


**Pay Now or Pay Later:
Designing for Safety**

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Evidence-Based Medicine

“Evidence-based medicine is the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients.”

Sackett, DL, WMC Rosenberg, JA Muir Gray, RB Haynes & WS Richardson (1996) “Evidence-Based Medicine: What it is and what it isn’t,” *British Medical Journal* 312: 71-2.

- *making decisions*
- *individual patients*
- *current best evidence*


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Evidence-Based Design

“Evidence-based design is the conscientious, explicit and judicious use of current best evidence from research and practice in making critical decisions, together with an informed client, about the design of each individual and unique project.”

Hamilton, DK (2007) “Evidence-Based Design Supports Evidence-Based Medicine in the ICU,” *ICU Management Journal* (Belgium), Autumn, 6(3) 31


- *making decisions*
- *individual projects*
- *current best evidence*

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What is an Evidence-Based Design Practice?

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, DK (2003) "The Four Levels of Evidence-Based Practice," *Healthcare Design*, November, 3:18-26.


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Evidence-Based Medicine

"Evidence-based medicine (EBM) requires the integration of the best research evidence with our clinical expertise and our patient's unique values and circumstances."


Straus, SE; WS Richardson; P Glasziou & RB Haynes (2005) *Evidence-Based Medicine*, 3rd ed. Elsevier: Oxford.

Design Corollary: *Evidence-based design (EvBD) requires the integration of the best research evidence with design expertise and the client's unique project goals and context.*


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EvBD Research - 2004 Literature Search

- Center for Health Design & Robert Wood Johnson Foundation
- Texas A&M, Georgia Tech
- Ulrich & Zimring meta-analysis
- 650+ studies
- Published report, webcast




Ulrich, RS, C Zimring, A Joseph, X Quan, & R Choudhary (2004). *The role of the physical environment in the hospital of the 21st century: A once-in-a-lifetime opportunity*. Concord, CA: The Center for Health Design.

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EvBD Research - 2004 Literature Search


Rigorous studies link the environment to outcomes in four areas:

1. Reduce patient stress & improve outcomes
2. Reduce staff stress & fatigue
3. Improve safety
4. Improve quality

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Reduce Patient Stress & Improve Outcomes


- Reduce noise
- Improve sleep
- Reduce spatial disorientation
 - Administrative & procedural information
 - External building cues
 - Local information
 - Global structure
- Reduce depression
- Provide nature and positive distractions
 - Gardens in healthcare environments
 - Art in healthcare environments
- Provide social support
- Improve communication to patients

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Patient Stress Scorecard








Reduce stress, improve quality of life and healing for patients and families


- Reduce noise stress ★★★★★
- Reduce spatial disorientation ★★★★★
- Improve sleep ★★★★★
- Increase social support ★★★★★
- Reduce depression ★★★★★
- Improve circadian rhythms ★★★★★
- Reduce pain (intake of pain drugs, and reported pain) ★★★★★
- Reduce helplessness and empower patients & families ★★★★★
- Provide positive distraction ★★★★★
- Patient stress (emotional duress, anxiety, depression) ★★★★★

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Staff Stress Scorecard











Reduce staff stress/fatigue, increase effectiveness in delivering care


- Reduce noise stress 
- Improve medication processing and delivery times 
- Improve workplace, job satisfaction 
- Reduce turnover 
- Reduce fatigue 
- Work effectiveness: patient care time per shift 
- Improve satisfaction 

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Patient Safety Scorecard








Improve patient safety and quality of care


- Reduce nosocomial infection (*airborne*) 
- (*contact*) 
- Reduce medication errors 
- Reduce patient falls 
- Improve quality of communication (*patient → staff*) 
- (*staff → staff*) 
- (*staff → patient*) 
- (*patient → family*) 
- Increase hand washing compliance by staff 
- Improve confidentiality of patient information 

