

# Risk Factors for Poor Outcomes in Children Hospitalized with Acute Decompensated Heart Failure

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## INTRODUCTION

- Acute heart failure is well established as the leading cause of hospitalizations and readmissions for adults in the US.
- Pediatric acute heart failure hospitalizations are less prevalent but carry significant mortality and morbidity.
- Despite being a heterogeneous group, being able to predict which patients are at risk of poor outcomes including death, transplant, or need for readmission can be crucial to reducing poor outcomes.

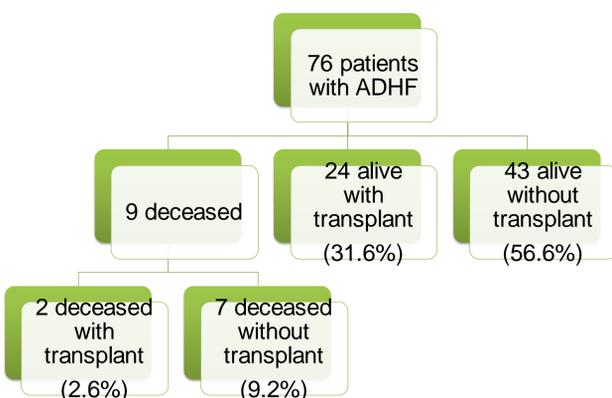
## PURPOSE

Determine risk factors that predict poor outcomes including death, transplant, or readmission following initial hospitalization for acute decompensated heart failure (ADHF) in pediatric patients.

## METHODS

- Retrospective single center review of pediatric patients (age <21 years) hospitalized from 2007 to 2015 with ADHF.
- Diagnoses included cardiomyopathy or repaired two ventricle congenital heart disease.
- Demographics, clinical characteristics during the initial hospitalization, and composite endpoints of death, transplant, or readmission were identified.

### Status at Latest Follow Up



I will not discuss off label use and/or investigational use of drugs/devices. All authors: No relationships to disclose.

## RESULTS

### Patient Characteristics

		Patient Cohort N=76 Mean ± SD or N (%)
Age at Admission (years)		5.2 ± 6.5
Sex		
Male		39 (51.3%)
Female		37 (48.7%)
Race		
Caucasian		40 (52.6%)
African American		5 (6.6%)
Hispanic		13 (17.1%)
Asian/Pacific Islander		7 (9.2%)
Native American		8 (10.5%)
Other		3 (3.9%)
Weight (kg)		25.0 ± 30.1
New Diagnosis at Admit		61 (80.3%)
HF Diagnosis		
DCM		39 (51.3%)
HCM		4 (5.3%)
RCM		2 (2.6%)
LVNC		4 (5.3%)
Myocarditis		22 (28.9%)
Other		5 (6.6%)

### Laboratory Values During Hospitalization

	N=76	Analysis Population Mean ± SD or median, [IQR]
Admission BUN (mg/dL)	76	14.9 ± 9.2
Discharge BUN (mg/dL)	65	20.2 ± 14.2
Admission Creatinine (mg/dL)	76	0.6 ± 0.3
Discharge Creatinine (mg/dL)	65	0.4 ± 0.3
Admission GFR (mL/min/1.73m <sup>2</sup> )	70	82.8 ± 36.4
Discharge GFR (mL/min/1.73m <sup>2</sup> )	62	106.0 ± 35.8
Admission BNP (pg/ml)	68	1390 [537, 2350]
Discharge BNP (pg/ml)	63	224 [68, 450]
Admission Hemoglobin (g/dL)	76	12.0 ± 2.2
Discharge Hemoglobin (g/dL)	43	11.5 ± 1.8
Admission Total Bilirubin (mg/dL)	53	1.7 ± 2.8
Discharge Total Bilirubin (mg/dL)	8	8.6 ± 21.0
Admission Serum Sodium (mEq/L)	75	138.6 ± 4.5
Discharge Serum Sodium (mEq/L)	73	137.1 ± 3.3
Admission ALC (/mm <sup>3</sup> )	76	3069 [1850, 4644]
Discharge ALC (/mm <sup>3</sup> )	76	3279 [1619, 4542]

