

# NEONATOLOGY TODAY

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### NEONATOLOGY TODAY

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## Millennium Neonatology: "Building for the Future"

By James F. Padbury, MD; Barry M. Lester, PhD

As the discipline of neonatology has matured, so has recognition that "best practices" and "standards of care" are needed to continue to improve outcomes of critically ill newborn infants.<sup>1</sup> Women & Infants Hospital of Rhode Island is part of the Department of Pediatrics at the Brown University Alpert Medical School, and provides services for critically ill newborn infants. The hospital moved to its present location adjacent to Rhode Island Hospital, and the Hasbro Children's Hospital in 1986 and became the Women & Infants Hospital of Rhode Island (WIH). At that time, the obstetrical service delivered about 5,500 infants/year. A 41-bed Newborn Intensive Care Unit was incorporated into the new facility. However, upward pressure on NICU census began not long after the move. There has been a subsequent increase in deliveries since 1990 to nearly 10,000 a year. In the last decade, there has been an increase in the complexity of newborn intensive care and an increased recognition by the community of excellence at Women & Infants, which has placed tremendous pressure on the facility and our capacity to care for these special patients. The census pressure in the NICU is due in greatest measure to a dramatic increase in survival of extremely low birth-weight infants. Women & Infants Hospital has been a nationally recognized leader in these dramatic improvements in survival. The most recently published data from the NICHD Neonatal Research Network, to which we belong, demonstrates survival at the "limit of viability" currently between 23 and 25 weeks.<sup>2</sup> Now, 30-40% of children born at 23 weeks' gestation (only a little over 5 months' gestation!) and

greater than 75% of children born at 24 weeks' gestation survive. This remarkable progress has resulted in an enormous increase in utilization of neonatal services in NICUs. At Women & Infants, the average daily census has risen from 50 to 70 patients per day, since 1995. This has created significant crowding in the Newborn Intensive Care Unit, Figure 1.



Figure 1: Crowding in the old NICU at WIH.

In recognition of the serious capacity issues at WIH, inter-departmental, interdisciplinary task forces were created to examine both neonatal and obstetrical service lines with a special emphasis on capacity. These task forces included members of the medical and nursing staff, administrative leadership, support staff and private voluntary physicians who use the facility, and they were supported by outside professional health consultants, epidemiologists and demographers. We reviewed delivery trends and utilization of the NICU from 1990 to the present. In order to project future needs, we reviewed the 2000 Census, and included adjustments for changes in population, race and ethnicity in our community. The analysis included models that

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took into consideration fertility rate by race, ethnicity and country of origin. These data were used to generate different “scenarios” for delivery rates and NICU beds needed over the next ten years. These data formed the basis for a successful, state-approved “Certificate of Need” for an 80-bed NICU, which was consistent with the documented regional needs for our services.

### Models of Care

While it was clear that a new NICU was needed at WIH, it was not clear what physical design and what “*model of care*” should be chosen. As the specialty of newborn intensive care has evolved, so have the *models of care*. ‘*Model of care*’ refers not only to the physical environment for the patient but that the design of the space surrounding that care is intimately related to outcomes. We identified several contemporary styles and *models of care*. These models included open bays where infants are cared for in a large open space or a partial modification called a “Pinwheel.” These models are similar to the existing NICU at WIH, albeit with new construction a much larger open bay would be needed. A rapidly emerging approach to newborn intensive care involves “single-family rooms.” This *model of care* recognizes that caring for critically ill patients (especially the very young and the very old) in a group or cohort can be disruptive. The clinical instability of children in shared space often leads to disruption of their neighboring partners. This is most apparent in NICUs where stability of vital signs (e.g. heart rate and breathing) is precarious. Even minimal visual, auditory and/or tactile stimulation can result in apnea and bradycardia. The single-family room design has garnered widespread acclaim for its many distinct advantages.<sup>3</sup> Patients cared for in individual rooms are less likely to be disturbed by their neighbors, the staff or other activities related to adjoining patients. This *model of care* also allows for better isolation of patients from nosocomial infections. This *model of care* uniquely provides for a level of privacy that is consistent with federal “HIPPA” Regulations. In addition, the single family room facilitates an expanded model to include a truly family-centered approach wherein the families can be present throughout most of the hospitalization and really become partners in care of their infants rather than episodic “visitors.” The benefit and focus goes beyond medical outcomes to improved neurodevelopmental outcomes of the babies.

