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Activity, triage levels and impact of the pandemic on hospital emergency departments: A multicentre cross-sectional study

Cristina Font-Cabrera[1,2,3] | Maria Eulàlia Juvé-Udina[3,4] | Jordi Adamuz[1,2,3] | Montserrat Diaz Membrives[5,6] | Núria Fabrellas[5] | Eva Maria Guix-Comellas[1]

[1]Department of Fundamental and Clinical Nursing, Faculty of Nursing, University of Barcelona, Barcelona, Spain

[2]Bellvitge University Hospital, Hospitalet de Llobregat, Barcelona, Spain

[3]Bellvitge Biomedical Research Institute (IDIBELL), Barcelona, Spain

[4]Catalan Institute of Health (ICS), Barcelona, Spain

[5]Department of Public Health, Faculty of Nursing, University of Barcelona, Barcelona, Spain

[6]Mútua Terrassa University Hospital, Barcelona, Spain

Correspondence
Eva Maria Guix-Comellas, Faculty of Nursing, University of Barcelona, Campus Clínic, C/ Casanova, 143, 8th floor, Barcelona 08036, Spain.
Email: evaguix@ub.edu

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Abstract

Aim: Describe the activity of hospital emergency departments (EDs) and the sociodemographic profile of patients in the eight public hospitals in Spain, according to the different triage levels, and to analyse the impact of the SARS-CoV-2 pandemic on patient flow.

Design: An observational, descriptive, cross-sectional and retrospective study was carried out.

Methods: Three high-tech public hospitals and five low-tech hospitals consecutively included 2,332,654 adult patients seen in hospital EDs from January 2018 to December 2021. Hospitals belonging to the Catalan Institute of Health. The main variable was triage level, classified according to a standard for the Spanish structured triage system known as Sistema Español de Triaje. For each of the five triage levels, a negative binomial regression model adjusted for year and hospital was performed. The analysis was performed with the R 4.2.2 software.

Results: The mean age was 55.4 years. 51.4% were women. The distribution of patients according to the five triage levels was: level 1, 0.41% ($n = 9565$); level 2, 6.10% ($n = 142{,}187$); level 3, 40.2% ($n = 938{,}203$); level 4, 42.6% ($n = 994{,}281$); level 5, 10.6% ($n = 248{,}418$). The sociodemographic profile was similar in terms of gender and age: as the level of severity decreased, the number of women, mostly young, increased. In the period 2020–2021, the emergency rate increased for levels 1, 2 and 3, but levels 4 and 5 remained stable.

Conclusion: More than half of the patients attended in high-technology hospital EDs were of low severity. The profile of these patients was that of a young, middle-aged population, mostly female. The SARS-CoV2 pandemic did not change this pattern, but an increase in the level of severity was observed.

Impact: What problem did the study address? There is overcrowding in hospital EDs. What were the main findings? This study found that more than half of the patients attended in high-technology hospital EDs in Spain have low or very low levels of severity. Young, middle-aged women were more likely to visit EDs with low levels of

Cristina Font-Cabrera and Eva Maria Guix-Comellas share credit for senior authorship.

severity. The SARS-CoV2 pandemic did not change this pattern, but an increase in severity was observed.
Where and on whom will the research have an impact? The research will have an impact on the functioning of hospital EDs and their staff.
Patient or Public Contribution: Not applicable.

KEYWORDS
emergency department, hospital information systems, nursing staff, hospital, patient classification systems, triaje

1 | INTRODUCTION

Crowding in the emergency department (ED) has become a serious and growing problem throughout the world, causing major public health problems and affecting many countries regardless of the health system or socioeconomic level (Austin et al., 2020). Saturation, collapse or crowding, occurs when the demand for care is excessive or exceeds the available resources, and thus making it difficult to provide urgent care to patients. (Font-Cabrera et al., 2023) It is estimated that between 20% and 40% of ED visits worldwide are considered inappropriate, indicating inadequate use of healthcare resources (Henricson et al., 2022). To address this situation, it is crucial to differentiate between patients with serious health problems and those with less urgent or non-urgent situations (Aghabarary et al., 2023). Triage plays a key role in the functioning of the ED by ensuring a continuous flow of activities without interruption (Alumran et al., 2020; Bijani & Khaleghi, 2019; Moon et al., 2019). Its main purpose is to assess and prioritize patients appropriately according to their acuity on arrival at the ED (Aghabarary et al., 2023). Accuracy in the triage process has been shown to be essential to ensure patient safety, avoiding both under- and over-triage of the emergency. Misassignment of patients can have negative consequences. (Ausserhofer et al., 2021; Fekonja et al., 2023).

