"Unraveling Disparities in Right Heart Failure: A Comprehensive Analysis of Demographics, Socioeconomic Factors, and Mortality Predictors in a 117,633-Patient Cohort (2017-2020)"

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Introduction

Right heart failure (RHF) is characterized by right ventricular systolic dysfunction and inadequate forward flow of blood into the lungs, culminating in clinical signs and symptoms of dyspnea, congestive hepatopathy, and edema.

Independent of the etiology, RHF Cause. Independent Increase in Mortality of Patients.

Large-scale socio-economic, demographic, and mortality predictors will help allocate resources efficiently.
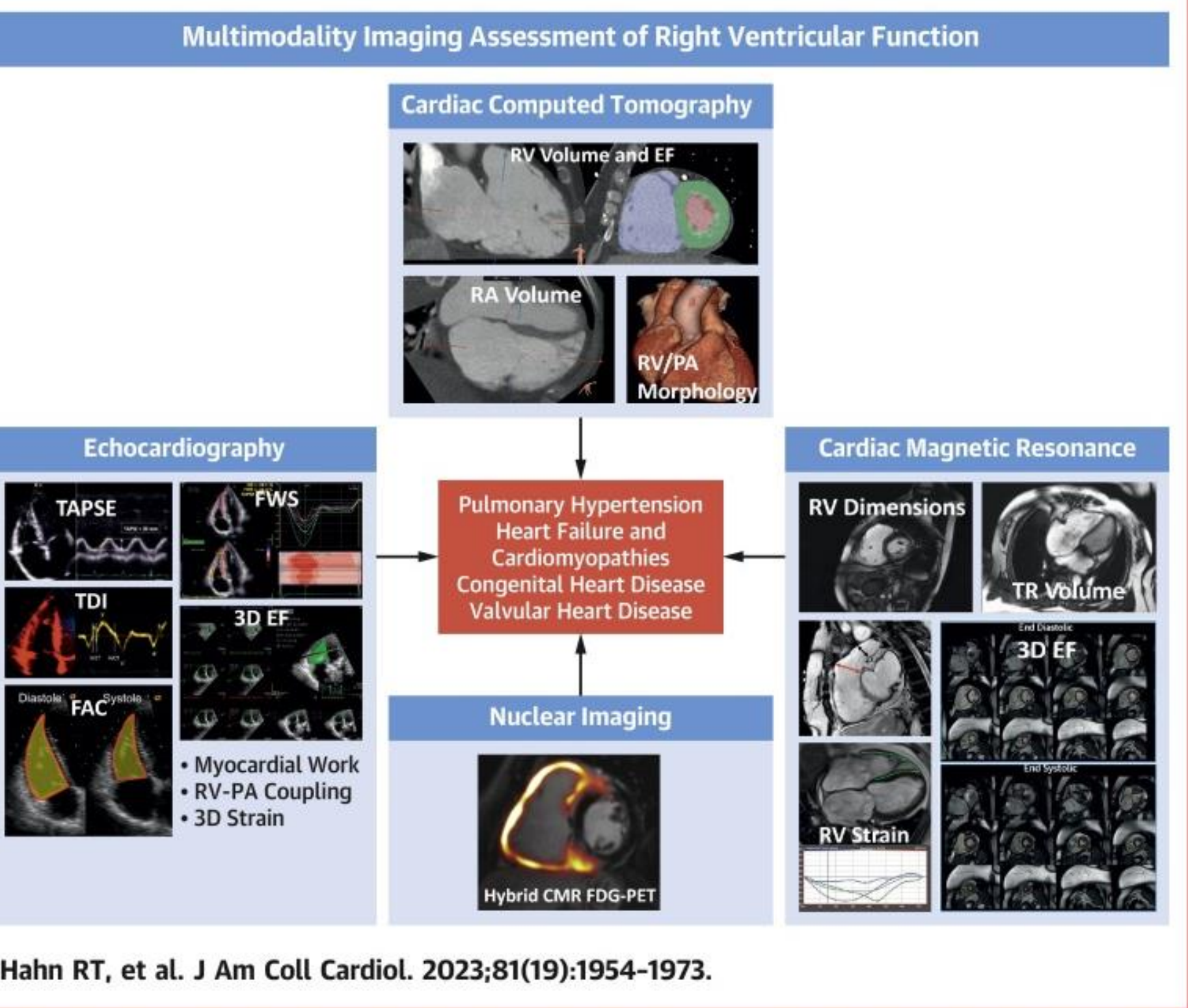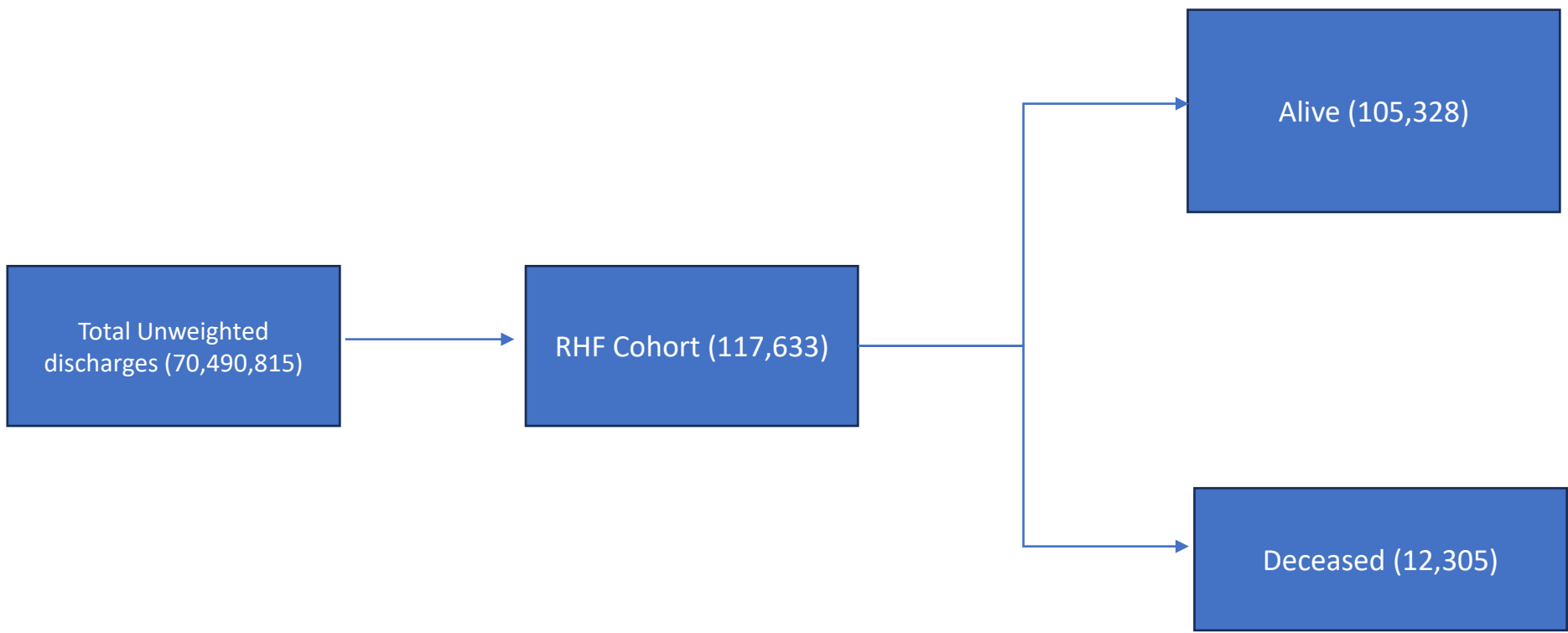

