Emergency Nurses' Perceptions of Efficiency and Design: Examining ED Structure, Process, and Outcomes

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Contribution to Emergency Nursing Practice

- There are few studies that simultaneously investigate the interactions among the physical structure, processes, and outcomes of emergency departments. Simultaneously investigating all 3 aspects of this model can offer insights into emergency nurses' perceptions of efficiency and satisfaction with design.
- In this study, all the structure and process factors including unit configuration, technology, lighting, visibility, patient room layout, storage, walkability, staff stress, data access, and teamwork were significantly associated with perceptions of efficiency and staff satisfaction with design.

Abstract

Introduction: Due to increasing demands, it is imperative for emergency departments to improve efficiency, while providing safe and effective care. Efficient and quality healthcare delivery are impacted by interactions among the emergency department's physical structure, processes, and outcomes. Examining the interrelationship between these three components is essential for assessing quality of care in the ED setting. Studies simultaneously investigating all three aspects of this model are rare.

Objectives: To study examined emergency nurses' perceptions of efficiency and satisfaction with the design of a newly constructed academic emergency department through analysis of these three assessment factors.

Methods: Data were collected using observational techniques, physical measurements of walking, and staff questionnaires. Correlation analysis was employed to investigate the relationships among specific structure, process, and outcome factors. Hierarchical linear regression was conducted to understand which structure and process variables in particular were related to the dependent variable, perceptions of efficiency and staff satisfaction with design.

Results: Outcomes revealed that all of the structure and process factors examined in this emergency department including unit configuration, technology, lighting, visibility, patient room layout, storage, walkability, staff stress, data access, and teamwork were significantly associated with perceptions of efficiency and staff satisfaction with design.

Discussion: The findings suggest that the structure of the built environment can shape healthcare processes occurring within it and ultimately improve the delivery of efficient care, thus increasing both patient and staff satisfaction. As such, the designed environment has a critical impact on enhancing performance, productivity, and staff satisfaction.

Key words: Emergency Department; Efficiency; Satisfaction; Design

Introduction

According to the Analysis of American Hospital Association Annual Survey,[1] in the 20-year period from 1994 to 2014, ED visits increased from 90.5 million to 136.3 million (51% increase), and the number of emergency departments decreased from 4,960 to 4,408 (11% decrease). As a result, it has become imperative for emergency departments to improve their efficiency while providing safe and effective care. Efficient and high-quality health care delivery are influenced by interactions among system *structure*, *processes*, and *outcomes*.[2] Donabedian[3] identifies structure as aspects of the physical environment that support care, whereas process

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denotes those activities used in both giving and receiving care. This leads to outcomes, including perceptions of efficiency and staff and patient satisfaction, both of which influence the health status of patients.[4] Examining the interrelationship among these 3 components is essential for assessing quality of care in the ED setting. However, studies that simultaneously investigate all 3 aspects of this model are rare.[4,5]

The delivery of effective care cannot be separated from the *structure* of the surrounding physical environment, which can either support or hinder the delivery of care and its outcomes. Further, it can have significant impact on people within the environment including patients, staff, families, and visitors. In their conceptual framework, Ulrich et al[6] identified built environment design variables such as visibility, lighting, proximity of storage for supplies and medication, technology (computer/workspace; internet access), functional adjacencies and floor layout (unit configuration), and patient room design as factors that have impact on efficient and high-quality care outcomes. For example, visibility is one variable that is affected by the structure of the emergency department. Lu[7] maintains that the visual fields in emergency nursing units have significant impact on staff's routine use of space—especially walking and collaboration—and the subjective feelings of patients within the units regarding quality of care.

Relating to *process*, Pati et al[4] conclude that the physical environment can either facilitate or impede operations and is rarely neutral to the processes occurring within it. Among the factors influencing health care processes and workflow within the emergency department are walkability, access to patient data, issues related to teamwork, and staff stress. An efficient workflow also has been linked to care procedures and patient throughput.[8] Conflicts between movement flow and desired work patterns of nursing staff can lead to waste, resulting from duplications, discontinuity, and interruptions and become bottlenecks in the process.[9] Factors hindering an ideal pattern of flow include disjointed or missing supplies and equipment and repetitive travel. Walking has been identified as a major time consumer for nurses, and evidence suggests that less walking translates into more time spent on patient care.[10] The average nurse has been found to walk between 3 to 6 miles per shift.[7,11,12] Not only does the built environment have impact on such processes as workflow and walkability, it has also been found to have impact on nurses' levels of stress. It has been determined that improved flow in an emergency department reduces stress among staff [13] and minimizes the number of patients leaving before treatment.[14] Effective teamwork is also a critical component of efficiency. The literature confirms that the physical design of nursing units can affect behaviors such as walking, collaboration, and patients perceptions of quality of care.[15] In an ideal flow for maximal efficiency, the physical structure should not impede the processes occurring within it.

The *outcomes* of health care service are influenced by the interactions between structure and process. Inefficiencies in the health care delivery process have been connected to poor outcomes and dissatisfied patients. Several studies have linked the physical environment and satisfaction, indicating that aspects such as access to supplies and equipment and nursing unit configuration can be positively or negatively related to retention of staff.[14,15] Efficiency within emergency departments is critical because the unit serves as the gateway to other hospital services and therefore deserves further study.

The objective of this study was to examine the efficiency of a newly constructed academic emergency department through analysis of the interactions among its structure, processes, and the resultant outcomes. The study was conducted 18 months after the facility's opening and examined a level 1 trauma emergency department with 62,041 annual visits at the time of the study. The emergency department encompasses 40,000 square feet and has separate treatment areas for pediatric and adult patients. The adult side includes 46 treatment rooms, 2 of which are used for triage. On the pediatric side, there are 12 treatment rooms and 2 triage rooms. Four additional "swing" rooms, which are centrally located, are used for either adult or pediatric care, based on patient volume. The adult treatment area uses a racetrack design with a central core that houses medication and supply rooms and includes 3 patient pod areas: express, critical, and acute care. The pediatric area also implemented the racetrack design with a central core. The trauma suite, located in the center of the emergency department and adjacent to the elevators, includes 8 beds and is positioned next to imaging services.

Methods

This study examined the relationships among specific structure, process, and outcome factors in a new emergency department. Descriptive data were collected using observational techniques, physical measurements of walking, and staff questionnaires; all methods were preapproved by the Institutional Review Board.

Observations were conducted to measure visibility and frequency of use of storage within the unit. Visibility counts captured the emergency nurses' ability to see their patients, patient room call lights, and peer line of sight using Zborowsky's[16] method. Patient visibility was determined by documenting the number of patient beds that could be seen from the nurses' station and was considered present when the upper third of the bed was visible through either