

Evaluating Nurses' Performance and Knowledge of the Correct Consumables and Inconsumable Disinfection Method in Endoscopy Departments of Covered Hospitals Mashhad University of Medical Sciences

Shapour Badiee Aval¹, Behnaz Samiee², Golnaz Sabouri³, Elnaz Sadeghian⁴, Zahra Abbasi Shaye⁵, Javad Mahmoudi Fathabadi², Rozita Davoodi², Fariba Zeinaly⁶, *Negar Yeganeh Khorasani⁷

¹Department of Complementary and Chinese Medicine, School of Persian and Complementary Medicine, Mashhad University of Medical Sciences, Mashhad, Iran.

²Deputy of Treatment, Mashhad University of Medical Sciences, Mashhad, Iran.

³Clinical Research and Development Center, Deputy of Treatment, Mashhad University of Medical Sciences, Mashhad, Iran.

⁴MSC of Medical engineering. Deputy of Treatment, Mashhad University of Medical Sciences, Mashhad, Iran.

⁵Akbar Clinical Research and Development Unit, Mashhad University of Medical Sciences, Mashhad, Iran.

⁶Student Research Department of Medical Sciences, Islamic Azad University of Sabzevar, Iran.

⁷Student Research Committee, Faculty of Pharmacy, Mashhad University of Medical Sciences, Mashhad, Iran.

ARTICLE INFO	ABSTRACT
<p>Article type: <i>Patient Safety</i></p> <hr/> <p>Article History: Received: 25 Sep 2022 Accepted: 13 Nov 2022</p> <hr/> <p>Key words: <i>Disinfectant, Endoscopy, Nurses.</i></p>	<p>Introduction: The increase and diversity of diagnostic and therapeutic methods using rigid or flexible endoscopes have focused much attention on the possibility of infection transmission in this way. Therefore, nursing personnel must have basic information on sterilization and disinfection of tools.</p> <p>Materials and Methods: This descriptive-analytical study aimed to evaluate the staff's performance and awareness of healthcare instructions for proper disinfection of endoscopic consumable and non-consumption equipment in the hospital affiliated with Mashhad University of Medical Sciences, which had endoscopy departments. The data collection tool was the standard endoscope decontamination evaluation checklist taken from the translation of the checklist of WHO and analyzed by SPSS 20 statistical software.</p> <p>Results: The results showed a statistically significant difference between nurses' knowledge and performance (P-value = 0.03), and nurses' performance had lower percentages than knowledge.</p> <p>Conclusion: Due to the statistically significant difference in nurses' knowledge and practice in correct disinfection of consumable and non-consumable equipment in endoscopy and the low performance of nurses in some areas of the disinfection process, interventions such as face-to-face training of nurses and continuous monitoring of performance, especially evaluation of three months of nurses' performance are necessary.</p>
<p>► Please cite this paper as: Badiee Aval SH, Samiee B, Sabouri G, Sadeghian E, Abbasi Shaye Z, Mahmoudi Fathabadi J, Davoodi R, Zeinaly F, *Yeganeh Khorasani N. Evaluating Nurses' Performance and Knowledge of the Correct Consumables and Inconsumable Disinfection Method in Endoscopy Departments of Covered Hospitals Mashhad University of Medical Sciences. <i>Journal of Patient Safety and Quality Improvement</i>. 2022; 10(4): 147-151. Doi: 10.22038/PSJ.2022.68115.1377</p>	

*Corresponding Author:

Student Research Committee, Faculty of Pharmacy, Mashhad University of Medical Sciences, Mashhad, Iran.
E-mail: yeganehn972@mums.ac.ir

Introduction

Every year millions of surgeries are performed in the world, and each of these operations includes medical instruments and surgical equipment related to sterile tissues or patient mucous membranes. One of the main dangers and complications of all medical methods and processes and infection treatment is proper disinfection method, as sterilization of equipment significantly reduces or eliminates the risk of infection through tools and equipment from the transmission. It also prevents the transmission of pathogens by a common device from one person to another and the transmission of environmental pathogens. Healthcare-associated infections (HAIs) are associated with hospitalized patients (1-7). In medical centers, it is important to ensure that the treatment processes and surgical and medical instruments do not transmit pathogens to the patient. As a result, a correct definition of disinfection and its methods are needed.

Disinfection is the removal of many of the pathogenic microorganisms present on inanimate objects, except bacterial spores. Disinfection is performed at three levels, including high-level disinfectant (HLD), intermediate-level disinfectant (I.LD), and Low-level disinfection (L.L.D) (8). Thermal disinfection is the chemical degradation of various pathogenic microorganisms, which is less lethal in this type of health care than sterilization because it kills most microorganisms and not all microbial forms (bacterial spores) (9).

