ORIGINAL ARTICLE

Feasibility, safety and efficacy of a care model based on multidimensional frailty assessment (3D/3D+), implemented in a hospital emergency department

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Objectives. To evaluate the feasibility, safety and efficacy of a care model based on multidimensional frailty assessment (3D/3D+), progressively implemented in a hospital emergency department (ED) for patients aged 75 years or older.

Methods. A type 1 hybrid effectiveness–implementation study. All medical emergency episodes involving patients aged 75 years or older attended from January 1st, 2018 through December 31st, 2023, were included. Multivariable autoregressive moving average (ARMA) time-series models were used to estimate the impact on hospital admission conversion rate, length of hospital stay, discharge destination from the ED, and revisits at 72 hours and 30 days.

Results. A total of 66,422 episodes were included, with a median age of 83.9 years (IQR, 79.4–88.3); 58.1% were women, and 61.5% had Model Andorrà de Triatge (MAT-SET) triage levels I–III. The multivariable time-series model adjusted for age and sex showed a 5–percentage point reduction in the proportion of hospital admissions in 2023 (β = –0.055; 95% CI, from –0.090 to –0.020) among high-priority episodes. In addition, there was a reduction in hospital stays > 2 days, an increase in referrals to intermediate care hospitalization, and a decrease in 30-day revisits, in both low- and high-priority episodes.

Conclusions. The study demonstrates the feasibility and effectiveness of transforming emergency care toward integrated, value-based practices centered on frailty using 3D/3D+ multidimensional assessment.

Keywords: Frailty. Hospital emergency services. Aging. Value-based health care. Hospitalization.

Viabilidad, efectividad y seguridad de un modelo asistencial basado en una valoración multidimensional de la fragilidad (3D/3D+) implementado en un servicio de urgencias hospitalario

Objetivos. Evaluar la viabilidad, efectividad y seguridad de un modelo asistencial basado en la valoración multidimensional de la fragilidad (3D/3D+) implementado de forma progresiva en un servicio de urgencias hospitalario (SUH) para pacientes de 75 años o más.

Métodos. Estudio híbrido de efectividad e implementación tipo 1. Se incluyeron todos los episodios de urgencias médicas correspondientes a pacientes de 75 años o más atendidos entre el 1 de enero de 2018 y el 31 de diciembre de 2023. Se emplearon modelos de series temporales multivariables autorregresivos y de media móvil (ARMA) para estimar el impacto en el índice de conversión a ingreso hospitalario, estancia hospitalaria, destino al alta del SUH y reconsulta a 72 horas y 30 días.

Resultados. Se incluyeron 66.422 episodios con una mediana de edad de 83,9 años (RIC 79,4-88,3), 58,1% mujeres y 61,5% con niveles de triaje I-III del Model Andorrà de Triatge-Sistema Español de Triaje (MAT-SET). El modelo multivariable de series temporales ajustado por edad y sexo mostró una reducción de 5 puntos porcentuales en la proporción de ingreso hospitalario en el año 2023 (β = –0,055; IC 95%: de –0,090 a –0,020) en los episodios de alto nivel de prioridad. Asimismo, se observó una reducción de las estancias hospitalarias superiores 2 días, un incremento de la derivación a hospitalización de atención intermedia y una disminución de las reconsultas a 30 días, tanto en los episodios de bajo como alto nivel de prioridad.

Conclusiones. El estudio muestra la viabilidad y eficacia de transformar la atención urgente hacia prácticas integradas, basadas en el valor y centradas en la fragilidad mediante el uso de la valoración multidimensional 3D/3D+.

Palabras clave: Fragilidad. Servicios de Urgencias Hospitalarios. Envejecimiento. Atención Médica Basada en Valor. Hospitalización.

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Introduction

The progressive aging of the population has transformed the profile of patients treated in hospital emergency departments (EDs). In many centers, individuals aged 75 years or older represent a growing proportion of consultations[1,2] characterized by high clinical, functional, cognitive, and social complexity.[3] This scenario places strain on traditional emergency care models, designed to respond rapidly and through standardized protocols to acute situations, but poorly adapted to the multidimensional assessment required by older adults.[4,5]

Frailty, understood as the reduction in physiological reserve that increases vulnerability to stressful events, is common in this age group and is associated with adverse outcomes such as hospital admissions and prolonged stays, repeat consultations, readmissions, institutionalization, and mortality.[6,7] In Spain, the EDEN cohort4 estimated that approximately 35% of older patients treated in EDs had some degree of functional dependence, with higher resource consumption and greater risk of complications. Similarly, the Frailty in European Emergency Departments (FEED) study,[8] promoted by the European Task Force for Geriatric Emergency Medicine (EGEM), estimated an average frailty prevalence of 40% in European EDs, with variations between countries ranging from 26% to 51%. In response to this reality, several international[9-11] and national recommendations[12-14] have advocated integrating systematic frailty screening, geriatric assessment adapted to the emergency setting, and differentiated care pathways. In a national survey conducted by the GEMES-SEMES Working Group and published in 2022, fewer than 15% of EDs reported using systematic frailty screening tools, as individual clinical judgment remained predominant.[13] This low adoption has been attributed to structural barriers inherent to the emergency setting, such as high health care pressure, the absence of validated and agile instruments suitable for triage or initial assessment, the shortage of professionals trained in geriatrics, and the lack of organizational models facilitating coordination with other levels of care.[15] Overcoming these obstacles requires pragmatic strategies that allow the progressive integration of frailty management into routine clinical practice.

The main objective of the present study was to evaluate the feasibility, safety and efficacy profile of a health care model based on multidimensional frailty assessment (3D/3D+) progressively implemented in an ED for patients aged 75 years or older.

