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Divergent Trends in Emergency Department Presentations Amid the Novel Coronavirus Disease 2019 Pandemic in Chicago, Illinois

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ABSTRACT

Excess deaths during the coronavirus disease 2019 (COVID-19) pandemic have been largely attributed to cardiovascular disease (CVD); however, patterns in CVD hospitalizations after the first surge of the pandemic have not well-documented. Our brief report, examining trends in health care avoidance documents that CVD hospitalizations decreased in Chicago before significant burden of COVID-19 cases or deaths and normalized during the first COVID-19 surge. These data may help to inform health care systems responses in the coming months while mobilizing vaccinations to the population at large. (*J Cardiac Fail* 2021;27:1472–1475)

Key Words: COVID-19, cardiovascular disease, pandemic.

The pandemic caused by the novel coronavirus disease 2019 (COVID-19) has led to more than 600,000 deaths in the United States as of August 2021. In addition to the direct burden of COVID-19, substantial indirect burden as a result of the pandemic has been reported in terms of excess deaths in the United States and across many European countries. Specifically, mortality owing to cardiovascular disease (CVD) has been identified as the leading cause of these excess deaths not directly attributed to COVID-19 during the pandemic.¹ This may be, in part, owing to health systems being overwhelmed or fear of COVID-19 infection and changes in behavior related to lockdown measures leading to avoidance of health care. Although many studies have identified decreases in patients presenting to the emergency department (ED) since the declaration of

a national emergency by the United States on March 13, 2020, these studies have been focused on the early phase of the pandemic and have not examined the potential “rebound” effect of delayed care.^{2,3} Additionally, differences in the use of telehealth services to better manage certain CVD conditions remotely (eg, heart failure [HF] compared with myocardial infarction [MI]) may have led to greater decreases in these CVD subtypes. Last, it is not known if trends in ED presentations in cities that experienced a high burden of COVID-19 temporally later in the pandemic differ. Therefore, we sought to describe trends in the number of ED presentations for CVD and across subtypes (HF, hypertension, MI, and stroke) at an integrated, multisite health system during the first 26 weeks of 2020 and 2019 and compare with COVID-19 cases in Chicago, Illinois, over the same period.

Methods

We analyzed data from the Northwestern Medicine Enterprise Data Warehouse, a comprehensive electronic repository across 10 hospitals that houses demographic, laboratory, and claims data on all inpatient and outpatient encounters.⁴ The Northwestern Medicine Enterprise Data Warehouse reflects data across 10 hospital systems, which represent a single integrated health care system in the greater Chicago area and includes an academic medical center and multiple community hospitals. We performed a retrospective analysis and identified

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records of all adults (≥ 18 years) presenting to the ED with a principal diagnosis of CVD based on *International Classification of Diseases, Tenth Edition* codes (acute MI [I21], stroke [G46, I60-I63, I67.8], HF [I11.0, I13.0, I13.2, I50], hypertension [I10-I16]). We described inflection points in weekly counts during the first 26 weeks of 2020 using a piecewise linear regression model.⁵ We displayed data as scatterplots with overlaid nonparametric smoothed curves generated with a locally weighted scatterplot smoothing method and estimated the percentage change in average weekly ED visits between 2019 and 2020. We repeated the analysis for all hospital admissions with a principal diagnosis of CVD over this same time period. A *P* value of less than .05 was considered statistically significant. Last, we qualitatively examined COVID-19 cases in Chicago. Analyses were performed in SAS v9.4 and MATLAB R2016b. The study was approved by the Institutional Review Board at Northwestern University Feinberg School of Medicine.