Sterilization is a chemical or physical process that kills all microbes, such as bacteria, spores, viruses, parasites, and fungi. The risk of transmitting pathogens is high when using protective equipment that is not sufficiently sterilized. One of the methods and strategies to control nosocomial infections is using chemicals in disinfection. Today, different chemicals with different formulations and uses are used in health centers and hospitals. Although using various chemicals as a disinfectant and antiseptics can be effective and useful in controlling nosocomial infections, the improper use or incorrect choice of a disinfectant for a specific purpose can lead to problems and consequences. Sometimes, it

causes many expenses to fix, and sometimes, it can leave irreparable damages and consequences. Therefore, the correct choice and use of a disinfectant are important (10).

About 30 years ago, Edge Spaulding proposed a rational approach to disinfecting and sterilizing equipment and patient care items, known as the classification plan because of its clarity and logical and appropriate steps; it is still used by hospital staff to control infection and the process of disinfection and sterilization. Spaulding believed that the application of disinfection solutions should be reasonable, so the basis for choosing the disinfection and sterilization method should be based on the level of risk and the criticality of the process being carried out. Based on this, the tools and factors related to medical care are classified into vital, semi-vital, and non-vital groups based on the degree of risk of infection (11).

Due to the increase and the variety of diagnostic and therapeutic methods using rigid or flexible endoscopes, much attention has been paid to the possibility of transmission of infection through this in the field. Nowadays, gastrointestinal endoscopy is developing rapidly and is becoming more important; while initially used only for diagnosis, in recent years, it has covered a wide range of treatments (12). Therefore, there is a high infection risk level classified according to the degree of invasiveness of the method. In this regard, effective decontamination can protect patients from infection, ensure the quality of diagnostic procedures and samples, and extend the equipment's life.

Also, due to the limitations of this equipment and the cost of tools and equipment, rapid rotation between patients in disinfection and their preparation is neglected. It should be planned so that there is enough time between patients for adequate endoscope disinfection. Staff should be trained and aware of the intricacies of the endoscope to ensure that they follow the instructions correctly. Infection prevention and control are important to a patient's safe care. On the other hand, it should be noted that nosocomial infections are divided into

endogenous and exogenous. In endogenous Infection, the source of infection is the natural flora of the patient's body; preventing these infections is difficult but sometimes possible. In the exogenous type, sources of infection are outside the patient's body. These infections are very dangerous and are caused by nosocomial-resistant microorganisms, but proper use and principled disinfectants help to control these infections significantly.

Of all kinds of infections, Nosocomial infections include urinary tract infections, pneumonia, and wound infections. Such infections can increase the length of hospital stay of patients. According to research on many nosocomial infections in the operating room, contaminated medical devices are one of the most important sources of nosocomial infections. So exogenous hospitalization infection can be controlled by disinfecting surgical instruments and different surfaces and observing sterilization. Staff knowledge of properly using effective and safe disinfectant and disinfectant solutions with minimal damage to equipment is one of the basic principles of prevention and control of nosocomial infections (10).

However, various studies show that the level of knowledge of nurses about the correct method of disinfecting medical equipment and instruments is insufficient; therefore, the necessity of holding training courses and compiling manuals or clinical guides in this field has been emphasized (13). The present study was designed to determine the knowledge of nurses working in the endoscopy departments of hospitals under the Mashhad University of Medical Sciences regarding the principles and correct method of disinfection of consumable and non-consumable equipment in these departments.

Materials and Methods

This research was a descriptive-analytical study to evaluate nurses' knowledge of the correct use of disinfection solutions for consumable and non-consumable equipment in the endoscopy department of hospitals under the coverage of Mashhad University of Medical Sciences was done in the second half of 1397. The sample size calculation was done in two stages. First, by

the census method of all the nurses working in these two departments, and then proportionally, 50% of the nurses were calculated. Also, the result used to calculate the sample size was the census method and quota.

The first phase of this study was to extract information about nurses' knowledge of the correct method of disinfection of consumer equipment and other Consumption in the endoscopy department was sampled by census method. So all nurses working in the hospitals of Mashhad University of Medical Sciences who worked in the endoscopy department were included in the study and asked to complete the questionnaires. Then, proportionally, 50% of nurses with at least five years of service and at least one year of experience in the endoscopy department were included.