2 | BACKGROUND

In the hospital setting, triage was introduced in the 1960's in the United States due to an increase in the ED population. Many of the patients had non-urgent health problems, and a three-level categorization system was created. This was later replaced by a four-level system, and finally, has been modified to five levels, as it allows for a more precise classification of patients (Woo et al., 2017). There are different validated scales that allow patients to be classified on arrival at the ED, such as National Triage Scale for Australasian Emergency, Canadian Emergency Department Triage Acuity Scale, Manchester Triage System, Emergency Severity Index 5 level Triage, and the Andorran Triage Model (MAT), and its Spanish adaptation, giving rise to the Spanish Triage System (SET) (Font-Cabrera et al., 2021).

In Spain, SET is used, based on the five levels of triage (1, resuscitation; 2, emergency; 3, urgency, 4, less urgent; and 5, non-urgent). Two types of patient classification have been identified according to their priority: high priority (HP) and low priority (LP). Patients classified in triage levels 1, 2 and 3 are considered HP, while levels 4 and 5 are considered LP (Bahadori et al., 2020; Cildoz et al., 2023; Williams & Haffizulla, 2021). A high frequency of patients are often seen in ED with low levels of urgency, specifically levels 4 and 5 (Alnasser et al., 2023; Uthman et al., 2018). These situations could be more appropriately managed in other healthcare facilities, which would help reduce ED congestion. Given this situation, it is also important to consider whether or not the pandemic has changed this pattern of ED use.

3 | THE STUDY

3.1 | Aim

The aim of this study is to describe ED activity and the sociodemographic profile of patients in eight public hospitals in Spain, according to the different triage levels, and to analyse the impact of the SARS-CoV-2 pandemic on patient flow.

4 | METHODS

An observational, descriptive, cross-sectional and retrospective study was conducted in eight public hospitals belonging to the Catalan Institute of Health (ICS) in Spain. The ICS leads the main public health entity of the state, providing health services to almost 6 million people. In the hospital field, it manages eight reference hospitals within the public hospital network, with the fundamental objective of offering quality care in these centres. Its care is divided between three large high-tech hospitals as well as five other regional referral hospitals. This differentiation makes it possible to effectively address health care needs, from highly complex cases to those of lesser complexity, guaranteeing comprehensive health care coverage for the population. It is financed with public funds from the National Health System of the Ministry of Health, through the collection of taxes from citizens.

All adult patients attending the ED of these hospitals from 1 January 2018 to 31 December 2021 were included using consecutive sampling. Patients attending for maternal and obstetric reasons were excluded, as well as patients without triage level assignment.

The main study variable was the triage level, classified according to the emergency level of the SET, which includes the categories of 1 (resuscitation), 2 (emergency), 3 (urgency), 4 (less urgent) and 5 (non-urgent). As secondary variables, sociodemographic and clinical data were collected from patients attended in high-technology (HT) hospitals: HT1, HT2 and HT3, and low technology (LT) hospitals: LT1, LT2, LT3, LT4 and LT5. In Spain, hospitals are classified into HT and LT depending on their healthcare resources, equipment and available services. HT hospitals offer basic services but are mainly characterized by providing specialized and complex treatments to patients, such as organ transplants or specialized treatments and very complex cures, thanks to their advanced technology and specialized units. On the other hand, LT hospitals provide more basic health care. They provide low-complexity patient care services such as conventional hospital wards, emergency services and operating theatres, but with more limited resources.

Different years were considered: 2018 and 2019, as pre-pandemic periods; 2020 as pandemic period and 2021 as post-pandemic. Data were obtained from the electronic medical record using the Minimum Basic Data Set (MBDS) register of the ED.

Categorical variables were described by the number of cases, the percentage of the total by category and the number of missing data. Continuous variables following a normal distribution were described by the number of cases, the mean, the standard deviation and the number of missing data. Continuous variables that did not follow a normal distribution were described by the number of cases, the median, the first and third quartiles and the number of missing data. The percentage of cases at each triage level across years and by hospital was plotted. The rates for each triage level were calculated over the years and are shown together with the number of emergency visits for that year.

A negative binomial regression model is fitted for each triage level, adjusted for year and hospital. We chose to use the negative binomial regression model because of its suitability for count data analysis, which aligns with the nature of our study on number of ED visits. Its robustness in handling overdispersed count data makes it a suitable choice for our analysis. Incidence rate ratio (IRR) estimators are presented together with the 95% confidence interval (CI). The analysis was performed with R 4.2.2 software.

The project was carried out in compliance with the rules and regulations in force in our jurisdiction, in particular the Organic Law on Data Protection and Guarantee of Digital Rights. To preserve the privacy of the patients, an anonymization process was applied by the Technical Secretariat of the ICS Corporate Centre, eliminating any identifying information. The study was approved by the Research Ethics Committee of the Bellvitge University Hospital with reference number PR085/20, on March 12th, 2020.

5 | RESULTS

Out of a total of 2,572,365 patients attending the ED of the eight ICS hospitals, 2,332,654 patients who met the inclusion criteria were included (Figure 1). Of these, 51.4% were women ($n=1199,847$). The mean age was 55.4 years (*SD* 20.7). Notably, 62.7% ($n=1,462,341$) of all patients seen in the ED were under 65 years of age.

