

Evaluation of Operating Room Noise by Different Medical Specialists

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Abstract

Noise pollution is in an increasing trend in the operating rooms, as has been the case in various other domains in life. It has been shown in studies that the main cause of this noise pollution consist of the behavior related to the operating room personel and the surgical equipment. These higher than normal noise levels may increase stress and decrease communication and performance, apart from the negative health effects on the operating team. In this study, we aimed to explore the sources of noise pollution and the place of music on these effects on anesthesiology and surgical doctors. Questions formulated through a questionnaire have been asked to the anesthesiology and surgical department physicians on a voluntary basis, and their approach to the concept of noise has been assessed. The study was planned as a descriptive study. In total, highest impact from noise pollution was found to be the aspirator (74.3%), chatting (55.4%), noises from the monitors (54.8%), alarms (48.6%), surgical material (25.9%) and music (23.8%). Noise had the most impact on the concentration of the doctors with a rate of 61.9%. Anesthesiologists, when compared to other surgical department physicians, were found to be impacted most by music with 37.2%. It is not realistic to eliminate all the noise and distraction. On the other hand, it can be minimalized through sufficient measures. Yet, general measures to keep the silence isn't too likely to keep the noise down during long operations. Whereas music stays as a matter of personal choice. Controlled studies on whether to keep or not the music in the operating rooms aren't yet sufficient, due to which, general recommendations do not apply. As a result of this study, we have found that while music might have performance increasing effects, it still has a potential as a distraction and interfere with the communication in the operating room.

Keywords

Operating Room, Noise, Music

1. Introduction

Noise is defined as unwanted and unpleasant sound. In recent years, noise pollution has started to increase in operating rooms as in all areas of life [1]. It has been found in studies that noise pollution in operating rooms is mainly caused by behaviors related to personnel and surgical equipment [2] [3]. In addition to the potential negative health effects on operating room staff, high noise levels can increase stress and reduce communication quality and performance [4]. It was shown in a study that excessive noise in the operating room has a negative impact on the work performance of anesthesiologists, surgeons, and nurses [5]. It was observed that, aside from the intensity of the noise, the type of noise also plays an important role in this negative effect on performance. Mechanical ventilators, aspirators, cautery, lasers, and the alarm sounds of these devices cause device-induced sounds and communication manner of personnel, door opening and closing sounds and selective music cause personnel-induced noise in the operating room. Music played in the operating room especially takes on a special role in this noise. An increase in the volume of music can affect communication and attention [6]. However, most operating room staff shows a positive attitude towards working with music on in the operating room. It is hypothesized that music has positive effects on performance, teamwork, concentration, and stress [7]. In clinical practice, it has been seen that music played in the operating room is mostly selected by the senior surgeon or the team [8] [9]. Whether music is useful or harmful in the operating room is still a controversial question. The purpose of this study was to investigate the sources of noise in the operating room that anesthesiologists and surgeons are exposed to and determine the role of music in this context. The secondary purpose of the study was to determine which type of music the mentioned staff would choose if they had a choice.

2. Materials and Methods

The ethics committee approval numbered E1-21-2160 was obtained from the Ethics committee of Ankara City Hospital on 01.12.2021 with study No. 2160.

Physicians and anesthesiologists of different surgical specialties working in our hospital, who volunteered for the study, were asked questions in the form of a questionnaire that we prepared, and their attitudes towards the concept of noise was evaluated. The study was modeled with a descriptive research design. The survey consisted of a total of 18 questions, including 3 demographic, 2 open-ended, and 13 multiple-choice questions. The questionnaire form is presented in **Table 1**. The collected data were recorded for evaluation.

Table 1. Questionnaire form.

Noise Sources

Aspirator
Surgical Materials
Monitor Sounds
Alarms
Music
Chats
Others

What are the Effects of Noise on You?

Communication Breakdown
Increased Stress Level
Risk of Increasing Human Error
Influencing Team Work Quality
Hearing Impairment
Decreased Concentration

Would you like music in the operating room?

Yes
No
Maybe

If Yes, What Kind of Music?

Age:
Gender:
Medical Specialist:

3. Statistics

The research was modeled with a descriptive research design. The data were collected via the survey method in October and November of 2021. The doctors participating in the study were grouped according to which specialty they worked in. The ages and genders of each group were evaluated in-group. The data obtained were evaluated using IBM SPSS Statistics for Windows 19.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were presented as mean values and the categorical values were presented as numerical variables (%).

4. Findings

The number of physicians participating in the study, their age, and the male/female ratios are presented in **Table 2**.