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Quality Scorecard

Improve overall healthcare quality and reduce cost


- Reduce length of patient stay 
- Reduce drugs (see patient safety) 
- Patient room transfers: number and costs 
- Re-hospitalization or readmission rates 
- Staff work effectiveness: patient care time per shift 
- Patient satisfaction with quality of care 
- Patient satisfaction with staff quality 

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**Research Conclusions:
Immediate Action is Indicated**


- Provide single-bed rooms
- Hospitals should be much quieter to reduce stress & improve sleep
- Provide stress reducing views of nature
- Develop efficient wayfinding systems
- Improve ventilation
- Improve lighting
- Design to reduce staff walking & fatigue

RS Ulrich (2004) "Opportunity of a Lifetime: Meta-analysis of the literature,"
RWJF presentation at the National Press Club, Washington, DC.

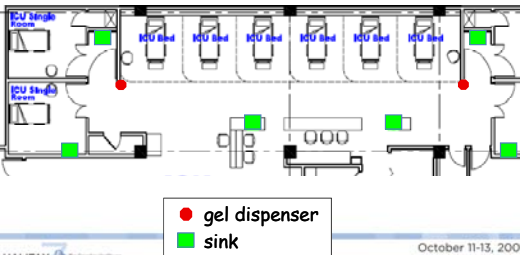
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Example of a Relevant Study


- Comparison of handwashing compliance in three ICU settings:
Xiaobo Quan, PhD student @ Texas A&M
- 1) open bay, 2) older private room, 3) larger private room w/
sink near door; nurses compared to themselves in settings
- Rigorous study methodology
- Findings have been submitted for publication

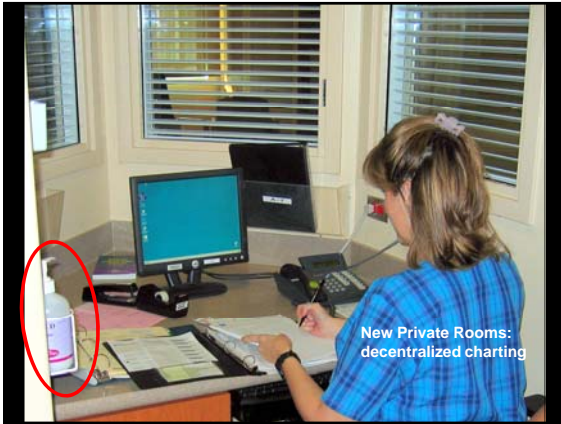
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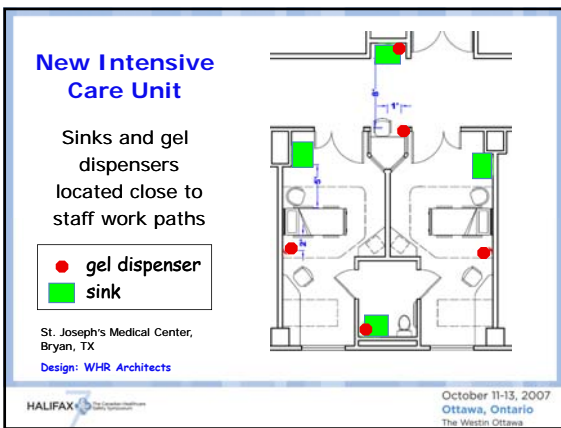
Old Intensive Care Unit
Combination of open bay
and small single-bed rooms