Differences were observed in the profile of patients according to triage level. Patients classified as priority level 1 (emergency) were 67.9% ($n=6497$) male compared to 32.1% ($n=3066$) female and mostly aged between 31 and 64 years. As the priority level decreased, the percentages were reversed, reaching level 5 (non-emergency) with 53.5% ($n=133,017$) of women and 46.5% ($n=115,396$) of men (Table 1). These lower triage levels (4 and 5) were attended mainly by women between 18 and 30 years of age. At level 3, women also predominated, but with a wider age range of 31–80 years. In terms of financial regime, all triage levels were dominated by Spanish National Public Health regime, except for level 1, where there was a percentage of patients from private insurance.

The profiles of patients seen in each hospital were similar in terms of gender, age and economic regime. There were no differences between hospitals or between years (Table 2).

Overall, over the 4 years and in the eight hospitals, the distribution of patients according to the five levels of SET triage was as follows: in level 1, 0.41% ($n=9565$) of the patients; in level 2, 6.10% ($n=142,187$); in level 3, 40.2% ($n=938,203$); in level 4, 42.6% ($n=994,281$); and finally, in level 5, 10.6% ($n=248,418$). In the detailed distribution of triage by year and by centre, the high percentages of level 4 and 5 patients in most of the hospitals stood out, especially in those considered HT: HT2 (63.61%), HT3 (61.50%) and HT1 (44.30%). In LT hospitals: LT5 (66.80%), LT3 (51.62%), LT2 (47.40%), LT1 (41.51%) and LT4 (30.91%) (Table 3).

A negative binomial regression model was fitted for each triage level, with the number of cases as the dependent variable and using year and hospital as independent variables. The reference category for the year was 2018, while for the hospital it was hospital LT1 (Table 4).

In the following negative binomial models, no significant differences were observed with respect to the triage level comparing the year 2019 with respect to 2018; in contrast, in 2020 a higher rate of emergencies was observed for all levels, except for level 4 and 5 which remained the same. Specifically, in level 1 there was a 37% higher incidence rate of emergencies in 2020 compared to 2018 (IRR: 1.37 with 95% CI 1.09–1.73), in level 2 there was a 17% higher (IRR: 1.17 with 95% CI 1.03–1.33), and in level 3 there was a 4% higher (IRR: 1.04 with 95% CI 1–1.08). In 2021, this is similar to 2020, with the exception of level 5, where no significant differences were found compared to 2018. Specifically, for level 1 there was a 52% higher incidence rate of emergencies in 2021 compared to 2018 (IRR: 1.52 with 95% CI 1.21–1.91), for level 2 2 there was a 22% higher (IRR: 1.22, 95% CI 1.07–1.39), for level 3 2 there was a 7% higher (IRR: 1.07, 95% CI 1.03–1.11) and for level 4 (IRR: 0.94, 95% CI 0.9–0.98).

