PHYSICAL RISK FACTORS IN HOSPITAL ENVIRONMENT

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Abstract

The factors found in the environment in quantities above the tolerance limit stop the normal development by their adverse actions. The impact upon people's health is that much bigger, due to the difference between the concentration of the polluting agent in the environment and the decreasing limit of tolerance.

As presented in this work, I have studied the identification of environmental physical factors that may turn into risk factors foar human health (noise pollution, microclimate, artificial ionizing radiation), *the abidance by hygiene measures by comparing environment factors's concentration and the norms imposed by the law and the action of the former on the state of health of the people present in hospitals (infirmary patients and medical personnel).*

We have taken into account in our study the period between 2003 – 2005; the tests performed highlighted the following: all readings of the indoor sound recorded in this medical facility exceed the noise limit, the noise rising in the above-mentioned period with 19,12 dB; the sound pollution tends to rise both in daytime and in night time.

The microclimate was agreeable, and it has not affected the average duration of the hospitalization.

The dosage on radiography scans was double than the normal ones.

Keywords*: risk factors, indoor noise, sound pollution, microclimate, artificial ionizing radiation.*

INTRODUCTION

International attention towards health, environmental protection and human rights has considerably increased during the past five decades.

Reducing heatlh risks due to pollution and protecting vulnerable groups (children, elderly, chronically ill) are the principles health of protection şi promotion.

The factors found in the environment in quantities above the tolerance limit stop the normal development by their adverse actions. The impact upon people's health is that much bigger, due to the difference between the concentration of the polluting agent in the environment and the decreasing limit of tolerance.

The sources of noise în a hospital are extremely varied, but some of them are common to all types of living quarters: noises produced by plumbing, radios, TVS, telephone, loud conversations, people moving; other are specific to hospitals: the monitoring equipment that checks the in-patients' condition, other medical installation and equipment, the hospital's staff, visitors.

The noise sensitivity varies according to sex and grows with age, especially on women. Teenagers under 16 and persons over 65 are more

sensitive to noise than middle aged people. The individual's stress level is very important in one's sensitivity to noise. We must also specify that some high pitched noises of a certain type can be extremely disturbing and its constant reiteration may be a mental risk factor for a longer period of time.

We mustn't omit the fact that there are noises with positive effects that may be used for relaxational purposes and help create an adequate microclimate. An american study shows that the use of the sound of the ocean in the background during sleep has led to the improvement of the quality of sleep in an intensive care unit after the patients underwent coronary surgery.

World Organization of Health (WOH) mentions a few non-auditory effects associated with noise: interference with sleep and the body's functions during sleep; reaction connected to stress, includind the adrenaline secretion; circulatory system reactions: constriction or dilation of blood vessels and the increase of blood pressure; reflex reactions asociated with the higher secretion of catecholamines; vestibular and balance disorders.

Other symptoms associated with noise are: nausia, headaches, iritability**,** anxiety, nervousness, insomnia, sleeping disorders, loss of appetite.

Due to the modifications induced by noise, its level is set to 30 plus or minus 5 dB in living quarters. Higher levels cause sleeping disorders and reflexes mediated by the vegetative nervous system, and are part of our stress reaction.

X-ray diagnostics is a significant source of radiation exposure among the population. Therefore, it is important that x-ray examinations are conducted using techniques that keep the patients' exposure as low as possible but still compatible with the medical purposes of the examinations. In order to achieve this, it is necessary to understand the factors that affect the exposure and to be able to assess the patients' doses for the assessment of cancer risk resulting from the radiation exposure.

MATERIAL AND METHOD

The level of noise and microclimate must be recorded in all the rooms that exist in a hospital, excluding the halls, which are considered isolation elements toward the staircase.

The appraisal took place in the Oradea Hospital of Obstetrics and Gynaecology, in the middle of a room, under locked doors and windows, at a distance of 1,30 m above the floor and the microphone was oriented towards the exterior wall.

A precision sound meter was used for the measurement of the sound level.

The number of measurement points of the noise level were chosen according to the size of the building, on the 1st and 4th floor.

The study was made during a single season: the summer season. The days chosen for the appraisal were mid-week days: wednesday or thursday. Two distinct sequences of time were observed: daytime between 6 am and 10 pm; night time between 10 pm and 6 am. The time sequence taken into account for the appraisal of the noise level was of 30 consecutive minutes, orrespondent to the highest pitch in noise level, with an instant recording of the noise values every 10 seconds.

The bill that settles the noise limit is represented by STAS 6156/1986, which sets the protection limits against noise in civil, social and cultural buildings (table 1).

The reading and intendment of the charts was made by comparison to sanitation standards.

Table 1.

Protection against noise in civil buildings(excerpt from STAS 6156/1986)

Type of building	Functional unit	Noise limit in dB (A)
Hospitals, clinics, dispensaries	Wards with 1-2 beds	30
	Wards with 3 or more beds	35
	Practice offices	35
	Refectories	45

The Environmental Protection Agency in the U.S.A. recommends that the noise level in hospitals should not exceed 45 dB during daytime and 35 dB during night time. The Decree of The Minister of Health no. 1957/1995 sets the limit of noise in a hospital as a labour environment at about 50 dB in a operating theatre and 60 dB for wards and practice offices in Romania.

