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Noise in an Emergency treatment ward

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Abstract

It is beign assessed the noise inside a typical social service Hospital in Mexico City, several sources and relevant areas have been identified and evaluated. This paper presents a detailed description of the Adults Urgency Room, where all the emergency cases are received and attended arround the clock. In this section of the hospital, forty to sixty patients are attended at the same time in a large open plan room, separated only by curtains, with only a few private rooms for doctors in order to attend incoming patients, trying to solve each case immediatelly, allow him/her entrance into the main room for full emergency treatment, or find a bed inside the hospital for a longer treatment. Noise sources are all over the place, and noise variablity is large.

1 Introduction

Hospitals are supossed to be quiet areas where patients stay for some period of time in order to regain health lost by sickness or accident, either by some kind of therapy, special treatments or surgery, and where some of them are continuosly monitored to waranty a fast response from the ward personel in the event of a crisis onset. Often times, hospitals are located away from noise producing sites or neighborhood traffic, so, little noise from the outside world can intrude within the hospital itself, or at least to the most critical areas [1].

Many hospitals are usually located in the midle of quiet suburbs, surrounded by extensive areas with gardens, or with buildings for other purposes (such as the hospital administration buildings), between the hospital itself and the suburb, which usually reduce most of the noise produced in the area surrounding the hospital, and of course, there are some hospitals located close to main streets with heavy traffic, and exposed to higher noise levels.

Even if the hsopital is in a quiet area, many normal activities within the hospital also produce certain amount of noise, which can be a large annoyance for workers or patients or to present some kind of health risk for the patients and/or working personel, depending on the noise level, frequency, time of ocurrence, duration, but also people exposed, distance from the noise sources, their particular sound sensibility and, most of all, their unique health condition.

The workers are expossed to this sounds on a regular basis for very long periods of time (several years), which also depend on their shift length (these shifts can be 8, 12 or 24 hrs. long at a time), three to six days a week; while most patients are exposed to this same sounds for as long as 24 hrs a day, for several days or weeks, but only during their stay for the treatment period, but their physical and psyquical condition are not normal, which make them particularly sensitive.

Typical noises inside hospitals are generated by Energy support machinery, Cloth washing, Food preparation, Electronic diagnostic and treatment equipment, Patient surveilance equipment, Furniture movement, Cleanning personel and machinery, Nurses activities, Visitors, etc., in areas like Machinery room, Waiting areas, Intensive care wards and therapy sites, Surgery rooms, Emergency attendance wards, In hospital rooms, etc. But all this common and old noises are nowadays complemented by the buzz of beepers, alarms, multiple voices, telephones and much more [2].

This paper presents partial results of a research project sponsored by the National Politechnic Institute and shows the instantaneos and average sound levels in dB (A) and description of the overall sound conditions found inside the emergency treatment ward of a Social Service Hospital located in Mexico City, which is typical of this goverment controled health centers with plenty of patients and limited budget.

2 Development

Among the different hospital areas with a large variety of sound sources located inside and outside the area, the Adults Emergency ward was selected for this part of the research proyect, because it presents a *sui generis* condition due to the amount of different activities that have to be performed in this area, and the physical characteristics of the ward itself, which has a capability to attend simultaneusly some fifty patients, but sometimes is ocupied by more than seventy, according to the eventual requierements.

This ward comprises an ambulance entrance for delicate patients arriving, plus a large waiting area for relatives or accompaining persons, and for just arriving less critical patients awaiting to be received by one of the incoming attendance doctors for the initial check up. 6 individual rooms for incoming patients, where a medical doctor verifies the patient bahavior and reactions in order to diagnose his actual condition and choose the proper medicines and treatment he should take back home, or pass him inside the ward for immediate emergency treatment. Incoming patiens usually arrive to the ward around the clock, with some random peak eventualities, either self walking, supported by their relatives, by car or in ambulance. They normally present an acute sicknesses development or accidental harm.

The emergency treatment area includes 300 square meters in an open plan facility to accomodate about 50 - 55 patients around a nurses central site, and where individual wheeled beds are only separated by a narrow corridor and a movable curtain in order to facilitate doctors and nurses displacement, the use of portable medical equipment or instruments, and bed movement, so the patients can be easily transported to other in-hospital services, such as X ray tests, as required by their particular condition. This large area is complemented by a couple of private rooms for patients with special conditions. Plus administration, services and storage areas.

Patients may remain within the ward for periods ranging from a couple of hours to several days, which depends on each patient condition, and the availability of rooms and beds at the corresponding ward within the main hospital building in case of a surgery and/or long treatment is mandatory [3].

The layout described and the nature of the emergency services stablish a tremendous fluctuation of sound levels within the ward, they were found in the range of some 50 dB (A) to well over 100 dB (A), including RMS and Peak values, depending on the sound source type and position, the emited sound energy, and the distance between the source and the observer, and it is due to the medical equipment operation; quiet and loud voices, even shouting; furniture movement; etc.

