



Published in final edited form as:

*Am J Crit Care*. 2024 January 01; 33(1): 20–28. doi:10.4037/ajcc2024404.

## Mental Health Symptoms in Parents of Infants 3 Months After Discharge Following Neonatal Cardiac Surgery

Amy J. Lisanti, PhD, RN, CCNS, FAHA<sup>1,2,\*</sup>, Ryan Quinn, MPH<sup>1</sup>, Jesse L. Chittams, MS<sup>1</sup>, Megan Laubacher<sup>1</sup>, Barbara Medoff-Cooper, PhD, RN, FAAN<sup>1,2</sup>, Abigail C. Demianczyk, PhD<sup>3</sup>

<sup>1</sup>University of Pennsylvania, School of Nursing, 418 Curie Blvd, Philadelphia, PA 19104

<sup>2</sup>Children's Hospital of Philadelphia, Research Institute, 3401 Civic Center Blvd, Philadelphia, PA 19104

<sup>3</sup>Cleveland Clinic Children's, Center for Pediatric Behavioral Health, 9500 Euclid Ave, Cleveland OH 44195

### Abstract

**Background:** Parents of infants born with congenital heart disease (CHD) are at risk for anxiety, depression, and post-traumatic stress (PTS). Few studies have examined whether modifiable factors exist during postoperative care in the pediatric cardiac intensive care unit (PCICU) influencing parent mental health post-discharge.

**Objective:** To describe mental health symptoms of mother-father dyads of infants with CHD three-months after infant PCICU discharge, and to determine factors during infant PCICU stay that are predictors of such symptoms.

**Methods:** A longitudinal cohort pilot study enrolled 56 parents (28 mother-father dyads) of 28 infants with CHD. During the first post-operative week from cardiac surgery, parents completed questionnaires measuring factors potentially influencing mental health. Three months after discharge, 42 parents of 22 infants completed validated measures on anxiety, depression, and post-traumatic stress (PTS).

**Results:** Three months after discharge, 26% of parents had clinically elevated levels of anxiety symptoms, 21% had clinically significant levels of depressive symptoms, and 19% had posttraumatic stress symptoms. In multivariable analysis, parental role alteration in the PCICU was predictive of anxiety ( $P = .002$ ), depressive ( $P = .02$ ), and posttraumatic stress ( $P = .02$ ) symptoms 3 months after discharge. Higher education level was predictive of anxiety symptoms ( $P = .009$ ). Postnatal CHD diagnosis was predictive of posttraumatic stress symptoms ( $P = .04$ ).

**Conclusions:** Parental role alteration perceived by parents during the PCICU stay is a modifiable stressor contributing to adverse mental health symptoms 3 months after discharge. Interventions targeting parental role alteration in the PCICU are critically needed.

\*Corresponding author: lisanti@upenn.edu, 2657 Old Cedar Grove Rd., Broomall, PA 19008.

**Conflicts of Interest:** None.

## Keywords

parents; heart defects; congenital; critical care; mental health; anxiety; depression; stress disorders; post-traumatic

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## INTRODUCTION

Parents of infants born with congenital heart disease (CHD) are at risk for psychological distress, with increased rates of depression, anxiety and post-traumatic stress (PTS).<sup>1</sup> Parents' mental health is influenced across the lifespan of the child, as early as the prenatal period at the stressful time of diagnosis and throughout infancy and childhood.<sup>2</sup> Arguably one of the most distressing times for parents is during the perioperative period, when newly born infants require cardiac surgery and recovery in the pediatric cardiac intensive care unit (PCICU).<sup>3</sup> Current literature exists regarding the lasting impacts of the ICU experience on parent mental health.<sup>4,5</sup> Few studies have examined to what extent the PCICU experience influences mental health symptoms in parents after infant discharge and if modifiable factors may be intervened upon to mitigate depression, anxiety, or PTS.

The PCICU Parental Stress Model has been proposed as a useful framework to describe the stressors influencing parent mental health during the PCICU experience.<sup>6</sup> The model posits that parents perceive stressors arising from the infant, the PCICU environment, and from within parents themselves, such as parental role alteration, the inability to care for, hold, and protect one's own child. These perceived stressors may elicit stress responses that can exhibit as mental health symptoms of anxiety, depression and PTS. The stress experience may also differ between men and women.<sup>7</sup> Studies have supported these relationships in the PCICU,<sup>8-10</sup> but none have examined whether these stressors have prolonged effect on mental health symptoms after discharge.