● gel dispenser
■ sink

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Example of a Relevant Study

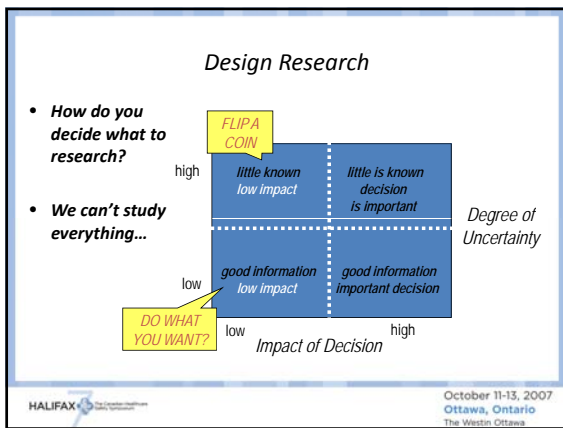
- Comparison of handwashing compliance in three ICU settings: Xiaobo Quan, PhD student @ Texas A&M
- 1) open bay, 2) older private room, 3) larger private room w/ sink near door; nurses compared to themselves in settings
- *Preliminary findings: compliance increased over open bay in both private rooms, by 70% in well-designed room*
 - *Implication: design more effective than special training in compliance*
- *Preliminary findings: infection rates reduced by 44% from open bay to well-designed private rooms*

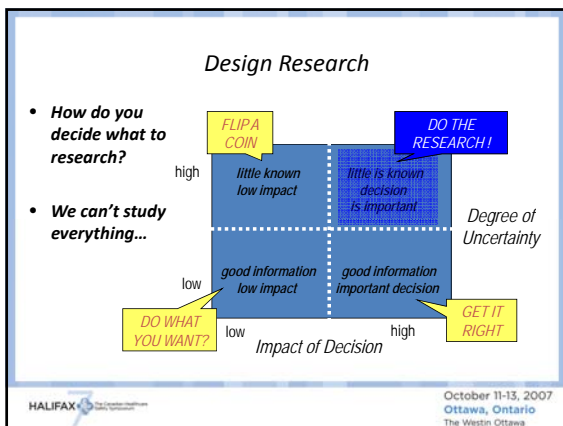
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Evidence-Based Design Process – WHR Architects

TASK	ACTIVITY
1 Identify the client's goals	Note most important and facility-related global and project-based goals
2 Identify firm's goals	Understand firm's strategic, project, and evidence-based design objectives
3 Identify the top 3-5 key design issues	Narrow the possible choices; work on high impact decisions
4 Convert design issues to research questions	Reframe statement of design issues to become research topics
5 Gather information - Benchmark examples - Literature sources - Firm's studies	Infinite possibilities must be narrowed; limited perspectives must be expanded
6 Critical interpretation of the evidence	No direct answers; requires open-minded creativity, balance and critical thinking
7 Create evidence-based design concepts	Based on creative interpretation of the implications of research findings
8 Develop hypotheses	Predict the expected results from implementation of your design
9 Select Measures	Discover whether your hypotheses are supported or not

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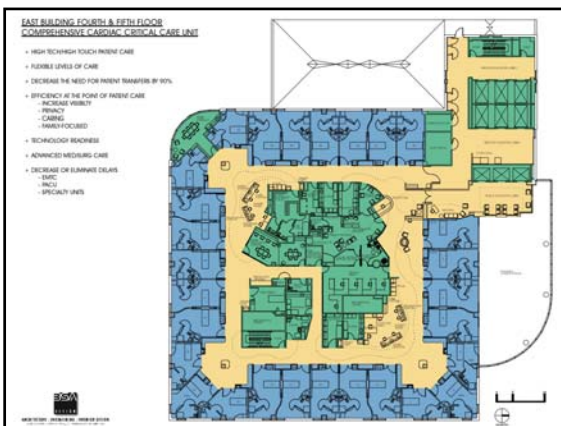


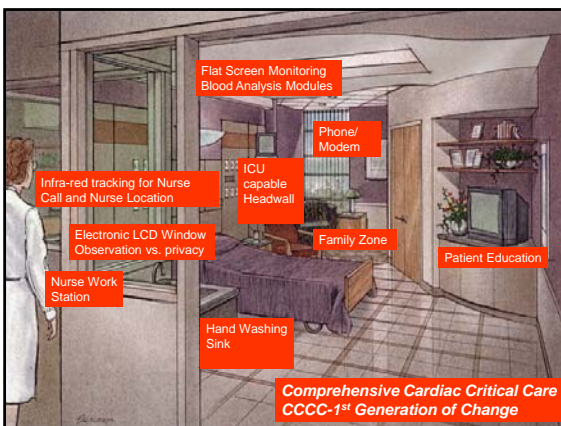
Case Study:
Cardiac Comprehensive Care Center
 Clarian Methodist Hospital
 Indianapolis, Indiana

