# Effect of Implementing Nursing Guidelines to Patients with Long -Term Urinary Catheter on Minimizing The Incidence of Urinary tract Infections

***Shimaa Gomah Yousef, Lecturer***

Faculty of Nursing, Benha University, Medical surgical nursing.

***Sanaa Mohamed Ahmed A. Eldeen, Professor***

Faculty of Nursing, Alexandria Univeristy, Med- Surgical Nursing.

***Marwa Moustafa Ragheb, Assistant professor***

Faculty of Nursing Benha University Med- Surgical Nursing,

***Ahmed Shwkey Zaghlol, Professor***

Faculty of Medicin Benha University, General surgery

## *Abstract*

*Urinary tract infection (UTI) is the most common and important complication of the use of indwelling catheters. The aim of this study was to determine the effect of implement nurses guidelines implementation among patient with long term urinary catheter on the incidence of urinary tract infections. The study was carried out in the urology department at Benha University Hospital using a quasi-experimental research design. The study included 60 adult patients in need for urethral catheterization for not less than seven days, and free from any manifestations suggestive of UTI on admission. Equally divided rondomly into a study group and a control group. Also, it included the 30 available nurses working in urology department at Benha university hospital. Three tools were developed and used for data collection, within. The nursing care guidelines were developed after reviewing related literature, rendered for nurses through session and implemented to study group patients. Research hypothesis; Nurses scheduled for guidelines sessions will gain higher knowledge and exhibit better practice mean scores than before. Patients scheduled for guidelines implementation will show decrease the incidence of catheter associated urinary tract infection. The result implies that, Positive urine culture was higher in the control group (86 %) compared to 6.6% in the study group. The result also implies that after the application of educational guidelines, nurses' knowledge, and practice toward the care of patients with urinary catheter have been improved significantly. There were no significant correlations between studied nurses' knowledge regarding their age's pre, immediate and 3 months post guidelines implementation: There were a statistical significant correlations between studied nurses' knowledge , practice, educational level and years of experience .*

***Introduction*:**

Indwelling urethral catheters (IDC) are part of a disposable system consisting of catheter, tubing and drainage bag and are common tools used in the management of patients. They are used in 15% to 25% of all hospital patients. [1]

The indications for a long-term indwelling catheter (persisting for more than 2 weeks) are more restrictive. They are: (1) urinary retention associated with bladder outlet obstruction, (2) urinary incontinence coexisting with urinary retention, (3) delayed healing of a high-stage pressure ulcer owing to urinary incontinence, and (4) palliative care settings where routine toileting is compromised by pain or immobility [2, 3]

Microorganisms can be introduced into the bladder and urinary tract at the time of catheter insertion either at the patient commensal bacteria or from the health worker inserting the catheter. In addition microorganisms can enter the urinary tract when the catheter is in situ by either extraluminal or intraluminal, where the bacteria enter the urinary tract by migrating along the external surface of the catheter, usually from the perineum. Intraluminal colonization is caused by bacteria migrating along the internal surface of the catheter, usually from access to urine in the collecting bag when the tap is opened and subsequent migration within the collecting system and catheter to reach the bladder [4]

Other potential complications include trauma, urethritis, urethral strictures, haematuria, bladder perforation and encrustation of the catheter leading to blockage of the urine flow. Urinary tract infections (UTI) are one of the most common nosocomial infections accounting for approximately 20% to 40% of all hospital acquired infections and 80% of these are associated with the use of urinary catheters. [5]

***Significant of the study*:**

Reported rates of (Urinary tract infections) UTI among patients with urinary catheters vary substantially. National data from (National Healthcare Safety Network) NHSN acute care hospitals in 2006 showed a range of pooled mean rates of 3.1-7.5 infections per 1000 catheter-days[6].

In Egypt, Prospective active surveillance of (catheter associated urinary tract infection) CAUTIs was conducted in 4 ICUs during a 12-month period from 2007 to 2008 using the standard Centers for Disease Control definitions. It was noted that a total of 161 episodes of infection were diagnosed, for an overall rate of 15.7 CAUTIs per 1000 catheter days**.** [7]

Hence, it has been reported that catheter associated problems, are frequent causes of significant morbidity, sepsis, and death. These problems can be prevented, allivated or minimized by applying nursing guidelines which include use of appropriate equipment, proper aseptic

techniques, infection control precautions, proper maintainance of the closed drainage system and routine urine cultures [8- 11]

During the catheterization procedure, nurses' efforts should also be made to minimize pain and trauma. These efforts include using an appropriate-size catheter, lubricating the catheter thoroughly, and inserting the catheter far enough into the bladder to prevent trauma to the urethral tissues with the inflation of the retention balloon. [12, 11]

The nurse should secure the catheter to the thigh or abdomen after insertion to prevent movement and the exertion of excessive force on the bladder neck or urethra. [13]

The catheter and collecting tube should be kept free from kinking, the collecting bag should be positioned below the level of the bladder at all times and never placed on the floor. The collecting bag should be emptied regularly using a clean collecting container. [10]

***Aim of the study***

The aim of this study is to determine the effect of implementing nursing guidelines to patients with long term urinary catheter on the incidence of urinary tract infections.

