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# Hospital Facility Design's Influence On Health Care Workers

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## Abstract

### Purpose

This integrative literature review examines the relationship between facility design interventions in health care buildings and health care worker outcomes.

### Methodology

An initial set of articles were identified, filtered using inclusion criteria, assessed, and rated, using an article rating system developed and validated by the researchers, based on evidence and research quality.

### Findings

Results (n=14) demonstrated relationships among health care facility design interventions, health care worker outcomes and cost avoidance; and did not demonstrate relationships among the investment in sustainable building design interventions and protecting the natural environment, affecting economic viability, or improving social welfare. Outcomes discussed include employee satisfaction, and the impact of indoor air quality, noise, patient room design, NICU design, and patient handling on caregivers. Quality research that relates health care facility design to employee outcomes is growing but narrow. Standardized methods for the evaluation of green buildings are still undefined.

### Research Limitations

The article search conducted for this literature review was limited to certain electronic databases. The article rating system used during the analysis has not been externally validated.

### Originality and Value

This study uses a more rigorous and transparent methodology than any previously used literature review methods within the field of environmental design research; and serves as a resource for hospital administrators, health care employees, and architecture, design and construction professionals when planning health care facilities.

## INTRODUCTION

### Background

According to the American College of Healthcare Executives' annual survey of top issues confronting hospitals, financial challenges ranked as the number one issue, followed by patient safety and quality, and health care reform implementation (Freund, 2013). External financial challenges were centered on Medicare reimbursement, cuts in government funding and Medicaid reimbursement. Internal financial challenges were centered on bad debt, decreasing inpatient volume, and increasing costs for personnel, supplies, and capital improvements, among other fiscal considerations. The implementation of health care reform has brought uncertainty, and administrators have been searching for opportunities to reduce operating costs and to develop provider and payer incentives.

Facility design and elements of the indoor environment contribute to real and perceived quality of care measurements, as defined by the Centers for Medicare & Medicaid Services (CMS), especially as patient satisfaction levels measured by the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) and other factors begin to impact pay for performance programs. Environmental design research is a field of research that explores relationships between humans and their surrounding environment – whether natural or constructed. Constructed environments (e.g., buildings, facilities, parks, cities) are also often referred to as the indoor environment, the built environment, or the physical environment. As a term, environmental design research is largely undefined; however, professional organizations exist that are associated with environmental design research, such as the Environmental Design Research Association (EDRA).

Previous environmental design research literature reviews (Schmalenberg & Kramer, 2007; Ulrich, Berry, Quan, & Parish, 2010; Ulrich et al., 2008) and white papers (Sadler, DuBose, & Zimring, 2008; Ulrich, 1991, 1997; Ulrich & Zimring, 2004) suggest a link between health care facility design interventions and improved quality of care and medical outcomes.

Many of the top issues confronting hospitals may be influenced by both the indoor environment and the organizational culture of a health care system. Within the category of patient safety and quality, the top four issues confronting hospitals are engaging physicians in improving the culture of quality, redesigning care processes, redesigning the work environment to reduce errors and pay for performance (Freund, 2013). Within the category of health care reform implementation, the top issue is the reduction of operation costs. Additional issues, such as studying the cause and mitigation of avoidable readmissions and avoidable infections in order to avoid penalties, were also included within the health care reform implementation category. Strategies that focus on cost implications (first costs, life-cycle costs, and cost avoidance), patient safety, and health care worker effectiveness require a comprehensive approach that links the success of health care facility occupant outcomes with the financial impacts on the health care organization.

A literature review by Sadatsafavi and Walewski (2013) focused on the influence of the physical work environment of health care facilities on job attitudes; and a relationship between health care human resource management and health care facilities, discusses the following:

Expenses related to human resources (HR) are higher than any other necessary expense in hospitals (including medication, devices, supplies, utilities, treatment facility improvements, installation / upgrade of health information technology, and liability coverage) with approximately 66 cents of every dollar of expenditures allocated for caregivers and staff (AHA, 2012). Therefore, HR expenses are a primary target for cost reduction when funding becomes limited (Sadatsafavi & Walewski, 2013). Conversely, strategies that require lower staff levels may not be worthwhile as organizations search for other ways to optimize expenditures without sacrificing their service quality (Filipova, 2011). For an organization to maintain a lasting competitive advantage, it has to create an organizational resource bundle, which consists of obtaining different types of capital (economic, social, and ecological)

and combining them to create resources that produce value (Barney, 1991; Rumelt, 1984; Wright, McMahan, & McWilliams, 1994). Organizational resource bundles contribute to performance advantage when they are rare, costly to imitate, and non-substitutable (Armstrong & Shimizu, 2007; Barney, 1991; Dyllick & Hockerts, 2002; Sirmon, Gove, & Hitt, 2008). Human capital (employees' knowledge, skills, abilities, motivation, and loyalty) is often an organization's most unique resource (Sadatsafavi & Walewski, 2013).