In order to explore the most recent approaches to NICU design and construction and the models of care that lead to the best outcomes, WIH staff undertook a series of site visits to selected NICUs across the United States. A site visit team was assembled which included physician and nursing leadership, staff nurses, architectural consultants, a parent from our *Family Advisory*

Table 1: Guiding Principles for Design of New NICU
Family-centered Care: Parents as “Partners”
Developmentally Supportive Care Environment <ul style="list-style-type: none"> <li>• Sound and light</li> <li>• People, other stimuli</li> </ul>
Clinical Excellence <ul style="list-style-type: none"> <li>• Support medical model</li> <li>• State-of-the-art: design, equipment, electronics, information technology (IT), PACS</li> <li>• Teaching environment</li> </ul>
Staff Invested <ul style="list-style-type: none"> <li>• Involvement in design</li> <li>• Involvement in governance: “collaborative teams”</li> </ul>
Incorporate established evidence-based clinical and safety practices
Point of Service Care <ul style="list-style-type: none"> <li>• De-centralize services to patient and patient room</li> <li>• Rational zone size</li> <li>• Minimize patient movement</li> </ul>
Location <ul style="list-style-type: none"> <li>• Single NICU</li> <li>• Adjacency/access from Labor and Delivery</li> </ul>
Unique Institutional Identity <ul style="list-style-type: none"> <li>• Learn from examples</li> <li>• Develop W &amp; I model</li> </ul>

*Council* and members of our philanthropy team. In choosing NICUs to visit, we felt that the units should be comparable in size to our own, based in an academic teaching program, recently-constructed, and spanning the spectrum of *models of care* from open bays to single-family rooms. The programs we visited included: Vanderbilt University Children’s Hospital in Nashville, Tennessee; Blank Children’s Hospital in Des Moines, Iowa; Northside Hospital and Scottish Rite Children’s Hospital in Atlanta, Georgia; and lastly Children’s Hospitals and Clinics in St. Paul, Minnesota.

The results of the visits were surprising and compelling. At every site we visited, caring, open, considerate professionals shared with us everything about their units, their successes, their preferences and their opportunities for improvement. After completion of our site visits, we convened the entire group to synthesize our experiences into a list of “*Guiding Principles*” and “*Design Principles*.” These are shown in Tables 1 and 2. While there was some concern that the

Table 2: Design Principles for Design of New NICU
<ul style="list-style-type: none"> <li>• Welcoming and reassuring</li> <li>• Sense of openness/preservation of privacy</li> </ul>
Single Family Rooms (Standard of Care) <ul style="list-style-type: none"> <li>• All rooms similar</li> </ul>
Zones within Room <ul style="list-style-type: none"> <li>• Baby</li> <li>• Parent (single sleeping accommodation, desk; no toilet, no VCR, no TV, no radio)</li> <li>• Staff</li> </ul>
Clarity of Organization <ul style="list-style-type: none"> <li>• Clear way-finding</li> <li>• Smooth flow</li> <li>• Ergonomic</li> </ul>
Zoning of NICU: Optimum range of zone size (to be determined based on staffing; operations)
Balance between staff and family needs <i>Support/Staff areas (total clinical support program to be developed)</i> <u>On Unit</u> <ul style="list-style-type: none"> <li>• Family support area</li> <li>• Dirty/clean utility</li> <li>• Satellite Pharmacy</li> <li>• Staff lounge</li> <li>• Conference room</li> </ul> <u>Adjacent to or off Unit</u> <ul style="list-style-type: none"> <li>• Offices (MD, NM, LCW)</li> </ul>
“Green Design” <ul style="list-style-type: none"> <li>• Maximize use of natural light</li> <li>• Evaluate impact on cost and operations</li> </ul>
<ul style="list-style-type: none"> <li>• Sensitivity to end of life issues</li> </ul>

single-family room model of care was beyond the scope of the large service at a facility like WIH, after visiting these recently constructed nurseries there was unanimous consensus that it was the only *model of care* that should be considered. Numerous studies have been published which demonstrate that environmental conditions in the Intensive Care Unit can have significant effects on outcome. For caregivers, the environment influences their work performance, their satisfaction and their health.<sup>4-6</sup> For patients, the physical environment can have a profound effect on rate of recovery, and development. While these observations are best documented in adult patients, it is clear that physical and environmental conditions also affect the outcome of critically ill newborn infants. We believe that, before the next decade is completed, this will be the dominant *model of care* in NICU design. In the fall of 2006, the American Institute of Architects made this very recommendation.

## The New NICU at Women & Infants Hospital of Rhode Island

The existing WIH NICU was an open-bay design with approximately 10,900 dgsf (departmental gross square feet)/1,013 dgm<sup>2</sup> (departmental gross square meters). Although the NICU was licensed for 60 beds, the actual volume was much higher and on average accommodates more than 70 babies a day. The space around each baby was less than 35 nsf (net square feet)/3.25 nm<sup>2</sup> (net square meters), which is much less than the present standards of 150-180 nsf/11.15 nm<sup>2</sup> of clear space for each baby. In order to incorporate all of the clinical programs within 80 single family rooms, the new NICU required more than 56,000 dgsf/5,200 dgm<sup>2</sup>. Although the hospital is only 20 years old and was designed to accept three additional floors on the top of the existing building, the existing floor plate was too small. It was insufficient to fulfill the guiding and design principles and it could not accommodate the physical adjacencies and bed zoning necessary to support an optimal medical model. Vertical expansion also meant that beds on the top floor of the hospital would need to be vacated which was not economically feasible. The decision to locate the NICU in a new addition at the front of the hospital met all of the guiding and design principles.

