Hear, Hear

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HEALTH FACILITIES MANAGEMENT

Assessing And Resolving Hospital Noise Issues

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Hospital employees and administrators usually view noise as the auditory cost of doing business: It's what happens in a fully functioning facility. However, to third parties, such as patients and even clinical staff, the experience can be much more negative. In fact, Florence Nightingale identified noise as one of the most serious of all insults to patients, as well as an adversary to the healing process. In 1859, she wrote that anything that causes the patient anticipation, anxiety or expectation causes harm, and noise is primary on the list. She also wrote that noise is that [sound] which damages the patient and, therefore, unnecessary noise is the "cruelest absence of care."

SOME BACKGROUND In 1972, the U.S. Congress passed the Noise Control Act. The Environmental Protection Agency (EPA) then formed the EPA Office of Noise Abatement and Control, which was funded until 1983 when Congress decided that noise abatement and control were more matters for states and cities than for the federal government.

The Occupational Safety and Health Administration (OSHA) has since established more concrete standards for noise control regulations as protective measures in the workplace. OSHA defines noise simply as "unwanted sound." It also lists symptoms and outcomes of noise exposure, and then focuses on protective standards.

While its standards are more empirical, OSHA documents clearly state that excessive noise can limit performance, impair communication and have other health impacts.

In the hospital setting, the ongoing risk for patients is noise annoyance, followed by hearing loss implications that occur under only special circumstances. For health care workers, OSHA regulations apply. (For more on the OSHA documents, log on to www.osha.gov/dts/osta/otm/noise/references.html and www.osha.gov/dts/osta/otm/otm_iii/otm_iii_5.html#1.)

Tools of choice

A noise assessment and remediation program requires decibel (dB) meters and many sets of ears, as well as paperwork to record findings and follow up on results. Among these tools, decibel meters require some selection information and advice.

Decibels are electronic power measures. The measure is one watt per one decibel unterminated (dBu), which refers to a ratio or change in power generated by a sound pressure level (SPL), which is the measure of air pressure on the inner ear. Decibels are electronic references to the SPLs caused by a sound vibration moving air, which is how people sense that a sound has occurred.

"Just-perceptible" volume changes (louder or softer) happen at about 3 dB change. At a 5 dB volume change, the perceived sound doubles. These measures are relevant to the objective issue of softer and louder. However, they do not necessarily define noise. Their value in this discussion has to do with determining "how noisy is the noise" and what to do about it.

Sound, while quantifiable in sound pressure readings, becomes more understandable when the measures respond as the human ear responds. "A-weighted" decibels (dBa) take into account the fact that the human ear responds best in certain frequency ranges. Noise measurements in relation to auditory effects are measured using the A-weighted scale.

Many different types of decibel meters are available, each with its own unique features. However, many of them are not necessarily useful. Readily available, easy-to-use, portable and cost-effective digital dB meters can be purchased at Radio Shack or similar retailers for about $50. These devices offer the basic functions required. Others are much more specific, as they are used for OSHA certification and validation, and for other industrial safety issues as well. Certainly, it is possible to graduate to certifiable devices. At this point, the benchmark is set by patient satisfaction and, as well, indirect (and relevant) outcomes of the auditory environment.

There are two ways in which a dB meter works. One is the measure of the instantaneous volume of a sudden event, like a slammed door. It is read quickly. The display shows an exact number and holds it until the user triggers the meter for the next reading. The other method is slower and averages ambient noise over time, such as 30 seconds.

Both measures are needed, one for determining audio impact of equipment, the other for environmental noise, such as the nurses' station at shift change. All the available devices do this and allow the user to set a ceiling parameter, such as 75 dB, and then indicate when sounds go above that.

It is important for users to spend time reading the owner's manual and practicing to familiarize themselves with the meter prior to the noise assessment.

Steps to take

Assessing the sound environment is not only the first step in managing it, but also the most crucial if substantial improvement is to occur.

In the simplest of terms, this can be accomplished over time by assembling a multidisciplinary task force, and arming each member with a decibel meter and assessment forms. The steps to take in this bare-bones approach include the following:

1. Profile the facility by surveying and listing the different areas and grouping them according to their relationships (see Figure 1). For instance, if the cafeteria is next to a waiting area, put these two areas in order.

