

## CONTROL OF THE ENVIRONMENT IN OPERATING THEATRES IN DIFFERENT TYPES OF HOSPITALS.

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### ABSTRACT

We try to compare an environment in different types of hospitals. The University Hospital in Prague is located in the centre of the town, in historical buildings. Homolka Hospital in Prague is one of the newest monoblock hospitals, well equipped; smaller but specialised (e.g. Leksell Gamma Knife). We compared the concentrations of anaesthetic gases and temperature in operating theatres with or without air-condition. The effect of ventilation systems was confirmed, when the systems were good operated.

**KEYWORDS:** operating theatre, liquid loss, anaesthetic gases

### INTRODUCTION

Hospitals are traditionally designed as a place for medical care of patients and the environment is designed especially for them. But there are many people who spent in this environment a lot of time and for then is the hospital their working environment. Unfortunately the medical personnel is only seldom considered to be in risk from the point of view of the working environment [1,2].

We try to compare environment in different types of hospitals. The University Hospital in Prague is located in the centre of the town, in historical buildings. Homolka Hospital in Prague is one of the newest monoblock hospitals, well equipped; smaller but specialised (e.g. Leksell Gamma Knife).

The control of the quality of the environment at the operating theatres is of concern in every surgical department. In Czech Republic this topic is under the responsibility of so-called hospital hygienist. Hospital hygienists do regularly microbiological control of the operating theatres and sterilisation department; of course they deal with the doctors all problems on their departments. Sometimes they collaborate on some kind of surveys and such surveys are good for comparisons between hospitals.

In this paper we would like to compare operating theatres with or without air-condition system. The survey was initiate by the Institute of Postgraduate Studies in Health – Care. In collaboration with the hospital hygienists the microclimate parameters and anaesthetic gases concentrations was detected in several hospitals as both of these parameters seem to us very important for comfort and also for later health problems of the medical personnel [3].

## METHODS

The microclimate parameters were measured by the Indoor microclimate analyser 1213 Bruel & Kjaer in 10, 110 and 170 cm height. The recommended value of the operative temperature ( $T_o$ ) and air velocity ( $v_a$ ) according to our standards for the professional environment are in table 1 [4,5,6].

Continual measurement of the anaesthetic gases (halotan, isofluran,  $N_2O$ ) was done by the MULTI – GAS MONITOR 1302 Bruel & Kjaer. There is no standards for the anaesthetic gases in Czech Republic but after these survey was proposed recommended limits (table 2) for the City of Prague by the Hygienist of the City of Prague.

Table 1: Recommended value for the operative temperature  $T_o$  and air velocity  $v_a$ .

TYPE OF THE WORK	$T_o$ -OPERATIVE OPTIMAL	TEMPERATURE TOLERABLE	AIR VELOCITY
I	20 – 23	18 – 24	<0,1
IIa	15 – 20	13 – 21	0,1 – 0,2
IIb	12 – 17	9 – 18	0,2 – 0,3
IIIa	10 – 14	7 – 17	0,2 – 0,3
IIIb	8 – 12	6 – 15	0,2 – 0,3

This measurement was done in 9 buildings at 12 operating theatres. Some of them have no air condition system or bad quality operating ventilation system.

Table 2: Recommended value of anaesthetic gases for City of Prague

	NPK (AVARAGE) $mg \cdot m^{-3}$	NPK (MAXIMAL) $mg \cdot m^{-3}$
$N_2O$	180	360
Halotan	40	80

## RESULTS AND DISCUSSION

The microclimate parameters in all operating theatres were out of the recommended limits. The temperature was too high when evaluate the staff at the operating theatre and in the same time the relative humidity was low. The situation got sometimes even worsens when the air-conditioning system was used or better to say, the temperature was in the limits but the relative humidity was low. In winter was the situation similar operating theatres and in operating theatres with and without air-conditioning system [7].

When evaluated the loss of liquids of the doctors and nurses working at the operating theatres (different hospitals and specialities) we found the loss of liquids comparable with the heat industry (steelworks, glassworks) but the cover of the loss of liquids during the “shift “ was very low, mostly less than one-half of the loss. The association with many commons complains and even illnesses of the circulation and urinary systems are possible [8].

Exposure to anaesthetic gases constitutes the most relevant chemical risk for people working at the operation theatres. Anaesthesia is most often achieved by using  $N_2O$  and halotan or isofluran (halogenated gases).

When compare the concentrations of anaesthetic gasses and the run of the measurement in breathing zone of anaesthesiologist (mostly sitting near the head of the patient) and the operating team (mostly standing) we clarify, that in the operating theatre without the air-condition system were exposures of both teams (anaesthesiologist, surgeon) of the same level. Concentrations of  $N_2O$  were well above the proposed limits. The situation was completely different in air-conditioned operating theatres. Concentrations of both  $N_2O$  and halotan (isofluran) were below limits, especially when the system of suction from the head area was used [9].

There are many risk factors in health care facilities, not only for patients but also for the health care personal. Unfortunately people don't care or even have no knowledge about other risk factors than microbial. In operating theatres the heat stress and the chemical risk of anesthetic gases constitutes the most relevant risk for the personal at least at the operating theatres without the air-condition systems or with bad working systems.

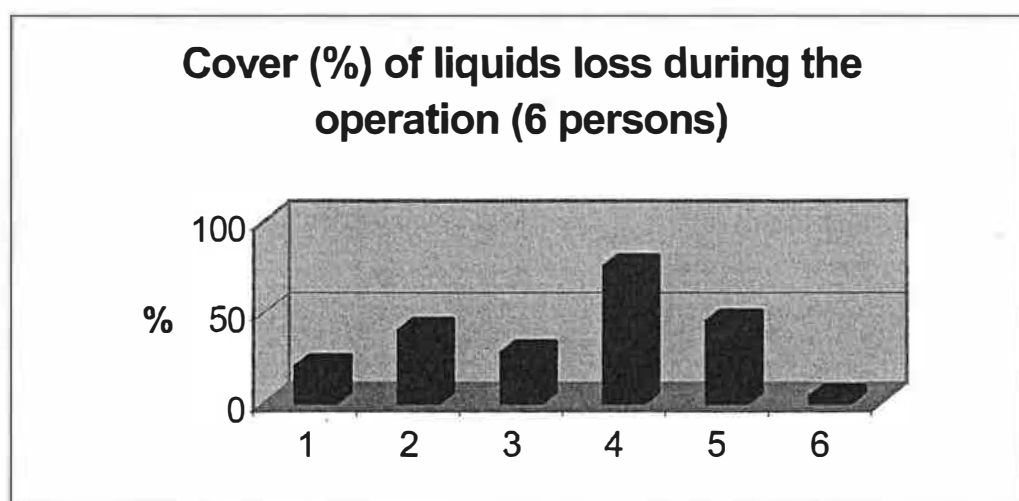


Figure 1. Recovery of liquids lost during operation in percentage during the work shift in six cases

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