A Case Study of the Touch Experience of One Postsurgical Infant with Congenital Heart Disease

Hannah Hicks, Student Nurse

Tondi M. Harrison, PhD, RN, FAAN

The Ohio State University College of Nursing Honors Program
Abstract

Purpose and Background/Significance: The trauma experienced by a critically-ill newborn in intensive care is intensified by separation from the physiologic regulation provided by maternal physical contact and the abundance of aversive touch. Adaptive physiologic regulation is associated with improved health and developmental outcomes. The purpose of this study was to examine the quantity and type of touch experienced by a postsurgical newborn infant with congenital heart disease in a cardiothoracic intensive care unit (CTICU) and cardiac step-down unit (SDU).

Methods: In this case study, the frequency and types of touch experienced by one full-term infant following surgical intervention for congenital heart disease were measured. Continuous video recordings of the infant were collected for nine hours on the first full post-operative day on the CTICU and seven hours on the first full day on the SDU. The Noldus Observer Behavioral Analysis system was used to code touch by type (procedural, task, comfort, holding, and no touch) and by caregiver (clinician, family, and other ([therapists, students]). Descriptive and visual analyses were conducted.

Results: On the CTICU day, the infant experienced no touch 66.57% of the time. For clinicians, percentage of time touch was associated with tasks was 15.80%, procedures 6.71%, and comfort 0.43%, and holding 0%. For families, percentage of time touch was associated with tasks was 0.26%, procedures 0%, comfort 10.06%, and holding 0%. For other, percentage of time touch was associated with tasks was 0.03%, procedures 0%, comfort 0.07%, and holding 0%. On the SDU day, the infant experienced no touch 27.00% of the time. For clinicians, percentage of time touch was associated with tasks was 8.82%, procedures 0%, comfort 0.13%, and holding 0.57%. For families, percentage of time touch was associated with tasks was 1.78%, procedures 0%,
comfort 6.00%, and holding 42.00%. For other, percentage of time touch was associated with task was 10.71%, procedures 0%, comfort 2.43%, and holding 0%.

**Conclusion:** In the CTICU, this newborn infant experienced primarily no touch, and the type of touch experienced was often task- and procedure-based. Given the often extended CTICU stays of these infants and the known associations between touch, physiological regulation, and outcomes, research with more infants and for longer observations is needed to describe current practice and to develop nursing interventions to increase both nurse- and family-infant interaction through positive forms of touch.
Introduction

Congenital heart disease (CHD) is the most common birth defect among both full-term and premature newborns, occurring in 6-10 infants per 1000 live births (Chu, Li, Kosinski, Hornik, & Hill, 2016). Many of these infants spend an extended amount of time in the cardiothoracic intensive care unit (CTICU) or cardiac stepdown units (SDU), especially following surgical intervention. This extended amount of time, as well as the invasiveness of medical interventions, leads to a unique experience of touch by these infants during their time in the hospital.

Background

While not much data exists on the experience of infants with CHD, the environmental experience of premature infants in the neonatal intensive care unit (NICU) has been extensively studied. Due to the invasive equipment, such as ventilators and monitoring wires, NICU patients are found to be significantly detached from human interactions (Gonya et. al, 2018). This can lead to developmental delays, lack of attachment to parents, and additional stress responses (Gonya et. al, 2018). It is postulated that the stress response negatively impacts cardiac function and development in infants with CHD. Chronic stress predisposes an individual to an increased sympathetic nervous system drive, leading to tachycardia and elevated blood pressure (Myers, 2016). Chronic stress responses coupled with the effects of stress on the heart can lead to detrimental consequences for infants with existing cardiac conditions.