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***Research hypothesis;*** Nurses scheduled for guidelines sessions will exhibit higher knowledge and practice mean scores than before. Nurses scheduled for guidelines sessions will decrease the incidence of catheter associated urinary tract infection for patient post implementing guideline than before.

## *Materials and Method:*

**Design:**

Quasi experimental design was used.

**Setting:**

The present study was conducted in the urology department at Benha University Hospitals.

## ***Subjects:***

***1- Patients:***

A sample of Convenience of an equal number of 60 adult patients, pre-operative with recent indwelling urethral catheter for at least one week, assigned randomly into study and control groups. Each group consists of 30 patients. They were matched by age and sex.

**a)** Study group: - 30 adult patients include both sexes. Insertion of catheter for this group was done under strict aseptic technique

**b)** Control group: Consist of 30 adult patients from both sexes. Insertion of catheter for this group was done according to hospital routine.

**Inclusion criteria:-**

- Their age ranged between 18- 60 years old
- On closed urinary drainage system.
- Receiving no local urinary antiseptics.

**Exclusion criteria:-**

Patient with upper and lower chest infection or bowel infection, patients with proved urinary tract infection and Comorbiditis illness e.g, diabetes mellitus, cancer anemia or chronic infection.

***2- Nurses:-***

All available nurses (30) working in the urology department at Benha University hospitals and who are assigned for caring for patients with urinary catheter. Nurses' with respiratory tract infection were excluded.

## *Tools of the study:*

The tools of this study are:

**Tool (1):**

**Nurses knowledge regarding long term urinary catheter questionnaire:**

Questionnaire sheet was designed by the investigator and adopted from previous research references after reviewing related literature. [14- 16]

It contained74 questions, the scores of total knowledge 148 points were allocated as follows; complete (2), incomplete (1), wrong or no answer (0) and categorized into three sub score levels

**Good**: 148- 96 points**,**

**Moderate**: from 85- 74 points and

**Poor:** 73- 0 points

**Tool (2):**

**The observation checklist for nurse's practice regarding long term urinary catheterized patients:**

The tool was developed by the researcher included 57 items, for each sub-item, if done correct and complete, gained (2), and if done incomplete (1) but if not done or wrong; (zero). The total scoring system of the tool was 114 points and categorized into three sub score levels;

**Good:** 114- 80 points,

**Moderate:** 79- 56 points,

**Poor:** 55- 0 points

**Tool (3): Patients;**

Socio demographic and medical history:

**1.** Sociodemographic characteristics of patient include: age, sex, marital status, educational level

**2.** Present medical history: Duration of hospitalization, mobility state, duration of catheterization, type of catheter material, design of catheter, size of catheter.

**3.** Assessments of problems that may arise while the catheter is inside as leakage, blockage, disconnection of the tube, and irritation or pain. It also included signs and symptoms of urinary tract infection

***Collection of urine for Bacterial culture and count***

Urinary infection was established when the number of variable bacteria was more than $10^5$ colonies / ml of urine. [17, 18]

***Guidelines construction:***

This was based on the results obtained from pre guidelines assessment using the interviewing questionnaire, observation check list as well as, literature review. [19, 20]

The nursing guidelines component include: the use of appropriate equipment, proper aseptic techniques, infection control precautions, proper maintenance of the closed drainage system and routine urine cultures.

The component was distributed and rendered for nurses through three sessions, developed and carried out by the researcher for the purpose of improving nurses' practice and knowledge for care of patients with long term urinary catheter. The first one (the purpose of training guidelines, and overview of lower urinary system), the second (catheter characteristics, causes, symptoms and diagnosis of urinary tract infections) and the third one (the preparation of patient prior for catheterization, steps necessary for catheter insertion , how to obtain specimen of urine and nursing strategies to minimize infections ).

**Methods**

Data collection for this study was carried out in the period from August 2011, until January 2012. The purpose of the study was explained by the researcher to all nurses included in the study. The average time needed for the completion of each interview (by nurses) was between 15 – 30 minutes.

- An official approval was obtained from the administrator of the study setting. Informed consent was taken from nurses to participate in the study.
- Patient consent was obtained and confidentiality of the collected data was ascertained.
- A convenient sample according to the previous criteria will be selected; for the study group: Insertion of catheter was done under strict aseptic technique; the nurses prepared and arranged all necessary equipment. Insertion of catheter for control group was done according to hospital routine.