Then, the infection control supervisor was present at the site during disinfection by the relevant nurse and completed the mentioned checklist through observation. In both stages of the study, those who did not want to cooperate were excluded. Data were collected in both phases from the checklist for evaluation of endoscopy questionnaires from the World Health Organization based on the translation approved by the Ministry of Health (14-17).

The checklist in two parts; the first part includes demographic information (gender, age, level of education, marital status), and the second part includes ten questions about nurses' awareness of how to properly disinfect introducing and non-consumable equipment in the endoscope (pre-clean stage, Manual cleaning, disinfection and rinsing, and drying, as well as how to use the automated system if used, storage of endoscopes and training related to the device) was provided to the nurses. Finally, the information was collected by the checklist using SPSS software version 20, and parametric analysis and reporting were performed using a t-test and chi-square test if necessary.

The score was calculated based on a percentage and 0 to 50% level of awareness and unfavorable performance, 51 to 70% relatively favorable or moderate, and 70-100% good considered.

Results

A total of 57 nurses participated in this research, including 20 men (35%) and 37 women (65%). According to the findings, the knowledge level of nurses in the area of clinical procedures (70.3%) was good; however, the awareness and performance of nurses were average in the areas of manual cleaning (61.66%), rinsing and drying systems (59.98%), disinfection (54.87%), and health and safety training (53.4%). Also, the level of knowledge of nurses in the areas of automatic endoscope preparation system (48.66%), performance monitoring according to the type of endoscope (38.9%), and storage (17.85%) was unfavorable. Statistical surveys did not show a significant difference between the demographic variables, including gender, age, level of education, marital status, with the knowledge and performance level. However, the comparison between the knowledge and performance indicated a statistically significant difference in the areas of clinical procedures ($p=0.025$), manual cleaning ($p=0.042$), automatic endoscope preparation system ($p=0.031$), and storage ($p=0.03$), which indicated the lower percentage of nurses' performance compared to their knowledge.

Discussion

On 13 October 2005, the World Health Organization announced more than 14 million people were suffering from Hospital infections. This amount is more than 25% in developing countries (18). Disinfection of consumable and non-consumable equipment in the endoscopy department is an important way to control infection and protect the health and safety of the Patients as well as the medical personnel of the endoscopy department (19). The purpose of this study was to investigate the knowledge and performance of nurses in hospitals covered by Mashhad University of Medical Sciences in health care instructions for the correct disinfection of consumable and non-consumable equipment of the endoscopy department. Sampling was done from 5 hospitals in Mashhad. Out of 57 nurses participating in this project, the highest level of nurses' knowledge was in the field of clinical procedures (70.3%), manual

cleaning (61.66%), and rinsing and drying systems (59.98%). Moreover, nurses lacked knowledge of storage (17.85%). Due to the existence of a statistically significant difference in the awareness and performance of nurses in the correct decontamination of consumable and non-consumable equipment in the endoscopy departments and the low level of knowledge of nurses in some areas of the disinfection process, interventions such as face-to-face training Nurses, continuously monitor the performance of nurses, especially the three-month evaluation of the performance of nurses is necessary. This finding was in line with the results of Sukhlecha's research, which was conducted in 2015 to investigate the knowledge and performance of hospital health staff regarding sterilization (13).

One of the main limitations of this study was to be conducted in several hospitals covered by Mashhad University of Medical Sciences, so results cannot be generalized to the whole country. Therefore, it is recommended to design similar studies in other regions. However, some of the gaps between knowledge and compliance with the principles related to health care were examined in this study. Also, determining the level of knowledge of nurses about the correct method of disinfecting consumable and non-consumable equipment in the endoscopy departments in hospitals determined Weakness points and showed their educational needs should help in this field. Based on this, the necessary planning can be done to train nurses to improve their awareness. In this way, it can be expected that the number of hospital infections, and the transmission of infection to patients through the mentioned medical devices and equipment, will decrease. Therefore, the results of this research will be effective in adopting preventive policies and planning in-service training for nurses working in the departments mentioned above in this field. The results of this study can increase the nurses' awareness of how to use disinfectant solutions correctly and significantly reduce hospital infections, which ultimately leads to improving patient and community health, reducing the length of hospitalization, reducing the possibility of re-hospitalization, and reducing care and treatment costs.

Ethical endorsement

This article is taken from the research project approved by Mashhad University of Medical Sciences with a code of ethics IR.MUMS.REC.1398.232.

Acknowledgments

The authors would like to thank the staff of the endoscopy department of Mashhad Teaching Hospitals for their help and cooperation in the data collection.

