

Best Evidence Statement (BEST)

Date: July 1, 2011

Evidence-Based Design of the Neonatal Intensive Care Unit (NICU)**Clinical Question**

P (population/problem)	Among infants in the NICU
I (intervention)	does care in a single family room environment
C (comparison)	versus care in an open bay environment
O (outcome)	decrease safety incidents.

Target Population

Infants needing care in the Neonatal Intensive Care Unit

Definitions:

Open-bay environment is a unit that has 4 to 7 infants housed in one area, such as a pod.

Single family room (SFR) refers to a private room in which the patient is cared for and the family has the option to stay at the bedside continuously.

Recommendations (See Table of Recommendation Strength following references)

It is recommended that patients in a NICU be provided care in a single family room environment, to decrease the rate of safety incidents (Bartley and Streifel, 2010 [5a], Domancio, Davis, Coleman, and Davis, 2010 [3a], Domancio, Davis, Coleman, and Davis, 2010 [4a], Ortenstrand, Westrup, Brostrom, Sarmon, Akerstrom, Brune, Lindberg, and Waldenstrom 2011 [2a], and Walsh 2006 [4a].) [Grade for this body of evidence is moderate.]

Note: - Both elements of staff and family satisfaction have also been proven to increase with the single family room environment.

Discussion/summary of evidence**Safety:**

Within the evidence, five articles addressed safety in the following aspects: nosocomial infections, peripheral intravenous catheter infiltrates, and medication or other healthcare related errors (Bartley & Streifel, 2010 [5a], Domancio, Davis, Coleman, & Davis, 2010 [3a], Domancio, Davis, Coleman, & Davis, 2010 [4a], Ortenstrand, et.al, 2011 [2a], & Walsh, W., Mcullough, K., and White, R., 2006 [4a]). Associations with decreased catheter associated blood stream infections (CABSI), increased breastfeeding success, and staff and family perceptions of safety, have been documented, with positive results, with the change to a single family room (SFR) environment. Domancio, Davis, Coleman, & Davis, (2010 [3a]) found a 2 day decrease in LOS, a significant decrease (57%) in apneic events, a significant ($p=0.048$) decrease in the amount of total parenteral nutrition days (which led to earlier breast milk introduction), and a comparative decrease in the nosocomial infection rate from 11% in the open bay environment to 6% in the SFR environment. A descriptive study by Walsh, Mcullough, and White, 2006 [4a] documented a significant decrease in nosocomial infections from 10.1 per 1000 patient days to 3.3 per 1000 patient days. Domancio, Davis, Coleman, & Davis, 2010 [4a]

and Bartley & Streifel, 2010 [5a] found that although the staff and families perceived an increase in safety related incidents these perceptions were not supported by the data.

Note:

In a randomized controlled trial in Sweden (*Ortenstrand et al., 2011 [2a]*), a 5 day reduction in length of stay (LOS) was found in preterm neonates admitted to the private room environment over those admitted to an open bay. Domancio (2010[3a]) also found a 2 day decrease in the LOS for those infants admitted into a SFR.

Family and Staff Satisfaction Supporting Information:

Many studies have documented an increase in both family and staff overall satisfaction with the change to the SFR environment from the open environment (Beck, Weis, Greisen, Andersen, and Zoffman, 2009 [2a], Domancio, Davis, Coleman, & Davis, B., 2010 [3a], Domancio, Davis, Coleman, & Davis, 2010 [4a], Stevens, Helseth, Khan, Munson, and Smith, 2010 [4a], Smith, Schoenbeck, and Clayton, 2009 [4a], Shepley, 2008 [4a], Alderson, 2007 [2b], Floyd, 2005 [5a], Carter, Carter, and Bennet, 2008 [4b], Harris, and Shepley, White, Kolberg, Harrell, J., 2005 [4b], Milford, 2008 [4b], Carlson, Walsh, Wergin, Schwarzkopf, and Eckland, 2006 [5b], Shepley, 2004 [5b], Padbury, VanVleet, and Lester, 2010 [5b], White, 2003 [5b], and Brown, P., & Taquino, L., 2001 [5b]). Many of these studies also documented an increase in the family participation in care including; availability for procedural consent and updates (Domancio, Davis, Coleman, & Davis, 2010 [4a], Stevens, Helseth, Khan, Munson, and Smith, 2010 [4a], Smith, Schoenbeck, and Clayton, 2009 [4a], Alderson, 2007 [2b], Carter, Carter, and Bennet, 2008 [4b]), teaching availability (Beck, Weis, Greisen, Andersen, and Zoffman, 2009 [2a], Carter, Carter, and Bennet, 2008 [4b]), and participation in individualized developmental care (Domancio, Davis, Coleman, & Davis, 2010 [4a], Shepley, 2008 [4a], Alderson, 2007 [2b], Floyd, 2005 [5a], Carter, Carter, and Bennet, 2008 [4b], Harris, Shepley, White, Kolberg, Harrell, J., 2005 [4b], Milford, Zapolo, and Davis, 2008 [4b], Carlson, Walsh, Wergin, Schwarzkopf, and Eckland, 2006 [5b], Shepley, 2004 [5b], White, 2003 [5b], and Brown and Taquino, L., 2001 [5b]).

