Risk Factors and Intervention Measures of Occupational Exposure of Medical Staffs

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\textbf{Abstract.} Objective: To explore the risk factors and intervention measures of occupational exposure of medical staffs. Methods: The risk factors of occupational exposure were analyzed and targeted intervention measures were made according to professional characteristics of clinical work. Results: The protection consciousness and protection knowledge of medical and nursing staffs were improved. Conclusion: It is required to strengthen the training of occupational exposure knowledge for medical staffs and improve their understanding of occupational exposure. Based on the specific reasons for the existence of the problem, appropriate measures should be taken to improve the compliance of medical staffs, minimize the occupational exposure of health care workers and protect occupational safety of medical staffs.

\textbf{Introduction}

Occupational exposure refers to the state of being possibly infected for the medical staffs and related personnel who are participated in occupational activities and are exposed to pathogen-containing blood or other potentially infectious agents through the mucous membranes, damaged skin or gastrointestinal route [1]. The work of the medical staffs makes it contact the body fluids and blood of all kinds of patients every day and there is a risk of occupational exposure at any time. At present, most of the key points of infection management were focused on preventing nosocomial infection, but not enough attention has been paid to occupational exposure of medical staffs who frequently contact with patients and their pollutants. Occupational exposure can not only damage the physical and mental health of the nursing staffs, but even threaten their lives. The risk factors and intervention measures of occupational exposure to medical staffs are summarized as follows:

\textbf{Analysis of Occupational Exposure Risk Factors for Medical Staffs}

\textbf{Physical Factors}

(1) Sharp injury: needle stab injury is the main risk factor for occupational exposure of medical staffs [2]. There are at least 1 million needle stabs around the world each year, which
can cause a variety of blood borne diseases. Due to the fact that the use of safety injecting devices is not popular in China, the high incidence of needle injuries is caused by the unskilled operation in first aid and rescue, of which HBV and HCV are the most common infections. (2) Wound Injury: According to a survey in Italy, the incidence of lumbosacral pain was 8.4% for medical staffs due to weight-bearing spine injuries [3]. The incidence of varicose veins of the lower extremities was significantly higher in the medical staffs than in the other groups because of the long standing time [4]. (3) Radiation injury: Because most nurses lack the knowledge of radiation protection and protective equipment, they are susceptible to get injuries when they have operations including radiography, intraoperative angiography, puncture under fluoroscopy in ICU ward, operating room, catheter room and so on. In addition, ionizing radiation, microwaves and the like can cause injuries to the nursing staffs. In the work of disinfection and sterilization, ultraviolet light can cause ophthalmia or dermatitis [5].

**Chemical Occupational Exposure**

(1) Cytotoxic drugs: The application of antitumor drugs can kill cancer cells, but it can also kill or inhibit the normal tissue cells of the human body at the same time. It can cause skin contact or inhalation of drugs for nurses in the process of allocation of drugs, exhausting, fluid changing, pulling the needle and other operations, which leads in potential risks of carcinogenesis, teratogenesis, and organ damage [6]. (2) Chemical disinfectant: The nurses have to contact with chemical disinfectants (formaldehyde, per acetic acid, ethylene oxide, glutaraldehyde, chlorinated disinfectant, etc.) every day. Prolonged exposure without protection can cause shortness of breath, headache, contact dermatitis, asthma and reproductive system disorders [7]. (3) Anesthetic gas: It is possible to cause abortion, fetal malformation and fertility reduction if one is exposed to an environment that is contaminated with a trace amount of anaesthetized exhaust gas for a long time [8].

**Biological Occupational Exposure**

It includes a variety of blood borne diseases and respiratory diseases. Doctors and nurses will not be able to wear gloves and masks because they try to save seconds when they save the patient. When working in the ICU, the medical staffs often sit in the bedside to observe patients. When they carry out the following operations, including suction, oxygen or artificial respiration of the tracheal intubation patient, blood, secretions and vomit of the patient are inevitably splashed on the face and body of the medical staffs, which brings a high risk of occupational exposure.

**Social and Psychological Factors**

Medical work is often uncertain, because medical staffs, especially those who work in the emergency or ICU, have long been surrounded by critical patients, accidental injuries, and death. Factors like the irregular life, work burden, psychological pressure overload, misunderstandings of patients and their family members, even being abusive and life-threatening, have a direct impact on the psychological and behavior of medical staffs.
Causes of Occupational Exposure

Inadequate Medical Staffs

China’s health administrative department provides a bed ratio of 1:0.4, while the clinical nurses are seriously inadequate with an average ratio of 1:0.33. In order to increase economic benefits, some hospitals often increase their beds, causing the nursing staffs to work excessively. As a result, nurses are physically and mentally at a high level of tension and mental illness (anxiety, depression, etc.), which increases the potential for occupational exposure.

