



## KEY POINT SUMMARY

### OBJECTIVES

To describe and analyze the environmental conditions of 10 patient rooms and two nurse stations.

## Spatial and Temporal Variations in Indoor Environmental Conditions, Human Occupancy, and Operational Characteristics in a New Hospital Building

Ramos, T., Dedesko, S., Siegel, J. A., Gilbert, J. A., Stephens, B., 2015 | PLoS ONE. Volume 10, Issue 3,

### Key Concepts/Context

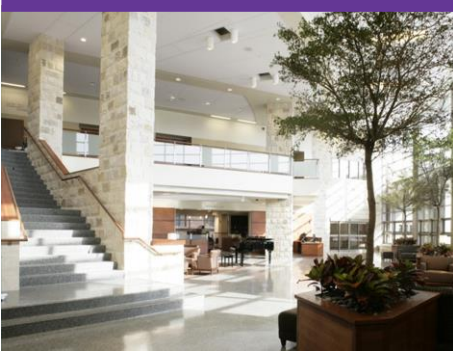
Certain environmental conditions in healthcare facilities can influence occupant health outcomes and overall comfort, as well as the survival and development of harmful germs. By studying factors such as a given hospital's physical designs, indoor temperatures, moisture levels, and workflows, the overall quality of the healthcare environment can be better understood and, if necessary, improved. Studying these factors can also reveal useful information about how healthcare environments are affected by the seasons and even the time of day.

### Methods

The researchers gathered environmental data on five patient rooms and one nursing station from two different floors of a hospital (for a total of 10 patient rooms and two nursing stations included in the study). Data on the temperature, humidity, illuminance, differential pressure, and CO<sub>2</sub> levels around each study site were gathered every day for one year at five-minute intervals. The data were then analyzed to identify patterns, similarities, and differences between each study location.

### Findings

Data analysis results indicated that room illuminance levels, temperature, humidity levels, and human occupancy patterns all had weak correlations among the separate rooms. Relative humidity, outdoor air characteristics, and humidity ratios were strongly correlated with outdoor seasonal patterns and showed strong correlations among the spatial aspects of each room. All rooms were found to be operating at



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neutral pressure and had an average of 100 combined exits and entries per day. The authors note that characterizing spaces in this fashion can help designers better understand the nature of the environmental factors that can interact with design decisions to influence patient health outcomes.

**Limitations**

The authors note that all rooms examined in this study experienced relatively light foot traffic during the study period; different levels of foot traffic could alter the measurements of several parameters included in this study.

**Design Implications**

Prior to any renovations or new construction projects, designers should consider several aspects of the indoor and outdoor environment, such as temperature, humidity, lighting levels, and projected foot traffic. Understanding spaces in this way can better inform design decisions and allow for the inclusion or exclusion of features that might help or hinder a given space's optimum performance.

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