Method

Design

A type 1 hybrid effectiveness-implementation study[16] was conducted based on the principles of the Consolidated Framework for Implementation Research (CFIR) to analyze the different contextual, organizational, and professional factors influencing the adoption, adaptation, and sustainability of health care innovations. Within this framework, the domains of acceptability, adherence, feasibility, and sustainability were specifically considered. The model was implemented progressively between 2019 and 2023. The study was approved by the Research Ethics Committee for Medicines of the Institut de Recerca i Innovació en Ciències de la Vida i de la Salut a la Catalunya Central (Catalonia, Spain) (EC 24/081).

Project setting

The study was conducted in the ED of the *Fundació Althaia, Xarxa Assistencial Universitària de Manresa* (Barcelona, Spain), integrated into the public health care system. This ED serves as the referral center for the regions of Bages, Moianès, and Solsonès, and provides occasional support to neighboring territories such as Berguedà and Cerdanya for highly complex processes or those requiring intensive care. The catchment area includes 260,000 inhabitants. The ED manages an annual average of 113,512 episodes, of which 15% correspond to individuals aged ≥ 75 years. It provides general medical-surgical care and specialized areas for pediatrics, psychiatry, traumatology, gynecology, and obstetrics.

The ED, located within an acute care hospital, forms part of an integrated health care network that includes primary care (PC), composed of 38 primary care centers (PCCs) and 100 local clinics, as well as an intermediate care hospital (ICH). The latter is oriented toward the care of patients, usually older and frail, experiencing crises requiring clinical care and specialized rehabilitation. Despite being managed by different entities, all facilities operate in coordination within the public health care system and share responsibility for planning and health care outcomes through strategic alliances between levels and organizations.

Study subjects

All emergency episodes corresponding to patients aged 75 years or older treated between January 1st, 2018 and December 31st, 2023 were included. Emergency visits managed in the specialized areas of gynecology, psychiatry, traumatology, and general surgery were excluded. Episode identification was performed using the hospital Emergency Minimum Basic Data Set (EMBDS) (Figure 1).

Description of the frailty-guided emergency care model

Our proposal is based on the Age-Friendly Health Systems model promoted by the Institute for Health care Improvement. This model encourages structured and person-centered care for the geriatric population, organized around the 4M framework: what Matters, Medication, Mentation, and Mobility.[17] The design and

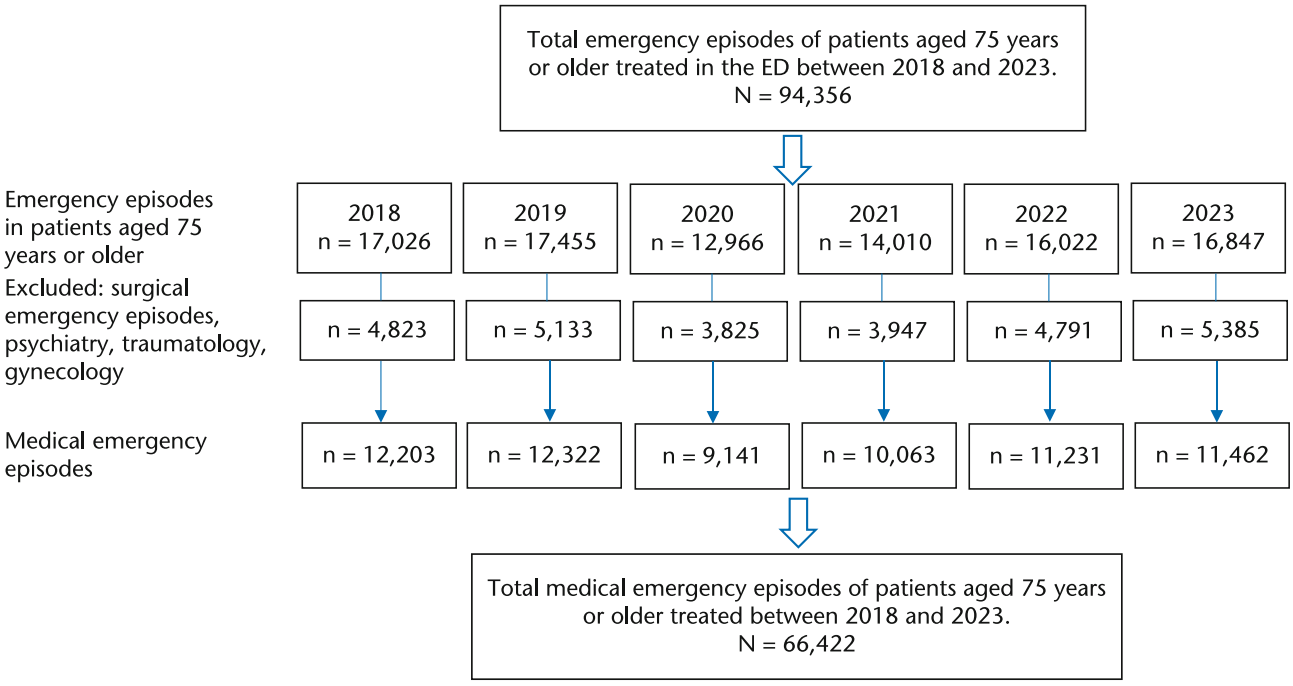

Figure 1. Flow diagram of episodes attended in the hospital emergency department between 2018 and 2023.

implementation of the model were based on strategies characteristic of research-informed implementation science,[18] complemented by contextual adaptation to the health care setting and a continuous evaluation approach. The progressive deployment of the model was structured into four sequential and partially overlapping phases between 2019 and 2023 (Supplementary data 1. https://revistaemergencias.org/extra/5149.pdf).