The purpose of this pilot study was to describe the mental health symptoms of mother-father dyads of infants with CHD three months after infant hospital discharge for neonatal cardiac surgery. We hypothesized that parents of infants with CHD would continue to experience increased mental health symptoms after hospital discharge and that stressors experienced during their infant's PCICU stay would be associated with those mental health symptoms. The specific aims of this study were to:

1. describe the magnitude of parent mental health symptoms of anxiety, depression, and PTS at three months post discharge;
2. compare differences in mental health symptoms of anxiety, depression and PTS across mother-father dyads; and
3. determine infant, parent, and hospital environmental factors during infant PCICU stay that predict anxiety, depressive, and PTS symptoms at three months post-discharge.

## METHODS

### Design and Sample

With approval from the hospital's institutional review board, the study was carried out with the ethical standards set forth in the Helsinki Declaration. A convenience sample of 28 biological mother-father dyads (56 parents) and their infants was consecutively enrolled from families admitted to a PCICU for neonatal cardiac surgery at one free-standing children's hospitals in the Northeast region from August 2018 to October 2019. This represents an adequate sample size for a pilot study.<sup>11</sup> Enrollment of dyads was specified in our inclusion criteria to reduce heterogeneity within a pilot sample and to allow for comparisons accounting for sex as a biological variable and across pairs of the same infant. Additionally, parents who were at least 18 years of age and could read and speak English were eligible for study inclusion if their infants also met the following inclusion criteria: a) <30 days of age b) >36 weeks gestational age c) birth weight >2500 grams. Infant exclusion criteria were a) listed for a cardiac transplant, or b) receiving end of life/palliative care. Parents were approached for informed consent for themselves and their infants so that demographic, clinical, and surgical data could be collected related to the infant.

Variable selection for the questionnaires and survey data were identified based on the Pediatric Cardiac ICU Parental Stress Model<sup>6</sup> and comprise of stressors arising from the infant, environment, and parent, including personal factors that can impact stress including sex, trait anxiety, and financial strain. Infant cardiac surgeries were categorized using the Society of Thoracic Surgery–European Association for CardioThoracic Surgery Congenital Heart Surgery Mortality scoring system.<sup>12</sup> Parents were instructed to complete study questionnaires on their own within one week of their infant's surgical procedure (baseline data) and again three months after their infant was discharged from the hospital.

### Measures during infant hospitalization within one postoperative week from neonatal cardiac surgery

**Parental Perception of Stressors.**—The *Parental Stressor Scale: Infant Hospitalization* (PSS:IH) measures parental perception of stressors with three subscales: infant appearance and behavior, parental role alteration, and the sights and sounds of the hospital environment.<sup>13</sup> The measure utilizes a 5-point Likert scale and total scores are calculated for each subscale, ranging from 1 to 5, with higher scores indicating greater stress. The instrument is a 22-item questionnaire with established validity and reliability.

**Quality of partner relationship.**—The PCICU Parental Stress Model posits that family dynamics such as the quality of their relationship with their spouses or partners can be a source of stress.<sup>6</sup> The *Dyadic Adjustment Scale* (DAS) is a 32-item instrument that measures the quality of the relationship between partners.<sup>14</sup> The total range of scores is from 0 to 151, with scores below 107 suggesting the quality of relationship is distressed.<sup>15</sup> The DAS has excellent validity and reliability.<sup>16</sup>

**Financial Strain.**—Financial strain was assessed using three items that address: 1) difficulty of living on current total household income; 2) anticipated hardships over the

next two months such as inadequate housing, food, or medical attention; and 3) anticipated reduction over the next two months of their current standard of living. Cronbach's alpha coefficients for this assessment has been reported to range from 0.86 to 0.88.<sup>17</sup>

### Measures Three-Months Post Infant Discharge

**Anxiety Symptoms.**—*The State Trait Anxiety Inventory* is a well-established instrument with two, 20-item subscales: the State-Anxiety scale and the Trait-Anxiety scale.<sup>18</sup> The State-Anxiety subscale measures the extent of anxiety symptoms being experienced in the current moment,<sup>8,19–22</sup> while the Trait-Anxiety subscale measures a stable, individual characteristic of one's tendency towards becoming anxious. Scores can range from a minimum score of 20 to a maximum score of 80 for both subscales, with higher scores indicating higher anxiety levels.