As a result, the highest degree of negative response to noise sources was towards

aspirators (74.3%), chats (55.4%), monitor sounds (54.8%), alarms (48.6%), surgical materials (25.9%), and music (23.8%), respectively. The numbers and percentages relating to the negative response level of the physicians who answered the questionnaire to noise sources are presented in **Table 3**.

The evaluation results relating to aspects in which noise affects physicians (communication disruption, increased stress level, increased risk of communication errors, teamwork quality effect, hearing impairment, and decreased concentration) are presented in **Table 4**. Decreased concentration (61.9%) and communication disruption (59.8%) were the aspects most specialists responded.

Table 2. Number of physicians, average age and male/female ratios.

Surgical Branches	The Number of Participants	Age (average/year)	Male/Female
Anesthesia	145	33	68/77
General Surgery	34	36	17/17
Neurosurgery	19	32	15/4
Pediatric Surgery	20	32	8/12
Obstetrics and Gynecology	31	34	9/22
Urology	28	35	28/0
Orthopedics	28	32	28/0
Ear Nose Throat Surgery	19	31	14/5
Eye Surgery	17	34	12/5

Table 3. Affected rates by noise sources by branches.

	Anesthesia	General Surgery	Neurosurgery	Pediatric Surgery	Obs & Gyn.	Urology	Orthopedics	Ear Nose Throat Surgery	Eye Surgery	Total
	145	34	19	20	31	28	28	19	17	339
Aspirator	110 (75.8%)	28 (82.3%)	17 (89.4%)	14 (70%)	11 (35.4%)	20 (71.4%)	23 (82.1%)	19 (100%)	10 (58.8%)	252 (74.3%)
Surgical Materials	52 (35.8%)	3 (8.8%)	8 (42.1%)	2 (10%)	3 (9.6%)	4 (14.2%)	12 (42.8%)	2 (10.5%)	2 (11.7%)	88 (25.9%)
Monitor Sounds	78 (53.7%)	17 (50%)	7 (36.8%)	14 (70%)	15 (48.3%)	16 (57.1%)	20 (71.4%)	13 (68.4%)	6 (35.2%)	186 (54.8%)
Alarms	72 (49.6%)	14 (41.1%)	8 (42.1%)	12 (60%)	17 (54.8%)	14 (50%)	17 (60.7%)	7 (36.8%)	4 (23.5%)	165 (48.6%)
Music	54 (37.2%)	6 (17.6%)	1 (5.2%)	4 (20%)	3 (9.6%)	4 (14.2%)	6 (21.4%)	1 (5.2%)	2 (11.7%)	81 (23.8%)
Chats	84 (57.9%)	15 (44.1%)	9 (47.3%)	14 (70%)	22 (70.9%)	16 (57.1%)	14 (50%)	3 (15.7%)	11 (64.7%)	188 (55.4%)

Table 4. Evaluation of the effects of noise by physicians.

	Anesthesia	General Surgery	Neurosurgery	Pediatric Surgery	Obs & Gyn.	Urology	Orthopedics	Ear Nose Throat Surgery	Eye Surgery	Total
	145	34	19	20	31	28	28	19	17	339
Communication Breakdown	94 (64.8%)	15 (44.1%)	12 (56.3%)	12 (60%)	12 (38.7%)	11 (39.2%)	23 (82.1%)	11 (57.8%)	13 (76.4%)	203 (59.8%)
Increased Stress Level	58 (40%)	14 (41.4%)	7 (36.8%)	14 (70%)	11 (35.4%)	10 (35.7%)	17 (60.7%)	7 (36.8%)	8 (47%)	146 (43%)
Risk of Increasing Human Error	89 (61.3%)	16 (47%)	8 (42.1%)	12 (60%)	12 (38.7%)	6 (21.4%)	16 (57.1%)	5 (26.3%)	1 (5.8%)	165 (48.6%)
Influencing Team Work Quality	86 (59.3%)	13 (38.2%)	14 (73.6%)	12 (60%)	14 (45.1%)	8 (28.5%)	14 (50%)	9 (47.3%)	2 (11.7%)	172 (50.7%)
Hearing Impairment	69 (47.5%)	11 (32.3%)	10 (52.6%)	2 (10%)	12 (38.7%)	10 (35.7%)	12 (42.8%)	11 (57.8%)	2 (11.7%)	139 (41%)
Decreased Concentration	81 (55.8%)	21 (61.7%)	14 (73.6%)	7 (35%)	14 (45.1%)	18 (64.2%)	26 (92.8%)	14 (73.6%)	15 (88.2%)	210 (61.9%)

5. Discussion

Until 1960s, the areas inside and immediately outside of hospitals were considered quiet areas, but after 1970s, this consideration seems to have changed [1]. Operating room noise can be caused by electrical appliances (aspirators, etc.), monitors, surgical instruments, music, human traffic, and chatting. Many of these sounds are unpleasant and can affect the mood of staff, or even cause psychological and physical damage at different degrees [10]. Noise being a stress factor that increases stress hormone levels is universally accepted [11] [12]. Excessive noise in the operating room can cause rapid burnout of personnel, stress reactions, a decrease in sensory-motor performance, and cognitive functions. In addition, noise can lead to more negative irritability, impaired hearing and impaired communication and concentration among surgical staff [3].

