Design and Construction Rx for the New Generation of NICUs

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The volume of neonatal intensive care admissions has soared in recent years, and a life is at stake with every admission. Whether the patient suffers from a medical condition related to a premature birth, disease, infection, birth defect or other complication, the hospital's primary objective must be to provide a healing atmosphere that allows each child to reach maximum potential.

A hospital system's ability to address the needs of its tiniest patients has become significantly more complex as the impact of environmental components on patient care has become better understood. As a result, changes to healthcare environments are evolving at record speed, with the field of neonatology at the forefront.

STRATEGIC BALANCING ACT

Meeting the specialized needs of NICU patients is now considered not only a medical issue but a strategic design and construction consideration as well, with hospital systems across the United States enhancing their facilities to address both the medical requirements of critically ill infants and the emotional and physical needs of their families. This family-centered approach to neonatal intensive care is a balancing act that requires clinical care improvements, superior infection control and nurturing surroundings for optimal family involvement.

While only a handful of hospitals have drastically departed from the 1980s' single-room fishbowl by implementing innovative design concepts, the private-room NICU design model is slowly gaining acceptance. Dozens of hospitals have private-room design models underway, with a hybrid likely to develop that encompasses a mix of private NICU patient rooms, private NICU cubicles and semi-private NICU pods.

PRACTICAL APPLICATIONS OF SCIENTIFIC PRINCIPLES

The creation of a family-centered NICU environment is part art, part science. Using lighting as one example, not only does lighting design have a tremendous impact on circadian rhythms, but also the lighting needs of infants, caregivers and families vary dramatically. Optimal lighting strategies in new unit constructions and existing NICU modifications are combining natural lighting with remote-controlled lighting systems and introducing new devices such as light-emitting diodes.

In addition to lighting, elements such as acoustics, technology, security and family provision areas are sure to be top of mind for children's hospitals that are planning, building, expanding or renovating a major pediatric care or women's facility.

THE HERE AND NOW OF NICUs

Given this construction boom, one might wonder how a healthcare system prioritizes its improvements amid medical and technological advances that impact all areas of care and patients of all ages. In most cases, these decisions are driven by a complex matrix of clinical capabilities, academics, financing resources and demographics. With the U.S. population surpassing 300 million in October 2006, pediatric care and women's health have remained paramount, and facilities for addressing their needs have received unprecedented funding. Facilities built in the 1980s and 1990s that have failed to add pediatric and women's facilities are now considered outdated — smaller patient rooms, obsolete technologies, the absence of family-centered gathering areas and less nurturing environments.

Conversely, hospitals with enhanced NICU facilities are incorporating a significantly increasing percentage of single-bed rooms as well as single-bed cubicles with ample space for patient, family, staff and equipment.

THE CRYSTAL BALL FUTURE OF NICUs

The family-centric NICU of the future will likely include enhancements such as visual and audio controls, high-level communications, monitoring technologies for improved patient safety, "universal" care areas, facility designs that improve connectivity between the family and staff, and support functions for parent-child contact, feeding time and bedside viewing.

Key factors are impacting design and construction strategies:

- Involving primary caregivers in the planning of NICUs
- Prioritizing the NICU privacy component
- Installing leading-edge technology for NICU communications and monitoring systems
- Creating flexible infant care areas
- Providing dedicated space and activities for socialization
- Designing nurturing family spaces, efficient support spaces and sufficient storage areas
- Incorporating natural lighting and design-flexible remote-controlled lighting systems
- Measuring and attenuating sound
- Drawing upon evidenced-based design principles
- Connecting community families and staff via theme concepts
- Installing state-of-the-art HVAC controls that regulate temperature, humidity and central air quality
- Planning for future expansion and technological advancements

THE EVOLUTION OF NICUS

First Generation

The first generation of NICU hospitals is rooted in the 1960s when Dr. Louis Gluck established the first American newborn intensive care center at Grace New Haven Hospital in Connecticut. The NICUs that followed were brightly lit, large, open rooms — almost twice the typical square footage than the average well-infant nurseries — and were designed to provide complex care in a central location to many premature infants requiring specialized equipment and highly trained staff. In 1976, the March of Dimes published a document titled *Toward Improving the Outcome of Pregnancy*, which encouraged the regionalization of neonatal care and called for different acquitting levels of neonatal intensive care.

Second Generation

Twenty years later in the 1980s, modern hospital NICUs emerged with notable changes including the administering of surfactant, which dramatically decreased the mortality rate of premature infants. Surfactant replacement therapy and other clinical advances required facilities to accommodate an increasing percentage of micro-premies — born at 23 to 25 weeks — that were surviving at record numbers.

In 1983, the first edition of *Guidelines for Prenatal Care* was published and provided a set of "prenatal bible" design guidelines. This and other similar publications pushed NICU design into the forefront, and an increasing number of healthcare systems began to develop or follow naturally recognized NICU design standards, the three most notable of which were:

- The eventual equipping of almost every hospital in the United States for neonatal resuscitation;
- The development of specific hospital facility guidelines for the planning of NICU departments; and
- Recognizing that family spaces are an integral part of the NICU environment.

By the late 1980s, most major hospital systems had adopted standards for intensive care nurseries. But with good news came bad: The standards were inconsistent, treatment areas were defiant in size and family areas were basically nonexistent. Space limitations prohibited the expansions of already-cramped spaces simultaneous with the ever-increasing admissions associated with more specialized care, equipment and technologies.

Current Generation

The emerging generation of NICUs is being designed to meet the emotional and physical needs to care for fragile babies in a home-like environment that incorporates safety, comfort and control processes. Over time, this new generation of NICUs will become regional birth centers that offer a level of care between the newborn nursery and the most comprehensive NICU clinical environment. New opportunities for innovative design will exist to accommodate more expansive, environmentally friendly and technologically advanced NICU facilities.

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