Research from the disciplines of strategic human resource management and the resource-based view of firms asserts that effective HR practices convey that the organization values employee contributions and cares about their wellbeing (Sadatsafavi & Walewski, 2013). In turn, providing for employee socio-emotional needs can lead to higher levels of employee motivation and commitment toward the organization. When this information is combined with research outcomes that measure how employees are influenced by their work environments, a strong case is presented for health care facilities to serve as an influential component of HR management strategies.

Multi-dimensional studies on job satisfaction show that by placing new values on different facets of the job, a person may sustain their satisfaction when certain qualities of the job change (Locke, 1969; Skalli, Theodossiou, & Vasileiou, 2008). For instance, one study reported that employees attempted to compensate for being undercompensated financially by altering their perceptions of the physical work environment; the results found that employees expressed higher levels of satisfaction with the physical work environment (Greenberg, 1989, 2011).

### **Purpose**

The purpose of this integrative review is to examine the relationship among the indoor environments of health care facilities and key, related health care worker outcomes that are linked to the quality of care and the associated cost of care. This study seeks to contribute new knowledge through evaluation of existing literature using a rigorous methodology to offer new perspectives on the measurable benefits of evidence based design and sustainable building design in health care settings. The objectives are: 1) to develop a methodology for the systematic evaluation of studies for inclusion based on the quality of the research; 2) to identify and integrate the research that informs the design of facility environments and the impact on health care

worker outcomes; and 3) to identify gaps in the literature where evidence based design and sustainable building design may contribute to positive health care worker outcomes. Seton Healthcare Family funded this review as part of a multi-method research study that will quantify the return on investment of sustainable building design and in which Seton's role is host organization.

### METHODOLOGY

The integrative literature review is a form of research that reviews, critiques, and synthesizes comprehensive literature on a subject in an integrated way so that new frameworks and perspectives on the topic are generated (Torraco, 2005). An integrative review is the most comprehensive methodological approach of literature reviews, allowing for the inclusion of experimental, non-experimental, and theoretical studies to fully understand the phenomenon analyzed (Whittemore & Knafl, 2005). The systematic selection of studies included is well defined and justified based on the inclusion and exclusion criteria. Findings from the studies are interpreted and synthesized in an unbiased way. The methods of an integrative review are replicable, following a peer review protocol (Whittemore & Knafl, 2005; deSouza, da Silva & de Carvelho, 2010).

The methodology for conducting this integrative literature review was to identify an initial set of articles through database searching, select articles that met inclusion criteria, perform an initial full text assessment, rate the evidence, and establish the final list of articles for inclusion based on the quality of the research (Figure 1). After the research questions were devised, keywords related to health care workers and health care facility design, evidence based design and sustainable building design that addressed issues, topics, building components, building features, building performance, processes and perceived benefits, were identified as search terms. Search terms were expanded to include variations in common terms and database searches were conducted using Boolean operators. Citations of articles relevant to the research questions were also used in the search. This integrative literature review relied on secondary data from published peer reviewed research and used EndNote® reference software as a writing tool.

### ANALYSIS

#### Inter-rater reliability of the Article Rating System.

Cohen's Kappa Weighted (Cohen, 1968) was used to measure the agreement between two raters for inter-rater reliability using an Article Rating System (see Figure 1). A

total of 42 articles met inclusion criteria. Ten of the 42 articles (24%) were tested using an Article Rating System (Harris & Detke, 2012), and then analyzed to determine the reliability of the raters. Cohen's Kappa Weighted results were 0.8532 with a standard error of 0.0418 and a confidence interval of 95%. A Kappa between 0.61 and 0.8 is considered strong agreement; a score of more than 0.8 is considered near complete agreement.

{image-1}

### RESULTS

#### Classification of Research Studies

Of the initial set of articles identified (42), articles that met inclusion criteria were classified by study design, analysis type, sample type, outcome(s) and independent variable(s). Four study design categories were identified for the classification of articles:

### DISCUSSION

The discussion of the literature included in this review is primarily organized by hypothesis, similar to the preceding results section. Portions of the discussion are also structured at a secondary level, according to outcomes measured.

#### Results showing a relationship between design interventions in health care facilities and health care worker outcomes (Hypothesis 1)

The overall return on investment of a facility is influenced by the impact of specific facility design interventions on health care workers. Design interventions can promote or demote several outcomes, such as job satisfaction, work related stress, turnover intention, job performance, job efficiency, and personal health for health care workers. In turn, the same list of outcomes can be directly or indirectly tied to the quality of care delivered by health care workers, which influences patient satisfaction and profitability.

The majority of the research reviewed for inclusion in this literature review referred to participants by using identifying terms interchangeably (e.g., caregiver, clinical staff, health care worker, nurses, nursing staff, and staff), which diminishes the reader

### CONCLUSIONS

The current status of quality research that establishes a relationship between design interventions in health care facilities and health care worker outcomes is growing but narrow. The research reviewed herein demonstrates that

relationships exist among several variables that contribute to health care workers

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