มหาวิทยาลัยมหิดล
คณะแพทยศาสตร์โรงพยาบาลรามาธิบดี

Hemodynamic Optimization Might Shorten Length of Stay during Fontan Operation: A Retrospective Analysis

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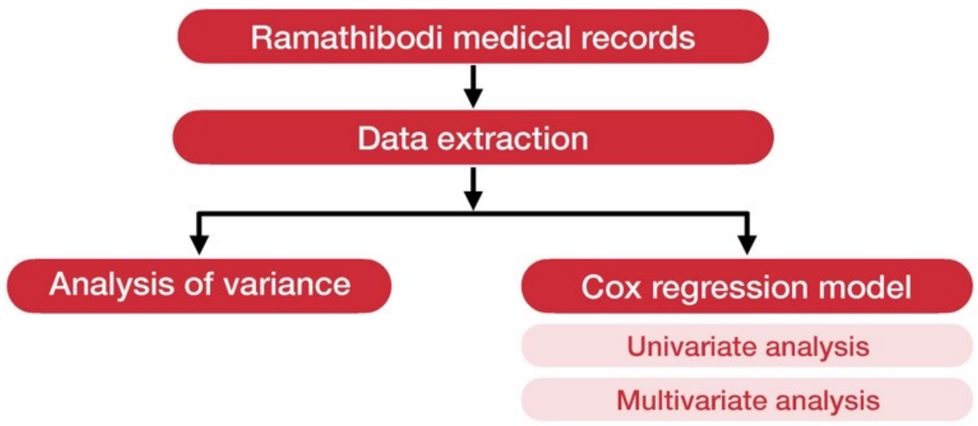
WHAT HAS BEEN KNOWN SO FAR?

- Nearly 10 percent of congenital heart disease belongs to complex congenital heart disease called **single ventricle physiology**.
- **Fontan operation** is a final step of the 3-stage operation which is done to optimize pulmonary circulation during infancy period and then to redirect the systemic venous flow from the upper part of the body and the lower part of the body to the pulmonary circulation respectively.
- There has been no previous study focusing on influence of **hemodynamic and echocardiographic variables** on **length of hospital stay** during Fontan operation.

WHAT DID WE DO?

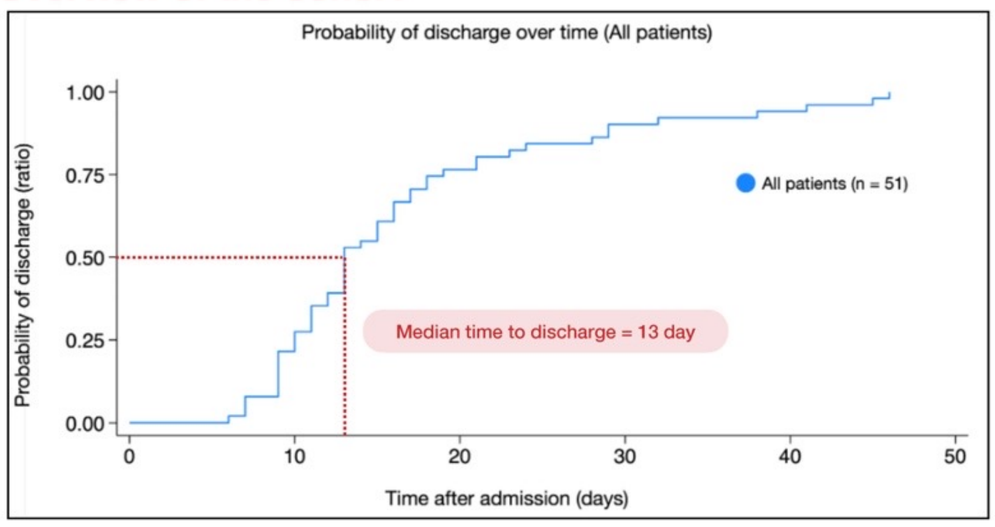


Outcome of interest	**Length of hospital stay**
Variables of interest	**Demographic variables** • Sex • Operative era • Prior palliative procedures **Echocardiographic variables** • Pre-operative anatomy • Systemic ventricle • Mcgoon ratio • Nakata index **Hemodynamics variables** • mPAP • PVRi • Preoperative oxygen saturation • SVEDP

- One-way ANOVA test was applied to determine the mean difference between groups of patients with different variables.
- Cox proportional hazards model was used to determine the significant predictive variables for length of stay.

WHAT DO WE FIND?