A key requirement for the new NICU was to locate it next to the existing Labor and Delivery Suite. Initially, the goal was to locate all beds and core programs on one floor. An advantage to having all programs on one floor was that all support programs could be centrally located. A disadvantage of the one-floor scheme was that the floor plate was too broad and long travel distances restricted the opportunity to bring natural daylight to interior areas. Furthermore, one large floor versus two smaller floors would be more expensive to build. For these reasons, and in order to preserve more land for future hospital expansion, the NICU was located on two floors. The New Clinical Addition was designed as a 5-story building, including the mechanical penthouse. The Basement houses building support services. The ground floor includes a new lobby, conference center and public support spaces. The NICU is on Floors 2 and 3. Floor 4 includes a 30-bed, dedicated high-risk Antenatal Care Unit. The fifth floor houses central mechanical and electrical equipment.

The single floor NICU would have had an enormous footprint, creating huge distances between service areas. Locating the NICU on two floors reduced that footprint (and cost) and allowed better geographic consolidation. The disadvantage of a two-floor NICU is that certain program elements have to be duplicated. Dedicated elevators (3) and stairs (4) for staff and patients became essential. In order to minimize duplication and to unite the two floors as much as possible, the design includes a vertical connection utilizing open atriums and open stair connections. This architectural design allowed us to provide visible and direct access to program spaces that includes the family center and staff lounge. Clustering specific programs around the atrium clarified way-finding, Figure 2.

### Building Organization

Each floor of the New Clinical Addition is organized into two 20-bed zones, totaling 80 beds. Each floor is supported by one medical team. Floor 2 is immediately adjacent to the Labor and Delivery (LD) suite and contains clinical programs such as Pharmacy and Respiratory Therapy. A Family Center and Staff Lounge are also on Floor 2. Staff/

service elevators are at the north entry, while public elevators service the sun-filled central lobbies. Locating patient elevators as close as possible to the LD provided the shortest possible travel access to the Floor 3 NICU. A 10-bed area on each floor was designed with both positive and negative air pressure flow. Negative pressure is activated to evacuate air-borne pathogens.

Each 20-bed pod is designed with core support elements that include a charting station between two rooms, clean supplies, soiled utility, equipment room and a family space that intimately accommodates several people. Each pod is organized with two blocks of rooms that are staggered from one another to allow maximum visibility, staff communication and interaction. Each zone has two rooms for twins and three single rooms that are connected and can accommodate triplets. There are no rooms anywhere on the floor that are physically isolated, a feature very important for staff.

Centrally located spaces that support both pods on each floor include a laboratory, respiratory workroom, physician on-call room, staff offices and conference rooms. The family and public entrance is centrally located to each

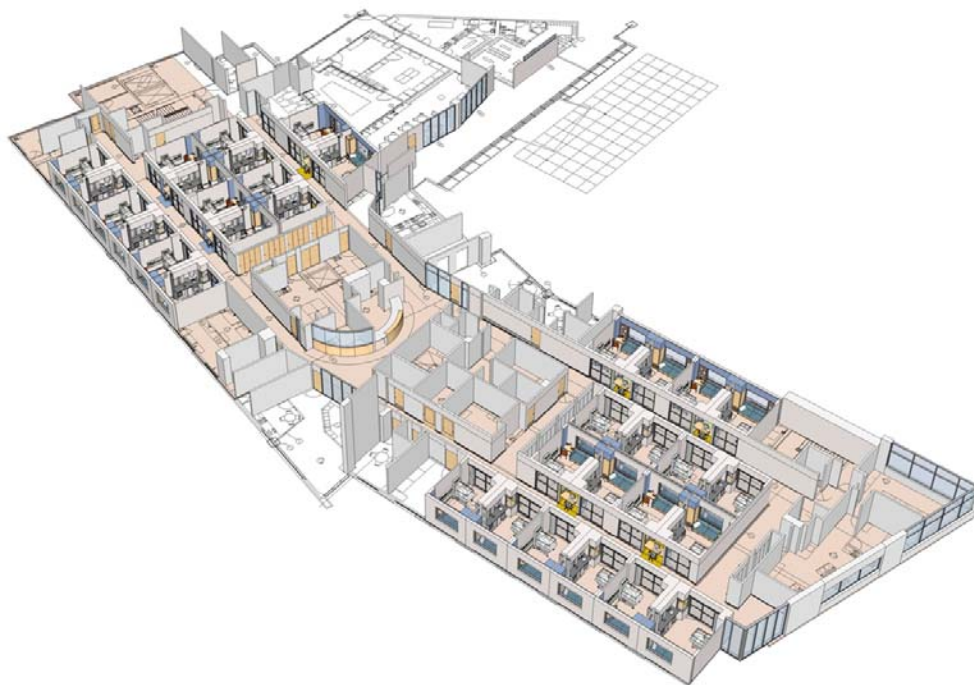


Figure 2: Three-D layout of NICU floor showing clustering of specific programs.



