

# ASSESSMENT OF THE ENVIRONMENTAL CONDITIONS OF A PUBLIC HOSPITAL

DAN MORARU<sup>1</sup>, ION MOLEAVIN<sup>2</sup>

<sup>1</sup>Pneumophthysiology Hospital of Braşov, <sup>2</sup>“Transilvania” University of Braşov

**Keywords:** hospital environment, risk of nosocomial infection, cleaning, disinfection

**Abstract:** Due to the fact that many infectious agents are present in hospitals, patients can become infected when they receive medical care and health workers may become ill during service. These diseases can be transmitted to other people who come into contact with the patients or staff.(1) A good management of nosocomial infections decreases the hospital microbiological load and, as well as the direct and indirect costs involved in a case of hospital infection.(2) This paper aims at investigating the quality of hospital care, high-risk behaviours among the medical personnel regarding the occurrence of nosocomial infections and at identifying those qualitative cleaning, disinfection, sterilization and occupational risk indices that improve the management of nosocomial infections in a medical unit with beds.

**Cuvinte cheie:** mediu spitalicesc, risc de infecție nosocomială, curățenie, dezinfecție

**Rezumat:** Pentru că mulți agenți infecțioși sunt prezenți în unitățile sanitare, pacienții se pot infecta în timpul în care primesc îngrijiri medicale, iar personalul sanitar se poate îmbolnăvi în timpul serviciului. Aceste boli se pot transmite și la alte persoane care vin în contact cu pacienții sau personalul.(1) Un bun management al infecțiilor nosocomiale scade încărcătura microbiologică a mediului spitalicesc cât și al costurilor directe și indirecte pe care le implică un caz de infecție intraspitalicească.(2) Prezenta lucrare își propune investigarea calității mediului spitalicesc, a comportamentelor cu risc crescut în rândul personalului medical pentru apariția infecțiilor nosocomiale. Identifică acei indici calitativi de curățenie, dezinfecție, sterilizare și de risc ocupațional care îmbunătățesc managementul infecțiilor nosocomiale într-o unitate sanitară cu paturi.

## INTRODUCTION

The hospital is an environment where along with contagious patients, other patients with a high risk of contacting infections are found. Hospitalized patients with infections or pathogen carriers are potential sources of infection for other patients and for the medical staff. The patients who get an infection during hospitalization become sources of infection. Hospitals overcrowding, frequent transfers of patients from one unit to another and concentrations of patients with susceptibility contributes to the development of nosocomial infections.(3,4)

Microbial flora may contaminate objects, devices and materials which may come into contact with the patient's body. A high frequency of nosocomial infections reflects the poor quality of medical services and involves avoidable costs.

The majority of microorganisms survive better in hospitals, for example, in water, food, dust and splash particles generated through coughing or speech (bacteria with a diameter of less than 10µm remain in the air for several hours and can be inhaled in the same way as dust particles), in objects like fabrics, equipment and supplies used in healthcare. Proper care of the environment reduces the risk of bacterial survival. Routine cleaning is important to ensure a clean and dust-free hospital environment. Usually, there are many microorganisms in the “visible dirt” and routine cleaning removes this dirt. Most areas of patient care require cleaning with wet mop. Dry sweeping is not recommended. Using a mild detergent solution improves the quality of cleanliness. Any area visibly contaminated with blood or body fluid visibly needs to be cleaned immediately. Hospital

residues are a potential reservoir of pathogenic microorganisms and require proper handling. Meanwhile, the main risk associated with infection is represented by the sharp instruments contaminated with blood.(5)

Within this context, specific post-exposure policies need to be developed and ensure compliance for a number of infectious diseases, such as human immunodeficiency virus (HIV), hepatitis, severe acute respiratory syndrome (SARS), chicken pox, measles and tuberculosis.(3)

## METHODS

This paper analyzes descriptively and retrospectively the qualitative indicators of hospital care and the environment (aeromicroflora samples from surfaces, sterility testing) after cleaning and disinfection procedures were implemented in a public hospital. Also, it analyzes the behaviour of health professionals with regard to the application of standard precautions (washing hands) and additional (patient isolation, wearing the mask) to prevent possible nosocomial infections.

