SYNOPSIS

KEY POINT SUMMARY

OBJECTIVES

To evaluate the way both pre- and post-occupancy affects indoor daylight quality in hospitals.

Pre- versus post-occupancy evaluation of daylight quality in hospitals

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Key Concepts/Context

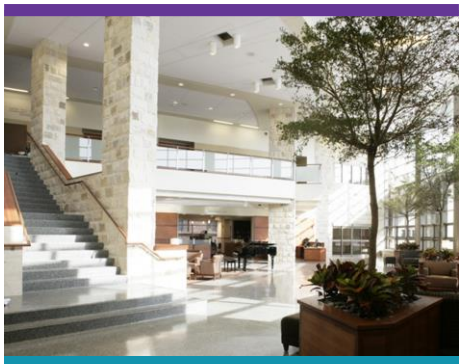
Studies show that most hospital occupants prefer natural daylight to electrical light. Daylight can be used to optimize patient comfort by creating a more attractive indoor setting. Daylight has been linked to higher levels of staff performance and productivity along with reduced energy use and hospital emissions. Comparisons of pre- and post-occupancy lighting levels evaluate how well a space being put to use matches the predicted situation. Although a plethora of studies discussing the benefits of natural lighting in healthcare settings have been published, few perspectives on this matter have been offered by researchers in the country of Jordan. This study attempts to fill this gap while contributing further evidence to the documented benefits of natural lighting.

Methods

A large hospital in a sunny, arid part of northern Jordan was selected for the study. It is a 15-story building where patient rooms occupy the fourth to sixth floors and ninth to twelfth floors. The building is divided into four “wings”, A, B, C, and D. In wings A and C, half of the patient rooms face north and half face south. In wings B and D, half of the patient rooms face east and the other half face west. Wings A and C have large windows (7.15 m2), while wings B and D have small windows (3 m2).

Lighting analysis software (RADIANCE) was combined with on-site measurements to find and compare illuminance levels, luminance levels, and daylight factors. Test measurements were taken from six reference points in wing B, and a differential between the RADIANCE reading and the on-site measurement was less than 20%.

Patient rooms from each wing were selected for measurement. Internal illuminance levels for post- occupancy were measured at a height of .8 meters off the ground with a grid of 1 meter by 1 meter devices. Reflectance values of room surfaces were found using both illuminance and luminance meters.



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Daylight levels were measured in patient rooms with light meters on the 4th, 11th, and 15th of December, June, and March from 11:00 a.m. to 4:00 p.m.

Data from the pre-occupancy portion was gathered using RADIANCE, and patient room configurations were modeled using computer aided design software (CAD).

On-site measurements were compared to the results obtained in the pre-occupancy stage, and a comparison of these two phases was performed using the 2007 edition of the Number Cruncher Statistical System.

Findings

Data analysis showed that building occupancy and interior furnishings can significantly increase illuminance levels in patient rooms, ultimately affecting daylight performance. Indoor daylight quality is highly correlated with hospital occupancy. In other words, hospital occupation and interior design parameters hold significant influence over illuminance levels and daylight factors.

Design Implications

The authors note that designers should consider integrating lighting and thermal models in buildings so that efficient lighting designs can be implemented to reduce solar heat gains and maximize patient and staff comfort. The surfaces of equipment and furniture kept within patient rooms should not be too reflective or heat-trapping. Building orientations in relation to the sun should always be considered when organizing healthcare spaces, and windows should always be equipped with curtains or shades to provide added control over daylight entrance.

Limitations

This study was a comparative analysis of light levels between patient rooms before and after occupancy. Patients or staff members were not asked about how lighting affected them, and the manner in which the patient rooms involved in the study were decisively populated by objects was not elaborated upon. A small sample size of one hospital in a distinct geographic location was used in this study.

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