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White Paper

Noise reduction strategies for the 21st century hospital

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It takes a team approach and fresh thinking to tackle the factors making today's hospitals twice as noisy as they were 50 years ago. The design community has numerous tools in their kit to bring quiet to healing.

Introduction

Historically, Florence Nightingale is credited with bringing up the issue of noise in 1859, saying "Unnecessary noise, or noise that creates an expectation in the mind, is that which hurts a patient." And, [It is] "… the most cruel absence of care which can be inflicted either on the sick or well."

The auditory environment of the 21st century hospital is substantially louder, more complex and more difficult to control than that of Nightingale's time. An article in the *Boston Globe*[1] on noise in hospitals reported that noise levels have doubled since the 1960s.

Numerous reports and studies point to the harmful effects of noise, which primarily include:

- Fractured sleep and slower healing[2]
- Intensive care psychosis or delirium has been directly linked to environmental stressors – **noise**, sleep deprivation and social isolation being primary[3]

And it isn't just patients who are impacted. A patient at Massachusetts General Hospital died after staff turned off a beeping heart monitor, highlighting the national problem of hospital staff dealing with noise fatigue. Noise isn't just harmful to patients … it also wears on staff, so much so that, in this case, they turned off a vital monitoring device.

Healthcare organizations and providers are mobilizing to turn down the volume of hospital noise. In a paper entitled Creating a Culture of Safety: Reducing Hospital Noise[3], Susan Mazer, Ph.D., suggests a multi-disciplinary team approach in tackling

noise issues, focusing mainly on patient equipment and alarms. Dr. Mazer stresses that hospitals need to create a "culture of quiet."

Reducing manmade sources

The first place to look in reducing noise in the hospital is in tackling manmade sources.
Some of these include:

Staff conversation – Interaction among caregivers is essential to quality care. Staff needs to be conscious, however, when conversation gets too loud and may be best carried out, say, back at the nurses' station or other non-patient spaces.

Device alarms – A study by Stanford University found that only 3.6% of cardiac alarms signaled a critical event.[4] This means that 96.4% of those beeps and alarms are likely disturbing patients and stressing staff.

Overhead paging – Public address can be a critical tool when alerting the entire facility to weather, security or other emergencies. But, paging abuse can be irritating.

One other tactic is to form a multidisciplinary team charged with developing strategies to monitor and reduce noise.

Quiet by design

The design community has a whole arsenal of products and solutions at their fingertips to help in the fight against noise in healthcare environments. An excellent article by Benjamin Davenny[5] addresses quiet design, including a focus on mechanical systems and interior finishes.

Mechanical systems – noise can be transmitted through radiation, the building structure and ducting. Strategies for reduction include:

- Centrifugal airfoil, plenum and mixed-flow fans to reduce ventilation noise.
- Larger ducts to reduce friction rates.

- Discharge rates for variable air volume (VAV) terminal boxes should be addressed in design.
- Vibration isolators for fans and other equipment need no special treatment for healthcare environments, but performance requirements should be reviewed.
- Since flexible fiber ducting is usually prohibited in hospitals, film and metal no-fill silencers can be an effective tool in attenuating duct noise.

Interior finishes – noise reduction in patient spaces and corridors can greatly benefit from several products designed for sound absorption:

- Ceiling tiles made from glass fiber can be very effective in absorbing sound. One area to be aware of is noise from ceiling plenum equipment, which might be better attenuated by mineral fiber ceiling panels.
- Wall coverings in the form of fabric panels or other sound absorbing material help reduce noise levels.
- Flooring should be chosen to lower transmission from footfalls, carts and equipment. Choices include rubber and, of course, carpet.

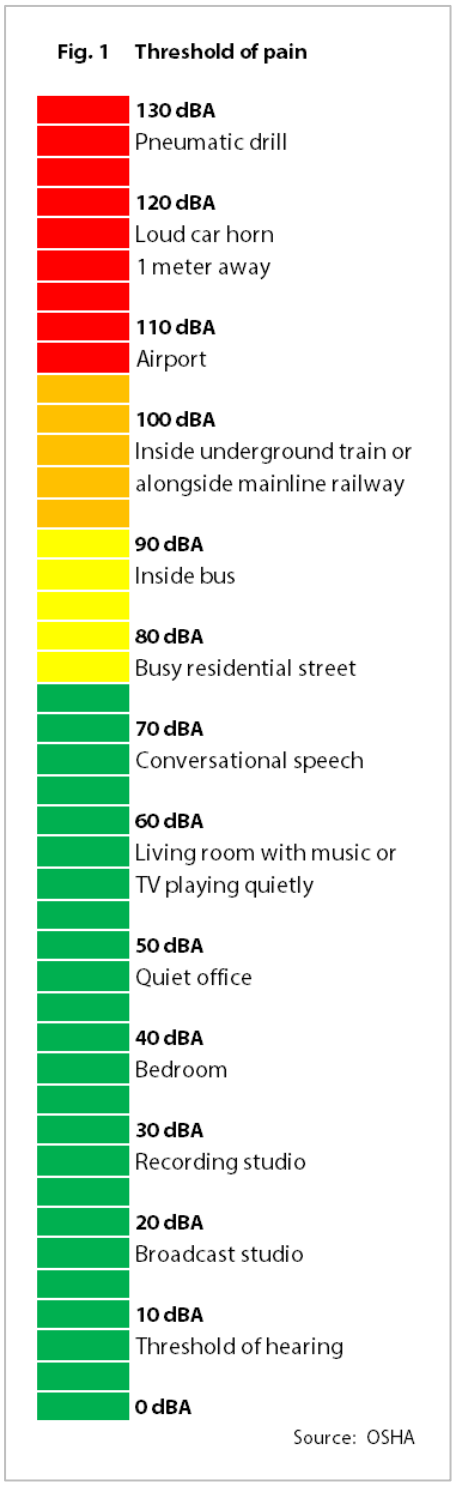
We would like to add another solution to Benjamin Davenny's arsenal: the often overlooked privacy curtain.

The noise of privacy curtains

As already stated, sleep interruption caused by noise has a significant negative impact on health and healing. And we knew that the opening and closing of privacy curtains in a patient's room had the potential to contribute to noise levels.

Our own experience showed that our newest bendable cubicle track was quieter. We could "hear" that when demonstrating the product. However, we wanted to be scientific about it, so we tested our bendable track and measured its decibel level (dBA) against traditional track products.

The results: We found that traditional aluminum track ranked somewhere between a busy residential road (80 dBA) and the inside of a bus (90 dBA).



By contrast, we found that our new bendable track operates at the more-comfortable level of conversational speech (70 dBA). See Fig. 1 at left.

Conclusion

We agree with Florence Nightingale and those calling to create a "culture of quiet" in hospitals. That said, there is no silver-bullet solution to reducing noise. It's obvious a multi-disciplinary approach looking across all aspects of design and material selection is needed. Yet, we take satisfaction knowing that even privacy curtain track can be designed to help bring the "Shhhh" to a patient's room.

Endnotes

1 http://www.boston.com/bostonglobe/ideas/articles/2010/05/30/fixing_the_noisy_hospital/

2 http://www.medpagetoday.com/Cardiology/Prevention/33223

3 http://healinghealth.com/downloads/HospitalNoise_BIT_SeptOct2012.pdf

4 www.aami.org/meetings/summits/alarms/Materials/PDFs/Drew_Tues.pdf

5 http://www.hfmmagazine.com/hfmmagazine/jsp/articledisplay.jsp?dcrpath=HFMMAGAZINE/Article/data/01JAN2010/1001HFM_FEA_Design

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