Original Article

Impact of Protocol of Care of Patients Undergoing Urinary Catheterization on Nurses' Knowledge

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Abstract

Background: The indwelling urinary catheter (IUC) is a widely utilized device in modern hospital environments, yet they are not always used appropriately in hospital settings and can result in prolonged use and improper management, increasing risk of infections and length of stay. Hence, professional must have knowledge related to the management of urinary catheterization.
Aim of the study: to evaluate the impact of protocol of care of patients undergoing urinary catheterization on nurses' knowledge.
Materials and Method: A quasi- experimental research design was used to conduct this study. The study was carried out at Intensive Care Unit, Urology Department and Department of Internal Medicine at Al-Azhar University hospital in Damietta City to test the hypotheses that positive changes in nurses' knowledge after implementing the protocol of care for patients undergoing urinary catheterization. The research design was a quasi-experimental design. A convenient sample of 50 nurses was included. One tool was used for data collections, part (1) Structured Interview Questionnaire tool it includes demographic data part (2) Nurse's Knowledge Assessment tool, to assess nurse's Knowledge about urinary catheterization and urinary catheter care
Results: The study results demonstrated that there were statistically significant improvements in the total score of nurses' knowledge regarding care of patients undergoing urinary catheterization throughout the protocol intervention.
Conclusion & Recommendations: The study recommended that providing ongoing in-service education for nurses to update their knowledge related to care of patients undergoing urinary catheterization and catheter – associated problems.

Key words: Urinary catheterization, indwelling urinary catheter.

Introduction

Urinary catheter considered one of the most invasive medical devices used in the acute care setting which involves introducing hollow tube through urethra into the bladder. Urinary catheters are a necessity for a substantial percentage of the population, including hospitalized patients, residents in long-term care institutions, and those with various urological or genitourinary disorders (Perry & Portter, 2010 and Ignatavicicius & Workman, 2013).

Indwelling urinary catheterization has a number of indications such as accurately monitor the urinary output of critically ill patients, increase the comfort of terminally or severely ill patients also catheterization helps to manage skin damage caused by incontinence, when all other methods of managing urinary incontinence have failed and use for maintaining a continuous outflow of urine for patients undergoing surgical procedures, as part of standard preoperative preparation, maintaining a continuous outflow of urine for patient with voiding difficulties because of neurological disorders that cause paralysis or loss of sensation affecting urination, and providing immediate treatment of acute urinary retention (Fakih et al., 2011and Tiwari et al., 2012).

The biggest risk factor for acquiring urinary tract infection (UTI) is the presence of an indwelling urinary catheter (Weber et al., 2011). Each day an indwelling catheter is in place increases the risk of infection an estimated 3% to 7% .Nurse driven protocols are effective in catheter associated urinary tract infection (CAUTI)

reduction, thus improving quality of care for patients in the hospital setting. Nurse driven protocols are beneficial over physician reminder systems because there is less delay in removal of the catheter. Nurses are at the forefront of care and require education, empowerment and support for a nurse driven protocol to be most effective (Lo et al., 2014 and Fisher, 2015).

There is a body of up-to-date research evidence relating to the appropriate management of patients with indwelling urinary catheters (IUC). Healthcare workers are in a position to reduce the morbidity and mortality relatedto the use of urinary catheters. Urinary catheterization is a routine medical procedure that allows direct drainage of the urinary bladder into an attached bag. It consists in the insertion of a catheter into a patient's bladder**.** The urinary catheterization is used to drain urine by aseptic technique and painless insertion of a catheter (tube) into a patient's bladder for withdrawing urine (Essomba et al., 2013 and Savage, 2015).

Aim of the Study

The aim of this study was to**;** Evaluate the impact of protocol of care of patients undergoing urinary catheterization on nurses' knowledge.

Research Hypothesis

For fulfilling the aim of this study the following hypothesis was formulated:

- There will be positive changes in nurses' knowledge after implementing the protocol of care for patients undergoing urinary catheterization.

