

Research Article**Effect of training on compliance with standard principles of urinary catheterization in surgical patients: an audit cycle evaluation****Parisa Naserian¹, Nasrin Elahi^{2*}, Sara Adarvishi³,
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Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran**ABSTRACT**

Background and Objective: Despite numerous health standards in hospitals, 80% of urinary tract infections are caused by catheterization. A urinary catheter is one of the important tools for medical and nursing care and given the widespread use of the device, its improper use could lead to infectious complications. The aim of this study was to evaluate the effect of training and implementation of audit cycle on compliance with standard principles of catheterization in chronic patients in operating room of one of the Hospital in Ahvaz..

Methods: the type of study was clinical trial by using clinical audit. Preliminary audit was carried out to determine the current status of bladder catheterization process in one-month period on 50 patients with chronic disease one of the hospital operating. After the intervention (training of personnel regarding the nursing standards and more supervision and control over the performance of staff) re-audit was performed. The data was obtained through the observation and using standard checklist of Fundamentals of Nursing and were analyzed using SPSS software.

Results: the results of the preliminary audit showed that the average compliance with standard principles of catheterizations before training was 54.74 which was reached to 109.94 after audit and training of the standard principles of catheterization. This difference was statistically significant ($p < 0.05$).

Conclusion: The results of the audit showed that more supervision and control over the performance of staff as well as implementing educational programs can be an effective step in reducing nursing errors associated with bladder catheterization process.

Keywords: education, audit cycle, urinary catheterization, chronic patients, operating room

INTRODUCTION

Hospital is a place for treatment and cure of patients and should not be a factor that causes diseases. Unfortunately, since the beginning of patients' admission to date, the hospitals have always been the center of various infections called "nosocomial infections" that cause numerous

problems for patients and medical staff. So far many patients who hospitalized for various reasons have lost their lives due to nosocomial infections (1). nosocomial infection is defined by Centers for Disease Control and Prevention (CDC) in USA as a group of infections that are

acquired by patients during their length of stay in hospital, and often after the first 48 hours of admission (2). According to the report of Centers for Disease Control (CDC), nosocomial infections cause the deaths of two million people annually and result in more than \$11 billion loss in hospitals in America. These infections cause many problems in the process of treatment and can cause considerable losses including prolonged hospital stay, increased use of medication, increased cost of medical procedures and so forth (3). Such infections undermine the work of best surgeons. Furthermore, by prolonged occupation of hospital beds in addition to economic losses, it damages one of the most important goals of macroeconomic policy of health systems in the world (public access to health facilities in the country) (2). According to the latest research articles, the most common nosocomial infections include urinary tract infections, pneumonia, and bacteremia. Among these infections, urinary tract infections (UTI) are responsible for 45% of nosocomial infections and in 80% of the cases hospital acquired UTIs are caused by catheterization. A urinary catheter is one of the most important tools for medical and nursing care and given the widespread use of this device, improper use of it can lead to infectious complications (4). Catheter-related side effects can be divided into two groups. The first group includes complications that may be caused in both short- and long-term use of catheters such as: fever, acute pyelonephritis and urinary tract infection. The second group includes complications that may be developed by long-term use of catheter such as obstruction, urinary tract stones, and chronic kidney inflammation, local infection of the tissues around the urethra, renal failure and in case of prolonged use of urinary tract catheter bladder cancer. These complications can cause illness, increased length of stay and hospital costs (5). Urinary tract infection in patients with urinary catheters in Shiraz Burn Center has been reported more than 85% (6). Catheter-related UTI on average increases the hospitals stays by 2.4 to 4.5 days and is associated

with increased mortality in hospital (7). Also, UTI is the second most common cause of nosocomial sepsis (8). Each hospital-acquired UTI adds about \$ 676 to the costs of hospitalization and in the outbreak of bacteremia this extra cost reaches to \$ 2836 (9,10). Since catheterization is one of the main parts of nursing care (4), the care during and after insertion of catheter has an important effect on occurrence or preventing UTI which are caused by catheterization. According to reports, improper technique for catheter insertion is the most important risk factor of infection and is responsible for the most cases of catheter-related infections (11). Crowe et al in one of the few studies on catheter care evaluated the care status of indwelling catheter and reported that infection preventing techniques are mainly considered at the beginning of catheterization and are less considered in the later stages. In overall, the quality of catheter care has been reported less than standard level (12). According to the Hampton report, the highest risk for transmission of infectious agents and catheter-related urinary tract infections is when a catheter is inserted (13). Aghajani and Adib reported that the quality of nursing care at the time of catheter placement is not favorable and is poor based on the 32% earned points (11). In addition, Mousavian and Mashali stated that factors such as poor disinfection or sterilization conditions during catheter placement, a catheter installation by different people, such as doctors, nurses or medical residents who have different educational levels can affect the level of bacteriuria (14). Given the extent of the consequences and complications of non-compliance with standards during catheterization, special attention should be paid to nursing care for catheterization in order to improve the quality of care (15). For this purpose, the audit training is used that is one of the centerpieces of clinical governance. Clinical governance provides a framework and a new method for clinical care standards in hospitals in Iran and also commits health care providers to the principles of excellence clinical services and thereby makes them responsive towards the maintenance and

