

## Supplementary Materials

# Incidence and Impact of Takotsubo Syndrome in Hospitalized COVID-19 Patients

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**SUPPLEMENTAL TABLE I. International Classification of Disease, 10th edition, Clinical Modification (ICD-10-CM) Codes Used for Comorbidities and Complications**

<b>Comorbidities/complications</b>	<b>ICD-10 code</b>
Takotsubo syndrome	I5181
COVID-19	U071
<b>Comorbidities</b>	
Smoking	F17-F17299, Z720, Z87891
Hypertension	I10, I15-I159
Diabetes mellitus	E10-E109, E11-E119, E13-E139
Hyperlipidemia	E780-E785
Obesity	Z683-Z6839, Z684-Z6845, E66-E669
Anxiety	F064, F40-F409, F41-F419
Depression	F32-F329, F33-F339, F341
Obstructive sleep apnea	G473-G4739
Chronic kidney disease	N18-N189
COPD	J41-J418, J42, J43-J439, J44-J449
Anemia	D50-D59, D60-D64
Cancer	C00-C969, D00-D099
<b>Complications</b>	
Cardiac arrest	I46-I469
Cardiogenic shock	R570
Ventricular arrhythmia	I472, I490-I4902
Acute kidney injury	N17-N179
Acute respiratory failure	J960-J9622
Mechanical ventilation	J810, J951, J952, J953, J9584, J960, J962, J80, R0603, 5A19[345]5Z <sup>6</sup>

COPD, chronic obstructive pulmonary disease; COVID-19, coronavirus disease 2019.

**SUPPLEMENTAL TABLE II. Baseline Characteristics of Unmatched Cohort**

Variables	Unmatched Cohort		P value
	COVID-19 without TTS	COVID-19 with TTS	
<b>No.</b>	211,448	171	
<b>Age, mean (SD), y</b>	64.26 (16.84)	68.95 (12.95)	<.001
<b>Sex, No. (%)</b>			<.001
Male	111,684 (52.8)	61 (35.7)	
Female	99,756 (47.2)	110 (64.3)	
Unknown	8 (0.0)	0 (0.0)	
<b>Race, No. (%)</b>			.02
White	107,524 (50.9)	108 (63.2)	
Black	37,912 (17.9)	22 (12.9)	
Hispanic	42,411 (20.1)	25 (14.6)	
Asian/ Pacific Islander	6,604 (3.1)	8 (4.7)	
Native American	2,131 (1.0)	0 (0.0)	
Other	8,425 (4.0)	4 (2.3)	
Unknown	6,441 (3.0)	4 (2.3)	
<b>Patient location, No. (%)</b>			.86
"Central" counties of metro areas of ≥1 million population	66,762 (31.6)	60 (35.1)	
"Fringe" counties of metro areas of ≥1 million population	49,135 (23.2)	43 (25.1)	
Counties in metro areas of 250,000-999,999 population	39,501 (18.7)	27 (15.8)	
Counties in metro areas of 50,000-249,999 population	18,737 (8.9)	15 (8.8)	
Micropolitan counties	20,056 (9.5)	14 (8.2)	
Non-metropolitan or micropolitan counties	16,427 (7.8)	11 (6.4)	
NA	830 (0.4)	1 (0.6)	
<b>Mean household income, No. (%)</b>			.07
\$1-\$42,999	71,345 (33.7)	40 (23.4)	
\$43,000-\$53,999	57,550 (27.2)	55 (32.2)	
\$54,000-\$70,999	45,586 (21.6)	44 (25.7)	
\$71,000 or more	33,653 (15.9)	30 (17.5)	
Unknown	3,314 (1.6)	2 (1.2)	
<b>Primary payer, No. (%)</b>			.03
Medicare	10,9532 (51.8)	112 (65.5)	

Medicaid	25,491 (12.1)	13 (7.6)	
Private including HMO	58,485 (27.7)	35 (20.5)	
Self-pay	7,186 (3.4)	4 (2.3)	
No charge	1 (0.2)	0 (0.0)	
Other	9,826 (4.6)	7 (4.1)	
Unknown	407 (0.2)	0 (0.0)	
<b>Hospital type, No. (%)</b>			.10
Rural	24,651 (11.7)	14 (8.2)	
Urban non-teaching	40,560 (19.2)	26 (15.2)	
Urban teaching	14,6237 (69.2)	131 (76.6)	
<b>Hospital region, No. (%)</b>			.002
Northeast	37,365 (17.7)	36 (21.1)	
Midwest	49,157 (23.2)	56 (32.7)	
South	88,504 (41.9)	49 (28.7)	
West	36,422 (17.2)	30 (17.5)	
<b>Hospital bed size, No. (%)</b>			.01
Small	54,200 (25.6)	38 (22.2)	
Medium	61,049 (28.9)	36 (21.1)	
Large	96,199 (45.5)	97 (56.7)	
<b>Comorbidities, No. (%)</b>			
Smoking	56,586 (26.8)	50 (29.2)	.52
Hypertension	87,998 (41.6)	57 (33.3)	.03
Diabetes mellitus	85,541 (40.5)	70 (40.9)	.96
Hyperlipidemia	88,805 (42.0)	84 (49.1)	.07
Obesity	59,865 (28.3)	40 (23.4)	.18
Anxiety	27,007 (12.8)	42 (24.6)	<.001
Depression	24,071 (11.4)	30 (17.5)	.02
Obstructive sleep apnea	21,753 (10.3)	10 (5.8)	.07
Chronic kidney disease	41,573 (19.7)	39 (22.8)	.35
COPD	31,065 (14.7)	42 (24.6)	<.001
Anemia	42,186 (20.0)	50 (29.2)	.003
Cancer	7,566 (3.6)	6 (3.5)	.99

COPD, chronic obstructive pulmonary disease; COVID-19, coronavirus disease 2019; TTS, takotsubo syndrome.

