The Quadruple Aim: Working Together, Achieving Success
CAPT Kevin Berry, MC, USN
26 January 2011
**Evidence Based Design**

Presented at the 2011 Military Health System Conference, January 24-27, National Harbor, Maryland

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<td>Joint Task Force National Capital Region Medical, 8901 Wisconsin Avenue BG 27, Bethesda, MD, 20889</td>
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Standard Form 298 (Rev. 8-98)  
Prescribed by ANSI Std Z39-18
DESIGN THINKING

DESIRABILITY (HUMAN)

FEASIBILITY (TECHNOLOGY)

VIABILITY (ORGANIZATION)

INNOVATION
Kaiser Innovation Consultancy
How we approach our work

- Bring internal and external resources together
- Discover and implement solutions
- Accelerate the pace of innovation
Center for Integration of Medicine and Innovative Technology: A non-profit consortium of Boston teaching hospitals and engineering schools, CIMIT fosters interdisciplinary collaboration among world-class experts in medicine, science and engineering, in concert with industry and government, to rapidly improve patient care.
Capabilities from Complexity

The Whole Augmentation System

Readiness
Health
Care
Cost

Human System
- Paradigms
- Organizations
- Procedures
- Customs
- Methods
- Language
- Skills
- Knowledge
- Learning
- Attitudes

Capability Infrastructure

Tool System
- Facilities
- Media
- Tools
- Machinery
- Vehicles
- etc.

Doug Engelbart Institute, “Focus on Capabilities”
http://www.dougengelbart.org/about/focus-capability.html
The work done should be aligned to the organization’s purpose and objectives reflecting its vision.
Model for Evidence Based Design

- Evidence Based Medicine
  - The Standard of Care.
- Standard of Care
  - Changes and
  - Defines duty: The responsibility to perform to a standard and to abide by rules and regulations.
Continue doing …
Facility Design

Avoid ...

• Paternalism
• Standards as lowest common denominator

Account for ...

• Evidence
• Change
  • Advances in diagnostics and treatments
  • Disruptive technology
• People
Policy Standards

- Life Safety Standards rooted in fire safety focused on the patient who can not save him/herself from smoke, heat and fire.
- Standards focus on people & processes.
- Standards do not mention Evidence Based Design.
- Reference to IHI …
Hospital leaders and boards face a new reality: they can no longer tolerate allowing environmentally preventable patient hospital-acquired conditions such as infections and falls; injuries to staff; unnecessary intra-hospital patient transfers that can increase errors; or increased patient and family anxiety, stress, and length of stay caused by noisy, confusing care environments.

Leaders need to understand the clear connection between constructing well-designed healing environments and improved health care safety and quality for patients, families, and staff, as well as the compelling business case for doing so. The physical environment in which people work and patients receive their care is one of the essential elements in reducing a number of preventable hospital acquired conditions.

As part of their management and fiduciary responsibilities, hospital leaders and boards should include cost-effective, evidence-based environmental design interventions in all their improvement programs or risk suffering the economic consequences in an increasingly competitive and transparent environment. Implemented successfully, responsible use of evidence-based design will improve patient safety and quality, enhance workforce recruitment and retention, and produce a significant multi-year return on investment.

“...I request that you instruct the respective design teams to apply patient-centered and evidence based design principles across all medical MILCON construction projects. A growing body of research has demonstrated that built environment can positively influence health outcomes, patient safety and long-term operating efficiencies to include reduction in staff injuries, reduction in nosocomial infection rates, patient falls and reduction in the length of hospital stay....”
EBD History

EBD Timeline

1970: Archie Cochrane: “evidence-based” research methods
1978: Planetree established
1980: First Planetree M/S unit opens
1985: Behavioral Architecture studies
1980s: Roger Ulrich’s pioneering studies on healing environments
1990: Cochrane Collaboration formed
1995: CHD’s analytical summary reports
2001: IOM publishes *The Quality Chasm*
1999: IOM publishes *To Err is Human*
2000: Ulrich & Zimring Meta-Analyses
2003: JCAHO begins revision of Infection control standards
2005: DoD Facility Planning Criteria & AIA Guidelines both recommend single-patient Inpatient rooms
2006: Pebble Project Initiated
2007: The Center for Health Design (CHD) established

Adapted from Malone, Mann-Dooks & Strauss, 2007
Evidence-Based Design is NOT

- An accumulation of anecdotes
- A smorgasbord of trendy features
- Dangerous, stressful and inefficient care processes and care cultures—enclosed in nicer colors and materials
Design Affects Patient & Staff

1. More evidence than expected: 800+ studies
2. A LOT of good evidence is available
3. Many designs make hospitals riskier and more stressful for patients, families & staff

Full report: www.healthdesign.org/research/reports
Effects of Viewing Nature

Post-surgical patients with similar acuity, those with better views enjoyed:

- .76 days shorter length-of-stay
- 40% reduction in strong & moderate analgesic dosage
- 71% fewer negative patient comments

(Ulrich 1984)
Impact of Natural Light

- Patients in Cardiac ICU (Beauchemin & Hays 1998)
  - Women stayed 1 day less in sunnier room
  - Death rate 70% higher in dull room

- Patients exposed to 46% more natural sunlight (Walch et al 2005)
  - 22% fewer analgesics
  - 21% lower drug costs
  - Less pain, stress
“It is the unqualified result of all my experience with the sick, that second only to their need of fresh air is their need of light …”

“They [the sick] should be able, without raising themselves or turning in bed, to see out of window from their beds, to see sky and sunlight at least, if you can show them nothing else, I assert to be, if not of the very first importance for recovery, at least something very near it.”
NOTES ON NURSING
What it is, and what it is not