For calculating patient doses in medical x-ray examinations was used Monte Carlo program (a computer program for calculating patients' organ doses and effective doses in medical x-ray examinations).

RESULTS AND DISCUSSIONS

After measuring the the noise level in the above-mentioned hospital, in the period of time between 2003 and 2005 the levels of indoor noise were set at 39,2 dB and 70,2 Db (figure 1), the average registrered noise level was 59,78 dB and the amplitude was at 31,00 dB (figure 1).

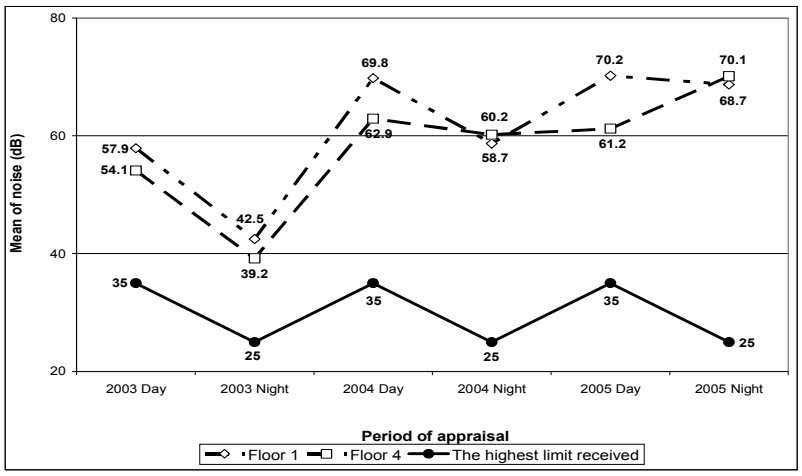

Figure 1. Level of indoor noise

By comparing the levels recorded during the three years of appraisal it is easy to notice that they differ significantly. The medium of noise level has increased by 19,12 dB along the studied period. (table 2).

On all appraisals the recorded values exceeded the noise limit.

Table 2.

Statistic parameters of indoor noise (during the studied period).

Period of appraisal	Medium	Standard deviation	Amplitude	Absolute cumulated frequency	Incresing absolute cumulated frequency LA
2003	48,43	7,78	18,70	4	4
2004	62,90	4,25	11,10	4	4
2005	67,55	3,71	9,00	4	4

The graphic representation (figure 2.) demonstrates that the daytime and night time sound pollution is increasing. Daytime sound pollution has increased significantly in 2004 and 2005 by comparison with 2003, which is illustrated with the error bars(the ones in 2003 and 2004 do not cross the 2005 limit). Actually, the error bars represent the trustworthy intervals. Sound pollution in 2005 has decreased compared to 2004, but not significantly.

The night time sound pollution has increased every year compared to the last one, the 2005 level being much higher than the 2003 level. This is illustrated with the help of the error bars.

The bias lines and the appraisal and correlation coefficient illustrate the same thing.

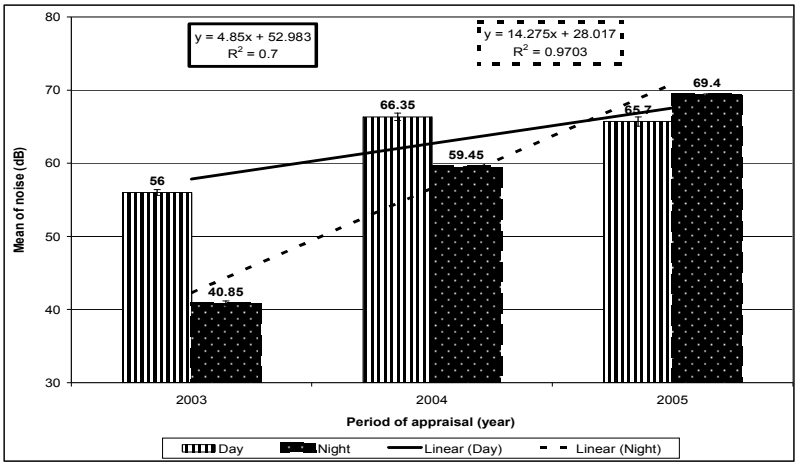

Figure 2. The evolution of sound pollution (day and night in comparison)

Results on microclimate have shown the following:

a. the temperature T_1(˚C) has the tendency to decrease as opposed to the air current speed, and T_2(˚C) has an increasing tendency; the regression and correlation analysis for the first location showed an inverted correlation between temperature and the air current speed and a low level of association (R_1 = -0,399), and a normal correlation of weak intensity in the second location (R_2 = +0,423) (figure 3);

