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Evidence-Based Design Supports Evidence-Based Medicine in the ICU

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Peter Pronovost, MD, of Johns Hopkins, lost his father to a medical error while in medical school and went on to experience the disturbing preventable loss of a child in his intensive care unit (ICU). Josie King died of dehydration in one of the world's premier academic hospitals. This has made Pronovost a tireless and widely recognized crusader for evidence-based improvements in critical care (Miller 2002). It is difficult to imagine that making medical decisions on the basis of the best available credible research findings would not lead to improved outcomes. This concept has been spreading since the early nineties.

"Evidence-based medicine is the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients." (Sackett et al. 1996)

As an architect specialized in the design of medical environments, including critical care, I propose that evidence-based design is an obvious analog to evidence-based medicine. Evidence-based design is the conscientious and judicious use of current best evidence, and its critical interpretation, to make significant design decisions for each unique project. These design decisions should be based on sound hypotheses related to measurable outcomes. I have previously published a description:

"Evidence-based designers make critical decisions, together with an informed client, on the basis of the best available information from credible research and the evaluation of completed projects." (Hamilton 2003)

Healthcare facility designs based on the findings of research are developed in an attempt to create environments that improve care by enhancing patient safety and being actively therapeutic, supportive of family involvement, efficient for staff performance and restorative for workers under stress. There is a clear compatibility of common themes between the design of healthcare environments based on research and the practice of evidence-based medicine in those physical settings.

There is a growing body of credible research relating the care environment to clinical outcomes. Environmental psychologists Roger Ulrich, PhD, of Texas A&M University and Craig Zimring, PhD, of the Georgia Technical Institute, together with their students, were funded by the Center for Health Design and the Robert Wood Johnson Foundation to produce a meta-analysis of the credible research in this area (Ulrich et al. 2004). They found more than 650 rigorous studies that dealt with patient and staff safety issues, the environment's impact on stress and the care environment's relationship with clinical quality.

An interesting and related example of application in the field comes to us from the Neuro ICU at Emory University in Atlanta. Dr. Alan Samuels, the unit director, found himself less than satisfied with proposed plans for a replacement ICU. He approached Zimring at nearby Georgia Tech to ask whether there was evidence relating clinical outcomes to design of critical care environments. They involved graduate students in a study which led to a design charrette, or intensive design session, with the architects. On the basis of the evidence collected, the ICU was redesigned. Samuels plans to study outcomes when the project is completed and report his results. I look forward to their publication.

More serious research relating critical care environments and outcomes is needed to answer important questions. In the area of safety, we need better research on the environment's role in spreading or preventing the spread of infection, as well as the efficacy and design of hand hygiene locations. We need to know which designs are associated with reduced error and injury. We know that daylight, artificial lighting, temperature, humidity, odor and noise all have physiological impact on the building's occupants, but we need to know much more about how they impact clinical outcomes in the ICU. Since communication is a major issue in the ICU, we need design research to discover better ways to encourage and enhance it. If productivity, performance and alertness are issues for management, then research can help identify effective ways in which

the physical setting can be designed as an enabler of the work process, rather than a barrier.The range of relevant studies is nearly infinite.

Clinicians who subscribe to the tenets of evidencebased practice in critical care should become champions of collaboration with architects and designers who are also working in an evidencebased model. Both must collaborate with researchers who can answer key questions for them. They are each, after all, seeking the same thing. The synergistic results will speak for themselves.

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