3 Evaluation

Sound level measurements were taken inside the ward around the clock, so the minimun, maximum, and average sound levels could be assessed, employing the mexican labor noise standard as reference for noise level measurements, due to lack of an specific standard for clinics or hospitals. The great variability was due to the different activities taking place at the same or at different times, which of course have no particular time for ocurrence, because emergencies do not happen by schedule [4].

It was clear that during the night, the average levels were generally lower than during the day, because most of the patients are asleep, and most of the nurses activities concentrate on following the doctors instructions on health cere for each patient, but also, it was at night when the sound level presented maximum variablility, for the same reazon described, plus the sudden arrival of ambulances bringing in a new emergency, with furniture movement, loud voices, and all the related activity. During the day-time there were also ambulance arrivals, with all the characteristic noise of such events, but it happened within higher average sound level, showing less variability under these conditions.

4 Results

Sets of instantaneous sound presure levels in dB (A) were taken in several spots within the ward, each set consisted of 50 readings, one every 5 – 10 seconds, within 5 minutes periods, according to the labor noise mexican standard, with the microphone 1.2 mts. from the floor, and about 1 mt. from the walls.

Tables I and II sumarize measurements results for two different days, and show couples of sets for the same spot of sound levels (day, odd columns and night, even columns, side by side), including mimimums, maximums, level difference and Leq averages, sound levels at: 1, 2. by the entrance of the large ward room; 3, 4. at the nurses central; 5, 6. by one bed, at patient ear's position, while being attended.

Location	1	2	3	4	5	6
Individual reading dB(A)						
1	81	60	65	68	69	70
2	78	79	59	72	70	62
3	82	84	60	75	70	69
4	74	64	58	77	72	61
5	78	69	77	79	68	65
6	75	89	56	80	70	60
7	74	88	55	77	65	71
8	77	64	62	75	68	54
9	76	74	60	76	69	64
10	71	84	63	78	59	62
Minimum	71	60	55	68	59	54
Maximum	82	89	77	80	72	71
Variation	11	29	22	12	13	16
Average – Leq.	77.5	83	67.9	75.8	68.1	66.5

Table I Noise measurements for day 1, including extreme and average levels during one day, 1,3,5 day time, 2,4,6 night time.

Location	1	2	3	4	5	6
Individual reading dB (A)						
1	75	72	74	68	69	61
2	74	77	59	65	67	62
3	72	69	60	72	71	67
4	71	64	78	70	75	70
5	80	82	68	79	71	63
6	65	87	56	75	67	71
7	70	88	65	77	64	62
8	72	74	62	83	67	64
9	64	62	64	76	69	53
10	61	60	63	68	62	65
Minimum	61	60	56	65	62	53
Maximum	80	88	78	83	71	71
Variation	19	28	22	18	9	22
Average – Leq.	73.5	81.5	70.2	76	69.8	66.9

Table II Noise measurements for day 2, including extreme and average levels during one day, 1,3,5 day time, 2,4,6 night time.

Both tables show only ten RMS readings out of fifty taken in each point, one every 5 – 10 seconds, where one minimum and one maximum were included for each measuring point in order to observe the span of the readings. The Leq values were determined from the whole set of fifty readings.

5 Comments

The World Health Organization (WHO) suggests a noise level of 35 dB (A) or lower for the interior of hospitals, and reports exist showing that noise levels in the range of 50 - 60 dB (A) are common in most hospitals evaluated. And as can be seen from the tables, Noise levels at this ward are even higher than those reported, which makes the condition even worse.

Background noise in the rest of the hospital was found to be in the range of 43 - 48 dB (A) (this levels could not be measured within the ward), but that was only when no activity was taken place, i.e. most patients asleep, nurses at their central sites, and no doctors or visitors in the patients areas. But when activity starts, noise levels start to climb, and as mentioned earlier, the emergency ward has plenty of activity most of the time, and although 24 hours noise level average for this ward could be lower than the values shown here, the ward is conspicually noisy.

Noise reduction would take more than just sound absorption in order to make the noise to fit within acceptable, or at least commonly found noise leveles. Here the main condition which allows most of the people in the ward to be exposed to such loud noise levels, is the fact that there is a single very large open plan facility, which might be good for the very large movility needed within the ward, and allows to accomodate more attended people in the small available area, for economic reazons, but which also eliminates the posibility of implementing some noise reduction by, for instance, fixed partitions in order to reduce the amount of patients exposed to the loudest noises, and also makes difficult to allow most of these patients to be able to recover properly and faster in a quiet environment, or at least to be less exposed to some, even if not so loud, frightening and disturbing sounds, which might cause in them unexpected reactions.

6 Conclusion

Although many hospitals are located in not so noisy areas, receiving little noise from the surrounding neighborhood, a little higher than the WHO recomendations, most of them make a lot of noise while performing their normal healing activities

Higher background noise somehow reduces discomfort for patients.

An emergency ward is full of noise most of the time, and the kind of ward described here does not allow for a significant noise reduction for patients, because all of them are in the same room.

Noise reuction should be impleneted at the sources, paths and with the use of adecuate absorption materials. Although shouts from treated patients and most surveilance equipment noise cannot be reduced.

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