



KEY POINT SUMMARY

OBJECTIVES

This study assesses indoor daylight quality within a pediatrics ward in a Jordanian hospital.

The effect of hospital design on indoor daylight quality in children section in King Abdullah University Hospital, Jordan

Alzoubi, H., Al-Rqaibat, S. 2014 | *Sustainable Cities and Society*. Volume 14, Pages 449-455

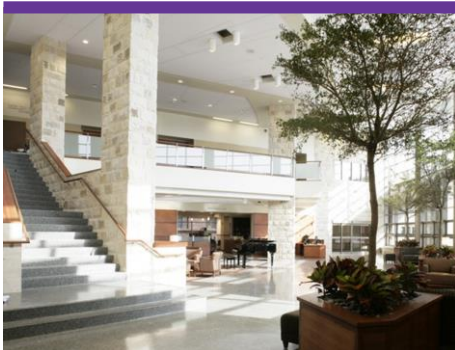
Key Concepts/Context

Previous studies have shown that natural lighting in assisted-living homes and hospitals can help reduce heating costs while benefitting the physiological and psychological states of patients and staff. Exposure to sunlight has been associated with reduced mortality rates among cancer patients, with mood improvements, and with reduced lengths of hospitalization for patients receiving treatment for myocardial infarction. For patient rooms, the recommended lighting levels are between 200-220 lux, with four types of recommended lighting options: general, reading, night lighting, and examination. When lighting levels approach 1500 lux, incidences of medication errors and data entry errors increase significantly. Although the benefits of daylight are well researched, there is a lack of documented research dealing with natural lighting in Jordanian healthcare centers.

Methods

Building simulation software (RADIANCE) and on-site measurements were used to analyze the natural lighting conditions in the hospital's pediatric wards. These wards are located on the fourth floor of "Wing A" in a 15-story hospital. Patient rooms on Wing A are divided evenly between northern and southern orientations, and feature the larger windows based on the two types of window designs used throughout the hospital.

Illuminance levels, luminance levels, and daylight factors were the dependent variables in the study. To compare lighting-level predictions made by the RADIANCE software with on-site measurements, eight reference points were arranged in a 1 meter by 1 meter grid at a height of 0.95 meters from the floor in the center of each patient room. Data from the 1st, 15th, and 30th of December, March, and June were used. Data were compared between the field measurements and



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computer simulations and analyzed using the 2007 edition of the Number Cruncher Statistical System (NCSS).

Luminance ratios in patient rooms were simulated during three days in December: the 4th, 10th, and 15th. These days in the months of March and June were used as well.

Findings

Wing A's average luminance levels exceeded 2000 lux in March and December, and reached around 500 lux in June. Rooms facing south in Wing A had excessive illuminance levels that could cause unpleasant conditions and negatively affect occupants' health. Overall, analysis of the results show that the hospital's illuminance values are higher than recommended, with differences varying from 25 lux to 5000 lux depending on time and room orientation. The pediatric ward's large windows greatly affect the luminance and illuminance in rooms oriented towards both the north and south. South-facing rooms have light values that exceed Chartered Institution of Building Service Engineers (CIBSE) recommendations, while north-facing rooms have lower-than-recommended light levels.

Design Implications

Special attention should be given to building orientations, window sizes, and window locations; all of these factors work in tandem with the sun's position to effect natural lighting levels, and should be considered so that there is neither too much nor too little natural light being let in. Materials with reflective surfaces can amplify lighting levels and cause uncomfortable glare. Curtains or other sun-shading devices should be available wherever possible so that light levels can be more easily controlled.

Limitations

This study examined used a small sample of one department in one hospital. More spaces facing different cardinal directions could have been examined. While all seasons were accounted for during the light measurement process, data could have been gathered from more days than three each month to contribute to even more accurate assessments.

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