Materials and Method:

Research Design

A quasi-experimental study design was used for the conduction of this study.

Setting

This study was carried out The study was conducted at Intensive Care Unit, Urology Department and Department of Internal Medicine at Suez Canal University hospital in Ismailia city.

Subjects

A convenient sample of 50 nurses working with patients undergoing urinary catheterization at Intensive Care Unit, Urology Department and Department of Internal Medicine, at Suez Canal University hospital in Ismailia city.

Tool of data collection

Part (1): Structured interview Questionnaire

It was developed by the researcher based on the review of recent related literature to assess the nurses' knowledge regarding nursing care provided to patients undergoing urinary catheterization **.**It Included items related to socio-demographic characteristics and work related data of the studied nurses such as age, gender, marital status, working unit, level of education, years of experience and attending training program related to urinary catheter.

Part (II): Nurses' knowledge assessment

It included a group of questions to assess the nurse's knowledge in relation to key components of urinary catheterization and catheter care

Scoring system

Regarding the scoring system for nurse's knowledge, all knowledge variables were weighted according to the item included in the answer of each question. Each question was corrected from 86 degrees. All questions was measured and divided by the number of questions to obtain the mean knowledge of each nurse. Knowledge below 75% was considered unsatisfactory while those equal to or above 75% was considered satisfactory.

Operational Design

The operational design of this study included preparatory phase, content validity, pilot study, and field work.

Preparatory Phase

It included reviews of current and post local and international related literatures, and theoretical knowledge of various aspects of the study using books, articles, and internet periodicals and magazines in order to develop the data collection tools.

Content Validity

It was ascertained by a Jury consisting of seven experts of professors and lecturers from the medical surgical department; Faculty of nursing and from medicine, surgery and urology department Faculty of Medicine, Suez canal University who revised the tools for clarity,

relevance, comprehensiveness, understanding and ease for implementation, according to their opinion modifications were applied.

Pilot study

Pilot study had been undertaken before starting the data collection phase. It was carried out on 10 % of participants to test the feasibility and applicability of the first and second tools and to estimate the time needed to complete the tools according to the pilot study necessary modifications were done. The subjects included in the pilot study were excluded from the study sample.

Field work description

Field study was conducted from the beginning of May (2015) to the end of May (2016). The study was carried out through the following phases:

1) ***Assessment phase***

In this phase after finalization of the tools, the researcher assessed nurses' learning needs using Tool II. Tool II was designed to assess nurses' knowledge related to providing care for patients undergoing urinary catheterization. The researcher introduced this Tool to each nurse and asked them to fill it out. The time taken to fill the tool was from 30 minutes to 60 minutes. Moreover, the researcher assessed available place, time, equipment, supplies, and instructional materials for conduction of the protocol of care.

2) The protocol of care development phase

The protocol of care was developed based on the identified needs and demands of nurses gathered in assessment phase and review of related literature. This phase included the following;

Setting objectives

The aim of protocol was to improve nurses performance related to care of patients undergoing urinary catheterization though:

Improve nurses' knowledge related to care of patients undergoing urinary catheterization

Preparation of the content

Content covered all areas about caring of patients undergoing urinary catheterization was prepared which included the following: anatomy and physiology of urinary system, investigation related to urinary system, definition, types and indications of urinary catheter, infection control related urinary catheter, contraindications of urinary catheter ,preparation during urinary catheter insertion , nursing care for urinary catheter , complications associated with urinary catheter

Planning of action

In this phase, the researcher designed a plan for a protocol of care implementation

Implementation phase

After official permission was taken from the concerned study setting. The researcher took the list of nurses who met the inclusion criteria. The participated nurses were divided into 10 groups, each consisted of five nurses. Each group was attended at conference room separately during morning and afternoon shift. The purpose and aim of the study was explained, then the researcher collect data about demographic characteristics using tool (I). This session is considered as introductory session.

