ARCHITECTURE FOR FAMILY ENGAGEMENT IN THE NEONATAL ICU: DESIGN RECOMMENDATIONS ABOUT THE SINGLE-FAMILY ROOM MODEL

HERMINIA MACHRY, PhD, EDAC
Postdoctoral Fellow
Georgia Institute of Technology
ANJALI JOSEPH, PhD, EDAC
Professor, Endowed Chair in Architecture + Health Design and Research
Clemson University
DAVID ALLISON, FAIA, FACHA
Professor, Director of Graduate Studies in Architecture + Health
Clemson University

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. (Fenwick et al., 2008)

NICU parents experience family engagement while preparing for their role after NICU discharge, through various actions and interactions. (Altimier et al., 2005; Örtenstrand et al., 2010)

Family engagement is critical to maximize family participation in health care (Carman et al., 2013)

Single Family Room (SFR) Design Model:

Is the current trend in NICUs, showing increased privacy and parental participation in care when compared to the previous model (open bay). (Shepley, 2014)

Shows **concerns related to peer-to-peer isolation** (Shepley et al., 2008; Cone et al., 2010; Bosch et al., 2012)

Still unexplored in-depth as to its impact on family engagement.

WARD

Source: www.stph.org/nicu

OPEN BAY

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 solely composed of Single-Family Rooms?

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 actions 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.

Conceptual Framework

BEING PRESENT:

The frequency and duration of parents' visits to their infants has been associated to how much they participate in interactions like breastfeeding and medical rounds. (Franck & Spencer, 2003; Davidson, 2013)

RECEIVING CARE:

Parents' phisiological and psychological wellbeing are important conditions for them to interact. (Garrouste-Orgeas et al., 2010)

Previous studies have found that access to information, social support and daily living activities mitigate parents' stress in the NICU. (Cleveland, 2008, Mundy, 2010)

RECEIVING & PROVIDING INFORMATION:

Interactions between parents and staff are critical to their effective communication as well as for parents' learning in the NICU, which often occurs through medical rounds and infant care training and coaching. (Davidson, 2013; Reeves et al., 2015; Cooper et al., 2007)

PROVIDING CARE:

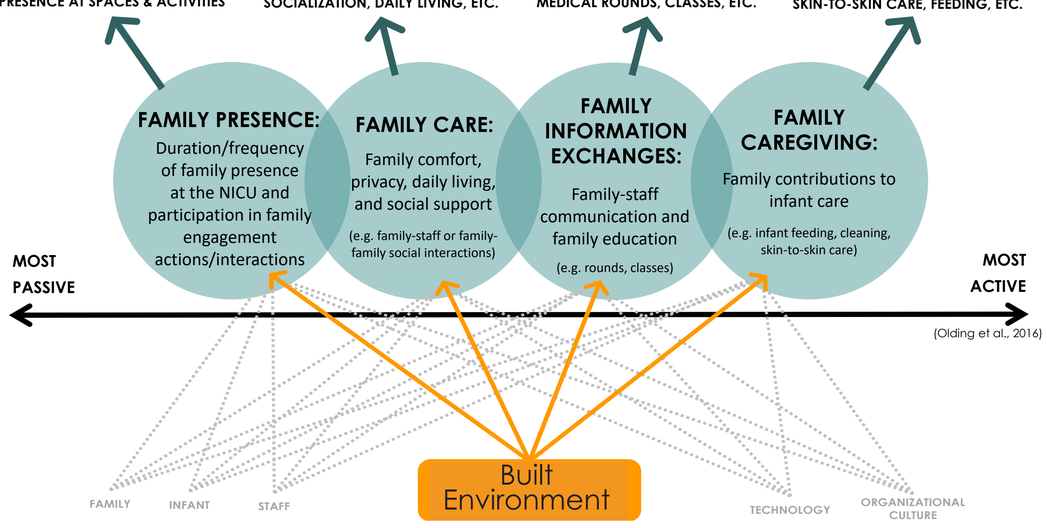
Participation in infant care is when parents are most active in the engagement process, occurring through hands-on parental contributions to care like infant feeding and cleaning. (Griffin, 2006; Skene et al., 2012)

PRESENCE AT SPACES & ACTIVITIES

SOCIALIZATION, DAILY LIVING, ETC.

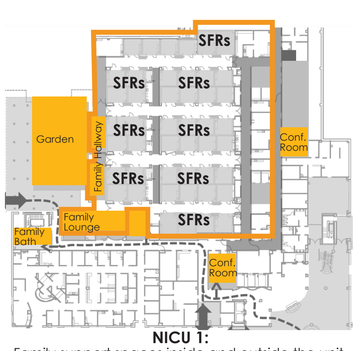
MEDICAL ROUNDS, CLASSES, ETC.

SKIN-TO-SKIN CARE, FEEDING, ETC.