Skin to skin contact (SSC) is considered a safe and reliable intervention for healthy newborn infants that works to decrease stress and enhance development (Moore, Bergman, Anderson, & Medley 2016). However, the observed experience of high-risk infants, such as those with CHD, shows that this is not always possible and not practiced as standard of care. An
alternative to SSC is massage therapy and comforting touch (Diego, Field, Hernandez-Reif, 2014). Massage therapy, done for just ten minutes three times per day, can lead to increased caloric consumption and subsequent weight gain in preterm infants (Diego et. al, 2014). These benefits are especially important for postsurgical hospitalized infants with CHD, as metabolic needs are significantly increased after surgery. An intervention that will improve caloric intake could help meet these increased needs. Comforting touch and massage therapy may also improve insulin and growth hormone production, which can lead to more positive outcomes and faster discharge from the hospital (Diego et. al, 2014). Given the simplicity of touch interventions, this type of intervention could be implemented in infants of all medical and surgical statuses, with the extant literature suggesting that the risk of negative effects is small (Diego et. al, 2014).

Comforting touch is one of the cornerstones of parent-infant bonding. Despite this, comforting touch from parents is lacking in the NICU environment (Gonya et. al, 2018). This may be due to a variety of factors. Lack of education, parental perception of the infant as fragile, or fear of hurting the infant can all contribute to a lack of interaction between parent and infant (Yang et. al, 2017). However, comforting touch and massage therapy are shown to be just as effective in improving weight gain and physiologic stabilization when it comes from the parents as it is when it is done by medical professionals (Field, Diego, & Hernandez-Reif, 2010). Additionally, comforting touch and massage therapy done by the parents increases bonding, possibly improving development in the long run (Field et. al, 2010).

While not much is known about comforting touch in infants with CHD, SSC has been shown to be a safe intervention (Harrison, Ludington-Hoe, 2015). In one case study, an infant who experienced one session of SSC maintained physiologic parameters such as heart rate, respiratory rate, oxygen saturation, blood pressure, and temperature before, during, and after the
intervention (Harrison, Ludington-Hoe, 2015). To our knowledge, no research has examined the effect of non-SSC comforting touch on physiological regulation among infants with CHD.

The purpose of this pilot study was to characterize in detail the environmental experience of touch of one postsurgical newborn infant with CHD in the pediatric CTICU and SDU. This study was part of a larger parent study examining the environmental experience of full-term infants with CHD who underwent cardiac surgery within the first 30 days of life.

**Case Study**

The infant in this case study was male, weighing 3.57 kg at birth. He was born 18 days before his due date to a 30-year-old mother. She was a multiparous, white woman who was married. This infant was born with hypoplastic left heart syndrome requiring surgery five days after birth. He was immediately admitted to the CTICU following birth, remained in the CTICU until 11 days of life, and was then transferred to the SDU until discharge home at 21 days of life.

Hypoplastic left heart syndrome is a type of congenital heart disease in which the left side of the heart does not develop correctly throughout fetal development (Anderson et al., 2010). This results in an underdevelopment of any of the left sided heart structures, including the left ventricle, mitral and aortic valves, and the ascending aorta (Anderson et al., 2010). Following the closure of the patent foramen ovale after birth, oxygen saturated blood cannot be pumped to the body, resulting in a systemic lack of oxygen (Anderson et al., 2010).

**Methods**

The parent study from which data were extracted for this detailed case analysis was an ongoing longitudinal descriptive study of the environmental experience of infants with CHD.

**Measures**
Touch was measured using five categories developed by the authors based on clinical experience: procedural, task, comfort, holding, no touch (Table I). The person providing the touch was also recorded and included clinician, family, and other (Table 2).

Procedure

Following receipt of informed consent from the parent, plans were made to begin videotaping. A GoPro Hero2 camera was used to continuously record the infant. The camera was attached to the head of the infant’s crib and positioned so that the view did not include any faces of the nurses, family members, or any other people who entered the room. The first recording period was the first day in the CTICU following cardiac surgery and the second recording was the first day following transfer to the SDU. Following recording, the video file was transferred to the Noldus Observer Behavioral Analysis system for coding.

