Unpredictable Fall of Severe Emergent Cardiovascular Diseases Hospital Admissions During the COVID-19 Pandemic: Experience of a Single Large Center in Northern Italy

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BACKGROUND: Northern Italy is one of the epicenters of severe acute respiratory syndrome coronavirus 2 (SARS-CoV 2) pandemic in Europe. The impact of the pandemic and the consequent lockdown on medical emergencies other than those SARS-CoV 2 pandemic related is largely unknown. The aim of this study was to analyze the epidemiologic impact of coronavirus disease 2019 pandemic on hospital admission for severe emergent cardiovascular diseases (SECDs) in a single Northern Italy large tertiary referral center.

METHODS AND RESULTS: We quantified SECDs admissions to the Cardiology Division of Udine University Hospital between March 1, 2020 and March 31, 2020 and compared them with those of the same time frame during 2019. Compared with March 2019, we observed a significant reduction in all SECDs admissions: −30% for ST-segment-elevation acute coronary syndromes, −66% for non-ST-segment-elevation acute coronary syndromes and −50% for severe bradycardia.

CONCLUSIONS: A significant decrease in all SECDs admissions has been observed during the SARS-CoV 2 pandemic and was unlikely caused by a reduction in the incidence of cardiovascular diseases. Fear of contagion may have contributed to the unpredictable drop of SECDs. Social education about early recognition of symptoms of life-threatening cardiac conditions requiring appropriate care in a timely fashion may help to reduce this counterproductive phenomenon.

Key Words: acute coronary syndromes | cardiology | COVID-19 | emergent cardiovascular diseases | pacemaker
food supply and health emergencies). Friuli Venezia Giulia, the region in which Udine is located, although not as severely hit by COVID-19 as neighboring regions such as Veneto and Lombardia, still faced an unprecedented healthcare emergency. In order to avoid viral spread within hospitals, our institution followed the indications of Italian Ministry of Health, arranging ad hoc measures including mandatory use of personal protective equipment for all hospital workers, out-of-hospital pre-triage for the identification of suspected SARS-CoV-2 infections and differentiated COVID-19 versus non-COVID-19 emergency department areas, with dedicated staff and equipment.

PURPOSE
The objective of this study was to analyze the epidemiologic impact of COVID-19 pandemic on hospital admission for severe emergent cardiovascular diseases (SECDs) in a single Northern Italy large tertiary referral center, covering an area of about 550,000 people.

METHODS
The data that support the findings of this study are available from the corresponding author upon reasonable request.

We retrospectively analyzed all SECDs admissions to the Cardiology Division of the University Hospital “S. Maria della Misericordia” (Udine, Friuli Venezia Giulia, Italy) between March 1, 2020 and March 31, 2020 and compared them with those of the same time frame during 2019. As a retrospective study, informed consent of the participants was not obtained. We considered as SECDs (1) ST-segment–elevation acute coronary syndrome (STE-ACS), diagnosed by 12-leads ECG and requiring primary percutaneous coronary intervention; (2) non-STE-ACS, diagnosed by 12-leads ECG and/or elevated serum cardiac troponin and confirmed by coronary angiography; and (3) second-degree or third-degree atrioventricular-block or acute sinus node dysfunction defined as sinus arrest, severe sinus bradycardia (heart rate <40 beats/min), or a junctional escape rhythm presenting with syncope, dizziness, or hemodynamic instability and requiring permanent pacemaker implantation. The study was approved by the institutional review board.