2. Design or customize the assessment tool to be used to collect data, assigning a member of the task force to each group area.

3. Document the state of the sound environment using the chosen decibel meters, remembering to include the causal and contextual information to the report, such as who, what, where, when and how (see Figure 2).

4. Evaluate all equipment that impacts patient care areas, such as phones, overhead paging, vacuum cleaners, pneumatic tubes, ice machines and medical equipment.

Don't be surprised if this ends up consisting of a few hundred items. Organize the list into areas and departments. For instance, all equipment used in a specific area should be listed together.

Test the equipment in the area it's being used in, as flooring and patient impact will vary. Common items, such as carts, may be listed as many times as there are areas, and the decibel readings will be different almost everywhere (see Figure 3).

5. Tabulate the findings. Once all the information is collected, make a list of items that need obvious repair or replacement. Make another list of the environments that need to be addressed (such as replacing flooring, adding sound barriers, etc.). Also indicate which spaces do not require any attention.

6. Create a schedule for repairs, replacements and reassessments of progress. Prioritize the tasks that need to be accomplished in order of urgency, but do not neglect other areas, as noise has a tendency to travel and breed upon itself.

7. Publicize the outcomes and activities. Everyone will want and need to know the outcome of what was found and what is going to be done about it. Continual information about auditory impact of equipment from those who use it can also be requested.

8. Measure the outcomes, including "after" dB readings and qualitative surveys using the same tables and charts that were originally used.

9. Set up ongoing protocols for maintaining all improvements and standards set by the process. It's important that all follow-up assessments are documented using the same charts and used in the initial assessment.

General rules

Beyond these specific steps, there are a number of general rules that health facility professionals should keep in mind during a noise assessment process. Among them are the following:

The goal is to manage the impact and risk of noise. The first assessment is the most challenging and verifies the obvious and the not-so-obvious causes and effects. Following this initial assessment, the ongoing responsibility is maintenance. If the sound environment is not maintained, it will revert and the organization will start over as if nothing had ever been done, with the caveat that it has been put on notice.

This is not a do-it-yourself effort, nor the job of a single department. Participation is needed from a broad section of the hospital representing each major department, such as housekeeping, environmental services, volunteers, lab, clinical services, admitting, emergency and surgery. It is best to recruit people who are most concerned with the issue, who have complained about it and who have received complaints.

Notify everyone of the plan to do an auditory assessment. Decibel measures are impersonal, indiscriminating and bear no bias to person or place or status. However, because it will be new to the organization, it is important to notify hospital personnel that this measure is not about who they are and does not record voices or anything else. It is an event evaluator in regards to one thing--loud and soft noises.

Nor should senior members of the administrative or clinical staff be exempt for the measurements. For instance, if the CEO is walking through the intensive care unit and energetically talking to the director of nursing on the day a person enters the ICU and stands by the entrance to hear what others hear and measure the volume of what happens, it counts. Rank plays no favor in this regard. What is disturbing to a patient has nothing

to do with the hierarchical structure of the facility.

Time lines are critical. Documenting sound levels and events does not take a long time. However, doing it in all areas and visiting each area takes planning. To assess a facility in reasonable time, deadlines are mandatory.

Furthermore, the time lines need to be arrived at by group discussion. Otherwise, considerations that overlook specific schedules and circumstances in particular units may become a problem.

However, do not warn departments about the measurement, as the goal is to measure what actually happens, not set up people to be on their best behavior. This should not interrupt normal activities. In fact, many people may not know that it was done. Assuming that some areas are dynamic, having peak periods that are sporadic, measure them at least three different times.

Document, document and document again. Create and use standard forms to collect sound data, such as those in Figures 2 and 3. Depending on the facility, this may be enough, or additional assessment forms may be required. Either way, use the same forms to assess and reassess, document areas of challenge, and revisit areas where peace once reigned.

In spite of the ambiguity of empirical measures in relationship to managing or even understanding noise, there is direct value in assessing the sound environment. This needs to be based on measures of sound levels relative of other factors. Thus, meaningful measures must be contextual and comparative.

It is not possible to empirically measure the annoyance factor, but its causes can be identified. Patient noise issues involve acute annoyance, disturbance and agitation, all of which have related physiological implications. However, in spite of common usage, a noise is not inherently "annoying." Therefore, it cannot be empirically measured on that basis.