The catheter was inserted for all patients included in the study (study and control groups) pre operative the urine specimen for bacterial culture and count was obtained within first 24 hours of catheter insertion as a baseline and on the fourth and before removal of catheter

- Study tools were developed by the researcher after review of related literature and was tested for content validity by 5 Experts professor in the medical surgical nursing, nephrologists' specialist. Content validity index was 94.7%and internal consistent reliability was 0.739% for tool (3).
- A pilot study was carried out on five nurses in order to evaluate the developed tool for the, clarity and applicability of the designed form in providing the required data, no modification was done.

**Limitation of the study :**

- Lack of nurses' cooperation.
- It was difficult to collect all the nurses together at the same time
- Limited number of patients.

**Statistical analysis:**

SPSS statistical software, version 17.0 (SPSS).. A *P* value less than .05 was considered statistically significant. ***( Ansari et al,. 2003).*** Categorical variables were presented as absolute values, and percentages were compared by use of the $\chi^2$ test or the Fisher exact test, as appropriate. Continuous variables were expressed as mean ± SD. The Student *F* test was performed to compare continuous variables. Correlations among variables were assessed by Pearson correlation analysis

**Results**

The results present the mean age distribution of both groups ranged from 22 years to 60 years of age. More than half of the patients (56.6%) were between 50- 60 years in study group, while more than half of the patients (60%) were between 30-50 years in control group. Also, it was shown that, male patients represented a higher percentage in the two groups; distribution showed 80% in study group and 76, 5% in control group.

It was found that the duration of hospitalization ranged from 7 days to more than 15 days. Half of the sample represented (53.3%) in study group were ranged from 8 days to 15 days and (30.3%) in control group. While the duration ranged of 7 days represented only (13.3%) in study group and (43.3%) in control group. Also it was found that no significant difference for both groups regarding type of catheter, duration of catheterization and design of catheter.

It can also be seen that there were no significant difference between the two groups and size of catheter ($\mathbf{X^2}$ = 2.781 and P = 1.470).

**Table (1):** The main manifestations among study group were back pain and suprapubic pain which represent (20.3% and 16.7%) respectively. While the main manifestation among control group was fever and bladder cramp which represent (26.7% and 20%) respectively. There were no statistical significant difference in both groups where p- value = 0.064 and $X^2 = 10.427$

**Table (2):** The majority of the control group had positive urine culture represented (73.3%) immediately before removal, compared to less than half (43.3%) of those in the study group; this difference was statistically significant (p = 0.001).

**Table (3):** The most common pathogenic organism was isolated in both groups in the first day after insertion; at fourth day of catheterization and before removal of catheter was Klebcills spp. There were statistical significant difference between the three times and pus cell counts / HPF in study group where $X^2$ = 4.862 and P-value = 0.087, while there were no statistical significant differences between three times and pus cell counts / HPF in control group where $X^2$ = 0.467 and P-value = 0.791.

**Table (4):** There were highly statistical significant differences between three times and bacterial count in study group where $X^2 = 14.359$ and P-value = 0.026, while no statistical significant differences between the three times in control group where $X^2 = 6.43$ and P-value = 0.376

The result presents that, the mean age of studied nurses ranged from 21 years to 45 years. Half of the samples were between 25 years to 35 years, which represented (43.3%) and one third of the sample, which represented (43.3%) were between 20 years to 25 years of age. It was found that, diploma of nursing represented a higher percentage in the total sample (80%), while only (16.7%) had technical institute with specialty in nursing science. The results also illustrated that, half of the sample( 50%) had 5 years to 10 years of experience, while few of the sample had more than 10 years of experience, which represented( 23.3%) of total sample.

**Also the results** display that, majority of the sample did not receive general training guidelines which represented (90%) of the sample. Only 3 nurses received training guidelines once with no competence evaluation which represented (100%) of total sample.

**Table (5):** indicates that, highly statistically significant difference was observed between pre, immediate post guidelines and 3 months post guidelines implementation between studied nurses' knowledge about anatomy and physiology of urinary system, medical terminology, investigations, common diseases, intake and output, urine characteristics, indications and contraindications of catheterization, types and characteristics of urinary catheter, infection control, procedure for catheterization, complications of urinary catheter and nursing management ( p= 0.0001) and medical terminology ( P = 0.0002).

**Table (6):** indicates that, highly statistically significant difference was observed between the three times of guidelines implementation between studied nurses' practice regarding pre-catheterization, preparation, catheter procedure, and method to obtain sterile sample which represented (0.0001), and continuing care represented (0.0002).

**Table (7):** illustrates that there were highly significant correlation coefficients between studied nurses' knowledge regarding educational level, years of experience immediate and three months post guidelines implementation( P= 0.001, 0.001), (0.002, 0.002) respectively.

