

UNIVERSITY *of*
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School of Occupational Therapy

Swaddle Bathing in the NICU

Madeleine Parrish

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A capstone project submitted in partial fulfillment for the requirements of the Doctor of Occupational Therapy degree from the University of Indianapolis, School of Occupational Therapy.

Under the direction of the faculty capstone advisor:

Taylor Gurley, MS, OTR, OTD

A Capstone Project Entitled

Swaddle Bathing in the NICU

Submitted to the School of Occupational Therapy at University of Indianapolis in partial fulfillment for the requirements of the Doctor of Occupational Therapy degree.

By

Madeleine Parrish, OTS

Doctor of Occupational Therapy Student

Approved by:

Faculty Capstone Advisor

Date

Doctoral Capstone Coordinator

Date

Accepted on this date by the Chair of the School of Occupational Therapy:

Chair, School of Occupational Therapy

Date

Abstract

This study examined how swaddle bathing impacts stress and maintaining temperatures compared to traditional tub and sponge bathing in the NICU. Education on the benefits and how to swaddle bathe was provided to the nursing staff, and surveys were distributed before and after education for nurses to compare bath tolerance, stress, and body temperature. Survey results were analyzed, and findings suggest that swaddle bathing was beneficial in increasing tolerance and decreasing stress cues during and after the bath, which is supported by current evidence. Providing the staff with baths made to facilitate swaddle bathing and further education on how to properly swaddle bathe is suggested to improve bathing in the NICU. Limitations of this study included having an informal education, decreased survey participation post-education, and having limited bathing products supporting swaddle bathing.

Introduction

This doctoral capstone took place in a level 3 neonatal intensive care unit (NICU) at Franciscan Health Indianapolis with the aim to decrease stress within this population. The criteria for NICU admission include prematurity, early term birth, low birth weight, heart complications, infections, respiratory problems, birth defects, and infants of diabetic mothers (Franciscan Health, 2021). Bathing is a problematic occupation within the NICU due to the increased risk of hypothermia for the infant population (Fernandez & Antolin-Rodriguez, 2018). Bathing can also cause physiological responses of stress in infants that may have long-term negative impacts on body regulation (Bembich et al., 2017). Based on the inclusion criteria for Franciscan Health's NICU, this specific population has high-risk factors for stress and hypothermia and would benefit from swaddle-bathing guidelines to decrease negative long-term impacts (Bembich et al., 2017). Franciscan Health's NICU provided the opportunity for learning advanced clinical skills such as neuroprotective intervention and policy development through interdisciplinary education for the team working at the NICU, which included neonatologists, nurses, respiratory therapists, occupational therapists, and physical therapists with advanced training specific to the NICU (Franciscan Health, 2021). Education for all involved parties is imperative to ensure consistent, evidence-based guidelines for occupations, including bathing, in the NICU (Santos et al., 2020). For this capstone, I utilized an interdisciplinary educator role for the medical team to introduce a developmentally appropriate, sensory-based bathing guideline as standard practice to decrease stress levels, which has negative impacts on growth in this population (Bembich et al., 2017).

Background

In a quasi-experimental study that has since been replicated many times, Peters (1998) found that bathing is a stressful occupation for infants in the NICU, especially due to this population's medical complications. Additionally, these infants are often not developmentally ready for an environment outside of the womb. The NICU is a stressful environment for infants due to sensory overload resulting from loud machines and other crying infants (Pineda et al., 2017). Stressful environments can negatively impact infant development, making it imperative that measures are taken to decrease as many stress factors as possible and provide as positive a sensory environment as possible (Pineda et al., 2017). These stress factors include auditory, visual, and tactile sensory overload, which cause physiological stress (Fernandez & Antolin-Rodriguez, 2018). Since bathing is an especially stressful occupation for newborns, this is an important area to modify as needed to make this occupation a positive and developmentally appropriate experience (McKim, 2020).

