

Daylighting Abstracts

1. Study of the relationship between indoor daylight environments and patient average length of stay (ALOS) in healthcare facilities

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Title: Study of the relationship between indoor daylight environments and patient average length of stay (ALOS) in healthcare facilities

Author: [Choi, Joon Ho](#)

Abstract: This study investigates how indoor daylight environments affect patient Average Length of Stay (ALOS), by evaluating and analyzing daylight levels in patient rooms in comparison to their ALOS. The patient ALOS data were taken at one general hospital in Incheon, Korea and the other in Bryan, Texas, U.S.A.; physical, environmental and daylighting conditions were assessed at each building site. The gathered data were analyzed using SPSS statistical package to determine the trends in patients length of stay in hospital wards with 95% and 90% statistical significances. The data were categorized based on the orientation of a patient room and were compared between different orientations and types of patient rooms in the same ward of each hospital. Selected hospital wards were classified based on their orientations and types of patient rooms. The other variables considered in the study were: the differences in daylighting environments (illuminance, luminance ration, daylight factor, diversity and uniformity of illuminance), and physical environment properties of the patient rooms of each hospital, and how these affected patient ALOS in both locations (Incheon and Bryan). To analyze the daylighting environment, on-site measurements, RADIANCE simulations and physical scale model measurements were conducted. This study also investigated patients feelings and opinions, and their preferences in daylighting environments with the questionnaire survey. Through this study, three hypotheses were tested and was evidence for the following conclusions. First, there may be a positive relationship between indoor daylight environments

and ALOS. Second, seasonal weather differences cause different indoor daylighting levels and may influence the length of patient hospitalization. Third, overall patient satisfaction and reactions to patient rooms may be related with indoor daylight environments. More controllable shading devices, naturally lighted indoor environments, and glare prevention create positive outcomes for patient ALOS and visual comfort. To increase the validity and confidence about the positive effects of daylight on human physiological conditions, further studies are necessary which provide more samples, facilities and other variables. This study was created as a basis for the development of recommendations for designing patient rooms in healthcare facilities and, as a result, should be used to achieve more effective healing environments.

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2. The Impact of Windows and Daylight on Acute-Care Nurses' Physiological, Psychological, and Behavioral Health

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Abstract

OBJECTIVE: To investigate the physiological and psychological effects of windows and daylight on registered nurses.

BACKGROUND: To date, evidence has indicated that appropriate environmental lighting with characteristics similar to natural light can improve mood, alertness, and performance. The restorative effects of windows also have been documented. Hospital workspaces generally lack windows and daylight, and the impact of the lack of windows and daylight on healthcare employees' well being has not been thoroughly investigated.

METHODS: Data were collected using multiple methods with a quasi-experimental approach (i.e., biological measurements, behavioral mapping, and analysis of archival data) in an acute-care nursing unit with two wards that have similar environmental and organizational conditions, and similar patient populations and acuity, but different availability of windows in the nursing stations.

RESULTS: Findings indicated that blood pressure ($p < 0.0001$) decreased and body temperature increased ($p = 0.03$). Blood oxygen saturation increased ($p = 0.02$), but the difference was clinically insignificant. Communication ($p < 0.0001$) and laughter ($p = 0.03$) both increased, and the subsidiary behavior indicators of sleepiness and deteriorated mood ($p = 0.02$) decreased. Heart rate ($p = 0.07$), caffeine intake ($p = 0.3$), self-reported sleepiness ($p = 0.09$), and the frequency of medication errors ($p = 0.14$) also decreased, but insignificantly.

CONCLUSIONS: The findings support evidence from laboratory and field settings of the benefits of windows and daylight. A possible micro-restorative effect of windows and daylight may result in lowered blood pressure and increased oxygen saturation and a positive effect on circadian rhythms (as suggested by body temperature) and morning sleepiness.

3. The Impact of Daylight and Views on ICU Patients and Staff

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Abstract

Objective: Using a pre-test/post-test quasi-experimental study in two New Hampshire ICUs, the impact of daylight and window views on patient pain levels, length of stay, staff errors, absenteeism, and vacancy rates were examined. One ICU was operational until 2007, the second opened in 2007. ICU patients were randomly selected from cardiac surgery, pneumonia, and chronic obstructive pulmonary disease admissions of one or more days, 58 from the old ICU, and 52 from the new. Regular medical staff members assigned to the unit between October 2006 and September 2007 (old unit) and March 2008 and February 2009 (new unit) were included.

