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# Redesigning the neurocritical care unit to enhance family participation and improve outcomes

## ■ ABSTRACT

Emory University Hospital recently converted its neurocritical care unit into an environment that enhances involvement of the patient's family. Each patient room now has an adjacent family area with comfortable accommodations for daytime and nighttime use. The new unit design, which drew from evidence on the impact of the physical environment on patient outcomes, facilitates better interactions between families and the medical team, and early studies show that patient satisfaction and staff satisfaction have increased. This article describes the impetus for and process of the unit redesign, as well as initial results and lessons learned.

**A**lthough my medical training prepared me well for treating brain injuries, I learned very little about caring for the enormous emotional needs of patients in neurocritical care units and their families. Having a physical environment that encourages the participation of the patient's family is extremely important. Not only can having loved ones nearby give great comfort to the patient, but it helps provide a critically ill patient with an identity, which affects quality of care in fundamental ways. Having an identity is an anchor for everything, ultimately influencing not only clinical care but research as well.

This article describes our experience in developing a new neurocritical care environment at Emory University Hospital over the last 10 years using an evidence-based design centered on caring for patients and their families.

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## ■ STARTING POINT: A RAPIDLY GROWING PATIENT POPULATION

Emory University Hospital, part of the Emory Healthcare health system, is the largest medical center in Georgia, with 43 neuroscience floor beds, 27 dedicated neurocritical care beds, and 10 intermediate neurocritical care beds. We have experienced rapid growth, with neurocritical care admissions rising from 587 in 1999 to more than 1,400 in 2007. We treat patients with meningitis, brain aneurysms, tumors, massive strokes, Guillain-Barré syndrome, myasthenia gravis, and other severe problems.

When we proposed building a replacement neurocritical care unit, we first appealed to the bottom line: if we had more beds and could attract more patients, we would generate more revenue. The hospital's mission stated that we had to take care of patients with neurological emergencies because no one else in town could.

The administration countered with predictable restrictions: because Emory University was at that time considering building an expensive replacement hospital, they did not want to spend a lot of money improving a single unit. They agreed only to meet the state and federal requirements so that we could quickly open up and receive additional patients.

The initial design was for a 24-bed intensive care unit (ICU) with a "track" around it: visitors would enter patient rooms from the back so as not to disrupt the central area used by the doctors and nurses. The rooms measured 200 square feet, as required by the state of Georgia, with no dedicated space for family members. This design actually duplicated the system we already had in many ways.

## ■ TRADITIONAL SYSTEM: PATIENTS SURROUNDED BY EQUIPMENT, NOT FAMILY

In our old unit, the typical patient room was so crowded with specialized equipment that it was virtually impossible to get to the patient without tripping over cords and knocking out catheters. It took some time to respond to an emergency, and maintaining

sterility in such an environment was obviously difficult. During rounds, residents, fellows, and the multidisciplinary team practically fell over one another, and actually seeing the patient in the midst of all this was a challenge. In the central area, nurses were crowded around desks with charts spread all over tables, increasing the potential for mistakes in record-keeping and medications.

Where were the families? We previously had a dark, dingy common space in the outside hallway, well away from patients. Families were prohibited from being in patient rooms during rounds for fear they should misinterpret or be alarmed by something they heard. Discussions between doctors and families took place either in the cluttered patient room or in a public area. Imagine this in situations in which a patient's prognosis was poor and discussion was needed regarding brain death and organ donation. The new space promised little more than some new converter chair/beds in the common areas.

I did not have a clear idea of exactly what we needed, but I knew that the proposed design was not it.

## **EVIDENCE FOR A BETTER WAY**

To convince the administration that we should pursue a completely new concept, we focused on key people: the chief executive officer of Emory Healthcare and the chief nursing officer of the neurosciences critical care unit. We told them that the current ICU was terrible for families and was inherently dangerous. The potential for medical mistakes was enormous and probably largely unrecognized. Staff burnout was also a potential issue: we reminded them of the tremendous nursing turnover, especially with our aging nursing population. We also told them that we believed there was a better way.

