

# Developing an assessment tool for Indoor Environmental Quality of Public Space in Healthcare facilities

Zoohee Choi, EDAC, Luciana de Cresce El Debs, Ph.D. and Hyun Joo Kwon, Ph.D.

Purdue University  
West Lafayette, Indiana

Indoor environmental quality (IEQ) in healthcare influences patients' well-being, and staff's productivity and satisfaction. Several studies have revealed that patients have positive experiences in a quality healthcare environment with sufficient daylighting, pleasant views, elements of nature, calming colors, various stimuli, restful sounds, and a sense of aesthetic. The quality of public space design contributes as a vital player in the healthcare experience by creating a positive and memorable experience even when the hospital climate is characterized by fear, anxiety, stress and uncertainty. Moreover, public space in healthcare is important in enhancing the hospital's image and is thus a front-page marketing tool. Even though there are several healthcare evaluating systems (e.g., Achieving Excellence Design Evaluation Toolkit, LEED healthcare) that evaluate indoor environmental quality of major areas of healthcare facilities, no framework has assessed specialized in the indoor environmental quality (related with psychological well-being) of public spaces in those facilities. In order to assure healthcare users' well-being, it is essential to create an indoor environmental quality assessment tool for healthcare public spaces. The purpose of this study is to develop an assessment tool that evaluates and manage the indoor environmental quality of a public space in healthcare based on a review of related literature, current certification programs and healthcare organization standards, and reviews of healthcare professionals.

To acquire and represent knowledge that may be relevant for Indoor Environmental Quality in healthcare public space, the assessment tool has been developed based on a review of related literature, current certification programs, healthcare organizational standards, and reviews from healthcare design professionals. Firstly, to verify the validity of the assessment tool, the study used Delphi technique. Three Delphi panel groups (researchers, designers and practitioners) reviewed and gave feedback for the elements of the assessment tool. The researchers revised the assessment tool according to the Delphi panel's feedback. Once an IEQ assessment tool has been done from the Delphi study, the researchers and two healthcare professional volunteers had case studies to see usability, feasibility and result reliability of the assessment tool. Findings demonstrate the importance of the indoor environmental quality in the healthcare facilities and result in the finalized assessment tool. The tool has three categories including the visual environment (daylighting, artificial lighting, quality of view, visual stimuli ornaments, architectural structure, color coordination and natural environment), the auditory environment (noise level, environmental surfaces, environmental intervention and background music) and indoor air quality (thermal comfort, CO<sub>2</sub> level and odor). The tool includes detailed knowledge, design strategies, back-up calculations and questions in technical language. The framework of the tool is separated into three parts: (1) measurement, (2) observation, and (3) rubric. The tool bridges a gap between ideal and current healthcare environments.

By evaluating indoor environmental quality of healthcare facilities located in the U.S., this research study could provide a systematic approach to identifying weaknesses and strengths of indoor environmental quality in healthcare. With the knowledge of assessment process, the healthcare professionals can identify and solve problems in the healthcare environment. Further, this study would also be an appraisal standard to evaluate how the healthcare buildings and their public spaces have maintained their well-designed indoor environmental quality. This study would be beneficial to facility managers and healthcare industry stakeholders as this study enhances the knowledge of the actual numeric values of indoor environmental quality which can be applied on a marketing tool or benchmarking process. With the assessment, the healthcare professionals may utilize this data when they make a decision for future design. Moreover, the result of the study will provide accurate information that could improve the well-being and healing environment of patients and visitors in a healthcare building. If the occupants more satisfied with the environment, their satisfaction will be impacted on a result of national standard survey instrument Hospital Consumer Assessment of Healthcare Provider and System (HCAHPS), which records consumer satisfaction and their experience in healthcare service.

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