Results

Of 1943 patients who presented to the ED for CVD in 2020 with mean a age of 53.0 ± 19.1 years, 25% were Black adults and 48% were female. There were no significant differences in age, sex, race, or history of obesity or diabetes in patients who presented in 2020 compared with 2019 ($n = 2480$, $P > .23$ for all). We identified 2 significant inflection points: March 4, 2020, and March 18, 2020 (Figure 1). Between January 1 and March 4, weekly counts for CVD presentations in ED were similar between 2019 and 2020. However, a significant decrease in CVD counts was observed between March 4, 2020, and March 18, 2020 (-49.5% [$-37.4, -61.5$]). During this same period, cumulative COVID-19 cases were low in Chicago in early March with the decrease in ED visits preceding the rise in COVID-19 cases; the rebound in ED visits began after lockdown measures were instituted nationally but before the peak in local COVID-19 activity. Between March 18, 2020,

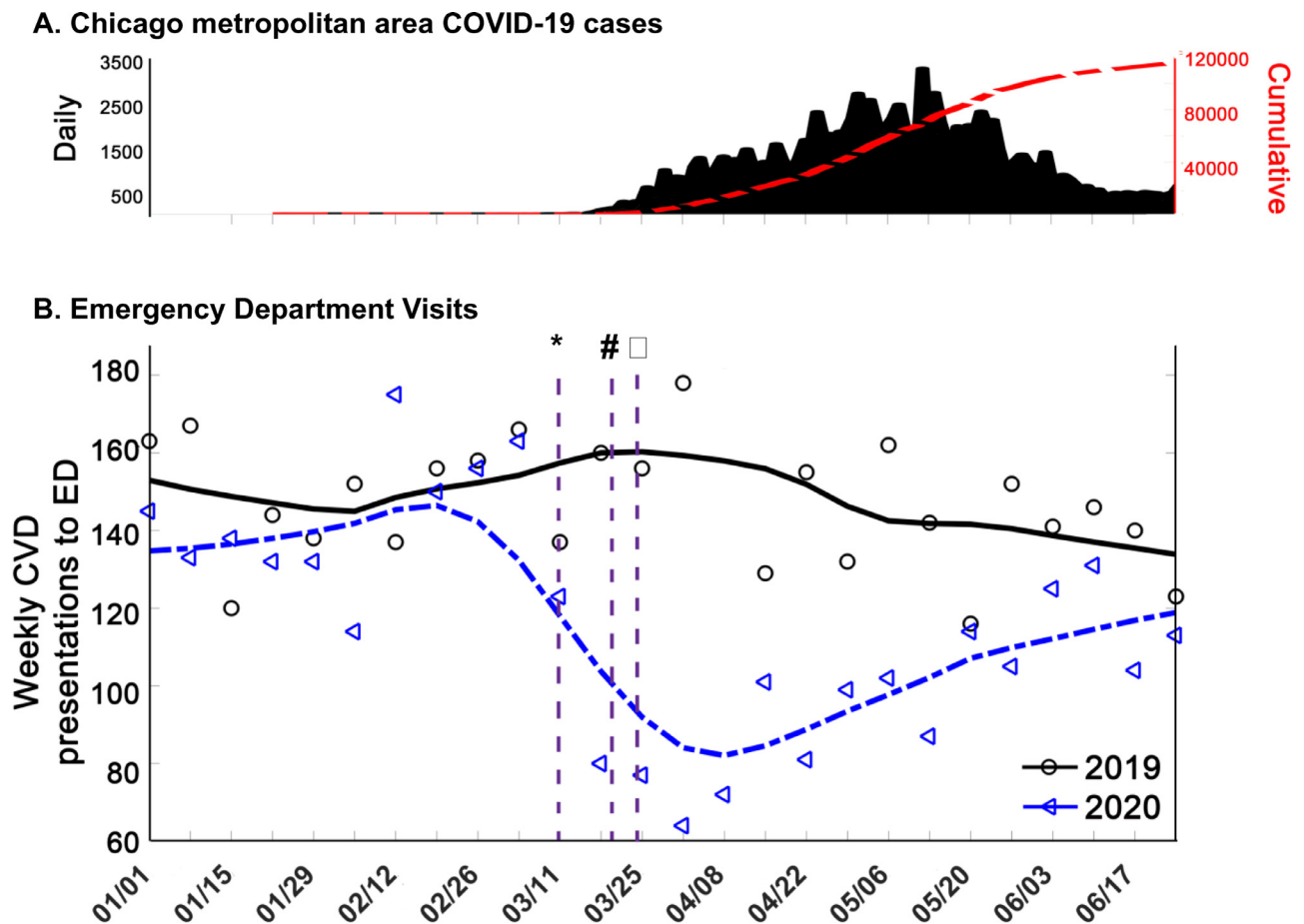


Figure 1. Trends in emergency department (ED) presentations for cardiovascular diseases (CVD) (A) compared with coronavirus disease 2019 (COVID-19) cases (B) in Chicago. The dashed purple lines with the following symbols—*, #, and Ψ —reflect the World Health Organization announcement identifying CVD as a high-risk condition for COVID-19 (March 10, 2020), Illinois shelter in place order (March 20, 2020), and targeted message by the health system to high-risk patients to mitigate fear in seeking urgent care (March 24, 2020).

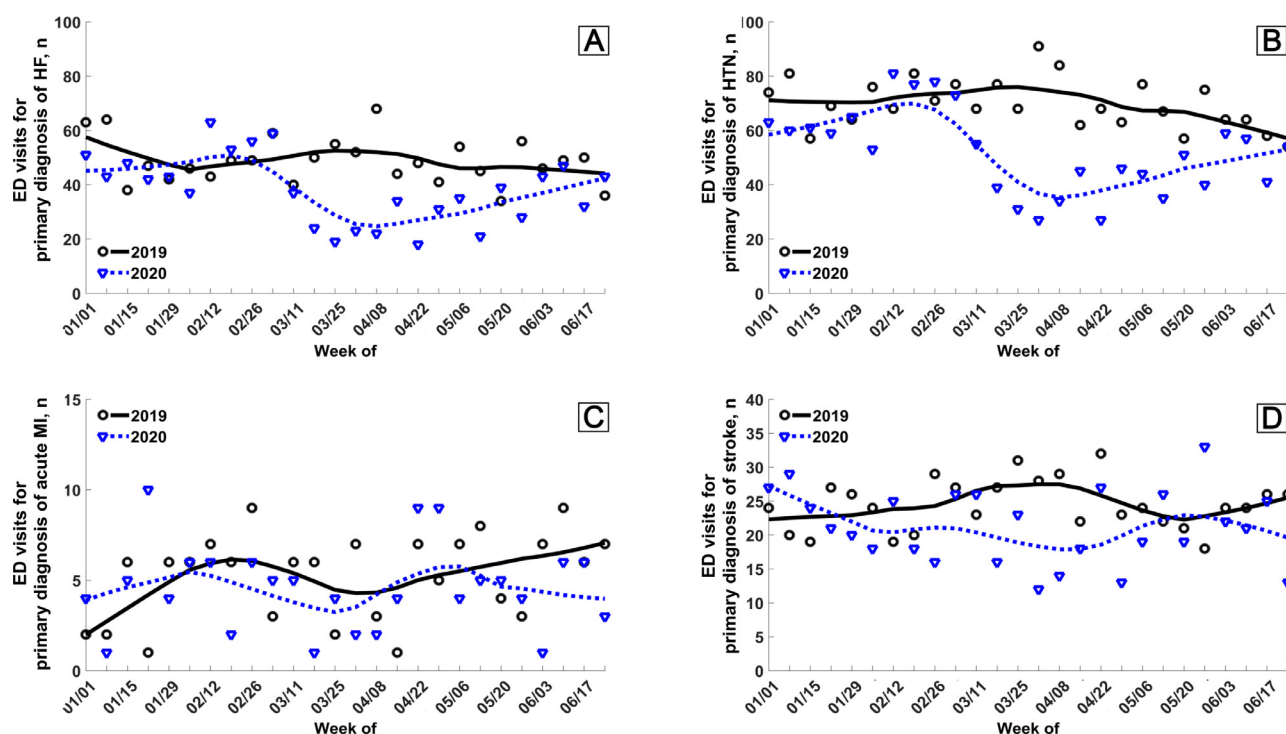


Figure 2. Trends in emergency department presentations for cardiovascular disease subtypes for a principal diagnosis of (A) heart failure (HF), (B) hypertension (HTN), (C) acute myocardial infarction (MI), and (D) stroke.