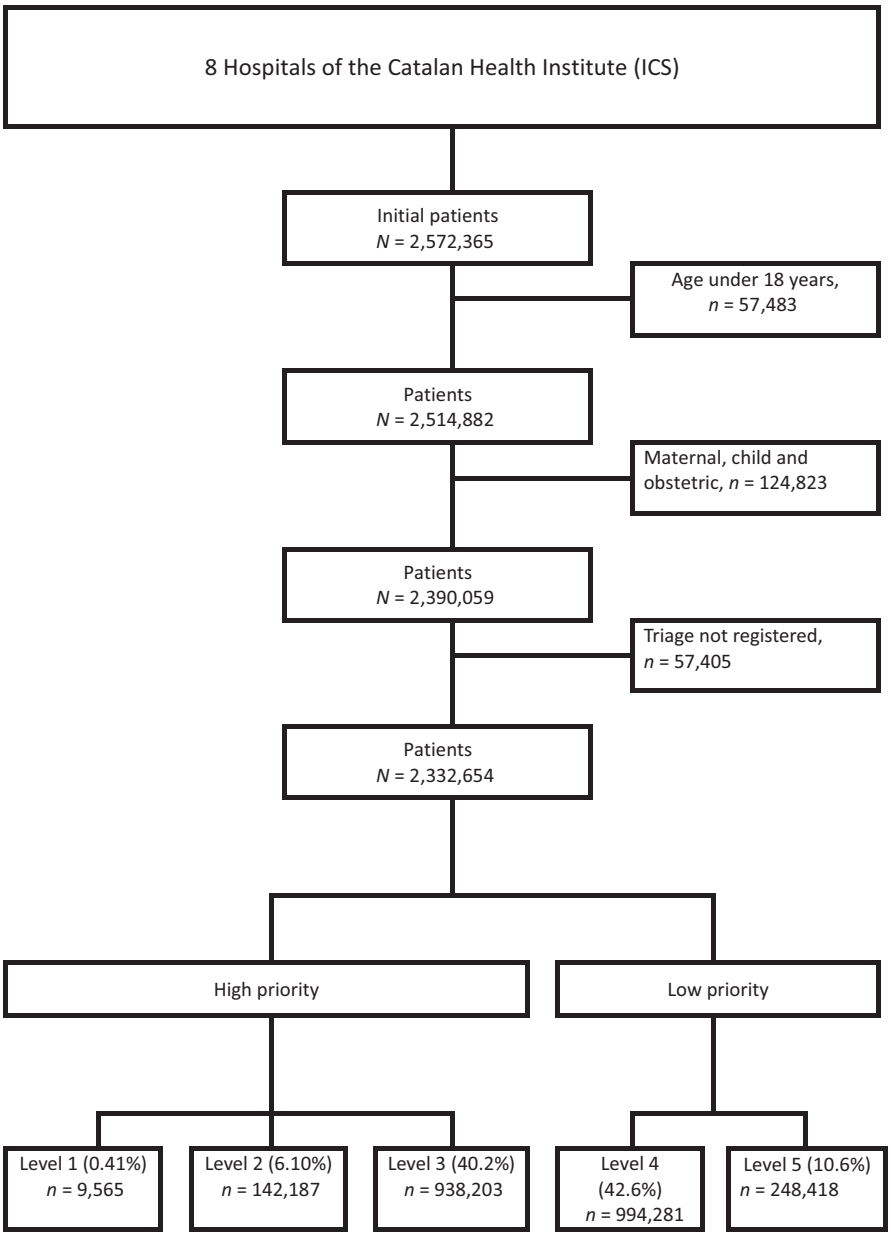

FIGURE 1 Flowchart for patient inclusion in the study.

TABLE 1 Demographic data based on triage.

	[All]	1	2	3	4	5
	N = 2,332,654	*N* = 9565	*N* = 142,187	*N* = 938,203	*N* = 994,281	*N* = 248,418
Sex, *N* (%)						
Man	1,132,791 (48.6%)	6497 (67.9%)	78,939 (55.5%)	468,549 (49.9%)	463,410 (46.6%)	115,396 (46.5%)
Woman	1,199,847 (51.4%)	3066 (32.1%)	63,246 (44.5%)	469,648 (50.1%)	530,870 (53.4%)	133,017 (53.5%)
Age, mean (standard deviation)	55.4 (20.7)	56.1 (19.7)	63.2 (19.2)	60.1 (20.7)	50.9 (19.7)	51.4 (20.3)
Age, *N* (%)						
18–30	345,118 (14.8%)	1261 (13.2%)	10,377 (7.30%)	99,650 (10.6%)	185,788 (18.7%)	48,042 (19.3%)
31–50	657,106 (28.2%)	2490 (26.0%)	26,657 (18.7%)	219,316 (23.4%)	329,553 (33.1%)	79,090 (31.8%)
51–64	460,117 (19.7%)	2257 (23.6%)	29,844 (21.0%)	180,833 (19.3%)	199,916 (20.1%)	47,267 (19.0%)
65–80	543,758 (23.3%)	2358 (24.7%)	44,962 (31.6%)	249,957 (26.6%)	196,493 (19.8%)	49,988 (20.1%)
>80	326,555 (14.0%)	1199 (12.5%)	30,347 (21.3%)	188,447 (20.1%)	82,531 (8.30%)	24,031 (9.67%)

TABLE 2 Profile of patients attending the ED according to triage levels, years and hospital.

	Woman (%)	18–30 (%)	31–50 (%)	51–64 (%)	65–80 (%)	>80 (%)	*CatSalut* economic regime[a] (%)
Triage level							
Level 1	32.061	13.183	26.032	23.596	24.652	12.535	71.863
Level 2	44.481	7.298	18.748	20.989	31.622	21.343	93.087
Level 3	50.059	10.621	23.376	19.274	26.642	20.086	94.188
Level 4	53.392	18.686	33.145	20.107	19.762	8.301	93.426
Level 5	53.547	19.339	31.837	19.027	20.123	9.674	92.849
Year							
2018	52.201	14.751	28.772	19.239	23.314	13.924	92.755
2019	52.007	15.046	28.506	19.396	23,196	13.855	93.003
2020	50.395	14.188	27.777	20.347	23.538	14.151	94.473
2021	50.909	15.092	27.508	20.060	23.236	14.104	94.235
ICS Hospitals							
HT1	48.680	12.504	26.520	21.015	27.039	12.922	94.733
HT2	53.465	14.240	29.049	20.567	24.404	11.740	96.500
HT3	53.927	15.508	28.198	18.795	21.982	15.517	95.243
LT1	48.397	14.674	27.453	18.776	21.377	17.721	86.781
LT2	49.941	15.754	28.507	20.166	22.489	13.084	91.034
LT3	52.325	17.880	31.373	19.454	20.686	10.607	91.971
LT4	51.148	12.286	25.305	19.414	25.455	17.541	93.356
LT5	50.825	15.609	28.181	19.259	22.308	14.644	94.228

Abbreviations: ED, emergency department; HT, high technology; LT, low technology.

