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Barriers Factors of Infection Control and Prevention in Intensive Care Units

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Abstract--- *Nosocomial or hospital-acquired infections (HAI) are a major problem in ICUs and one of the major causes of hospitalization, medical costs, and mortality. The purpose of this study was to investigate the barriers factors in the prevention and control of nosocomial infections in the intensive care unit. The present study was a qualitative research with conventional content analysis approach. Twenty-one healthcare workers were selected by purposive sampling method and a deep and semi-structured interview was conducted with them. Data were analyzed using qualitative content analysis method. Data analysis revealed the main theme of Barriers factors, which included four categories of Human factors, Environmental factors, Individual factors and Complexity. According to the findings, it is necessary to identify facilitators to make nosocomial infections better diagnosed and provide appropriate and effective planning to improve the safety and quality of patient care.*

Keywords--- *Qualitative Study, Nosocomial Infection, Intensive Care.*

I. INTRODUCTION

In parallel with the growth in the number of hospitals and their expansion, hospital-acquired infection (HAI), also known as nosocomial or healthcare-associated infection, has become almost one of the major healthcare problems inducing increased risks of mortality and morbidity due to long hospital stay and consequently lead to a sharp rise in hospital costs (1). HAI control and prevention are now regarded as priorities worldwide. In addition, numerous factors have been identified influencing the spread of such infections including expansion of hospitals, emerging diseases such as human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS), mad cow disease, as well as risks of hepatitis B virus (HBV) and hepatitis C virus (HCV) transmission and increasing resistance of bacteria (2, 4).

Accordingly, problems associated with HAI and their control and prevention methods can be affected by other factors such as use of invasive procedures, frequent changes in medical and surgical techniques, modifications in fixed-dose combination (FDCs), antibiotic therapies, and creation of resistant microorganisms. HAI prevention and control is also a multifaceted and multidimensional issue. Moreover, HAI prevalence is directly and closely

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correlated with sanitary conditions of hospitals as HAI incidence in advanced hygienic hospitals is less than 10% (5).

Infection control and prevention in hospitals does not have a long history in Iran. Some statistics released in developing countries have correspondingly indicated that the exact amount of HAI in such countries varies based on numerous factors such as number of hospital beds, hospital referral status, type of hospitals i.e. teaching or regular ones, presence or absence of monitoring programs, wards, equipment and facilities, as well as adequacy of resources and funding for such programs (6).

As claimed by hospital administrators, there is no trace of infection in Iran, or it is only about 1%. Based on the last report released by infection control experts of the Ministry of Health and Medical Education, HAI had been also reported by 1.3% (7). There is currently no accurate statistics and documentation of the incidence rate of HAI in Iran, as most patients with such infections are not monitored after discharge and also no true estimate of HAI is available (8).

With regard to the principle of prevention is much better than cure, there can be no doubt that the most effective and desirable method with a low cost to fight HAI is prevention of their incidence. Today, actions completed in the path towards infection control and prevention are taken into account as the basic indices of quality of patient care and vital components of hospital management. Moreover, nurses as the largest group of caregivers play an important role in the spread, prevention, and control of infections and they are considered as key members in HAI management. Reflecting on HAI incidence in some special wards, the main purpose of the present study was to investigate the barriers factors in the prevention and control of nosocomial infections in the intensive care unit.

II. MATERIALS AND METHOD

This qualitative study was conducted using content analysis method. Accordingly, conventional content analysis meant extracting objective content was more than what is written in textual data which could create explicit and hidden themes and patterns from the content of participants' data (9). To achieve data immersion, the researchers listened to the interviews several times, transcribed and typed them verbatim, and repeatedly reviewed the texts. The data were then read word-by-word in order to extract the codes, and the highlighted words were subsequently coded and annotated. The participants' own words and the researchers' perceptions were also used for initial coding. Through coding, semantic units were extracted from the participants' statements. Afterwards, the codes were grouped according to their similarities and differences and the main categories were obtained via comparisons. Eight steps taken in this qualitative content analysis are illustrated in Table 1 below.

Table 1: Eight steps of data collection in qualitative content analysis

Step 1: Prepare data
Step 2: Identify semantic units
Step 3: Develop categories and coding map
Step 4: Test coding map in a text sample
Step 5: Encode full text
Step 6: Evaluate coding consistency
Step 7: Outline results based on coded data
Step 8: Report methods and results

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In this study, the data were collected through open-ended semi-structured interviews, and then analyzed using content analysis method as a good technique to obtain reliable and valid results from textual data to create knowledge and new insight and also to provide facts in the form of a practical guide to actions (10).

