Comparison of the Effect of Water Vs. Povidone-Iodine Solution for Periurethral Cleaning in Women Requiring an Indwelling Catheter Prior to Gynecologic Surgery

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Urinary catheterization is a common procedure in the care and treatment of hospitalized patients (Gray, 2004). More than 25% of inpatients in hospitals are catheterized during their hospital stay (Phipps et al., 2006). The sterility of the urinary tract is maintained in part by the outflow of urine, which prevents pathogenic organisms from ascending into the bladder. The use of a urinary catheter in a patient’s management impairs this protective mechanism (Cotterill & Elliott, 1992). Progress in operative techniques, the introduction of new drugs, and modernizing of medical equipment have allowed long and complicated surgeries to be performed. For that reason, the number of patients who need catheterization of their urinary bladder is increasing (Pawelczyk et al., 2002). Urinary catheters are often used after gynecological surgery to monitor urine output, to allow patients to pass urine, and to help tissues heal. Even short-term catheter use after gynecologic surgery is associated with a high risk of post-operative bacteriuria and urinary tract infection (UTI). Although asymptomatic bacteriuria often disappears without treatment, 15% to 20% of patients will develop symptomatic UTIs (Schiotz & Gutti, 2002).

Urinary catheterization is associated with approximately a 5% increased risk of bacteriuria for each day the catheter is in place (Schiotz, 1996). While skin irritation and inflammation around the urethral meatus are uncommon,

This study compared rates of bacteriuria and urinary tract infections in 60 women randomized to periurethral area cleansing with water or povidone-iodine solution prior to insertion of an indwelling urinary catheter. A urine specimen was collected immediately before and 24 hours after catheter insertion. There were no significant differences in the rate of bacteriuria or urinary tract infections in the water and povidone-iodine groups.

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Introduction
Urinary catheterization is a common procedure in the care and treatment of hospitalized patients. There is a need for catheter-related care that is safe for clients, free of adverse effects, and cost-effective.

Objective
The purpose of the current study was to compare rates of bacteriuria and urinary tract infections (UTIs) when water and povidone-iodine solution were used for periurethral cleaning prior to catheterization in women who had indwelling catheters inserted prior to gynecologic surgery.

Methods
After ruling out a UTI, 60 women undergoing inpatient gynecology surgery who required urinary catheterization as part of their routine care were randomly assigned to periurethral cleansing with water or povidone-iodine prior to inserting an indwelling catheter. By design, all subjects were negative for bacteriuria at the time of catheter insertion. Urine cultures were obtained at the time of catheter removal, and rates of bacteriuria and UTIs were compared in the two groups.

Results
Overall, 18.3% of the 60 subjects had bacteriuria at the time of catheter removal, but the rates were not statistically significantly different in the water (20%) and povidone-iodine (16.7%) groups. None of the subjects met the criteria (colony count greater than 105) for a UTI.

Conclusions
The findings of the current study, which are consistent with previous research, suggest that compared to water, the use of topical antiseptics for cleaning the periurethral area prior to catheter insertion does not significantly reduce the incidence of bacteriuria and UTIs. These findings should be confirmed in other patient populations.

Level of Evidence – II
(Melnyk & Fineout-Overholt, 2005)

and many cases of asymptomatic bacteriuria will resolve spontaneously, a substantial number of patients with indwelling catheters will develop a symptomatic UTI. These infections can lead to distressing symptoms for patients; contribute to emotional distress for both patients and families; be associated with significant morbidity, excess mortality, and prolonged hospital stays; and contribute to high health care costs (Colgan, Nicolle, McGlone, Hooton, 2006; Wolday & Erge 1997). There is, therefore, a need for catheter-related care that is safe for clients, free of adverse effects, and cost-effective (Gray, 2004). Research studies provide some evidence on the effectiveness of interventions in reducing the risk of catheter-related UTIs. These include indications for the indwelling catheter use, catheter materials, the use of closed drainage systems, and catheter size, hygiene, irrigation, and changing intervals. The level of evidence supporting each of these interventions varies (Gray, 2004).

It is generally accepted based on research evidence that the use of topical antiseptics during catheter care does not reduce the risk of catheter-related UTIs (Gray, 2004; Webster et al., 2001). Their use is still, however, generally recommended prior to catheterization. There is limited research comparing the use of topical antiseptics and water in cleansing the periurethral area prior to catheterization (Cheung, et al., 2008; Webster et al., 2001). Both of these studies suggest that compared to water, cleansing with topical antiseptics does not reduce the risk of UTIs. Although uncommon, topical antiseptic solutions can be associated with local allergic reactions, which add to the costs associated with urinary catheterization. If not associated with an increased risk for bacteriuria and UTIs, cleaning with water is an economical, widely available alternative to topical antiseptics. The present study was designed to add to the evidence base comparing topical antiseptics and water for pre-catheterization periurethral cleansing. The aim of the present study was to compare rates of bacteriuria and UTIs when water and povidone-iodine solution were used for periurethral cleaning prior to catheterization in women who had indwelling catheters inserted prior to gynecologic surgery.

