



KEY POINT SUMMARY

OBJECTIVES

This study explores the roles that emergency department spatial attributes and physical properties play in affecting ED staff performance and satisfaction.

Effects of Emergency Department Physical Design Elements on Security, Wayfinding, Visibility, Privacy, and Efficiency and its Implications on Staff Satisfaction and Performance

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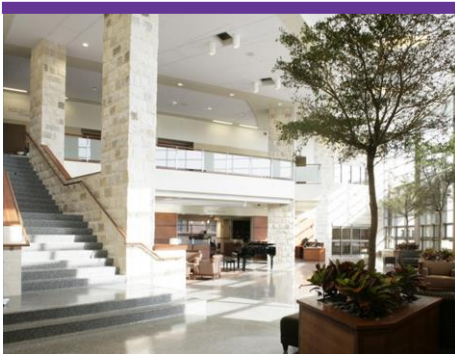
Key Concepts/Context

While it is commonly known that emergency departments (EDs) are often challenging and stressful work environments, it is less understood how the physical design of the ED environment contributes to staff performance and satisfaction, especially in the context of five important subtopics: security, visibility, wayfinding, privacy, and efficiency. This study suggests that these subtopics are interrelated and that design decisions can be made to enhance them, thereby improving staff satisfaction and performance.

Methods

The author of this study conducted structured interviews and gathered surveys from frontline staff members working in two different EDs. One ED operated using centralized nursing units, while the other ED used decentralized nursing units. For the ED with the centralized nursing units (Site 1), the medication rooms, nursing station, physician station, tubing systems, and hospitalist workroom were all positioned adjacent to each other within different “pods”. In the ED with decentralized nursing units (Site 2), clinical staff work areas such as medication rooms, nursing stations, and dictation areas were dispersed in smaller clusters around the ED.

A total of 67 staff members from both sites were recruited via e-mail to participate in the interviews and surveys. The surveys used items scored with a 5-point scale to collect information concerning staff perceptions of spaces, services and operations, delivery of care, visibility, bottlenecks, collaboration and communication, recommended improvements, and overall satisfaction. Simple linear regression determined the magnitude of the relationship between “physical, staff performance,



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or satisfaction". Stepwise regression models were generated to understand significant predictors of ease of access to supplies and equipment.

To analyze the spatial layouts of each ED, Depthmap software was used to conduct visibility graph analysis (VGA) and agent-based simulation, which helps represent the number of pedestrian flow per time unit within the environment.

Nonparametric Mann-Whitney tests were used to analyze significant differences between gate count mean values in both Site 1 and Site 2. All data were analyzed using the SPSS software (Version 24.0).

Findings

Safety and security were an important issue of consideration for the respondents and were related to issues with ineffective wayfinding systems near ED entrances and exits. The presence of multiple entrances and blind spots, along with visitors venturing behind registration desk areas, all factored into a sense of compromised security. Suggestions for improvement included mirrors, bulletproof glass at nursing stations, and metal detectors. Providing separate waiting and triage areas for behavioral health patients could also help promote security.

For wayfinding, agent analysis found that Site 1 experienced comparatively more obstructed movement patterns due to the presence of certain columns, walls, and corridors with more indirect connections and obstacles. Site 2 featured a rectangular unit shape with pods aligned linearly and perpendicularly connected corridors, all of which enhanced movement and visibility. Staff noted that improving wayfinding would help reduce bottlenecks.

For visibility, 15.6% of staff satisfaction was derived from having adequate surveillance towards patients and the ability to communicate face-to-face with colleagues. Site 1 was more restricted in visibility, whereas the intersecting corridors and short intervals created higher visibility around nursing stations and hallways in Site 2.

For privacy, the ease of private conversations with team members accounted for 15% of staff satisfaction. It was recommended that sound-absorbent materials be used in check-in areas with separated booths to enhance acoustical privacy, especially during overcrowded periods.

For efficiency, an important factor for staff satisfaction was that supplies were accessible and easily distributed. Standardization of equipment and supply location was found to be an important factor in eliminating distraction or confusion, thereby enhancing efficiency.

In general, the centralized pod design of Site 1 promoted colleague interaction and collaboration, while the decentralized pods of Site 2 resulted in a lack of visibility that negatively affected communication and generated feelings of isolation.



Limitations

The author notes that this study's primary limitation is the convenience sampling and cross-sectional evaluations used; future studies could benefit from including more than two EDs with greater varieties in spatial layouts. A similar survey was given to participants from both sites, and participants were given the option to report their location or not, which may have influenced statistical comparisons.

Design Implications

Designers can help promote security by providing different medical and behavioral patient and triage rooms for normal patient volumes; enhance wayfinding with eye-level signage, limited entrances, and hierarchical pathways; employ rectangular unit shapes with perpendicularly connected corridors, and limit columns and blind corners for better visibility; provide individual check-in booths for improved privacy; and improve efficiency by standardizing the location of supplies and equipment.

And Also...

This study features helpful floorplan figures with color-coordinated maps indicating pedestrian traffic and visibility patterns.

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