Researchers discovered that tub bathing without swaddling can reduce moderate to mild pain for full-term newborns when compared to not bathing based on pain behaviors, oxygen saturation levels, and vital signs (Gunay & Coskun, 2018). This study's findings show that bathing can be a positive experience for infants (Gunay & Coskun, 2018). However, full term infants' sensory and motor systems are better developed and integrated than premature infants and infants in the NICU, making tub bathing without swaddling developmentally inappropriate method for the NICU population (Peters, 1998). Additionally, while tub bathing can reduce pain in newborns, researchers found that swaddle bathing newborns is a safer way to bathe in terms of preventing hypothermia and decreasing stress (Caka & Gozen, 2018). Therefore, swaddle bathing has clear advantages over tub bathing, even in fully developed infants (Caka & Gozen,

2018). Overall, the literature has found overwhelming evidence that swaddled bathing decreases pain and stress in premature infants when compared to sponge bathing and other various types of traditional bathing of infants (Fernandez & Antolin-Rodriguez, 2018). In these studies, stress in infants while bathing was measured through the frequency of behavioral responses, such as grimacing, yawning, tongue extension, and fussing or crying (Paran et al., 2016). Researchers also used physiological measures, such as respiratory rates, heart rates, and oxygen saturation levels (Ceylan & Boluslk, 2018). Many researchers measured pain using scales such as the Newborn Infant Pain Scale (Caka & Gozen, 2018).

In programs that replaced traditional bathing with swaddled bathing for premature infants, the infants showed decreased respiratory and heart rates, increased oxygen saturation levels, and decreased stress scores (Ceylan & Boluslk, 2018). Using the Newborn Infant Pain Scale, researchers found that swaddle bathing correlated with significantly lower pain levels (Caka & Gozen, 2018). Researchers also found that swaddled bathing helps maintain body temperature, which is important as infants lose heat and can reach unsafe levels of hypothermia during bathing (Quraishy et al., 2012).

The model guiding my capstone project was the Person-Environment-Occupation-Performance (PEOP) model. This model views occupational performance as an outcome of transactions between the person, occupation, and environment (Cole & Tufano, 2008). This viewpoint is important for this project in the NICU because it concentrates on how an infant interacts with his or her environment in the NICU while bathing. Infants in the NICU are often underdeveloped, resulting in poor thermoregulation and sensory disintegration, which can negatively impact the bathing occupation (Fernandez & Antolin-Rodriguez, 2018). Additionally, the NICU environment can overload an infant's senses (Fernandez & Antolin-Rodriguez, 2018).

When an infant and environment interact while bathing in the NICU, this population is more likely to exhibit signs of hypothermia, sensory overload, pain, and stress (Fernandez & Antolin-Rodriguez, 2018). These findings suggest that there is an incongruency within this transaction. By using the PEOP model, I identified ways to improve this transaction in the development of the capstone and make bathing a more comfortable and developmentally appropriate occupation for this population. When assessing the efficacy of this protocol, I used the PEOP model to ensure that all domains, such as the person, environment, and occupation, are modified to fit the NICU population's unique needs. If discrepancies became evident within this transaction, it was important that my project adapted to remain client centered.

The frame of reference that guided my capstone project was Sensory Integration. According to this frame of reference, disability includes sensory integrative dysfunction (Cole & Tufano, 2008). Sensory disintegration is more common in this population due to the sensory and motor systems not fully developed yet (Gunay & Coskun, 2018). Therefore, it was imperative that my capstone utilized creative methods to aid in sensory integration while bathing and preventing as much pain and stress in the infants as possible. The Sensory Integration frame of reference helped guide the project towards developmentally appropriate methods of bathing in the NICU to enhance sensory integration and create a more relaxing bathing environment. Quraishy et al. (2012) created a specific protocol that was used as an excellent example for my capstone project, which included step-by-step instructions for safe, less stressful swaddle bathing. It uses a sensory-based approach to decrease stressors and increase positive sensory experiences, which fits into the Sensory Integration frame of reference very well (Quraishy et al., 2012). Overall, my goal was to utilize the PEOP model and Sensory Integration frame of reference to guide the creation of a developmentally appropriate bathing protocol for infants in

the NICU, as well as educate the NICU interdisciplinary medical team to ensure a holistic approach for supporting development in this population.