**Table (8):** illustrates that, there were high significant correlation coefficients between studied nurses' knowledge regarding their practice pre, immediate and 3 months post guidelines implementation P= (0.000, 0.002, 0.001) and (0.001, 0.001, 0.002)

**Table (9):** illustrate that, there were high significant correlation coefficients between studied nurses practice regarding the incidence of

urinary tract infections on three times of catheterization first day after catheter insertion, fourth day and before catheter removal P = ( 0.001, 0.001 and 0.002) , ( 0.0001, 0.0001 and 0.002)

**Discussion**

The aim of this study is to determine the effect of nurses guidelines implementation among patient with long term urinary catheter on the incidence of urinary tract infections. Implementation of guidelines in which performance feedback was given to nurses has had further improvements in compliance with infection control measures and a further reduction in the rates of catheter-associated UTI.

In the present study, the study and control groups had different age and sex distribution. This is of great importance since urinary tract infections affected by patient age and gender. [7, 21]

Most patients in the both groups were males. This finding was in agreement with ***Nirmanmoh et al*** [22] who stated that out of 125 patients with a urinary catheter included in the study, 80 were males and 45 females. It is known that males are prone to obstructive urinary lesion especially from benign prostatic hyperplesia (BPH), cancer of the prostate and stricture which occurred with advancing age. This finding agrees with a previous study ***Oni et al*** [23] who stated that males were also predominantly affected in present study.

As regards hospital patients' stay, more than half of both groups in the present study were found to be ranged from 7 days to 16 days. This finding was explained by ***Taiwo and Aderounmu***[24] who demonstrated that, a catheter associated urinary tract infection lengthen hospital stay in postoperative patients by 6 days. Other factors affecting length of hospital stay, as administrative constraints (e.g. failure of the medical system to investigate the patient properly before admission).

The study showed that the duration of catheterization for half of the sample in study group ranged from 8 days to 15 days. This finding was in agreement with ***Tambyah*** [25] who reported that catheter-associated UTI increases hospital stay. This finding is in the same line with ***Jahn et al*** [26] who stated that, the longer a catheter is in place, the increased risk of UTI development.

The present study intervention, similar catheters were used for patients in the study and control groups, this is related to limited resources which had significant effect on risk of CAUTI.

Many experimental studies have demonstrated that, the local host inflammatory response and tissue necrosis associated with catheter use are greatest with natural rubber, but less with latex and minimal with silicone as mentioned by ***Stickler*** [27]. In contrast, ***Gitliffe*** [28] recommended catheters made from silicon, silicon elastomer- coated latex and hydrogel coated latex for long term indwelling use.

It was found that the common catheter size used were 18ch and 20ch. It is in contrast with finding of ***Pomfret*** [29] who asserted the importance to check the size of catheter which depends on the nature of the patients' urethra. Most patients should have smaller catheter less than the caliber of urethra.

The findings showed that, the main manifestations among study group were back pain and suprapubic pain, while the main manifestations among control group were fever and bladder cramp. This finding was in contrast with ***Abd El Aty,*** [30] who found that, the most common symptoms of urinary tract infection was the strong urine smell in the study group. This finding was in agreement with ***Pappas et al*** [31] who stated that signs and symptoms compatible with CA- UTI include new onset or worsening of fever flank pain, acute hematuria and pelvic discomfort.

The majority of the patients in the first day showed pus cell count of more than 5/ HPF while the result decline in the fourth day and before removal of the catheter, In this respect, the presence or absence of pyuria is relatively unhelpful in diagnosis of UTI. It is supportive but reflects inflammation rather than necessarily infection [32]. This interpretation was supported by ***Pratt et al*** [33], who reported that the presence or absence of pyuria in centerfuged urine is the worst of all criteria for the diagnosis of UTI.

The present study revealed that there was statistical significant difference between the three times regarding bacterial colony count in study group, while no significant difference in control group. This is expected as it is a part of the intervention, and it was hypothesized that, this will lead to lowering the rate of catheter-related urinary tract infection. This finding agrees with ***Abd El Aty*** [30] who stated that, the study intervention was effective in decreasing the rate of urinary tract infections among patients in the study group. The findings are in congruence with ***Peter et al, Willson et al*** [34,35] who have suggested guidelines on management and prevention of catheter-associated urinary tract infections and showed similar success.

The findings showed that, the Klebsiellais was the most common organism isolated on both groups, followed by Escerchia coli and Pseudomonas spp. This finding are In agreement with ***Nicolle,.; Aly et al.*** [36, 37] who stated that Escherichia coli is the most commonly isolated gram negative bacteria, and is frequently the initial infectious organism.

The finding presents the study nurses' age not affect their behavior. This finding is in contrast with ***Ball & Pike*** [38] who demonstrated that, age is a key variable influencing response behavior, followed by gender. This finding was in agreement with ***Elpern et al*** [39] who found that 40% of nurses' within age 20 – 35 years ago.

The results showed that, diploma of nursing represented a higher percentage in total sample, while only 5 nurses had Technical institute with specialty in nursing science. This finding were

contrast with ***Elpern et al*** [39] who found that only 8% of participated nurses in his study had diploma in nursing, while Baccalauriate 92%.

