Acoustics - a Major Quality Parameter in Medical Interventions

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Predominant stress parameters for patients in the OT

- Distinct feeling of weakness and subjection
- Existential self-questioning
- Anxiety referring to diagnosis, physicians’ skill etc.
- Loss of control
- Unknown, threatening environment
- Loneliness
- Boredom

ANXIETY SUGGESTIBILITY
Anxiety and stress have a widely underestimated influence on shortterm and longterm outcome.
Medical interventions mean stress - physical AND psychological (for patients and staff)!

- Medical procedures provoke anxiety and stress!
- Stress is – at least partially – “homemade“ and avoidable!

- Stress impairs cognitive processes!

- Health care sector: Highest sickness absence rate (statutory health insurance)
Total Knee Replacement

Incision → Post-Processing → Closure

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Individual noise shielding
Positive auditory stimuli
Phonograph in Operating-Room

To the Editor:—For some time I have been employing a phonograph in my operating-room as a means of calming and distracting my patients from the horror of the situation when going under the anesthetic and during operations performed partially or entirely with local anesthesia. The phonograph talks, sings or plays on, no matter how anxious, busy or abstracted the surgeon, anesthetist and assistants may be, and fills the ears of the perturbed patient with agreeable sounds and his mind with other thoughts than that of his present danger. Too often when told to keep up an agreeable conversation with our patients operated on under "local," the assistants merely ask again and again if the sufferer is being hurt or if he feels any pain, thus only adding to the self-consciousness of the patient, and, after weather commonplaces are exhausted, it seems impossible to find a topic for conversation of any sort, and dead silence ensues. It is not uncommon for nervous patients to beg to have the phonograph continue, should it run down, and many of them converse animatedly with the anesthetist on the subject of the pieces being played throughout the entire operation.

I owe to Dr. Burdick, our anesthetist, thanks for his selection of records admirably adapted to the tastes and temperament of the subjects.

Evan O'Neill Kane, M.D., Kane, Pa.
Surgeon, Kane Summit Hospital.
Here's Why Your Surgeon Listens to Music While You Go Under the Knife

By Aaron Mamitt, Tech Times | December 12, 9:52 AM

Many surgeons believe that music should be played while in the operating room, with classical music being the most widely listened to.

The popularity and benefits of music in the operating room was discussed by David Bosanquet and his co-authors in the British Medical Journal, where he is an editorial author. Bosanquet is also a surgical registrar in the University Hospital of Wales department of surgery.

Bosanquet wrote that music is played in the background for 62 to 72 percent of operations, and it is the lead surgeon that often chooses the song.

The reason for music in the operating room is the supposed effect of reducing anxiety, and because it improves the efficiency and communication of team members. Bosanquet adds that surgical performance also appears to be enhanced with music because focus on the task is increased, especially for the surgeons that regularly listen to music.

Classical music is the most popular genre in the operating room because, according to Bosanquet, it is able to "evoke mental vigilance," aided by the fact that there are no lyrics.
Stress factors in the operating theater – concerning the staff

- Increasingly complex working environment
- Low fault tolerance
- Narrow space
- Ambitious time schedules
- Sensory overload
- Mutual stress boost (chain reaction)
accidents and patient harm. To help hospitals reduce technology-related risks, ECRI Institute publishes an annual list of Top 10 Health Technology Hazards.

The just-released 2015 hazards list highlights 10 safety topics that ECRI Institute deems crucial for hospitals to address in the coming year.

“Technology safety can often be overlooked,” says James P. Keller, Jr., vice president, health technology evaluation and safety, ECRI Institute. “Based on our experience, there are serious safety problems that need to be addressed. ECRI Institute recommends that hospitals use our list as a guide to help prioritize their technology-related safety initiatives.”

The 2015 Top 10 Health Technology Hazards report, available for download as a free public service, details a variety of technology hazards that put patients at risk. Each hazard includes an overview of the issue and recommended action steps to aid healthcare facilities in their efforts to maintain a safe environment for patients and healthcare workers. Topics on the 2015 list include:

1. **Alarm hazards**: Inadequate alarm configuration policies and practices

2. **Data integrity**: Incorrect or missing data in electronic health records and other health IT systems

3. **Mix-up of IV lines** leading to misadministration of drugs and solutions

4. **Inadequate reprocessing of endoscopes and surgical instruments**
ONE MAN’S MUSIC ...

... is another man’s noise
One man’s music/communication/alarm etc. is another man’s noise!

- Distinct and entitled acoustic interests
- Partially incompatible

Useful Sound
Anesthesia Team
(Music?)

Useful Sound
Surgical Team
(Music?)

Micro-Audio-
Vision
Patient

Signals/Alarms/External Information

Communication

One man’s music/communication/alarm etc. is another man’s noise!
“Adverse health effects occur, in particular, when noise interferes with intended activities (e.g. communication, concentration, relaxation, sleep)”
A noise-reduction program in a pediatric operation theatre is associated with surgeon's benefits and a reduced rate of complications: a prospective controlled clinical trial.

Engelmann CR, Neis JP, Kirschbaum C, Grote G, Ure BM.

**Abstract**

**OBJECTIVE:** We assessed the impact of a noise-reduction program in a pediatric operating theatre.

**BACKGROUND:** Adverse effects from noise pollution in theatres have been demonstrated.

**METHODS:** In 156 operations spatially resolved, sound levels were measured before and after a noise-reduction program on the basis of education, rules, and technical devices (Sound Ear). Surgical complications were recorded. The surgeon's biometric (saliva cortisol, electrodermal activity) and behavioral stress responses (questionnaires) were measured and correlated with mission protocols and individual noise sensitivity.

**RESULTS:** Median noise levels in the control group versus the interventional group were reduced by -3 ± 3 dB(A) (63 vs 59 dB(A), P < 0.001) with a grossly decreased number of peaks greater than 70 dB(A) (Δn = -61/hour, P < 0.01). The intervention significantly reduced non-operation-related noise. The incidence of postoperative complications was significantly lower in patients of the intervention group (n = 10/56 vs 20/58 control; P < 0.05).

"Responders," surgeons with an above-average noise sensitivity (correlation r = -0.6 for the work subscale of the NoiseQ questionnaire, P < 0.05), experienced improved intrateam communication, a decrease in disturbing conversations and sudden noise peaks (P < 0.05). Biometrically, the intervention decreased both the surgeon's pre- to postoperative rise in cortisol by approximately 20% and the surgeon's electrodermal potentials of greater than 15 µS, indicating severe stress by 60% (P > 0.05).

**CONCLUSIONS:** Spontaneous noise during pediatric operations attains the magnitude of a lawn mower and peaks resemble a passing truck. The sound intensity could be reduced by 50% by specific measures. This reduction was associated with a significantly lowered number of postoperative complications. The surgeon's benefits are idiosyncratic with "responders" experiencing marked improvements.

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Collective wellbeing

Individualization

Zoning
Neurozeptives Entspannungs- und Stressreduktionsmodul (NEST)

“Neuroceptive relaxation and stress reduction module”
“If the ‘box‘ is free, I’ve caught myself standing next to it – because the music is so soothing. 30 seconds is already enough to settle me down.“
Clear long-term perspectives

Holistic approach, appropriate to the situation

Standardization/platform concept

Iterative, diligent proceeding (even short steps are steps!)

LET’S DO IT!