[a]*CatSalut* uses public taxes to fund public healthcare in Spain. As a public organization, it manages economic resources from taxes to ensure that the population has access to healthcare, within the National Health System.

In the case of hospitals, behaviours are more varied. Hospitals of HT (HT1, HT2 and HT3) were associated with lower severity triage levels (4 and 5) compared to the reference hospital of LT1. In contrast, LT hospitals were associated with higher severity triage levels (1 and 2), except in the case of the HT1 hospital where a stronger association with higher severity levels (1 and 2) was observed a 77% and 24% higher incidence rate (IRR: 1.77 with 95% CI 1.3–2.41 and IRR 1.24, 95% CI 1.07–1.39, respectively).

6 | DISCUSSION

In Spain, more than half of the emergencies attended in the ED were classified as triage levels of low urgency (levels 4 and 5). These results are in line with several international studies, where this percentage of patients consulting the ED with a low level of severity ranges from 64.9% to 89% (Alnasser et al., 2023; Al-Otmy et al., 2020; Bahadori et al., 2020; Fekonja et al., 2023; Uthman et al., 2018). This is one of the main causes of ED overcrowding (Alnasser et al., 2023; Al-Otmy et al., 2020), although it should be noted that this overcrowding is multi-causal. Other relevant factors include poor ED drainage, insufficient beds or shortage of healthcare staff (Bittencourt et al., 2020; Hsu et al., 2019; Sartini et al., 2022). Such crowding has become a serious and growing problem worldwide. ED overcrowding leads to delays in diagnosis and initiation of treatment, increasing hospital stay and morbidity and mortality, increasing errors and increasing costs (Austin et al., 2020; Bittencourt et al., 2020). In our study, it is even more worrying that the percentages of patients with low severity levels were identified mainly in HT hospitals (hospitals created for high specialization). For sure some of these patients could have been cared for at other levels of care such as primary care centres (Gonçalves-Bradley et al., 2018; Leey-Echavarría et al., 2022). Therefore, it is necessary to implement differentiated circuits that reduce this care pressure, especially in mild pathologies, considering the inclusion of advanced practice nurses and referral to primary care. These services will help to optimize available resources and improve ED care (Font-Cabrera et al., 2021).

APNs are trained to perform comprehensive assessments, diagnose and provide appropriate pharmacological treatments for patients with minor illnesses. The advanced practice nurse (APN) could solve the health problems of a large group of patients who are currently presenting to and overcrowding EDs (Fekonja et al., 2023; Sartini et al., 2022; Williams, 2017). Although in many countries such as the United Kingdom, the United States, Canada or Australia, this figure has already been successfully consolidated in ED, in Spain and in many other countries, this implementation of the APN has

TABLE 3 Distribution of triage levels by year and hospital.