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Research Goal

We aimed to identify the predictors of mortality in patients diagnosed with RHF and discern differences in demographic, socioeconomic, and health between survivors and the deceased.

Methods

We used a large cohort of 117,633 individuals diagnosed with RHF over four years (2017-2020) with 70,490,815 unweighted discharges from the National Readmission Database (NRD) supplied by the Agency for Healthcare Research and Quality (AHRQ).

Baseline characteristics were obtained and compared between survivors and non-survivors. ANOVA analysis was performed to identify differences in groups. predictors. An alpha level of <0.05 was used to indicate statistical significance.

Results

Baseline characteristics for index admissions

	Died	Alive	Total	p-value
Unweighted discharges	10.46% (12,305)	89.54% (105,328)	117,633	
Indicator of sex				0.078
Male	47.04%	47.88%	47.79%	
Female	52.96%	52.12%	52.21%	
Age in years at admission, Mean (SD)	68.72 (14.62)	66.45 (15.67)	66.69 (15.58)	<0.001
Age group				<0.001
18-<45 y	7.16%	10.12%	9.81%	
45-<65 y	27.37%	31.49%	31.06%	
≥65 y	65.47%	58.39%	59.13%	
LOS during index admission				<0.001
<7 days	53.56%	57.97%	57.51%	
≥7 days	46.44%	42.03%	42.49%	
Median household income national quartile for patient ZIP Code				<0.001
0-25th %ile	25.53%	27.10%	26.93%	
26th-50th %ile (Median)	26.92%	27.53%	27.47%	
51st-75th %ile	25.73%	25.39%	25.43%	
76th-100th %ile	21.82%	19.98%	20.18%	
Total charges				<0.001
<$50k	26.23%	48.50%	46.17%	
$50k - <$100k	22.45%	24.47%	24.26%	
≥$100k	51.33%	27.03%	29.57%	
Total charges adjusted for yearly inflation				<0.001
<$50k	26.70%	49.15%	46.80%	
$50k - <$100k	22.54%	24.32%	24.14%	
≥$100k	50.75%	26.53%	29.06%	
Total Cost				<0.001
<$10k	15.85%	34.27%	32.34%	
$10k - <$25k	29.81%	37.89%	37.05%	
$25k - <$50k	24.69%	16.11%	17.01%	
$50k - <$100k	16.64%	7.45%	8.41%	
≥$100k	13.01%	4.28%	5.19%	
Primary expected payer/insurance				<0.001
Medicare	68.55%	66.58%	66.79%	
Medicaid	10.75%	14.23%	13.87%	
Private Insurance	15.58%	14.96%	15.03%	
Self-pay	2.11%	2.01%	2.02%	
No charge	0.11%	0.18%	0.17%	
Other	2.90%	2.03%	2.12%	
Calendar year				<0.001
2017	6.37%	5.97%	6.01%	
2018	26.71%	28.65%	28.44%	
2019	31.16%	33.59%	33.34%	
2020	35.76%	31.79%	32.21%	

- Among 117,633 patients, 12,305 (10.46%) died during the index admission.

- Survivors were younger (66.45 years versus 68.72 years, *p*<0.001) with the majority of the deceased ≥65 years old.

- LOS, median household income, total charges, total cost, and primary expected payer/insurance differed between both groups (all *p*<0.001).

Results

Mortality Predictors	Adjusted OR	Standard Error	p-value	[95% CI]
Age group, 18 to <45 y	Reference			
45 to <65 y	1.283	.053	<0.001	1.184	1.391
≥65 y	1.76	.078	<0.001	1.614	1.919
Female	1.094	.022	<0.001	1.052	1.137
LOS during index admission, ≥7 days	1.127	.022	<0.001	1.085	1.171
Primary expected payer/insurance, Medicare	Reference			
Medicaid	.974	.037	.483	.903	1.049
Private Insurance	1.168	.037	<0.001	1.098	1.243
Self-pay	1.331	.094	<0.001	1.158	1.53
No charge	.83	.234	.51	.478	1.443
Other	1.55	.094	<0.001	1.376	1.745
Comorbidities				
Myocardial Infarction	1.794	.046	<0.001	1.706	1.887
Congestive Heart Failure	.38	.093	<0.001	.235	.613
Peripheral Vascular Disease	1.031	.03	.292	.974	1.092
Cerebrovascular Disease	1.428	.056	<0.001	1.322	1.542
Dementia	1.069	.044	.106	.986	1.158
COPD	.813	.017	<0.001	.78	.846
Rheumatoid Disease	1.015	.043	.791	.931	1.099
Peptic Ulcer Disease	1.216	.09	.008	1.052	1.406
Mild Liver Disease	.842	.033	<0.001	.779	.911
Moderate/Severe Liver Disease	1.542	.066	<0.001	1.418	1.677
Uncomplicated Diabetes	.906	.028	.002	.852	.963
Diabetes with Chronic Complications	.824	.023	<0.001	.78	.872
Hemiplegia or Paraplegia	1.431	.11	<0.001	1.222	1.653
Renal Disease	1.37	.031	.019	1.011	1.132
Cancer (Metastatic)	2.778	.137	<0.001	2.522	3.059
Cancer (Other)	1.343	.057	<0.001	1.236	1.46
AIDS	1.066	.163	.675	.79	1.439
Hypertension	.687	.016	<0.001	.657	.719
COVID-19	5.971	.342	<0.001	5.336	6.68
CCI ≥4	1.145	.039	<0.001	1.07	1.224

