
Tachycardia (>120 beats per minute)[e]	303 (5.5)	226 (2.4)	**2.4 (2.0–2.9)**	**<0.001**
Significant bradycardia (<50 beats per minute)[e]	112 (2.0)	137 (1.4)	**1.4 (1.1–1.8)**	**<0.001**
Hypoxemia (peripheral arterial oxygen saturation ≤90%)[f]	692 (14.1)	456 (6.2)	**2.5 (2.2–2.8)**	**<0.001**
Glasgow coma scale score <15[g]	285 (8.2)	191 (2.3)	**3.8 (3.2–4.6)**	**<0.001**

TABLE 2. Continued.

Variables	EDOU N = 6393 n (%)	Non-EDOU N = 17,562 n (%)	OR (95% CI)	*p*-value
Analytical data				
Leucocytosis (>11,000/microL)[h]	1831 (31.3)	1770 (22.5)	**1.6 (1.4–1.7)**	**<0.001**
Leukopenia (<4000/microL)[h]	167 (3.0)	231 (3.0)	1.0 (0.8–1.2)	0.800
Erythrocytosis (hemoglobin ≥16.5 g/dL in men; ≥16 g/dL in women)[i]	162 (2.6)	183 (1.1)	**2.5 (2.0–3.0)**	**<0.001**
Anaemia (hemoglobin <9 g/dL)[i]	364 (7.5)	225 (4.0)	**2.0 (1.7–2.4)**	**<0.001**
Thrombocytosis (>400,000/microL)[j]	309 (5.3)	310 (4.0)	1.4 (1.2–1.6)	**<0.001**
Thrombocytopenia (<100,000/microL)[i]	200 (3.4)	261 (3.3)	1.0 (0.9–1.2)	0.738
Hyperglycaemia (≥180 mg/dL)[k]	1031 (18.1)	1049 (13.4)	1.4 (1.3–1.6)	**<0.001**
Hypoglycaemia (<70 mg/dL)[k]	61 (1.1)	84 (1.1)	1.0 (0.7–1.4)	0.100
Elevated serum creatinine (>1.4 mg/dL)[k]	1529 (27.0)	1444 (19.0)	**1.6 (1.5–1.7)**	**<0.001**
Hypernatremia (>145 mEq/L)[l]	205 (3.5)	169 (2.2)	**1.7 (1.3–2.0)**	**<0.001**
Hyponatremia (<135 mEq/L)[l]	913 (15.8)	960 (12.4)	1.3 (1.2–1.5)	**<0.001**
Hyperkalaemia (>5.5 mEq/L)[m]	219 (4.0)	193 (2.6)	**1.6 (1.3–1.9)**	**<0.001**
Hypokalaemia (<3.5 mEq/L)[m]	410 (7.3)	404 (5.4)	**1.4 (1.2–1.6)**	**<0.001**
Serum lactate (>2 mmoL/L or >18 mg/dL)[n]	468 (30.0)	365 (29.3)	1.0 (0.9–1.2)	0.900

EDOU: Emergency Department Observation Unit; OR: unadjusted odds ratio (for EDOU admission); CI: confidence intervals; ED: Emergency Department.
p-values in bold denote statistical significance (p < 0.05).
[a]*variable registered in 6249 of the EDOU group and 17,1393 episodes of the No-EDOU group.*
[b]*variable registered in 5757 of the EDOU group and 9878 episodes of the No-EDOU group.*
[c]*variable registered in 2286 of the EDOU group and 4239 episodes of the No-EDOU group.*
[d]*variable registered in 3068 of the EDOU group and 5541 episodes of the No-EDOU group.*
[e]*variable registered in 5531 of the EDOU group 9616 episodes of the No-EDOU group.*
[f]*variable registered in 4919 of the EDOU group and 7405 episodes of the No-EDOU group.*
[g]*variable registered in 3467 of the EDOU group and 8339 episodes of the No-EDOU group.*
[h]*leukocyte count was requested or registered in 5856 of the EDOU group and 7878 episodes of the No-EDOU group.*
[i]*hemoglobin determination was requested or registered in 4824 of the EDOU group and 5770 episodes of the No-EDOU group.*
[j]*platelet count was requested or registered in 5799 of the EDOU group and 7827 episodes of the No-EDOU group.*
[k]*plasmatic glucose and serum creatinine were requested or registered in 5686 of the EDOU group and 7808 episodes of the No-EDOU group.*
[l]*plasmatic sodium was requested or registered in 5785 of the EDOU group and 7768 episodes of the No-EDOU group.*
[m]*plasmatic potassium was requested or registered in 5611 of the EDOU group and 7442 episodes of the No-EDOU group.*
[n]*serum lactate was requested or registered in 1581 of the EDOU group and 1245 episodes of the No-EDOU group.*