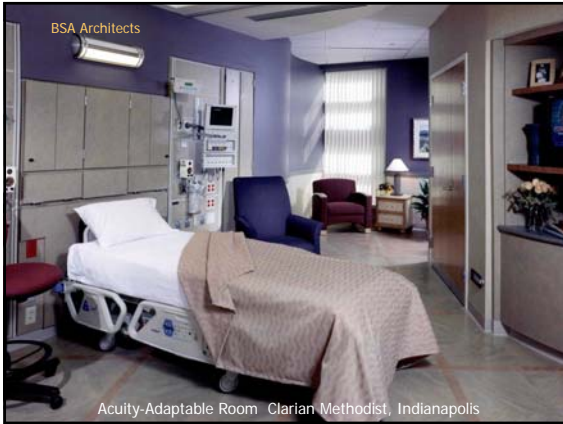
- \$7+ million 56-bed unit (2 floors of 28) opened February 1999
- Constructed in shell space
- Patient-centered nursing, decentralized charting
- Acuity adaptable unit is both CCU and stepdown
- Private ICU rooms with conventional headwall
- Family accommodations

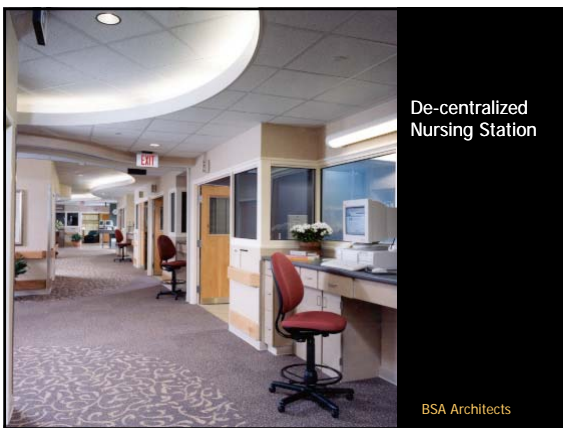
Source: A. Hendrich (2004)

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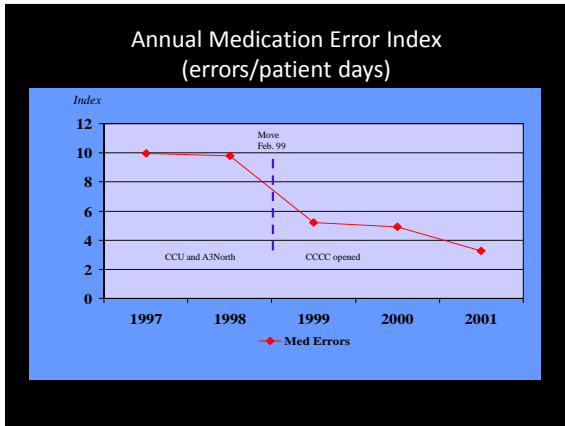