At the beginning of each session, pretest related to the session content was provided to participants, followed by hands out. During the session, the researcher teach content in a clear, simple language using lectures , illustrative pictures and discussion giving feedback using positive verbal words.

At the end of each session the researcher, close the session by summary for the main points. Posttest was at the end of the 4th session using toll II.

Evaluation phase

The protocol of care was evaluated three times using tool II. Tool II used to evaluate the studied nurses .Evaluation was done three times, first time: immediately after protocol implementation, second time after three Months, and third time: after six month.

Ethical Consideration

Explain the aim of the study to the directors of Intensive Care Unit, Department of Urology and Internal Medicine to take their permission to start this study**.**

Oral consent was taken from the study subjects after explaining the aims and nature of the study to them, and they were assured that the information collected would be treated confidentially and used for the research purpose only, and they have the right to withdraw from the study at any time.

Statistical Design

The collected data organized, tabulated and statistically analyzed using statistical package for social science (SPSS) version 16 for windows, running on IBM compatible computer. Qualitative data (categorical data) were expressed as relative frequency (number) and percent distribution, and for comparison between groups, the Chi square (X^2) or Mann-Whitney test (Z) was calculated. Quantitative data were expressed as mean± SD, and for comparison between two means, the student (t) test was calculated. For interpretation of results, the p value ≤ 0.05 was considered significant.

Results

Table (1) shows the demographic and work related data of studied nurses. It revealed that (96%) of the studied nurses were female and (90%) their age from 21 to 36 years. There were 46% of studied nurses had technical nursing institute, while only (16%) had nursing bachelor; and (48%) had less than five years of experience and (50.0%) working in intensive care unit (ICU) and (30%) work in urology unit. All studied nurses (100%) have not any previous training course about urinary catheterization. Table (2) Shows that there were high statistical significant differences in knowledge scores related to all items of infection control policies during the urinary catheterization throughout the protocol intervention among studied nurses (p<0.001). There was (28%)before intervention ,(100%) immediately after ,(98%) 3months after and (96%) 6 months after protocol intervention among studied nurses have satisfactory score knowledge related to infection control policies during the urinary catheterization. There was high statistical significant difference (X2 =117.31, p<0.001) in total knowledge score among studied nurses throughout intervention duration Table (3) Denotes that before intervention, (2%) have satisfactory knowledge score, immediate after (94%), 3 month after (84%) and 6 month after intervention (72%) have total satisfactory knowledge score. Moreover, there were statistically significant differences (X2 =111.62, p<0.001) about nursing care for patients undergoing urinary catheterization while, there was no statistical significant difference (X2 =3.72 p=0.27) among studied nurses in knowledge score about patient ability to urinate after urinary catheter removal. Table (4) reveals that there were statically significant difference in the total score of nurses' knowledge regarding urinary catheter care throughout the protocol intervention between posttest, pre protocol first follow up and pre, second follow up, and pre protocol (X^2 =146.2 P<0.001). A high statistical significant improvement in nurse's knowledge were found between the immediate posttest and the pre protocol level, between pre protocol and 3month after (P<0.001). There were no statistically significant differences between immediately posttest and first follow up (P= 0.56) and between first and second follow up (p = 0.31). In addition, there was no statistical significant difference between first and second follow-up (P= 0.64).Table (5): Shows that there were high statistically significant differences between the knowledge of studied nurses and their education throughout the protocol intervention (p=0.001) except in immediately after protocol No statistically significant difference was found (p=0.09). Moreover there were high statically significant differences between practice of studied nurses and their education pre, immediately posttest , post three months and post six months of protocol intervention(p=0.001)