**Depressive Symptoms.**—The *Center for Epidemiological Studies-Depression (CES-D)* is a valid and reliable 20-item instrument that measures the amount of depressive symptoms experienced in the past week using a 4-point Likert scale.<sup>23</sup> A total score is calculated resulting in a possible range of 0 to 60, with a score of 16 or higher indicative of depressive symptoms likely consistent with clinical depression.

**Posttraumatic Stress Symptoms.**—The *Impact of Events Scale – Revised (IES-R)* is a 22-item measure used to assess symptoms of PTS related to a specific traumatic event, which in this case was their infant's hospitalization for cardiac surgery.<sup>24</sup> The IES-R is a well-established measure that has high reliability and validity, and has been used with parents related to their infant's critical illness.<sup>25</sup> Scores can range from 0 to 88, with scores equal to 24 or higher indicating clinical risk of PTS symptoms and scores of 33 or higher indicating probable PTS disorder diagnosis.

### Analysis

Summary statistics were computed for participants' demographic and clinical characteristics. Participant characteristics were compared between mothers and fathers using Chi-squared tests and t-tests. Participants' characteristics were also tested for association with attrition, as not all participants completed the 3-month post-discharge timepoint. Parents' mental health symptoms measured 3 months after discharge from their infants' hospitalization were compared between mothers and fathers using linear mixed effects models.

Associations between each baseline parent and infant characteristic (Tables 1 and 2), perceived stressor, measured at baseline within the first postoperative week in the PCICU, and each mental health symptom, measured at 3 months after discharge, were assessed using linear mixed effects models. Variables which exhibited significant association ( $p < 0.05$ ) with each mental health symptom were included for consideration in the variable selection process for each mental health outcome. Separate linear mixed effects models were constructed for each mental health symptom using a backward selection method. Final models for each mental health outcome, anxiety, depressive, and PTS symptoms, were presented. All models accounted for anticipated correlation between parents of the

same infant using an unstructured covariance matrix. Participants were excluded in the model building process if predictor or outcome data were missing. As a sensitivity analysis, variables associated with participant attrition were included in a multiple imputation model to estimate missing outcome values for subjects lost to attrition, utilizing a multivariate normal imputation method. Statistical analyses were conducted using SAS 9.4 for windows.

## RESULTS

### Participant Characteristics

We consecutively screened 135 families for study enrollment, approaching 60 eligible for consent. Fifty percent of families approached consented for study participation, with those declining due to feeling too stressed or busy to participate, or because they had already enrolled in other research studies. Two mother-father dyads withdrew from the study after providing initial consent because they felt too busy, resulting in a final sample of 28 mother-father dyads. Additional details about the screening and enrollment procedures for this study have been described previously.<sup>10</sup>

Of the 56 participants enrolled in the study, 14 did not complete the 3-month post-discharge timepoint, leaving a final sample of 42 parents of 22 infants, which included 20 dyads. Participants lost to follow-up exhibited higher rates of postnatal diagnosis ( $p=0.008$ ), self-reported history of a depressive disorder diagnosis prior to study enrollment ( $p=0.008$ ), self-reported surgical or medical history prior to study enrollment ( $p=0.011$ ), and tobacco consumption ( $p=0.036$ ) compared to participants who completed the study. Participants lost to follow up exhibited higher mean DAS subscale and total scores ( $p<.01$ ) compared to those who completed the study.

Sample characteristics are presented in Table 1. Most mother-father dyads were White (73.8%) and non-Hispanic (87.8%), had a minimum of a college education (71.4%), and were married. At baseline, there were no significant differences between mothers and fathers on the demographic characteristics collected, except for sex and self-reported history of anxiety disorder. At the time of enrollment, when parents completed the first set of measures including the PSS:IH, the infants of the parent dyads in this sample were on average 10 days old and were 5 days post neonatal cardiac surgery (Table 2). The vast majority (95.5%) had been prenatally diagnosed with CHD.

