SYNOPSIS

KEY POINT SUMMARY

OBJECTIVES

Our purpose in this paper is to describe the current state of these design characteristics in U.S. adult medical-surgical (M-S) and intensive care units (ICUs).

The Design of Adult Acute Care Units in U.S. Hospitals

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Key Concepts/Context

In 2005, the Agency for Healthcare Research & Quality (AHRQ) publicized a commissioned report about hospital environments (Nelson, West, & Goodman, 2005). The report included a summary of all published research (N=328 reports) about those environments and patient and staff outcomes, including safety, satisfaction, and efficiency, as well as clinical outcomes. Although many gaps were noted, the presence and use of specific resources were found to be at least somewhat related to several outcomes. In 2007, AHRQ, building on this work, released a DVD highlighting specific research-based positive design elements (AHRQ, 2007). Among the nursing-unit characteristics deemed by AHRQ to influence patient and staff outcomes are: providing single rooms, work areas for staff that are not long distances from the bedside, frequent staff hand-hygiene stations, "visibility" of patients from nurse work areas, and noise reduction via ceiling tiles and carpeting (AHRQ, 2007).

Agency for Healthcare Research and Quality. (2007). Transforming hospitals: Designing for safety and quality. Retrieved, August 8, 2008, from http://www.ahrq.gov/qual/transform.htm

Nelson, C., West, T., & Goodman, C. (2005). The hospital built environment: What role might funders of health services research play. Washington, DC: U.S. Department of Health and Human Services.

Methods

Descriptive study of patient visibility; distance to hygiene, toileting, charting, and supplies; unit configuration; percentage of private rooms; and presence or absence of carpeting.

Setting

56 ICUs and 81 medical-surgical units in six metropolitan areas

Metrics and Measurement

The investigators collected unit-specific information based on visual observation, distance measurements, and unit director interviews at one general ICU, one medical and one surgical unit per hospital. In hospitals without a general ICU, data were collected on one medical and one surgical ICU. In hospitals with more than one medical and surgical unit, data were collected on the units with the highest rate of physical-restraint use. Inter-rater reliability of greater than 0.98 was maintained by restricting data collection to the investigators.

Data were collected via observation, measurement, and interviews. Unit configurations were classified via an iterative process.

Data Analysis

Descriptive data were analyzed according to ICU and non-ICU status using SPSS (Version 15).

Findings

Using SPSS (Version 15), we noted that the descriptive results varied by ICU or non-ICU status. We conducted all analyses based on this dichotomy.

Configurations. The variation in distribution among ICUs and M-S units was large. Four designs were predominant in ICUs. Four other designs were most prevalent in M-S units. Parallel corridor configurations accounted for 43% of M-S units with "surrounded" and "spokes, no end stations" as distant seconds. ICUs were more diverse, with no configuration representing one-fourth of the units studied.

Private rooms. The mean percentage of ICU private rooms was 86.7% (SD 28.5) and 43.6% (SD 38.7) in M-S units. The mean number of beds was 17.3 (SD 8.7) in the ICUs; and 32.9 (SD 8.6) in the M-S units. The minimum ICU bed number was 8 and the maximum 47. Comparable statistics for M-S units were 13 and 60.

Patient visibility. The average percentage of beds allowing patients to be seen was 63.4% (SD 31.2) in the ICUs and 5.3% (SD 14.7) in M-S units.

Carpeting. Main corridors were carpeted in 20% (n=11) of ICUs and 39.5% (n=32) of M-S units. We noted carpet in fewer than 5% of all patient rooms. Almost all were in M-S units. Within these units, not every room was carpeted.

Distances. Almost every unit had hand-hygiene facilities within 10 feet of every bed. No differences were noted between ICUs and M-S units. The average distance from bedside to a body-waste disposal facility was 14 feet (SD 14.5) in ICUs versus 11.9 (SD 10.6) in M-S units. This difference was because M-S rooms were slightly more likely to have an en-suite toilet than were ICU rooms. The M-S unit mean distance to supplies (52.6 feet; SD 30.6) was much greater than in ICUs (18.2 feet, SD 17.9). The average distance to charting materials in M-S units (27.6 feet, SD

22.3) was more than double that of ICUs (12.5 feet, SD 19.8). Almost all differences were because of the greater likelihood that room-based supplies (83% of ICUs versus 17% in M-S units) and room-based computers or paper-charting facilities were provided for each ICU room.

Intra-hospital and intra-unit variation. In the 14 hospitals in which we studied two ICUs, three had the same configurations for both ICUs. Of the 38 hospitals for which data for two M-S units were available, 16 (42%) had the same unit configuration. ICU pairs had the same "carpet in hallway" status in 13 of the 14 hospitals; this was also the case in 35 of the 38 M-S unit pairs. In 12 of the 14 hospitals in which two ICUs were studied, less than 10 feet of difference in average distance to the charting facility was noted. In 11 of the 14 hospitals, the ICU pairs were also very similar concerning the distance to dispose of body waste. In sixof the 14, the distance to supplies was similar. When differences between ICU pairs were noted, they tended to be significant. In five hospitals the differences between the average distance to supplies was more than 20 feet. Although mean distances to charting facilities and body-waste disposal sites were similar for almost all M-S pairs, average distance to supplies was different by 10 or more feet in half of the hospitals. In three hospitals, the mean difference between the M-S unit pairs was more than 40 feet. Unit differences within hospitals were usually related to (a) placement of units in buildings or wings of different designs and (b) the tendency to refit previously identical units. Some units had converted patient rooms to supply rooms. Some units had mobile computers while others in the same institution did not.

Design Implications

There is room for improvement on almost every design variable, particularly on medical-surgical units. Future planning should take into consideration the interaction of bed capacity and unit configuration.

Among the designs, the "spokes, no end station" had the longest distances, worst visibility, and fewest private rooms. This design is one that should require much scrutiny before being adopted in new designs. Although others (Hendrich et al., 2004; Page & Page, 2004) have noted that parallel corridors often require more walking, this was not true in our study of ICUs. We believe this discrepancy is because of (a) the tendency to place supplies and charting materials within patients' rooms, (b) the placement of multiples of the same work area along the inner supply rectangle, and (c) the relatively small unit size. In contrast, the parallel corridor design on large M-S units was found to have among the longest walking distances. Our recommendation is to consider the potential interaction of bed capacity with configuration in future research.

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Based on the large variation of characteristics such as number of beds, distance to supplies, charting, and waste disposal within each design category, we do not recommend that design configuration be used as an unadjusted variable. For example, a great difference probably exists in the amount of walking required on a “parallel corridor” unit that serves 46 patients in private rooms with only one nursing station versus a parallel-corridor unit that serves 24 patients and has provisions for charting in each room.

Limitations

The study is limited in that we studied units in nonfederal hospitals of more than 99 average daily census in urban areas. Smaller, rural, and federal hospitals may use different designs and have a different frequency of desirable characteristics. The design did not allow for examining every unit, thus the degree to which design differences within a single institution exist may be understated. The study design did not allow for including other design aspects (e.g., acoustical tile, air filtration, grab bars, sitting stations in hallways, and artwork) noted by AHRQ as improving outcomes (AHRQ, 2007).