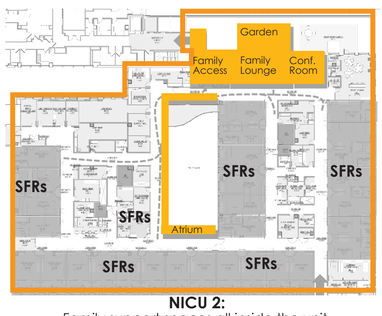


Cross-case Findings

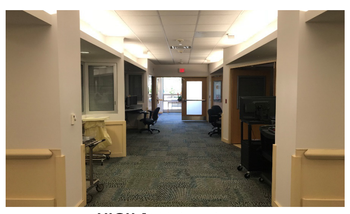
CASE 1	CASE 2	Built Environment Factors	Impact on Family Engagement Behaviors
UNIT LAYOUT Location of family support rooms (inside vs. outside) in relation to the overall unit.		**Physical Proximity:** Physical distance / spatial depth between family support rooms and the unit. **Accessibility:** Direct/indirect physical connectivity between family support rooms and the unit. **Visibility:** Visual access into family support rooms.	Family support rooms located inside the unit **support family wellbeing and family-staff communication**. Family support spaces located outside the unit **hinder family motivation to use spaces**. **Other impacting factors:** organizational culture
UNIT AESTHETICS *(Positive Distractions)*		Color intensity around unit (Bright vs. muted colors) Signage themes around unit (adult vs. infant-like)	Bright colors and infant-like signage themes **support** family wellbeing.
PRESENCE OF SPACE		**SFR:** NICU with vs. without private rooms **Family support room:** NICU with vs. without family support rooms (family lounge, garden, conference room, etc.)	The presence of SFRs **supports family privacy, which supports family presence at bedside, family wellbeing, family-staff communication, direct infant caregiving, and feeding caregiving.** The presence of SFRs in the unit **hinders sleep comfort, respite and community living.** **Other impacting factors:** organizational culture
TYPE OF SPACE		**SFR + Bathroom:** Bathroom inside vs. outside SFR. **Couplet-care SFR:** SFR with vs. without accommodations (patient bed) for inpatient mother inside the SFR.	SFRs with private bathrooms and Couplet-care SFRs **support family wellbeing**. Couplet-care SFRs **hinder sleep comfort for inpatient mothers**. **Other impacting factors:** family member characteristics and organizational culture.
SIZE OF SPACE		**Size of family zone:** Big enough to accommodate family bed for at least 2 people; storage and sources of distraction. **Size of infant zone:** Big enough to accommodate infant care equipment and flexible family chair positioning at bedside.	Adequate family zone size **supports family wellbeing.** Adequate infant zone size **supports direct infant caregiving.** **Other impacting factors:** infant and family characteristics.
FURNITURE/EQUIP. LAYOUT		Location of zones, internal partitions, furniture and equipment in the SFR. Location of seating in family support rooms.	Zone and furniture/equipment layout affording direct family-staff visibility as well as direct family-infant visibility **supports family-staff communication and direct infant caregiving.**
FURNITURE/EQUIP. DESIGN		**Family bed:** ergonomic comfort and size. **Infant bed:** recessed and flexible storage. **Storage:** for family and infant care supplies.	Adequate family bed **supports family presence at bedside overnight and family wellbeing.** Adequate infant bed design **supports direct infant caregiving.** Adequate storage **supports family wellbeing and face-to-face communication.** Adequate storage and infant care equipment **support infant caregiving.** **Other impacting factors:** organizational culture.
SOURCES OF DISTRACTIONS *(Positive Distractions)*		TV Artwork / decorations Windows Childcare artifacts	Sources of distraction in the SFR **support family wellbeing and prolonged bedside presence.** Sources of distraction in the SFR **may hinder family focus on infant caregiving.** **Other impacting factors:** organizational culture.
INFORMATION DISPLAYS			Information displays **support family-staff interface communication and information access.** **Other impacting factors:** technology and organizational culture.



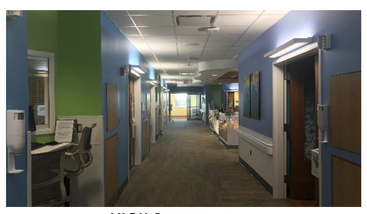
NICU 1:
Family support spaces inside and outside the unit.



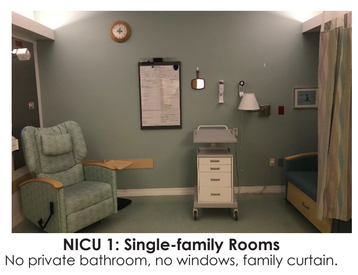
NICU 2:
Family support spaces all inside the unit.