### Aims 1 and 2 Results: Parent Mental Health

Mental health symptoms reported by mothers and fathers three months after infant discharge are presented in Table 3. Parents reported average Trait-Anxiety scores of 36.27 (SD = 9.86), while State-Anxiety scores were higher on average than Trait-Anxiety scores at 39.21 (SD = 13.01). A total of 26.2% (n=11) of parents reporting State-Anxiety scores above the 75<sup>th</sup> percentile when compared to a normative sample,<sup>18</sup> with significantly more mothers (n=9, 40.9%) than fathers (n=2, 10.0%) reaching this threshold ( $p=0.02$ ). Reported depressive symptoms were 10.56 on average (SD = 10.73), with scores above the cutoff for clinically significant symptoms of depression reported by 21.95% (n=9) of parents. Parents reported mean PTS symptoms of 15.33 (SD = 13.98), with 19.05%

(n=8) of parents reporting enough symptoms to indicate clinical concern for PTS disorder diagnosis, and 11.9% (n=5) reporting symptoms consistent with a probable diagnosis of PTS disorder. Compared to mothers, fathers reported significantly lower State-Anxiety scores ( $p=0.006$ ) and Trait-Anxiety scores ( $p=0.04$ ). Fathers also reported significantly less depressive ( $p=0.03$ ) and PTS symptoms ( $p=0.02$ ) compared to mothers. No significant differences were found between mothers and fathers in rates of clinical concern for diagnosis of depression or PTS disorder.

### **Aim 3 Results: Associations with Parent Mental Health Symptoms**

To determine factors during infant hospitalization predicting anxiety, depressive, and PTS symptoms at three months post-discharge, a separate model was generated for each of the three mental health outcomes (Table 4).

**Anxiety Symptoms:** Trait anxiety, parental role alteration, and parent education were found to be significantly associated with anxiety symptoms as measured by state anxiety scores at 3 months post-discharge. In multivariable analysis, for each one unit increase in parental role alteration, anxiety symptoms were estimated to increase by  $5.98 \pm 1.64$  ( $p = 0.002$ ). Parents with an education level of college or more were estimated to have anxiety symptoms  $10.89 \pm 3.75$  units greater compared to parents with an education level of high school/technical school or less ( $p = 0.009$ ). These findings were consistent regardless of parent sex.

**Depressive Symptoms:** Parental role alteration was the only variable to significantly predict depression symptoms as measured by CES-D scores at 3 months post-discharge. Specifically, regardless of parent sex, for each one unit increase in parental role alteration, CES-D total score was estimated to increase by  $4.41 \pm 1.72$  ( $p = 0.018$ ).

**Post-traumatic Stress (PTS) Symptoms:** Parental role alteration, infant appearance and behavior, timing of diagnosis, and quality of partner relationship were each found to be significant predictors of PTS symptoms in the unadjusted analysis ( $p < 0.05$ ). In multivariable analysis, for each one unit increase in parental role alteration, PTS symptoms were estimated to increase by  $5.06 \pm 1.91$  ( $p = 0.0155$ ). Parents of children with postnatal diagnosis are estimated to have posttraumatic stress symptoms  $21.80 \pm 10.07$  units greater compared to parents of children with prenatal diagnosis ( $p = 0.0428$ ). These findings were again consistent regardless of sex.

**Multiple Imputation analysis to account for attrition.**—As a sensitivity analysis, multivariable analyses were reproduced utilizing a multiple imputation method. Results confirmed those of the complete case analysis, with only one exception: education did not remain statistically significant in the final model for anxiety symptoms.

## **DISCUSSION**

This study builds on the current evidence demonstrating the burden of mental health symptoms experienced by parents whose infants have been cared for in a PCICU for neonatal cardiac surgery. In this cohort of parents three-months after infant hospital



discharge, at least one out of every five parents experienced clinically significant levels of both depressive and PTS symptoms, with one out of four parents experiencing clinically elevated levels of anxiety symptoms. These findings are consistent with previous studies measuring mental health symptoms of parents of infants with CHD.<sup>1</sup> Mothers reported significantly greater anxiety, depressive, and PTS symptoms compared with fathers, although more mothers self-reported a history of anxiety disorder and higher trait anxiety than fathers, which could have influenced our results. While these findings are consistent with other studies,<sup>26,27</sup> our study is strengthened by its comparison of mothers and fathers across dyads, controlling for the same infant. Previous research has demonstrated that mothers and fathers experience stress differently,<sup>7</sup> and while mothers may exhibit greater number or intensity symptoms, this does not minimize the very real and taxing experience by fathers of infants with CHD.