Phase 1 (2019-2020): conceptual design and development of the 3D/3D+ tool

The 3D/3D+ tool[19,20] was designed by the GERIURG group of the Societat Catalana de Medicina d'Urgències i Emergències (SoCMUE). Inspired by comprehensive geriatric assessment (CGA),[21] it combines the frailty accumulation of deficits model[22] with components of the phenotypic approach.[23] It is applied rapidly and adapted to the pace of health care delivery, with the ability to perform clinical stratification and guide decision-making in real time.[24] It can be used by both physicians and nursing staff, facilitating its integration into the workflow of the ED.

The 3D component evaluates baseline status during the previous 2 weeks (functionality, cognition, and home environment) and classifies patients into 4 frailty levels: no frailty (3D 0), early frailty (3D 1), intermediate frailty (3D 2), and advanced frailty (3D 3), prioritizing the detection of deficits in autonomy or cognition. The 3D+ component adds indicators of acute vulnerability (recent functional decline, delirium, pharmacological risk, and feasibility of 24-hour home treatment) and has demonstrated predictive capacity for 30-day mortality[20] (Figure 2). Its application during routine clinical care, along with the assessment of individual preferences, guides the selection of the most appropriate health care resource at discharge (Figure 3). Of note, the 3D/3D+ tool does not replace CGA, but rather acts as a clinical alert for the detection of frailty and guidance of its management during multidisciplinary meetings.

The tool was evaluated in a sample of patients aged ≥ 75 years identified as complex chronic patients (CCP) or patients with advanced chronic disease (ACD),[25] with CGA performed by their primary care (PC) team. CCPs present multimorbidity and difficult clinical management (2-3% of the general population), whereas ACD patients have limited life expectancy and high palliative care needs (1-2%). In a sample of 278 patients recruited over one month, its feasibility and stratification capacity into four frailty levels were confirmed.[16] Following this pilot testing, systematic screening was extended to all patients aged ≥ 75 years treated in the ED.

Simultaneously, a training program based on the Geriatric Emergency Department Guidelines (ACEP)[26] was implemented for all ED health care staff. This was complemented by service-based learning integrated into clinical practice and was consolidated as annual training to ensure sustainability within the health care team.

Phase 2 (2021): reorganization of the health care process, with organizational adaptation and operational design

After the most critical phase of the COVID-19 pandemic had passed, the ED initiated a functional reorganization aimed at integrating a frailty-centered model. Three main measures were implemented:

