



KEY POINT SUMMARY

OBJECTIVES

A simulation program was used to examine how the layout of different types of patient rooms within a single nursing unit impacted nurse walking distances.

Exploring the spatial arrangement of patient rooms for minimum nurse travel in hospital nursing units in Korea

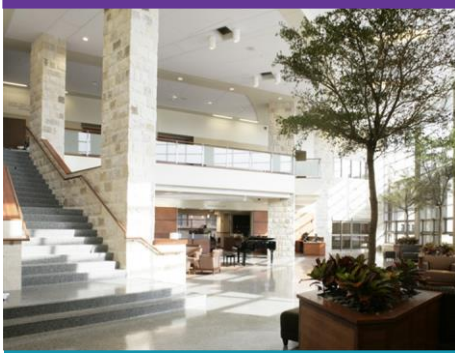
Lee, J., Lee, H., Shepley, M. M., 2020 | Frontiers of Architectural Research, Volume 9, Issue 4, Page(s) 711-725

Key Concepts/Context

Studies have shown that when nurses have to walk long distances, time at the patient bedside is reduced and nursing fatigue and stress increase. The arrangement of patient rooms within a nursing unit can impact nurse well-being and optimize patient care. The results of this study suggest that revising unit room arrangements can maximize efficiency, especially in areas where single-patient rooms are not feasible.

Methods

Researchers identified eight different medical-surgical unit layouts common in Korean hospitals (four rectangular and four triangular). Each unit included single, double, or multi-occupancy room types. An agent-based simulation program was used to evaluate nurse walking distances within each unit layout. The authors first replicated each layout in the simulation program and then developed virtual agents to simulate nurse walking behaviors along programmed walking routes between different unit locations. Nurse walking behaviors were programmed using parameters including visit locations, number of visits to a specified location, and flow between patient assignments. Movements between patient assignments were assessed when assigned patient rooms were adjacent to one another (contiguous) and when they were not (non-contiguous). Virtual agents were programmed to initiate movement from a designated starting point (nursing station) and then move to a point of interest (patient room or supply room) and then reach a destination point (nursing station). Thirty-three walking routes were compared among the different unit layouts. Researchers examined unit characteristics that might have resulted in increased walking distances. Then selected layouts were modified and re-evaluated to see if re-locating unit elements resulted in a reduction in walking distance. Unit modifications included 1) moving the nursing station to a central location on the unit, 2) moving multi-bed patient rooms closer to the nursing



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stations, and 3) placing multi-bed rooms, double-bed rooms, and single-bed rooms in a mixed pattern within the unit.

Findings

Researchers noted that the following changes reduced simulated nurse walking steps: moving the nursing station to a central location on the unit; moving multi-bed patient rooms closer to nursing stations; and placing multi-bed rooms, double-bed rooms, and single-bed rooms in a mixed pattern. First, because the nursing station was the location to which nurses most frequently travelled, locating this element centrally reduced nursing steps. Secondly, because multiple trips between nursing stations and multi-bed rooms resulted in longer walking distances, moving these rooms closer to a centrally placed nursing station reduced the number of steps taken over multiple trips. Finally, mixing the placement of room types (single, double, and multi) appeared to allow for more equitable patient assignments and reduced travel between both non-adjacent rooms and the nursing station. When unit layouts were modified to include these three findings, simulated nurse walking distance was reduced by 15 percent.

The novel use of agent-based simulations is promising. By programming typical nurse walking behaviors and using findings to modify and refine unit layouts, researchers provide useful insights into placement of nursing stations and different types of rooms. While this was a basic application of the technology, it did result in potentially useful recommendations and holds promise for providing insight into further unit and facility design.

Limitations

There were several limitations to the generalization of findings for this study. First, the simulated nurse walking distance was limited to a single scenario. Second, the study did not take into account patient acuity or nurse experience. Third, this study used unit layouts and room types on those most typical in Korea, which may not be representative of units where single-bed rooms are ubiquitous. Finally, the study did not account for proximity between nurses who may need to consult with one another on patient care or unit operations.

Design Implications



The simulation technology used indicated that nurses make multiple trips between the nursing station and multi-patient rooms such that on units with more than one room type, it may be beneficial to ensure multi-patient rooms are near the centralized nursing station and multi-patient, single-, and double-occupancy rooms are alternated along corridors to reduce walking distances. Because nurses may travel between different room types, alternating may make patient assignments (and associated walking distances) more equitable.

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