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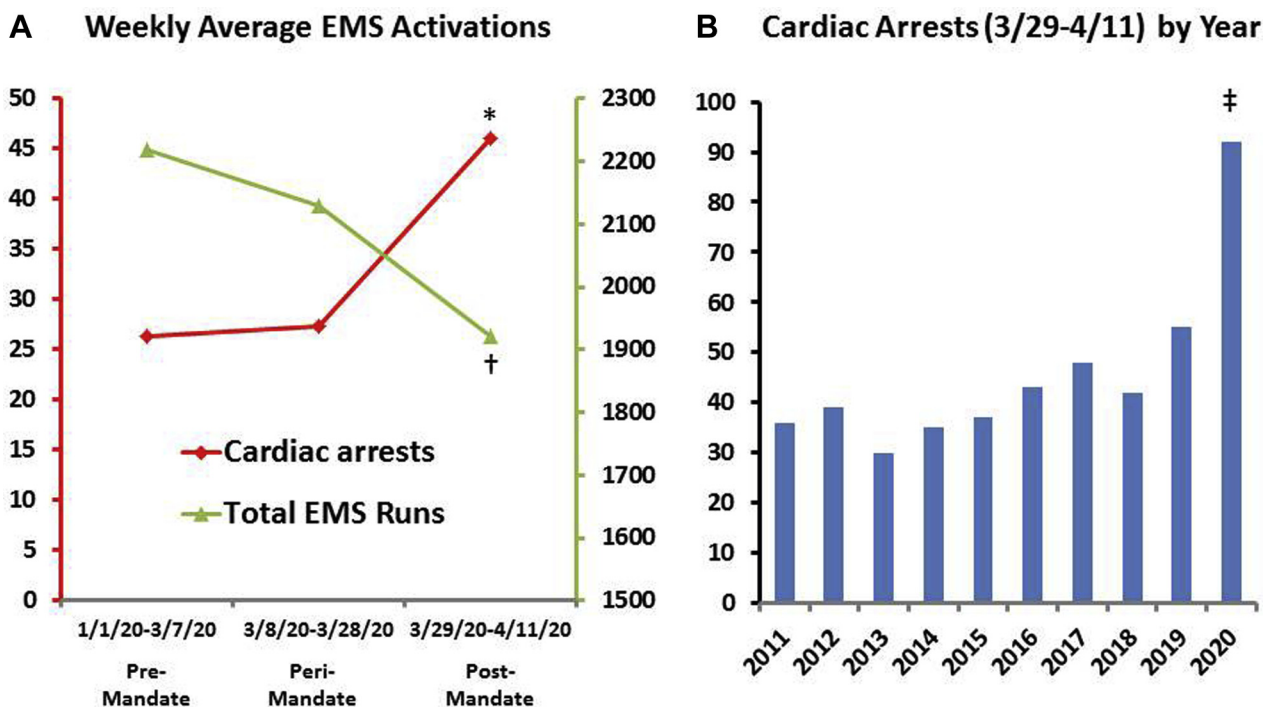
RESEARCH CORRESPONDENCE

Excess Cardiac Arrest in the Community During the COVID-19 Pandemic

Recently, Garcia et al. (1) and Rodriguez-Leor et al. (2) demonstrated a 38% to 40% reduction in presentations for acute cardiac catheterization laboratory activations across a consortium of high-volume primary percutaneous intervention centers correlating with the implementation of nationwide social distancing recommendations. Multiple theories have been proposed to explain this observation, ranging from a true decrease in the occurrence of acute coronary syndromes to a response to altered ambulatory care and adherence to strict social distancing guidelines (3).