1. Dual nursing triage, which complemented the *Model Andorrà de Triatge-Sistema Español de Triaje* (MAT-

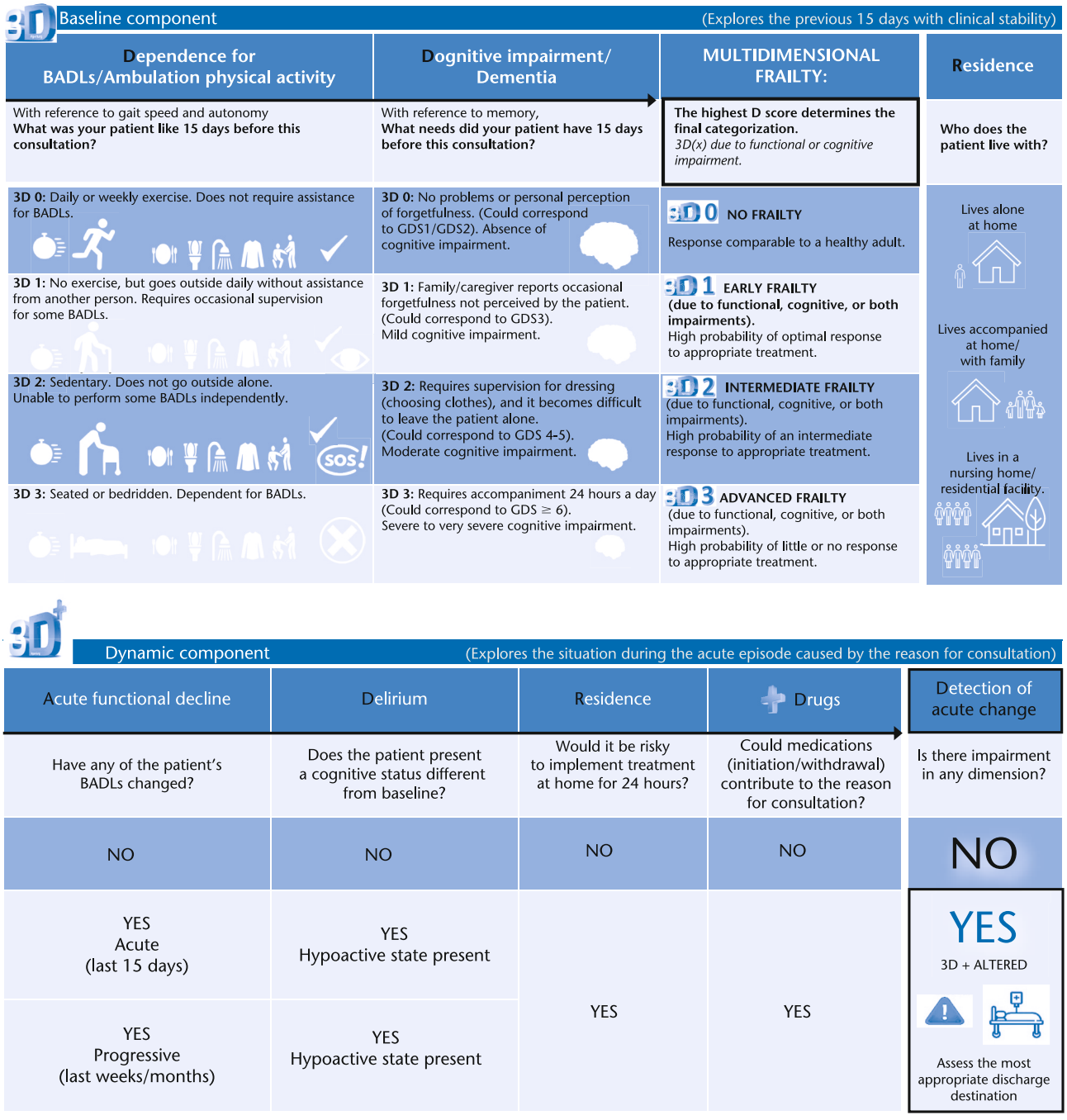

Figure 2. 3D/3D+. Rapid geriatric assessment tool: 3D for the estimation of baseline frailty and 3D+ for the assessment of dynamic frailty, understood as the impact of the reason for consultation on baseline frailty. Image provided by the GERIURG working group of the *Societat Catalana d'Urgències i Emergències* (SocMUE).

SET) with an initial frailty assessment using the baseline component of the 3D/3D+ tool or through prior identification from PC services (CCP/ACD). This information, visible from triage onward, allowed prioritization of patient placement for initial assessment in the observation unit (OU), specifically those with intermediate or advanced frailty and triage III-IV, or triage II in cases of advanced organ failure or oncological disease. The OU, as a polyvalent short-stay emergency area, was redesigned for this patient profile. It consisted of 14 individual rooms equipped with adjustable beds, armchairs, accessible bathrooms, and natural lighting. When availability was limited, patients underwent clinical assessment in other areas, with priority given to transfer as soon as space became available.

2. Systematic medical assessment, conducted by emergency physicians, ensuring universal application of the 3D/3D+ tool and appropriate discharge resource allocation for all patients aged ≥ 75 years on a continuous basis (24/7).

Clinical reason for admission	3D	3D+	Completed diagnosis	Incomplete diagnosis	Home/ Residence
No	3D 0,1,2,3	Not altered	–	–	Yes
No	3D 0,1,2,3	⚠	–	–	Intervention 🤝
Yes	3D 0	Not altered	TU / HAH	CH	–
Yes	3D 0	⚠	UT	AGU	–
Yes	3D 1	Not altered	TU / HAH	AGU	–
Yes	3D 1	⚠	AGU	AGU	–
Yes	3D 2	Not altered	TU / HAH	AGU	–
Yes	3D 2	⚠	HAI	AGU	–
Yes	3D 3	Not altered	HAH / ICH	ICH	–
Yes	3D 3	⚠	ICH	ICH	–

CH: conventional hospitalization; AGU: acute geriatric unit; TU: transition unit; ICH: intermediate care hospitalization; HAH: hospital-at-home; ⚠ altered dimension; 🤝 linkage with primary care.

Figure 3. Proposal for appropriate health care resource allocation at discharge from the hospital emergency department guided by the 3D/3D+ tool.
Patients without indication for admission but with altered 3D+ may benefit from a community-based intervention after discharge. Patients classified as 3D3, with or without altered 3D+, may benefit from intermediate care hospitalization or home care. Patients with incomplete diagnosis, with or without altered 3D+, benefit from acute hospitalization. Patients with completed diagnosis may benefit from transitional care units, intermediate care, or hospital-at-home programs, depending on the center and the diversity of available health care levels.
Source: García-Pérez D, Robles-Perea L, Vena-Martínez A, Arnau A, Robles-Bernabeu G, Espaulella-Panicot J. The 3D/3D+ as a rapid geriatric assessment tool and for appropriate health care resource allocation at discharge from Emergency Departments. Rev Esp Geriatr Gerontol. 2022;57(4):212-219.

3. Creation of the transition unit (TU), integrated into the Department of Internal Medicine (DIM), which allocated 8 rooms for stays of ≤ 72 hours for frail patients. This did not involve an increase in the number of beds, but rather a reorganization with specific transitional functions, ensuring continuity with emergency care and planning of the destination resource. Its location outside the ED and under the responsibility of the DIM allowed maintenance of departmental operational capacity during periods of high demand. The unit was supported by an advanced practice nurse, who played a key role in coordination between services and community resources, ensuring safe transitions (Supplementary data 2. https://revistaemergencias.org/extra/5149.pdf).

Phase 3 (2022): operational implementation and territorial coordination

Once the internal reorganization had been consolidated, territorial actions were integrated, including daily clinical meetings with interprofessional teams (ED, DIM, ICH, hospital-at-home –HAH–, social worker, advanced practice nurse) for shared decision-making and safe transitions. Alliances with community resources were strengthened (PC, primary care emergency centers –PCEC–).

–Urgent Primary Care Centers (PCEC)–, ICH, and reverse referral[27] of patients aged ≤ 75 years without clinical complexity to PCECs, thereby concentrating hospital resources on complex or frail patients.

Phase 4 (2023): institutional consolidation of the model and outcome evaluation

The model was officially recognized by the institution as the Program for Differentiated Care of Multicomplexity (*Programa de Atención Diferenciada a la Multicomplejidad;* PADIM). Continuous monitoring allowed evaluation of its impact on reducing conventional hospitalizations, increasing the use of alternatives to conventional hospitalization, and maintaining clinical safety.