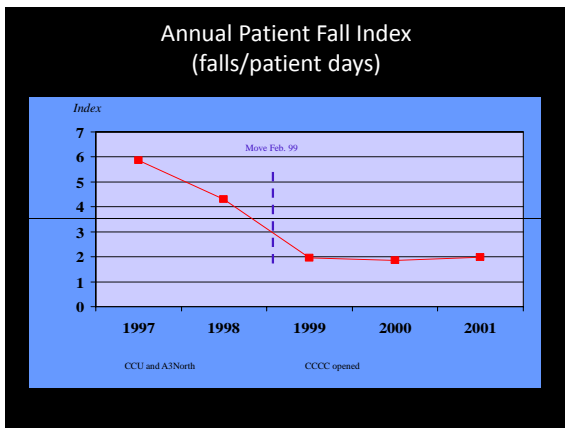


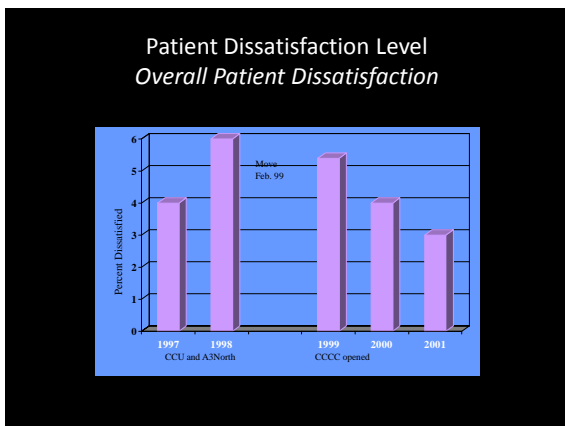


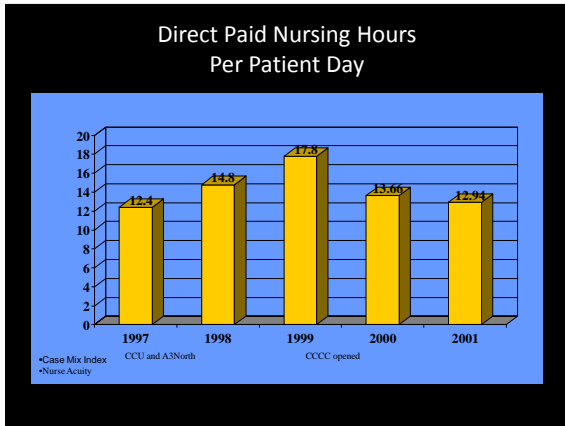
Areas of Measurement	
Topics	Results
<ul style="list-style-type: none">• Clinical outcomes• Satisfaction• Education• Personal growth• Cost• Efficiency	<ul style="list-style-type: none">• 75% drop in falls• 90% reduction in unit-to-unit transfers• Patient dissatisfaction dropped from 6.7% to 3%• Improved medication error index• Reduced caregiver workload index

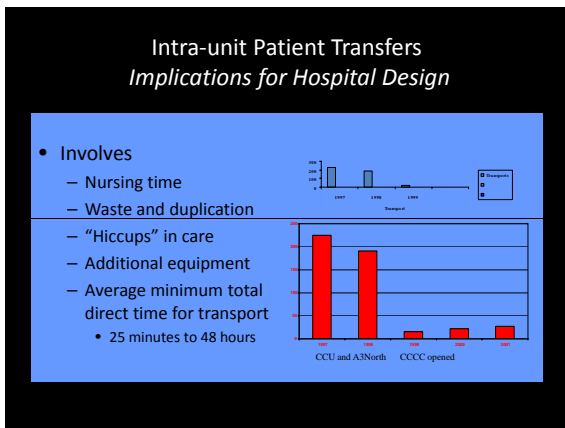
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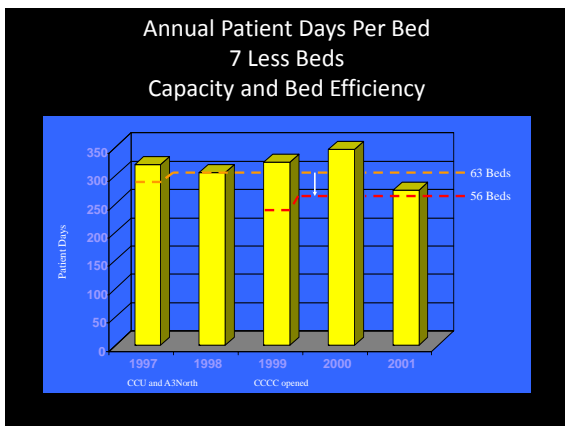