Studies have shown that the level of negative response to noise decreases as the experience of surgeons and anesthesiologists increases. It was found that the noise generated by high-volume sounds lowered the efficiency of surgical staff by hindering communication, and this effect was more pronounced in young doctors. While younger surgeons were more affected by background noise, senior surgeons reported feeling more distracted during critical steps of procedures [3] [13].

The most harmful acute effect of noise pollution in the operating room is its hinderance of verbal communication. Communication between operating room employees is an important component of patient safety [14]. The hinderance of verbal communication, while not always causing surgical errors, is nevertheless quite distracting and can affect cognitive and emotional functions [15]. It was shown in studies that verbal communication that is not related to the case were more distracting when compared to verbal communication related to the case

[16]. This problem, which can be caused by noise, should be taken seriously.

The devices in the operating room emit high levels of disturbing alarm sounds while turned on. These sounds can easily cause stress among the operating room staff [1] [3]. In this study, the average percentage of negative response to monitors and alarms among all of the surgical branches was 54.8% and 48.6%, respectively. Orthopedists were the most negatively responsive surgical team to monitor and alarm sounds. The least negatively responsive specialists were ophthalmologists. Anesthesiologists reported that they were negatively responsive to a near-average level. The noise level in orthopedic surgeries is generally higher than in other types of surgery. Tools such as the cutter and the drilling motor used in procedures cause high noise levels [17] [18]. Wang and Giv evaluated the noise level in the orthopedic operating rooms as the highest among operating rooms in their study [19]. In the current study, the group that most often experienced hinderance of communication and decreased concentration caused by noise was orthopedists. At the same time, it was seen that they identified all sources of noise as high impact stressors.

Anesthetists are particularly negatively affected by noisy operating rooms since they are constantly in the operating room, close to noisy equipment, and work during critical times when noise is at the highest level. In one study, it was found that 84% of anesthesiologists were negatively affected by noise in the operating room [5]. In their study, Murthy and Stevenson reported that the cognitive efficiency and short-term memory of anesthesiologists exposed to noise were impaired [20] and that their response time to changes in the patient was prolonged [21].

Interestingly, even if the music volume increases, music is generally not subjectively identified as a negative factor by the operating room staff [22]. It was shown that music affects surgeons' performance positively, neutrally, or negatively in different ways. In their frequently cited study, Allen and Blascovich found that surgeons who listened to music of their choice experienced decreased autonomic reflexes and increased mental performance [23]. However, it was also reported that music has a negative impact on surgical performance, especially among less experienced surgeons. In a study conducted by Siu *et al.*, it was shown in a simulated robotic model that music with high rhythm had beneficial effects on surgical performance, suggesting that music may be valuable for skill acquisition and training [24].

How music affects anesthesiologists in the operating room is not a well-understood topic. However, many anesthesiologists think that music can cause problems in the process of their practices. In their study, Hawksworth *et al.* found that 26% of anesthesiologists reported that music reduced their focus and disrupted their communication with other staff, while 51% reported that music distracted them when a problem was encountered [25]. In contrast, in a later study conducted by the same researchers, they failed to detect any negative effects of music chosen by the staff or classical music in psychomotor tests, again per-

formed with anesthesiologists [26]. In this study, anesthesiologists were the group most negatively responsive to the sound of music when compared to other surgical branch physicians, at a rate of 37.2%. Orthopedics (21.4%) was the group second most negatively responsive to music, while ENT and neurosurgery branches were the least affected groups (5.2%). When all of the physicians were evaluated together, 53.3% of the participants answered “yes” to whether they wanted music in the operating room, while 11.2% answered “no”, and the remaining 35.5% answered “maybe”.

6. Conclusion

The elimination of all sources of noise and distractions in the operating room is unrealistic. However, these can be minimized with some necessary precautions. It is unlikely that general rules of silence will be adhered to in order to reduce noise during long operations, and music is still a matter of personal preference. Unfortunately, controlled studies are not sufficient to give a solid conclusion to whether there should be music in the operating room. Therefore, no general advice can be given. As a result of this study, it is believed that music can have beneficial effects on performance on the one hand, and it can be a potential distraction and possibly interfere with communication on the other hand.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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