and June 30, 2020, a significant increase in weekly CVD counts was observed, concurrent with increases in COVID-19 cases in Chicago. Patterns were heterogeneous across CVD subtypes (Figure 2); no differences in MI presentations were noted between 2019 and 2020. However, there were significant decreases in ED visits for HF (-53.0% [$-41.4, -64.6$]), hypertension (-53.5% [$-42.0, -65.0$]), and stroke (-26.7% [$-3.1, -50.2$]) between March 4, 2020, and March 18, 2020. Similar patterns were observed among the 1951 patients hospitalized with CVD over this same time period when compared with 2019 ($n = 2430$).

Discussion

In this retrospective analysis with data from 4423 patients presenting to the ED at 10 hospitals from an integrated health care system, we demonstrate significant decreases in patients presenting for acute CVD care in early March 2020 before significant COVID-19 burden in Chicago. In contrast with the published literature, we observed no change in acute MI presentations, but significant decreases in presentations with a principal diagnosis of stroke, HF, or hypertension. Despite increasing COVID-19 cases in Chicago after March 18, 2020, we observed normalization (without over-correction) of ED visits in patients presenting for acute CVD care over this time.

This study confirms and extends prior work identifying dynamic patterns in ED presentations for acute CVD care. Other studies have focused on high burden areas in the United States (eg, New York City, Boston) that were affected early in the pandemic before there was adequate time for health systems to plan and identify interventions to mitigate health care avoidance owing to fear of COVID-19. The current study demonstrates similar patterns in early March with decreases in patient presentations to the ED at a time when COVID-19 was being recognized on a global scale, rather than significant local burden of COVID-19. In contrast, we note increases in ED presentations concurrently with increases in COVID-19 cases locally. The increases after reopening in early June are consistent with prior work from Norway and Germany that showed similar patterns once restrictions were loosened.^{6,7} Potential explanations may include the use of targeted institutional messaging for at-risk patients, local and national media campaigns, and public health messaging focused on mitigating fear to avoid delays in seeking urgent care.

Unlike prior studies, we did not observe a significant difference in patients presenting with acute MI to our ED.⁸ However, significant decreases in patients with a principal diagnosis of HF or hypertension suggests the potential for the greater use of remote monitoring and management options when possible.⁹ Additionally, it is unclear whether lower counts of HF and

hypertension presentations represent altered management or a true decrease in incidence, which may be related to changes in dietary intake with lockdown measures (eg, decreased sodium intake).¹⁰ Unfortunately, studies are emerging that document increases in the prevalence of unhealthy behaviors, including greater intake of poor quality diet, a greater degree of sedentary behavior, and significant weight gain.¹¹ These adverse trends are likely to further accelerate prepandemic changes observed in declining cardiovascular health.¹²

Limitations of the study to note include the retrospective nature with the potential for residual confounding and bias. Although we were not able to assess severity at the time of presentation, similar patterns in both ED presentations and inpatient hospitalizations for CVD suggest this differences is unlikely to explain the findings. Additionally, we were unable to assess other health behavior changes that may have occurred and potential for misclassification with use of *International Classification of Diseases* codes. Our study is ecological in nature and cannot confer causation. However, these data may inform potential strategies to counsel high-risk patients with risk for recurrent surges with novel COVID-19 variants while awaiting herd immunity amidst vaccine hesitancy and limited global vaccine distribution.

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Declaration of Interest

The authors have no competing interests to declare.

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