	Total 4 years	2018	2019	2020	2021
Eight ICS hospitals	***N* (%)**	***N* (%)**	***N* (%)**	***N* (%)**	***N* (%)**
Triage	*N* = 2,332,654	*N* = 615,096	*N* = 632,892	*N* = 501,412	*N* = 583,254
Level 1	9565 (0.41%)	1677 (0.27%)	2182 (0.34%)	2396 (0.48%)	3310 (0.57%)
Level 2	142,187 (6.10%)	34,107 (5.54%)	33,327 (5.27%)	33,891 (6.76%)	40,862 (7.01%)
Level 3	938,203 (40.2%)	241,341 (39.2%)	248,635 (39.3%)	203,495 (40.6%)	244,732 (42.0%)
Level 4	994,281 (42.6%)	270,810 (44.0%)	278,364 (44.0%)	209,115 (41.7%)	235,992 (40.5%)
Level 5	248,418 (10.6%)	67,161 (10.9%)	70,384 (11.1%)	52,515 (10.5%)	58,358 (10.0%)
HT1	*N* = 410,828				
Level 1	3434 (0.84%)	252 (0.23%)	763 (0.69%)	1071 (1.22%)	1348 (1.29%)
Level 2	47,345 (11.5%)	8726 (8.05%)	10,036 (9.10%)	12,960 (14.8%)	15,623 (14.9%)
Level 3	178,102 (43.4%)	44,195 (40.8%)	46,568 (42.2%)	39,397 (45.1%)	47,942 (45.8%)
Level 4	135,937 (33.1%)	41,040 (37.9%)	37,407 (33.9%)	26,022 (29.8%)	31,468 (30.1%)
Level 5	46,010 (11.2%)	14,192 (13.1%)	15,539 (14.1%)	7983 (9.13%)	8296 (7.93%)
HT2	*N* = 379,270				
Level 1	872 (0.23%)	204 (0.20%)	205 (0.20%)	205 (0.25%)	258 (0.28%)
Level 2	8622 (2.27%)	2048 (2.01%)	1891 (1.80%)	2099 (2.60%)	2584 (2.81%)
Level 3	128,420 (33.9%)	32,983 (32.4%)	34,772 (33.1%)	28,125 (34.8%)	32,540 (35.4%)
Level 4	214,020 (56.4%)	60,091 (59.1%)	61,819 (58.9%)	43,523 (53.9%)	48,587 (52.9%)
Level 5	27,336 (7.21%)	6404 (6.30%)	6252 (5.96%)	6782 (8.40%)	7898 (8.60%)
HT3	*N* = *545,734*				
Level 1	1791 (0.33%)	346 (0.24%)	383 (0.26%)	387 (0.32%)	675 (0.49%)
Level 2	20,209 (3.70%)	5085 (3.57%)	4994 (3.40%)	4972 (4.16%)	5158 (3.77%)
Level 3	187,832 (34.4%)	48,782 (34.2%)	47,754 (32.5%)	41,338 (34.6%)	49,958 (36.5%)
Level 4	255,660 (46.8%)	69,050 (48.4%)	70,765 (48.2%)	55,549 (46.4%)	60,296 (44.1%)
Level 5	80,242 (14.7%)	19,351 (13.6%)	22,871 (15.6%)	17,391 (14.5%)	20,629 (15.1%)
LT1	*N* = 253,446				
Level 1	1149 (0.45%)	295 (0.44%)	282 (0.41%)	215 (0.40%)	357 (0.57%)
Level 2	23,333 (9.21%)	7858 (11.6%)	5922 (8.62%)	4214 (7.77%)	5339 (8.47%)
Level 3	123,674 (48.8%)	32,449 (48.0%)	33,010 (48.1%)	25,486 (47.0%)	32,729 (51.9%)
Level 4	81,948 (32.3%)	20,528 (30.4%)	22,894 (33.3%)	18,693 (34.5%)	19,833 (31.5%)
Level 5	23,342 (9.21%)	6420 (9.50%)	6564 (9.56%)	5607 (10.3%)	4751 (7.54%)
LT2	*N* = 197,719				
Level 1	1385 (0.70%)	358 (0.70%)	304 (0.57%)	295 (0.69%)	428 (0.84%)
Level 2	13,719 (6.94%)	3141 (6.17%)	2983 (5.61%)	3119 (7.26%)	4476 (8.82%)
Level 3	88,883 (45.0%)	23,068 (45.3%)	22,816 (42.9%)	19,326 (45.0%)	23,673 (46.7%)
Level 4	69,767 (35.3%)	19,552 (38.4%)	19,469 (36.6%)	14,410 (33.6%)	16,336 (32.2%)
Level 5	23,965 (12.1%)	4766 (9.37%)	7591 (14.3%)	5792 (13.5%)	5816 (11.5%)
LT3	*N* = 244,924				
Level 1	548 (0.22%)	126 (0.20%)	138 (0.20%)	120 (0.23%)	164 (0.26%)
Level 2	13,460 (5.50%)	3736 (5.90%)	3643 (5.41%)	2834 (5.49%)	3247 (5.19%)
Level 3	104,606 (42,7%)	26,334 (41.6%)	29,064 (43.1%)	21,966 (42.5%)	27,242 (43.6%)
Level 4	114,014 (46.6%)	29,943 (47.3%)	31,433 (46.7%)	24,041 (46.5%)	28,597 (45.7%)
Level 5	12,296 (5.02%)	3217 (5.08%)	3092 (4.59%)	2703 (5.23%)	3284 (5.25%)
LT4	*N* = 119,432				
Level 1	230 (0.19%)	55 (0.16%)	63 (0.19%)	66 (0.26%)	46 (0.17%)

(Continues)

TABLE 3 (Continued)

Eight ICS hospitals	Total 4 years *N* (%)	2018 *N* (%)	2019 *N* (%)	2020 *N* (%)	2021 *N* (%)
Level 2	8614 (7.21%)	2143 (6.36%)	2152 (6.50%)	1912 (7.59%)	2407 (8.77%)
Level 3	73,661 (61.7%)	21,595 (64.0%)	20,863 (63.0%)	15,464 (61.4%)	15,739 (57.4%)
Level 4	33,690 (28.2%)	9466 (28.1%)	9259 (28.0%)	7026 (27.9%)	7939 (28.9%)
Level 5	3237 (2.71%)	458 (1.36%)	759 (2.29%)	711 (2.82%)	1309 (4.77%)
LT5	*N* = 181,301				
Level 1	156 (0.09%)	41 (0.09%)	44 (0.09%)	37 (0.09%)	34 (0.07%)
Level 2	6885 (3.80%)	1370 (2.92%)	1706 (3.51%)	1781 (4.50%)	2028 (4.38%)
Level 3	53,025 (29.2%)	11,935 (25.5%)	13,788 (28.4%)	12,393 (31.3%)	14,909 (32.2%)
Level 4	89,245 (49.2%)	21,140 (45.1%)	25,318 (52.1%)	19,851 (50.1%)	22,936 (49.6%)
Level 5	31,990 (17.6%)	12,353 (26.4%)	7716 (15.9%)	5546 (14.0%)	6375 (13.8%)

