OUTLINE:
Evidence-based design
A conceptual framework for evidence-based lighting design
Case study examples: research vs organizational goals
The challenges in real world research

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Evidence-Based Design (EBD) is the process of basing decisions about the built environment on credible research to achieve the best possible outcomes.
A Process not a Prescription

1. Define evidence-based goals and objectives.
2. Find sources for relevant evidence.
3. Critically interpret relevant evidence.
4. Create and innovate evidence-based design concepts.
5. Develop a hypothesis.
6. Collect baseline performance measures.
7. Monitor implementation of design and construction.
EBD Goals Require Balance

Organization: Cost (first and operating) +

People: Staff & patient ergonomics +

Environment: Light quality (design) +

Intended Outcomes

Graphic by George Retseck and Jen Christiansen

Sources: U.S. Department of Energy and Efficacy calculations based on currently available bulbs (traditional, halogen and compact fluorescent); SWITCH LIGHTING (led)
Conceptual Model

Lighting
(artificial & natural)

Design Strategies
- Daylight: Direct and borrowed (windows, skylights, light shelves, courtyards)
- Artificial: Light fixtures/luminaires: (fixture body, lamp, control devices)

Environmental conditions
- Quantity (illumination)
- Quality (flexibility, color, glare)
- Sustainability (green, efficient)

Outcomes
- Safety
  - Healthcare-associated infections
  - Falls
  - Medication errors
- Patient health
  - Stress/anxiety
  - Sleep quality
- Patient satisfaction
- Staff health
  - Stress/anxiety
  - Circadian aliment
- Staff satisfaction
- Environmental impact
  - Energy use
  - Ecological footprint
  - Recycling
- Organizational
  - Return on investment
  - Life-cycle costs

IES
LESA
Tailored lighting intervention improves measures of sleep, depression, and agitation in persons with Alzheimer’s disease and related dementia living in long-term care facilities
February 11, 2015 Authors: Mariana Figueiro, PhD & Mark Rea, PhD


Healthcare facilities should be designed to support patients in coping with stress.

Healthcare environments will support coping with stress and promote wellness if they are designed to foster:

1. Sense of control;
2. Access to social support;
3. Access to positive distractions, and lack of exposure to negative distraction


Case Study Examples
Improving Pediatric Radiography Patient Stress, Mood, and Parental Satisfaction Through Positive Environmental Distractions (RCT)

Control and Design Interventions (RCT in 3 environments)

Quan et al., 2016
Control and Design Interventions (RCT in 3 environments)

No AE
AE with light
AE with light & projection

Quan et al., 2016
At the hospital designed for families, by families.

Nemours Children’s Hospital Orlando: 2012 Opening
https://www.youtube.com/watch?v=s5Hmk7PKmoA
Playful and Efficient

http://www.nemours.org/about/mediaroom/resources.html
Control Creates Art

http://www.nemours.org/about/mediaroom/resources.html
2012: Video Walls move from Clubs to Care

https://www.youtube.com/watch?v=Evo4bUB8BZU
“Play is a powerful, positive coping mechanism whereby children/youth can realize mastery and control over the environment and escape emotionally and cognitively from the situation at hand.

Two current challenges:

• opportunities for disabled children

• experiences that do not increase infection risks.”

2014: Donor $$s Fun ➡ Therapy (and remote monitoring)
Narrow spectrum of visible indigo-colored light (405 nanometers) that produces a chemical reaction that kills the bacteria from the inside - like bleach released within cells.

This visible light is lethal to pathogens but is safe for use in the presence of patients and staff (non-UV).

Location: Froedtert & the Medical College of Wisconsin Froedtert Hospital (Pebble Partner alum)

Setting: 450 sq.ft. waiting area in the Gastroenterology (GI) Diagnostic clinic.

Results: 70%+ continuous reduction of S. aureus throughout the area (consistent with other published studies).
Tech Changes at the Speed of Light: Research Take Time
Real World Research Challenges

What is the business case?
Who is the champion?

Is there risk of turnover?  \textit{SEE YA!}
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