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## Pebble Acoustics Conversation Call Notes from Tuesday, June 3, 2008

### Agenda

- Introductions
- Key issues
  - what are the burning topics to address
  - How to develop standard methodology for measuring noise, noise perception, and outcomes
  - What are other organizations doing around noise control
- Goal is to develop workgroups around developing standard methodology and other issues of interest

### Key issues around sound control in healthcare environments

#### Balancing a good acoustical environment vs. Infection Control

- Materials with good acoustic properties tend to be more porous and as such accumulate more dust and are more difficult to clean. There appears to be a conflict between good acoustic properties and infection control properties of materials (especially ceiling tiles) commonly used in hospital environments
- Currently it appears that there is no standard set of infection control and cleanability requirements - individual states and institutions have different requirements/standards/ building codes
- Would it be feasible to create a list of infection control standards for each state?
- Need to develop standard guidelines for using different materials in different areas of the hospital
- Can we develop a list of standards currently and what gaps are being addressed?
- The Facilities Guidelines Institute has a subcommittee that deals specifically with surfaces, but do they address acoustics?
- Would it be possible to cross reference the infection control guidelines and acoustical guidelines in the AIA interim guidelines?
- Ella Franklin spent a year on infection control literature review for the ER One project, and found that there is minimal research and defining cleanability is almost impossible
  - The ER One project has incorporated rubber flooring, Corian surfaces, and advanced ventilation systems for infection control purposes and will study the impact of these materials on cleanability through Pebble Research projects

#### Privacy/ Intelligibility/HIPAA

- Need to balance sound reduction methods with sound masking techniques
  - Adding sound masking equipment may add slightly to the overall/background noise level, but it decreases the transient noise instances (i.e. ice machine, cart in hallway, etc.) that tend to be more disruptive to patients
- Square footage allocations – The architectural challenge is that more space is needed to decrease noise and increase privacy and what is the cost benefit analysis
- We need to keep in mind that any time there is a visual line, that also translates to a line for transmission of sound
- Culture change/ training/ and behavior modification is extremely important in noise reduction and privacy issues
  - Need to structure the environment to foster the behavior change (i.e. quiet nooks near the patient rooms for clinicians to talk)



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- Some facilities have incorporated “yakker trackers” that gives visual cues (stop light) when decibel levels reach a certain point

### **The impact of noise on stress levels and sleep**

- What research has been done on not just limiting noise, but on the outcomes related to sound reduction and incorporating “pleasing” sound?
- Jo Solet is leading a study on the impact of different types of noise on people’s sleep patterns by altering the decibel levels of typical hospital sounds to see what noise levels/ thresholds impact sleep patterns.
- Some research has been done within the hospitality industry; however, these environments don’t have as many variables and are more easily controlled
- How do you decrease the noise created from the medical equipment (IV pumps, and alarms that are required to function at a certain level)?
  - The EPA guidelines - noise threshold levels are 45 dBA for Day and 35 dba at night
- When discussing noise, must also consider patient perception vs. reality
- Having an environment that is too quiet is not the ideal either (patient perception vs. reality)
  - Benchmarking – what consistent level of sound is best for creating an optimal healing environment?
  - Are there studies citing the specific sound levels needed to reduce stress?

### **Equipment and Material Choices**

- What environmental modifications can be made quickly and at minimal cost to improve the acoustical environment?
  - Higher grade acoustical ceiling tiles, different wheels on equipment, flooring, staff behavior
  - Need to work with medical equipment manufacturers to create quieter products. There might be some equipment used in healthcare facilities that could be much quieter:
    - Refrigeration
    - Bed wheels
    - Door closing can be made quieter through foam in retractable door handles
  - Create list of equipment that can be changed
- Need to create a hierarchical list of suggested modifications
- St. Josephs Community Hospital in West Bend, WI is currently collecting baseline data for a noise study and the report is slated for December, 2008
- Jersey Shore is currently collecting baseline data on the effects of acoustical tile and carpet installation. Will also be interviewing patients and staff
- Installing Carpet to reduce noise vs. added physical stress on staff and cleanability of carpet?
  - Carpet doesn’t absorb noise, rather keeps sound from being generated (e.g. from wheels)
- Stress on staff vs. stress on patients with regards to installation of materials that may produce a more patient friendly environment, but create more stress/work for staff

### **Work performance and noise**

- What noise levels make staff less effective, contribute to errors?
- Many clinicians monitor their patients by relying on cues they get from equipment sounds and patient responses
  - What signals must be auditory and which could be relayed through visual or tactile cues or some other means?
  - How do you balance safety (auditory cues) with noise reduction



### **Key Metrics and Methodology for Measuring Noise**

First step is to identify the individual sources of complaints and take steps to deal with those main sources individually

- What are the sources of noise?
- Address each noise source separately
- Eliminate noise sources where possible
- The net effect on overall noise level may not change dramatically, but the perceived noise levels by patients will be greatly improved

Ongoing efforts on developing standard methodology

- Ken Roy (Armstrong) is working with UC Berkely on an IEQ Survey – the focus is on understanding the expectations of medical professionals and patients around noise
- US Green Build with ASHRAE are developing a Performance Measurement Protocol for noise and sound in healthcare facilities (ASHRAE 189). Environments will be rated at different levels based on the extent to which they address noise:
  1. Basic – background noise
  2. Intermediate – Reverb time
  3. High Performance – Intelligibility, Articulation and Privacy Indices (starting to be developed)

Are there existing standards on speech privacy w/ regards to HIPAA? - Research on sound intelligibility and privacy has been conducted in office environments, not in healthcare. Need to measure actual voice levels in treatment/ closed healthcare areas

- Know how to do it, but has not yet currently been done in healthcare
- Need to go into lots of existing environments and take sound measurements, then do statistical analysis of levels not to be exceeded

Sound measurement considerations:

1. Need to isolate sources of noise in different types of spaces
2. Collect and compare before and after sound levels
3. measure RC or NC curve, not just decibel levels
4. performance decrement, impacts associated with different sound environments

Modeling – if you change x what will be the effect and if you change y what will be the effect, and if you change both, what will be the effect?

- This will work for changes in reverberant sound, but not so well for impulsive sounds you can't account for

### **Action Items**

- Need to “get the message out” to equipment manufacturers that they need to take sound into account when developing equipment
  - First step would be to create a list of top vendors to target
- Need to go beyond vendors and also target Regulatory Agencies



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- Develop protocols for sound measurements

**Proposed workgroups on acoustics**

**Impacting Equipment manufacturers**

This group would focus on developing a list of equipment in the healthcare environment (low lying fruit) that could potentially be made quieter and would then develop strategies for reaching out to these groups

**Guidelines and standards**

Understand intersection between infection control and acoustics guidelines and work with committees within FGI to address these issues

**Standard methodology**

Focus of group will be on developing standard protocols for measuring different aspects of the acoustic environment – decibel levels, noise perception, conducting a noise audit, sound intelligibility etc. The group will identify standard techniques in the literature and ongoing efforts (e.g. UC Berkeley, Ken Roy) as basis for work.

**Research agenda**

This group will develop a research agenda around acoustics issues in healthcare. The focus will be on identifying research gaps and developing research questions that can be addressed through future research