Abbreviations: HT, high technology; LT, low technology.

not yet been possible, mainly due to political or economic issues. It is essential to consider this proposal to improve ED performance, as it would reduce waiting times, avoid collapse and possibly also improve patient satisfaction (Boman et al., 2021; Morley et al., 2018; Woo et al., 2017). Several studies have shown that APN in ED decreases medication administration time, increases patient comfort and satisfaction and reduces delay in diagnosis (Austin et al., 2020; Bittencourt et al., 2020). There is a need to respond to low-complexity patients, triage levels 4 and 5, as they represent a large proportion of ED patients and are also more vulnerable to overcrowding due to long waiting times (Font-Cabrera et al., 2023; Hinson et al., 2018).

When assessing the volume of ED activity and the level of triage assigned, it is important to note that previous studies show that around 20% of patients are not correctly triaged on arrival (Bijani et al., 2020). Therefore, accuracy in the triage process is critical to ensure patient safety. Triage error is of particular concern in cases requiring urgent care, (Bijani et al., 2020; Font-Cabrera et al., 2023) but is no less important at other levels of severity as it could help to redistribute and improve available care resources and therefore prevent ED overcrowding.

This study shows that the SARS-CoV2 pandemic did not change ED activity with respect to low-emergency levels. Although an increase in triage rates 1, 2 and 3 was observed in 2020, possibly attributable to the pandemic, the percentage of patients presenting to the ED being classified as level 5 SET remained stable compared to previous years (Savioli et al., 2021, 2022, 2023). In the year 2021, the trend of patients with a higher level of severity continued to grow. There were also no differences in the volume of activity carried out by EDs during the years considered pre-pandemic (2018–2019), nor in the percentages of categorization of each of the different MAT/SET levels. These differences in triage rates by year may be attributed to the SARS-CoV2 pandemic but could also be due to other factors such as population ageing or complexity of care (Hinson et al., 2018; Savioli et al., 2022; Vilpert et al., 2018).

Studies relating ED use and triage level with gender and age of patients are very scarce. The present study shows that low-emergency cases were mostly female. Alnasser et al. (2023) showed a similar percentage (63.2%) in the United Arab Emirates. Further studies along these lines would be needed to assess this association in depth. At levels 4 and 5, a younger age profile was also observed, around 50 years (Alnasser et al., 2023; Williams & Haffizulla, 2021). At this point, it would be interesting to consider the existence of a possible bias, as stated by Savioli et al. (2023), since as age increases, patients are more likely to be assigned a higher triage level due to their greater vulnerability and need for urgent care. The group of patients aged 65 years or older attending EDs in Catalonia represents almost 40%, which is above the average, which according to Vilpert should be between 20% and 30%, and this proportion is expected to increase in the coming years due to the ageing of the Spanish population (Vilpert et al., 2018).

Our study has certain limitations. Firstly, there may be a loss of information due to its retrospective design. There could have been information biases that may have influenced the interpretation of the study results, although this aspect may be corrected by the large volume of patients included. And finally, causal relationships between the different variables cannot be established as it is a descriptive study.

For future research, it is crucial to assess the presence of under- or over-triage in this large population. It is noteworthy that more than half of the patients presenting to hospital EDs are of low acuity, which makes it necessary to analyse whether prioritization is appropriately adjusted to the clinical situation of the patients.

7 | CONCLUSIONS

In conclusion, there was an oversaturation of ED activity in Spain which, although multifactorial, could be due mainly to the inappropriate use of HT hospitals, as a large volume of patients

TABLE 4 Negative binomial models for each of the triage levels adjusting for year and hospital.