A total number of 21 individuals participated in this study and 23 interviews were conducted. The first participant was one having Master's degree in Nursing and working as an infection control supervisor who expressed her willingness to have an interview. A total of 14 interviews - with two ICU heads, five specialists, two infection control supervisors, four nursing experts, one hospital administrator, and one infection control expert at university level - were thus performed during non-emergency hours as agreed by both sides.

The participants were medical staff working in different cities across Iran who met the inclusion criteria. The interview location was selected according to the participants' wishes, so all the interviews were performed in safe, quiet, and trustworthy environment. The inclusion criteria were at least one year of work experience in ICUs and one year of experience in management in centers with ICUs.

Moreover, semi-structured interviews were used as a method of data collection and production. For the interviews, a basic question was firstly addressed: "What do you do to control infection in ICUs?", and the rest of the questions were raised and directed based on responses to this question. The sequence of the questions was not similar for each participant, because the process of asking questions depended on the interviews and answers given by each individual. Asking such questions at the onset of the interviews could also allow the participants to talk about important experiences in their lives.

RESULTSA large number of the participants (57.1%) were female and 42.8% of them were in the age range of 45- 36 years (Table 2).

Table 2: Demographic characteristics of the participants

Demographic characteristics		Number (percentage)
Gender	Female	12 (57.1)
	Male	9 (42.8)
Age	Under 35 years old	2 (9.5)
	36-45	9 (42.8)
	46-55	7 (33.3)
	Over 55 years old	3 (14.2)
Level of education	Bachelor's degree	9 (42.8)
	Master's degree	3 (14.2)
	PhD degree	2 (9.5)
	Specialist	7 (33.3)
Position	Critical care nursing expert	1 (4.7)
	Infection control supervisor	3 (14.2)
	Infection control doctor	2 (9.5)
	ICU resident clinical pharmacist	1 (4.7)
	ICU head nurse	3 (14.2)
	Ward nurse	2 (9.5)
	Infection control expert at university level	1 (7.4)
	ICU head	3 (14.2)
	Clinical governance and patient safety expert	1 (4.7)
	Hospital administrator	2 (9.5)
	Hospital head	1 (4.7)
	Faculty member - Critical Care Nursing Department	1 (4.7)

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To reflect on inhibitory factors affecting HAI control and prevention in ICUs, data analysis was completed and finally 203 codes, 28 sub-categories, and 9 categories were obtained from the interviews. Continually reviewing the extracted codes, eliminating duplicates, and merging identical ones, eventually, 92 codes remained that fell into 10 sub-categories and 4 main categories. The main categories of inhibitory factors involved in HAI control and prevention in ICUs were human factors, environmental factors, individual factors, and complexity (Table 3).

Table 3: Barriers factors affecting HAI control and prevention in ICUs

Main categories	Sub-categories
Human factors	Heavy workload Lack of manpower Role conflict
Environmental factors	Equipment shortages Quality of materials and equipment
Individual factors	Individualist approach A spirit of negligence Carelessness
Complexity	Complexities of infection control methods Non-applicability of clinical guidelines

Human Factors

As one of the inhibitory factors influencing HAI control and prevention in ICUs, human factors include heavy workload, lack of manpower, and role conflict. To establish a standard system for HAI control and prevention, it is thus suggested to develop a coherent program to remove obstacles associated with human factors.

Heavy Workload

Assessments by infection control team based on placement evaluation is not possible because of lack of manpower, interference by other medical staff, unclear roles and responsibilities, and over-accountability to senior managers. In this respect, one of the participants said that:

"*... I believe that the medical staff working in this ICU, especially the nursing ones, suffer from very heavy workload ... as you know, providing care for these patients always needs attentiveness, diligence, and devotedness ... on account of accreditation, such duties have also multiplied over recent years ... there is a need to have documentation ... I am wondering when this paperwork will be ended and we can freely provide more services to patients ...*" (Participant no.10)

Lack of Manpower

Manpower is considered as one of the eight essential components in HAI control and prevention. It has been also introduced as one of the key elements in this respect, especially in hospitals as the most important part of healthcare system. For example, one of the interviewees stated that:

"*... among the main challenges is lack of cleaning service workers to do the washings .... I think, there is no supervision on hygiene, especially in Vali-e Asr Hospital ... there are insufficient health worker aids in evening and night shifts in ICUs and also shortage of skilled workforce in Central Sterilization Services Department in this complex ... if you ask me, infection control system fails to move forward if such stimulants are not corrected...*" (Participant no.3)