Occupational therapy is beneficial in the NICU because it provides a holistic approach and examines the biological, developmental, and social-emotional factors of this population (Vergara et al., 2006). Occupational therapists have advanced skills in interdisciplinary education and providing complex interventions to infants in the NICU using an occupational-based approach as opposed to a medical model approach (Vergara et al., 2006). These skills are beneficial to promoting developmentally appropriate care in the NICU for all occupations. While NICU nurses have the most interaction with their patients and families, they are often overworked with medical aspects of care and do not have the time, energy, or resources to create an evidence-based bathing protocol (Santos et al., 2020). Therefore, providing the NICU staff with education on developmentally appropriate, evidence-based bathing guidelines for infants in the NICU is well within the scope of practice and advanced knowledge and skills of occupational therapists within this setting (Vergara et al., 2006). My capstone goal was to provide education on swaddle bathing to the NICU staff and introduce evidence-based, developmentally appropriate guidelines for bathing infants at Franciscan Health's NICU to improve patient care.

Project Design and Implementation

This project was designed to measure how swaddle bathing can impact infants' bathing experiences compared to traditional tub or sponge bathing. Bathing is a stressful occupation for infants in the NICU, which may cause long-term negative impacts on body regulation (Bembich et al., 2017). This population is also at a higher risk of hypothermia during bathing (Fernandez & Antolin-Rodriguez, 2018). Current evidence supports the utilization of swaddle bathing in the NICU to decrease stress and the risk of hypothermia (Fernandez & Antolin-Rodriguez, 2018). To

measure how swaddle bathing can impact bathing in the NICU, nurses were provided a survey to fill out for 2 weeks (see Appendix A). This survey showed the types of baths given, stress responses, and body temperature differences before and after bathing.

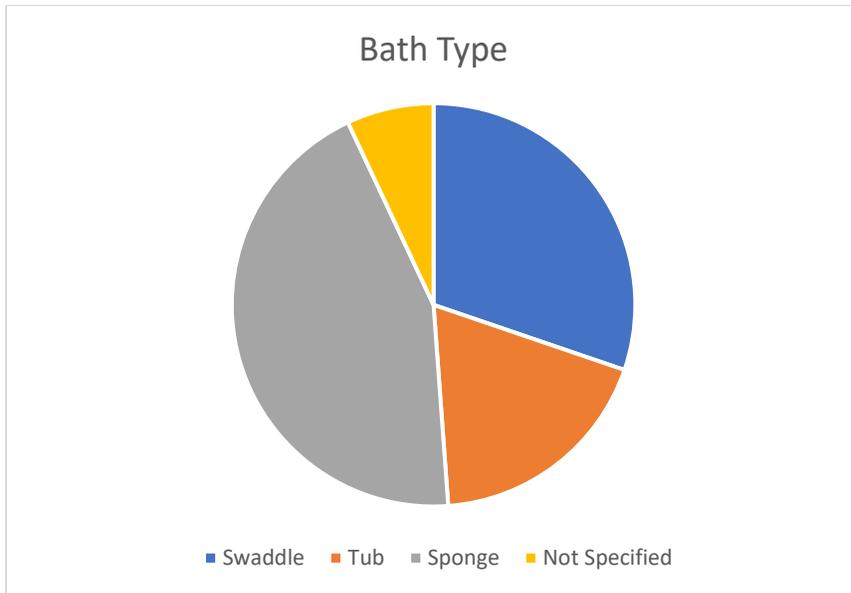
Following the survey, a poster was presented in the NICU to educate staff on how bathing impacts the infants, what swaddle bathing is, and how swaddle bathing can be utilized in the NICU to improve the bathing occupation for the population (see Appendix B). After 1.5 weeks of allowing the NICU staff to learn about swaddle bathing and the evidence supporting its benefits, the same survey was redistributed for 2 weeks to continue data collection and determine if education caused any changes in the type of bathing used. To assess the differences in infant response to different types of baths, the researcher determined percentage of types of bathing used, the number of stress signs observed in bathing, and the amount of heat loss in each bathing type. This information was collected to help determine the efficacy of education and any differences of heat loss and stress cues in infants during different types of baths.