For staff and parent satisfaction, the grade for the body of evidence: moderate.

Health Benefits, Side Effects, and Risks

Some of the potential health benefits that may arise from a single family room NICU environment may include: decreased nosocomial infections, decreased length of stay, decreased need for oxygen therapy, decreased parenteral feeding times, increased incidence of breast milk/lactation, increased individualized developmental care, and increase in family participation in care. All of these factors may decrease harm and potential sequelae related to increased hospital stay.

Moving into a single family room unit may not create any side effects for the patient population. One of the potential risks could be the lack of experience of staff that has not used the single family room model of care, which in turn could lead to further safety incident. Another potential risk is while caring for another patient; the nurse is not able to continuously observe infants in another room.

References (evidence grade in []; see *Table of Evidence Levels following references*)

Alderson, A. (2007). The ethics of space in clinical practice. *Clinical Ethics*, 2, 95-91. [2b]

Bartley, J. & Streifel, A. (2010). Design of the environment of care for safety of patients and personnel: does form follow function or vice versa in the intensive care unit? *Critical Care Medicine*, 38 (8), S388-398. [5a]

- Beck, S., Weis, J., Greisen, G., Andersen, M., & Zoffman, V. (2009). Room for family-centered care – a qualitative evaluation of a neonatal intensive care unit remodeling project. *Journal of Neonatal Nursing*, 15, 88-99. [2a]
- Brown, P., & Taquino, L. (2001). Designing and delivering neonatal care in single rooms. *Journal of Perinatal and Neonatal Nursing*, 15(1), 68-83. [5b]
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- Carter, A., & Bennet, S. (2008). Families' views upon experiencing change in the neonatal intensive care unit environment: from the „baby barn“ to the private room. *Journal of Perinatology*, 28, 827-828. [4b]
- Domancio, R., Davis, D., Coleman, F., & Davis, B. (2010). Documenting the nicu design dilemma: comparative patient progress in open-ward and single family room units. *Journal of Perinatology*, 1-8. [4a]
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- Floyd, A. (2005). Challenging designs of neonatal intensive care units. *Critical Care Nurse*, 25(5), 59-66. [5a]
- Harris, D., Shepley, M., White, R., Kolberg, K., & Harrell, J. (2006). The impact of single family room design on patients and caregivers: executive summary. *Journal of Perinatology*, 26, S38-S48. [4b]
- Milford, C., Zapolo, B., & Davis, G. (2008). Transition to an individual-room nicu design: process and outcome measures. *Neonatal Network*, 27(5), 299-304. [4b]
- Ortenstrand, A., Westrup, B., Brostrom, E., Sarmon, I., Akerstrom, S., Brune, T., Lindberg, L., & Waldenstrom, U. (2010). The stockholm neonatal family centered care study: effects on length of stay and infant mortality. *Pediatrics*, 125, e278-285. [2a]
- Padbury, J., VanVleet, M., & Lester, B. (2010). Building for the future of rhode island's newborns. *Medicine & Health Rhode Island*, 134-138. [5b]
- Shepley, M. (2004). Evidence-based design for infants and staff in the neonatal intensive care. *Clinics in Perinatology*, 31, 299-311. [5b]
- Shepley, M., Harris, D., & White, R. (2008). Open-bay and single-family neonatal intensive care units caregiver satisfaction and stress. *Environment and Behavior*, 40 (2), 249-268. [4a]
- Smith, T., Schoenbeck, K., & Clayton, S. (2009). Staff perceptions of workplace quality of a neonatal intensive care unit before and after transition from an open bay to a private room design. *Work*, 30, 211-227. [4a]
- Stevens, D., Helseth, C., Khan, M., Munson, D., & Smith, T. (2010). Neonatal intensive care nursery staff perceive enhanced workplace quality with the single-family room design. *Journal of Perinatology*, 30, 352-358. [4a]
- Walsh, W., Mcullough, K., and White, R. (2006). Room for improvement: nurses' perceptions of providing care in a single room newborn intensive care setting. *Advances in Neonatal Care*, 6 (5) 261-270. [4a]
- White, R. (2003). Individual rooms in the nicu – an evolving concept. *Journal of Perinatology*, 23, S22-S24. [5b]

