



A Simultaneous Use Dyad Design: Clip for Care, Breaking Barriers to Kangaroo Care in the NICU

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Introduction/Concept/Context: Approximately 1 in 10 babies are born prematurely in the US each year (CDC, 2022) and this pre-term birth rate is among the worst of high-resource nations (March of Dimes Report Card, 2021). Premature delivery often results in the baby requiring time in a hospital's Neonatal Intensive Care Unit (NICU). The NICU provides premature babies with crucial medical assistance necessary for the baby's health and survival. However, the NICU creates many barriers for mothers to participate in essential care activities including breastfeeding and kangaroo care. Kangaroo care is a method of holding a baby skin-to-skin with the typical placement of the infant on the mother's chest. This activity has been shown to promote breastfeeding and increase breastmilk supply, which in the NICU may be inhibited by biological and environmental barriers. Research has shown that mothers who give birth prematurely are less likely to initiate breastfeeding and the duration in which they breastfeed is shorter compared to mothers who give birth to full-term babies (Naylor et al., 2020). Therefore, *the purpose of this design* research was to create a garment that eliminates barriers and enables mothers to successfully perform kangaroo care in the NICU while also enhancing a mother's ability to breastfeed. Accordingly, *the design challenge* was to utilize the Simultaneous Use Dyad (SUD) Framework for User Center Design (Ridgway & Clarke-Sather, 2022), to create a kangaroo care garment that addresses the needs of both mom and baby, who will use the garment simultaneously.

Building upon past design research (Ridgway, 2023; Cobb & Clarke-Sather, 2020), this current design exploration was guided by the SUD framework (Ridgway & Clarke-Sather, 2022). The SUD framework clearly delineates the design process for creating garments that are used by two different users at the same time. Designing a kangaroo care garment is extremely complex as the garment solution must consider the needs of both mother and infant. Utilizing the SUD framework, the research team followed the five-stage design process. In the research stage, the team used Clothing Taskscape Theory (Tullio-Pow & Strickfaden, 2022) to explore the user dyad, environment (NICU) and the tasks (kangaroo care and breastfeeding). The design team collaborated to gain access to past interview, survey, and observational data (Clarke-Sather & Naylor, 2019). This data was used to create a list of user needs for all three users: Mom, baby, and dyad. The team then did an analysis to determine to top needs of each user and did a needs assessment to examine conflicts between the user needs. For moms, the top needs priorities were comfort, ability to be worn in and out of the NICU, abdominal support/compression for postpartum care, and cooling properties as mother's report getting hot while conducting kangaroo care (Naylor et al., 2020). Baby's needs included medical tube access/support, easy and quick access to mom for placement and removal, warmth for body temperature regulation, and body support. The dyad's needs included assess to chest and breasts for kangaroo care and breastfeeding. The major user needs conflict

for the simultaneous use dyad addressed in the current design was temperature regulation. Research has shown that moms report the need to stay cool and avoid sweating while infants must be kept warm, between 97.7°F – 99.4°F (Bell, 2022), during kangaroo care. A needs conflict such as this one, calls for the designer to creatively problem solve to meet the needs of both users. Previously design work (Ridgway & Cobb, 2022), used laser cutting to increase breathability for a kangaroo care garment, however this method resulted in poor durability. Therefore, learning from past iterations, the current garment design integrates a large mesh panel across the back and up over top of the shoulders to increase the breathability of the garment and keep mom cool. Mom's often sit in leather recliners while performing kangaroo care in the NICU, therefore, increased increase airflow to the back and shoulders is essential in keep moms cool. To resolve the need conflict, the current design integrated a heavy, but soft cotton waffle fabric on the front of the garment where the baby would be wrapped to keep the infant warm. The integration of these two types of fabrics is a direct result of using the SUD Framework to guide this design research. When a needs conflict arises, the designer must innovate to provide a solution.