Data Analysis

After collection, data were analyzed using the Noldus Observer Behavioral Analysis system. Touch was determined as beginning when physical contact was first made with the infant and ending when physical contact ended. Touch that involved multiple initiation and ending of contact, such as a task, was coded as multiple occurrences of touch. For example, even though one task was taking place, each time the provider put their hands on the infant and then removed them was counted as one occurrence of touch. In this way, we could capture instances of comforting touch that may have occurred in the midst of a task or procedure.

Results

Touch in the cardiothoracic intensive care unit

In the CTICU, recording took place for a total of 9 hours and 4 minutes. Data were collected from 0700-1604. As shown in Figure 1, task-based touch was the most common type of
touch, resulting in 16.09% of the total time recorded. Following task, comforting touch took place 10.56% of the time, while procedural touch took place 6.71% of the time. The majority of the time recorded, the infant had no touch from others (66.7%). No holding took place in the CTICU.

Task-based touch took place for 87 minutes and 51 seconds of the total recording time. Of that, clinicians accounted for 86 minutes and 11 seconds, family for 1 minute and 39 seconds, and other for 1 second (Figure 2).

Procedural touch took place for 36 minutes and 42 seconds, all done by clinicians. Comforting touch took place for 58 minutes and 05 seconds. Of that, 2 minutes and 31 seconds were from the clinicians, 54 minutes and 58 seconds were from the family, and 37 seconds from others (Figure 3).

**Touch in the cardiac step-down unit**

In the SDU, recording took place for 7 hours and 3 minutes. Recording took place from 0700-1403. As shown in Figure 4, holding was the primary type of touch, at 43.11% of the total time. After holding, no touch was the most common at 27.0%, followed by task (21.31%) and comforting touch (8.56%). No procedural touch took place in the SDU.

Task-based touch took place for a total of 90 minutes and 47 seconds. Of that, clinicians accounted for 37 minutes and 19 seconds, family for 7 minutes and 52 seconds, and other for 45 minutes and 16 seconds (see Figure 5).

Comforting touch took place for a total of 36 minutes and 48 seconds. Of that, clinicians accounted for 0 minutes and 53 seconds, family for 25 minutes and 30 seconds, and other for 10 minutes and 25 seconds (see Figure 6).
Holding took place for a total of 182 minutes and 18 seconds. Of that, clinicians held the infant for 2 minutes and 43 seconds, while family held the infant for 179 minutes and 39 seconds (see Figure 7).

Discussion

This study’s purpose was to determine the experience of touch of a newborn with CHD following cardiac surgery in two different environments. The types of touch, the role of the person touching the infant, and the amount (in minutes) of touch the infant received varied greatly between the CTICU and the SDU.

In the CTICU, the infant received far more task-based and procedural-based touch than in the SDU. In the CTICU, most of the touch being done was by clinicians, while family members provided minimal comfort and care. This lack of involvement may point to the family’s perception of the infant in the ICU setting. In the NICU setting, qualitative data suggests that many parents feel shocked or frightened over their infant’s appearance and clinical situation (Yang et. al, 2017). The intubation tubes, IV lines, and monitors may present an overwhelming experience to the family, leading to anxiety over interacting normally with their infant. Similarly, family may be less likely to touch their infant, whether it be comforting touch or task-based, in the CTICU setting.

In the SDU, family was much more involved in providing task-based and comforting touch to their infant. The SDU is a more private, less technological unit with single rooms so family may be more willing to interact with their infant normally. Because this infant was full term, his appearance was closer to what parents may have perceived as a healthy infant after the intubation tube was removed and IV lines were minimized. This normalized appearance and bedroom-like room may contribute to a more positive perception by the parents of their infants,
leading to more involvement in care and holding, which is an important topic for future investigation

At present, there may be opportunity to promote comforting touch and holding by families in the CTICU through nurse education focused on safe infant interaction. In working toward this goal, the development and institution of protocols to facilitate family-infant touch in the CTICU is critical, as units lack this guidance despite evidence showing that family interaction contributes to the growth and development of infants. Specifically, family involvement is shown to optimize relationships between parent and infant, as well as to optimize the infant’s physical, cognitive, and psychosocial development (Craig et al., 2015). By educating and assisting families to hold their infant, provide comforting touch, and be involved in task-based touch, infant development may be enhanced, and parent-infant bonds may strengthen.

