

Ensuring Quieter Hospital Environments

Nurses provide valuable input during a unit redesign at one hospital.

This is the fourth in a series of articles from Planetree, an international nonprofit organization founded in 1978 that's "committed to improving medical care from the patient's perspective." For more information, go to www.planetree.org.

Patients often complain about the amount and level of noise they hear during hospitalization. The near-constant din created by equipment, hallway traffic, and conversation results in a less-than-restful experience for many. And the effects can be detrimental; studies in adult patients have linked excessive noise to sleep disturbance^{1,2} and increased blood pressure, heart rate, and stress.³ Excessive noise and inadequate sound isolation can interfere with patients' auditory or "speech" privacy—which by law hospitals and other health care facilities must safeguard. (Oral communication about a patient's health information is protected under the Health Insurance Portability and Accountability Act of 1996.⁴) When patients aren't assured of such privacy, they can be reluctant to fully disclose their conditions and concerns. One study of ED patients found that curtain partitions provided inadequate speech privacy, causing a few patients to withhold portions of their history.⁵

It's significant that the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey (www.hcahponline.org/surveyinstrument.aspx), which measures patients' perceptions of hospitalization,

includes a noise-related question: "During this hospital stay, how often was the area around your room quiet at night?" In results published on the Department of Health and Human Services' Hospital Compare Web site (www.hospitalcompare.hhs.gov), just 56% of patients nationwide who were discharged from July 1, 2007 through June 30, 2008 reported that their room was "always" quiet at night, a finding that suggests there is marked room for improvement. Such data have significant financial implications as well. Under a proposed "value-based purchasing program" that will link payment to hospital performance, the Centers for Medicare and Medicaid Services has recommended including the HCAHPS survey as one performance measure.⁶

Nurses and other health care staff are also adversely affected by high noise levels. According to one literature review, such levels have been associated with increased stress and annoyance, fatigue, emotional exhaustion, and burnout.⁷ And excessive noise can interfere with staff communication, increasing the likelihood of error.⁷

Guidelines set by the World Health Organization (WHO) for background noise in patient

rooms recommend that average sound levels not exceed 35 dBA during the day and 30 dBA at night, and that maximum transient levels not exceed 40 dBA.⁸ These sound levels are on the order of sounds produced by a breeze blowing through trees at five to 10 miles per hour. Other resources commonly used by engineers make similar recommendations for sound levels in hospitals.^{9,10} Yet one literature review found that these maximums are often exceeded, frequently peaking at 85 dBA and higher⁷—a level roughly equivalent to that produced by heavy traffic on a highway heard from a distance of 25 feet. And researchers who analyzed data gathered at various hospitals between 1960 and 2005 identified "a trend of increasing noise levels during daytime and nighttime hours," with most sound levels 20 to 40 dBA higher than those recommended in the WHO guidelines.¹¹

Sources of noise on an inpatient unit include the movement of people and equipment; conversations of staff, patients, and visitors; sounds from patients in distress; medical equipment; other devices such as telephones, computer printers, and televisions; the public address system; and the hospital ventilation system.^{12,13} A facility's architectural design can also play a role. For example, a unit with long corridors and distances between patient rooms and the nurses' station might encourage staff to

hold “microconferences” in the hallways.¹³

Although many factors contribute to noise in hospitals, the effects of some can, and should, be mitigated.

ONE HOSPITAL'S INITIATIVE

In 2000 Alegent Health's Mercy Hospital in Council Bluffs, Iowa, began a major renovation and expansion initiative. (One of us, CMB, has worked there since 1998.) The first area to undergo renovation was the combined medical-surgical and pediatric unit on the third floor; its design and furnishings had been unchanged since the hospital was built in 1971. The goal was to create a calm, healing environment with reduced noise levels.

The original 44-bed unit had three wings radiating from a central nurses' station where patient charts were located; the unit secretaries were also stationed there. Nurses, physicians, and other providers often gathered in this central area, which frequently resulted in high levels of activity and noise.

