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Decreases in acute heart failure hospitalizations during COVID-19

The cardiovascular complications of patients infected with COVID-19, the prognostic impact of baseline cardiovascular conditions in infected patients, and the potential for angiotensin-converting enzyme inhibitor or angiotensin receptor blocker interaction with COVID-19 severity has garnered considerable attention and research. Yet, the pandemic's psychosocial impact on an uninfected patient's decision to voluntarily present to the hospital for non-COVID-19 urgent care is yet to be completely understood or investigated. Acute heart failure (AHF) is the most common reason for hospital admission among the elderly, and the rate of AHF hospitalizations may increase during natural disasters.[1] However, behind the curtain of the COVID-19 pandemic a concerning trend is emerging. Patients are reluctant to present to the hospital for urgent or emergent non-COVID-19 reasons, including AHF.

Early reports of patient-initiated healthcare system interactions indicate patients are prioritizing avoidance of potential COVID-19 exposure over their health needs. Internationally, patients are avoiding or delaying care for emergent conditions such as acute coronary syndrome and stroke.[2,3] In response, the American College of Cardiology released a statement urging patients to seek medical care for heart attack and stroke symptoms.[4] Rapid quantification of AHF admissions is more difficult than other cardiovascular conditions because it is a clinical diagnosis which is often not clear immediately upon hospital admission. Vanderbilt University Medical Center (VUMC) is experiencing an unprecedented decrease in AHF hospital admissions, which is echoed in conversations with various academic medical centres across the country. We report admissions to VUMC for AHF, illustrating a mean decrease of $62 \pm 7\%$ in the AHF hospital census from March 22nd to April 20th relative to the same calendar day last year (*Figure 1*).[5] The percentage difference in AHF hospitalizations from 2019 to 2020 was significantly different ($-11 \pm 12\%$ vs. $-46 \pm 16\%$, $P = 0.0012$) in the pre-COVID-19 period (Weeks 1–9) compared to the COVID-19 period (Weeks 10–16). Normally, reports of national AHF hospitalization rates originate from administrative coding or quality registries, but these methods can be impeded by delays in reporting and analysis. No other data are currently available to determine the extent of decrease in hospitalizations for AHF. While limited in scope, our single-centre AHF hospitalization data are based upon a validated algorithm using clinical variables collected and recorded in real time.[6]

Delaying care until symptoms are critical could theoretically lead to fewer admissions but a higher severity of illness in patients that do seek care. However, patient characteristics of severity at AHF hospital admission were not different between the pre-COVID-19 period and the following COVID-19 period of 2020 at VUMC. Patients did not differ in admission systolic blood pressure (120 ± 23 mmHg vs. 117 ± 22 mmHg, $P = 0.25$), blood urea nitrogen (33 ± 23 mg/dL vs. 34 ± 26 mg/dL, $P = 0.64$), serum creatinine (1.9 ± 1.6 mg/dL vs. 1.6 ± 1.2 mg/dL, $P = 0.16$), B-type natriuretic peptide (1121 ± 1319 pg/mL vs. 1198 ± 1324 pg/mL, $P = 0.58$), or serum sodium (138 ± 4 mEq/L vs. 137 ± 5 mEq/L, $P = 0.62$) in the pre-COVID-19 period and COVID-19 period, respectively. Likewise, neither the need for admission to an intensive care unit (17% vs. 22%, $P = 0.25$), length of stay (9 ± 8 days vs. 11 ± 10 days, $P = 0.07$) nor the inpatient mortality rate (5.9% vs. 2.8%, $P = 0.16$) differed in the pre-COVID-19 period and COVID-19 period, respectively. Compared to the pre-COVID-19 period, older patients may have been less likely to seek AHF hospital admission during the COVID-19 period [mean age 68 years, 95% confidence interval (CI) 67–70 vs. 66 years, 95% CI 64–68; $P = 0.13$] but the difference in mean patient age was not statistically significant.

Of the numerous consequences of decreasing AHF hospitalizations, the adverse impact on patient health is the most concerning. Patient's quality of life may be diminished by trying to suffer through debilitating symptoms under a cloud of anxiety that the very care one needs necessitates going to the perceived most dangerous place. Measures to decrease AHF hospital admissions for reimbursement reasons have been associated with increases in mortality, raising the question if suppression of AHF hospitalizations at the patient-level could increase the risk of death.[7] While we did not observe a trend toward increased mortality in our cohort, a larger population is needed to adequately investigate this question. Additionally, clinical trials with AHF hospitalizations as a primary endpoint may require longer-than-anticipated study durations to adequately measure differences between treatments. These changes in study duration will need to be incorporated into the statistical analysis plan well in advance of the original planned endpoint of the study as the number of patients being followed is reduced over time, especially if there is a planned duration of follow-up.

The reasons patients delay care are likely multifactorial and complex. The intense media coverage could unintentionally move patients from a healthy respect for COVID-19 into a state of fear, in which the hospital is viewed as a danger to be avoided at all costs. The appropriate reallocation of hospital resources to COVID-19 treatments may leave patients without the traditional avenues for assessment and triage. Alternatively, one must entertain the idea that AHF hospital admissions are decreased due to decreased exacerbations. Stay-at-home orders could theoretically improve medication and dietary adherence.