The findings also illustrate that, half of the sample had 5 years to 10 years of experience, while few of the sample had more than 10 years of experience. This finding is in contrast with ***Elpern et al*** [39] who found that, 36% of studied nurses had 3- 5 years of experience and 20% had 11- 20 years of experience.

It was found that, majority of the sample did not receive general training guidelines. This finding is supported by ***Saleh*** [40] who found that less than one quarter of nurses did not receive any training course. ***Rawlins*** [41] mentioned that, an orientation guidelines and training was essential for nurses to be implemented and helps new nurses to identify the rules and responsibilities.

The current study revealed that, the nurse's knowledge showed statistically significant differences between pre, immediate and three months post guidelines implementation about anatomy of urinary system and kidney, Kidney hormone and difference between male and female: This finding is in line with ***Tortora and Grabowski*** [42] who stated that nurses should have up to date knowledge of related anatomy and physiology before learning skills related to urinary catheter.

Also the results showed that, there was statistically significant difference between the three times guidelines implementation regarding nurses knowledge on medical terminology, investigations, common diseases related to urinary system. This was in agreement with ***Walsh*** [43] who emphasized on the fact that, a correct theoretical knowledge of underlying principles of the action is essential before practice. He also added that, knowledge without practice has no effect.

This study shows that there is statistically significant difference related to nurse's knowledge regarding intake and output at three times of guidelines implementation .Adequate urine flow must be ensured. The patient should receive sufficient fluids given orally to maintain an output of more than 50–100 mL/h [44]

***Foxley and Addison*** [45] studied the efficacy of Fluid intake and found that it was associated with catheter care advice. Fluid intake also dilutes urine and therefore can inhibit bacterial growth. ***Monroy-Torres and Macias*** [46] Who studied the effect of Cranberry juice which causes acidification of urine and is therefore becoming integral in catheter care advice. Record Intake and output provide information on fluid balance and kidney function [47].

The results presented statistically significant difference between three times guidelines implementation in relation to nurses' knowledge regarding urine characteristics. This finding was in agreement with ***Margaret and colleges*** [47] who studied the efficacy of guidelines that consisted of an education guidelines focusing on knowledge about character of urine that would determine the need for changing catheter. Their results found

that after guidelines, 15% of subjects whose catheter was changed had less infection compare with pre education guidelines.

The present study showed that, there were statistically significant difference between three times guidelines implementation in relation to knowledge about indications and contraindications of urinary catheter. This finding was in agreement with ***Crouzet and associates*** [48] who standardized indications for catheter insertion and / or removal guidelines, they found that, after implementation of the guidelines the incidence of CAUTI declined from 12.3 to 1.8 UTI per catheterized days.

The results show that there were statistically significant differences between three times guidelines implementation in relation to knowledge regarding types and characteristics of urinary catheter. ***Margaret and colleges*** [46] who found that, optimal CAUTI prevention guidelines should consider multiple aspects of catheter design, support the use of antimicrobial catheters; either silver alloy hydrogen catheters, or antibiotic impregnated silicone catheters.

The result presents high statistically significant difference at three times guidelines implementation in relation to knowledge of study nurses regarding complications of urinary catheter. Moreover, ***Margaret and colleges*** [46] found that, incidence of urinary tract infection decreased with gaining knowledge and feedback post guidelines regarding CAUTI, blockage and obstruction and relates it with practical field. The result shows that there were highly significant differences between three times guidelines implementation in relation to nurse's knowledge regarding procedure of catheterization. this in line with ***Margaret and colleges*** [46] who focus on specific components of insertion technique which described as" sterile" and specifically, nurses' washed their hands, open sterile pack for catheterization and use of sterile gown and gloves.

The result illustrates that, there were highly statistically significant differences between three times guidelines implementation in relation to knowledge regarding infection control. This finding is in line with ***Apisarthanarak and colleagues*** [49] who found that, any patient with an indwelling catheter that remained in place for more than 3 days was reviewed by the team, appropriate and inappropriate indications for catheterization and the reason for initial catheterization was revised and nurses monitored patients for signs and symptoms of CAUTI.

The result shows that there were statistical significant differences between level of practices among studied nurses and pre-catheterization preparation at three times guidelines implementation. ***Margaret and colleges*** [46] strict precatheterization preparation education/ feedback to nurses using sterile technique or clean technique as hand scrubbing for 4 minutes or hand washing using soap and water. Also, donning sterile gloves or non sterile gloves and gowns, and employing a catheter insertion kite and perineal cleansing, using a providence iodine solution,

either using two methods would decrease incidence of CAUTI.

Also the result presents that, there were statistical significant difference between level of practices among studied nurses and patient's preparation at three times guidelines implementation. This finding is in line with ***Kamdar et al*** [50] who reported that, nurses should gain knowledge before learning skills, so that nurses will be able to prepare patient for procedure e.g learn how to introduce herself and confirm their identity, learn how to explain and discuss procedure to both reduce patient anxiety and embarrassment and to ensure understanding so that consent given is well informed.

