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Outcomes of In-hospital Cardiopulmonary Resuscitation in Patients with and without History of Heart Transplantation: Results from National Inpatient Sample 2000-2014

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Introduction: According to the American Heart Association update in 2017, 2,804 patients underwent heart transplantation (HT) in the US in 2015. The outcome of cardiopulmonary resuscitation (CPR) in HT patients in comparison to patients without HT during hospitalization is not known. **Methods:** We utilized the National Inpatient Sample database from years 2000 - 2014. We selected non-pregnant patients over the age of 18 who underwent CPR during admission in US hospitals over the specified period. We selected patients with ventricular fibrillation (VF) and cardiac arrest based on International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) and Clinical Classification Software-Diagnoses codes supplied by the Healthcare Cost and Utilization Project (HCUP). Non-VF patients were cardiac arrest patients excluding VF. We used STATA version 13.0 (College Station, TX) for database analysis. **Results:** Our study population consisted of 280,790 discharge records. Baseline characteristics are presented in Table 1. Multivariable logistic regression analysis of mortality and length of stay (LOS) in patients with in-hospital cardiopulmonary resuscitation for cardiac arrest, VF arrest and non-VF arrest with or without HT did not reach statistical significance. **Discussion:** Heart transplant patients are at increased risk of ventricular arrhythmias and death from accelerated atherosclerosis of transplanted heart (cardiac allograft vasculopathy, CAV) or allograft rejection. These patients are susceptible to bradycardic events and electromechanical dissociation related to CAV. **Conclusion:** Through our study, we can conclude that the outcome of HT patients who undergo CPR is the same as those without history of HT.

Characteristics	Odds ratio/Coefficient	p-value	95% confidence interval
In-hospital cardiopulmonary resuscitation for cardiac arrest			
Mortality	1.29	0.32	0.78 – 2.12
LOS	-0.89	0.56	-3.92 – 2.13
In-hospital cardiopulmonary resuscitation for ventricular fibrillation arrest			
Mortality	2.30	0.16	0.72 – 7.38
LOS	0.11	0.97	-6.16 – 6.37
In-hospital cardiopulmonary resuscitation for non-ventricular fibrillation arrest			
Mortality	1.08	0.77	0.65 – 1.79
LOS	-1.36	0.37	-4.36 – 1.64

Baseline characteristics	In-hospital cardiopulmonary resuscitation with history of heart transplantation	In-hospital cardiopulmonary resuscitation without history of heart transplantation	p-value
Total admissions	187	280,603	-
Age	58.32 (SE: 1.24)	67.32 (SE: 0.11)	<0.0001
Female	22.04	44.96	<0.0001
Race			0.29
Caucasian	70.17	64.72	
Black	19.53	19.66	
Hispanic	5.48	9.42	
Asian or Pacific Islander	2.42	2.98	
Native American	0.38	0.49	
Expected primary payer			<0.0001
Medicare	70.96	64.84	
Medicaid	7.12	10.01	
Primary insurance	21.44	17.90	
Self-pay	0.00	4.72	
No charge	0.00	0.37	
Mean household income for patient's Zip code			0.52
0-25 th percentile	26.03	27.80	
26 th -50 th percentile	22.35	25.54	
51 st -75 th percentile	23.63	23.63	
76 th -100 th percentile	27.99	23.03	
Mean Charlson comorbidity index	2.38	2.50	0.35
Risk factors			
Obesity	7.15	7.74	0.75
Smoking	5.21	15.51	<0.0001
Hypertension	62.67	52.24	0.005
Dyslipidemia	22.04	19.31	0.36
Diabetes mellitus	36.18	30.00	0.08
Chronic kidney disease	49.37	20.30	<0.0001
End stage renal disease	20.17	7.40	<0.0001
Peripheral vascular disease	0.55	0.19	0.51
Severe sepsis	21.95	15.24	0.04
Stroke	1.04	5.55	<0.0001
Chronic lung disease	14.79	26.72	<0.0001
Pneumonia	21.58	22.81	0.68
Heart failure	33.81	36.24	0.29
Venous thromboembolism	11.23	6.23	0.046

Hispanics (HR 1.12; 0.85-1.49, p=0.422). There was no evidence of effect modification by gender in any race/ethnic group (p-interaction >0.05). H-ISDN was not significantly associated with mortality among normotensives in any race/ethnic group. **Conclusion:** In real-world practice in a large urban center, there was a suggestion of an inverse association between H-ISDN use and mortality among hypertensive patients, but this was not statistically significant. Use of H-ISDN did show a significant association with lower mortality among hypertensive blacks, which lends support to the benefits of this drug combination in this race/ethnic group.