	Level 1				Level 2				Level 3				Level 4				Level 5			
Predictors	Incidence rate ratios	SE	CI	*p*	Incidence rate ratios	SE	CI	*p*	Incidence rate ratios	SE	CI	*p*	Incidence rate ratios	SE	CI	*p*	Incidence rate ratios	SE	CI	*p*
Intercept	0.00	0.00	0.00–0.00	**<.001**	0.09	0.01	0.07–0.10	**<.001**	0.47	0.01	0.45–0.49	**<.001**	0.33	0.01	0.31–0.35	**<.001**	0.09	0.01	0.07–0.12	**<.001**
Year 2019	1.09	0.13	0.87–1.37	.448	0.95	0.06	0.84–1.08	.429	1.01	0.02	0.97–1.05	.638	1.00	0.02	0.96–1.05	.849	1.03	0.11	0.83–1.28	.793
Year 2020	1.37	0.16	1.09–1.73	**.006**	1.17	0.08	1.03–1.33	**.016**	1.04	0.02	1.00–1.08	**.032**	0.96	0.02	0.92–1.01	.096	1.03	0.11	0.83–1.29	.757
Year 2021	1.52	0.17	1.21–1.91	**<.001**	1.22	0.08	1.07–1.39	**.002**	1.07	0.02	1.03–1.11	**<.001**	0.94	0.02	0.90–0.98	**.008**	1.06	0.12	0.85–1.32	.625
HT1	1.77	0.28	1.30–2.41	**<.001**	1.24	0.11	1.04–1.48	**.018**	0.89	0.02	0.84–0.94	**<.001**	1.01	0.03	0.95–1.08	.711	1.20	0.19	0.88–1.63	.243
LT2	1.55	0.24	1.14–2.11	**.005**	0.74	0.07	0.62–0.89	**.001**	0.92	0.03	0.87–0.97	**.003**	1.08	0.04	1.01–1.16	**.016**	1.31	0.21	0.96–1.78	.082
HT2	0.51	0.08	0.37–0.69	**<.001**	0.25	0.02	0.21–0.29	**<.001**	0.70	0.02	0.66–0.73	**<.001**	1.73	0.06	1.62–1.85	**<.001**	0.79	0.12	0.58–1.07	.129
LT3	0.49	0.08	0.36–0.68	**<.001**	0.60	0.05	0.50–0.72	**<.001**	0.88	0.02	0.83–0.92	**<.001**	1.44	0.05	1.34–1.53	**<.001**	0.54	0.09	0.40–0.74	**<.001**
LT4	0.43	0.07	0.31–0.60	**<.001**	0.78	0.07	0.65–0.94	**.008**	1.26	0.03	1.20–1.33	**<.001**	0.87	0.03	0.81–0.93	**<.001**	0.30	0.05	0.22–0.41	**<.001**
HT3	0.71	0.11	0.52–0.96	**.027**	0.40	0.04	0.34–0.48	**<.001**	0.71	0.02	0.67–0.74	**<.001**	1.44	0.05	1.35–1.54	**<.001**	1.59	0.25	1.17–2.16	**.003**
LT5	0.19	0.03	0.14–0.27	**<.001**	0.41	0.04	0.34–0.49	**<.001**	0.60	0.02	0.57–0.63	**<.001**	1.52	0.05	1.42–1.62	**<.001**	1.90	0.30	1.40–2.59	**<.001**
Observations	32				32				32				32				32			
R^2 Nagelkerke	1.000				1.000				1.000				1.000				0.998			

Abbreviations: CI, confidence interval; HT, high technology; LT, low technology; SE, standard error.

Bold values indicates *p* is statistically significant.

consulted for low levels of severity was detected. The profile of these patients was that of a young, middle-aged population, mostly female. Although the SARS-CoV2 pandemic did not change this pattern, an increase in the severity level of the patients seen was observed.

AUTHOR CONTRIBUTIONS

Made substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data: CF-C, MEJ-U, JA, EMG-C. Involved in drafting the manuscript or revising it critically for important intellectual content: CF-C, MEJ-U, JA, MDM, NF, EMG-C. Given final approval of the version to be published. Each author should have participated sufficiently in the work to take public responsibility for appropriate portions of the content: CF-C, MEJ-U, JA, MDM, NF, EMG-C. Agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved: CF-C, MEJ-U, JA, MDM, NF, EMG-C.

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CONFLICT OF INTEREST STATEMENT

The authors declare that they have no conflict of interest.

PEER REVIEW

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DATA AVAILABILITY STATEMENT

The data used in this study were provided by Institut Català de la Salut (ICS) under confidentiality agreements. We are committed to respecting and safeguarding the privacy of the data provided by the institution. Consequently, we are prevented from directly sharing the data used in this research in order to comply with the confidentiality terms established. Data not available. The data that has been used is confidential.

STATISTICS

The statistics were checked prior to submission by an expert statistician, Esther Garcia Lerma. email: egarcial@idibell.cat.

CLINICAL TRIAL REGISTRATION NUMBER

NCT05230108.

ORCID

Núria Fabrellas https://orcid.org/0000-0001-6720-0291

Eva Maria Guix-Comellas https://orcid.org/0000-0001-9866-7265

TWITTER

Cristina Font-Cabrera CristinaFont13 GRIN_IDIBELL

Jordi Adamuz jordi_adamuz

Montserrat Diaz Membrives UniBarcelona

Núria Fabrellas FpNuria

Eva Maria Guix-Comellas EvaGuix

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