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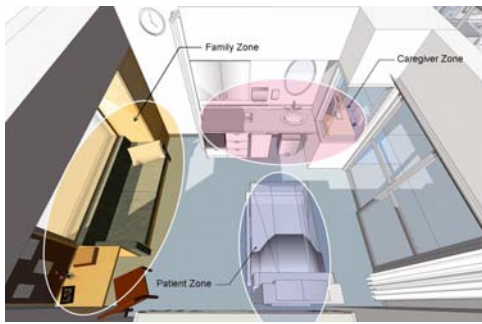


Figure 3: Patient Zone, Staff Zone and Family Zone in each room.



Figure 4 A (Top): Twin Room showing patient and parent space.

Figure 4 B (Middle): Single Patient Room.

Figure 4 C (Bottom): Nursing charting and work area showing line of site into each room.

pod. The Secretary Station is adjacent to the entry. In addition to providing information, the Station serves as a security screening post. The team room near the secretary accommodates the entire medical team, adequate terminals for electronic charting and a diagnostic quality, HD imaging station.

### The Infant's Room

Each NICU room is 175 nsf/16.25 m<sup>2</sup> and has three distinct zones: Patient, Staff, and Family, Figure 3. Each room provides an opportunity to individualize and personalize its space according to each baby's developmental needs. The NICU Room provides the privacy and separation that is necessary to perform critical procedures with restricted admissions, without affecting other infants.

Each caregiver/staff zone has a sink, a dedicated refrigerator and storage cabinets for needed supplies. The patient zone headwall provides medical gases and electrical services for the hookup of various equipment, including ventilators, pumps, and monitors. The family space accommodates a sleeper for parents, desk and storage, which can be separated by a privacy curtain. Every room has indirect dimmable lighting that can be adapted to individual needs related to circadian rhythms and delivery of services. Every room has a heating, ventilation and air conditioning (HVAC) system that facilitates procedures being performed within the room.

Before finalizing the design of the NICU room, the staff and designers built an actual working mock-up room. The mock-up was extraordinarily helpful for the staff to determine where everything should be located, to establish staffing flow patterns, and to evaluate which equipment configuration worked best. A staff-wide participatory process enabled acceptance of the single room model concept. The mock-up room was crucial in deciding the final design solution for the NICU room. Compliance with the mock-up also assured that the intent of the staff was implemented in the New Clinical Addition. Actual representations of our new single and twin rooms and the lines of sight we have created are shown in Figures 4 A, B and C.

### Family Participation

An important aspect of our NICU design is family participation. Space needs to be provided for the family in their individual rooms and outside the patient rooms.

It is important that family members have a place to congregate with other parents or, otherwise, find respite from the stressful NICU environment. In addition to a family room in each pod, we have created a Family Center centrally located with a comfortable lounge,



Figure 5: The Family Center joins elements and interactions from each floor.

kitchenette, sibling play area, conference and resource space. A family advocate who helps families with individual needs also serves this area. The family program elements are distributed over both floors but are all centrally located along with a 1200-gallon salt-water aquarium in an "open atrium" shown in Figure 5.

### Staff Satisfaction and Retention

Staff support spaces, access to daylight, and a less stressful environment are of great importance for the well-being and retention of staff. Although it was not possible to locate all staff workrooms and stations next to a window, the design provides interior glazed partitions, Figure 6. Staff can view out; daylight is transmitted through adjoining spaces. The importance of locating the staff lounge remote from the workspace should not be overlooked. It is crucial that this space be comfortable, have natural lighting, and is able to reduce stress in such a highly charged environment. At WIH, our lounge was designed to support complementary activity with plenty of natural lighting.

### Environmental Design

We designed the new clinical addition with the goal of improving patient and staff well-being, reducing energy consumption and minimizing negative impact on the environment. We achieved a Leadership in Energy and Environmental Design (LEED) Silver Certificate.

### Daylight

Seventy-five percent (75%) of all occupied spaces receive daylight. Ninety-percent (90%) of all occupied spaces have views to the exterior. Extensive use of indirect lighting reduces light pollution.

### Water

A storm water management system decreases rainwater run-off and treats storm water. Landscaping uses native species that do not require irrigation. The plumbing fixtures reduce water consumption by 20%.