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Hydralazine/Isosorbide Dinitrate, Blood Pressure and Mortality in Patients with Heart Failure with Reduced Ejection Fraction

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Introduction: The use of hydralazine and isosorbide dinitrate (H-ISDN) has been shown to reduce mortality in African American patients with heart failure with reduced ejection fraction (HFrEF). We aimed to evaluate the association of H-ISDN use with all-cause mortality among HFrEF patients with and without hypertension in large health system serving an inner city population. **Hypothesis:** H-ISDN is associated with lower mortality in patients with hypertension, and this association differs by race/ethnicity. **Methods:** We queried electronic health records to identify all patients ≥18 years old diagnosed with HFrEF (EF <40%) in 2000-2016 at Montefiore Health System, Bronx, NY. Cases were identified based on inpatient or outpatient ICD-9 codes for HF, and EF was based on echocardiographic reports. Hypertension was defined based on ICD-9 code or SBP ≥140mmHg or DBP ≥90mmHg. Patients who died within 30 days from index date were excluded. Multivariable Cox models adjusting for baseline characteristics shown in the Table were performed separately in normotensive and hypertensive patients, and subsequently stratified by race/ethnicity (groups defined a priori). Outcome was all-cause mortality. Median follow-up was 40 (20-79) months (up to December 31, 2017). **Results:** Of 11,962 patients included, mean age was 65.2±15.6, mean EF 22.7±7.3%, 60% were male, 31% were non-Hispanic black, 69% were hypertensive, and 13% were prescribed H-ISDN. Overall, H-ISDN was not significantly associated with mortality among hypertensive (HR 0.88; 0.77-1.01, p=0.084), nor among normotensive patients (HR 1.12; 0.92-1.37, p=0.254). H-ISDN was associated with significant mortality reduction in hypertensive blacks (HR 0.78; 0.63-0.97, p=0.025), but not in hypertensive whites (HR 0.95; 0.69-1.32, p=0.76) or hypertensive

	Total (n=11,962)		Male (n=7,212)		Female (n=4,750)	
	Normotensive (n=3,680)	Hypertensive (n=8,282)	Normotensive (n=2,436)	Hypertensive (n=4,776)	Normotensive (n=1,244)	Hypertensive (n=3,506)
H-ISDN	470 (12.8)	1,119 (13.5)	355 (14.6)	718 (15.0)	115 (9.2)	401 (11.4)
Age	62.4±16.5	66.4±15.0	61.6±15.7	64.1±14.4	64±18.0	69.5±15.2
Race						
NH Whites	912 (24.8)	1,838 (22.2)	605 (24.8)	1,098 (23.0)	307 (24.7)	740 (21.1)
NH Blacks	1,036 (28.2)	2,746 (33.2)	628 (25.8)	1,495 (31.3)	408 (32.8)	1,251 (35.7)
Hispanics	714 (19.4)	1,902 (23.0)	495 (20.3)	1,094 (22.9)	219 (17.6)	808 (23.1)
Others	1,018 (27.7)	1,796 (21.7)	708 (29.1)	1,089 (22.8)	310 (24.9)	707 (20.2)
MI	1,048 (28.5)	2,738 (33.1)	732 (30.1)	1,601 (33.5)	316 (25.4)	1,137 (32.4)
COPD	1,096 (29.8)	2,760 (33.3)	659 (27.1)	1,420 (29.7)	437 (35.1)	1,340 (38.2)
CKD	1,076 (29.2)	1,949 (23.5)	744 (30.5)	1,153 (24.1)	332 (26.7)	796 (22.7)
Malignancy	270 (7.3)	819 (9.9)	174 (7.1)	494 (10.3)	96 (7.7)	325 (9.3)
Aflb	981 (26.7)	1,952 (23.6)	686 (28.2)	1,185 (24.8)	295 (23.7)	767 (21.9)
DM	1,044 (28.4)	3,656 (44.1)	692 (28.4)	2,005 (42.0)	352 (28.3)	1,651 (47.1)
ACEI/ARB	1,915 (52.0)	4,494 (52.3)	1,310 (53.8)	2,642 (55.3)	605 (48.6)	1,852 (52.8)
Beta-blockers	2,362 (64.2)	5,260 (63.5)	1,620 (66.5)	3,146 (65.9)	742 (59.7)	2,114 (60.3)
MRA	777 (21.1)	1,273 (15.4)	547 (22.5)	794 (16.6)	230 (18.5)	479 (13.7)
CCB	542 (14.7)	1,216 (14.7)	359 (14.7)	686 (14.4)	183 (14.7)	530 (15.1)

Continuous variables are shown as mean±SD and compared among groups using ANOVA. Categorical variables are shown as n (%), and compared using chi-square test. Bolded values are p<0.05

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Predicting New Heart Failure Hospitalization Among Patients with an Existing Heart Failure Diagnosis