During the planning stage of the unit's renovation, hospital staff and community members were invited to share their ideas. To improve patient privacy, the group agreed that semiprivate rooms should be converted to private ones. The nursing staff, seeking to improve workflow efficiency and increase nurses' proximity to patients, recommended having a nurses' station on each of the unit's three wings. Although this model was likely to increase renovation costs and complicate nursing assignments, it was accepted. Other design changes aimed at reducing unit noise included adding carpeting in the hallways, creating open kitchenettes on each wing for patient and family use, and adding family areas with seating, telephones,

and a television to patient rooms (a curtain can be drawn when the patient wants privacy). Spaces dedicated to family use help to reduce noise levels in other areas. The use of indirect lighting in hallways and soothing colors on walls also contributes to a more serene environment.

All of these measures appear to have contributed to a quieter environment, and patients and families have reacted favorably. Since the renovation the unit's noise-reduction efforts continue to be effective, as evidenced by the hospital's most recent HCAHPS survey results, which were markedly above the national average. Among patients hospitalized between July 1, 2007 and June 30, 2008, 65% of Mercy Hospital patients reported that the area around their rooms was “always” quiet at night, compared with 56% of patients nationwide.

Inventive ways to address staff concerns have also been found. For example, the carpeted hallways make moving patients and equipment and cleaning more difficult. So the hospital purchased motorized beds for the unit and is equipping each patient room with a computer to eliminate the need for a computer cart. A new carpet design permits individual tiles to be removed, which allows for easier cleaning.

STRATEGIES FOR REDUCING NOISE

As Mercy Hospital's renovation of the medical-surgical unit shows, informed **architectural design** can markedly reduce ambient noise levels. Effective strategies include selecting appropriate sound-blocking and sound-absorbing materials during construction, locating noisy equipment and high-traffic areas away from patient rooms, and purchasing and using quieter equipment when that's an option. For

example, during new construction or major renovation, staggering patient room doorways along a corridor, or placing each room's bathroom between the head of the bed and the corridor, can reduce the amount of room-to-room sound transfer and enhance speech privacy. Using transparent materials for sound barriers between common areas and patient rooms allows staff to see patients while reducing sound transfer. The use of carpeting and acoustically absorbent ceiling tiles in hallways helps to reduce sound propagation.

The Green Guide for Health Care, a resource for best practices in sustainable design for health care settings, has a technical brief outlining these and other strategies (<http://bit.ly/JE8eu>). The brief interprets the *Interim Sound and Vibration Design Guidelines for Hospital and Healthcare Facilities* (<http://bit.ly/gitNV>). These interim guidelines will be incorporated into the *Guidelines for Hospital and Health Care Facilities* (forthcoming in 2010 from the American Society for Healthcare Engineering), a definitive resource that's accepted as code or reference (in whole or in part) in more than 40 states and by seven federal agencies. (For more information, write to info@fgguidelines.org.)

Electronic strategies might include moving television speakers closer to the listener to minimize disturbance to others and equipping staff with personal pagers to minimize public address system use. At Johns Hopkins Hospital in Baltimore, Maryland, after staff on a pediatric ICU were given personal pagers, overhead pages decreased from one at least every five minutes to one or two per hour.¹¹

Some sounds, such as equipment alarms and signals, cannot be eliminated. To minimize such

disturbances, introducing white noise through a sound-masking system—consisting of a central electronic controller and several emitters (speakers)—can be helpful. This constant, low-level background sound fills in the gaps between louder, intermittent noises, making them less noticeable. The system should be located in patient rooms but *not* in corridors or at nurses' stations, where the additional sound could interfere with monitoring. One study found that the use of white noise increased subjects' arousal threshold during sleep.¹⁴ (Patients on ototoxic drugs should not be exposed to white noise; indeed, they should be assigned the quietest rooms available.)

Behavioral and administrative measures to reduce noise should also be considered. At Saint Marys Hospital in Rochester, Minnesota, such measures have included conducting shift-change reports behind closed doors, changing IV bags before the alarm sounded, muffling the pump speaker when programming changes, and restocking supplies during the evening rather than at night.¹⁵ ▼

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