The results presented that, there were statistical significant difference between the level of practices and catheterization procedure at three times guidelines implementation. A professional who undertakes the process of catheterization must be competent with insertion and manipulation of the urinary catheter's system, trained in aseptic techniques to improve patient outcomes**.** [51]

The result presents that there were statistical significant difference between three times guidelines implementation and practice regarding method of obtaining sterile sample. ***Christine*** [52] reported that nurses should learn how to obtaine urine samples from sampling port using an aseptic technique. If healthcare staff are transporting specimens to the laboratory they must adhere to Packaging

The result illustrates that, there were no significant correlation coefficients between studied nurses' knowledge and their age's at three times guidelines implementation, while there were highly significant correlation coefficients between studied nurses' knowledge and educational level, years of experience. This finding was inconsistent with ***Simms*** [53], who found that age, level of education and years of experience have been found to be positively related to job satisfaction.

The result illustrates that, there were high significant correlation coefficients between studied nurses' knowledge and their practice at three times guidelines implementation. ***Joyce and Wenger,*** [54] mentioned to a "nurse-driven protocol" for Foley catheter removal, in which nurses documented daily the medical necessity of Foley catheters and were empowered to remove them when they were unnecessary.

The finding illustrate that, there were high significant correlation coefficients between studied nurses practice regarding the incidence of urinary tract infections on three times of catheterization first day after catheter insertion, fourth day and before catheter removal . This is in the same line with ***Gokula et al*** [16] who found that, nurses play the role of adopting measures to reduce the incidence of these infections, since it is a task predominantly performed by nurses.

## Conclusion

The study findings lead to the conclusion that, the incidence rate of urinary tract infection among patients with urinary catheterization can be decreased through application of nursing care guidelines. The Klebsiella and E. coli are the common micro-organisms isolated in both groups with significant bacteriuria. The main mechanical problems developed among both groups were blockage and irritation.

Positive urine culture immediately before removal was higher in the control group, compared to less than half of those in the study group; this difference was statistically significant.

## Recommendations

**1.** Establish standard of urinary catheter care regarding catheter associated urinary tract infection prevention.

**2.** Provide and implement written guidelines for catheter use, insertion, and maintenance.

**3.** Nurses are responsible for patient education are accountable for ensuring that appropriate training and educational guideliness to prevent CAUTI are developed and provided to patients, and families.

**4.** Research is needed for developing health education guideliness for the patients, regarding self care after catheterization.

**Table (1) Distribution of manifestations of urinary tract infection among study and control groups**

| .Manifestations | | Study (n=30) | | Control (n=30) | |
|---|---|---|---|---|---|
| | | № | % | № | % |
| Back pain | | 7 | 20.3 | 3 | 10.2 |
| Suprapubic pain | | 5 | 16.7 | 2 | 7.8 |
| Slight gross hematuria | | 3 | 10.2 | 3 | 10.2 |
| Turbid urine | | 2 | 7.8 | 2 | 7.8 |
| Fever | | 2 | 6.7 | 8 | 26.7 |
| Bladder cramp | | 1 | 4.3 | 6 | 20 |
| Chi-square | $X^2$ | 10.427 | | | |
| | P-value | 0.064 | | | |

(*) Statistically significant at $p<0.05$

**Table (2) Comparison of the results of urine culture among patients in the study and control groups as estimated on the first day, fourth day and before removal of urinary catheter.**

| Bacterial culture | | Stud group | | | | Control group | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | - ve | | + ve | | - ve | | + ve | |
| | | № | % | № | % | № | % | № | % |
| First day | | 11 | 36.7 | 19 | 63.3 | 9 | 30 | 21 | 70 |
| Fourth day bacterial count | | 11 | 36.7 | 19 | 63.3 | 8 | 26.7 | 22 | 73.3 |
| Immediately before removal of catheter | | 17 | 56.7 | 13 | 43.3 | 8 | 26.7 | 22 | 73.3 |
| Chi-square | $X^2$ | 12.38 | | | | | | | |
| | P-value | 0.001* | | | | | | | |

