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Research Letter

Cardiac Status Among Heart Failure Patients With Implantable Cardioverter Defibrillators Before, During, and After COVID-19 Lockdown

To the Editor:

During the coronavirus disease 2019 (COVID-19) pandemic, inpatient services for acute cardiac conditions including heart failure decreased markedly, while telemedicine services increased.¹ Little information is available on the extent to which cardiac status changed among patients with heart failure in this period. Implantable cardioverter defibrillators (ICDs) and cardiac resynchronization therapy defibrillators (CRT-Ds) implanted in patients with heart failure provide useful information on markers of cardiac status as measured by thoracic impedance, atrial fibrillation (AF), and device discharges.² We assessed trends in markers of cardiac status among patients with ICDs or CRT-D devices in New York City and Minneapolis/Saint Paul from 2019 to 2020, with an emphasis on the shutdown period.

Methods

A deidentified dataset of individuals aged 18 years and older from New York City and Minneapolis/Saint Paul with ICDs and CRT-Ds transmitting between January 1, 2019, and December 31, 2020, was derived from Boston Scientific Corporation's LATITUDE database. These 2 cities were chosen for their data availability and asynchronous COVID-19 case burdens. Measured variables included daily thoracic impedance, nighttime heart rate (HR), respiration rate, HR variability, time in AF, percentages of patients with AF time greater than 1 hour, and HeartLogic index³ for heart failure decompensation. We used remote monitoring data exclusively from scheduled regular data uploads to eliminate potential selection bias in event-based data uploads.

We assessed the trends in daily thoracic impedance, AF, and device discharges using the 7-day moving average of these metrics in 2020. Data from 2019 were used as a comparator to account for seasonal variability. We considered 2-sided *P* values of less than .05 as statistically significant. Analyses were performed using R version 4.0.2. This study was approved by the Institutional Review Board at Yale University.

Results

The study sample included 4555 patients, of whom 3146 were from New York City (mean age 68.0 ± 13.3 years, 32.2% women) and 1409 were from Minneapolis/Saint Paul (mean age 67.3 ± 13.5 years, 29.5% women). Of the 4555 patients in the analysis, 2701 (59.3%, 1893 in New York City and 808 in Minneapolis/Saint Paul) had ICDs and 1854 (40.7%, 1253 in New York City and 601 in Minneapolis/Saint Paul) had CRT-Ds. Three-quarters (74.8%) of patients in 2019 were also in the 2020 cohorts. There was little to no statistical or clinically meaningful change in thoracic impedance and AF burden in these patients during the COVID-19 shutdown period (Fig. 1). The average daily nighttime HR, HR variability, HeartLogic index, AF, and percentages of patients with daily AF time greater than one hour decreased slightly (relative change of <5%) from the date that the emergency declaration was announced (March 7, 2020, in New York City and March 13, 2020, in Minneapolis/Saint Paul) to the end of stay-at-home order (June 8, 2020, in New York City and May 18, 2020, in Minneapolis/Saint Paul). Conversely, average daily thoracic impedance increased slightly in the same time period. However, none of these changes were statistically significant (*P* > .05 for all). After the restrictions were lifted, these physiologic markers returned to the 2019 levels. The trends were similar in both New York City and Minneapolis/Saint Paul and were consistent across age and sex subgroups.

Discussion

There is little to no change in most markers of cardiac status among heart failure patients with implanted ICD or CRT-D devices in New York City and Minneapolis/Saint Paul during the COVID-19 pandemic, and this finding is consistent for all age and sex subgroups. All the changes in medical care, the stress of the pandemic, and the change in behaviors did not seem to have any major effect on this patient population. It is plausible that telemedicine mitigated some of the effects of a decrease in inpatient care.⁴

Our result of the nonsignificant trends in markers of cardiac status among heart failure patients is