In our sample, perceived alteration in the parental role strongly predicted all measured mental health symptoms, regardless of parent sex. Role alteration can occur frequently in parents of infants in the PCICU when they are unable to hold, feed, care for, or protect their infant from pain. Parental role alteration has been consistently demonstrated in multiple cohorts to predict both anxiety and depressive symptoms in parents while they are still in the PCICU with their infants.<sup>8-10</sup> This study is the first to suggest the prolonged influence of parental role alteration on these symptoms, persisting three months after discharge. Additionally, our findings demonstrated that parental role alteration may indeed be perceived as a traumatic stressor for both mothers and fathers, indicated by its association with PTS three months after discharge. Golfenshtein and colleagues found that the parent domain of the Parenting Stress Index, a measurement that includes the aspect of perceived ability to fulfill parental roles, strongly influenced PTS symptoms in parents of infants with CHD at discharge and four months post-discharge.<sup>28</sup> It too appeared as a central variable in their modeling to predict PTS over time. Parent stress arising from parent role functioning was also correlated with PTS in parents of other cardiac populations.<sup>29</sup>

The finding that parental role alteration experienced during infant critical illness is a significant risk factor influencing parent mental health 3-months post discharge is of upmost importance. The parent-infant connection is foundational to the human experience,<sup>30-34</sup> and essential for the wellbeing and bonding of parents and infants.<sup>35</sup> For this population of parents of newly born infants with CHD, a growing body of literature is calling for family-centered developmental care practices such as skin-to-skin holding, parent participation in care, supporting parents to read and respond to their infant's cues, shared decision-making, and other engagement strategies to augment the parental role in the PCICU.<sup>36,37</sup> Parents have described the inability to hold and even touch their infants in the PCICU, feeling helpless regarding how to serve in the role of parent during hospitalization.<sup>3,6</sup> Gramszlo and colleagues<sup>38</sup> reported that parents desire to learn caregiving skills from nurses, and that although learning may occur informally over time during the hospitalization, parents said they would benefit from consistent, hands-on, formalized education to support their child and acknowledge that this learning would decrease their stress. Indeed, parental role alteration is a modifiable stressor that can be targeted by interventions to support parent caregiving in the PCICU. Parent engaged interventions that include nurses partnering with parents to integrate parents in the care of their infant have long demonstrated improvements

in parent mental health in other pediatric populations; <sup>21,39,40</sup> yet, few have been tested in the CHD population in the PCICU. <sup>41</sup> Interventional studies tailored to the specific needs of infants with CHD and their families and designed with parents as key partners are critically needed to demonstrate how PCICU nurses, physicians, and other health care professionals can consistently engage parents to provide caregiving activities and connection, even during periods of hemodynamic instability or through the often unpredictable trajectory of recovery from neonatal surgery.

In addition to parental role alteration, we identified factors influencing parent mental health symptoms post-discharge from the PCICU, including higher parent education and the postnatal diagnosis. Higher parent education was significantly associated with greater anxiety symptoms 3 months post-discharge, but this relationship should be interpreted with caution, as it did not remain significant in the sensitivity analysis. Previous studies in other pediatric populations have found that parents with less education were more at risk of developing anxiety or stress symptoms. <sup>42,43</sup> However, a recent study<sup>28</sup> found that higher education was associated with significantly higher PTS symptoms. We also found that postnatal diagnosis was associated with greater PTS. Previous research has found that prenatal diagnosis contributed to greater symptom clusters of acute stress disorder, a precursor to PTSD. <sup>26</sup> More research is needed to understand the role of parent education and timing of diagnosis on the development of mental health symptoms to identify parents at greatest risk and create targeted interventions.

Although this study was strengthened by its grounding in a theoretical framework, it was limited by small sample size, demographically homogenous sample, its single-site design, and lack of a healthy control group. Thus, the current findings are considered exploratory and should be validated using a larger, more representative sample. Another limitation is that parents who were lost to follow up appear to have been more distressed acutely, which may mean that the study's findings underestimate the true parent mental health symptoms at 3 months. While the present analyses are exploratory, we provide important findings which may inform the design of future research. Furthermore, due to the exploratory nature of our analysis and the anticipated collinearity across mental health symptoms measured at multiple time points, we did not include baseline mental health symptom measures in our models. Future studies should examine the mediation or moderation of mental health symptoms in the PCICU on later mental health symptoms and examine trajectories over time, as this has been demonstrated in parents of hospitalized children cared for in a general pediatric unit. <sup>44</sup> Future studies with larger, more heterogeneous samples should measure additional factors that have been demonstrated to influence parent mental health in cardiac and other populations, such as single parent status, peri- and post-operative complications, and health care utilization post-discharge. <sup>28,42</sup>

## CONCLUSIONS

Parents are experiencing symptoms of anxiety, depression, and PTS in the early months post-discharge from the PCICU, with mothers reporting significantly more symptoms than fathers. Parental role alteration perceived by parents appears to be a key modifiable



stressor predictive of adverse mental health symptoms, even three months post-discharge. Interventions targeting parental role alteration in the PCICU are critically needed.<sup>37</sup>

## Funding:

This work was supported by a grant from the Cardiac Center at Children's Hospital of Philadelphia. Dr. Lisanti was also supported by NINR T32NR007100.