The medical community bases clinical decisions, such as choosing a drug to treat infection, on evidence from the literature. Shouldn't such evidence also inform how we design hospitals and ICUs? I rapidly learned that convincing scientific evidence exists that the physical environment affects outcome.<sup>1</sup> The literature shows that we can empower families and staff and significantly reduce cost.

We proposed a new design founded on an evidence-based approach for patient- and family-centered care. We were confident that a better design could reduce staff stress and enhance performance, and we hoped it could also reduce costs and improve effectiveness. As an academic institution, we wanted to measure such factors and continue to study this issue by building a living laboratory of a new type of family-centered

ICU. We also wanted every treatment tool available while remaining flexible enough that we could continue to change in the future. Most importantly, we wanted to keep patients the center of our focus.

## **■ EMPHASIS ON FAMILY INVOLVEMENT**

We sometimes fool ourselves into thinking that technology improves outcomes when, in fact, many other factors may be more beneficial. When we designed the ICU we had several goals or "design drivers" in mind, with accompanying measurable outcomes to be tracked (**Table 1**).

Our primary driver was support for families. We proposed completely eliminating all the signs restricting visitors to the ICU, such as those reading, "No visiting: Physician rounds in progress" (we were tempted to rewrite that sign as, "Physician rounds in progress: Visitor presence mandatory"). Rarely is the family actually required to participate in the care of a patient; we have no contract with the family delineating what the health care system provides and what we expect the family to do.

We planned for a family zone in the patient room, a children's room, lockers and showers, and a family quiet room. Outcome measures would be patient/family satisfaction and provider satisfaction based on surveys, as well as the number of patient/family complaints and the number of litigation filings.

Other important drivers were the desire to support more procedures at the bedside, reduce infection, reduce medical errors, and increase patient safety. Every goal had measurable outcomes to be tracked.

## **■ DESIGN PROCESS WAS DYNAMIC**

To help determine factors such as patient room size and configuration as well as the design of family spaces, we analyzed best practices of the prior 10 years' winners of the ICU Design Citation Award, which is given jointly by the Society of Critical Care Medicine, the American Association of Critical Care Nurses, and the American Institute of Architects Academy on Architecture for Health. We partnered with the division of health care design at Georgia Institute of Technology's College of Architecture as well as with a psychologist specializing in the role of the physical environment and with numerous graduate students. Several architectural design brainstorming meetings were held.

We then created a simulation that consisted of a large mock-up of the proposed ICU, including a nurses' station, patient rooms, booms, and family areas. We spent an entire day role-playing a variety

**TABLE 1**  
Redesign principles: drivers, responses, measurable outcomes

Design drivers	Design response	Outcome measures
Support families	Family zone in patient room	Greater satisfaction on Press-Ganey and Emory ICU surveys
	Kids' room	Fewer complaints and litigation
	Lockers and showers	
	Family quiet room	
Support more procedures at the bedside	Medical gas booms	Fewer patient transfer complications and lower costs
	Larger patient zone	Fewer errors
	Improved ergonomics	Shorter stays More time spent by ICU staff in the ICU area
Reduce infection	Numerous rubs and handwashing stations	Improved handwashing compliance Lower MRSA and nosocomial infection rates
Reduce medical errors and increase patient safety	Improved ceiling tiles	Fewer medical and medication errors
	Carpet where appropriate	Less litigation
	Charting niches	Reduced self-extubation
	Zoned caregiver area	Decreased falls and injuries related to patients leaving beds

ICU = intensive care unit; MRSA = methicillin-resistant *Staphylococcus aureus*

of procedures, including resuscitation, intubation, implantation of a brain monitor, handoffs with nurses inside and outside the room, and interactions between families and staff. Videographers recorded everything for later analysis.

We changed designs as we learned from such experiences. We originally planned to distribute the nurses' stations throughout the ICU but later decided to keep a communal area as well, recognizing that nurses and doctors like to be with each other and need to support one another.

About 50 family members of patients who had graduated from or were still in the critical care unit were involved with the unit's design throughout the process.