**Energy**

In order to optimize energy performance, the building envelope was designed to reduce energy consumption to eighteen percent (18%) less than building code stan-

dards. Heating, ventilation and air-conditioning systems (HVAC) and lighting were designed to improve building performance by twenty percent (20%) below US national code. The efficiency results, in part, from enhanced refrigerant manage-

ment. The design minimizes the heat island effect on roofs and paved areas by use of high-albedo roofing and maximum shading of paved areas.

**Materials**

Ten percent (10%) of the materials used contain recycled content. Examples include steel, concrete, linoleum flooring and ceiling tiles. Ten percent (10%) of the materials used, including steel, concrete and brick, were extracted, processed, and manufactured regionally. Low-emitting materials were specified and include: adhesives, sealants, paints and carpets.

**Physical Environment in the Intensive Care Setting**

The conclusions of the site visit team were based on the results of the experiences of the people we visited. We have also examined published and unpublished data from Centers that have recently changed to different models of care. We should note that there are no data, which conform to the “gold standard for evidenced-based practice” which is a randomized, controlled “head-to-head” trial comparing, single family rooms to other models of care. The information to date is either anecdotal or based on retrospective, historical comparisons. The experiences of the units we visited were compelling in our decision to employ the single family room model of care exclusively. Nonetheless, documentation according to the best standards of “evidence-based practice” and “evidence-based design” is still lacking.

We are in the midst of conducting a prospective, longitudinal study of the impact of this model of care on outcomes. Our interdisciplinary research team includes PhD trained developmental specialists, neonatologists, neonatal nurses, OT and PT specialists and, of course, parents. The theoretical model underlying our study is shown in Figure 7. We believe that infants in the single room NICU will have better medical and neurobehavioral outcomes at discharge than infants in the open bay NICU. Medical outcomes include: length of stay, gestational age at discharge, weight, weight gain, illness severity and resource utilization, gestational age at enteral feeding, sepsis and necrotizing enterocolitis. Neurobehavioral outcomes include better NICU Network Neurobehavioral Scale (NNNS) profiles, better sleep state organization and sleep physiology, better infant mother feeding interaction scores and lower pain scores. We also believe that the positive effects of the new NICU will be explained in part by other mediating factors that can be expected to co-occur with the transition to the new NICU. These factors include changes in family centered care, developmental care, parenting and family

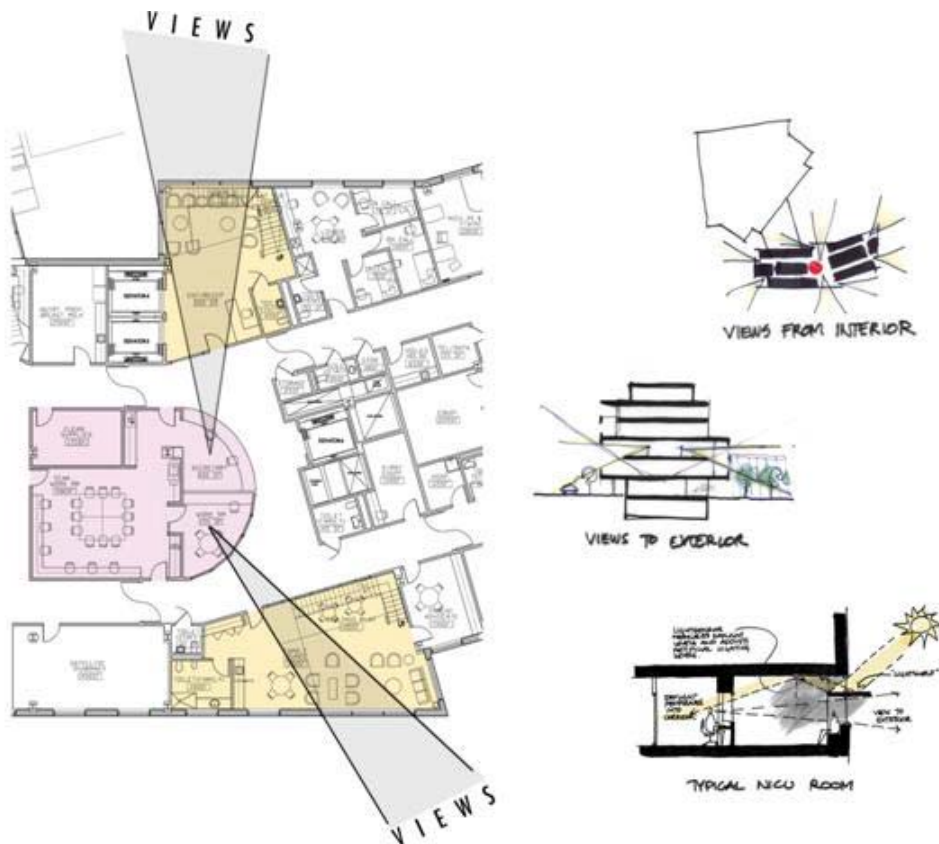


Figure 6: Line of sight from staff, family and lounge areas.