Project Outcomes

To determine differences between swaddle, sponge, and traditional tub bathing of infants in the NICU, survey responses were analyzed to understand the bathing experiences. These surveys were distributed for 2 weeks prior to providing education and 2 weeks after education to record any differences in temperature loss during bathing and the amount of stress signs demonstrated during and after the bath. Out of 43 baths recorded by nursing staff, 13 were swaddle baths, 8 were tub baths, 19 were sponge baths, and 3 were not specified and therefore not included in further analysis (see Figure 1). There were no significant differences before and after education, so all data was consolidated for these findings.

Figure 1.

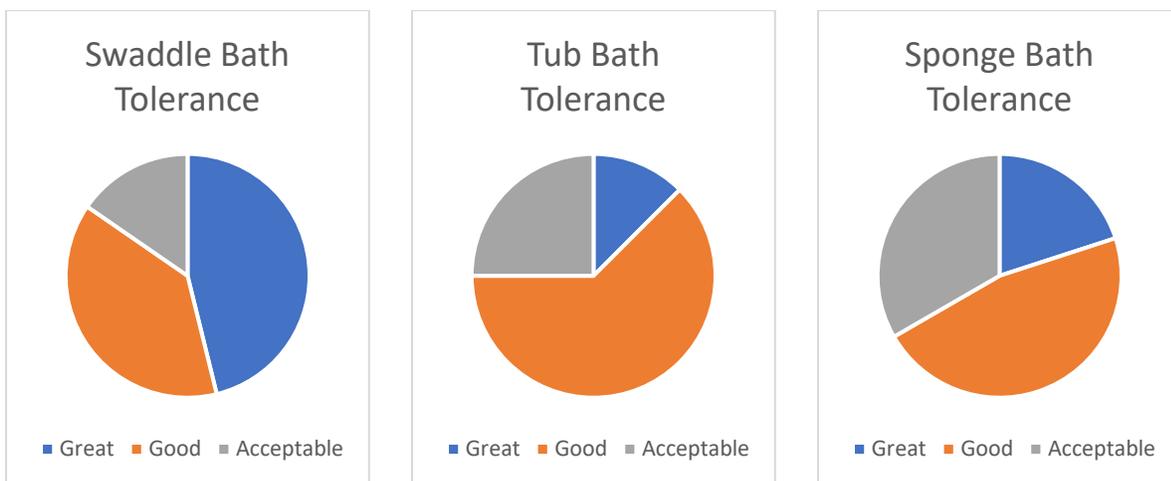
Bath Types Used in NICU



Data from the surveys submitted show that infants demonstrated better tolerance of baths with swaddle bathing (see Figure 2). Options included poor, acceptable, good, and great overall tolerance of bath, with 46.15% of swaddle baths perceived as “great,” 38.46 “good,” and 15.38% “acceptable.” Traditional tub bath tolerance had 12.5% “great,” 62.5% “good,” with no “great” tolerances, and 25% “acceptable.” Sponge bathing was the most common bath type, with 20% “great,” 46.67% “good,” and 33.33% “acceptable” tolerance.

Figure 2.