(*) Statistically significant at $p<0.05$

**Table (3) Distribution of study and control group regarding pus cell counts / HPF as estimated on the first day, fourth day and before removal of urinary catheter in relation to different pathogenic organisms(№ = 30)**

| Types of microorganism | Pus cell count in first day | | | | Pus cell count in fourth day | | | | Pus cell count before removal of catheter | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Less than 5 Pus cells/HPF | | More than 5 pus cells/HPF | | Less than 5 pus cells/HPF | | More than 5 pus cells/HPF | | Less than 5 pus cells/HPF | | More than 5pus cells/HPF | |
| | study % | control % | study % | control % | study % | control % | study % | control % | study % | control % | study % | control % |
| **Sterile** | 20 | 16.7 | 16.7 | 13.3 | 23.3 | 13.3 | 13.3 | 13.3 | 36.7 | 16.7 | 23.3 | 10 |
| **Klebsills spp.** | - | - | 23.3 | 26 | 3.3 | 3.3 | 26.7 | 16.7 | - | 3.3 | 10 | 30 |
| **Pseudomonas spp.** | - | - | 13.3 | 20 | 6.7 | 3.3 | 6.7 | 13.3 | 3.3 | 3.3 | 6.7 | 7.5 |
| **E. coli** | - | - | 13.3 | 10 | 6.7 | 3.3 | 3.3 | 10 | 6.7 | | 6.7 | 6.7 |
| **Staphylococcus aureus** | - | - | 3.3 | 3.3 | - | - | - | 10 | - | - | - | 10 |
| **Proteus mirabilis** | - | - | 3.3 | 3.3 | 3.3 | 3.3 | - | 3.3 | - | - | - | 3.3 |
| **Candida albicans** | 3.3 | 6.7 | 3.3 | 3.3 | - | 3.3 | 6.7 | 3.3 | 3.3 | | 3.3 | 3.3 |
| **Total** | 23.3 | 23.3 | 76.7 | 76.7 | 43.3 | 30 | 56.7 | 70 | 50 | 23.3 | 50 | 76.7 |
| **Study group** | | $X^2$ | 4.862 | | | | | | | | | |
| | | P-value | 0.047 | | | | | | | | | |
| **Control group** | | $X^2$ | 0.467 | | | | | | | | | |
| | | P-value | 0.791 | | | | | | | | | |

**Table (4) Distribution of study and control group in relation of bacterial count on the first day, fourth day and before removal of urinary catheter**

| Bacterial count group | | First day | | $4^{th}$day bacterial count | | Immediately before removal of catheter | |
|---|---|---|---|---|---|---|---|
| | | Study % | Control % | Study % | Control % | Study % | Control % |
| Sterile | | 36.7 | 30 | 36.7 | 26.7 | 56.7 | 26.7 |
| Less than 10.000cfu/ml | | 3.3 | 3.3 | 16.7 | 3.3 | 23.3 | 3.3 |
| 10.000- 100.000cfu/ml | | 23.3 | 26.7 | 13.3 | 10 | 10 | 6.7 |
| More than 100.000cfu/ml | | 36.7 | 40 | 33.3 | 60 | 10 | 63.3 |
| Study | $X^2$ | 14.359 | | | | | |
| | P-value | 0.026* | | | | | |
| Control | $X^2$ | 6.43 | | | | | |
| | P-value | 0.376 | | | | | |

**Table (5) Mean score of nurses` knowledge about care of patient with urinary catheter pre, post- immediate and 3 months post-guidelines implementation.**

| Knowledge items (Ideal range) | Nurses Knowledge score (n=30) | | | | |
|---|---|---|---|---|---|
| | Preguidelines | Post-guidelines | 3 months post-guidelines implementation | F | P |
| | Range Mean±SD | Range Mean±SD | Range Mean±SD | | |
| Anatomy and physiology of urinary system 0-8 | 0-3 2.91±1.91 | 1-7 6.57±1.69 | 1-5 4.91±1.95 | 160.23* | 0.0001* |
| Medical terminology related to urinary system 0-6 | 0-3 2.55±1.72 | 1-5 4.55±0.73 | 1-4 3.41±1.48 | 110.02* | 0.0002* |
| Investigation related to urinary system 0-6 | 0-2 1.18±1.45 | 1-5 4.73±0.87 | 1-3 2.45±1.17 | 200.52* | 0.0001* |
| Common diseases related to urinary system 0-6 | 0-1 0.89±0.57 | 1-5 4.73±0.87 | 1-3 2.45±1.17 | 158.72* | 0.0001* |
| Intake and output 0-6 | 0-2 1.24±0.58 | 1-5 4.49±0.87 | 1-3 2.47±0.48 | 226.05* | 0.0001* |
| Urine characteristics 0-4 | 0-1 1.12±2.0 | 1-4 3.11±0.81 | 1-3 2.0±0.94 | 217.75* | 0.0001* |
| Indication and contraindication sof catheterization 0-6 | 0-3 2.15±0.45 | 2-6 5.57±1.76 | 1-5 4.77±1.80 | 215.23* | 0.0001* |
| Types and characteristics of urinary catheter 0-16 | 0-6 4.28±1.75 | 2-14 12.67±2.72 | 1-11 10.39±1.64 | 285.28* | 0.0001* |