quality of services that they offer (16). Clinical audit is a systematic approach based on valid evidences and standards that ensures us the quality of health care is constantly upgrading (17). In this process, standard for providing care and services is determined and then the status quo is evaluated and the cases that do not comply with the standards are determined to improve the quality of care and services (18). The main purpose of monitoring and control in clinical audits is continuous improvement of personnel's performance in the hospital or any other healthcare center. Having a good standard and accurate process control is important because by comparing the result of the actions with the standards, deviations can be detected (20). In this regard nurses as one of the largest health care providers, must have extensive knowledge and skills in order to provide the assigned responsibilities. Audit is performed to assess the nurses' performance and their compliance with the standards (21). Failure to use a proper and scientific audit and quality control system can cause nurses' discontent and ultimately lack of interest in work that undermines the quality of care (22). JafarZadeh et al in a study aimed at clinical audit and improving the process of bladder catheterization showed that more supervision and control over the performance of personnel as well as educational programs can be an effective step in reducing nursing error associated with bladder catheterization process (23). Hence, as the urinary catheterization is the main responsibility of the nurses, the quality of catheterization care largely depends on how services are provided by nurses (15). Nevertheless, the results of some studies have shown that urinary catheterization procedures are not properly followed by nurses (24). Considering the fact that clinical governance provide a framework and a new method for compliance with clinical care standards in hospitals in Iran and that it executed five years ago, however no study entitled clinical audit evaluation has been conducted on the principles of catheterization in patients referred to the operating room in a

complete audit cycle in Ahvaz while its necessity is felt. According to the researcher's observations, urinary catheter and cares are not conducted in accordance with existing standards. Therefore, the aim of this study is to investigate the principles of urinary catheterization in patients referred to general operating room in one of the Hospital in Ahvaz in order to improve the quality of nursing care in the area of catheterization. Also the study aims at reducing post-operative infection in patients in order to decrease waste of time, extra costs related to complications arising from non-compliance with legitimate standards and to enhance satisfaction with nursing care.

METHODS

This study was a randomized clinical trial which was carried out after obtaining the permission of the relevant authorities and the approval of the ethics committee of Jondi-Shapour University of Medical Sciences in 2016. The study population consisted of nurses involved with responsible for urinary catheterization of patients with chronic diseases such as diabetes, cardiovascular disease and chronic kidney disease referred to the general operating room of one of the Hospital.

The study sample consisted of urinary catheterization in patients with chronic disease referred to the general operating room. According to the study by Jafarzadeh et al (2011) in Mashhad(16), sample size was estimated 100 patients by statistician Research environment was operating room of one of the hospital in Ahvaz. In this study, the status quo was examined based on the observation of the researcher. This environment was selected because the researcher was familiar with the environment and his presence as a colleague did not cause exhibitiv behaviors in nurses while observing and collecting information. Event sampling observation was selected as the method of this study which is based on the number of observations recorded by the researcher. Inclusion criteria included all urinary catheterization in the general operating room. Exclusion criteria were emergency catheterization and urinary catheterization in