In both units, comforting touch by the clinicians was sorely lacking. Most of the comforting touch done by clinicians was in conjunction with task-based or procedural touch, and not initiated as an independent activity in caring for a newborn infant. Nurses are often the only individuals interacting with a hospitalized infant for extended periods of time, since families may not be able to visit due to obligations such as work and caring for other children. In situations when family presence is rare, the effect of extended periods of time without comforting touch on infant stress response and development remains an important topic of inquiry.

Nurses play an important role in influencing their patients’ experiences in the hospital. Nurse managers and clinical nurse leaders need to focus education on the importance of comforting touch in the growth and development of hospitalized infants. Armed with this knowledge, nurses can take further steps to comfort their patients and be involved in facilitating normal growth and development during extended hospital stays.
The data available for this case analysis provided a unique opportunity to carefully detail the touch experience of a postsurgical CHD patient in two environments over a total period of 16 hours and 7 minutes. However, this case analysis was limited to a single patient and did not include data on the entire hospital stay, with recording durations varying between each unit and limited to day shift. Cameras were taken down before the end of the full recording sessions in both units due to external factors. Due to the aforementioned limitations, the experience of the assessed infant may not be fully representative of the experience of all infants with CHD in the CTICU and SDU. This case study, however, provides a baseline of the amounts and types of touch infants experience in these environments.

Further research is needed to determine the associations among types and frequency of touch, biological indicators of physiologic stress, and infant health, particularly among infants with CHD. Previous studies that looked at stress reactivity in premature infants used telomere length and salivary cortisol as biological stress markers (Provenzi et al., 2019). Incorporating these markers and a similar study design may help us determine the effects of stress as it relates to the amounts and types of touch experienced in the CTICU and the SDU.

**Conclusion**

Touch plays an important role in the growth and development of newborn infants. The experience of touch in full-term infants with CHD in the CTICU and SDU environments largely varies between units. Family was more involved in the care and comfort of their infant in the SDU than the CTICU, while clinicians provided very little comforting touch in both environments. More research is needed to determine the implications of types and frequency of touch as it relates to biological stress indicators.
References


Table 1

*Types of Touch*

<table>
<thead>
<tr>
<th>Type of Touch</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procedural</td>
<td>Aversive touch (IV starts, injections, intubation/extubation, chest tube removal, dressing changes)</td>
</tr>
<tr>
<td>Task</td>
<td>Measurement of vital signs, position changes, diaper changes, adjusting sensors, blood draws</td>
</tr>
<tr>
<td>Comfort</td>
<td>Stroking, massaging, sustained touch</td>
</tr>
<tr>
<td>Holding</td>
<td>Blanket held or SSC</td>
</tr>
<tr>
<td>No touch</td>
<td>No touching from caregiver or family</td>
</tr>
</tbody>
</table>
Table 2

*Role of Individuals Providing Touch*

<table>
<thead>
<tr>
<th>Type of Individual</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinician</td>
<td>Primary nurses, secondary nurses, nurse practitioners, respiratory therapists, physical therapists, and child life specialists.</td>
</tr>
<tr>
<td>Family</td>
<td>Parents, grandparents, or other close family members of the infant</td>
</tr>
<tr>
<td>Other</td>
<td>Nursing students, non-medical staff</td>
</tr>
</tbody>
</table>
Figure 1. Percentage of each type of touch in the CTICU
Figure 2. Amount of time each type of person spent on task-based touch in the CTICU
Figure 3. Amount of time for each caregiving role spent on comforting touch in the CTICU
Figure 4. Percentages of each type of touch in the SDU
Figure 5. Amount of time each caregiving role spent on task-based touch in the SDU
Figure 6. Amount of time each caregiving role spent on comforting touch in the SDU
Figure 7. Amount of time each caregiving role spent on holding in the SDU