Example Publication of Environment/Outcome Findings


- Hendrich, A. (2003a). *Case Study: The impact of Acuity Adaptable rooms on future designs, bottlenecks and hospital capacity*. Paper presented at the Impact Conference on optimizing the physical space for improved outcomes, satisfaction and the bottom line, Atlanta, GA.
- Hendrich, A., Bender, P. S., & Nyhuis, A. (2003). Validation of the Hendrich II Fall Risk Model: a large concurrent case/control study of hospitalized patients. *Applied Nursing Research*, 16(1), 9-21.
- Hendrich, A., Fay, J., & Sorrells, A. (2002). Courage to heal: Comprehensive Cardiac Critical care. *Healthcare Design*, 11-13.
- Hendrich, A., Fay, J., & Sorrells, A. K. (2004). Effects of Acuity-Adaptable Rooms on Flow of Patients and Delivery of Care. *American Journal of Critical Care*, 13(1).

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Case Study:

*Neuro ICU
Emory University
Atlanta, Georgia*

- Design for unit questioned
- Experts invited to review
- Evidence gathered
- Team explores implications in "charrette" workshop
- Redesign of unit

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Emory University Neuro ICU (existing)

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Typological Analysis: Clustering

5 Clusters of 5 patient beds with self-contained nursing stations

2 Clusters of 10 patient beds

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Typological Analysis: Family Area

Family area outside the unit

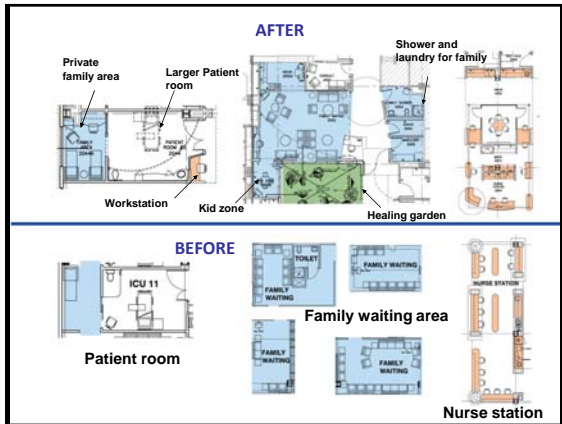
Family area inside the unit

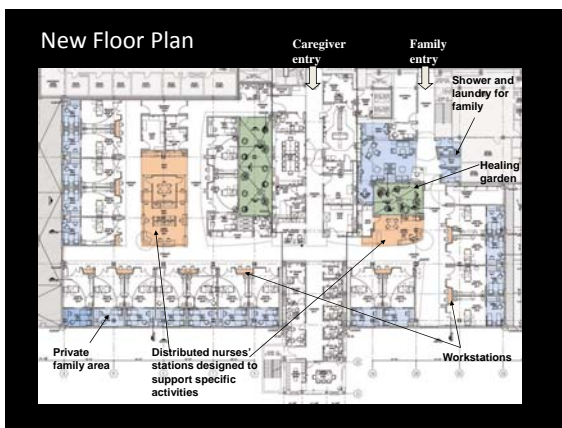
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July 2005 Charrette: Emory University Hospital, Georgia Tech, HKS

- Presentation of findings
- Discussion
- Redesign based on evidence

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Conclusion

- Building design can **enable** the performance and outcomes you desire
- Or building design can **hinder** the performance and outcomes you desire
- **Pay Now or Pay Later:** *If you don't invest in rigorous study during the design phase, you risk paying for it year after year in buildings that are less efficient and which do not support safety, quality, or best practice*

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Conclusion

- There is a growing body of relevant evidence about the environment's impact on outcomes
- Evidence-based designers can work with you to design high performance facilities
- There is an ethical imperative to design facilities that can improve performance and outcomes
- *If you are building a health facility, insist on an evidence-based process and collaborate with experienced designers*

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Controversies in Healthcare Safety

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