patients with anatomical problems. The instruments used to collect data were demographic questionnaires and checklist. The demographic data including nurse's age, work experience, education level, training history about infection control, working shift, gender, type of surgery, necessity of catheterization, size of the used catheter and antibiotics use were collected using self-administered questionnaire. In order to assess the compliance with principles of urinary catheterization nursing, standard checklist of urinary catheterization compiled by Nursing Organization was used. This checklist contained 54 close-ended questions which was filled based on the observed events. In terms of response criteria, each item consisted of three parts. First part was related to the performance based on the principles with the highest score of 2 and this is when the care is in accordance with the standard. The second part with score 1 is when the performance is inconsistent with the principles. The third part with score 0 is when there is no relevant care. The questions of checklist was marked and scored and then the care score was determined according to the questions related to each observation in the specific section. Because the instrument used in this study was a standard checklist of Nursing Organization and approved by the audit team in Iran, there was no need to determine the validity and reliability of the questionnaire. For sampling, the researchers first formed an audit team including a researcher, a nurse responsible for infection control, head nurse in the operating room and a nurse responsible for clinical governance of operating room. With the agreement of the audit team members, relevant checklist was extracted using standard text book of nursing services compiled with Nursing Council of Iran in 2006 and revised and the changes were applied by the team members. Then the researcher referred to the study place daily in three shifts of morning, afternoon and night and completed the checklist based on the structured observation of urinary catheterization procedure in patients referred to the operating room. It should be noted that in the first step the researcher fully

observed urinary catheterization process and then immediately began to fill the checklist. Quality measures of the check list were as follows: performing based on the principles, not performing based on the principles, and not performing with the scores allocated from 2 to 0, respectively. Then the checklists were analyzed by the team and items that did not meet the standards were specified. The possible approaches for improving the current situation were determined by the team and the proper reforms and training were implemented. After going through the period of time needed for implementation of reforms, again the catheterization process was assessed using the checklist and the results before and after implementations of reforms were compared.

The collected data were analyzed with SPSS software (V 20) and using descriptive and inferential statistical methods. Descriptive statistics included mean (Indices of central tendency), SD (diffusion index) and frequency distribution and relative frequency. Inferential statistical methods with significance level of 0.05 and Confidence Interval of 95% were considered. In order to measure qualitative and quantitative variables before and after the implementation of corrective measures McNemar's test and paired t-test were used, respectively. In case the data was not normally distributed, Wilcoxon test was used to compare each of the variables before and after implementing the necessary reforms. Since clinical audit aims to improve the quality and is not an unexpected inspection, the nurses were notified of the observation while doing the catheterization process. The nurses were explained that the process is observed not the person, and the observation was first performed without checklist to resolve any misconception and limitation.

RESULTS

A total of 50 nurses were evaluated including 25 men and 25 women. The mean age of participants was 28.16 ± 28 years. Most surgeries were related to hysterectomy, laparotomy and orthopedic surgery. In terms of work experience, 33 nurses (66%) had less than 5 years, 32 nurses (32%)

between 5 and 15 years and 1 nurse (2%) had more than 15 years work experience. In terms of history of participation in infection control training courses, 5 people (10%) had participated and 45 people (90%) had not participated in training program. 100% of patients in relevant wards had received antibiotics before surgery. In relation to the size of the urinary catheter, 5 catheter with size 12 (10%), 14 catheter with size 14 (28%) and 31 catheter with size 16 (62%) was used. The results in table 1 show that there is statistically significant difference between the average of all evaluated areas in terms of the compliance with the principles of catheterization and urinary catheter-related audit before and after intervention. The results in Table 2 also show that according to the regression model adjusted by using backward method (after excluding the confounding effect of other variables) there is a significant correlation between the audit variable related to urinary catheterization with variables age, gender and passing training program for infection control (yes-no). Part of the variance for response change (urine catheterization-related audit) which justified by variables in the final regression model (R^2) was 0.40 which reflects the efficiency of the model. In other words, 40% of the variable changes of "urinary catheterization-related audit" are explained compared to the independent variables in this model and 60% is explained by other variables.

DISCUSSION

In this study, at first, clinical audit related to urinary catheterization and the distance between the status quo and desirable standards was determined with an average. The average of pre-intervention was 54.74 and after the audit and compliance training for standard catheterization was promoted to 109.94. In a study by Hassan Zadeh et al (2014), which was conducted in Tabriz University of Medical Sciences using standard checklist, the distance of current situation of catheterization with the desired standards was reported 43.29. Also, according to the self-assessment and observations, there was a

significant difference between the average of pre- and post-training (28), which was in line with the results of this study.

