Clinical Implications of Environmental Lighting in the Hospital

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Current state of Affairs

- Low levels of light may impact clinical outcomes
  - Depression – serotonin affected
  - Lack of energy/alertness
  - Circadian misalignment
  - Cell stress – immune response
  - Cortisol changes – wound healing
Low Light and Poor Clinical Outcomes

- Cell proliferation – cancer
- Melatonin production – sleep/wake
- Cardiac and respiratory function - increase in light $\Rightarrow$ heart rate variability
- Metabolic changes
- Cognitive performance
Current state of Affairs

Only a few light studies have been done in hospitals


Current state of Affairs

- The **brightness (intensity)** of light is measured in ‘lux’: One lux equals brightness of **one candle, one meter away in a dark room**.

- **Examples:**
  - Common living room: 20-50 lux
  - Bright office: 100 to 500 lux
  - Outdoors on cloudy day: 1500 lux.
  - Outdoors on sunny day: 50,000 lux.
  - At the beach: 100,000 lux
Ordinary lux in healthcare environment

- **50 lux**
  - Critical Care
  - Nurseries
  - **Standard patient rooms**
  - Radiology/Radation therapy
  - **Corridors (during night)**

- **100 lux**
  - Recovery rooms
  - Labor
  - **Corridors (during day)**
  - Waiting areas
Ordinary lux in healthcare environment

- **300 lux**
  - Physical therapy
  - Occupational therapy
  - Nursing stations

- **500 lux**
  - Emergency Outpatient
  - Post-anesthesia recovery room
  - Autopsy

- **3,000 lux**
  - Operating room
### Bernhofer Study: Light Exposure (in lux)

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Ordinary hospital room
Mean lux levels of light exposure during day in study sample compared to light exposure necessary for Circadian Entrainment

![Graph showing mean lux levels of light exposure during different seasons compared to the necessary light exposure for Circadian Entrainment.](chart.png)
Other Findings

- Patients experience poor sleep patterns
- Less light/more fatigue
- More fatigue/more pain
The Psychology of Light

- Little/no research regarding mood and light in hospitals. However:
  - Anecdotes of caregivers in sunny rooms
  - While circadian entrainment can take weeks, effects of sunlight on mood can be quick
    - *Positive affect through positive association with light (sunshine)*
    - *Decreased stress through neurotransmitter response*
Current study in Miller pavilion

Mean lux (measured at pillow height):
- lightest rooms = 947
- dimmest rooms = 280
Avon room – when designed, was based on little science but on something else that’s very powerful – the human experience. \textbf{The science will follow}....
Future Studies

✓ Recognize that the short time patients are hospitalized DOES matter

✓ Randomized controlled trials (RCT) needed to determine lighting effects on patient symptoms

✓ Light can impact the patient experience and patient satisfaction with care

✓ May be the most simple, cost-effective way to enhance patient outcomes
Every life deserves world class care.