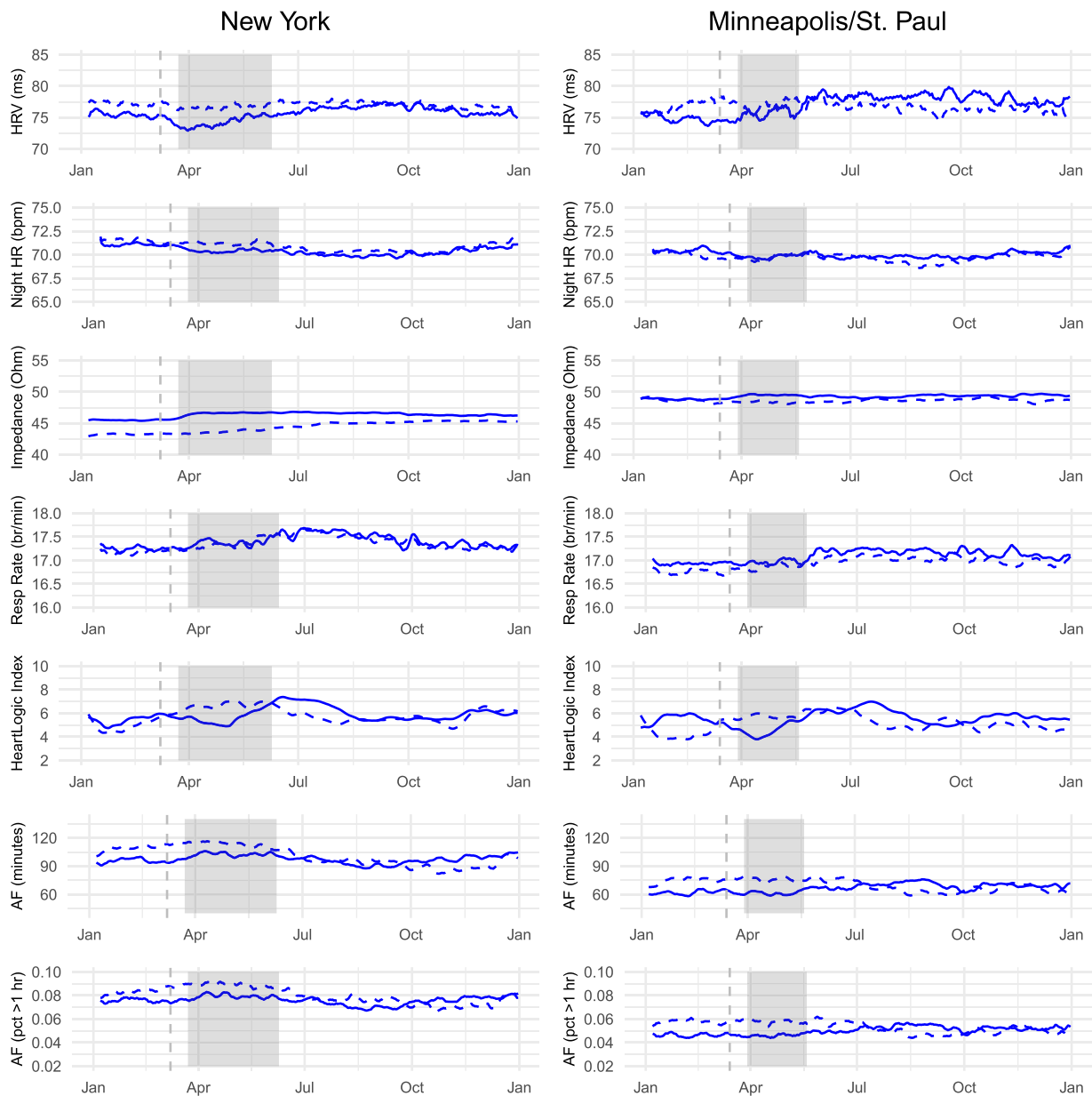


Fig. 1. Trends in atrial fibrillation (AF) among patients in New York City and Minneapolis/Saint Paul in 2019 and 2020. The solid line is 2020 and the dashed line is 2019. The vertical line is the date of regional emergency declaration (March 7, 2020 in New York City, and March 13, 2020 in Minneapolis/Saint Paul) and the shaded area is the stay-at-home order (March 22, 2020 to June 8, 2020, in New York City, and March 28, 2020, to May 18, 2020, in Minneapolis/Saint Paul). HR, heart rate; HRV, heart rate variability.

consistent with prior studies. In a previous study of 49 heart failure patients with wireless implantable hemodynamic monitoring in New York City, Oliveros et al⁵ found that there was no significant difference in the mean pulmonary artery diastolic pressures before and during COVID-19, nor was there a difference in the mean HR. However, we further extended the literature by assessing a wider range of decompensation markers in a larger sample of heart failure patients over a longer period of time.

Limitations of our study include a reliance on data produced by the device, the lack of details on comorbidities, medications, and health care utilization. We were also limited to these 2 cities because of data availability.

In conclusion, this study provides unprecedented information that the cardiac health of heart failure patients with ICDs or CRT-D devices did not substantially change during the period of the pandemic with marked restrictions and disruptions in medical care delivery.

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