Study variables

The variables included were obtained from the EMBDS registry and included administrative variables (total number of emergency episodes attended, episodes in individuals aged ≥ 75 years, and medical episodes), as well as episode-specific variables: age, sex, country of origin, triage level (MAT-SET), classification as CCP or ACD, reason for consultation, patient origin, means of transportation, and discharge destination. Information regarding the reference population and its age structure was obtained from the *Institut d'Estadística de Catalunya* (IDESCAT).[28]

Dependent safety and efficacy variables focused on health care and clinical management indicators such as

the acute hospital admission conversion index, hospital length of stay, discharge destination, ED revisits within 72 hours, and ED revisits within 30 days.

Implementation indicators were evaluated through institutional reports, clinical and administrative records, educational activities, and qualitative follow-up of multidisciplinary dynamics.

Statistical analysis

Categorical variables are expressed as absolute values and relative frequencies. Quantitative variables are summarized using the median and interquartile range (IQR). Normality of continuous variables was assessed using the Kolmogorov-Smirnov test. For bivariate analysis, the nonparametric Mann-Whitney U test was used. Comparisons of qualitative variables were performed using the chi-square test or the Monte Carlo exact method in contingency tables where expected frequencies were < 5. For each dependent variable, both primary and secondary, autoregressive moving average (ARMA) time-series models with covariates including sex, age, and year of hospitalization were adjusted. In some cases, variables intended to capture seasonal components of the process, particularly annual periodicities, were also considered. For most dependent variables, the selected model was an ARMA (1,1). Model selection in each case was based on evaluation of residual behavior and the Akaike Information Criterion (AIC). The level of statistical significance used was 5% two-sided ($P < .05$). Statistical analysis was performed using IBM SPSS Statistics v.29 (IBM Corporation, Armonk, New York, United States) and R software (v4.5.2; R Core Team, 2025).

Results

Table 1 illustrates the annual evolution of the reference population, as well as the number and characteristics of emergency episodes attended. Between 2018 and 2023, 610,021 visits were managed in the ED, of which 94,356 (15.5%) corresponded to patients aged ≥ 75 years. Of these, 70.4% were medical emergencies. Women accounted for 58.1%. The group aged 75-79 years increased from 3.0% to 4.0%, whereas the group aged 80-84 years decreased from 3.4% to 2.5% ($P < .001$). The group aged ≥ 85 years remained stable.

Statistically significant changes were observed in triage distribution ($P < .001$). Level III increased from 42.7% to 58.5%, while level IV dropped from 46.4% to 26.8%; levels I and V remained < 1%. CCP patients ranged between 22.3% and 27.6%. The most common reasons for consultation were cardiopulmonary conditions, followed by neurological, infectious, and abdominal conditions. Nonspecific presentations (asthenia, pain, or falls) reflected the initial diagnostic complexity in this patient profile (Supplementary data 3. https://revistaemergencias.org/extra/5149.pdf). The use of medical transport showed an initial increase from 51.9% in 2018 to 60.5% in 2020, subsequently stabilizing at approximately 57-58% and reaching 56.5% in 2023 ($P < .001$).

Hospital admission conversion index and length of stay

The baseline admission proportion was 0.23 (23%) for low-priority episodes and 0.55 (55%) for high-priority episodes. In low-priority episodes, the multivariable time-series model adjusted for age and sex showed statistically significant differences between the reference year (2018) and the years 2020 ($\beta = 0.081$; $P = .047$) and 2021 ($\beta = 0.081$; $P = .048$), with an increase in the expected admission proportion. No significant differences were observed between 2018 and the years 2022 or 2023. In high-priority episodes, a significant decrease of –0.055 units in the expected admission proportion was observed in 2023 ($P = .002$) (Figure 4, Table 2, and Supplementary data 5 and 6. https://revistaemergencias.org/extra/5149.pdf).

In low-priority episodes, a significant reduction in the proportion of hospitalizations lasting more than 2 days was observed in 2022 ($\beta = –0.084$; $P < .001$) and 2023 ($\beta = –0.132$; $P < .001$). In high-priority episodes, significant differences were identified for the years 2021, 2022, and 2023 (Supplementary data 7-9. https://revistaemergencias.org/extra/5149.pdf).

Discharge destination from the ED and use of alternatives to conventional hospitalization

In low-priority episodes, a significant increase in discharges to ICH was observed in 2022. In high-priority episodes, a significant increase was observed for the years 2021 ($\beta = 0.016$; $P = .012$), 2022 ($\beta = 0.033$; $P < .001$), and 2023 ($\beta = 0.046$; $P < .001$) (Supplementary data 10-12. https://revistaemergencias.org/extra/5149.pdf).

Safety at discharge from the ED

In low-priority episodes, a statistically significant reduction in 30-day revisits was observed in 2023 ($\beta = –0.024$; $P = .014$). In high-priority episodes, a significant reduction was observed in 2022 ($\beta = –0.025$; $P = .012$) and 2023 ($\beta = –0.021$; $P = .032$) (Supplementary data 13-15. https://revistaemergencias.org/extra/5149.pdf).