## ■ PROPOSAL BECOMES REALITY

The new unit opened February 2007. The new rooms range from 345 to 450 square feet, compared with 120 to 200 square feet for the old rooms. Each room is a suite, consisting of the patient room and a family area separated by a curved wall with large glass-block windows that let in light and create a cocoon-like effect (Figure 1). The family area has a table, chairs, comfortable sleeping arrangements, a flat-screen television, wireless Internet access, music, and a white-

noise system to blunt surrounding noises.

The new unit allows us to do things we could not do before. I can now easily hold a private conversation with a family member when I visit a patient. Family members can leave the room for some respite and still be just a stone's throw away from their loved one.

Patient rooms are much bigger than before, and the booms lift a lot of equipment off the floor. The beds and doors are configured so that patients who are awake have a direct line of sight to the nurse's station.

## ■ MEDIA ATTENTION AND REACTIONS

Our new unit was featured in both an article<sup>2</sup> and a health care blog<sup>3</sup> by the *Wall Street Journal*. The article opened as follows: "For decades, hospitals tried to keep visitors out of intensive-care units for more than a few minutes at a time. This year, Emory University Hospital here went the other way: It began inviting family members to move into the ward and take a hand in the patient's care."<sup>2</sup> I think the reporter captured the key idea well, but I would change the word "visitors" to "participants" to indicate that patients' family members really have a degree of responsibility.

There were interesting comments from readers in response to the article. Many were positive, but not

everyone felt the changes were a good idea. One reader wrote, "Pandering to a half-dozen relatives is rarely beneficial to anyone. When we realize that hospitals are there to heal and not to entertain, we'll cut down the excess costs of treating critical care patients. A close relative is entitled to know what's happening on a timely basis. Any involvement beyond that should be limited to what is medically beneficial to the patient."

Another comment, probably from someone who works in an ICU, was, "This sounds more like a marketing ploy by hospital administrators than a plan developed by the nurses and physicians in the trenches." Interestingly, administrators at Emory resisted the changes because of the high expense. Although the tone of this comment seems cynical, the writer brings up a valid danger—that limited health care resources potentially could be diverted from the patient to the family. But although care that fosters family participation costs more money and takes more energy, what matters is that we are doing a better job for patients and their families.

### BENEFITS OF FAMILY-CENTERED UNITS: A CASE STUDY

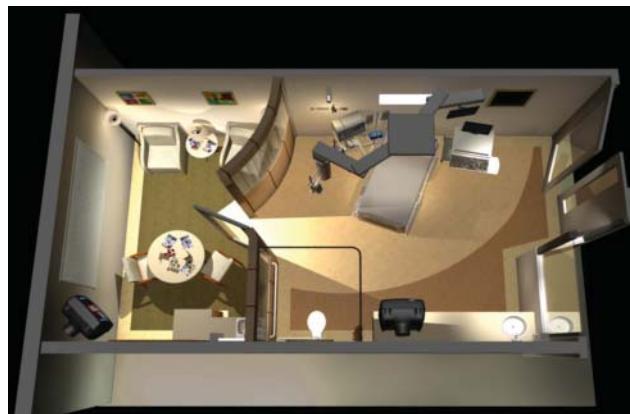
The following case study illustrates some of the advantages of our new family-centered unit.

David was a 31-year-old computer programmer, the father of a 3-year-old girl, and about to be married. He came in with a grade 3 subarachnoid hemorrhage from a severe carotid intracranial aneurysm. He was in the old neurocritical care unit for 4 or 5 days, and then was moved to the new unit when it opened.

The family—David's parents and his fiancée—kept a rotating vigil. The *Wall Street Journal* article described how they always felt that they were in the way in the old ICU, whereas they felt welcome in the new facility. The family often stood at David's bedside as the team explained the purpose of the complex monitors and instruments. The mother said, "This was our home for a month, and it got so that the nurses could tell when we needed a hug."<sup>2</sup>

After 2 weeks, David developed neurogenic pulmonary edema, severe pneumonia, acute respiratory distress syndrome, and heart failure. We induced a coma to protect his brain from high intracranial pressure and placed hypothermia catheters to lower his core temperature in an attempt to better oxygenate him. Just as he was getting better, the aneurysm ruptured again, and we knew that recovery was hopeless.