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**Table 1.**

Parent Demographics and Characteristics (n=42)

Parent Demographics and Characteristics		Total (n=42)	Mothers (n=22)	Fathers (n=20)	P-value
<b>Age</b>	Mean (SD)	33.2 (4.95)	32.7 (5.24)	33.8 (4.69)	0.492
<b>Sex</b>	Female	22 (52.4%)	22 (100.0%)		<b>0.000</b>
	Male	20 (47.6%)		20 (100.0%)	
<b>Marital status</b>	Single	4 (9.5%)	2 (9.1%)	2 (10.0%)	0.894
	Married	36 (85.7%)	19 (86.4%)	17 (85.0%)	
	Divorced	1 (2.4%)	1 (4.5%)		
	Domestic partner	1 (2.4%)		1 (5.0%)	
<b>Race</b>	Asian	3 (7.1%)	2 (9.1%)	1 (5.0%)	0.919
	Black or African American	3 (7.1%)	2 (9.1%)	1 (5.0%)	
	White	31 (73.8%)	15 (68.2%)	16 (80.0%)	
	Multi-Racial	2 (4.8%)	1 (4.5%)	1 (5.0%)	
<b>Ethnicity*</b>	Hispanic or Latino	5 (11.9%)	2 (9.5%)	3 (15.0%)	0.663
	Non-Hispanic	36 (85.7%)			
<b>Education*</b>	Less than College	11 (26.2%)	4 (18.2%)	7 (35%)	0.331
	College Graduate	19 (45.2%)	9 (42.9%)	10 (50.0%)	
	Graduate Degree	11 (26.2%)	8 (38.1%)	3 (15%)	
<b>Annual Income*</b>	<\$60,000	9 (21.4%)	4 (18%)	5 (25%)	1.000
	\$60,001–\$100,000	9 (21.4%)	6 (27.3%)	3 (15%)	
	\$100,001 and over	23 (54.8%)	11 (52.4%)	12 (60.0%)	
<b>Number of Children</b>	Mean (SD)	1.9 (0.68)	1.9 (0.61)	2.0 (0.76)	0.848
	1	10 (23.8%)	5 (22.7%)	5 (25.0%)	0.738
	2	26 (61.9%)	14 (63.6%)	12 (60.0%)	
	3	5 (11.9%)	3 (13.6%)	2 (10.0%)	
	4	1 (2.4%)		1 (5.0%)	
<b>Congenital diagnosis</b>	Postnatally	2 (4.8%)	1 (4.5%)	1 (5.0%)	1.000
	Prenatally	40 (95.2%)	21 (95.5%)	19 (95.0%)	
<b>Tobacco consumption</b>	No	39 (92.9%)	22 (100.0%)	17 (85.0%)	0.059
	Yes	3 (7.1%)	0 (0%)	3 (15.0%)	
<b>Self-reported History of Anxiety Disorder</b>	No	37 (88.1%)	17 (77.3%)	20 (100.0%)	<b>0.023</b>
	Yes	5 (11.9%)	5 (22.7%)	0 (0%)	
<b>Self-reported History of Depressive Disorder</b>	No	39 (92.9%)	20 (90.9%)	19 (95.0%)	0.607
	Yes	3 (7.1%)	2 (9.1%)	1 (5.0%)	
<b>Self-reported History of Other Mental Health Issue</b>	No	41 (97.6%)	22 (100.0%)	19 (95.0%)	0.288
	Yes	1 (2.4%)	0 (0%)	1 (5.0%)	
<b>Self-reported History of Other Surgical or Medical Issue</b>	No	26 (65.0%)	11 (52.4%)	15 (78.9%)	0.105
	Yes	14 (35.0%)	10 (47.6%)	4 (21.1%)	

\* Percentages do not equal 100% due to missing data.