RESULTS
Overall, from March 1, 2020 to March 31, 2020, 57 patients were admitted for SECDs compared with 117 during the same period last year (−51%). A decrease was observed in all SECDs hospital admissions: 27 versus 19 for STE-ACS (−30%); 44 versus 15 for non-STE-ACS (−66%) and 46 versus 23 for atrioventricular-block/acute sinus node dysfunction (−50%). The distribution of SECDs hospital admission per each 10-day period of March 2020 compared with March 2019 is represented in the Figure. The drop of SECDs admissions was more evident in the second and third 10-day period of March 2020, with a decrease of 56% and 54%, respectively. Demographic data and onset symptoms are reported in Tables 1 and 2. Angina was more frequent at presentation among patients with STE-ACS compared with those with non-STE-ACS (77.8% versus 46.7%). Compared with March 2019, there was a reduction in the number of patients with non-STE-ACS presenting only with dyspnea (6.7% versus 22.7%). Among patients presenting with severe bradyarrhythmia, we noticed a higher prevalence of onset with syncope (47.8% versus 30.4%) and a reduction of fatigue (34.8% versus 56.5%) as well. Contrasting data were detected for hospital admissions of patients over 65 years: compared with March 2019, there was a drop of both STE-ACS patients (36.8% versus 51.9%) and patients with severe bradyarrhythmia (86.9% versus 97.8%) but not for non-STE-ACS patients (66.6% versus 61.3%).

DISCUSSION
During the pandemic of COVID-19, we observed a halving of SECDs admissions to our hospital. Recently, Garcia et al.5 have also reported a reduction in STE-ACS cardiac catheterization laboratory activations in the United States, during the COVID-19 pandemic. The causes underlying this phenomenon are largely unknown; however, a significant decrease in the incidence of cardiac diseases seems unlikely. A more sedentary indoor lifestyle may have reduced hospital admissions related to exertional angina but cannot explain the global reduction of SECDs. The hypothesis that patients may avoid referral to hospitals dealing with COVID-19 preferring “COVID-free” hospitals, cannot be claimed as well. As matter of fact, in the Friuli Venezia Giulia region, there are only 3 hub hospitals performing percutaneous coronary

| Nonstandard Abbreviations and Acronyms |
|---------------------------------------|
| **COVID-19** | coronavirus disease 2019 |
| **SARS-CoV 2** | severe acute respiratory syndrome coronavirus |
| **SECD** | severe emergent cardiovascular disease |
| **STE-ACS** | ST-segment–elevation acute coronary syndrome |
Figure. Distribution of severe emergent cardiovascular diseases hospital admission per each 10-day period of March 2020 compared with March 2019.

The upper part of the graphic shows admissions to our division for different severe emergent cardiovascular diseases in March 2019 and March 2020, divided into 10-day blocks. The lower part of the graphic shows the difference between the total number of admissions in March 2020 compared with March 2019 for the same blocks reported above and for the whole period as well. NSTE-ACS indicates non-ST-segment–elevation acute coronary syndrome; STE-ACS, ST-segment–elevation acute coronary syndrome.
interventions and pacemaker implantations, and all of these hospitals were designated to be involved in the management of COVID-19. Moreover, hospital referral for SECDs is based on local regulations limiting patient preference and a decrease in cardiovascular emergencies has also been reported in the nearest hub centers.\textsuperscript{6} It is our opinion that fear of contagion might have contributed, at least in part, to the unpredictable reduction of SECDs. The ubiquitous presence of COVID-19 news on mass media, spread of fake news on social media, and the lack of verified information on the aforementioned dedicated precautions to limit in-hospital spread of the disease have contributed to the perception of hospitals as unsafe. According to this hypothesis, the drop of SECDs admissions to our division appeared more evident in the second and third 10-day period of March 2020 in an inversely proportional fashion to the curve of infected people, which at that time reached more than 100,000 cases in Italy. Interestingly, the greatest reduction was in non-STE-ACS admissions (−76%), probably because non-STE-ACS clinical presentation was more nuanced than that of STE-ACS. Consistently, we observed a higher proportion of pacemaker implantations for syncope and dizziness, which are more specific symptoms than generic fatigue. Our study does not provide data on mortality; however, considering the number of ACS of March 2019 in our hospital, 37 patients are missing. Based on data showing that the mortality of untreated ACS patients might be between 30% to 40%,\textsuperscript{7} we could estimate about 11 to 15 ACS deaths in 1 month. Moreover, about 20% of patients presenting with symptomatic bradyarrhythmia require temporary emergency