BY
FLORENCE NIGHTINGALE

New York
D. Appleton and Company
1860

[First American Edition]
Lighting

Improved Lighting Reduced Pharmacy Errors

Booker & Roseman, 1995
Reducing Back Injuries

Costs of patient handling injuries based on cost per injury prior to ceiling lifts.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Direct Cost *</th>
<th># Injuries</th>
<th>Avg direct cost per injury</th>
<th>Avg indirect cost (2x) **</th>
<th>Total Cost one injury</th>
<th>Avg # injuries per year</th>
<th>Total Annual Cost</th>
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<td>Neuro</td>
<td>$222,646</td>
<td>15 (3 yrs)</td>
<td>$14,843</td>
<td>$29,686</td>
<td>$44,529</td>
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<tr>
<td>ICU</td>
<td>$95,003</td>
<td>10 (2 yrs)</td>
<td>$9,500</td>
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<td>$142,500</td>
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<tr>
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<td></td>
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*Direct costs of patient handling injuries only

** Indirect costs include light duty salaries, replacement salaries, and training cost

Source: Joseph & Fritz, 2006
Actual savings **after** ceiling lifts are installed and used.

Cost reduced by **85%** to **$54,660**

Payback: **2.5 years**

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<td>6 (2 yrs)</td>
<td>$ 7288</td>
<td>$14,576</td>
<td>$21,864</td>
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<td>$ 0.</td>
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- Elevates BP, pulse, respiration
- Worsens sleep
- Reduces O2 sat (infants)
- Increases work pressure (staff)
- Erodes speech intelligibility

Peak noise in patient room during shift change: 113 DB!
Research Example

“Influences of Noise on Outcomes in Coronary Critical Care”
Blomkvist, Theorell, Ulrich, Erikson, Hagerman and Rasmanis, 2004
STUDY

• Patients: adults (94) diagnosed with acute myocardial infarction in a coronary critical care unit in a Stockholm hospital

• Intervention: Acoustics were improved by periodically changing ceiling tiles from sound-reflecting to sound-absorbing tiles

• Findings: During good acoustics patients slept better, had less physiological stress, and a lower incidence of re-hospitalization

Hand Washing

Design to Increase Hand Washing

Conveniently located sink

- Easy-to-clean sink counter (continuous impervious surface)
- Automatic faucet (no touch)
- Soap dispenser
- Alcohol-based gel dispenser

Sinks and gel dispensers should be close to staff movement paths

M. D. Anderson
Ambulatory Cancer Center Houston
Family Presence

- Families want access to patients, caregivers, information
- Clinicians are worried that family members will be bothered by difficult procedures…but family members typically are not
- Family members can reduce falls and errors…if they are present, trained and have the right information
Patient Room

DeWitt

» Several Dual Occupancy rooms
» Limited Privacy
» No defined Family Zone
» Black and white t.v.
» Institutional appearance of walls

FBCH

» All inpatient rooms private
» Furnished to look residential
» Art on walls
» Pull out sofas for overnight guests
» Flat screen t.v., internet access, temp control

Fort Belvoir Community Hospital
ICUs’ New Message: Welcome, Families
In Units With Critical Patients, Hospitals Ask Loved Ones to Help; Emory Retools for Sleepovers

By LAURA LANDRO

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.

For three recent weeks, Scott Roberts lived almost full-time in Emory’s new neuroscience intensive-care unit, which opened in February. After a bone-marrow transplant, his wife, Kristi, was struck by Guillain-Barre Syndrome, a paralyzing nerve disorder that caused her immune system to attack the nerves outside her brain and spinal cord. Kristi, 33 years old, was able to track her husband only with her eyes.

Mr. Roberts watched doctors and nurses attend to her ventilator and feeding tubes, relaying feedback to the staff by reading the look in his wife’s eyes. Donning a sterile gown and mask to protect her immune system from infection, he helped nurses active members of the health-care team. A wave of recent studies shows that critically ill patients may benefit from having families present. There’s even a case to be made, researchers say, for having loved ones present for resuscitation, brain-cather insertions and other life-and-death procedures.

Earlier this year, the Society of Critical Care Medicine, the largest international society representing intensive-care professionals, recommended that ICUs offer open visiting hours and increase family involvement. “Why would we presume that we can dictate how often or who is allowed to visit during the patient’s most trying moments on earth?” says Judy Davidson, a critical-care nurse at San Diego’s Scripps Mercy Hospital and lead author of the society’s guidelines.

The recommendation came as hospitals nationwide are set to spend some $30 billion over the next decade to update aging facilities. The result is that many, like Emory, are considering committing the friends-and-family principle to brick and mortar. “There has always been this wall between doctors and families,” says Owen Samuels, a neurologist who directs neuroscience critical-care medicine at Emory. “It is high time we take down that wall.”

The transition has taken some getting used to. Emory’s ICU staffers say they have had to curb the irreverent jokes and banter

The Backdrop: ICUs long resisted opening hours. But studies suggest that patients benefit when the family is at hand, and it may help loved ones as well.

What’s Next: With U.S. hospitals set to spend $300 billion on upgrades over the next decade, more facilities are expected to follow suit.
Emory Neuro ICU

Old

New
Completing the EBD cycle

- MHS research by DoD Patient Safety Analysis Center, Army Public Health Command, Noblis, Georgia Tech and others:
  - Falls
  - Noise and associated stress
  - Patient handling injuries
  - Patient transfers
  - HAI’s
  - Patient/Staff/family satisfaction

- Disseminating what we’ve learned
Design Thinking

Built Environment

Evidence Based Design