A Novel Simulation to Prepare Caregivers of Children Diagnosed with a Critical Congenital Heart Defect

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Background and Purpose

Infants born with critical congenital heart disease (CCHD) require extensive postoperative recovery and specialized home care needs.

Caregivers of critically ill neonates are at increased risk for stress, which may interfere in their ability to learn home care.

Limited studies have examined the use of technology-enhanced learning for caregivers of infants with CCHD.

The purpose of this pilot was to determine the feasibility and effectiveness of an interprofessional led low-fidelity simulation program on caregivers' perceived stress, developed for caregivers of infants with CCHD who require cardiac surgery after birth.

Methodology

Caregivers (n=14) enrolled in the pilot during the prenatal period from October 2021 through March 2022. Data collection time points included: prenatal, CICU admission and Cardiac Acute Care Unit (CACU) prior to discharge.

Low-fidelity simulation scenarios delivered in the prenatal period and CICU admission. Third time point included prior to "Rooming-In" practice (Table 1).

Comparison group (n=42) identified from a study with comparable data collection time points but no simulation program.
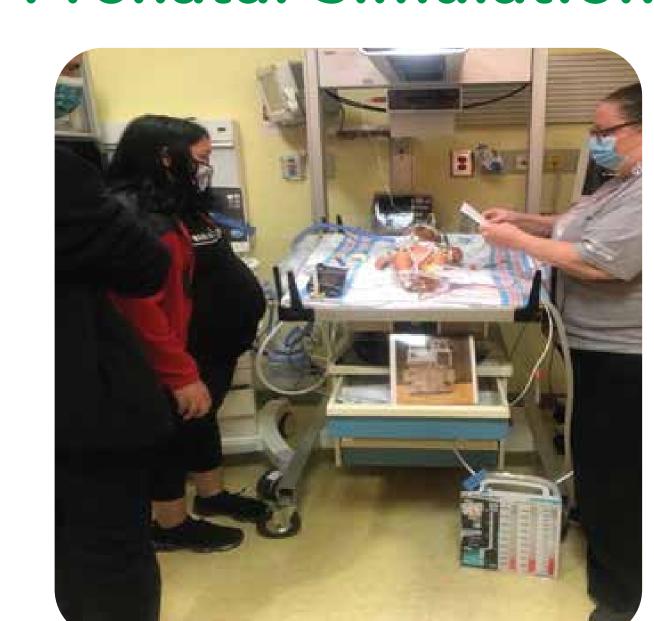
Categories created to indicate a change in stress at each time point.

Statistical Analysis: Descriptive analysis and Fisher's exact tests examined differences in change categories between the simulation and comparison groups.
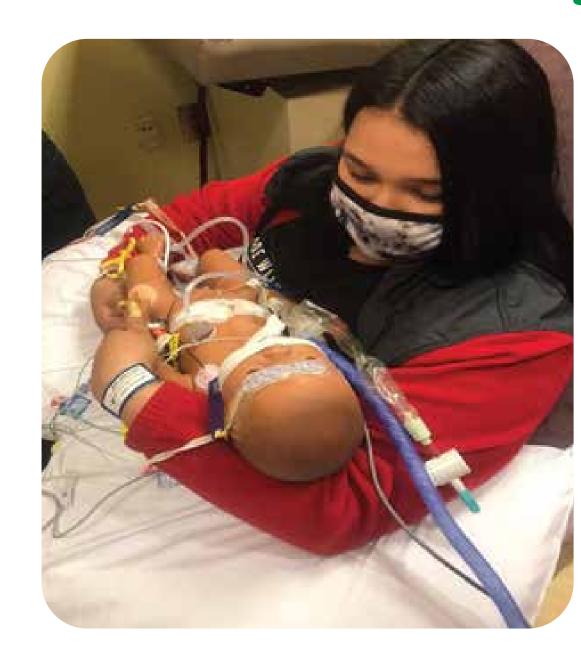
Table 1 Description of Timepoints

