SYNOPSIS

KEY POINT SUMMARY

OBJECTIVES

The purpose of this study is to quantitatively measure the degree of visibility towards patient beds among different nursing unit designs using a technique for qualitatively characterizing key differences in the visibility structure of specific floor plans.

Measuring the Structure of Visual Fields in Nursing Units

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Key Concepts/Context

A nurses' central role is to treat and attend to patients' needs in a timely manner. This becomes complicated when managing several patients simultaneously, especially those in critical care. Therefore, developing an efficient system that helps nurses manage patient care and reduces nurse burnout rates is critical.

Extensive research has gone into analyzing the differences between nursing floor layouts, whether they be single-corridor, double-corridor, or radial stations.

The focus of this paper is around visibility analysis and how it relates to nursing units. This study measures visibility in quantitative terms to support past qualitative research.

Extensive research has been done on visibility analysis in the context of architecture. Michael Benedikt popularized the concept of isovists and isovist fields, which describes everything visible from a defined focal point within a three-dimensional space. Others, such as Peponis, etc., all (1997) offered a visibility analysis based on appearance or disappearance of visual information around edges, corners, and surfaces. Peponis suggested projecting visibility diagonals linking edges and corners and looking at whether they cross or do not cross occluding walls.

But it was found that these visibility analysis systems were not applicable to nursing stations. This is because from a nurse's vantage point not all points of visibility should be treated with equal importance. Some visible points are more significant than others. Therefore, visibility should be defined around a preselected focus of attention called targeted visibility. Target visibility is defined by the number of targets that can be viewed from any possible observation point by scanning sight lines.

This approach is derived from Gibson's theory of affordance. In simplified terms, affordance is the idea that certain environmental properties are more functionally

DESIGN IMPLICATIONS

Radial-designed nursing units facilitate the most efficient healthcare delivery system between nursing staff and patients.

Other than the unit configuration, details of the design also matter, including location of doors and windows along corridors, location of toilets in patient rooms, location of nursing stations, and so on.

By designing for key environmental components, design solutions can address important issues such as work efficiency, patient satisfaction, and quality of care.

significant than others, and visibility analysis should focus on the environmental features that are most relevant to its users. These quantitative measures, therefore, will have more meaningful interpretations related to some people more than others, depending on context.

In this study, the objects of study are patient beds in nursing units. Targeted visibility is used here to study the key differences in patient bed visibility depending on nursing station design.

The results from this research support previous findings that radial designs are more successful and more efficient than double- and single-corridor nursing station designs. This is because nurses travel less and can spend more time caring for patients; nurses can collaborate with the medical staff more easily; and patients feel patients are better observed and attended to in a timely manner.

Methods

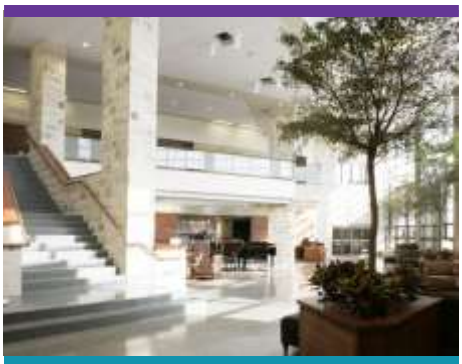
The target visibility index (TVI) was produced to measure the degree of patient bed visibility among different nursing units. This evaluation system helps compare how different nursing unit configurations help with workflow and patient care. The targeted visibility index (TVI) uses a geographic information system (GIS)-based extension developed to quantitatively validate previous qualitative findings and serve as a potential future measurement rubric.

Floor layouts are uploaded into the program and targeted visibility analysis is calculated from the floor plan. First, the grid of observation points is superimposed on the floor plan. Then a value is placed on each specific visual target. After that, a straight line (representing the line of sight) is created to each target starting at the observation point. If the line does not intersect with lines from the top layer of the floor plan, then the object is considered visible. If it does intersect, then it is considered invisible. Anything with partial visibility is counted as visible. A tally is taken of the number of visible targets and entered into a table.

The TVI is based on the collection of all targeted visibility data gathered from the patient beds. Therefore, the TVI measures how much the observer can see all targets in a nursing unit. TVI was then calculated using the three unit layouts (single-corridor, double-corridor, and radial), and showed that the radial unit had the highest TVI value (0.41), the double-corridor had second highest (0.12), and the single-corridor had lowest (0.03). Therefore, the TVI calculations corresponded exactly with the original empirical findings from Trites' research.

Findings

- Quantitative findings (TVI) matched the qualitative research done previously on nursing units.



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- Nurses favor radial units because they believe they enhance teamwork and quality of healthcare delivery.
- Patient prefer radial units because they feel closely observed and have quicker responses from the nursing staff.
- Decreased patient falls and injuries due to radial nursing unit design (decreased patient falls by 67%)
- Reduced time nurses spend traveling, allowing nurses more time for direct bedside care
- Radial design helps increase communication and contact between staff and patients.