presence of arterial hypotension, arterial hypertension, significant tachypnoea, tachycardia, bradycardia, hypoxemia, and a Glasgow Coma Scale (GCS) score <15 was significantly associated with EDOU admission. The strongest associations were observed for tachypnoea (OR = 4.0; 95% CI: 3.4–4.7) and GCS <15 (OR = 3.8; 95% CI: 3.2–4.6).

Regarding laboratory abnormalities (Table 2), erythrocytosis (OR = 2.5; 95% CI: 2.0–3.0) and anaemia (OR = 2.0; 95% CI: 1.7–2.4) showed the strongest associations with EDOU admission. Of the 31 variables analysed in the EDEN-20 dataset, 27 showed statistically significant differences between the EDOU and non-EDOU groups.

Table 3 displays the 10 most common ED diagnoses in each group. In the EDOU group, the leading diagnoses were: heart failure, pneumonia, urinary tract infection, chest pain, other specified respiratory disorders, atrial fibrillation and flutter, syncope and collapse, acute exacerbation of chronic obstructive pulmonary disease, unspecified lower respiratory infection, and cerebral infarction.

Multivariable logistic regression analysis, which included the 29 variables that differed significantly between groups, identified five independent predictors of EDOU admission: age ≥80 years, tachypnoea, bradycardia, GCS <15, and anaemia (Table 4, Fig. 2).

Regarding the outcomes, the need for hospital admission was 54% in the EDOU group compared to 15% in the non-EDOU group (aOR = 2.4; 95% CI: 2.0–2.8). The EDOU group also showed higher rates of 30-day rehospitalization (aOR = 1.6; 95% CI: 1.2–2.3). Notably, EDOU care showed a negative, but non-significant, association with 30-day ED

TABLE 3. The 10 most frequent primary emergency diagnoses in the EDOU and no-EDOU groups.

Diagnoses (ICD-10 code)	EDOU N = 6393 n (%)	Diagnoses (ICD-10 code)	Non-EDOU N = 17,562 n (%)
1. Heart failure (I50)	477 (7.5)	1. Back Pain (M54)	697 (4.0)
2. Pneumonia, unspecified (J18.9)	228 (3.6)	2. Abdominal and pelvic pain (R10)	463 (2.6)
3. Urinary tract infection, site not specified (N39.0)	203 (3.2)	3. Urinary tract infection, site not specified (N39.0)	362 (2.1)
4. Chest pain, unspecified (R07.4)	183 (3.0)	4. Heart failure (I50)	358 (2.0)
5. Other specified respiratory disorders (J98.8)	181 (2.8)	5. Injury of unspecified body region (T14)	340 (1.9)
6. Atrial fibrillation and atrial flutter, unspecified (I48.9)	179 (2.8)	6. Other articulation disorders, not elsewhere classified (M25)	280 (1.6)
7. Syncope and collapse (R.55)	173 (2.7)	7. Other specified respiratory disorders (J98)	273 (1.6)
8. Chronic obstructive pulmonary disease with acute exacerbation, unspecified (J44)	158 (2.5)	8. Syncope and collapse (R.55)	239 (1.4)
9. Unspecified acute lower respiratory infection (J22)	155 (2.4)	9. Conjunctivitis (H10)	232 (1.3)
10. Cerebral infarction (I63)	98 (1.5)	10. Airway haemorrhage (haemoptysis, epistaxis) (R04)	211 (1.2)

ICD-10: 10th revision of the International Statistical Classification of Diseases and Related Health Problems; EDOU: Emergency Department Observation Units.