Discussion

Indwelling urinary catheterization is an invasive intervention with potentially serious outcomes that can lead to morbidity and mortality issues in hospitalized patients so nursing professionals must have sound (and where possible evidence-based) knowledge related to the management of an indwelling urinary catheter, complications caused by an indwelling urinary catheter and ways to prevent and manage these complications (Altun and Karakoc, 2010 and Bernard et al., 2012). Hence nurses must be fully trained, have knowledge of the underlying principles of nursing care to patient undergoing urinary catheterization, be aware of condition and needs of each patient undergoing urinary catheterization , be familiar of the purposes, indications and complications associated with this procedure. This could to enable them to assume the responsibilities of care provided for those patients (Altun and Karakoc, 2010 and Bernard et al., 2012). Moreover Drekonja et al., 2010 added that improved nurses' knowledge can be achieved through education, and leads to practices resulting in decreased CAUTI and other catheter-related complications. Therefore, the aim of this study is to evaluate the impact of protocol of care of patients undergoing urinary catheterization on nurses' performance

Table (1): Distribution of the studied nurses according to their demographic and work related data (No=50)

Items		N	%
-Age	Less than 21years	5	10.0
	21 to 36 years	45	90.0
-Gender	Male	2	4.0
	Female	48	96.0
-Marital state	single	9	18.0
	Married	40	80.0
	Divorced	1	2.0
	Widow	0	0.0
-Education level	Nursing diploma	19	38.0
	Technical nursing institute	23	46.0
	Faculty of nursing	8	16.0
-Years of experience	Less than 5 years	24	48.0
	5 to 10 years	20	40.0
	More than 10 years	6	12.0
-Work Department	Urology	15	30.0
	ICU	25	50.0
	Internal medicine	10	20.0
-Training course	yes	0	0.0
	No	50	100.0

Table (2): Percentage distribution of studied nurses' satisfactory knowledge regarding the infection control policies during the urinary catheterization throughout the protocol intervention (No=50)

Items	Before intervention		Immediately After		3 Months After		6 Months After		X^2	P-value
	N	%	N	%	N	%	N	%		
The best Effective method to prevent infection	44	88.0%	50	100.0%	50	100.0%	50	100.0%	18.55	<0.001**
Hand washing before catheter insertion	18	36.0%	49	98.0%	45	90.0%	45	90.0%	72.61	<0.001**
Hand washing before urine bag emptying	10	20.0%	47	94.0%	46	92.0%	45	90.0%	101.24	<0.001**
Hand washing before taking urine sampling	12	24.0%	47	94.0%	43	86.0%	41	82.0%	75.64	<0.001**
Site of catheter insertion	41	82.0%	50	100.0%	49	98.0%	49	98.0%	20.29	<0.001**
Follow Sterilization basics	30	60.0%	46	92.0%	46	92.0%	46	92.0%	28.57	<0.001**
During catheter insertion use gloves	37	74.0%	50	100.0%	49	98.0%	49	98.0%	33.08	<0.001**
Urethral opening disinfection	42	84.0%	50	100.0%	49	98.0%	49	98.0%	17.26	0.001**
Change glove before bag emptying	38	76.0%	49	98.0%	49	98.0%	49	98.0%	26.16	<0.001**
Daily cleaning around urinary catheter	13	26.0%	45	90.0%	43	86.0%	43	86.0%	70.23	<0.001**
Following Infections control policies	36	72.0%	50	100.0%	45	90.0%	44	88.0%	18.42	<0.001**
Disinfection urethral opening	37	74.0%	50	100.0%	48	96.0%	47	94.0%	24.66	<0.001**
Total	14	28.0%	50	100.0%	49	98.0%	48	96.0%	117.31	<0.001**

Table (3) Percentage distribution of studied nurses' satisfactory knowledge regarding nursing care for patients undergoing urinary catheterization throughout the protocol intervention (No=50)