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Role Conflict

Conflict is as a process in which one side or both sides can hinder fulfillment of goals of the opposite side; therefore, the role of medical staff needs to be assigned properly and unambiguously. Accordingly, one of the participants noted that:

"*… in addition to all these equipment, facilities, materials, disinfectants, solutions, etc., there is a need to take a look at job descriptions … I believe that job description for each person must be identified in this ward … unfortunately, as the head, I have repeatedly observed that health worker aids have done the patient suctioning process … there are numerous examples for such cases …*" (Participant no.7)

Environmental Factors

Environment represents all elements beyond the boundaries of an organization that can potentially affect it. Hospital environment also refers to all physical and social components incorporated into behaviors and decisions in an organization. One of the most relevant factors in terms of organizational change is thus the environment surrounding an organization i.e. the territory in which organizations have been formed and transformed. Environmental components are accordingly regarded as structures used to evaluate and understand the concept of environment in an organization.

Equipment Shortages

Today, medical equipment has become a fundamental part of modern hospitals, accounting for half of the total project costs in such centers. Inactive equipment, in the meantime, can impressively contribute to extra costs. The given problem is much more evident in developing countries, particularly in terms of HAI control and prevention. In this line, an interviewee said that:

"*… infection control in ICUs entails exploitation of all equipment and facilities … the fact that there are shortages in the implementation process is a significant problem that should be met … such shortages include shields, N95 masks, cleaning cloth, as well as lack of a sink for hand washing as the simplest, the most important, the best, and the top priority in controlling and preventing HAI …*" (Participant no.3).

Quality of Materials and Equipment

If economic justification for the use of materials and equipment used as well as disadvantages of poor-quality materials and any infections that occur in medical centers is explained for managers and experts, appropriate medical equipment and related materials with the least complications will be selected. For example, a participant believed that:

"*... the equipment and materials available in this ward are determined by the details and structures of the purchases that are delivered … they are sometime single-use items and have poor quality … for example, solutions purchased sometimes lead to hand rashes, equipment and materials are not new enough and they cannot be used for hand hygiene, and also faucets do not have lever controls... there are lots of problems and there is a need to reconsider the quality and quantity of such equipment and materials … the management does not care about infection control at all … as if you are talking to a brick wall …*" (Participant no.10)

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Individual Factors

Individual factors inhibiting HAI control and prevention in ICUs include an individualistic approach, a spirit of negligence, and carelessness.

Individualist Approach

As HAI control and prevention is a group work, heads of hospitals together with front-level members of a medical team should pay special attention to this important program. Even patients and their companions need to have peace of mind regarding infection control and also play a major role in collaboration with hospital staff. Accordingly, one of the interviewees stated that:

"*... working in ICUs requires systematic and team planning ... infection control should be viewed as a group process ... unfortunately, everybody is trying to fulfill their own jobs ... these attitudes are a big pain in the neck in these wards as a major disadvantage to patients and client-centered healthcare systems ...*" (Participant no.12)

A Spirit of Negligence

In healthcare systems, especially hospitals, problems and issues caused by negligence, carelessness, and improper performance by medical staff have been always prevalent. This is especially true for HAI control and prevention, as noted by a study participant:

"*... another challenge in controlling and preventing infections in ICUs is carelessness that can lead to other illnesses, for example, there have been cases where catheter head has become out of place and has come into contact with some other objects, but nurses have connected it to the same place ... or the catheter head has been unintentionally in contact with microbial contaminated sites ... or nurses have not cared about their hand hygiene ...*" (Participant 10)

Carelessness

Carelessness means that a medical team is responsible for an individual but they neglect them which can produce damages and losses; that is, some measures must be taken but they fail to do so. Therefore, medical errors occur in the course of HAI control and prevention. In this regard, a participant added that:

"*... in my idea, it is necessary to control infections and to curb disorders and irregularities in this ward ... there is also a need to implement all principles and rules strictly and carefully, but the staff are sometimes too careless, they are not aware of the importance of such infections ... if they consider the significance of such issues, no disasters occur in ICUs; for example, a doctor placed a central line venous pressure catheter that did not meet standard precautions ...*" (Participant no.6)

Complexity

Patients with critical conditions are more subjected to HAI due to disease severity, complexity of care in ICUs, and ambiguity of some implementation guidelines and standards compared with individuals with other health problems.