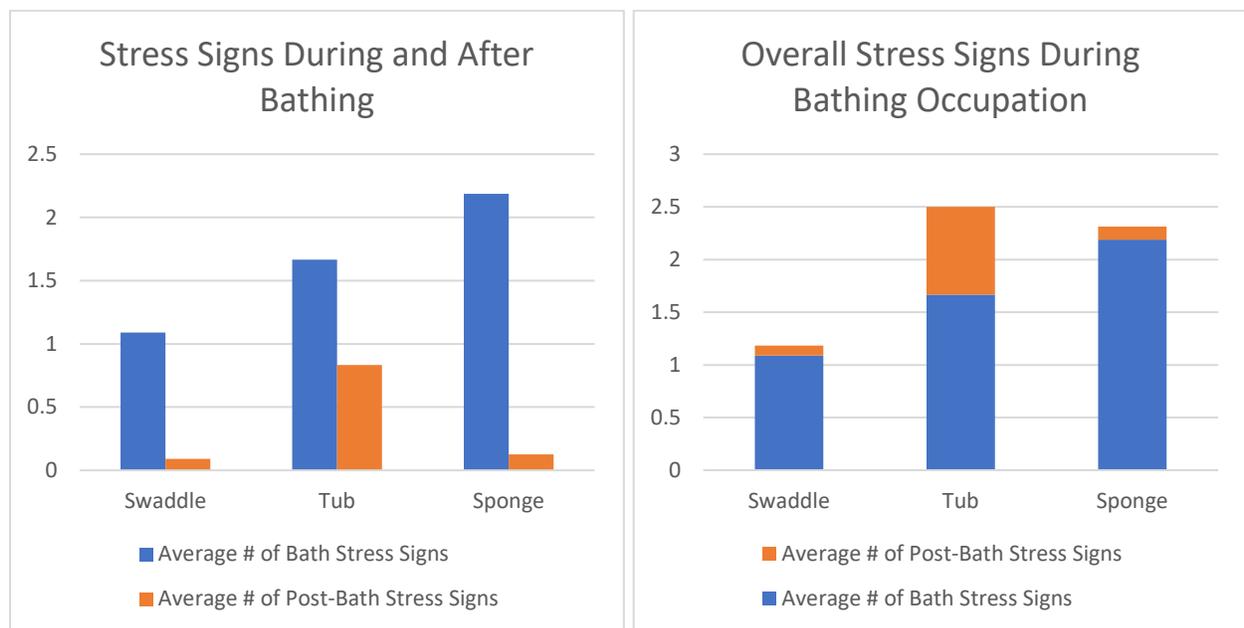
Tolerance of Different Bath Types



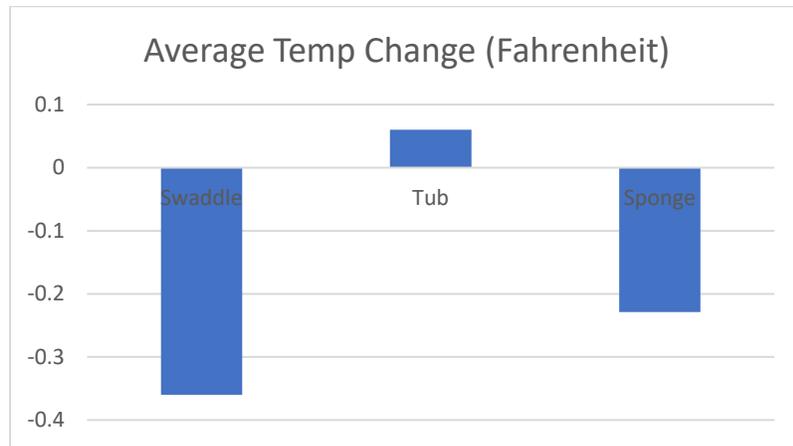
Overall, stress signs were noted most often with sponge bathing. To compare stress signs, the average number of stress signs for each bath type was calculated (See Figure 3). Findings showed an average of 2.11 stress cues during bathing and 0.17 post-bath. Tub bathing had an average of 1.63 stress cues during bathing and 0.83 post-bath. Swaddle bathing had the least stress signs, with an average of 0.69 during bath and 0.08 post-bath.

Figure 3.

Observed Stress Signs During and After Bathing



On each survey, nurses recorded the infant's temperature before and after the bath. There was not significant heat loss with any type of bath. However, Figure 4 shows that swaddle bathed infants lost the most heat out of the bath types with an average of -0.32 degrees Fahrenheit. Comparatively, sponge bathed infants lost an average of -0.23 degrees Fahrenheit, and tub bathed infants gained an average of 0.01 degrees.