Reference

1. Magill SS, Edwards JR, Bamberg W, Beldavs ZG, Dumyati G, Kainer MA, Lynfield R, Maloney M, McAllister-Hollod L, Nadle J, Ray SM. Multistate point-prevalence survey of health care-associated infections. *New England Journal of Medicine*. 2014 Mar 27;370(13):1198-208.
2. Council of the European Union: Council conclusions on patient safety and quality of care, including the prevention and control of healthcare-associated infections and antimicrobial resistance (2014/C 438/05). *Official Journal of the European Union* (2014)
3. Rutala WA, Weber DJ. Disinfection, sterilization, and antisepsis: An overview. *American journal of infection control*. 2016 May 2;44(5):e1-6.
4. Rutala WA, Weber DJ. Disinfection and sterilization in health care facilities: what clinicians need to know. *Clinical infectious diseases*. 2004 Sep 1;39(5):702-9.
5. Charrier L, Argentero PA, Farina EC, Serra R, Mana F, Zotti CM. Surveillance of healthcare-associated infections in Piemonte, Italy: results from a second regional prevalence study. *BMC Public Health*. 2014 Dec;14(1):1-7.
6. Durando P, Icardi G, Ansaldi F, Crimi P, Sticchi C, Compagnino F, Fabbri P, Baldelli I, Bellina D, Sacco R, Assensi M. Surveillance of hospital-acquired infections in Liguria, Italy: results from a regional prevalence study in adult and paediatric acute-care hospitals. *Journal of Hospital Infection*. 2009 Jan 1;71(1):81-7. Lizioli A, Privitera G, Alliata E, et al. Prevalence of nosocomial infections in Italy result from the Lombardy survey in 2000. *J Hosp Infect* 2003; 54 141-8.
7. Lizioli A, Privitera G, Alliata E, Banfi EA, Boselli L, Panceri ML, Perna MC, Porretta AD, Santini MG, Carreri V. Prevalence of nosocomial infections in Italy: result from the Lombardy survey in 2000. *Journal of Hospital Infection*. 2003 Jun 1; 54(2):141-8.
8. Rutala WA, Weber DJ. Disinfection, sterilization, and control of hospital waste. *Mandell, Douglas, and Bennett's principles and practice of infectious diseases*. 2015:3294.
9. Damani NN. Disinfection and sterilizations. In *Manual of Infection Control Procedure*, 2nd edn. London: Cambridge University Press, 2003
10. Sterilization, sterilization and disinfection in hygienic environments Qazvini and Dr. Mehdi Norouti .Acupuncture. Suspension: Dr. Kiarash Omid Mehr Mashhad. 1392
11. Spaulding EH. Chemical disinfection of medical and surgical materials. In: Lawrence C Block SS, eds. *Disinfection, sterilization, and preservation* Philadelphia: Lea & Febiger, 1968: 517-31.
12. Iwakiri R, Tanaka K, Gotoda T, Oka S, Ohtsuka T, Sakata Y, Chiba T, Higuchi K, Masuyama H, Nozaki R, Matsuda K. Guidelines for standardizing cleansing and disinfection of gastrointestinal endoscopes. *Digestive Endoscopy*. 2019 Sep; 31(5): 477-97.
13. Sukhlecha AG, Vaya S, Parmar GG, Chavda KD. Knowledge, attitude, and practice regarding sterilization among health-care staff in a tertiary hospital of western India. *Int J Med Sci Public Health*. 2015 Oct 1;4(10):1377-82.
14. Essential Elements of a Reprocessing Program for Flexible Endoscopes – Recommendations of the Healthcare Infection Control Practices Advisory Committee. CDC. HICPAC. Provide on (<https://www.cdc.gov/hicpac/>).
15. Qazvini K, Sadeghi R. Disinfection and preparation of medical tools and equipment in health centers. Ni Nagar Publications; 2018.
16. Qazvini K, Nowrozi M. Sterilization, disinfection and disinfection in healthcare environments. Omid Mehr Mashhad Publications; 2014.
17. Masoumi Asl H, et al. National Guidance of Nosocomial Infection Care System . Center for Infectious Diseases, Ministry of Health, Treatment and Medical Education, Chekame-Ava Publications. 2007.
18. Rosenthal VD Device-associated nosocomial infections in limited-resources countries: findings of the International Nosocomial Infection Control Consortium (INICC). *American Journal of infection control*. 2008; 36(10): S1717-12
19. Shin JE, Jung Y, Lee JH, Son BK, Jang JY, Kim HK, Jang BI. Updates on the disinfection and infection control process of the accredited endoscopy unit. *Clinical Endoscopy*. 2019 Sep 30;52(5):443-50