TABLE 4. Results of multivariable logistic regression analysis of the key variables associated with emergency department observation unit admission.

Variables	B	Standard error	Wald	*p*-value	Adjusted OR	95% CI
Glasgow coma scale score <15 points	1.7	0.4	20.8	**<0.001**	**5.0**	**2.6–10.0**
Significant bradycardia (<50 beats per minute)	1.2	0.5	5.4	**0.025**	**3.1**	**1.2–8.0**
Significant tachypnea (>20 breaths per minute)	0.9	0.2	16.0	**<0.001**	**2.5**	**1.6–4.0**
Anemia (hemoglobin <9 g/dL)	0.7	0.3	6.3	**0.014**	**2.0**	**1.2–3.6**
Age ≥80 yr	0.5	0.1	12.6	**<0.001**	**1.6**	**1.2–2.1**

p-values in bold denote statistical significance ($p < 0.05$).
B: β coefficient; OR: odds ratio; CI: confidence intervals.

revisit among discharged patients (aOR = 0.9; 95% CI: 0.7–1.2).

No significant associations were observed between EDOU use and prolonged hospital stay (aOR = 1.2; 95% CI: 0.9–1.5), 30-day hospital admission after ED discharge (aOR = 1.1; 95% CI: 0.9–1.4), in-hospital mortality (aOR = 1.0; 95% CI: 0.7–1.5), or all-cause 30-day mortality (aOR = 1.0; 95% CI: 0.8–1.4) (Table 5).

4. Discussion

This exploratory study reveals previously unreported sociodemographic, functional, and clinical characteristics of a representative sample of EDOUs in Spain. It also identifies factors associated with admission to EDOUs—an area scarcely addressed in the literature—and describes selected short-term outcomes following observation unit care.

ED visits by older adults are associated with higher rates of hospital admission, prolonged inpatient stays, unplanned readmissions, functional decline, and mortality [21, 25]. For many of these patients, EDOUs may offer a safe and efficient alternative to conventional admission, helping to avoid unnecessary hospitalization [18].

In our study, patients admitted to EDOUs were older, with greater comorbidity, functional dependence, and cognitive impairment than those who were not admitted to observation units. This suggests a more complex clinical profile, consistent with previous findings [15, 19].

Except for arterial hypertension, all other abnormal physical examination findings were significantly associated with the decision to admit to the EDOU (Table 4). These signs likely influenced clinicians during the triage and initial evaluation phases. Caterino *et al.* [26] found that among older patients in EDOUs, age >65 was not predictive of hospital admission and that hypertension was the only significantly associated vital sign. However, to our knowledge, no previous studies have

