

Public health impact of the COVID-19 pandemic on the emergency healthcare system

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ABSTRACT

Background The Lombardy region has been the Italian region most affected by the coronavirus disease 2019 (COVID-19) pandemic in 2020. The emergency healthcare system was under deep stress throughout the past year due to the admission of COVID-19 patients to the emergency department (ED) and had to be thoroughly reorganized.

Methods We performed a retrospective descriptive analysis of patients admitted into the ED recorded in the Lombardy online regional portal called EUOL (Emergenza e Urgenza OnLine). We compared the data registered in the EUOL with the patients admitted to the EDs from 1 January 2019 to 31 December 2019 and from 1 January 2020 to 31 December 2020.

Results The number of admissions to the ED decreased by 32.5% in 2020 compared with 2019, reaching the lowest number in March and April. However, the percentage of patients hospitalized after ED significantly increased in 2020 compared with 2019 ($P < 0.0001$), reflecting the management of patients with a more severe clinical condition. More patients arrived at the ED by ambulance in 2020 (21.7% in 2020 versus 15.1% in 2019; $P < 0.0001$), particularly during March and April.

Conclusions This analysis showed the importance of monitoring the pandemic's evolution in order to treat more critically ill patients, despite a lower number of patients.

Keywords emergency care, health services, public health

Background

The first Italian case of coronavirus disease 2019 (COVID-19) was reported in the Lombardy region on the 21st of February. In 2020, the Lombardy region accounted for 478 903 cases of COVID-19, 22.7% of the total Italian cases (2 107 166) and 25 123 deaths, 33.9% of the total deaths in the country (74 159).¹ Indeed, since the beginning of the pandemic, the emergency healthcare system in the Lombardy region had to deal with numerous problems. The emergency medical service (EMS) was under deep stress as a result of the high number of first aid calls due to COVID-19.² The regional EMS Trust (AREU—Agenzia Regionale Emergenza Urgenza), that serves ~10 million citizens in the Lombardy region, coordinates and delivers pre-hospital emergency and urgency care in the region.² Hospital emergency departments (ED) and AREU went through a deep reorganization to keep treating critical patients during this pandemic.^{2–5}

To understand the public health impact of the COVID-19 pandemic on the Lombardy emergency healthcare system during 2020, we aimed to analyze (i) the number of patients admitted to the ED; (ii) how they reached the ED (walk-in or by ambulance); (iii) the triage code assigned to them at the admission and (iv) the outcome of the patients after ED (hospitalized or discharged).

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Table 1 Analysis of patients admitted to ED in 2020 versus 2019

	2020 (n)	2019 (n)	Δ 2020–2019 (%)	OR (IC95%)	P
Admitted to ED	2 400 392	3 515 962	–31.7%		
Hospitalized after ED	386 820	417 045		1.43 (1.42–1.43)	$P < 0.0001$
Discharged after ED	1 843 829	2 842 852		0.784 (0.781–0.787)	$P < 0.0001$
Red code	65 495	65 637		1.47 (1.46–1.49)	$P < 0.0001$
Yellow code	515 723	665 056		1.17 (1.17–1.18)	$P < 0.0001$
White or green code	1 819 174	2 785 269		0.821 (0.818–0.824)	$P < 0.0001$
Walk-in	1 719 222	2 752 708		0.700 (0.697–0.702)	$P < 0.0001$
Ambulance	566 857	594 859		1.52 (1.51–1.52)	$P < 0.0001$

Methods

We performed a retrospective analysis of the patients admitted into the EDs in the Lombardy region. We analyzed the data recorded in the online regional portal called EUOL (Emergenza e Urgenza OnLine). We compared the data of the patients admitted into the EDs from 1st January 2020 to 31st December 2020 with those admitted into the EDs from 1st January 2019 to 31st December 2019.

The study was conducted in accordance with Helsinki declaration and approved by the AREU Data Protection Officer on 1st February 2021.

The categorical variables are presented as number and percentage, and were analyzed by means of χ^2 test. The relative odds ratios (OR) and 95% interval confidences (IC 95%) were provided.

Results

The number of patients admitted to the EDs in the Lombardy region in 2020 was 32.5% lower than in 2019 (Table 1), with daily admissions of 7140 and 10 793 patients in 2020 and 2019, respectively.

Figure 1 shows that the number of patients admitted to the EDs halved during February 2020 and continued to decrease in March 2020, dropping in April. The medium daily number of patients in March and April was 4405. From May to December the number of patients admitted increased again (with a medium daily number of 6868) but never reaching the 2019 levels.

The percentage of patients hospitalised after ED (Table 1) significantly increased in 2020 compared with 2019 (OR 1.47 [1.46–1.48], $P < 0.0001$), whereas the percentage of patients discharged significantly decreased (Table 1). The number of patients classified as red or yellow codes at hospital admission was significantly higher in 2020 than in 2019 ($P < 0.0001$).

