

# Overcrowding and boarding time in Emergency Department in Italy

Poster Code:  
OP6

Lucrezia Ferrario<sup>1,2</sup>, Elisabetta Garagiola<sup>1,2</sup>, Federica Asperti<sup>3</sup>, Daniele Bellavia<sup>1,2</sup>, Fabrizio Schettini<sup>1,2</sup>, and Emanuela Foglia<sup>1,2</sup>

<sup>1</sup> Carlo Cattaneo – LIUC University and LIUC Business School, Castellanza, Italy; <sup>2</sup> HD LAB – Healthcare Datascience LAB - Carlo Cattaneo – LIUC University, Castellanza, Italy; <sup>3</sup> PhD Student Carlo Cattaneo – LIUC University

## Background

The **overcrowding in emergency departments** (EDs) represents a primary concern for hospitals, that are often called to efficiently manage patient demands and reducing EDs stress. Overcrowding would cause **higher boarding time** (BT), that is a critical **indicator of quality** of care for hospitals: extended periods awaiting an inpatient bed in the ED may **exacerbate the patients' clinical conditions**, increasing the time required to stabilise their acute problem in hospital.

## Objective

The present research activity aims at defining the **ED performance in Italy**, with the identification of a specific **KPI dashboard** and the factors leading to a greater boarding time.

## Methods

### Data collection

**Real-life data** were collected from an Emergency Department in Northern Italy, considering the time horizon **01/01/2019 and 31/12/2022** and focusing only on **adult ED accesses** (N=131,602)

### KPIs

The following KPIs were assessed: **time between ED access and the first visit, BT, ED overall stay, ED repeated access within 72 hours**, the National Emergency Department Overcrowding Scale (**NEDOCS**) and the Emergency Department Working Index (**EDWIN**), were examined to analyse overcrowding determinants. The indicators were calculated with an **annual time-step**, to understand **trends in ED accesses** in the pre-pandemic, pandemic and post-pandemic periods

### Normative reference

The KPI dashboard was structured considering:

**National Guidelines** on Triage-Overcrowding and the **Regional** normative references; Performance Evaluation System of Regional Health Systems, defined by the **Sant'Anna** of Pisa; **Guidelines for the control and management of boarding**, defined by the Piedmont Region; **Additional Indicators** were proposed, consistent with available data and evidence in the literature

### Statistical analysis

A **bivariate correlation** was performed to understand the **organisational factors** leading to an increase of the boarding time

## Results

- No consistency emerged** in the time between ED access and first visit, except for white codes: **only half of the patients** has been visited within 30 minutes or 60 minutes, for yellow and green priorities respectively
- There's an increasing **trend in ED repeated accesses within 72 hours**, especially in 2022, for red and yellow codes.

Boarding time [min]	2021	2022
RED	20:22	20:15
YELLOW	21:00	19:26
BLUE		17:08
GREEN	28:54	12:56
WHITE	89:21	42:02

% of patients with LoS < 8h	2019	2020	2021	2022
RED	64,0%	45,2%	53,4%	59,9%
YELLOW	62,4%	42,6%	44,7%	49,6%
BLUE				31,5%
GREEN	42,7%	28,8%	26,2%	26,5%
WHITE	63,8%	40,0%	36,7%	56,3%

Waiting time between triage and first visit	Standard time (National guidelines)	2019	2020	2021	2022
RED	0 min	64,66	37,59	28,4	81,3
YELLOW	15 min	89,68	79,35	99,05	156,58
BLUE	60 min				226,91
GREEN	120 min	150,22	141,72	153,31	161,22
WHITE	240 min	91,38	63,81	106,25	121,92

Repeated accesses in 72h	2019	2020	2021	2022
RED	7.3%	6.5%	9.4%	10.5%
YELLOW	9.4%	6.8%	8.9%	10.4%
BLUE				11.0%
GREEN	6.8%	7.3%	7.0%	8.0%
WHITE	6.1%	4.9%	5.9%	6.2%

### NEDOCS vs. EDWIN

- NEDOCS** index showed an **effective overcrowding in all years**, with a decrease of approximately 13% between pre-pandemic and pandemic years, while there was a significant increase in post-pandemic period
- EDWIN** index didn't show overcrowding, **in contrast with NEDOCS index**, and showed a decrease of 21.28% between 2019 and 2020

Year	EDWIN				NEDOCS	
	RED	YELLOW	GREEN	WHITE	Abs. Values	% from Pre-COVID
2019	0.064	0.321	0.330	0.103	555	-
2020	0.063	0.250	0.202	0.070	671	-13.92%
2021	0.063	0.266	0.244	0.068	1,253	-11.76%
2022	0.076	0.204	0.196	0.010	2,377	+5.64%

### EDWIN

	Boarding time	Day timeslot	Priority code access	Priority code dimission	Number of avl. physicians	Number of avl. nurses
Boarding time	1					
Day timeslot	-0,057**	1				
Priority code access	-0,028**	-,052**	1			
Priority code dimission	-0,019**	-,053**	,883**	1		
Number of avl. physicians	0,039**	-,828**	,051**	,044**	1	
Number of avl. nurses	0,039**	-,828**	,051**	,044**	1,000**	1

Boarding time increases as the **complexity of the day's** band increases, as the complexity of the **priority code** assigned decreases and as **available human resources** (physicians or nurses) decrease  
→ **Overnight** admission requires longer time; BT is greater for **white and green codes** and in turns with **less professionals**

## Conclusions

- The availability of data allowed to calculate the **87.5% and the 100% of the KPI** referring to the **Italian standard ED guidelines** and the **Performance Evaluation System**, respectively. **Lack of information in hospitals** and non-homogeneity leads to a calculation not completely correct of **NEDOCS and EDWIN**
- This study demonstrates the **usefulness of the EDWIN and NEDOCS** in assessing ED crowding and overcrowding. The integrated measurement of both indicators may provide more comprehensive information for understanding ED dynamics and potential prediction of critical situations, thereby improving ED management