Items	Before intervention		Immediately After		3 months After		6 months after		X^2	P-value
	N	%	N	%	N	%	N	%		
Fluids intake per day	27	54.0%	45	90.0%	43	86.0%	43	86.0%	25.43	<0.001**
Observe input output fluids	10	20.0%	45	90.0%	41	82.0%	37	74.0%	67.57	<0.001**
Output fluids per day	22	44.0%	44	88.0%	37	74.0%	37	74.0%	24.57	<0.001**
To keep urine flow …	18	36.0%	46	92.0%	40	80.0%	38	76.0%	43.03	<0.001**
Times per day for catheter cleaning	21	42.0%	46	92.0%	44	88.0%	44	88.0%	48.48	<0.001**
Hard clean around urinary catheter	3	6.0%	46	92.0%	43	86.0%	40	80.0%	108.55	<0.001**
Routine bladder irrigation	6	12.0%	43	86.0%	36	72.0%	34	68.0%	66.12	<0.001**
When UC obstructed ---	19	38.0%	47	94.0%	44	88.0%	43	86.0%	55.93	<0.001**
Betadine in U collection bag	16	32.0%	49	98.0%	45	90.0%	44	88.0%	77.80	<0.001**
Uri bag emptying per day	27	54.0%	47	94.0%	46	92.0%	44	88.0%	36.04	<0.001**
Nursing care to prevent infection	11	22.0%	43	86.0%	35	70.0%	34	68.0%	48.04	<0.001**
When U bag infected	16	32.0%	47	94.0%	42	84.0%	40	80.0%	57.45	<0.001**
When to sample for urine culture	29	58.0%	49	98.0%	47	94.0%	46	92.0%	41.42	<0.001**
Sterilization of test opening	21	42.0%	48	96.0%	46	92.0%	44	88.0%	58.50	<0.001**
Used gloves at sampling	8	16.0%	47	94.0%	43	86.0%	44	88.0%	98.78	<0.001**
before removing urinary catheter	46	88.0%	50	100.0%	50	100.0%	50	98.0%	12.24	0.007*
Patients ability to urinate after UC removal	48	96.0%	50	100.0%	50	100.0%	49	98.0%	3.72	0.27(NS)
Total	1	2.0%	47	94.0%	42	84.0%	36	72.0%	**111.62**	**<0.001****

Table (4): Percentage distribution of the total score of nurses' knowledge regarding urinary catheterization and care of patients undergoing urinary catheterization throughout the protocol intervention (No=50)

		Before intervention		Immediately After		3 Months After		6 Months After		Statistics	
		N	%	N	%	N	%	N	%	X^2	P-value
Total knowledge	**Satisfied**	5	10.0%	49	98.0%	48	96.0%	47	94.0%	146.2	<0.001**
	Non-satisfied	45	90.0%	1	2.0%	2	4.0%	3	6.0%		
Mean ± SD		61.12±11.01		95.61±5.63		91.07±7.20		89.75±7.95		F=148.1	<0.001**
immediate Post- pre protocol		Z = 8.78, p < 0.001**									
F3- pre protocol		Z= 8.57, p < 0.001**									
F6- pre protocol		Z= 8.36, p < 0.001*									
F3-immediately post protocol		Z= 0.58, p = 0.56(NS)									
F6-immediately Post protocol		Z= 1.01, p = 0.31(NS)									
F6-F3		Z= 0.45, p = 0.64(NS)									

Table (5): Relation between mean score of studied nurses' total satisfactory knowledge and practice regarding care of patients undergoing UC throughout the protocol intervention according to their education (No=50)

		Educational level			F-test	P-value
		Secondary diploma	Technical institute	Bachelor		
		Mean±SD	Mean±SD	Mean±SD		
Total satisfactory Knowledge score	Pre protocol	59.65±10.78	57.06±7.99	76.28±5.24	14.38	<0.001**
	Immediately after protocol	94.52±5.79	95.17±5.98	99.47±1.47	2.44	0.09(NS)
	3 months after protocol	89.91±6.77	89.19±6.95	99.19±1.45	7.81	0.001**
	6 months after protocol	89.01±6.88	87.09±7.81	99.19±1.45	9.42	<0.001**

In the same line, Kaushal, (2015) emphasize the positive impact of a training program on the knowledge scores hence the healthcare organizations can engage in continuous training programs to regularly maintain and enhance the knowledge of the nurses. Also CDC, (2013) reported that nurses educated in use and management of indwelling urinary catheter can impact the development of CAUTI and serve to reduce CAUTI risks. The CDC guidelines recommend education include proper insertion techniques for IUCs, management and care , appropriate indications, duration and prevention of potential complications with indwelling urinary catheters .