The risk to be transported to the hospital by ambulance was significantly higher in 2020 compared with 2021, while a smaller number of patients reached the hospitals on their own.

Red code patients during the first pandemic wave, in March and April 2020, grew by 3.24% compared with the same period in 2019; while during the second wave, from October to December 2020, they slightly increased by 1.34%.

The percentage of patients that arrived by ambulance to the ED peaked in March–April and October–November 2020, reaching >30% of the total number of admissions in those periods.

Discussion and conclusion

Our analysis aimed to understand the public health impact of the COVID-19 pandemic on the emergency healthcare system in the Lombardy region. In 2020 the number of patients admitted to the EDs experienced a massive decrease in March 2020, when strong non-pharmaceutical interventions were put in place in Italy (national lockdown), and dropped in April. Later on, from May to December, when non-pharmaceutical interventions were partially eased, the number of patients admitted kept increasing but without reaching the 2019 levels. During 2020, the percentage of patients hospitalized after ED increased compared to the previous year, probably due to a higher number of critically ill patients affected by COVID-19. Indeed, the percentage of patients classified with a red or yellow code during the triage was significantly higher in 2020, especially in areas where the pandemic had spread more widely.² We cannot exclude that the patients with less severe symptoms avoided going to hospitals because they were afraid to get infected with COVID-19. Another data linked to the severity of the patients' clinical condition was the number of patients transported to the hospital by ambulance, which was significantly higher in 2020 than in the previous year.

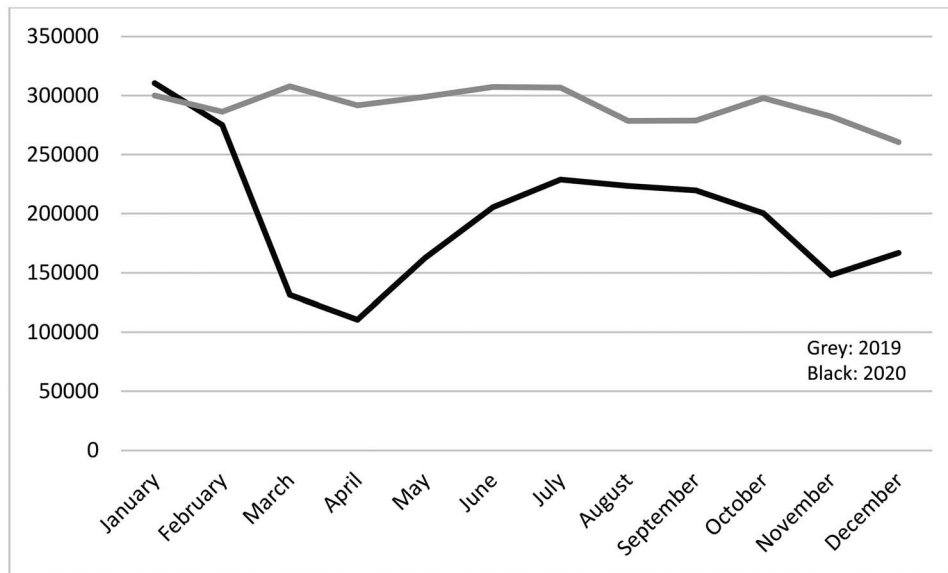


Fig. 1 Number of patients admitted to ED in the Lombardy region in 2020 and 2019.

Indeed, the Italian Ministry of Health recommended people not to walk in to the EDs if they had COVID-19 symptoms but to call their general practitioner or the first aid dedicated number managed by the AREU EMS.

Our results showed, on the one hand, inappropriate visits to the EDs by non-emergency and low complex cases in 2019 before the pandemic (OR 0.821 [0.818–0.824], $P < 0.0001$) and, on the other hand, they also highlighted that patients in critical condition were reluctant to visit the ED due to the fear of getting infected. The decrease in ED admissions has shown to be detrimental,^{6–8} indeed, it could have delayed patients in seeking for medical help in life-threatening conditions. Furthermore, other studies showed that the median arrival time of the EMS was longer in 2020 than in 2019.^{2,9}

Monitoring ED admissions during the COVID-19 pandemic is crucial due to the high number of hospitalized patients after ED. Indeed, urgent action is needed to prevent delays in accessing emergency care and to increment and ensure provision of high-quality care. Likewise, EMS played a crucial role in the overall public health impact of the COVID-19 pandemic, increasing the percentage of patients transported to the hospital with severe clinical condition, reorganizing and allocating resources to the areas that were most affected during the pandemic.^{2,5}

Authors' contributions

GS, AOA, MM, GMS and AZ conceived and designed the study; GS, AOA and NF collected and analyzed the data;

GS, AOA, GFV and NF interpreted the results of the experiments; GS and NF prepared figures; GS, AOA and NF drafted the first version of the manuscript; all authors edited, revised the manuscript, and approved the final version before submission.

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