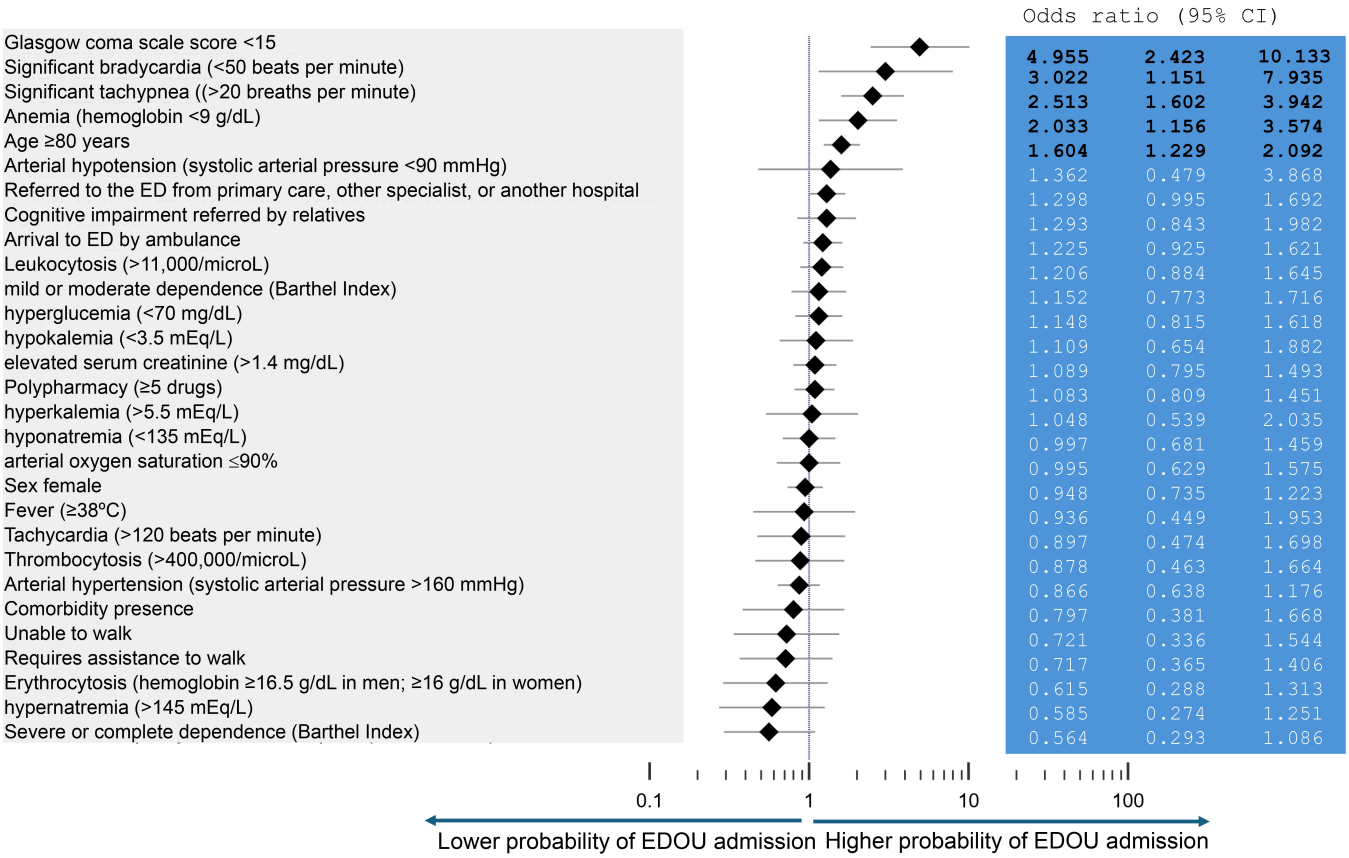

FIGURE 2. Adjusted associations for variables analyzed in the EDEN-20 Study with admission in emergency department-observation units (EDOU). The multivariable model included only significant variables ($p < 0.05$) on univariate analysis. The odds ratio in bold numbers denotes statistically significant differences ($p < 0.05$). ED: Emergency Department; EDOU: Emergency Department Observation Unit; CI: Confidence Interval.

TABLE 5. Association between EDOU admission and short-term outcomes.

Shor-term outcomes	EDOU stay N = 6393 n (%)	Non-EDOU stay N = 17,562 n (%)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	*p*-value
Need for hospitalization (all patients)	3442 (54.0)	2642 (15.0)	**6.6 (6.2–7.0)**	**2.4 (2.0–2.8)**	**<0.001**
Prolonged hospitalization (>7 d) (in hospitalized patients)	1432 (42.0)	1110 (42.2)	1.0 (0.9–1.1)	1.2 (0.9–1.5)	0.12
30-day revisit ED (in non-hospitalized patients)	706 (24.0)	3083 (21.0)	1.2 (1.0–1.3)	0.9 (0.7–1.2)	0.58
30-day hospital readmission (in hospitalized patients)	385 (11.3)	284 (10.8)	1.0 (0.9–1.2)	**1.6 (1.2–2.3)**	**0.02**
30-day hospital admission after discharge from ED (in non-hospitalized patients)	313 (10.6)	864 (5.8)	**2.0 (1.7–2.2)**	1.1 (0.9–1.4)	0.40
In-hospital mortality (in hospitalized patients)	376 (2.9)	287 (2.9)	1.0 (0.9–1.2)	1.0 (0.7–1.5)	0.80
30-day all-cause mortality (all patients)	590 (9.2)	534 (3.0)	**3.2 (2.9–3.7)**	1.0 (0.8–1.4)	0.90

Covariates included in the adjusted model were those shown in Table 4.
OR: odds ratio; CI: confidence intervals; ED: Emergency Department; EDOU: Emergency Department Observation Unit.
p-values in bold denote statistical significance ($p < 0.05$).

examined the role of physical signs in predicting admission to an observation unit.