In this study, 50 nurses including 25 men and 25 women were evaluated. The average age of participants was 28.16 ± 28 years while in the study by Ansarian et al (2012) in Ghazvin the most people who were underwent catheterization and evaluated were women with the frequency of 36 (90%). The frequency of men was 4 (10%). Most participants were in the age group 21-30 years old, which was inconsistent with this study in terms of gender and age range of subjects. Ansarian concluded that there is a significant relationship between the methods of catheterization and individual demographic characteristics such as gender, age and level of education. This result is in line with our findings regarding the correlation between audit variable related to urinary catheterization with gender, age and passing training programs for infection control (5). In the study by Ansarian et al, the factors such as academic education and the timeframe between graduation and beginning work in the hospital was investigated because most participants were women with bachelor's degree and also due to obtaining favorable results related to the catheterization methods. In contrast, the majority of participants in this study had less than 5 years' work experience who were not follow the standard principles of catheterization and thereby the results of this study is inconsistent with Ansarian study results. In order to justify this discrepancy, it should be noted that people with little experience normally follow the old routine procedures in the hospital (5).

Ansarian et al indicated a significant relationship between the catheter sterilization and individual demographic characteristics such as gender, age and level of education. In addition, following the sterilization procedure during catheterization has been reported at a desirable level. In this regard, factors such as the sensitivity of the person in charge of catheterization due to the academic education alongside following the requirements learned at university can be noted. Furthermore,

although the participants were young and have sufficient attention for the work, but the level of sterilization during catheter placement in this study was low which is due to following the old routine in this process (5).

Moreover, similar study carried out by Jafarzadeh et al (2011) in Om Al banin Hospital in Mashhad. Initially, audit carried out on 40 patients hospitalized in women ward in order to determine the current status of bladder catheterization process in one-month period. After the intervention (training about nursing standards and supervision and control over the performance of staff) re-audit was performed. The results of the preliminary audit showed that, in 70% of cases bladder catheterization process was conducted in accordance with standards and after the intervention, re-audit reached the level of 82%, which the difference was statistically significant. In line with our study, the results of the audit study by Jafarzadeh showed that more supervision and control over the performance of staff as well as educational programs can be an effective step in reducing nursing error associated with bladder catheterization process (23). TelschianTabrizi et al (2011) conducted a study with the aim of reporting the cases in compliance with the standard guidelines and to determine the severity of pain and distress (discomfort) caused by urinary catheterization in 100 healthy women who underwent elective cesarean in teaching hospitals in Tabriz. The results of this study showed that not using lubricant gel is one of the factors that increase pain, discomfort and suffering in patients. Also, contrary to the guidelines' recommendation, failure to provide adequate explanations to patients about catheterization process causes increased distress and concerns in patients. Telschian suggested that due to the large amount of pain and distress in study subjects nursing guidelines for catheterization should be followed. Similar results have been obtained in the present research (29).

CONCLUSION

Audit results associated with standard principles of urinary catheterization showed that more

supervision and control over the performance of staff as well as holding training courses can be an effective step in improving the quality of urinary catheterization by nurses.

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REFERENCES:

1. Morseli P, Hafez M, Efati M. A review of hospital infection and control methods. *Journal of Military Medicine factory the Islamic Republic of Iran* 2007; 2(3): 31-4. (Persian)
2. Amanloo S, Farjah GH, Taghavi MR, kelarestagh H, Jahantigh HA, Saboori GH. Microbial contamination in hospital operating rooms AmiralMomenin city of Zabol. *Journal of North Khorasan University of Medical Sciences* 2011; 3(3): 7-14. (Persian)
3. Lari pour M, Farsad SH. Incidence of nosocomial infection in a hospital in the city of Qom in 2007. *Journal of Medical Microbiology of Iran* 2011; 5(6): 7-17. (Persian)
4. Basami K, Mahdavi Z, NikravanMofrad M, Kohestani H, Baghcheghi N. Effects of disinfecting meatus and urinary catheter with 10% Povidone Iodine ointment on incidence rate of bacteriuria in hospitalized male patients in neurologic wards. *Journal of Arak University of Medical Sciences* 2008; 11(2): 10-18. (Persian)