Discussion

Type 1 hybrid effectiveness-implementation studies have become established as a useful methodology for simultaneously advancing clinical knowledge and improving health care processes in EDs. The present study shows a coherent clinical evolution following the progressive implementation of a health care model based on linked value-based practices, with a 5 percent-

Table 1. Annual evolution of the reference population and characteristics of emergency episodes (2018-2023)

	2018 n (%)	2019 n (%)	2020 n (%)	2021 n (%)	2022 n (%)	2023 n (%)	*P*
Inhabitants	208,090	205,688	207,818	208,720	208,245	211,369	
Age							**< .001**
75-79 years	6,195 (3.0)	6,780 (3.3)	7,574 (3.6)	7,657 (3.7)	8,029 (3.9)	8,454 (4.0)	
80-84 years	7,036 (3.4)	6,449 (3.1)	5,678 (2.7)	5,646 (2.7)	5,383 (2.6)	5,260 (2.5)	
≥ 85 years	7,594 (3.6)	7,893 (3.8)	8,012 (3.9)	7,797 (3.7)	7,898 (3.8)	7,940 (3.8)	
Emergency episodes	116,353	116,712	79,654	90,226	104,061	103,015	
Age ≥ 75 years	17,026 (14.6)	17,455 (15.0)	12,996 (16.3)	14,010 (15.5)	16,022 (15.4)	16,847 (16.4)	**< .001**
Medical emergencies ≥ 75 years	12,203 (71.7)	12,322 (70.6)	9,141 (70.3)	10,063 (71.8)	11,231 (70.1)	11,462 (68.0)	**< .001**
Medical emergencies ≥ 75 years							
Triage level (MAT-SET)*							
I	19 (0.2)	26 (0.2)	18 (0.2)	19 (0.2)	17 (0.2)	22 (0.2)	
II	1,224 (10.0)	1,338 (10.9)	1,025 (11.2)	1,197 (11.9)	1,457 (13.0)	1,617 (14.1)	
III	5,216 (42.7)	5,698 (46.2)	4,239 (46.4)	5,080 (50.5)	5,908 (52.6)	6,700 (58.5)	
IV	5,657 (46.4)	5,164 (41.9)	3,808 (41.7)	3,723 (37.0)	3,785 (33.7)	3,075 (26.8)	
V	87 (0.7)	96 (0.8)	51 (0.6)	44 (0.4)	64 (0.6)	48 (0.4)	
Age (median [IQR])*	84 (80-88)	84 (79-88)	84 (79-88)	84 (79-88)	84 (79-89)	83 (79-89)	**< .001**
75-79 years	3,112 (25.5)	3,442 (27.9)	2,678 (29.3)	2,759 (27.4)	3,293 (29.3)	3,535 (30.8)	**< .001**
80-84 years	3,907 (32.0)	3,661 (29.7)	2,429 (26.6)	2,788 (27.7)	2,728 (24.3)	2,887 (25.2)	
≥ 85 years	5,184 (42.5)	5,219 (42.4)	4,034 (44.1)	4,516 (44.9)	5,210 (46.4)	5,040 (44.0)	
Sex*							**.024**
Male	5,010 (41.1)	5,065 (41.1)	3,928 (43.0)	4,219 (41.9)	4,768 (42.5)	4,837 (42.2)	
Female	7,193 (58.9)	7,257 (58.9)	5,213 (57.0)	5,844 (58.1)	6,463 (57.5)	6,625 (57.8)	
CCP (yes)	3,290 (27.0)	3,242 (26.3)	2,271 (24.8)	2,243 (22.3)	2,628 (23.4)	3,167 (27.6)	**< .001**
ACD (yes)	378 (3.1)	321 (2.6)	170 (1.9)	149 (1.5)	199 (1.8)	321 (2.8)	**< .001**
Country of origin*							.291
Spain	8,284 (97.7)	8,310 (97.7)	6,104 (98.2)	6,672 (97.6)	7,343 (97.8)	7,431 (97.9)	
Outside Spain	193 (2.3)	193 (2.3)	113 (1.8)	164 (2.4)	163 (2.2)	161 (2.1)	
Week period							.605
Weekdays (Monday to Friday)	9,264 (75.9)	9,350 (75.9)	6,973 (76.3)	7,654 (76.1)	8,513 (75.8)	8,623 (75.2)	
Weekends	2,939 (24.1)	2,972 (24.1)	2,168 (23.7)	2,409 (23.9)	2,718 (24.2)	2,839 (24.8)	
Origin[1]*							
Home	10,195 (83.5)	9,543 (78.2)	6,592 (72.1)	7,302 (72.6)	8,215 (73.1)	8,326 (72.6)	NA
Nursing home	–	609 (5.0)	731 (8.0)	734 (7.3)	838 (7.5)	985 (8.6)	
Acute care hospital	181 (1.5)	213 (1.7)	188 (2.1)	221 (2.2)	276 (2.5)	270 (2.4)	
Social health care network resource	45 (0.4)	27 (0.2)	132 (1.4)	263 (2.6)	208 (1.9)	240 (2.1)	
Primary care resource	1,769 (14.5)	1,798 (14.7)	1,492 (16.3)	1,516 (15.1)	1,681 (15.0)	1,606 (14.0)	
Hospital-at-home	6 (0.0)	2 (0.0)	2 (0.0)	4 (0.0)	1 (0.0)	0 (0.0)	
Outpatient clinic	7 (0.1)	8 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	
Other outpatient care	0 (0.0)	4 (0.0)	4 (0.0)	23 (0.2)	12 (0.1)	35 (0.3)	
Origin from another emergency care facility*							
No	10,106 (96.6)	10,250 (86.6)	7,461 (81.6)	8,326 (82.7)	9,274 (82.6)	9,586 (83.6)	**< .001**
Hospital emergency department	181 (1.7)	222 (1.9)	188 (2.1)	221 (2.2)	276 (2.5)	270 (2.4)	
Primary care emergency center	0 (0.0)	1,315 (11.1)	1,474 (16.1)	1,490 (14.8)	1,662 (14.8)	1,586 (13.8)	
Medical emergency system	179 (1.7)	42 (0.4)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	
Continuous primary care	0 (0.0)	5 (0.0)	18 (0.2)	26 (0.3)	19 (0.2)	20 (0.2)	
Means of arrival to the ED*							**< .001**
Own means	5,867 (48.1)	6,003 (48.7)	3,608 (39.5)	4,264 (42.4)	4,682 (41.7)	4,985 (43.5)	
Ambulance	6,334 (51.9)	6,315 (51.2)	5,532 (60.5)	5,797 (57.6)	6,549 (58.3)	6,476 (56.5)	
Helicopter	2 (0.0)	4 (0.0)	1 (0.0)	2 (0.0)	0 (0.0)	1 (0.0)	