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Complexity of Infection Control Methods

With the advancement of technology, increasing complexity of medical care, growing number of patients requiring mechanical ventilation, susceptibility to infection has risen. Therefore, there is a need to adhere to specific principles for infection control and prevention. For example, one of the interviewees said that:

"*... with the progress of medical science and development of treatment methods, an increase in types of ventilators, various disinfectants, etc., infection control management has become much more difficult ...*" (Participant no.6)

Non-Applicability of Clinical Guidelines

Clinical guidelines are a systematic collection of the latest and the most reliable scientific evidence describing clinical treatment procedures or processes, such as HAI control and prevention in a classified manner with respect to priorities, efficiency, and cost-effectiveness. However, infection control guidelines have several ambiguities in terms of implementation relating to environmental conditions of Iran which need to be localized. In this respect, a participant reiterated that:

"*... in connection with the applicability of infection control principles and methods in ICUs, environmental factors and ventilation standards are undesirable ... international standards have not been also transformed into Iranian context ... the Ministry of Health and Medical Education has merely translated guidelines developed by the World Health Organization and has then distributed them among healthcare centers ...*" (Participant no.6)

III. DISCUSSION

The purpose of this study was to investigate the barriers factors in the prevention and control of nosocomial infections in the intensive care unit. Lack of manpower was thus delineated as one of the main themes highlighted by the participants as a fundamental problem. In order to achieve goals in hospitals, individuals with scientific capabilities must work in healthcare sectors, as human resources play a key role in relation to other factors. Their importance in medical centers is also undeniable because hospitals will be disrupted if they are not endowed with specialized, skilled, and well-trained staff. One important variable affecting undesirable quality is delivery of healthcare services by human factors. It should be noted that manpower plays a vital role in evolution and improvement of healthcare services and they have been almost always emphasized by human resources management as an important element in an organization (11).

Lack of manpower was accordingly reported as one of the sub-categories of human-associated inhibitory factors involved in HAI control and prevention in ICUs. In recent years, human resources expertise has also intensified its dominance over all organizational activities, especially in healthcare centers such as hospitals. Some hospitals have thus considered duties of human resources as a key factor in implementing healthcare services strategies to accomplish organizational mission and to achieve goals and have further advocated it as their competitive advantage. So, lack of manpower can directly and indirectly, at all levels, have a negative impact on improving quality of hospital services, increasing patient satisfaction, economizing hospital administration, and ultimately producing social and community health.

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Role conflict was also one of the inhibitory factors influencing HAI control and prevention in ICUs that was investigated in this study. In healthcare centers, healthcare providers are more vulnerable to conflicts due to complicated organizations, abundance and variety of interactions, expertise, as well as hierarchical roles and nature, so this problem is of utmost importance (12). Although conflicts are not always destructive and harmful and a certain degree of this phenomenon can improve services, rise in conflicts or their severity can result in disruption. In the past, conflict was assumed destructive and harmful, but numerous studies in behavioral sciences have demonstrated that all conflicts are not so and a specific level of conflict is essential in an organization (13).

Besides, hand washing was regarded as one of the concepts pointed out by all participants. Studies have revealed that hand hygiene among healthcare workers has been typically at a low level (1) although observing hand hygiene has been always considered as a worldwide priority to reduce healthcare-associated infections (14).

Shortages of equipment and quality of materials and equipment were the sub-categories of environmental factors involved in HAI control and prevention in ICUs. According to the World Health Organization, about 60% of medical equipment in developing countries is not ready for use most of the time. Various ways have been thus suggested to address these problems, but the best possible approach is to employ effective medical supply management. Generally, available information implies that approximately 40% of medical equipment is rarely employed efficiently in a developing country. Due to mismanagement and lack of necessary infrastructure to purchase, maintain, and exploit imported medical technologies, national health resources are being wasted continuously. Some experts have also pointed out that third world hospitals have become graveyards for new equipment. Inactive equipment, however, is a major contributor to extravagant costs and waste of resources (15).

Furthermore, ambiguity of guidelines has been shown to be an inhibitory factor affecting HAI control and prevention in ICUs. Such clinical guidelines are used to improve service quality, to reduce unnecessary or detrimental interventions, to treat patients with maximum quality and minimum damage, to lower costs, and to improve overall performance of healthcare systems. These clinical guidelines cannot be established on their own but their effectiveness depends on their distribution and implementation. If clinical guidelines are not properly established, time, energy, and expenses dedicated to develop them will be wasted. Clinical guidelines must be thus paired with resources, facilities, and infrastructures in order to be implemented correctly (16).

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