Inadequate knowledge of Protection and Self-protection Awareness

Most of our grass-roots medical staffs lack of professional knowledge of occupational protection, resulting in a high incidence of occupational exposure. Clinical practice often makes nurses expose to the risk of splashing by blood or body fluids, and 67.5% of them never wear protective goggles. 3.2% of nurses never wear gloves when performing invasive operation [8]. According to a report made by Hua Dian, et al., 57.3% of people in a general hospital did not take any protective measures because fewer infectious diseases were encountered. Only 25.8% of health care workers wash and disinfect their hands correctly, and only 4.5% of people correctly grasp the use and effectiveness of disinfectants [9].

Inadequate Emergency Response Knowledge

According to the CDC survey in the United States, post-exposure prophylaxis (PEP) of medical staffs after occupational exposure to HIV can reduce the HIV infection rate by 79% and at the same time, PEP has a protective effect and can reduce the risk of HIV transmission by 81% [10]. When the nursing staffs was stabbed, about 86% of the people took general disinfection measures (iodine plus alcohol) and only about 4% were able to handle the problem more standard, with 0.33% of nurses taking no action. The proportion of unqualified protection assessment was 94% [11]. Many hospitals do not have sound occupational exposure reporting and support systems.

Preventive Measures for Occupational Exposure of Health Staff

Strengthening Occupational Safety Education, Establish and Improve Occupational Protection System

It is essential to strengthen medical staff’s training in occupational and pre-employment occupational protection and work out guidelines and precautionary measures to prevent occupational injuries so that medical and nursing staffs fully recognize the importance of implementing standard precautions and fundamentally improve compliance with occupational protection. At the same time, it is important to establish a safety management system, protective measures, and procedures for dealing with occupational exposure. And health care staff should be fully aware of the importance of occupational exposure prevention through training.

Increasing Investment in Manpower and Material Resources

We should improve the management of human resources. It is an effective way to reduce occupational injuries by alleviating the shortage of medical staffs, strengthening investment in
medical safety work environment, improving medical equipment and improving protective measures.

**Standardizing Nursing Behavior and Prevent Sharp Injuries**

The medical staffs should master the operation techniques of sharp instruments skillfully. The most common cause of needle injury is to reset the needle cap after the use of the needle. We should prohibit putting the contaminated needle back into the needle cap, and we must try to use one hand to set the needle. It is forbidden to separate the polluted needles directly by hand. After the infusion of the needle, the scalp needle should be put into the sharp box immediately. When the infusion and puncture fail, the pollution needles are prohibited from hanging on the Murphy’s dropper of the infusion tube, and they should be replaced with new needles immediately. You should find someone to help you when the patient does not cooperate with the treatment. Do not bend or break the used needle. When passing the scalpel or scissors, you should use the curved plate to pass instead of taking directly by hand. It is necessary to choose the correct way to break the ampoule. Personal operation habits are the determinants of sharp injury. Unarmed ampoule is a common cause of sharp injury, which should be prohibited. The use of hard sharp instrument collection box can reduce the incidence of needle stab by 50%, which is worth popularizing [12].

**Strengthening the Compliance of Hand Hygiene**

There are 5 hand-washing instructions in China’s “Hand Hygiene Norms of Medical staffs in Medical Institutions”, which includes the following: (1) direct contact with patients before and after contact with different patients, move to clean parts from the contaminated part of the same patient’s body; (2) before and after the contact with the patient’s mucosa, damaged skin or wound; after the contact with the patient’s blood, body fluids, secretions, excretions, wound dressing; (3) before and after wearing isolation clothes and after picking gloves; (4) before and after the aseptic operation; before cleaning aseptic items; after dealing with contaminated goods; (5) after contacting the surroundings and articles of the patient. It is worth noting that wearing gloves can’t replace hand washing, and a correct hand washing is the most economical and effective measure to prevent infection.

**Correctly Mastering the Treatment Process of Sharp Instrument Injury**

Squeezing the wound, repeatedly rinsing the wound with soapy and flowing water (when the mucous membrane is contaminated, the wound is repeatedly washed with saline), disinfection (2%iodine, 75%alcohol), bandage, reporting, detection of related antibodies (vaccinating or taking prophylactic drugs and assessing if necessary), psychological intervention.

**Attaching great Importance to the Dangers of Chemotherapy Drugs**

Nurses should wear protective gloves and masks when formulating disinfectants and wear goggles when necessary. Nurses should also be familiar with methods and precautions of chemical disinfection, and strengthen self-protection awareness. When encountering a large
disaster, it is essential to wear protective clothing, protective clothing, clothing and other protective equipment to save the body, which can protect the patient and ensure their own safety.

**Conclusion**

In a word, the occupational risk factors of the medical staffs cannot be ignored, and the cause of occupational exposure is multifaceted, and the emphasis is on protection. In order to establish the consciousness of occupational protection, we should first start with the change of ideas. Still, we should strengthen occupational protection education, improve self-protection awareness, improve the compliance of medical staffs, minimize the occupational exposure risk of medical staffs, so as to ensure occupational safety of medical staffs.

**References**