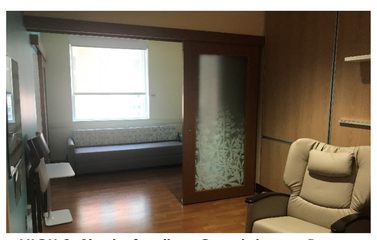
NICU 1: Mute colors



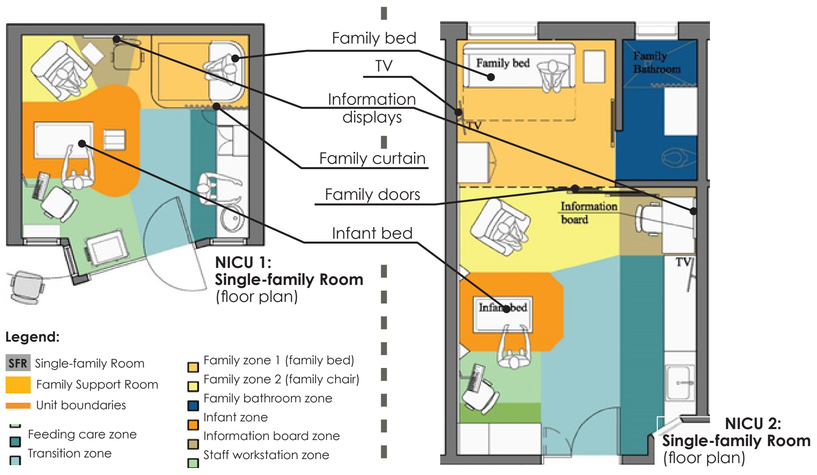
NICU 2: Bright colors



NICU 1: Single-family Rooms
No private bathroom, no windows, family curtain.



NICU 2: Single-family + Couplet-care Rooms
Private bathroom, windows, family doors.



NICU 1:
Single-family Room
(floor plan)

NICU 2:
Single-family Room
(floor plan)

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 beds, chairs and storage** so that they support comfort and encourage families to sleep and stay longer at bedside.

CLEMSON ARCHITECTURE + HEALTH

REFERENCES

Altimier, L. B., Eichel, M., Warner, B., Tedeschi, L., & Brown, B. (2005). Developmental care: Changing the NICU physically and behaviorally to promote patient outcomes and contain costs. Neonatal Intensive Care, 18(4), 12-16.
Bosch, S., Bledsoe, T., & Jenzarli, A. (2012). Staff perceptions before and after adding single-family rooms in the NICU. HERD: Health Environments Research & Design Journal, 5(4), 64-75.
Carman, K. L., Dardess, P., Maurer, M., Sofaer, S., Adams, K., Bechtel, C., et al. (2013). Patient and family engagement: A framework for understanding the elements and developing interventions and policies. Health Affairs (Project Hope), 32(2), 223-231. doi:10.1377/hlthaff.2012.1133 [doi]
Cleveland, L. M. (2008). Parenting in the neonatal intensive care unit. Journal of Obstetric, Gynecologic, & Neonatal Nursing, 37(6), 666-691.
Cone, S. K., Short, S., & Gutcher, G. (2010). From "baby barn" to the "single family room designed NICU": A report of staff perceptions one year post occupancy. Newborn and Infant Nursing Reviews, 10(2), 97-103.
Cooper L, Gooding J, Gallagher J, et al: Impact of a family-centered care initiative on NICU care, staff and families. Journal of Perinatology, 27:S32-S37, 2007
Davidson, J. E. (2013). Family presence on rounds in neonatal, pediatric, and adult intensive care units. Annals of the American Thoracic Society, 10(2), 152-156.
Fenwick, J., Barclay, L., & Schmied, V. (2008). Craving closeness: a grounded theory analysis of women's experiences of mothering in the Special Care Nursery. Women and birth, 21(2), 71-85.
Franck, L. S., & Spencer, C. (2003). Parent visiting and participation in infant caregiving activities in a neonatal unit. Birth, 30(1), 31-35.
Garrouste-Orgeas, M., Willems, V., Timsit, J. F., Diaw, F., Brochon, S., Vesin, A., ... & Moulard, M. L. (2010). Opinions of families, staff, and patients about family participation in care in intensive care units. Journal of critical care, 25(4).
Griffin, T. (2006). Family-centered care in the NICU. The Journal of perinatal & neonatal nursing, 20(1), 98-102.
Mundy, C. A. (2010). Assessment of family needs in neonatal intensive care units. American Journal of Critical Care, 19(2), 156-163.
Olding, M., McMillan, S. E., Reeves, S., Schmitt, M. H., Puntillo, K., & Kitto, S. (2016). Patient and family involvement in adult critical and intensive care settings: a scoping review. Health Expectations, 19(6), 1183-1202.
Örtenstrand, A., Westrup, B., Broström, E. B., Sarman, I., Åkerström, S., Brune, T., ... & Waldenström, U. (2010). The Stockholm Neonatal Family Centered Care Study: effects on length of stay and infant morbidity. Pediatrics, peds-2009.
Reeves, S., McMillan, S. E., Kachan, N., Paradis, E., Leslie, M., & Kitto, S. (2015). Interprofessional collaboration and family member involvement in intensive care units: emerging themes from a multi-sited ethnography. Journal of interprofessional care, 29(3), 230-237.
Shepley, M. M. (2014). Design for pediatric and neonatal critical care. Routledge.
Shepley, M. M., Harris, D. D., & White, R. (2008). Open-bay and single-family room neonatal intensive care units caregiver satisfaction and stress. Environment and Behavior, 40(2), 249-268.
Skene, C., Franck, L., Curtis, P., & Gerrish, K. (2012). Parental involvement in neonatal comfort care. Journal of Obstetric, Gynecologic & Neonatal Nursing, 41(6), 786-797.