Overview of the cohort



Analysis of variance (ANOVA) test

Clinical parameters	No. of Patients	Length of Stay (Days) (Mean ± SD)	P-value
Pre-operative Anatomy (Primary Diagnosis)	**51**		**0.001***
Double inlet left ventricle (DILV)	4 (8%)	14.75 ± 10.21	
Double outlet right ventricle (DORV)	18 (35%)	24.05 ± 12.16	
Hypoplastic left heart syndrome (HLHS)	5 (10%)	13.60 ± 4.16	
Pulmonary atresia (PA)	9 (18%)	12.89 ± 3.55	
Tricuspid atresia (TA)	15 (29%)	11.73 ± 3.84	
Systemic Ventricle	**51**		**<0.001***
Right ventricle	28 (55%)	21.78 ± 4.91	
Left ventricle	23(45%)	12.53 ± 11.70	
mPAP	**51**		**0.235**
< 15 mmHg	38 (74%)	15.76 ± 8.39	
≥ 15 mmHg	13 (25%)	19.21 ± 11.10	
PVRi	**51**		**0.219**
< 2 WU m^2	32 (63%)	15.40 ± 9.41	
≥ 2 WU m^2	19 (37%)	18.89 ± 10.14	
Preoperative oxygen saturation	**46**		**0.626**
< 80%	5 (11%)	19.20 ± 10.83	
≥ 80%	41 (89%)	16.98 ± 9.44	
SVEDP	**51**		**0.005***
< 12 mmHg	21 (41%)	12.24 ± 4.08	
≥ 12 mmHg	30 (59%)	19.83 ± 11.29	
McGoon ratio	**51**		**0.843**
< 2	24 (47%)	16.96 ± 9.77	
≥ 2	27 (53%)	16.44 ± 8.85	
Nakata index	**16**		**0.819**
< 250 mm/m^2	15 (94%)	14.73 ± 7.21	
≥ 250 mm/m^2	1 (6%)	13.00 ± 0.00	
Operative era	**51**		**0.240**
Before 2015	27 (53%)	18.15 ± 8.83	
After 2015	24 (47%)	15.12 ± 9.54	
Prior palliative procedures	**51**		**0.792**
Glenn shunt	18 (35%)	15.67 ± 9.83	
Pulmonary artery banding and Glenn shunt	7 (14%)	18.57 ± 9.09	
Systemic to pulmonary shunt	1 (2%)	19.00 ± 0.00	
Systemic to pulmonary shunt and Glenn shunt	23 (45%)	17.37 ± 9.37	
Other prior palliative procedures	2 (4%)	10.00 ± 4.24	

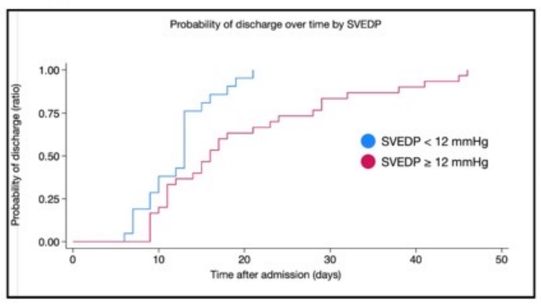
*statistically significant at significance-level-α = 0.05

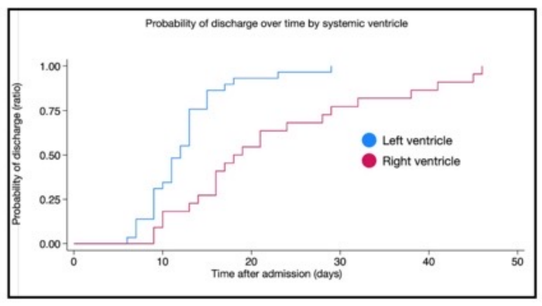
Multivariate cox regression model analysis

Clinical parameters	HR	95% CI	P-value
Systemic right ventricle	0.31	0.16-0.59	<0.001*
SVEDP ≥ 12 mmHg	0.41	0.21-0.80	0.008*

*statistically significant at significance-level-α = 0.05

Kaplan-Meier curves of selected variables





- The patients with **right ventricle** as systemic ventricle were associated with **69% less probability of discharge** in the hospital compared with those with systemic left ventricle (HR: 0.31; 95% CI: 0.16-0.59; P<0.001).
- **SVEDP** of more than **12 mmHg reduced the probability of discharge by 59%** compared to SVEDP of less than 12 mmHg (HR: 0.41; 95% CI 0.21-0.80; P= 0.008).

ABBREVIATIONS: ANOVA = analysis of variance; CI = confidence interval; DILV = double inlet left ventricle; DORV = double outlet right ventricle; HLHS = hypoplastic left heart syndrome; HR = hazard ratio; mPAP = mean pulmonary arterial pressure; PA = pulmonary atresia; PVRi = pulmonary vascular resistance index; SVEDP = systemic ventricular end-diastolic pressure; TA = tricuspid atresia; WU = wood unit

> *"Higher SVEDP (≥ 12 mmHg), and right-sided systemic ventricle significantly lead to longer length of stay during Fontan Operation."*

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