To evaluate this issue, we queried the Denver Health Paramedic Division database before and after the emergence of coronavirus disease-2019 (COVID-19). The Denver Health Paramedic Division is the sole emergency medical services provider for the city and county of Denver and surrounding communities. We compared the total number of ambulance activations and the number of out-of-hospital cardiac arrests (OHCAs) per week across 3 time frames related to the local outbreak: pre-mandate, January 1 until the Colorado state declaration of emergency (January 1, 2020, to March 7, 2020); peri-mandate, between the declaration of emergency and the statewide "shelter-in-place" order (March 8, 2020, to March 28, 2020); and post-mandate, the 2-week period following the implementation of shelter-in-place practice (March 29, 2020, to April 11, 2020). Finally, we compared the post-mandate period with historical data for the corresponding period between 2011 and 2019. The study

FIGURE 1 Denver Area OHCA During COVID-19 Pandemic



(A) In Denver, there was a larger mean number of weekly out-of-hospital cardiac arrests following implementation of "social distancing." **(B)** Out-of-hospital cardiac arrests (OHCA) were 2.2-fold higher in 2020 compared with averaged historical controls over the same 2-week period. *$p < 0.005$ versus peri-mandate and pre-mandate; †$p = 0.037$ versus peri-mandate, $p = 0.002$ versus pre-mandate; ‡$p = 0.002$. EMS = emergency medical services.

was approved by the Denver Health ethics committee. Comparisons were made using analysis of variance with Fisher post hoc testing.

There was a significantly higher (main effect, p = 0.003) mean number of weekly OHCAs in the post-mandate period (46 per week) compared with pre-mandate (26 per week; p = 0.001) and peri-mandate (27 per week; p = 0.004) periods (**Figure 1A**). The weekly average of all ambulance activations was progressively lower across all time periods (pre-mandate, 2,218; perimandate, 2,129; post-mandate, 1,921; p = 0.007) (**Figure 1A**). Finally, comparing the 2020 post-mandate period with historical controls demonstrated a 2.2-fold higher total count of OHCAs (92 vs. 41; p = 0.002) (**Figure 1B**). COVID-19 deaths in Denver totaled 41 during the post-mandate period (4). Total ambulance activations for this 14-day period increased annually between 2011 and 2019 (from 3,072 in 2011 to 4,716 in 2019) but was markedly lower in 2020 (3,841).

Historically, most OHCAs are related to myocardial ischemia (5), but in the setting of the pandemic, it is possible that complications of COVID-19 are responsible (i.e., following respiratory failure or myopericarditis). Unfortunately, during this time frame, COVID-19 testing was not widely available, but it is interesting to note that the excess in OHCA was greater than the number of patients who died with COVID-19 diagnoses during the same time frame. An alternative unifying hypothesis for decreased hospital ST-segment elevation myocardial infarction volume regionally (1), internationally (2), and locally (Jeb Burchenal, MD, personal communication, May 29, 2020) and these data is an increased incidence of myocardial infarction–related OHCA. Across-the-board restrictions on nonemergent procedures enacted by states, hospitals, and cardiovascular society guidelines may lead to delays in diagnosis and definitive treatment. Finally, patient fear of contracting COVID-19 while seeking care may lead to avoidance of lifesaving therapies.

A review at the patient level is essential to obtain a more granular understanding of these data. However, in the interim, providers should consider the unintended consequence of the pandemic response in the context of chronic and emergent cardiovascular disease. One possibility suggested by our data is that patients with acute coronary syndromes are not presenting for care, resulting in an increase in OHCA.

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RESEARCH CORRESPONDENCE

Outcomes of Percutaneous Coronary Intervention for In-Stent Chronic Total Occlusions

Insights From the PROGRESS-CTO Registry

Percutaneous coronary intervention (PCI) of in-stent (IS) chronic total occlusions (CTOs) represents 5% to 25% of all CTO PCIs and has been associated with lower success rates in some studies (1,2). We analyzed the clinical, angiographic, and procedural characteristics of 5,667 CTO PCIs performed at 5,547 patients enrolled in the PROGRESS-CTO (Prospective Global Registry for the Study of Chronic Total Occlusion Intervention; NCT02061436) registry between 2012 and 2020 at 28 U.S. and 4 international centers. The study was approved by the institutional review board of each site.