Readmission within 30 days

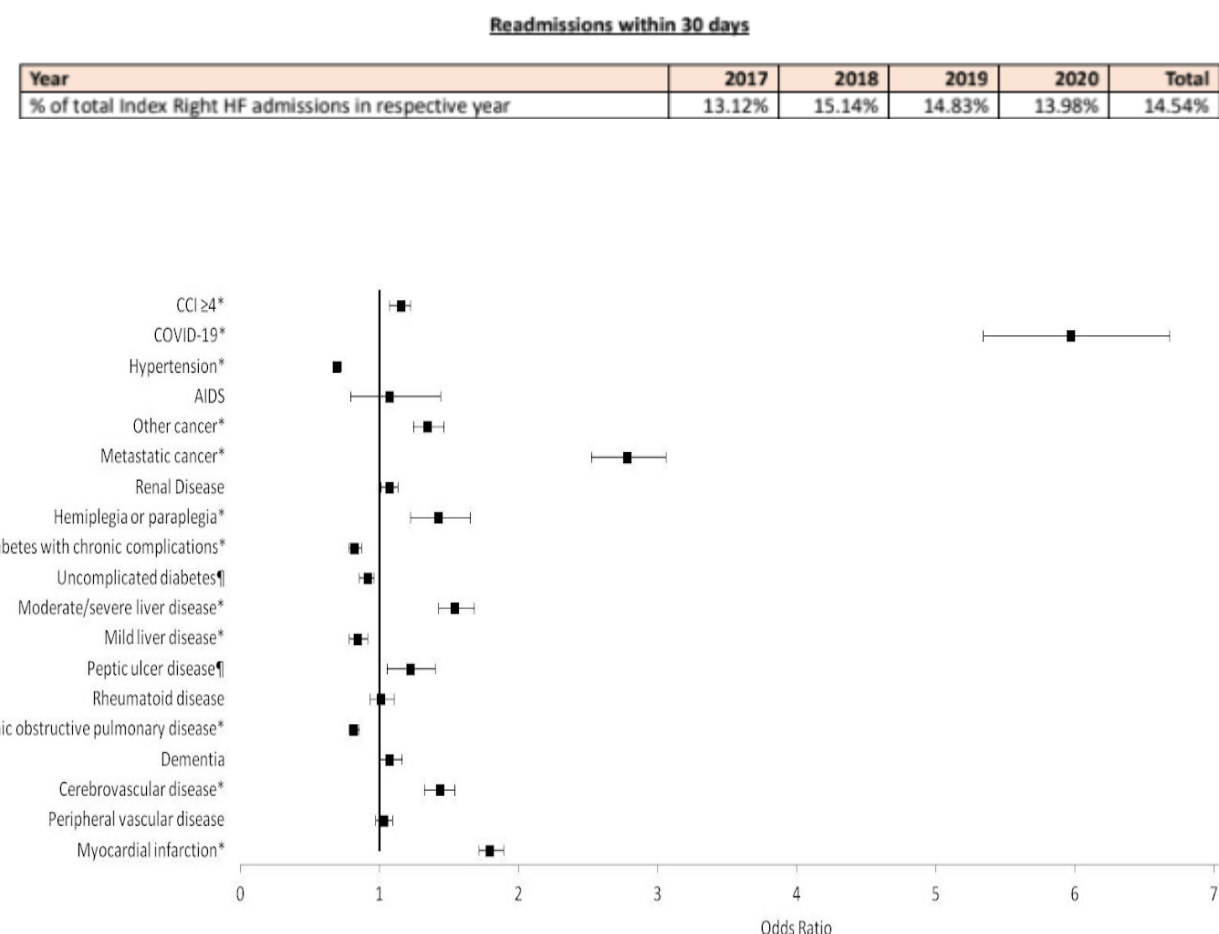| Year	2017	2018	2019	2020	Total
% of total Index Right HF admissions in respective year	13.12%	15.14%	14.83%	13.98%	14.54%

Figure 2. Forest plot of predictors of mortality based on comorbidities. Point estimates with 95% confidence intervals are shown. Logistic regression (LR) analysis (age and gender adjusted) was performed*p<0.001
*p<0.01
CCI: Charlson Comorbidity Index

- Nearly all assessed co-morbidities were significantly higher in non-survivors compared to survivors except for chronic obstructive pulmonary disease, mild liver disease, diabetes mellitus (uncomplicated and with chronic complications) and hypertension.

- Charlson Comorbidity Index (CCI) was ≥4 for 56% of non-survivors and 48.96% in survivors.

- The strongest predictors of mortality were COVID-19 infection (OR: 5.97, 95% CI: 5.34-6.68), metastatic cancer (OR: 2.78, 95% CI: 2.5-3.06), and myocardial infarction (OR: 1.79, 95% CI: 1.71-1.89).

- The readmission rate over four years was 14.54%.

Conclusion

In this large study comprising 70 million discharges, the patient cohort consisted of 117,33 patients who had a 10.46% mortality in the cohort.

This study provides valuable insights into the patient profile and outcomes associated with RHF, highlighting differences in demographics, socioeconomic factors, and comorbidities among survivors and non-survivors.

This database is composed of discharge-level hospitalization data from 28 geographically dispersed states across the United States.

Patients were presented from all income quartiles and the mortality differed between groups. Interestingly, the highest national quartile for patient zip code had the highest mortality.

Patients who died of RHF had increased incidence of Myocardial Infarction, Peripheral Vascular Diseases, Severe liver disease, and renal disease.

MACCE-related diagnoses were significantly higher in the non-survivor group when compared to the survivor group.

Out of all the predictors, COVID-19, metastatic cancer, cerebrovascular disease, myocardial infarction, and moderate to severe liver disease were statistically significant.

Acknowledgements

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