IQR: interquartile range; NA: not applicable; ED: emergency department.
[1]In the 2018 EMBDS version (4th edition), the category "Home" also included assisted/social living residences.
*Refers to the total number of patients with medical emergencies aged ≥ 75 years.
Values in bold denote statistical significance ($P < .05$).

age-point reduction in the proportion of hospital admissions in 2023 (β = –0.055; 95% CI, –0.090 to –0.020) among high-priority episodes. In low-priority episodes, an increase in the percentage of admissions was observed during 2020 and 2021, whereas in high-priority episodes this increase was observed only in 2020, probably associated with the impact of the COVID-19 pandemic. Similarly, a reduction in lengths of stay > 2 days, an increase in referrals to intermediate care hospitalization, and a decrease in 30-day revisits were observed in both low- and high-priority episodes. These results reflect better alignment of health care resources with the frailty profile, without compromising clinical safety.

These findings are consistent with other experiences in the field of frailty care in emergency settings. Puig-

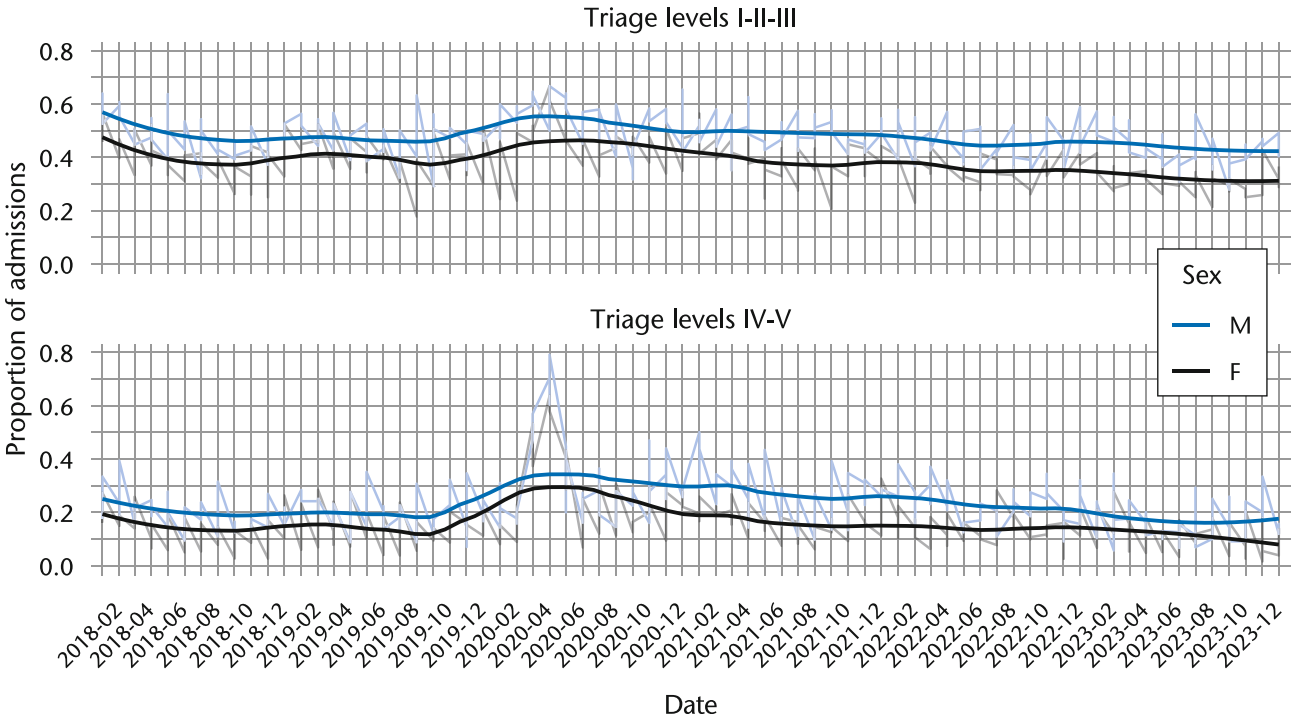

Figure 4. Monthly evolution of the percentage of hospital admissions (2018-2023) according to triage level and sex.

Campmany *et al.*[29] reported an absolute reduction of 1 percentage point and a relative reduction of approximately 9.3% through a Frailty Care Program (PAF, 2011-2019), while the Frailty Unit of *Hospital Clínico de Valencia* (Valencia, Spain) documented a relative reduction of 24% in admissions among patients aged ≥ 85 years,[30] an age group in which health care decision-making is especially complex.

The decision to focus the intervention on patients aged ≥ 75 years was based on the higher prevalence of frailty and greater resource utilization in this group.[31] Expanding the range to younger ages would have diluted the impact of the model in terms of both effectiveness and operational feasibility. This focus, together with the integration of frailty as a clinical axis, allowed decisions to be guided from a functional and social perspective rather than a purely diagnostic one.

