


Long-term outcomes after heart failure hospitalization during the COVID-19 pandemic: a multisite report from heart failure referral centers in London

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Abstract

Aims Patients hospitalized for heart failure (HF) had worse in-hospital outcomes during the first wave of the COVID-19 pandemic. However, their long-term outcomes are unknown. We describe long-term outcomes among patients who survived to hospital discharge compared with patients hospitalized in 2019 from two referral centers in London during the COVID-19 pandemic.

Methods and results In total, 512 patients who survived their hospitalization for acute HF in two South London referral centers between 7 January and 14 June 2020 were included in the study and compared with 725 patients from the corresponding period in 2019. The primary outcome was all-cause mortality. The demographic characteristics of patients admitted in 2020 were similar to the 2019 cohort. Median (IQR) follow-up was 622 (348–691) days. All-cause mortality after discharge remained significantly higher for patients admitted in 2020 compared with the equivalent period in 2019 ($P < 0.01$), which may relate to observed differences in place of care with fewer patients being managed on specialist cardiology wards during the COVID-19 pandemic.

Conclusion Hospitalization for HF during the first wave of the COVID-19 pandemic was associated with higher all-cause mortality among patients who survived to discharge. Further studies are necessary to identify predictors of these adverse outcomes to improve outpatient management during a critical period in the management of acute HF.

Keywords COVID-19; Coronavirus; Acute heart failure; Mortality; Hospitalization

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Background

Admission for acute heart failure (HF) during the coronavirus disease (COVID-19) pandemic has been associated with higher in-hospital mortality.^{1–4} While the number of patients presenting to hospital with HF reduced over the peak of the pandemic, those who did present had more adverse outcomes.² Similarly, out-of-hospital mortality rates increased for patients with pre-existing cardiovascular conditions over the course of the pandemic.⁵ However, there remains a paucity of information regarding post-discharge mortality in patients hospitalized for acute HF during the pandemic in the UK.

Notably, before the outbreak, the National Heart Failure Audit (NHFA) reported an association between specialty cardiology input during hospitalization for acute HF and both 30 day and 1 year survival post-discharge.⁶ Given that the availability of cardiology services was restricted during the peak of the COVID-19 pandemic and patients presented to the hospital more unwell,^{7–9} it is possible that patients hospitalized during this period and survived until discharge would have higher post-discharge mortality. Furthermore, while the UK has had high rates of COVID-19 infections and recorded an increase in the number of acute cardiovascular deaths in the community,¹⁰ we still do not know

whether this applies to patients who have been admitted for acute HF.

Methods

In this retrospective study, we analysed all consecutive patients admitted for HF between 7 January and 14 June 2020, and the equivalent period in 2019, in King's College Hospital and Princess Royal University Hospital, London, UK. Patients who survived to discharge with a discharge diagnosis of HF in the first or second diagnostic position based on local Hospital Episode Statistics (HES) data, as well as available

outcome data, were included in our analysis. Patients admitted or tested positive for COVID-19 on admission were excluded. The primary outcome was all-cause mortality.

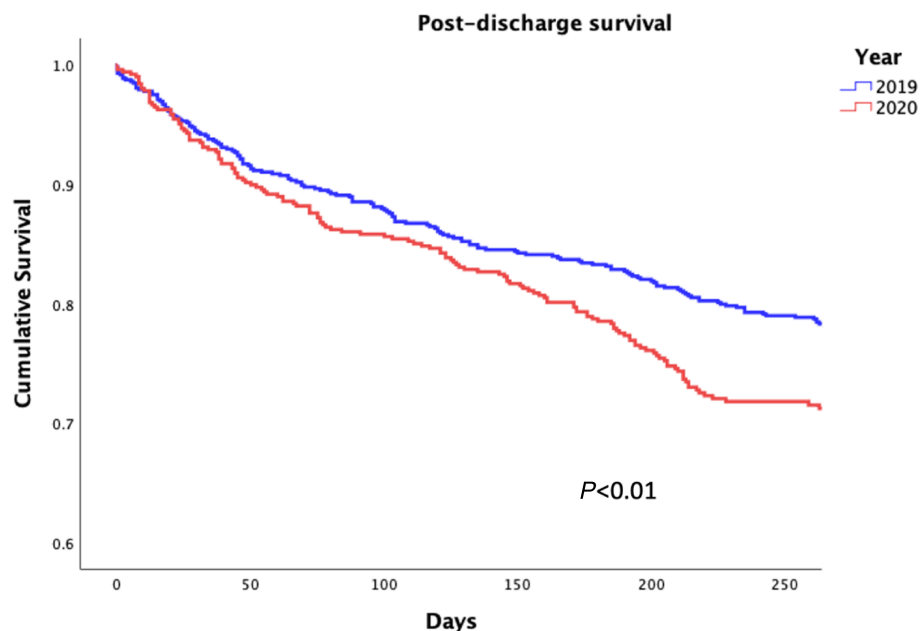
Results are expressed as mean \pm standard deviation (SD), median (interquartile range [IQR]), or count (percentage), where appropriate. The baseline characteristics between years were analysed using Student's *t*-test and Mann–Whitney *U* for parametric and non-parametric variables respectively whereas the χ^2 test was performed when comparing categorical variables. Normality was assessed using the Shapiro–Wilk test. Kaplan–Meier curves for all-cause mortality were used to compare survival between 2019 and 2020 using the log-rank test. Cox-proportional hazard models were performed to adjust for possible confounders from an