Aesthetics: It was the intention of the designer to create a garment that had the visual appeal of an elevated Athleisure garment rather than a medical care garment. This balanced, symmetrical garment was created in a single-color scheme utilizes a variety of black fabrics and notions. Research has reported that mother's seek maternity clothing in neutral colors (Gordon, 2015). Each of the three fabrics used (mesh, waffle, tricot) vary in texture and sheen creating visual emphasis while maintaining unity. The proportion of the garment was created such that the cropped jacket would sit above a new mother's postpartum belly and that the tank top was long enough to not interfere with a c-section incision.

Process, Technique, and Execution: Both flat patterning and draping were used to create the many elements of this design. This design consists of a tank top with built-in nursing/pumping bra that contains special features to facilitate kangaroo care and a cropped jacket that features mesh paneling, large kangaroo care zipper front "pocket", and hidden lapped seams giving access to a built-in bra strap clip system to hold infant medical tubing (fig 1.). The tank top with bra system and the cropped jacket are sewn together to create one innovative NICU kangaroo and breastfeeding care garment. All of the design elements and construction techniques were purposefully chosen to meet a user(s) need. For example, the zipper up the front of the cropped jacket was assembled with large, lapped panels integrated on the inside so that when the zipper is unzipped the baby's body is completely protected. There is a one-inch panel and a ¾ inch panel which lap over each other when the garment is zipped also protecting mom's bare skin from the zipper. The tank top has a built-in bra which was created with two overlapping panels to hold a breast pump in place and can function as a hands-free pumping bra (fig 2.). Additionally, the interior cups are created to fold down and completely expose the mother's chest while still covering the nipple with enough room for a breast pad (used to collect leaking milk) to be inserted. This carved out design makes it possible for a mother to conduct kangaroo care without exposing her breast entirely addressing a reported privacy issue in the NICU (Naylor et. al, 2020) A 1-inch elastic band connects the bra structure to the lower part of the tank top which anchors bra onto the body and provides breast support. The cropped jacket was anchored

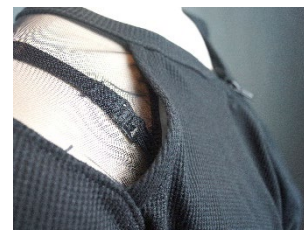


Figure 1. Lapped Seam and Clip System

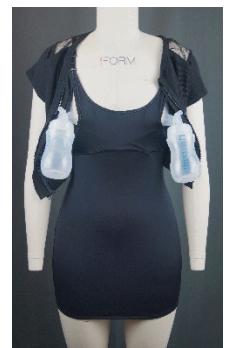


Figure 2. Built-in pumping bra

at the side seam and stitched into the center back waist seam to provide stability. The front of the jacket contains gathers along the hem to create fullness across the chest resulting in a large “pocket” for the baby to sit. The cropped jacket is finished with a one-inch sport elastic band to provide support for the baby’s body but is not attached to the tank top to allow the infant’s medical cords to hang down and not be impeded. Fabric selection and placement was purposeful to meet the needs of the users: (1) tricot fabric is ideal for activewear, supportive, yet breathable, (2) waffle knit soft, stretchy, warm, (3) mesh is soft and breathable. Please watch [this supplemental video](#) to view more information about the design features.

Design Contribution and Innovation: This design works builds off previous design scholarship (Ridgway & Cobb, 2023 ; Cobb & Clarke-Sather, 2020) to create a garment that puts the needs of a SUD at the forefront of the design. The use of the SUD framework in this design helps to solidify the design process and articulate tacit knowledge. Regarding innovation, this design utilizes the patent pending clip system which was originally designed to hold a mother’s shirt up while she breastfeeds (Ridgway, 2023), however this new design uses it for a new function of holding and securing medical tubes. Therefore, the current design extends the use of this clip system and further validates its usefulness in design by exploring a new application of its use. Future research should continue to evaluate design options that decrease the barriers to kangaroo care and meet the needs of simultaneous use dyads.

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