The study covers a longitudinal development, 2011-2013, of microbial load from wards at risk and the etiology of the taken samples. We analyze the impact of migrating from the hospital, the occupational risk behaviour on the incidence of nosocomial infections.

The specimens are represented by all self-control samples of the hospital from 2011-2013, samples collected from areas of wards, pharmacy, radiology, ambulatory, laundry, functional explorations, Bronchology department, food pantry

<sup>2</sup>Corresponding author: Ion Moleavin, Str. Podul lui Grid, Nr. 15A, Cod 500133, Braşov, România, E-mail: imoleavin@yahoo.com, Tel: +40723 534266

Article received on 09.07.2014 and accepted for publication on 22.08.2014  
ACTA MEDICA TRANSILVANICA December 2014;2(4):180-182

and food pantries from other wards, aeromicroflora samples, surfaces and hands of staff, a total of 376 records. Data were collected from the hospital laboratory's self-control register.

Documentary analysis was performed using statistical data processing programs, such as Epi Info 2000, SPSS, Microsoft Excel.

The control of the efficiency of chemical disinfection was done using bacteriological method for aeromicroflora, surfaces, sheets, equipment used in food pantry and staff's hands. Microbial flora was determined before and after disinfection.

To determine the bacterial flora, samples were obtained by wiping with moistened swab from a bounded area (walls, tables, bed), for the aeromicroflora was used the Koch sedimentation method in Petri plates. After thermostating samples, the total number of germs was determined, also the presence of *E. coli*, *Proteus*, or hemolytic *Staphylococcus*.

In operating and delivery rooms, newborns, infants and premature newborns room, infusion solutions laboratories, the above-mentioned bacteria is not allowed and total bacterial count cannot exceed the standards: 200 NTG/m<sup>3</sup> (total number of germs / m<sup>3</sup>) after the cleaning and disinfection and 500 NTG/m<sup>3</sup> during work.

**RESULTS AND DISCUSSIONS**

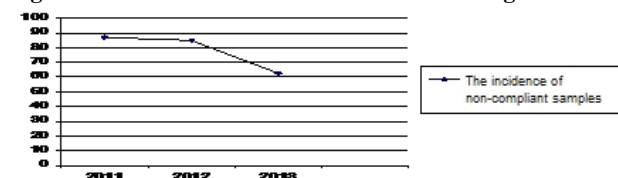
Successful control of hospital infections is based on maintaining a safe environment for patients (population) and health care staff in a complex place such as hospitals or any medical facility.

A total of 376 bacteriological samples were collected, analyzed and interpreted from the air, the surfaces, the medical tools and the hands of the medical staff of a medium-size public hospital during 2011-2013. The results show that the aeromicroflora determination in 2011, from 70 samples, 61 (87.14%) exceeded health standards for total germ number or pathogens present; in 2012 from 100 samples, 85 (85%) exceeded health standards; in 2013 from 59 samples, 37 (62.71%) exceeded health standards for total number of germs or other pathogens present.

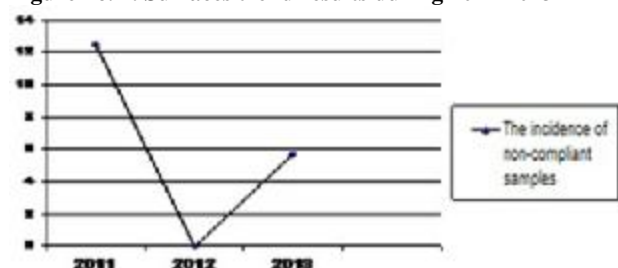
A clean environment plays an important role in preventing hospital infections. Many factors, including sharing patient care areas, air quality, water, laundry service, can significantly influence the transmission of hospital infections.

The trend shows a decrease of potential nosocomial germs, during aeromicroflora samples research (figure no. 1).

**Figure no. 1. Aeromicroflora trend results during 2011-2013**



**Figure no. 2. Surfaces trend results during 2011-2013**



Routine cleaning is important to ensure a clean and dust-free hospital environment. Usually, there are many microorganisms in "visible dirt" and routine cleaning removes this dirt.