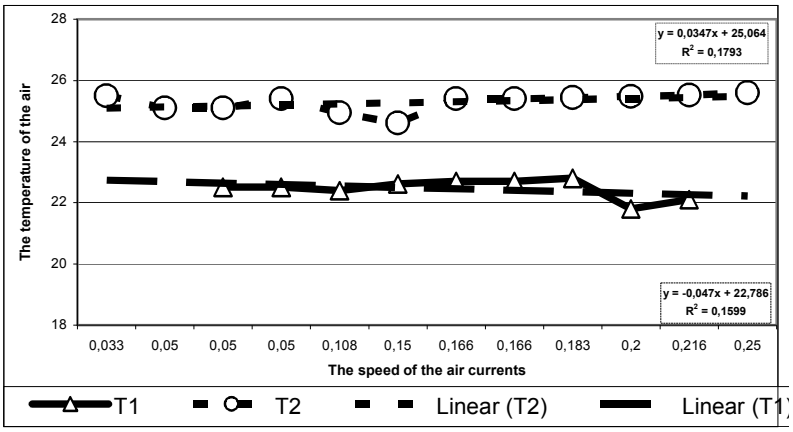

Figure 3. The evolution of the temperature of air

b. in both places, relative humidity of the air, U_r, has a decreasing tendency as opposed to the speed of the air-current, the regression and correlation analysis in both places showed inverted correlations between the relative humidity of the air and the speed of the air-currents; it also showed

that there is no correlation between U_r and v in the first location (R_1 = -0,173), and a moderate correlation in the second location (R = -0,506) (figure 4).

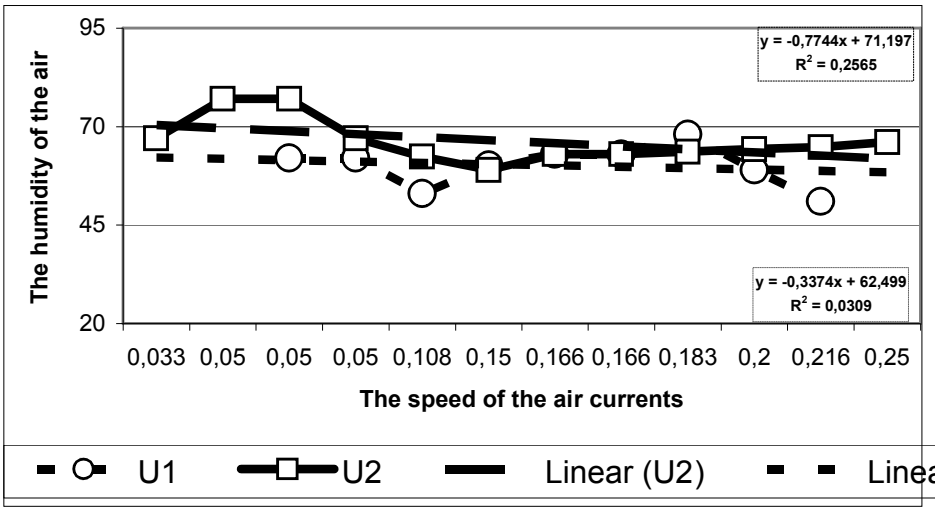

Figure 4. The evolution of the humidity of the air

The results on artificial ionizing radiation have shown that the the X-ray appliance Philips DuoDiagnost: in Radioscopy examination: maximum dosage in the air on the entrance surface is normal; Radiography examination: excepting pulmonary examination, the dosage is lower than the reference numbers (figure 5).

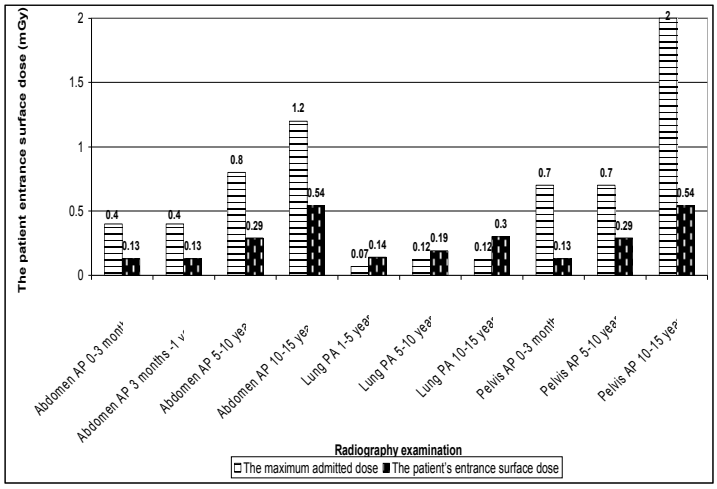

Figure 5. The radiografy examination

CONCLUSIONS

1. Noise pollution is permanent, both on the 1st and the 4th floor.

2. The average hospitalization period increased consequently to the increase in the noise pollution values.

3. The microclimate was agreeable, and it has not affected the average duration of the hospitalization.

4. Artificial ionizing radiation is a risk factor, the dosage on radiography scans was double than the normal ones.

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