Design and Methods
A single-blinded prospective randomized trial was performed. The purpose of this study was to compare urinary colonization rates in subjects whose periurethral area was cleaned with water versus povidone-iodine before the insertion of an indwelling urinary catheter. The sample for this study was 60 women undergoing inpatient gynecology surgery who required urinary catheterization as part of their routine care and were expected to have their catheter in place for 24 to 48 hours. They were hospitalized in a university hospital in Yazd in Iran. Women were excluded from the study if they took an antibiotic drug during the week before surgery, if their catheter was removed before 24 hours, or if there were bacteriuria on the first urine sample. The study was approved by the university’s ethical research committee, and written informed consent was obtained from all participating patients.

Following consent, women were randomly assigned to either the water or povidone-iodine group. Demographic data were collected from each subject, including age, the number of pregnancies, and the number of vaginal examinations. The date and time that the indwelling catheter was inserted was documented. Two urine specimens were obtained from each patient for urinalysis and culture, one at the time of catheterization (a clean voided urine specimen) and the other at the time of catheter removal 24 hours post-surgery. All catheters were removed 24 hours following surgery. Routine sterile hospital pro-
procedure was followed during insertion of the catheter for all subjects. The only difference between the two groups was that tap water was used to clean the periurethral area in the experimental group, and povidone-iodine was used in the control group. Two staff nurses collected the urine specimens at baseline, did all catheterizations, and collected the urine specimen at the time of catheter removal. Prior to starting data collection, they were trained by the principal investigator and observed to make sure they were following the study procedure and performing the catheterizations the same way.

At the time of removal, approximately 3 mL of urine (the second urine specimen) was aspirated from the sampling port of the catheter with a sterile syringe. The specimens were transferred immediately to the laboratory and were cultured by using a technique capable of detecting 1 colony-forming unit (CFU) per milliliter. One mL of undiluted urine was evenly spread on pre-dried sheep-blood agar plates followed by serial dilutions. After aerobic incubation at 37 degrees Celsius for 24 to 48 hours, each colony type was enumerated and fully identified by using standard techniques and criteria. The outcomes of bacteriuria and UTI were based on the urine colony count. A colony count of greater than 10^5 organisms per mL was considered bacteriuria, while counts greater than 10^5 were classified as UTIs. The types of microorganisms were identified. Any antibiotic therapy prescribed by the patient’s physician was also recorded.

Data analysis, conducted by SPSS software version 12, included descriptive and analytic statistics. The Chi-square and Fisher’s exact tests were used to examine differences in rates of bacteriuria and UTIs at a p = 0.01 level.

Results

Seventy-two (n = 72) gynecological patients were enrolled in the study, but 12 were excluded because they did not have results for the second urine specimen. Data were analyzed for 60 subjects with urine cultures at both time points. Their mean age was 48.18 ± 10.32 years. The number of children the women had given birth to (parity) varied. Parity was 0 to 3 for 43.4% (n = 26), 4 to 7 for 38.3% (n = 23), and more than 7 (multiparity) for 18.3% (n = 11). The majority (55%, n = 33) of the women had one pelvic examination during the study hospitalization, 13.3% (n = 8) had two or more, and 31.7% (n = 19) had none.

Of the 60 subjects with complete data, 30 were in the povidone-iodine group, and 30 were in the water group. The study groups were similar with respect to demographics and surgical indications. All subjects had their catheter removed 24 hours post-surgery.

There were no significant differences in the rates of bacteriuria or UTIs in the two groups (see Table 1). Overall, 18.3% of the 60 subjects had urinary tract bacteriuria at greater than 10^3 cfu/L at the time of catheter removal. Asymptomatic bacteriuria was diagnosed in 11 subjects (6 [20%] in the water group and 5 [16.7%] in the povidone-iodine group) (see Table 1). None of the women in either group met the criteria for a UTI (a colony count greater than 10^5 cfu/L). Table 2 shows the microorganisms identified in the urine cultures of the two groups at the time of catheter removal. The most common microorganism in water group were Escherichia coli (10.0%), staphylococcus aeroginosa (6.65%), and Enterococcus species (3.35%).

### Table 1.
**Comparison of the Frequency Bacteriuria in the Water and Povidone-Iodine Groups in Urine Specimens Collected at the Time of Catheter Removal**

<table>
<thead>
<tr>
<th>Groups</th>
<th>Bacteriuria</th>
<th></th>
<th></th>
<th>Sum</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>%</td>
<td>No</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Water</td>
<td>6</td>
<td>20</td>
<td>24</td>
<td>80</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>Povidone-iodine</td>
<td>5</td>
<td>16.7</td>
<td>25</td>
<td>83</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>11</td>
<td>18.3</td>
<td>49</td>
<td>81.7</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>Fisher exact test</td>
<td>X² = 0.111</td>
<td>df = 1</td>
<td>p = 0.5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note: p = 0.001 was considered statistically significant.