Table 1 Demographic characteristics of patients that survived to discharge

		2020	2019	P-value
Number of admissions (total <i>n</i> = 1237)		512	725	
Age, years, median (IQR)		80 (71–87)	79 (69–87)	0.51
Male, sex, <i>n</i> (%)		251 (49)	394 (54)	0.07
Ethnicity, <i>n</i> (%)	White	348 (68)	483 (72)	0.07
	Black	89 (17)	153 (23)	
	Other	41 (8)	39 (6)	
Specialty at discharge, <i>n</i> (%)	Cardiology	111 (22)	203 (28)	0.04
	General medicine	195 (38)	260 (36)	
	Other	206 (40)	262 (36)	
Diagnostic position, <i>n</i> (%)	First	340 (66%)	463 (64%)	0.36
	Second	172 (34%)	262 (36%)	
Length of stay, days, median (IQR)		6 (9)	7 (11)	0.22

IQR, interquartile range.

Figure 1 Kaplan–Meier curve for post-discharge mortality in the 2019 and 2020 cohorts.



unselected list of candidate variables. Data analysis was performed using Statistical Package for Social Sciences (SPSS), for Windows, Version 27 (IBM Corp, Armonk, New York, USA).

Results

Of the 1372 hospitalizations, 1237 (90%) patients survived to discharge and were included in the present analysis. Three patients were excluded due to missing outcome data. In total, 512 patients were admitted from 7 January to 14 June 2020, compared with 725 during the equivalent period in 2019. Median (IQR) follow-up for the whole cohort was 622 (348–691) days. The 2020 cohort were similar to the 2019 patients with respect to demographic characteristics (*Table 1*). For the 2020 cohort, the median (IQR) age was 80 (71–87) years and 49% were male. We observed a significant difference in place of care, with a reduction in specialist cardiology input and more care delivered on general medical wards ($P = 0.04$). No difference between rates of HF diagnosis in the first and second diagnostic positions was observed. The number of patients that died post-discharge for 2020 and 2019 cohorts was 172 (44%) and 321 (34%), respectively. The Kaplan–Meier survival curves demonstrated significantly higher all-cause mortality after discharge among patients admitted in 2020 (log rank test $P < 0.01$) (*Figure 1*). At multivariable analysis, admission with HF in 2020 remained independently associated with worse prognosis (hazard ratio 1.24, 95% confidence intervals 1.01–1.53; $P = 0.04$), together with age, and female sex.

Conclusions

This study is the first to describe long-term outcomes of patients admitted during the first wave of the pandemic compared with the previous year. Our findings show an association between admission with HF in 2020 and increased all-cause mortality even after discharge, when compared with 2019 hospitalizations. This develops the notion

of increased out-of-hospital mortality in patients with cardiovascular conditions described in several countries.^{5,7,10}

Interestingly, being admitted with HF in 2020 remains an important independent prognostic factor. The prognostic discrepancy between 2020 and 2019 may be attributed to several factors. Among those, the sicker status at presentation and the reconfiguration of specialist care due to the unprecedented strain imposed on hospitals by the pandemic might have played a role.¹¹ Indeed, it is well established that specialist input for patients with reduced ejection fraction (HFrEF) during HF hospitalization is associated with better 30 day and 1 year mortality.⁶ Furthermore, our findings may also challenge the effectiveness of virtual healthcare, given the increased use of telephone follow-up consultation to combat restrictions on face-to-face appointments, but this requires further research.

Our study has some limitations. First, our analysis was limited to two South London referral centers. Therefore, it may not be generalizable to healthcare settings dissimilar in COVID-19 incidence, which warrants further multicenter studies. Second, we may have introduced selection bias by only including patients with available data. Third, we did not have data on other variables, including clinical characteristics, prescribed medications, rates of specialty cardiology input, and follow-up. Limiting the analysis to only those with available clinical data might have introduced an additional selection bias. Fourth, we only report associations and do not prove a causal relationship. Finally, we excluded patients with confirmed COVID-19 on admission but could not account for patients who acquired COVID-19 during their hospitalization or in the community post-discharge as we were unable to ascertain cause of death. Nonetheless, as pre-existing cardiovascular disease increases the risk for adverse outcomes after coronavirus infection,¹² our results remain relevant.

The COVID-19 pandemic stretched HF services and fewer patients were managed on specialist wards. This was associated with increased all-cause mortality post-discharge. Further research is required to validate our findings across other centers and countries but, if confirmed, highlights a need for careful follow-up of patients who are discharged following hospitalization during the COVID-19 pandemic.

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