Figure 4.*Average Temperature Changes After Bathing***Summary**

The stress sign findings of this project were in line with current research. Capstone data showed that swaddle bathing elicited the fewest stress signs both during and post-bath when compared to tub and sponge baths (Figure 3). In a systemic review, Fernandez and Antolin-Rodriguez (2018) found significant evidence that swaddle bathing helps decrease stress in premature infants, which is supported by the survey results of this project. After swaddle bathing during this project, many nurses and parents also reported increased relaxation.

One large difference in this project compared to current research was temperature changes in bathing. Evidence suggests that swaddle bathing decreases heat loss due to providing additional insulation (Quraishy et al., 2012). However, the nurses in the NICU reported more heat loss with swaddle bathing, losing an average of 0.32 degrees Fahrenheit with swaddle bathing. While this heat loss was not significant compared to sponge or tub bathing and did not reach levels close to hypothermia, it may suggest that swaddle bathing was not provided correctly for many infants. One limitation of this study was that the education was informal. Education was provided to the nursing staff halfway through the capstone experience focusing on the benefits of swaddle

bathing and providing instructions and a QR code for a video example of swaddle bathing in the NICU's break room. Since education was informal and staff had the option to partake or not, swaddle baths may have been given improperly. A mandatory, comprehensive education on swaddle bathing in the future would be beneficial in improving bathing experiences in patients and providing neuroprotection.

Another limitation was the baths available at the hospital. The education included instructions for using the Dandy Tub, which is a tub specifically made to facilitate swaddle bathing. The Dandy Tubs made swaddle bathing more practical in the NICU, but the hospital had only three Dandy Tubs. Therefore, only three patients were able to use the Dandy Tubs, and most swaddle baths that occurred were not in baths made for swaddle baths, making the process more difficult for nurses. Based on this, I suggest the hospital invests in more developmentally appropriate bath products to ensure developmentally appropriate care of their patients.

Despite these limitations, nurses that took part in the surveys shared positive perceptions of swaddle bathing, with feedback suggesting infants were more relaxed and had increased tolerances of swaddle baths compared to traditional tub baths and sponge baths. Overall, the project supported evidence that swaddle bathing decreases stress, which can have negative impacts on infant brain development (Bembich et al., 2017).

Conclusion

During this capstone experience, I learned about the importance of providing and advocating for neuroprotection in all occupations for patients in the NICU. I learned about the Synactive Theory of Development, which shows the need to support neurodevelopment to allow the infant to learn to self-regulate arousal and behavioral levels (VandenBerg, 2007). By providing baths that decrease stress, infant brains can create synaptic connections to associate

touch with positive experiences, as opposed to the pain and discomfort generally associated with touch during routine care and necessary medical procedures. This can help decrease disability and neurodevelopmental problems often seen in NICU grads (VandenBerg, 2007).

Through this project at Franciscan Health Indianapolis' NICU, the staff learned valuable methods to provide neuroprotection during the bi-weekly occupation of bathing. By utilizing swaddle bathing as evidence-based practice, the brain development of patients in the NICU will be better supported for improved long-term outcomes (Bembich et al., 2017). Research suggests that providing developmentally appropriate care for preterm infants and infants with complex medical needs may decrease the risk of sensory disorders or neurodevelopment disorders seen later in life (VandenBerg, 2007). After these findings were disseminated, Franciscan Indianapolis began comparing different swaddle bathing products to standardize bathing in their NICU in order provide their patients with best practice. This capstone provided Franciscan Health with evidence and suggestions on how to improve patient care within the NICU.