Meanwhile, the attendance of such training courses had no statistically significant associations with nurses' knowledge or practice. This reflects a lack of effectiveness of such courses, which might be attributed to the courses' content and/or process, or the attendants' motives of attendance and their willingness to learn. In this respect, the American Association of colleges of nursing **(AACN)** encourages lifelong learning and offer incentives for nurses seeking to advance their education (AACN, 2014).

As regard nurses' knowledge about infection control policies during the urinary catheterization throughout the protocol intervention. Present study findings revealed that improvement of nurses' knowledge regarding the infection control policies during the urinary catheterization, and their total score. These improvements were high statistically significant differences. This finding is supported by Opina and Oducado, (2014) who stated that low level of knowledge and poor practices on infection control in the use of urethral catheters. This indicates that nurses need to be educated and trained more on infection control in the use of urethral catheters. The nurses' level of knowledge had a bearing on their practices on infection control in the use of urethral catheters. Also Kaushal, (2015) reported that Continuous training program will significantly increase the knowledge levels of the critical care staff and hence improve their infection control practices

As regard total score of nurses' knowledge regarding care of patient undergoing urinary catheterization throughout the protocol intervention. It revealed that there were statically significant difference in the total score of nurses' knowledge regarding urinary catheter care throughout the protocol intervention between posttest, pre protocol first follow up and pre, second follow up, and pre protocol. This result was congruent with that of Drekonja et al. (2009) who stated that, a more effective form of teaching with explanation of the underlying concepts is required to improve knowledge and application of best practice technique for the management of an indwelling urinary catheter, as indicated by the significant improvement in post workshop test scores.

In this respect Talaat et al. (2011) also mentioned that hospital accreditation is still not mandatory in Egypt. However, the Ministry of Health in Egypt recently started developing national accreditation bodies as a preliminary step towards international accreditation of Egyptian hospitals. Limited funds to ensure availability of supplies, lack of personnel with the knowledge and expertise in IC, and in particular hospital epidemiologists, remain a challenge. Use of devices with outdated technology may also be a factor, such as use of urinary catheters without sampling ports and single lumen catheters for bladder irrigation.

As regard level of education of studied nurses the results revealed that; there were high statically significant differences between the knowledge of studied nurses and their educational level throughout the protocol intervention. The results supported by Prasanna and Radhika,(2015) who reported that There is significant association between the level of knowledge of staff nurses regarding catheter care with their selected socio demographic variables like Educational qualification, Source of information. The results contradicted with Nasser, (2012) who said that no significant association between Nurses` characteristics and knowledge and practice.

Conclusion

Based on study findings, it can be concluded that: There was statistically significant improvement of nurses' knowledge regarding the infection control policies during the urinary catheterization. There were statistically significant difference in the total score of nurses' knowledge as well as practice regarding urinary catheter care throughout the protocol intervention between posttest, pre protocol first follow up and pre, second follow up, and pre protocol. A high

statistical significant improvement in nurse's knowledge were found between the immediate posttest and the pre protocol level, between pre protocol and 3month after and between pre-second follow up.

Recommendations

- Providing ongoing in service education for nurses to update their knowledge related to care of patients undergoing urinary catheterization and catheter –associated problems
- Provide equal opportunities for nurses to attend national and international congresses and in-service training programs related to urinary catheter care.
- Guidelines for infection control of catheters should be reviewed as part of the health authority and considered by both the medical and nursing staff for minimizing infection.

References

Altun, I., Karakoc, A. (2010): The impact of an interactive workshop on the management of urinary catheterization on nurses. Journal of Urologic Nursing; 4(3): 125-132.

American Association of Colleges of Nursing (AACN) (2014): The Impact of Education on Nursing Practice. Available at http://www.aacn.nche.edu/media-relations/fact-sheets/impact-of-education.internet accessed at November, 2014.