| Characteristics | Total Number of Patients (N=105) | Study Period (March 1–March 31, 2020) (N=34) | Inter-Year Control Period (March 1–March 31, 2019) (N=71) |
|-----------------|----------------------------------|-----------------------------------------------|------------------------------------------------------|
| Male sex        | 69 (65.7%)                       | 6 (40.0%)                                     | 32 (72.7%)                                          |
| Age, y          | 67.7±11.7                        | 61.5±12.6                                     | 69.0±10.1                                           |
| Age ≥65 y       | 58 (55.2%)                       | 10 (66.6%)                                    | 27 (61.3%)                                          |
| Known coronary artery disease | 26 (24.8%) | 6 (40.0%)                                     | 15 (34.1%)                                          |
| Chronic obstructive pulmonary disease | 9 (8.6%) | 1 (6.7%)                                      | 6 (13.6%)                                           |

| Presentation symptom | Study Period (March 1–March 31, 2020) (N=34) | Inter-Year Control Period (March 1–March 31, 2019) (N=71) |
|----------------------|-----------------------------------------------|------------------------------------------------------|
| Angina               | 61 (58.7%)                                    | 14 (77.8%)                                          |
| Dyspnea             | 12 (11.5%)                                    | 1 (5.5%)                                            |
| Atypical chest pain | 23 (22.1%)                                    | 1 (5.5%)                                            |
| Major arrhythmia or cardiac arrest | 8 (7.7%) | 2 (11.2%)                                      |

NSTE-ACS indicates non-ST-segment–elevation acute coronary syndrome; and STE-ACS, ST-segment–elevation acute coronary syndrome.

Table 2. Characteristics of Patients Admitted for Acute Sinus Node Dysfunction or Atrioventricular Block During the Study Period (March 1–March 31, 2020) as Compared With Inter-Year (March 1–March 31, 2019) Control Period

| Characteristics                  | Total Number of Patients (N=69) | Study Period (March 1–March 31, 2020) (N=23) | Inter-Year Control Period (March 1–March 31, 2019) (N=46) |
|----------------------------------|----------------------------------|-----------------------------------------------|------------------------------------------------------|
| Male sex                         | 48 (69.6%)                       | 17 (73.9%)                                    | 31 (67.4%)                                          |
| Age, y                           | 78.3±13.2                       | 77.9±19.2                                     | 78.5±9.3                                            |
| Age ≥65 y                        | 65 (94.2%)                       | 20 (86.9%)                                    | 45 (97.8%)                                          |
| Type of conduction disorder      |                                  |                                              |                                                     |
| Acute sinus node dysfunction     | 16 (23.2%)                       | 4 (17.4%)                                     | 12 (26.1%)                                          |
| Second-degree atrioventricular block | 23 (33.3%)                      | 10 (43.5%)                                    | 13 (28.3%)                                          |
| Third-degree atrioventricular block | 30 (43.5%)                      | 9 (39.1%)                                     | 21 (45.7%)                                          |
| Presentation symptom             |                                  |                                              |                                                     |
| Syncope                          | 25 (36.2%)                       | 11 (47.8%)                                    | 14 (30.4%)                                          |
| Fatigue                          | 34 (49.3%)                       | 8 (34.8%)                                     | 26 (56.5%)                                          |
| Dizziness                        | 10 (14.5%)                       | 4 (17.4%)                                     | 6 (13.0%)                                           |
Therefore, of 23 patients absent in comparison with 2019, we could estimate a further 4 to 5 deaths. As proof of this, recent data suggest a significant increase in mortality in Udine during this period, which was not fully explained by COVID-19 cases alone. For this reason, some cardiac patients may be dying at home.

The impact of this phenomenon on the incidence of cardiovascular diseases in our region in the immediate future is hard to predict and may include higher incidence of late presenters complicated myocardial infarctions, as recently reported, but also heart failure and sudden cardiac death. Our experience might suggest that other countries’ healthcare institutions facing the initial phases of SARS-CoV 2 outbreak should adopt adequate public information policies. This might avoid, or at least cushion, this counterproductive phenomenon. In addition, cardiologists might reeducate the public to recognize early symptoms of life-threatening cardiac conditions and seek appropriate care in a timely fashion.

ARTICLE INFORMATION

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