The first step in determining how to address the issue is to determine the scope of the problem. Implantable, remote haemodynamic monitoring data from ongoing clinical trials (GUIDE-HF, NCT03387813) analysed by time periods could ascertain if patients are maintaining goal haemodynamic parameters without hospitalization needs or are delaying care for worsening cardiac function. Analyses of international AHF registries would facilitate comparisons of national and regional hospital admission trends. Understanding the extent of reduced AHF hospitalization rates will be critical for the care of patients with heart failure in the COVID-19 era.

Conflict of interest: none declared.

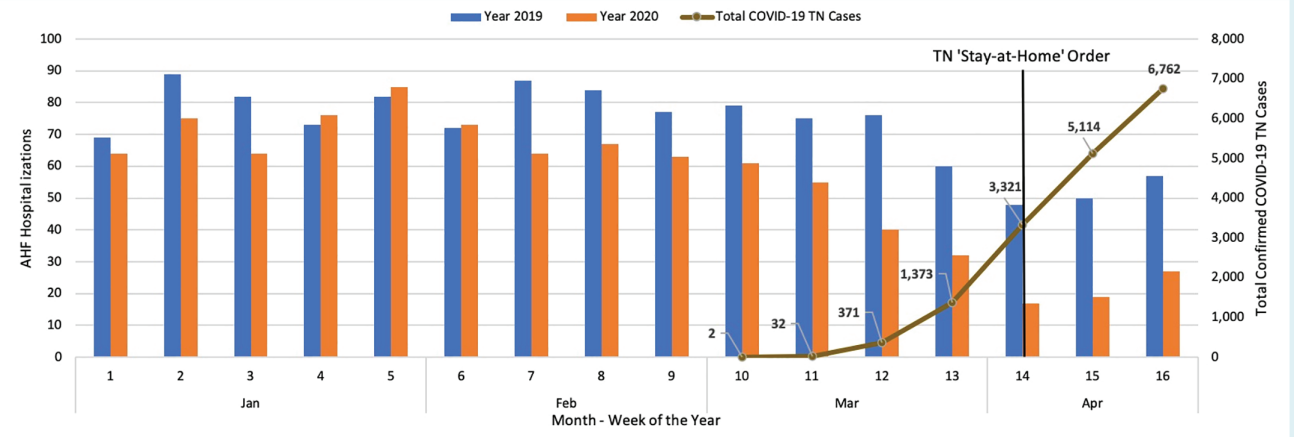

Figure 1 The number of hospital admissions for acute heart failure (AHF) in weekly intervals to Vanderbilt University Medical Center decreased both compared to the same time period in 2019 and in current year as confirmed cases of COVID-19 began to rise.[5] The 'stay-at-home' order for the state of Tennessee (TN) was signed on April 2, 2020.

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Excess out-of-hospital deaths during the COVID-19 outbreak: evidence of pulmonary embolism as a main determinant

Coronavirus disease 2019 (COVID-19) deteriorates pulmonary function and can lead to acute hypoxaemic respiratory failure. COVID-19 may also directly impact the cardiovascular system.[1] Cases of pulmonary embolism (PE) were reported in in-hospital settings[2–5] and in a small post-mortem autopsy series.[6] Our study investigates the relation between PE and out-of-hospital unexplained death during COVID-19 outbreak.

The Institute of Forensic Medicine of Paris (IFMP) regularly performs unenhanced post-mortem computed tomography (PMCT) on deceased subjects upon judicial request to investigate death causes. The study objective was to compare proximal PE rate on PMCT between subjects suspected of COVID-19 during the outbreak peak in Paris (from 23 March to 7 April 2020, COVID-19-suspected group) and subjects scanned during 2019 (control group).

We analysed ≥18-year-old subjects presenting unexplained death explored with PMCT, excluding traumas and putrefied bodies. During the COVID-19 outbreak peak, only subjects who were suspected to have contracted COVID-19 were included. As virologic tests were not performed due to prioritization of reverse-transcriptase polymerase chain reaction tests to living patients, the COVID-19-suspected status was determined following clinical context and lung computed tomography abnormalities which have demonstrated a high diagnostic value.[7] Thoracic and limb PMCTs were blindly read by two experts and disagreements were solved in consensus. Proximal PE and deep vein thrombosis (DVT) were defined according to previous study criteria.[8] In accordance with French legislation, Ethics Committee approval was not needed for this retrospective, non-interventional study; commitment to compliance was filed (Reference Methodology MR-004, no. 2617140420). Statistical analysis was performed with R software, using Fisher and Mann–Whitney U tests for comparisons, and logistic regression to adjust odds ratio (OR) on age and sex. Results are expressed as median and interquartile range (IQR).

The unexplained death rate was strikingly higher during COVID-19 outbreak peak [68 (79%) of 86 deaths] than during the control