Microbial flora of the surfaces: in 2011, out of 32 samples, 4 (12.5%) had exceeded the total number of bacteria; in 2012 out of 12 samples, none had exceeded the total number of germs and in 2013 out of 35 samples, 2 (5.71%) had exceeded the total number of germs.

The trend shows a decrease of germs with nosocomial potential during the period of research (figure no.2)

The risk of transmission of infections from the tools and equipment depends on the presence of microorganisms, their number and virulence. Any instrument or equipment that comes in contact with a sterile area of the body should be sterilized. If the instrument or equipment will come in contact with mucous membranes or non-intact skin should be the subjected of a high level disinfection, and if it will come in contact with intact skin, it needs a lower level of disinfection or cleaning.

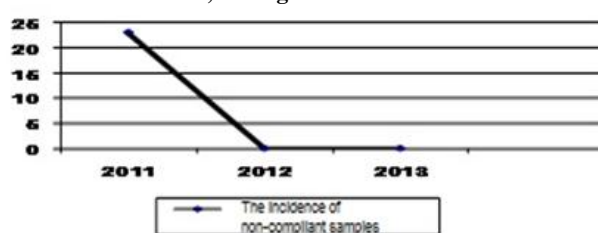
Proper hand hygiene can minimize the number of microorganisms gathered on hands surface during usual daily tasks and after contact with blood, body fluids, secretions, excretions, and equipment or areas known to be contaminated or not.

The hospital is a good place for communication about personal hygiene, for example, the visitors and the general public can be informed about the rules of hygiene such as washing hands.

Microbial flora collected from the hands of the staff: out of 13 samples collected in 2011, 3 (23%) exceeded health standards for total germs count, in 2012 and 2013 out of 15, respectively 6 samples, no evidence has exceeded health standards.

In health care facilities, the spread of resistance organisms is favoured when hand washing, infection control precautions and cleaning equipment are suboptimal. The trend shows a decreasing incidence of the non-compliant samples from the staff's hands, which shows the efficiency of training and periodic retraining regarding standard and additional precautions (figure no. 3).

**Figure no. 3. Trend of the positive results of samples taken from the staff hands, during 2011-2013**



**CONCLUSIONS**

1. Keeping and maintaining a safe environment for the population, patients and medical care staff requires dangers identification and risk classification. This implies unconditional cooperation between staff, patients and the existence of logistical support. Microbiological load of the hospital environment influences the incidence of nosocomial infections.
2. During aeromicroflora's determination, there were identified hemolytic germs, but the trend of the samples which exceed the total number of germs is decreasing in the studied period (2011-2013).

3. When determining the microbial load on surfaces, there was highlighted a percentage of 0-12,5% of samples exceeding the permissible number of total germs. The trend over a three-year study is decreasing.
4. Certain risk behaviours, lack or failure of universal precautions regarding hand washing affects the incidence of nosocomial infections.
5. The samples obtained from the hands of staff show that in 2011, 23% of the samples exceed the hospital regulations.
6. Permanent training staff knowledge of sanitary rules on supervision, control and prevention of nosocomial infections and also the rules for cleaning, disinfection and sterilization has a positive impact on the results of microbiological control.
7. A good management of nosocomial infections decreases the microbiological load, both the hospital and the direct and indirect costs involved in a case of hospital infection.

### REFERENCES

1. CDC Guidelines for Environmental Infection Control in Health Care Facilities. MMWR 2003;52:1-42.
2. Communicable Diseases Network Australia. Infection Control guidelines for the prevention of transmission of infectious diseases in the health care setting 2nd Ed. Department of Health and Aging. Australia; 2002.
3. Garner J. Guideline for Isolation Precautions in Hospitals. Infection Control & Hospital Epidemiology 1996;17:53-80.
4. Wenzel RP, Edmond MB. Listening to SARS: Lessons for infection control. Annals of Internal Medicine 2003;139(7):592.
5. World Health Organization. Prevention of Hospital Acquired Infections-A Practical Guide. 2nd ed. Geneva; 2002.