Timepoint 1 Prenatal Period	Timepoint 2 CICU prior to CACU transfer	Timepoint 3 CACU prior to rooming-in
Consent	Self-report Questionnaires	All discharge home education has been completed
Health Literacy Assessment	Low-fidelity simulation with medical grade doll mocked up to resemble newborn ready for transfer	Self-report Questionnaires
Self-report Questionnaires	Audiotape of CACU patient room sounds	
Low-fidelity simulation with medical grade doll mocked up to resemble immediate post-op newborn	RN explains all tubes, lines, wires, and equipment	
Simulation setting includes audiotape of CICU sounds and all post-op bedside equipment	RN demonstrates nasogastric tube placement	
RN explains all tubes, lines, drains, wires, and equipment	RN demonstrates medication administration	
Define healthcare team member roles	Define CACU routine, healthcare team member roles	
Intubated mobility simulation	Debrief	
Debrief		

Prenatal Simulation   Intubated Mobility   CACU Transfer

Results

Sample consisted of 12 caregivers from the simulation group and 21 caregivers from the comparison group with complete data.

>50% White, non-Hispanic in both the simulation (58.33%, n=7) and comparison groups (52.38%, n=11). Caregivers were all self-reported female. The caregivers' perceived stress was the primary outcome variable.

Caregivers in the simulation group showed a steady decrease in their perceived stress score over time. Caregivers in the comparison group, showed a decrease from Time 1 to Time 2 and an increase from Time 2 to Time 3 (Table 2).

Differences in change over time were reflected in the analysis of the groups by change category (Table 3). No statistically significant differences in change category by group from Time 1 to Time 2 (p=.84). Time 2 to Time 3, the comparison group had unfavorable stress category changes in 42.86% (n=9) of caregivers, and the simulation group caregivers had no unfavorable changes, a statistically significant difference (p=.01).

Table 2 PSS 10 Total Score Descriptive Statistics over Time

Variable	Timepoint 1 (Prenatal)	Timepoint 2 (CACU transfer)	Timepoint 3 (Rooming In)
PSS 10 Total Score, M (SD)			
Simulation Study (n=12)	12.75 (6.08)	11.08 (6.10)	9.83 (5.47)
Comparison Group (n=21)	18.00 (6.40)	13.10 (7.29)	19.10 (2.51)
Low Stress Level n (%)			
Simulation Study	7 (58.33)	8 (66.67)	9 (75.00)
Comparison Group	5 (23.81)	10 (47.62)	1 (4.76)
Moderate Stress Level, n (%)			
Simulation Study	5 (41.67)	4 (33.33)	3 (25.00)
Comparison Group	15 (71.43)	10 (47.62)	20 (95.24)
High Stress Level, n (%)			
Simulation Study	0	0	0
Comparison Group	1 (4.76)	1 (4.76)	0

Table 3 Stress Category Change over Time

Type of Change	Simulation Study (n=12)	Comparison Group (n=21)	p-value for Fisher's Exact Test
	T1 to T2		.8452
Favorable	2 (16.67)	6 (28.57)	
Neutral	9 (75.00)	14 (66.67)	
Unfavorable	1 (8.33)	1 (4.76)	
	T2 to T3		.0139
Favorable	1 (8.33)	1 (4.76)	
Neutral	11 (91.67)	11 (52.38)	
Unfavorable	0	9 (42.86)	
	T1 to T3		.3625
Favorable	3 (25.00)	2 (9.52)	
Neutral	8 (66.67)	14 (66.67)	
Unfavorable	1 (8.33)	5 (23.81)	

Conclusion

First known study to determine the feasibility and effectiveness of a low-fidelity simulation program developed for caregivers of infants with CCHD requiring cardiac surgery after birth.

The findings in this pilot study indicate caregivers receiving the simulation program had a decrease in stress over the course of an average of 9.6 weeks compared to the comparison group, which showed a short-term decrease but overall increase.

Findings in the pilot study have potential to improve caregiver stress from prenatal diagnosis of CCHD to discharge home after cardiac surgery.

The findings can translate to better patient and family outcomes through implementation of an interprofessional led simulation program during three critical time points (prenatal period, CICU admission, before discharge home).

Future work should include random treatment assignment to assess causal relationships.