The family was by his bedside 24 hours a day and knew that the medical team was as well. They witnessed the whole situation and understood when we



**FIGURE 1.** Design of the patient/family suites in Emory University Hospital's redesigned neurocritical care unit. The patient room is separated from the family area by a curved wall with large glass-block windows that let in light and create a cocoon-like effect.

ran out of options. As David's parents and fiancée gathered at the bedside, I told them that David had progressed to brain death. Shortly after that, the team that arranged organ donation came to speak with David's parents, and they elected to donate. They were grateful for the time they had with him and for the way they were treated. David's father said, "No one ever misled us or told us anything but the truth...and most importantly, we were there for everything."<sup>2</sup>

We did everything we could for David, and nothing could change his ultimate outcome. But I think that the way someone dies is incredibly important. The circumstances of how he was treated probably helped allow the family to donate David's organs and better come to terms with his death. They later generously donated their time to help the neurocritical care unit develop the family-centered approach we wanted by participating in many discussions about their experiences.

### FAMILY-CENTERED UNITS POSE CHALLENGES

Units that are designed for both patients and their families bring to the fore enormous issues that arise in the ICU daily. How does one care for patients and their families simultaneously? Our challenges have included the following, among others:

- **Team rounding.** Nobody was happy about inviting families to rounds. Training medical students and fellows with families in the room is a real paradigm shift and raises many controversial issues. Yet I feel that the family needs to be aware of what is going on, particularly because our patients often are intubated and sedated and cannot act as their own advocates.
- **Nursing handoffs.** Imagine a nurse operating

six or seven intravenous pumps and trying to figure out medications while having a family member—or three or four members—“in her face” 24 hours a day.

- **Urgent or frightening treatment.** How do you deal with resuscitation? What if the family is right by the bedside: do you ask them to leave? What kind of support do they need?

We do not have all the answers to such problems. We are currently studying them and trying to figure out best practices.

### ■ SUCCESSES AND FUTURE DIRECTIONS

Emory's neurosciences critical care unit won the 2008 ICU Design Citation Award from the Society of Critical Care Medicine, the American Association of Critical Care Nurses, and the American Institute of Architects Academy on Architecture for Health.

We are now beginning to look at outcomes resulting from the unit redesign, and they all are going in the right direction. ICU patient satisfaction and staff satisfaction have increased, according to self-assessments. Other outcomes being assessed are length of stay and benchmark parameters of quality.

We are currently piloting a staff-family simulation workshop that will train all 80 members of our ICU nursing staff, including fellows, residents, and other faculty, in the fundamentals of communication. Using a one-way mirror, a team of psychologists and experts

in grief and posttraumatic stress will watch simulated conversations among staff and actors role-playing situations involving brain death, organ donation, and diagnoses involving high mortality.

Although the concept of care centered around the patient and his or her family seems as acceptable as motherhood and apple pie, there is enormous resistance to it, even from the most dedicated health care workers. The process was long and laborious: we spent about a year and a half preparing for it with a family-centered team and involved all sorts of charters and directors along the way. Starting the changes is the real challenge.

### ■ REFERENCES

1. Ulrich R, Quan X, Zimring C, Joseph A, Choudhary R. The role of the physical environment in the hospital of the 21st century: a once-in-a-lifetime opportunity. Research report from the Center for Health Design; September 2004. [http://www.healthdesign.org/research/reports/physical\\_environ.php](http://www.healthdesign.org/research/reports/physical_environ.php). Accessed October 30, 2008.
2. Landro L. ICUs' new message: welcome, families. Wall Street Journal. July 12, 2007. <http://online.wsj.com/article/SB118419577614963880.html>. Accessed October 30, 2008.
3. Mantone J. Building family-friendly ICUs. Wall Street Journal. July 12, 2007. <http://blogs.wsj.com/health/2007/07/12/building-family-friendly-icu/>. Accessed October 30, 2008.

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