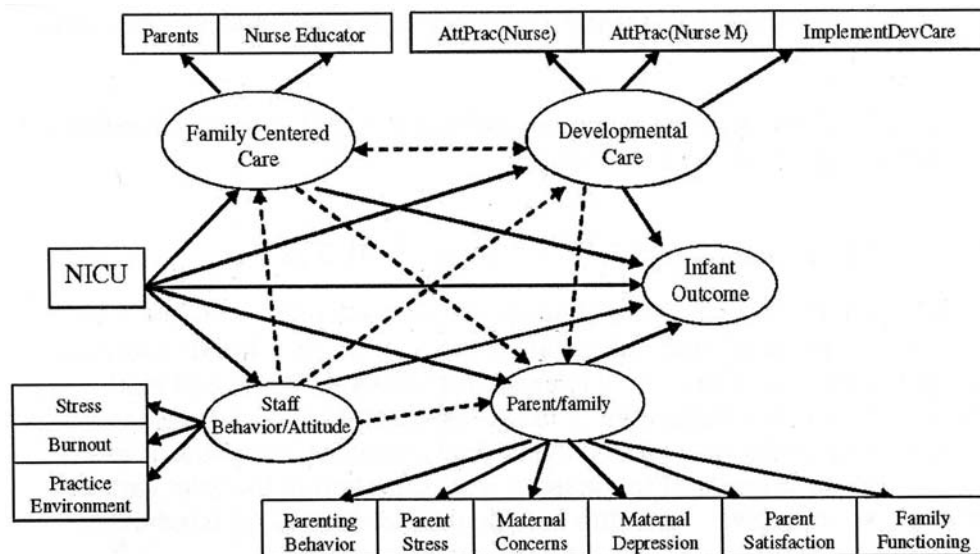


Figure 7: Theoretical Model for Study of the impact of Single Family Room NICU.

factors, staff behavior and attitudes and changes in medical practice and will be used as mediators in the statistical analysis. We have two years of carefully collected, prospective measurements of the elements illustrated in the Figure. We are continuing in the new NICU. We believe that findings from this study will influence the future of NICU design and model of care throughout the nation.



Figure 8. New Women & Infants' South Pavilion adjoining existing hospital.



Figure 9. Move of patients to the new NICU.



Figure 10. Families in the new NICU.

## Summary and Recommendations

Women and Infants Hospital's design principles reflect a commitment to family-centered care, which is at the heart of the Hospital's *Building for the Future* programs. We have created a welcome and reassuring environment with a sense of openness, along with provision of privacy for patients. We have created a contemporary, LEED Silver certified building that compliments our existing structure, Figure 8.

There has emerged among our staff and administration the unanimous view that the single-family room model of care is the only model able to provide these benefits. Families and patients' well being and outcome are at the center of our professional goals. We recognized the importance of a balance between staff and family needs in achieving those optimal outcomes. We have paid careful attention to providing adequate support areas for our professional staff and for ancillary professionals who contribute so much to newborn outcome. We believe that our design will enhance the clinical excellence that we have demonstrated in the past and of which the Hospital is proud. Importantly, we recognized the significance of design in creating optimal safety practices. We have incorporated the recommendations from the United States' Institute of Medicine Report "*Patient Safety: Achieving a New Standard for Care*" and the safety issues it raised. The recommendation includes provision for "point of care service" using terminal service for as many procedural undertakings as possible. Locating the NICU as close as feasible to the Labor & Delivery and operating suites was crucial.

On September 16, 2009, the high-risk antenatal obstetric service moved first to the new Antenatal Care Unit (ACU). It was glorious!

The move of women into the new Antenatal Care Unit, which was anticipated to take a number of hours, was completed in record time. As everyone moved into their spaces, there was a combined sigh of relief. The NICU was next, 68 patients with three additional admissions during the course of the move. As was the case with the Antenatal Care Unit, we were able to move more rapidly than originally planned. After 1½ hours, we had already moved 40% of the babies. As the patients moved along the corridors to the new NICU, Figure 9, there were crossing guards at each of the turns identifying every patient. We had an "emergency stopover" location that thankfully we never needed to use. As we began to fill the new spaces, family members were summoned from a Hospitality Suite in the first floor education center to be in their new room when their child arrived. By late afternoon, we closed the doors for the final time in the former Special Care Nursery and, to the cheers of all, we brought the last patient over to the

new NICU. Every child was in his/her own room with space for parents to sleep and be with them – hold them quietly and bond even in the middle of one of the most high tech units ever built, Figure 10. We have been there for two months now; it is absolutely spectacular! It is quiet, it is light, and it feels good. The families are happy. The nurses are happy. The residents are happy. It feels like a glove. What were we thinking? We love our new home...come and visit!

