**Background**

Family members greatly contribute to the development of infants treated at the Neonatal Intensive Care Unit (NICU), improving infant development, reducing NICU length of stay, and minimizing potential hospital readmissions. (Frosen et al., 2018)

NICU parents experience family engagement while preparing for their role after NICU discharge. Through various actions and interactions, family engagement is critical to maximize family participation in health care continuum in the NICU. (Carman et al., 2013; Shepley et al., 2008; Cone et al., 2010; Bosch et al., 2012)

**Conceptual Framework**

**METHODS**

QUALITATIVE, GROUND-UP MODEL BUILDING APPROACH

Case Study Research Design: Two NICUs representative of the SFR design model, with various family support rooms, and offering various family engagement actors and interactions.

**Data Collection**

- Physical assessment, field observations, interviews with parents and staff, and survey with parents.
- Data analysis: Thematic analysis, pattern matching, cross-case synthesis.

**Cross-case Findings**

**Built Environment Factors**

**Impact on Family Engagement Behaviors**

- Physical Proximity: Physical distance / spatial depth between family support rooms and the unit.
- Accessibility: Direct/in-direct physical connectivity between family support rooms and the unit.
- Visibility: Visual access into family support rooms.
- Other impacting factors: organizational culture.

**Physical Proximity**

- Family support spaces located inside the unit support family wellbeing and family-staff communication.
- Family support spaces located outside the unit hinder family motivation to use spaces.

**Accessibility**

- The presence of SFRs supports family privacy, which supports family presence of bedside, family wellbeing, family-staff communication, direct infant caregiving, and caregiving.
- The presence of SFRs in the unit hinders sleep comfort, respite, and community building.

**Visibility**

- Adequate family zone size supports family wellbeing.
- Adequate zone size supports direct infant caregiving.

**Pre-Requisites of Space**

- SFRs with vs. without private rooms.
- Family support rooms (NICU with vs. without family support rooms, family lounge, garden, conference room, etc.)

**Type of Space**

- SFRs vs. NICUs with vs. without staff visibility.

**Size of Space**

- Family bed: ergonomically comfortable and sizeable
- Infant bed: reconfigurable and flexible storage, storage for family and infant care supplies.

**Furniture/Equipment Layout**

- Adequate family bed supports family presence at bedside overnight and family wellbeing.
- Adequate infant bed designs support direct infant caregiving.
- Adequate storage supports family wellbeing and face-to-face communication.

**Sources of Distractions**

- Adequate information display supports family-staff interface communication and information exchange.

**Design Recommendations**

- Locate family support spaces inside or with direct/easy access to the unit to support family presence, infant proximity, and comfort.
- Provide enough space around infant bed to avoid clutter and facilitate bedside caregiving and educational interactions.
- Provide enough space and furniture at family zone so that it accommodates at least two family members and facilitates family presence and comfort.
- Locate SFR zones and furniture so that direct visibility between family, staff, and infant is afforded, facilitating caregiving and family-staff communication.
- Locate SFR zones and vertical partitions to support spatial hierarchy, shielding family members from staff visibility while also fostering infant supervision.

- Locate information displays so that it facilitates its direct visibility, supporting family-staff communication as well as information awareness.
- Design family bed, chairs, and storage so that they support comfort and encourage families to sleep and stay longer at bedside.

**Legend:**

- Single Family Room (SFR, floor plan)
- NICU 1: Single-family + Mute colors
- NICU 2: Single-family + Bright colors
- Transition zone
- Garden
- Family support rooms (family lounge, garden, family support room: NICU with vs. without family support rooms, family lounge, garden, conference room, etc.)
- Access: Family members from staff visibility while also fostering infant supervision.
- Location of family support rooms.
- Access to the overall unit.
- Location of zones, internal partitions, furniture and equipment in the SFR.
- Physical access into family support rooms.

**Design Recommendations About the Single-Family Room Model**

- Related to the SFR zones and vertical partitions.

**Aim**

Explore how various types of built environment characteristics may support, facilitate or hinder behaviors related to the family engagement continuum in the NICU.

**Research Question:**

How can built environment characteristics impact family engagement behaviors related to family presence, care, information exchanges and caregiving in NICU settings—singly composed of Single-Family Rooms?