Bernard MS., Hunter KF.and Moore K N. (2012): A Review of Strategies to Decrease the Duration of Indwelling Urethral Catheters and Potentially Reduce the Incidence of Catheter- Associated Urinary Tract Infections. Society of Urologic Nurses and Associates, Urologic Nursing; (32) (1); p.29-30.

Centers for Disease Control and Prevention (2013): Catheter-Associated Urinary Tract Infection (CAUTI) Event. Available at: http://www.cdc .gov/nhsn/PDFs/ psc Manual/7pscCAUTIcurrent.pdf.

Drekonja DM., Kuskowski MA., and Johnson JR. (2010): Internet survey of Foley catheter practices and knowledge among Minnesota nurses. Am J Infect Control; 38(1):31-7.

Essomba1 N., Leme L., Esiene A., bong T., Etoundi O., Gweth N., Abologo L. and Bilong B.(2013) : Identification and quantification of bacteria associated with indwelling urinary catheterization, International Journal of Current Microbiology and Applied Science, 2(5) pp. 168-177

Fakih MG., Greene MT., Kennedy EH., Meddings JA., Krein SL., Olmsted RN. and Saint S. (2012): Introducing a population-based outcome measure to evaluate the effect of interventions to reduce catheter-associated urinary tract infection. American Journal of Infection Control. 40(4): 359-64.

Fisher J.(2015): Preventing Catheter Associated Urinary Tract Infections: Implementation of a Nurse Driven Catheter Removal Protocol and Education Program, A Project Presented to the Faculty of California State University, Stanislaus, In Partial Fulfillment of the Requirements for the Degree of Master of Science in Nursing,p.1-12.

Ignatavicicius DD. and Workman ML. (2013): Medical surgical nursing; patient centered collaborative care; Urinary Elimination; 7th edition, Vol two, Elseiver, USA ;P.1061.

Kaushal G. (2015): Impact of Training on Knowledge, Attitude and Practices Scores of ICU Nurses regarding Standard Precautions of Infection Control in a Super Speciality Hospital of Delhi, Indian Journal of Research, 4, 8, 282-285.

Lo E., Niccole, L., Coffin, E., Gould C., Maragakis L., Meddings J., Pegues, A., Pettis M., Saint S. and Yokoe S. (2014): Strategies to prevent catheter-associated urinary tract infections in acute care hospitals: 2014 update. Infection Control and Hospital Epidemiology,35(5), 464-479

Nasser R. (2012): Effect of In-service Education for Nurses on CAUTI. Faculty of Health Sciences Department of Nursing, Beirut University.

Opina M. and Oducado R. (2014): Infection Control in the Use of Urethral Catheters: Knowledge and Practices of Nurses in a Private Hospital in Iloilo City. Asia Pacific Journal of Education, Arts and Sciences; Vol. 1 (5); 93-99.

Perry AG. and Portter PA. (2010): Clinical Nursing Skills Technique, urinary elimination, 7th ed., Elsevier Mosby, USA, P.864.

Prasanna K., Radhika M. (2015): Knowledge regarding Catheter care among Staff Nurses. International Journal of Applied Research 2015; 1(8): 182-186

Savagea A. (2015): Teaching materials for indwelling urinary catheter management: a case study of one library in Tanzania, International Journal of Urological Nursing 9 (3), 156–164

Talaat M., Hafez S., Saied T., Elfeky R., El-Shoubary W. and Pimentel G. (2010): Surveillance of catheter-associated urinary tract infection in 4 intensive care units at Alexandria university hospitals in Egypt . American Journal of Infection Control, Vol 38(3), 222-228.

Weber J., Sickbert-Bennett E., Gould V., Brown M., Huslage K., Rutala A.(2011) :Incidence of catheter-associated and non-catheter-associated urinary tract infections in a healthcare system. Infect Control Hosp Epidemiol.; 32(8):822–823.