From the implementation perspective, the model achieved almost universal implementation of 3D/3D+ screening (Supplementary data 16 and 17. https://revistaemergencias.org/extra/5149.pdf), integrated into discharge reports and accompanied by internal ED reorganization (dual triage, OU, TU), daily multidisciplinary clinical meetings, and effective coordination with PC, ICH, and social services, thereby reinforcing its feasibility. The analysis of 1,000 patients referred to ICH in 2023, presented at the *XXV Congrés de la Societat Catalana de Geriatria i Gerontologia* (November 2023), confirmed the clinical orientation of the model: predominantly women with a mean age of 86 years, 82% with moderate-to-advanced frailty, and 52% with dementia. These data support that referrals responded to real health care needs rather than administrative criteria.

This study has limitations that should be considered. The evaluation of effectiveness was based on administrative registries (EMBDS), which could affect the precision of certain indicator estimates. Implementation assessment was descriptive, supported by institutional records and evidence of practices, without a systematic quantification framework. Furthermore, this was a single-center experience, which may limit generalizability. However, the consecutive inclusion of all medical episodes in patients aged ≥ 75 years and the temporal consistency of the observed trends provide robustness to the results. Regarding the 3D/3D+ tool, although it enables homogeneous frailty assessment in emergency settings regardless of professional profile, it still lacks formal multicenter validation despite its increasing use in Catalan hospitals. Its current digitalization process represents an opportunity to strengthen its standardization and future reproducibility.

The study was conducted in an integrated health care environment, which facilitated coordination between care levels and consolidation of value-based practices. Its essential components—systematic frailty screening, appropriate discharge resource allocation, and interprofessional coordination—are transferable to less structured settings. In territories without specific facilities (ICH, HAH), its application may be adapted through reorganization of existing resources, provided there is a shared territorial vision and co-responsibility between care levels is encouraged. The ED cannot function in isolation; it must be integrated into a collaborative network involving ICH, PC, social services, and community resources. The significant change did not consist of performing more activities, but rather of ad-

Table 2. Point estimates, 95% confidence intervals, and *P* values for the coefficients of an ARMA(1,1) time-series process for modeling the proportion of hospital admissions in low-priority episodes (triage levels IV and V) and high-priority episodes (I, II, and III), additionally considering covariates such as sex, age, and year of hospitalization

	Autoregressive (AR) and moving average (MA) model					
	Low-priority triage levels IV and V			High-priority triage levels I, II, and III		
	Estimated coefficients	95%CI	*P*	Estimated coefficients	95% CI	*P*
Sex						
Male	Ref.			Ref.		
Female	–0.0713	–0.0836 a –0.0591	< **.001**	–0.0942	–0.1064 a –0.0821	< **.001**
Age						
75-79 years	Ref.			Ref.		
80-84 years	0.0325	0.0186 a 0.0464	< **.001**	0.0284	0.0141 a 0.0427	< **.001**
≥ 85 years	0.0793	0.0654 a 0.0932	< **.001**	0.0380	0.0237 a 0.0522	< **.001**
Year						
2018	Ref.			Ref.		
2019	0.0360	–0.0367 a 0.1087	.332	0.0060	–0.0290 a 0.0411	.736
2020	0.0816	0.0013 a 0.1620	**.046**	0.0512	0.0167 a 0.0857	**.004**
2021	0.0814	0.0007 a 0.1622	**.048**	0.0028	–0.0315 a 0.0371	.873
2022	0.0467	–0.0380 a 0.1314	.280	–0.0321	–0.0664 a 0.0023	.067
2023	–0.0081	–0.0911 a 0.0749	.848	–0.0549	–0.0901 a –0.0197	**.002**
Baseline expected value						
μ	0.2271	0.1661 a 0.2881	< **.001**	0.5550	0.5234 a 0.5867	< **.001**
Seasonal components						
α_{12}[a]				0.0130	0.0031 a 0.0228	**.010**
β_{12}[a]				–0.0046	–0.0144 a 0.0053	.362
AR component						
φ[b]	0.8877	0.8009 a 0.9745	< **.001**	0.7554	0.5117 a 0.9990	< **.001**
MA component						
ϑ[c]	–0.5709	–0.6860 a –0.4557	< **.001**	–0.6064	–0.8921 a –0.3207	< **.001**

[a]Coefficients associated with the seasonal component of the time series. Specifically, $\alpha 12$ is associated with the $\sin(2\pi t/12)$ component, whereas $\beta 12$ is associated with the $\cos(2\pi t/12)$ component.
[b]Coefficient related to the autoregressive component of the time-series model.
[c]Coefficient related to the moving-average component of the time-series model.
Ref.: reference; 95% CI: 95% confidence interval.
Values in bold denote statistical significance ($P < .05$).

dressing them differently and in a coordinated manner. Systematic frailty detection emerges as the central axis of change by guiding decisions toward functional and social needs. The proposed model, structured and feasible, is aligned with the priorities of the Catalan health care system[25] and has been recognized as an institutional reference in the document *Recomanacions per a l'atenció a la fragilitat en els dispositius d'urgències del Servei Català de la Salut* (2025).[14]

In conclusion, transformation of the ED through the 3D/3D+ model demonstrates that it is possible to reverse the trend toward systematic hospital admission in older patients by prioritizing alternatives based on value and functionality. The success of the model lies not only in the screening tool itself, but also in the change in health care culture: moving from treating isolated acute events to managing vulnerability in coordination with the territory. The results validate that even in a high-pressure environment, systematic frailty detection acts as a safe catalyst that reduces conventional hospitalization and revisits.

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