

Increase Patient Safety by Creating a Quieter Hospital Environment

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In the typical hospital environment, sounds of beepers, alarms, machines, telephones, voices, are considered “usual and customary”—normal to those who work there and those who watch the television show “ER.” To patients, however, the sounds of the hospital are far from normal. Depending on age, hearing acuity, medication levels, culture, and fears, these sounds are antagonistic, worsening a situation that is already difficult. Beyond difficult, however, prolonged exposure to environmental noise can increase anxiety and stress, ultimately impacting patient safety. But the good news is that it is possible to address the noise issue and create an environment for patients that is not only of better quality, but also inherently safer.

The Risks

Noise is a primary cause of sleep deprivation and disturbance among patients.¹ It increases their anxiety and decreases their confidence in the clinical competence of the staff, putting into question basic consideration on the part of the hospital in general. It contributes to patient falls, causes confusion, and results in increased medication and restraint use. Furthermore, noise-induced stress is contagious, impacting the attendant family member who eventually winds up at the nurses’ station complaining about a variety of issues, each worsened by extraneous noise.

Sudden noises, such as a dropped tray or slammed door, may cause a “startle reflex” in patients, resulting in physiological responses such as facial grimacing, muscular flexion, increased blood pressure, higher respiratory rate, increased heart rate, and vaso-constriction.¹ Patients exposed to continuous extraneous noise can also

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Check Points

How can noise be reduced in hospitals?

- ✓ Consider auditory impact of a planned equipment purchase
- ✓ Check to see if a mechanical adjustment can help prevent or ease noise level
- ✓ Work with clinicians and other departments to create a quieter environment

experience altered memory, increased agitation, less tolerance for pain, and feelings of isolation. These environmentally generated symptoms are often medicated or otherwise treated in ways unrelated to their cause.

Those who work in noisy environments for long shifts, day in and day out, also have similar stress-induced experiences.² They report everything from exhaustion, to burnout, depression, and irritability expressed at home. Interfering and distracting sounds have been shown to contribute to medical and nursing errors. JCAHO mentions noise as a potential risk factor related to medical and nursing errors, stating that the ambient sound environments should not exceed the level that would prohibit clinicians from clearly understanding each other.³ In an answer to a reader question about the effect of music in the operating room, the editors of the *AORN Journal* reported a surgical episode in which the music was so loud that surgeon’s directions to the anesthesiologist regarding heparin levels were misunderstood by 8,000 units.⁴ Thus, beyond annoyance, within the sound environment lie potential safety risks that are often unidentified or ignored.

The Noise Culprits

The EPA recommended guideline values for continuous background noise are 35 decibels during the day and 40 decibels at night in patient rooms. However, a review of

the literature by Ulrich and Zimring indicates that many studies have shown noise levels in most hospitals are much higher.⁵ And, as Ulrich and Zimring point out, equipment, including paging systems, alarms, bedrails, telephones, ice machines, pneumatic tubes, and carts are one of the primary causes of noise in hospitals.⁵

Using digital decibel meters, staff members at Northside Hospital in Atlanta, GA, measured the sound levels of 238 pieces of equipment, including 59 heavy rolling carts.⁶ The investigators grouped sound levels according to dB ratings, indicating the time of day at which they occurred. For instance, at 1 p.m., they found the pneumatic tube and paging system rated at over 80 db (and often increased past 90dB, equivalent to the volume of a hair dryer next to our ears). In the afternoon, they found monitors, the nurses' station, food carts, groups of five people with pagers, and other typical scenarios to vary between 70-79 dB. Late in the evening, after 9 p.m., they found that printers, elevator buzzers, trash carts rolling at high speed, and the ice machine rated even higher.

Indeed, much of the noise caused by the auditory predators in the hospital environment can be significantly reduced by mechanical adjustments, maintenance, or purchasing new equipment where possible. The auditory impact of equipment can be reduced by changing wheels, applying padding, repairing or replacing door bumpers, using thicker carpeting, and installing effective acoustic ceiling tiles. For example, at Northside Hospital, the decibel level of the pneumatic tube system was brought down to 50 dB (over 400% quieter) by the careful use of padding.

More importantly, new equipment purchases should be based not only on function and price, but also on auditory impact. While this is not currently or prominently noted, it must become a requisite specification. What is needed are descriptive specifications related to operational environments, such as:

- Where the device is to be used
- Auditory impact to user
- Auditory impact to patient (if applicable)
- Transient and continuous auditory measures

Also, any other sounds that would indicate malfunc-

tion of equipment should be noted and evaluated for their impact on patients and users. Regarding what is acceptable, perceptible measures, not only empirical measures, must be related to the situation. This means that if it sounds noisy, it is noisy. If it sounds inappropriately loud, it is inappropriately loud. If it is annoying, it definitely is! Compliance standards must be established according to the environment of use and circumstance, not merely a sound level meter.

To date, noise control in hospitals remains a continuing challenge. While research has shown that noise is a risk factor to patients and staff, stringent auditory impact standards for medical equipment have not been established or enforced. In reviewing equipment for safety and functionality, biomedics are well positioned to take

the next step in improving their organizations' health-care environments. By working together with facilities managers and clinicians, local standards that meet the needs and culture of the organization can be established to requests for proposals and bids.

National standards apply to the sound environment as a whole, but they have not been heeded. Neither have they kept up with the increasing number of new types of healthcare settings and the plethora of new equipment being used in those settings. Therefore, it will be new standards set by users applied to purchasing decisions that will ultimately change the way manufacturers develop new equipment. ■

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