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# Global Neonatology Today: A Monthly Column from Dr. Dharmapuri Vidyasagar

## An Ode to the Newborns of the World

In today's neonatal world,  
Though 130 million babies are born a year,  
Life is but a chance to most.  
Yearly, four million succumb to the shadow of death,  
Before their first month of life.  
Another four million die before they see their first birthday.

Lucky are those born in the western world.  
Once born they carry a guarantee of life for a century!

Imagine being born in countries of Sub-Sahara, India and Latin America,  
That is, if born alive,  
May have but a few minutes or hours to breathe,  
May not see the full cycle of the day.  
If survived to see the dawn of the day, may be gone by the dusk.  
For the baby is swallowed by the shadow of death,  
If survived longer, which some of them do,  
Only few make it a week longer than their brothers and sisters,  
Because the shadow of death follows,  
Till the line of four more weeks is crossed,  
Then it continues to wait at the door,  
To eat away the last months of life before the end of the year.

Lucky are those born in the EU, and USA!  
How lucky you ask?  
They are born with lease of life that may last a century!  
That is how lucky!

Alas! In today's neonatal world ,  
Yearly four million newborns succumb,  
To the shadow of death before their first month of life  
Another four million die before they see their first birthday,  
Lucky are those born in EU and USA.  
They are born with a lease of life that may last a century!

For the neonatologists in the world,

A day in the world of neonatology is a bad dream.  
Yes indeed, it could be a bad dream,  
But only if you let it happen.  
Let us pledge it is a bad dream bygone.

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***“In today’s neonatal world,  
Though 130 million babies are born a year,  
Life is but a chance to most.  
Yearly, four million succumb to the shadow  
of death, before their first month of life.  
Another four million die before they see  
their first birthday.”***

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NT

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# Medical News, Products and Information

## Nation Gets A "D" As March of Dimes Releases Premature Birth Report Card 18 States, Puerto Rico and DC Failed

The United States is failing hundreds of thousands of its youngest citizens on the day they are born, according to the March of Dimes.

In the first of what will be an annual *Premature Birth Report Card*, the nation received a "D" and not a single state earned an "A," when the March of Dimes compared actual preterm birth rates to the national Healthy People 2010 objective.

The only state to earn a "B" was Vermont. Eight others earned a "C," 23 states earned a "D," and 18 states plus Puerto Rico and the District of Columbia got failing grades of "F."

"It is unacceptable that our nation is failing so many preterm babies," said Dr. Jennifer L. Howse, President of the March of Dimes. "We are determined to find and implement solutions to prevent preterm birth, based on research, best clinical practices and improved education for moms."

November 12th marked the nation's 6th Annual Prematurity Awareness Day, a time when the March of Dimes mobilizes volunteers and parents to draw attention to premature birth (birth before 37 weeks gestation), which affects more than 530,000 babies each year in the United States. Premature birth is the leading cause of newborn death and a major cause of lifelong disability.

In this election year, the March of Dimes invites all Americans to help send a message to President-elect Barack Obama, and to federal and state lawmakers by signing the 2008 Petition for Premies.

In addition to providing state rankings, the March of Dimes *Premature Birth Report Card* analyzes several contributing factors and prevention opportunities, including rates of late preterm birth, smoking, and uninsured women of childbearing age. The purpose is to raise public awareness of the growing crisis of preterm birth so elected and appointed officials will commit more resources to address this problem and policymakers will support development of strategies that benefit mothers and babies.

The Report Card also is supported by the American Academy of Pediatrics, the Association of Women's Health Obstetric and Neonatal Nurses, the National Business Group on Health, the American Benefits Council and dozens of other business and maternal and infant health organizations.

The Report Card also calls for:

- Expanded federal support for prematurity-related research to uncover the causes of premature birth and lead not only to strategies for prevention, but also improved care and outcomes for preterm infants.
- Hospital leaders to voluntarily review all Cesarean-section births and inductions of labor that occur before 39 weeks gestation, in an effort to reverse America's rising preterm birth rate. The review should ensure that all C-sections and inductions meet established professional guidelines.
- Policymakers to improve access to health coverage for women of childbearing age and to support smoking cessation programs as part of maternity care.
- Businesses to create workplaces that support maternal and infant health, such as providing private areas to pump breast milk, access to flextime, and information about how to have a healthy pregnancy and childbirth.

The National Healthy People 2010 preterm birth objective is to lower the rate to 7.6% of all live births. Latest available data (2005) show that the national preterm birth rate is 12.7%.

"Employers can play a key role in helping their employees and dependents have healthy babies and healthy families," said Helen Darling, President of the National Business Group on Health. "The March of Dimes *Premature Birth Report Card* provides guidance on best practices that can help any size business."

The March of Dimes says that in 2009, Report Card grades will reflect state actions taken that have the potential to reduce preterm birth rates in future years.