Note: Full tables of evidence grading system available in separate document:

- [Table of Evidence Levels of Individual Studies by Domain, Study Design, & Quality](#) (abbreviated table below)
- [Grading a Body of Evidence to Answer a Clinical Question](#)
- [Judging the Strength of a Recommendation](#) (abbreviated table below)

Table of Evidence Levels (see note above)

<i>Quality level</i>	<i>Definition</i>
1a† or 1b†	Systematic review, meta-analysis, or meta-synthesis of multiple studies
2a or 2b	Best study design for domain
3a or 3b	Fair study design for domain
4a or 4b	Weak study design for domain
5 or 5a or 5b	Other: General review, expert opinion, case report, consensus report, or guideline

†a = good quality study; b = lesser quality study

Table of Recommendation Strength (see note above)

<i>Strength</i>	<i>Definition</i>
“Strongly recommended”	There is consensus that benefits clearly outweigh risks and burdens (or visa-versa for negative recommendations).
“Recommended”	There is consensus that benefits are closely balanced with risks and burdens.
No recommendation made	There is lack of consensus to direct development of a recommendation.

Dimensions: In determining the strength of a recommendation, the development group makes a considered judgment in a consensus process that incorporates critically appraised evidence, clinical experience, and other dimensions as listed below.

1. Grade of the Body of Evidence (see note above)
2. Safety / Harm
3. Health benefit to patient (*direct benefit*)
4. Burden to patient of adherence to recommendation (*cost, hassle, discomfort, pain, motivation, ability to adhere, time*)
5. Cost-effectiveness to healthcare system (*balance of cost / savings of resources, staff time, and supplies based on published studies or onsite analysis*)
6. Directness (*the extent to which the body of evidence directly answers the clinical question [population/problem, intervention, comparison, outcome]*)
7. Impact on morbidity/mortality or quality of life

Supporting information

Introduction

For years the design of the Neonatal Intensive Care Unit (NICU) has been referred to as a „baby barn“ in many instances. This refers to a room or many rooms, housing anywhere from 6 to 12 babies. In the early 1990s, the concept of the single family room NICU began to take shape. Many Pediatric Intensive Care Units and Cardiac Intensive Care Units have already started the transformation to new, private room models.

Slowly the NICU community has come to embrace this innovation and research examining the effects on outcomes. As of now, research regarding infant outcomes and safety is slowly starting to become available.

Group/team members

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Search strategy

Databases: Ovid Medline, PubMed, Cinahl, Nursing Reference Center, Google Scholar, and hand search.

Keywords: NICU, NICU Re-Design, NICU Design, NICU private room, Single Family Room NICU.

Limitations: English, 2000 to February 2011, peer-reviewed.

Retrieved: September 9, 2010 – February 18, 2011.

Copies of this Best Evidence Statement (BEST) are available online and may be distributed by any organization for the global purpose of improving child health outcomes. Website address: <http://www.cincinnatichildrens.org/svc/alpha/h/health-policy/ev-based/default.htm>

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Note

This Best Evidence Statement addresses only key points of care for the target population; it is not intended to be a comprehensive practice guideline. These recommendations result from review of literature and practices current at the time of their formulation. This Best Evidence Statement does not preclude using care modalities proven efficacious in studies published subsequent to the current revision of this document. This document is not intended to impose standards of care preventing selective variances from the recommendations to meet the specific and unique requirements of individual patients. Adherence to this Statement is voluntary. The clinician in light of the individual circumstances presented by the patient must make the ultimate judgment regarding the priority of any specific procedure.

Reviewed against quality criteria by 2 independent reviewers.