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Appendix A

Bathing Survey

NICU Bathing Survey

** Please Exclude Intubated Infants **

Date: _____ Time: _____

Current Weight: _____ GA: _____ Corrected Age: _____ Day of Life: _____

Type of Bath (circle one): Sponge / Tub / Swaddle

Current Respiratory Support (circle one): NIMV / CPAP / HFNC / RA

PRE-BATH (recorded within 15 minutes of bath)

Current FiO2: _____ Current Oxygen Saturation: _____ Temperature: _____

Stress Cues Present:

- | | |
|---|--|
| <input type="checkbox"/> Hypotonia
<input type="checkbox"/> Finger Splaying
<input type="checkbox"/> Crying/Irritability
<input type="checkbox"/> Flailing Movements | <input type="checkbox"/> Extension of Extremities
<input type="checkbox"/> Sneezing
<input type="checkbox"/> Yawning
<input type="checkbox"/> Hiccups |
|---|--|

DURING BATH

Stress Cues Present:

- | | |
|---|--|
| <input type="checkbox"/> Hypotonia
<input type="checkbox"/> Finger Splaying
<input type="checkbox"/> Crying/Irritability
<input type="checkbox"/> Flailing Movements | <input type="checkbox"/> Extension of Extremities
<input type="checkbox"/> Sneezing
<input type="checkbox"/> Yawning
<input type="checkbox"/> Hiccups |
|---|--|

POST-BATH (recorded within 15 minutes after bath)

Current FiO2: _____ Current Oxygen Saturation: _____ Temperature: _____

Stress Cues Present:

- | | |
|---|--|
| <input type="checkbox"/> Hypotonia
<input type="checkbox"/> Finger Splaying
<input type="checkbox"/> Crying/Irritability
<input type="checkbox"/> Flailing Movements | <input type="checkbox"/> Extension of Extremities
<input type="checkbox"/> Sneezing
<input type="checkbox"/> Yawning
<input type="checkbox"/> Hiccups |
|---|--|

Overall Tolerance of Bath (circle one): Poor / Acceptable / Good / Great

Note. Adapted from “The Effect of a Swaddle Bathing Policy in the NICU on the Prevention of Hypothermia and Stress in the Premature Neonate” by C. MacDowell, 2021. College of Nursing, Creighton University.

Appendix B

Swaddle Bathing Education Resources

Benefits of Swaddle Bathing:

- Research-based and best practice³
- Improves physiological stability²
- Decreases risk of hypothermia⁴
- Decreases stress & stress cues³
- Improves ability to feed after bath⁵



Bathing can be a stressful activity for premature infants! It can cause physiological responses of stress that may have long-term negative impacts on body regulation¹. Decreasing stress can decrease negative long-term impacts¹.

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How to Swaddle Bathe:



Please watch this quick instructional video for swaddle bathing!

Submerge infant to shoulder depth in swaddling cloth, ensuring infant's feet are touching the bottom corner of the tub for foot bracing.

Wipe eyes with fresh water, from the inner corner to the outer corner. Clean face with additional clean water.

Supporting infant's head, slowly unswaddle one arm at a time to wash, using hand or a wash cloth.

Slowly expose one leg at a time to wash and clean genital area. If the infant demonstrates any signs of stress allow time for recovery.

Rock the infant forward supporting under the neck. Wash the back through the wash cloth, so as not to disorganise the infant.

Top up with warm water if necessary. Wash the infant's head.

Gently unswaddle the infant, remove from the tub leaving the cloth in the bath, maintaining a contained, flexed position for security.

Quickly draw the infant to caregiver's chest and wrap in the fetal position in a towel, ensuring that the head is covered.

After bathing the infant should be alert and eager to feed orally.

PHIL 2008

Swaddle Bathing Clinical Practice Guideline*



CAUTION:
For mothers with a bloodborne pathogen, bathe infant as soon as possible after birth.

Swaddle Bathing...

- Supports family centered care^{1,2,8,20}
- Decreases behavioral stress^{9,10,14,16,18,19}
- Improves thermoregulation^{9,10,14,16,17}
- Enhances ability to feed after bath^{17,8}
- Can be routine bathing practice in hospitals^{1,2,7,8,9,14}

Educate family about how to bathe

Keep bath as short as possible (7-10 min.)