Regarding laboratory values, most abnormalities were associated with admission to an EDOU, except for leukopenia, thrombocytopenia, hypoglycaemia, and elevated lactate. Anaemia and erythrocytosis showed the strongest associations, possibly reflecting transfusion needs and exacerbated chronic obstructive pulmonary disease (COPD), respectively.

The analysis of emergency diagnoses (Table 3) showed that the five most common reasons for EDOU admission were heart failure, pneumonia, urinary tract infection, chest pain, and other specified respiratory disorders. Ross *et al*. [15] listed the 20 most common diagnoses among patients aged ≥65 admitted to EDOUs in the United States, including conditions such as dehydration, syncope, COPD, cellulitis, abdominal pain, atrial fibrillation, anaemia requiring transfusion, and social problems. All 10 most frequent diagnoses in our study are included within Ross's top 20. Surprisingly, diagnoses like back pain, abdominal/pelvic pain, or trauma-related injuries were not prevalent in our cohort, possibly because these cases are often managed in standard ED consultation areas or referred directly to specialist care.

Our multivariable regression model identified five independent factors associated with EDOU admission: age ≥80 years, tachypnoea, bradycardia, GCS <15, and anaemia. Although not predictive, the model provides an explanatory framework to identify the clinical profile associated with the decision to admit to EDOUs. Understanding these patterns is key to standardizing practice and optimizing care for older adults in the ED.

Observation unit use among adult ED patients is estimated at around 10% overall [6], and approximately 2% for geriatric patients [15]. In our study, 27% of patients aged ≥65 were managed in an EDOU—a proportion rarely reported in the biomedical literature. Furthermore, 54% of hospital admissions occurred after an EDOU stay, compared with just 15% directly from the ED ($p < 0.001$). These figures highlight the central role of EDOUs in managing geriatric patients in Spain.

Previous studies in the U.S. and U.K. have reported inpatient admission rates from EDOUs among older adults ranging from 16% to 78% [15, 27–30]. Our results fall within this range. In unadjusted analyses, 30-day hospital readmission after ED discharge (10.6% *vs.* 5.8%; OR = 2.0; 95% CI: 1.7–2.2) and 30-day all-cause mortality (9.2% *vs.* 3.0%; OR = 3.2; 95% CI: 2.9–3.7) were significantly higher in the EDOU group. However, these differences disappeared after adjusting for covariates in the regression model, except for a slight increase in 30-day rehospitalization after observation unit stay (11.3% *vs.* 10.8%; OR = 1.6; 95% CI: 1.2–1.3; $p < 0.05$).

In an extensive cohort study, Dharmarajan *et al*. [31] evaluated outcomes after observation stays in older adults and reported that 20% of hospital revisits and 50% of all subsequent hospitalizations occurred after an initial observation stay. The 30-day mortality rate in their study was 1.8%, much lower than ours, likely due to the younger age and lower comorbidity burden in their population.

More recently, Berger *et al*. [32] analysed ED return rates after EDOU discharge in a general population and found an overall revisit rate of 9.4%. In contrast, our cohort had a revisit rate of 24%, possibly reflecting the older age and higher complexity of our patients.

It is important to note that EDOU admission criteria were not standardized across centres. Variability in local protocols, unit structure, and bed availability likely influenced patient selection [33–35]. Therefore, the observed association between EDOU care and outcomes may partly reflect differences in patient complexity rather than the effect of EDOU management itself.

5. Limitations

Our findings should be interpreted in light of several limitations. First, the 48 participating EDOUs were not randomly selected; they volunteered to participate. Nevertheless, they represent 12 of Spain's 17 autonomous communities, including university, high-complexity, and regional hospitals, minimizing potential selection bias.

Second, this analysis is based on a secondary use of a multipurpose registry. Therefore, some associations may be influenced by variables not captured in the original design.