*Potential subjects were excluded if they had bacteriuria in their baseline urine specimen collected at the time of catheterization. Thus none of the subjects had bacteriuria prior to catheter insertion.*

### Table 2.
**Microorganisms Isolated in the Urine Cultures of Water and Povidone-Iodine Subjects at the Time of Catheter Removal**

<table>
<thead>
<tr>
<th>Microorganism</th>
<th>Water Subjects n (%)</th>
<th>Povidone-Iodine Subjects n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerobic gram-negative bacilli</td>
<td>0 (0)</td>
<td>1 (3.3)</td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>2 (6.5)</td>
<td>1 (3.3)</td>
</tr>
<tr>
<td>Streptococcus</td>
<td>0 (0)</td>
<td>1 (3.3)</td>
</tr>
<tr>
<td>Escherichia coli</td>
<td>3 (10.0)</td>
<td>2 (6.7)</td>
</tr>
<tr>
<td>Enterococcus</td>
<td>1 (3.3)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>None (negative culture)</td>
<td>24 (80.0)</td>
<td>25 (83.3)</td>
</tr>
</tbody>
</table>
Bacteria in the povidone-iodine group included *E. coli* (6.65%), aerobic gram-negative *bacilli* (3.35%), *staphylococcus* (3.35%), and *streptococcus* (3.35%).

**Discussion**

The current study compared bacteriuria and UTI rates when periurethral cleaning was performed using water or povidone-iodine prior to insertion of an indwelling urethral catheter in women scheduled for gynecology surgery. There were no significant differences in the rates of bacteriuria or UTIs. Research comparing use of water to topical antiseptics for cleaning prior to catheter insertion is limited. The findings of the current study are consistent with two previous studies examining the use of topical antiseptics prior to catheter insertion. Webster and colleagues (2001) compared bacteriuria rates in pregnant women whose periurethral area was cleaned with water versus chlorhexidine 0.1% prior to insertion of an indwelling catheter as part of their routine management at the time of delivery. Of the 436 patients with complete data (water group, 219; antiseptic group, 217), a total of 38 (8.7%) had urinary tract bacteriuria greater than 10⁶ cfu/L. The rates of bacteriuria were similar in both groups (water group, 8.2%; antiseptic group, 9.2%; odds ratio 1.13; 95% confidence interval 0.58 to 2.21) (Webster et al., 2001). Cheung and colleagues (2008) compared rates of symptomatic UTIs when 0.05% chlorhexidine gluconate (CHG) or water were used for periurethral cleaning prior to insertion of an indwelling catheter in a sample of home care patients (*n* = 20; 8 in the sterile water group and 12 in the CHG group). There were no significant differences in colony counts in the two groups, and none of the subjects developed a UTI.

While no other studies comparing the use of a topical antiseptic and water for cleaning the periurethral area were found, a study by Schiotz (1996) compared UTI rates in women who had gynecological surgery when an antiseptic gel was either used or not used to lubricate the catheter prior to insertion. UTIs occurred in 17.4% and 18.3% of the patients, respectively (*p* = 0.95).

The findings of the current study and previous research suggest that compared to water, the use of topical antiseptics for cleaning the periurethral area prior to catheter insertion does not significantly reduce the incidence of bacteriuria and UTIs. Based on the results of these studies, water was an equally effective means of reducing bacteriuria. It is a simple and cost-effective method of periurethral cleansing prior to catheter insertion. Additional research is needed to determine if these findings are true in different groups of patients.

**Limitations**

This study has several limitations. First, the results are valid only for the institution and subjects included in this study. Secondly, implementation of this protocol required a great deal explanation for both patient and staff acceptance. Because the staff routinely used an antiseptic solution prior to catheter insertion, extensive education was required prior to implementation of the protocol. The principal investigator held four 1-hour educational sessions with the nursing staff prior to starting the study. Another limitation of the study was that all catheterizations were not performed by the same person. Although the two staff nurses who did the catheterizations and collected the pre and post-catheter urine specimens were trained by the principal investigator and observed to make sure they were following the study protocol, it is possible that there were inconsistencies in the way they implemented the procedure during the study. Finally, women participating in this study were scheduled for elective gynecological surgery and were relatively healthy. Consequently, the findings may not be applicable to all hospitalized patients, or patients of different ages with multiple co-morbid conditions.

**Implications for Urologic Nursing Practice**

Since this was a small study conducted in one hospital and with otherwise relatively healthy women scheduled for gynecological surgery, additional research is needed to establish the safety of periurethral cleansing with water prior to the insertion of an indwelling catheter in other patient groups. If future studies in more diverse patient populations confirm that this procedure is not associated with an increased risk for catheter-associated UTIs, a change in the current practice of using antiseptic agents for cleansing prior to catheter insertion may be appropriate. Although the risk of a local adverse reaction to these agents is not common, they do occur, and there are added costs associated with use of these agents.

**References**


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