**SUPPLEMENTAL TABLE III. Standardized Mean Differences of Covariates Before and After Propensity Score Matching Between COVID-19 patients With and Without TTS.**

Variable	Type	SMD	
		Baseline	Matched
Age	Continuous	0.3119	0.0002
<b>Sex</b>			
Male	Binary	-0.1715	-0.0234
Female	Binary	0.1715	0.0234
Unknown	Binary	0	0
<b>Race</b>			
White	Binary	0.1231	0
Black	Binary	-0.0506	0.0117
Hispanic	Binary	-0.0544	-0.0273
Asian/Pacific Islander	Binary	0.0156	0.0039
Native American	Binary	-0.0101	0
Other	Binary	-0.0165	0
Unknown	Binary	-0.0071	0.0117
<b>Patient location</b>			
“Central” counties of metro areas of ≥1 million population	Binary	0.0351	0.0117
“Fringe” counties of metro areas of ≥1 million population	Binary	0.0191	-0.0253
Counties in metro areas of 250,000-999,999 population	Binary	-0.0289	0.0078
Counties in metro areas of 50,000-249,999 population	Binary	-0.0009	-0.0019
Micropolitan counties	Binary	-0.013	0
Non-metropolitan or micropolitan counties	Binary	-0.0134	0.0097
NA	Binary	0.0019	-0.0019
<b>Mean household income</b>			
\$1-\$42,999	Binary	-0.1035	0.0068
\$43,000-\$53,999	Binary	0.0495	-0.0136
\$54,000-\$70,999	Binary	0.0417	-0.0244
\$71,000 or more	Binary	0.0163	0.0292
Unknown	Binary	-0.004	0.0019
<b>Primary payer</b>			
\$1-\$42,999	Binary	0.137	-0.0136
Medicare	Binary	-0.0445	-0.0331
Medicaid	Binary	-0.0719	0.0234
Private including HMO	Binary	-0.0106	0.0058

Self-pay	Binary	-0.0025	0
No charge	Binary	-0.0055	0.0175
Other	Binary	-0.0019	0
<b>Hospital type</b>			
Rural	Binary	-0.0347	-0.0039
Urban non-teaching	Binary	-0.0398	0.0058
Urban teaching	Binary	0.0745	-0.0019
<b>Hospital region</b>			
Northeast	Binary	0.0338	0.0136
Midwest	Binary	0.095	-0.0107
South	Binary	-0.132	-0.0019
West	Binary	0.0032	-0.001
<b>Hospital bed size</b>			
Small	Binary	-0.0341	-0.0039
Medium	Binary	-0.0782	0.0097
Large	Binary	0.1123	-0.0058
<b>Comorbidities</b>			
Smoking	Binary	0.0248	-0.001
Hyperlipidemia	Binary	0.0712	-0.0273
Hypertension	Binary	-0.0828	0.037
DM	Binary	0.0048	0.0117
Obesity	Binary	-0.0492	-0.0078
OSA	Binary	-0.0444	-0.0058
CKD	Binary	0.0315	-0.0097
COPD	Binary	0.0987	-0.0019
Anxiety	Binary	0.1179	0.0078
Depression	Binary	0.0616	-0.0078
Anemia	Binary	0.0929	-0.0175
Cancer	Binary	-0.0007	-0.0058

CKD, chronic kidney disease; COPD, chronic obstructive pulmonary disease; COVID-19: coronavirus disease 2019; DM, diabetes mellitus; OSA, obstructive sleep apnea; TTS, takotsubo syndrome

**SUPPLEMENTAL TABLE IV. Outcomes of TTS in Non-COVID-19 Cohort**

<b>Variables</b>	<b>TTS in Non-COVID-19</b>
No. (%)	7,932 (0.13)
<b>Outcomes</b>	
Death, No. (%)	580 (7.31)
Cardiac Arrest, No. (%)	340 (4.29)
Cardiac Shock, No. (%)	558 (7.04)
Ventricular Arrhythmia, No. (%)	554 (6.99)
AKI, No. (%)	2,001 (25.21)
ARF, No. (%)	2,547 (32.11)
Mechanical Ventilation, No. (%)	1,406 (17.73)
LOS, mean (SD), days	6.98 (9.58)
Total charge, mean (SD), USD	112,881.40 (227,113.50)

AKI, acute kidney injury; ARF, acute respiratory failure; COVID-19, coronavirus disease 2019; LOS, length of stay; TTS, takotsubo syndrome.