Preterm birth is the leading cause of death in the first month of life in the United States. The preterm birth rate has increased about

20% since 1990, and costs the nation more than \$26 billion a year, according to the Institute of Medicine report issued in July 2006.

Babies who survive a premature birth face the risk of serious lifelong health problems including learning disabilities, cerebral palsy, blindness, hearing loss, and other chronic conditions including asthma. Even infants born just a few weeks too soon have a greater risk of breathing problems, feeding difficulties, hypothermia (temperature instability), jaundice and delayed brain development.

The March of Dimes is the leading nonprofit organization for pregnancy and baby health. Its mission is to improve the health of babies by preventing birth defects, premature birth and infant mortality. For the latest resources and information, visit: [www.marchofdimes.com](http://www.marchofdimes.com).

## Defining Feeding Milestones in Neonates Helps Improve Quality of Life

A recent study conducted by researchers and physicians at Nationwide Children's Hospital sheds new light on feeding challenges often faced by premature infants. Although the prevalence of this disorder is well recognized, the feeding milestones for infants have not been well described. A new study, published online in the *Journal of Perinatology*, defines the feeding milestones leading to these infants' transition to oral feeding based on their gestational age and explains other coexisting disorders affecting these skills.

"Feeding problems are an important area of neonatal morbidity that requires attention. It worries both parents and caregivers, and prolongs the length of hospitalization which escalates the cost of medical care," said the study's lead author, Sudarshan Jadcherla, MD, Medical Director of the Neonatal and Infant Feeding Disorders Program at Nationwide Children's Hospital. "The nature of feeding milestones, including the timeline for the acquisition of independent swallowing abilities, and the impact of co-morbidity factors influencing these skills has not been well explained until now."



Barth Syndrome  
Foundation

## The Barth Syndrome Foundation

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**Symptoms:** Cardiomyopathy, Neutropenia, Muscle Weakness, Exercise Intolerance, Growth Retardation

According to the Nationwide Children's study, infants who were less than 28 weeks gestational age had significant feeding delays and stayed in the hospital for a prolonged period of time. Infants who were born after 28 weeks gestational age attained successful feeding milestones at a similar postmenstrual age. This study also found that airway and digestive morbidities significantly affected the oral feeding milestone.

"Knowledge of these facts paves the way for anticipatory guidance to care providers and helps in the development of higher quality feeding plans," continued Dr. Jadcherla, also an Associate Professor of Pediatrics at The Ohio State University College of Medicine. "Advances in neonatal intensive care have an increased survival rate, and the use of resources has also increased astronomically to improve these infants' quality of life."

Data for the study, conducted in collaboration with the Medical College of Wisconsin, was obtained by observing the feeding progress of nearly 200 infants. Collaborators tracked the age at which the infants acquired first feedings, maximum tube feedings and maximum oral feedings. Other resource usage measures included the total length of hospital stay, the duration an infant used a feeding tube and the total time they were on respiratory support.

### Maternal HAART Minimizes the Risk of Postnatal HIV Transmission

Newswise — Researchers conducting clinical trials in Rwanda have concluded that the risk of postnatal transmission is minimal in HIV-positive mothers undergoing highly active antiretroviral therapy (HAART) while breastfeeding. The results of the trials have been published in the current issue of *AIDS*, the leading journal in the field of HIV and AIDS research. The journal is published by Lippincott Williams & Wilkins, a part of Wolters Kluwer Health,

a leading provider of information and business intelligence for students, professionals, and institutions in medicine, nursing, allied health, and pharmacy.

Although formula feeding has been the recommended strategy for preventing postnatal HIV transmission in developed countries for many years, researchers have recognized that this intervention is not feasible for many women in resource-limited settings. Despite this, there had until now been no single study conducted which formally compared maternal breastfeeding with HAART with formula feeding within the same cohort in resource-limited countries.

Dr. Cécile Alexandra Peltier, together with her colleagues, conducted their study with the aim of assessing the 9-month HIV-free survival of children with two strategies to prevent HIV mother-to-child transmission. Women participating in the cohort study could choose the mode of feeding for their infant: breastfeeding with maternal HAART for six months, or formula feeding. All received HAART from 28 weeks of gestation.

Of the 227 infants who were breastfed during the trial, only one became infected with HIV, corresponding to a 9-month cumulative risk of postnatal infection of 0.5% in the breastfeeding group. Moreover, the overall mortality rate of the infants involved in the study was significantly higher in the formula-fed group (5.6%) than in the breastfed group (3.3%).

The results of the study have led researchers to conclude that maternal HAART while breastfeeding could be a promising alternative strategy in resource-limited settings. A key implication of this study is that women can be offered a choice in infant-feeding options, both of which could be safe and effective, given regular postnatal follow-up and counseling.

Visit [www.wolterskluwer.com](http://www.wolterskluwer.com) for more information.

## NEONATOLOGY TODAY

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