5. Ansarian N, Hashemi F. Evaluation of sterile precautions during catheter in the operating room teaching hospitals of the province Qazvin in 2010. *Edrak Journal of Qazvin University Research Committee* 2012; 7(26): 49-52. (Persian)
6. Asgariyan M, Hoseini SR, KHeyrandish P. The incidence of blood and urinary infections in burned patients admitted to the Burn Center Ghotbeddin Shiraz in 2000-2001. *Journal of Mazandaran University of Medical Sciences* 2003; 13(38): 33-9. (Persian)
7. Apisamtharak A, Rutjanawech S, Wichansawakun S, Ratanabunjerdkul H, Patthranitima P, Thongphubth K, et al. Initial inappropriate urinary catheters use in a tertiary care center: Incidence, risk factors, and outcomes. *Am J Infect Control* 2007; 35(9): 594-9.
8. Maki DG, Tambyah PA. Engineering out the risk of infection with urinary Catheters. *Emerging Infectious Diseases* 2001; 7(2): 1-12.
9. Saint S. Clinical and economic consequences of nosocomial catheter-related bacteriuria. *American Journal of Infection control* 2000; 28(4): 68-75.
10. Gammack JK. Use and management of chronic urinary catheters in long-term care: much controversy, little consensus. *J Am Med Dir Assoc* 2003; 4 (2): 52-59.
11. Adib Haj Bagheri M, Aghajani M. Quality of care for patients with a urinary catheter in place in teaching hospitals of Kashan in 2005. *Feyz Journal* 2008; 12(1): 61-8. (Persian)
12. Crow R, Mulhall A, Chapman R. Indwelling catheterization and related nursing practice. *J Adv Nurs* 1988; 13: 489-495.
13. Hampton S. Nursing management of urinary tract infections for catheterized patients. *Brjnurs* 2004; 13: 1180-1184.
14. Mosavian SM, Mashali K. Study of bacterial infections of the urinary tract catheterization and after Determine the pattern of antibiotic resistance of bacteria isolated from patients. *Journal of Hamadan University of Medical Sciences and Health Services* 2004; 11(2): 29-34. (Persian)
15. Newman DK. The indwelling urinary catheter: principles for best practice. *Journal of wound, ostomy, and continence nursing: official publication of The Wound, Ostomy and Continence Nurses Society / WOCN.* 2007; 34(6): 655-61; 62-3.
16. Offenstadt G. Clinical governance: Definitions and recommendations. *Intensive and Critical Care Medicine.* 2009: 61-8.
17. Yarmohammadian M H, Mojahed F, Vahidi RG, Gholipour K, Shokri A, Rasti V. Clinical Audit of Self-Discharge against Medical Advice in Dr. Soulati Hospital in Urmia, Iran. *Health Information Management. Special management of the health system* 2012; 9(7): 1006-14.
18. Hadizade F, Adibi P. Clinical Governance, a solution for implementation, health information journal 2012; 9(3): 305-9.
19. Khalighi Nejad N, Ataee M, Window to the clinical governance and clinical service excellence. *Of Isfahan. Isfahan University of Medical Sciences and health services* 2007 (1): 5-10.
20. Hardin S, Kaplow R. *cardiac surgery essentials for critical care nursing.* Canada, Jones and Bartlett, 2010.
21. Masoudi ASL I. *Fundamentals of nursing care management.* Tehran: Jamenegar-Salemi; 2010. p. 27-28.
22. Hosseini H. *Structural and Process Standards in Emergency Ward of th Selected Hospital of Isfahan University of Medical Sciences.* *IJNMR* 2007; 12(2): 65-68.
23. Jafar Zadeh A, Hoseini M, Davoodi R, Rahmani SH, Sabiiri G. The audit process bladder catheterization gynecological hospital Ommolbanin in 2011. *Tabriz University of Medical Sciences Congress Portal.*
24. Oman KS, Makic MB, Fink R, Schraeder N, Hulett T, Keech T, et al. Nurse-directed interventions to reduce catheter-associated urinary tract infections. *American journal of infection control.* 2012; 40(6): 548-53.

25. Dailly S. Auditing urinary catheter care. *Nurs Stand.* 2012; 26(20): 35-40.
26. Chenoweth CE, Gould CV, Saint S. Diagnosis, management, and prevention of catheter-associated urinary tract infections. *Infectious disease clinics of North America.* 2014; 28(1): 105-19.
27. Book of standards of nursing care. Nursing Council of the Islamic Republic of Iran. Tehran. 2006.
28. Hasanzadeh S, Golanbar P, Sharifi M, Noriasl H, Sarbazvatan H, Ghafari R, et al. Catheterization Of The Bladder Skills Training To Improve Clinical Services Offered To Patients In The Clinical Audit. The 1st Conference Congress on Clinical Audit and Quality Improvement. 17-19 oct 2012; Tabriz, Iran.
29. TelschianTabrizi N, Torabi Z, Mokhtarkhani M, Madani M, Parnianfard N, Hajebrahim S. Catheterization Of The Bladder Skills Training To Improve Clinical Services Offered To Patients In The Clinical Audit. The 1st Conference Congress on Clinical Audit and Quality Improvement. 17-19 oct 2012; Tabriz, Iran.