

A Study on Human-centered Design of Toddler Hospital Gowns

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Introduction: The quality of treatment influences hospitalization experience. Hospital gown plays a substantial role as it is a clinical supplement intended to provide physical and psychological well-being for inpatients (Wilkin et al., 1992). But the traditional gowns are non-fitted one-piece knee-length tunic-like dresses with a full opening at the back with knot closures and loose short sleeves. Dehumanizing aspects of care, as symbolically represented by the hospital gown, may adversely impact patient well-being (Morton et al., 2020). Younger children, especially those between the ages of six months to four years, are most vulnerable, and the positive experience of hospitalization has proven to be very effective in reducing their emotional distress. (Bonn., 1994). Based on the existing literature, no study focused on improving the traditional toddler's hospital gown's functionality, usability, and comfort from the users', caregivers', and medical practitioners' perspectives. To rectify this gap, original data is collected from healthcare professionals and parents of hospitalized children to develop an understanding of problems associated with traditional gowns and develop design criteria for a novel toddler hospital gown design.

Literature Review: Researchers applied a user-centered approach to design maternity gowns based on interviews and market research (Hwang., 2022). Another study reported the design process of a single-use hospital gown for adults called "OriGown (Black et al., 2013). Park (2014) used an integrating process model which consolidated the universal design principles and functional-expressive-aesthetic attributes for hospital gowns. Cho (2016) interviewed licensed nurses and adult patients and their findings concluded that a gown should accommodate all body activities, the opening should provide privacy and dignity, closures should be easy to reach for donning & doffing, fasteners should be easy to grip, manipulate, and seam finishes should not be bulky. Gordon (2013) designed two adult hospital gowns for acute care patients and clinical purposes, considering current manufacturing and laundering capabilities. The only available study about children's hospital gowns surveyed satisfaction with the fit, design preferences, and demographic information (Suh et al., 1999).

Methodology: Byrne's (2001) interview method for data collection and qualitative data analysis was employed as the methodology. Ten parents whose kids (aged 1-5) were admitted to the hospital overnight, were recruited, and five pediatric nurses were recruited from UC Davis Health Children's Hospital. Each participant participated in a 45-60-minute interview session, answering questions based on their experience using hospital gowns, focusing on Lamb & Kallal's (1992)

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Functional, Expressive, Aesthetic (FEA) model. The interview was audio-recorded for transcription and then coded to understand the problems associated with hospital gowns for toddler patients from the users', caregivers', and medical practitioners' perspectives to develop design criteria for new hospital gowns with improved functionality, comfort, and usability.

Results and Discussion: *Functional Mobility:* Based on the interviews results, the traditional gown is not functional in accommodating some activities like rolling on bed and using the toilet due to its loose fit. *Donning-Doffing/Closures:* When children have vital monitors, IV fluids, and blood transfusion attached to the body, multiple openings are required on sleeves and pants legs to maneuver the hand and feet without detaching the equipment. Moreover, knot closures are reported as cumbersome and cause tactile discomfort. Parents suggested adding seamless closures while nurses highlighted the importance of non-metal closures to make the gown MRI compatible. Also, durable closures to retain the harsh laundry processing were preferred. *Body access/Telemetry opening:* The traditional gown has plenty of back access as it has full back opening. On the other hand, parents and nurses mentioned that the current gown has no front opening to access the patient's chest. Nurses suggested a front opening is very important to access the center line (which cannot be unplugged for the risk of infection), G-tube, chest tube, ostomy bag, and monitor lung (see Image 1). They

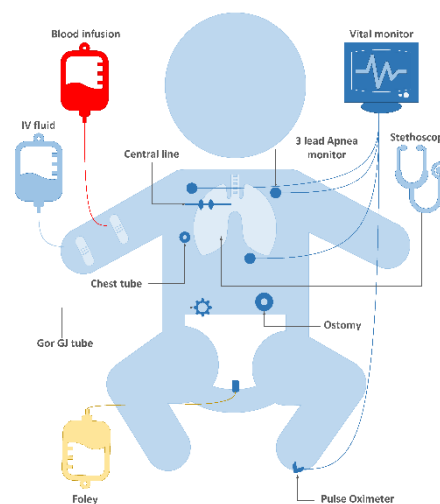


Image 1: The map of possible vital monitors and treatments that requires front access.

also suggested adding telemetry openings to the gown to direct ECG/EKG wires and tubes to the body and adding clips to secure those wires and tubes. *Size/Fit:* Nurses pointed out that the gowns don't fit properly because only three/four sizes were available for kids aged between 1-12. Some hospitals provide two-piece gowns, but the sizes were mismatched where shirts fit properly, while the pants legs were long, and the waist was large according to the parents. Parents preferred drawstrings over elastic so they could fasten the waist and roll the pants. Parents defined the loose fit of one-piece gowns as more uncomfortable for their children since both the form and the fit are unfamiliar to their regular clothing. In addition to the gowns, parents and nurses used adult-size socks to keep children's feet warm because kids-size socks were not commonly available. Parents and nurses described difficulty of attaching the pulse oximeters to the toe with these oversized socks. Nurses recommended socks with toe openings for pulse oximeter connection as it is an essential vital monitor that goes to the kid's body during hospital stay. *Sensorial/ material comfort:* Parents highlighted the importance of sensorial comfort for hospital gowns as the kids are already sick and tired. Most parents found the gown materials rough and stiff, which was the first reason they opted out of it. *Thermal comfort:* The parents were concerned about the thermal comfort of their kids as the gowns were very lightweight, and their kids felt cold. Nurses indicated

blankets were not allowed in crib-type hospital beds due to safety reasons. *Aesthetic Color/Pattern*: Parents and their kids liked bright colored gowns and patterns like animals and superheroes that uplift kids' moods. *Design/Silhouette*: Kids prefer something other than a traditional gown for its tunic-like silhouette that makes kids look comfortable. *Expressive Privacy*. Parents and nurses recommended a modest design that focuses on privacy, as the back opening of the gown exposed the whole back during the checkup and walking.

Conclusion: The interviews shed light on how to design a kids' hospital gown from users', caregivers', and medical practitioners' perspectives. The results indicated that front access, telemetry openings to channel wires, and secure clips are essential, while sewed sleeve and pants legs should be avoided, which require unplugging any vital monitor or ongoing treatment during changing clothes. Sizing and fit are important factors for mobility; flat closures are required for tactile comfort. Non-metal and durable closures are necessary for MRI compatibility and retaining the frequent harsh laundering. Socks that allow thermal comfort and attachment of pulse oximetry, soft materials that can keep warm, overall gown design that feels familiar the regular clothes, uplifting colors and patterns, and modest design that accommodates privacy are all important design criteria revealed as interview results. The following design criteria will help design highly functional, user-friendly, and comfortable hospital gowns for toddlers. Moreover, it will guide adaptive clothing design for patients with special health conditions.

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