***Significant P<0.05**

**Table (5) contin.**

| Knowledge items (Ideal range) | Nurses Knowledge score (n=30) | | | | |
|---|---|---|---|---|---|
| | Preguidelines | Post-guidelines | 3 months post-guidelines implementation | F | P |
| | Range Mean±SD | Range Mean±SD | Range Mean±SD | | |
| Infection control 0-26 | 0-10 8.79±2.67 | 2-25 23.46±4.57 | 1-23 20.36±2.49 | 167.24* | 0.0001* |
| Procedure for catheterization 0-36 | 0-21 18.34±4.67 | 2-35 33±15.49 | 1-30 28.67±12.68 | 197.25* | 0.0001* |
| Complications of urinary catheter 0-20 | 0-9 8.37±4.28 | 1-19 18.73±6.57 | 1-17 16.47±6.43 | 156.84 | 0.0001* |
| Nursing management 0-26 | 0-10 9.55±6.19 | 1-25 23.84±2.52 | 1-22 20.57±4.18 | 187.14* | 0.0001* |
| Total | 0-25 15.25±6.19 | 1-35 30.24±15.49 | 1-30 28.67±12.68 | 158.46 | 0.0002* |

***Significant P<0.05**

**Table (6) Mean score of nurses` practices about care of patient with urinary catheter pre, immediate post and 3 months post-guidelines implementation.**

| Practices items (Ideal range) | Nurses' practices score (n=30) | | | | |
|---|---|---|---|---|---|
| | Pre-guidelines | Immediate post-guidelines | 3 months post-guidelines implementation | F | P |
| | Range Mean±SD | Range Mean±SD | Range Mean±SD | | |
| Pre-catheterization 0-4 | 0-1 1.12±2.0 | 1-4 3.11±0.81 | 1-3 2.0±0.94 | 217.75* | 0.0001* |
| Preparation with urinary catheter 0-26 | 0-10 9.55±6.19 | 1-25 23.84±2.52 | 1-22 20.57±4.18 | 187.14* | 0.0001* |
| Catheterization 0-28 | 0-12 10.12±3.42 | 1-26 24.21±4.12 | 1-23 19.50±3.28 | 167.24* | 0.0001* |
| Continuing care 0-34 | 0-15 13±5.49 | 1-30 28.67±12.68 | 1-28 23.84±8.52 | 120.02* | 0.0002* |

***Significant P<0.05**

**Table (6) contin.**

| Practices items (Ideal range) | Nurses' practices score (n=30) | | | | |
|---|---|---|---|---|---|
| | Pre-guidelines | Immediate post-guidelines | 3 months post-guidelines implementation | F | P |
| | Range Mean±SD | Range Mean±SD | Range Mean±SD | | |
| Sterile method of obtaining sample 0-22 | 0-14 10.39±1.64 | 1-20 18.73±6.57 | 1-18 16.47±6.43 | 128.51* | 0.0001* |
| **Total** | **0-13 9.24±1.64** | **1-27 25.11±4.12** | **1-23 18.47±6.43** | **133.28** | **0.001*** |

***Significant P<0.05**

**Table (7) Correlation between nurses' total knowledge about care of patient with urinary catheter and their demographic characteristics**.

| Nurses characteristics (n=30) | Total knowledge score | | | | | |
|---|---|---|---|---|---|---|
| | Pre- guidelines | | Immediate post guidelines | | 3 months post-guidelines implementation | |
| | r | P | R | P | r | P |
| **Age** | 2.03 | 0.02 | 3.54 | 0.215 | 2.57 | 0.214 |
| **Educational level** | 4.46 | 0.14 | 11.58 | 0.001* | 8.53 | 0.001* |
| **Years of experience** | 5.58 | 0.46 | 22.58 | 0.002* | 10.25 | 0.002* |
| **Years of experience at urology department** | 3.77 | 0.23 | 10.42 | 0.000* | 7.45 | 0.0001* |

***Significant P<0.05**

**Table (8) Correlation between nurses' knowledge and practices about care of patients with urinary catheter pre, immediate post and three months post-guidelines implementation.**

| Variables | Correlation | | | | | |
|---|---|---|---|---|---|---|
| | Pre- guidelines | | Immediate post | | 3 months post-guidelines implementation | |
| | R | P | R | P | r | P |
| **Knowledge** | 28.5 | 0.000* | 96.5 | 0.002* | 90.9 | 0.001* |
| **Practices** | 28.5 | 0.001* | 97.5 | 0.001* | 82.5 | 0.002* |

***Significant P<0.05**

**Table (9) Correlation between nurses practices about care of patients with urinary catheter regarding incidence of urinary tract infection on the first day, fourth day and before removal of urinary catheter**.

| Variables | Correlation | | | | | |
|---|---|---|---|---|---|---|
| | First day | | At fourth days | | Before removal | |
| | r | P | R | P | r | P |
| **Practices** | 28.5 | 0.001* | 97.5 | 0.001* | 82.5 | 0.002* |
| **Incidence of infection** | 55.8 | 0.0001* | 20.4 | 0.0001* | 8.5 | 0.002* |

***Significant P<0.05**

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