### Clinical Variables During Hospitalization

	Analysis Population N=76 N (%)
Systolic Dysfunction	69 (90.8%)
Number Inotropes	
0	20 (26.3%)
1	45 (59.2%)
>1	11 (14.5%)
ICU Stay	65 (85.5%)
Mechanical Ventilation	40 (52.6%)
MCS	15 (19.7%)

### Multivariable Cox Proportional Hazard Model for Composite Outcome (Death, Transplant, or Readmission)

	Analysis Population (N=76; Events=31)	
	HR (95% CI)	p-value
Systolic Dysfunction	--	--
MCS	--	--
Admission Ln(BNP)	1.77 [1.20,2.63]	0.004
New Diagnosis at Admit	0.26 [0.12,0.57]	0.001
Admission Sodium	--	--

## RESULTS

### Univariate Cox Proportional Hazard Model for Composite Outcome (Death, Transplant, or Readmission)

	Analysis Population (N=76; Events=31)	
	HR [95% CI]	p-value
Age at Admission (years)	0.99 [0.94,1.04]	0.570
Male	1.00 [0.52,1.93]	0.997
Race		
Caucasian	ref	
Other	1.21 [0.63,2.34]	0.570
Weight (kg)	1.00 [0.99,1.01]	0.821
Systolic Dysfunction	0.33 [0.14,0.80]	<b>0.014</b>
New Diagnosis at Admit	0.37 [0.19,0.74]	<b>0.005</b>
Inotropes (yes)	0.88 [0.43,1.79]	0.728
Number		
0	ref	
1	0.81 [0.38,1.69]	0.569
>1	1.26 [0.46,3.41]	0.652
ICU Stay	0.74 [0.32,1.68]	0.467
Mechanical Ventilation	0.93 [0.49,1.79]	0.834
MCS	1.65 [0.78,3.52]	<b>0.193</b>
Admission BUN	1.01 [0.97,1.06]	0.531
Admission Creatinine	0.83 [0.30,2.30]	0.727
Admission GFR	1.00 [0.99,1.01]	0.430
Admission Ln(BNP)	1.59 [1.10,2.30]	<b>0.014</b>
Admission Hemoglobin	1.10 [0.94,1.28]	0.220
Admission Total Bilirubin	0.99 [0.86,1.13]	0.845
Admission Sodium	1.09 [1.01,1.17]	<b>0.034</b>
Admission Ln(ALC)	1.12 [0.69,1.82]	0.635

### Univariate Cox Proportional Hazard Model for Readmission

	Median [IQR], N (%)	Analysis Population (N=64; Events=19)	HR (95% CI)	p-value
New Diagnosis at Admit	54 (84.4%)	0.44 [0.16,1.22]	0.114	
Systolic Dysfunction	60 (93.8%)	0.42 [0.10,1.83]	0.249	
Inotropes	46 (71.9%)	0.88 [0.34,2.32]	0.801	
ICU Stay	53 (82.8%)	0.56 [0.20,1.55]	0.263	
Mechanical Ventilation	29 (45.3%)	0.50 [0.19,1.32]	0.161	
MCS	9 (14.1%)	0.74 [0.17,3.20]	0.686	
Admission Ln(BNP)	1390 [526, 2180]	1.62 [0.97,2.70]	0.065	
Discharge Ln(BNP)	257 [94, 476]	2.98 [1.73,5.16]	<b>&lt;0.001</b>	
Discharge A	55 (85.9%)	0.48 [0.16,1.46]	0.197	
Discharge Beta Blockers	34 (53.1%)	1.18 [0.47,2.93]	0.722	
Discharge Diuretics	47 (73.4%)	3.65 [0.84,15.79]	0.084	
Discharge Aldactone	33 (51.6%)	1.65 [0.65,4.20]	0.292	
Discharge Milrinone	3 (4.7%)	0.99 [0.13,7.45]	0.995	

## CONCLUSION

- Neither illness severity nor medications at discharge influences the risk of poor outcomes including death, transplant, or readmission.
- BNP at hospital admission and at discharge can predict poor outcomes including need for readmission.
- New diagnoses are protective against composite outcome of death, transplant, or readmission.