Annoyance and disturbance are responses reported through patient satisfaction surveys, complaints and other outcomes. Sleep deprivation or disturbance, for instance, while potentially caused by many factors, is most commonly attributed by the patient to noise.

For these reasons, it is critical to combine actual sound level measures with the specific context of listening--the place and time. This kind of precision provides valuable information about the environment--both physically and behaviorally.

Some conflict is likely. All studies regarding noise say that people are noisier than equipment; that people violate the environment before monitors or paging; and that patients are more irritated by inappropriate laughter than by the ice machine. Thus, the task is to reveal the outcomes of not only environments and equipment, but also of people. It is important to remember that seldom is one intentionally noisy and/or considers himself or herself to be noisy; few people decide to be a disturbance. Nonetheless, it happens.

Be simple and thorough. Most squeaky wheels have tires. "Simple" is oiling the squeaky door; "thorough" is also checking how the door closes, and all other doors like it. Simple is fixing the hydraulic door closer; thorough is checking the doorstops and jams. Simple is replacing the ballast in the humming fluorescent light; thorough is adding "ballast replacement" to maintenance procedures.

Assume that each auditory event is symptomatic and that there are other related issues that may not be as obvious. For instance, if it is observed that the voices at the nurses' station are inappropriately loud, check whether there are other aggravating factors that force people to raise their voices. For example, an ice machine might raise the noise floor or a point of traffic congestion might force people to speak louder.

While it may seem the first step is to deal with the obvious problem, be organized and methodical. The assessment, if done diligently, provides not only critical information needed to establish goals, but also a broader understanding of the diverse nature of how sound impacts different populations and operations. The good news is the solutions are often within the assessment.

Noise is never gone, but will seem so when it is manageable. Noise grows on itself and reroots regularly. A quiet environment--one that is appropriate to patient care and safety--requires tending. The first year is the hardest. After that, it needs maintenance.

The tools and strategies discussed in this article should be used again and again and again. Assessment, strategic actions and maintenance are the perpetual process of environmental design. There is no end, nor is the situation ever truly "fixed."

Vigilance and diligence

Success will come with vigilance and diligence. It will improve the organization and improve patient satisfaction, reduce medical errors and increase staff effectiveness. It will also increase patient and staff safety.

If there are doubts about staff having the time to do this, the skeptics may want to spend a weekend in the hospital and evaluate whether what they experience, how they sleep and what they hear is the best of care.

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FIGURE 1. Sample organizational profile of specific areas

	AREA	ASSESSMENT DATE	PERSON ASSIGNED	COMPLETION VERIFICATION
FIRST FLOOR				
	Lobby			
	Transition hall:			
	Lobby to outpatient clinic			
	Admitting			
	Administration			
	Gift shop			
	Elevator lobby A			
OUTPATIENT SURGERY CENTER				
	Pre-op holding			
	PACU			
	Post-op recovery			
	Admitting			
	Waiting area			

FIGURE 2. Sample assessment of environments

Place	Date/ Time	Distance from Sound Source	Decibels	Irritants	Strategy
Nurses' station, fourth floor, Station 1	7 a.m.	10 ft.; in hall	90 dB	Vacuum during nursing shift change	Reschedule with housekeeping to minimize impact
First floor lobby	noon	10 ft. from admitting desk; first row chairs	65 dB	Acoustics of lobby make all discussion too loud	Add acoustical treatment: fabric flags to hang and other treatments to calm the area.
Cafeteria	8 a.m.	Middle of room	85 dB	Ice machine rattles and is very noisy	Repair ice machine and consider either moving or enclosing

FIGURE 3. Sample of auditory impact of equipment data

Equipment Used	Area	Distance From Sound Source	Decibels Level	Obvious Causes	Recommendation	Scheduled Repair or Replacement
Cart #1079	Pre-op surgery	5 ft.	90 dB	Hard wheels on hard surface; rattle in handle	Change wheels to rubber; fix handles	2/20/05, repair
Floor waxer	Third floor med-surg	6 ft.	95 dB	Functional noise	Schedule time when patients are not disturbed; also, look for machines with lower auditory impact. Check with manufacturer.	6/3/05, replacement
Ice machine	Surgery waiting room	Middle of room	70 dB	Functional fan noise	Move or surround with plexiglass to minimize noise	3/4/05, repair