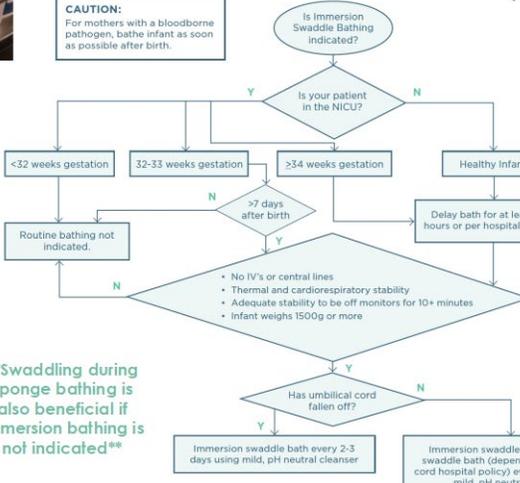
Bathe in a quiet draft-free environment

If vernix is present, leave on skin

****Swaddling during sponge bathing is also beneficial if immersion bathing is not indicated****



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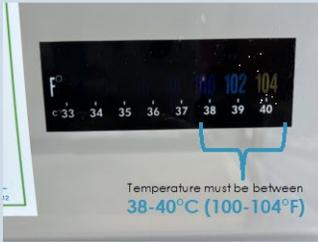
Dandy Tub Tips



1. Place sling on top of tub and strap around the bottom.



2. Fill to line with warm water.



3. Use temperature indicator on Dandy Tub.
(If no numbers appear, it's too hot)

Temperature must be between 38-40°C (100-104°F)



4. Swaddle baby in a thin fleece blanket and slowly lower into sling.

*currently in the process of obtaining bathing blankets

Appendix C

Project Timeline

Week	DCE Stage	Weekly Goal	Objectives	Tasks	Date Completed
1	Orientation Screening/Evaluation	1) Complete orientation by end of week 2) Begin needs assessment by end of week	-Complete site orientation -Update MOU with site mentor -Observe clinical work in the NICU	-Complete Learning Compass modules -Finalize MOU -Begin lit review for any new research regarding swaddle bathing -Review site guideline examples and current bathing guidelines and equipment used	1/14/22
2	Screening/Evaluation	2) Complete literature search for gestational age bathing and sensory needs by end of week	-Complete research	-Distribute surveys -Meet with Taylor	1/21/22
3	Screening/Evaluation	1) Complete bathing literature search by end of week	-Determine guideline requirements in swaddle bathing	-List specific guideline requirements needed -Write intro	1/28/22

			-Begin distributing surveys		
4	Screening/Evaluation	1)Complete rough draft of bathing guidelines by end of week	-Contact manufacturers for bathing products -Continue distributing surveys -Background draft due 2/4	-Write background draft	2/4/22
5	Screening/Evaluation	1)Complete final draft of bathing guidelines by end of week	-Send final draft to site and faculty mentors -Continue surveys	-Write project design draft	2/11/22
6	Screening/Evaluation	2)Begin creating swaddle bathing education presentation by end of week	-Send final draft to site and faculty mentors	-Create education presentation	2/18/22
7	Implementation	1)Create final swaddle bathing presentation for staff education by end of week	-Revise presentation as needed -Send presentation to mentors	-Work with site mentor throughout implementation process	2/25/22
8	Implementation	1)Present education & increase	-AOTA conference 3/31-4/2	-Place education in NICU and	3/4/22

		awareness of poster/ppt		advocate to staff -Email Stephanie Lee PowerPoint if appropriate for Learning Compass	
9	Implementation	1)Utilize swaddle bathing protocol at least once by end of week		-Finalize methods section with Taylor	3/11/22
10	Implementation	1)Complete swaddle bathing education with nursing staff by end of week	Post-surveys	-Write outcome draft	3/18/22
11	Implementation	1)Distribute post-education surveys	Post-surveys	-Write dissemination plan	3/25/22
12	Implementation		Final week of post-surveys		4/1/22
13	Discontinuation	1)Analyze survey results by end of week	-Determine any differences of stress cues/temps in bathing types	-Create site presentation of findings -Finalize outcomes section	4/8/22
14	Dissemination	1)Disseminate survey findings to site by end of week	-Abstract, Summary, Conclusion draft due 4/15 -Final site mentor evaluation	-Write abstract, summary, and conclusion draft	4/15/22