Results: Variables other than unit design had a more significant impact on relative pain levels in each unit. Comparing light levels independent of ICU assignment supported the hypothesis that increased light levels reduce pain perception and length of stay, but the relationship was not statistically significant. One trend, not statistically significant, suggested that view was associated with reduced pain perception. A decrease in incident filings supported the hypothesis that improved natural light and views reduced errors, but results were not statistically significant. Some subcategories demonstrated significance. Mean absenteeism per person decreased from 38 to 23 hours from the old unit to the new ($p = 0.05$). Average

vacancy rates decreased by 25% (from 10.12% to 7.49% staff openings per year) in the old and new units ($p = 0.04$).

Conclusion: High levels of natural light and window views may positively affect staff absenteeism and staff vacancy. Factors such as medical errors, patient pain, and length of stay require additional research.

4. Relationships between Exterior Views and Nurse Stress: An Exploratory Examination

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Abstract

Objective: Examine the relationships between acute stress and alertness of nurse, and duration and content of exterior views from nurse work areas.

Background: Nursing is a stressful job, and the impacts of stress on performance are well documented. Nursing stress, however, has been typically addressed through operational interventions, although the ability of the physical environment to modulate stress in humans is well known. This study explores the outcomes of exposure to exterior views from nurse work areas.

Methods: A survey-based method was used to collect data on acute stress, chronic stress, and alertness of nurses before and after 12-hour shifts. Control measures included physical environment stressors (that is, lighting, noise, thermal, and ergonomic), organizational stressors, workload, and personal characteristics (that is, age, experience, and income). Data were collected from 32 nurses on 19 different units at two hospitals (part of Children's Healthcare of Atlanta) in November 2006.

Results: Among the variables considered in the study view duration is the second most influential factor affecting alertness and acute stress. The association between view duration and alertness and stress is conditional on the exterior view content (that is, nature view, non-nature view). Of all the nurses whose alertness level remained the same or improved, almost 60% had exposure to exterior and

nature view. In contrast, of all nurses whose alertness levels deteriorated, 67% were exposed to no view or to only non-nature view. Similarly, of all nurses whose acute stress condition remained the same or reduced, 64% had exposure to views (71% of that 64% were exposed to a nature view). Of nurses whose acute stress levels increased, 56% had no view or only a non-nature view.

Conclusions: Although long working hours, overtime, and sleep deprivation are problems in healthcare operations, the physical design of units is only now beginning to be considered seriously in evaluating patient outcomes. Access to a nature view and natural light for care-giving staff could bear direct as well as indirect effects on patient outcomes.

5. Title: Access to daylight and outdoor views: a comparative study for therapeutic daylighting design

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Abstract: This study compares the impact of access to daylight and the provision of outdoor views and their relationship to patients' recovery time in an open-heart surgery environment.

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Schools

Title: Impact of nature window view on high school students stress recovery

Author(s): [Chen, Chen](#)

Although a number of studies demonstrate that direct or indirect exposure to green space is associated with reduced symptoms of stress (Grahn & Stigsdotter, 2003; R. S. Ulrich et al., 1991), few studies have investigated the impact of a view of nature from school classroom windows on students' stress recovery. We do not know whether a natural classroom window view has significant impacts on students' stress recovery. Does a natural window view help students recover from stress faster than a barren window view or no window view? In this thesis, 94 participants were randomly assigned to three different window view conditions in high school classrooms: 1) nature window view, 2) barren window view, and 3) no window. Then participants completed the standard Trier Social Stress Test (TSST) to induce stress. We measured stress three times throughout the experiment by asking students to self-rate their stress levels using a visual analog scale (VAS) questionnaire and by taking skin conductance and temperature measurements. Analyses revealed that classroom window view has a significant influence on students' stress recovery. Even though the participants' self-reports do not show a relationship between the window view conditions and stress recovery, the two physiological measurements revealed a significant relationship between window views and stress recovery. The findings indicate that a natural

window view has a stronger impact on stress recovery than barren or no window views.

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