Third, we did not model potential interactions between clinical variables (*e.g.*, bradycardia and beta-blocker use, GCS, and baseline cognitive impairment). Similarly, due to data limitations, we could not apply frailty indices (*e.g.*, Clinical Frailty Scale) or comorbidity scores (*e.g.*, Charlson Index). Instead, we used the Barthel Index as a validated proxy for baseline functional status.

Fourth, we could not confirm whether any individual appeared more than once in the dataset. Although the inclusion period was short, the possibility of repeat visits cannot be excluded. We analysed outcomes per visit, and the data were extracted from electronic health records without patient identifiers.

Lastly, although we described the structural features of each EDOU (Table 1), we did not analyse whether unit type (*e.g.*, Type I *vs.* Type II) or organizational model (*e.g.*, open *vs.* closed) influenced outcomes. Future analyses using multilevel or hierarchical models are warranted.

This was an exploratory multicentre registry analysis, and we did not apply formal corrections for multiple comparisons. Although multivariable models were used to control for confounding, univariate associations should be interpreted cautiously. Future studies should confirm these findings in prospectively designed cohorts.

6. Conclusions

Observation units are increasingly used to manage older adults presenting to emergency departments. In this multicentre study involving 48 Spanish hospitals, we found that admission to an EDOU was associated with indicators of greater clinical complexity, such as advanced age, abnormal vital signs, impaired consciousness, and anaemia.

Short-term outcomes, including hospital admission and 30-day readmission, were more frequent among EDOU patients. However, these associations likely reflect patient complexity rather than adverse effects of EDOU care itself. EDOU use was not associated with increased mortality or prolonged hospital

stays.

These findings underscore the need to establish standardized criteria for EDOU admission in geriatric emergency care. Developing evidence-based, protocol-driven strategies may improve patient selection and promote safer, more efficient use of observation resources.

AVAILABILITY OF DATA AND MATERIALS

The data presented in this study are available on reasonable request from the corresponding author.

AUTHOR CONTRIBUTIONS

FJMP—designed the research study. FJMP, IBF, JGC, GBP, ÒM, CF, SA, AAA, JJ, PLL, OJTU, PEH, PPE, MCSP, MRG, MFPP, MGT, MBG, MVB, FLL, RMM, VTG, RJGH, JPG, CLA, MDP, MER, MIV, MRR, AMG—performed the research. FJMP, IBF, JGC, GBP, SA, ÒM—analyzed the data. FJMP, IBF, JGC, ÒM, SA—wrote the manuscript. All authors contributed substantially to the study conception, data acquisition, and data verification, critically revised the manuscript drafts, and read and approved the final version.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The EDEN project received approval from the Clinical Research Ethics Committee of Hospital Clínico San Carlos de Madrid (protocol HCSC/22/005-E). Given the registry's non-interventional nature, Spanish legislation allows centralized approval by a lead ethics committee, with required notification to local committees. The requirement for informed consent was waived by the same Ethics Committee due to the study's retrospective, non-interventional design and the use of anonymized data. The study adhered to the principles outlined in the Declaration of Helsinki.

ACKNOWLEDGMENT

We thank all members of the SIESTA network for their commitment and valuable contributions to the development of this study.

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Hospital de Zumarraga, Gipuzkoa: Patxi Ezponda.

Hospital Virxe da Xunqueira, La Coruña: Andrea Martínez Lorenzo.

Hospital Universitario Río Hortega, Valladolid: Inmaculada García Rupérez, Pablo González Garcinuño, Raquel Hernando Fernández, José Ramón Oliva Ramos, Virginia Carbajosa Rodríguez.

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Hospital Juan Ramón Jiménez, Huelva: Asumpta Ruiz Aranda, María José Marchena, José María Santos Martin.

FUNDING

This research received no external funding.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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How to cite this article: Francisco Javier Montero-Pérez, Inmaculada Bajo-Fernández, Juan González del Castillo, Guillermo Burillo-Putze, Cesáreo Fernández, Sira Aguiló, *et al.*, on behalf of the researchers of the SIESTA network. Admission rates and outcomes of elderly patients in emergency department observation units. A Spanish multicentre study. Signa Vitae. 2025; 21(10): 80-91. doi: 10.22514/sv.2025.146.