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**Table 2.**

Infant Demographics and Clinical Characteristics (n=22)

Infant Demographics and Clinical Characteristics		M(SD) or n(%)
Timing of Diagnosis	Prenatal	21 (95.5%)
	Postnatal	1 (4.5%)
Infant Age - Days	Days	10 (4.3)
Gestational Age - Weeks	Weeks	38.3 (1.1)
Birth Weight	Grams	3150.9 (464.8)
Class of Defect	Bi-ventricular physiology	9 (40.9%)
	Single ventricle physiology	13 (59.1%)
STAT Score *	1	1 (4.5%)
	2	2 (9.1%)
	3	3 (13.6%)
	4	6 (27.3%)
	5	10 (45.5%)
Cardiopulmonary Bypass	Total Minutes	84 (35.1)
	Cross Clamp Minutes	46 (26.5)
	DHCA ** Minutes	22 (20.9)
Hospital Length of Stay	Days	32.5 (29.2)

\* STAT Score: Society of Thoracic Surgery–European Association for CardioThoracic Surgery Congenital Heart Surgery Mortality scoring system

\*\* DHCA: Deep Hypothermic Circulatory Arrest



**Table 3.**

Parent Mental Health Measures Three-Months Post Infant Discharge

Parent Mental Health Measures	Total Parents M(SD)	Mothers			Fathers			Difference						
		Mean	Standard Error	95% CI	Mean	Standard Error	95% CI	Estimated Difference	Standard Error	p value	95% CI			
Trait Anxiety Scores (Trait Anxiety Subscale STAI) (n=41)	36.27 (9.86)	37.91	2.24	33.25	42.57	34.10	1.96	30.03	38.16	-3.81	1.71	0.036	-7.36	-0.26
Anxiety Symptoms (State Anxiety Subscale STAI) (n=42)	39.21 (13.01)	42.82	2.65	37.30	48.33	34.59	2.81	28.74	40.44	-8.23	2.66	0.006	-13.76	-2.70
Depressive Symptoms (CES-D) (n=41)	10.56 (10.73)	12.32	2.39	7.35	17.29	8.56	2.13	4.14	12.99	-3.76	1.63	0.032	-7.15	-0.36
PTS Symptoms (IES-R) (n=42)	15.33 (13.98)	18.18	3.06	11.81	24.55	12.22	2.82	6.35	18.09	-5.96	2.40	0.021	-10.95	-0.98

STAI: State-Trait Anxiety Inventories

CES-D: Center for Epidemiological Studies-Depression

IES-R: Impact of Events Scale - Revised

**Table 4.**

Final Linear Effects Model of Predictors of Mental Health Symptoms

<b>Final Linear Effects Model of Predictors of Anxiety Symptoms (n=38)</b>					
<b>Effect</b>	<b>Estimate</b>	<b>Standard Error</b>	<b>Degrees of Freedom</b>	<b>t Value</b>	<b>Pr &gt;  t </b>
Intercept	14.87	6.32	21	2.35	0.029
Parental Role Alteration	5.98	1.64	21	3.64	0.002
Education: College or more	10.89	3.75	21	2.91	0.009
Education: High school/ Technical school or less	0	.	.	.	.
Father	-4.03	3.32	21	-1.22	0.238
Mother	0	.	.	.	.
<b>Final Linear Effects Model of Predictors of Depressive Symptoms (n=37)</b>					
<b>Effect</b>	<b>Estimate</b>	<b>Standard Error</b>	<b>Degrees of Freedom</b>	<b>t Value</b>	<b>Pr &gt;  t </b>
Intercept	-1.42	5.97	21	-0.24	0.815
Parental Role Alteration	4.41	1.72	21	2.57	0.018
Father	-3.49	2.30	21	-1.52	0.144
Mother	0	.	.	.	.
<b>Final Linear Effects Model of Predictors of Posttraumatic Stress Symptoms (n=38)</b>					
<b>Effect</b>	<b>Estimate</b>	<b>Standard Error</b>	<b>Degrees of Freedom</b>	<b>t Value</b>	<b>Pr &gt;  t </b>
Intercept	1.41	6.56	20	0.21	0.833
Parental Role Alteration	5.06	1.91	20	2.65	0.016
Timing of Diagnosis: Postnatal	21.80	10.07	20	2.16	0.043
Timing of Diagnosis: Prenatal	0	.	.	.	.
Father	-5.42	2.81	20	-1.93	0.068
Mother	0	.	.	.	.