# Indwelling Urinary Catheterization versus Clean Intermittent Catheterization for the Short-Term Management of Hospitalized Patients with Transient Acute Urinary Retention: A Prospective Randomized Trial

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***Background:*** *Acute urinary retention (AUR) is a common problem in hospitalized patients. Either indwelling urethral catheterization or clean intermittent catheterization (CIC) can be the choice of treatment. Catheter-associated urinary tract infection (CAUTI) is the common complication.*

***Objective:*** *The primary objective of this study was to compare rates of CAUTI between CIC and indwelling urethral catheter technique for the short-term management of patients with transient AUR.*

***Material and Method:*** *One hundred patients hospitalized patients who developed first-time AUR between June 2014 and May 2015 were randomized into CIC and indwelling urethral catheter groups using a sealed-envelope technique. The primary outcomes of the study were catheter-associated asymptomatic bacteriuria and CAUTI. The secondary outcomes were pain, gross hematuria, cloudy urine, and quality of life.*

***Results:*** *There was no statistically significant difference between the CIC and indwelling urethral catheter groups in terms of the rates of CAUTI (10% vs. 8%) and catheter-associated asymptomatic bacteriuria (52% vs. 36%) (p = 0.214). In addition, there was no statistically significant difference in terms of gross hematuria (8% vs. 20%, p = 0.084), cloudy urine (26% vs. 22%, p = 0.640), pain score [0 (range, 0 to 7) vs. 0 (range, 0 to 6), p = 0.246], and quality of life [5 (range, 2 to 5) vs. 5 (range, 2 to 5), p = 0.596].*

***Conclusion:*** *In hospitalized patients with transient AUR, CIC was not shown to be superior to indwelling urethral catheterization in terms of rates of infections. Quality of life, pain, rates of gross hematuria, and cloudy urine were also similar in both groups. Furthermore, indwelling catheterization is preferable in patients without caretakers.*

***Keywords:*** *Urethral catheter, Clean intermittent catheterization, UTI, Pain, Quality of life, Hematuria, Cloudy urine*

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Urinary retention is the inability to voluntarily pass urine. It is the most common urological emergency[1]. This condition can be acute or chronic. Acute urinary retention (AUR) is a common problem in hospitalized patients. The International Continence Society (ICS) defines AUR as a "painful, palpable or percussable bladder, when the patient is unable to pass any urine"[2]. Weinstein et al reported that 12% to 16% of adult hospital inpatients would have a urinary catheter at some point of time after admission[3]. The causes of AUR in these patients may be spontaneous or may develop in response to a trigger such as inflammation, surgery, anesthesia, medications with sympathomimetic or anticholinergic effects, antihistamines or other substances, or other causes that are usually transient. Most of these patients can eventually void spontaneously without the need of further treatments other than urethral catheterization or clean intermittent catheterization (CIC)[4,5].

Catheter-associated urinary tract infection (CAUTI) is the most common nosocomial infection,

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accounting for up to 40% of all nosocomial infections[6-8]. The National Healthcare Safety Network (NHSN) has reported the CAUTI rates of 0.2 to 4.8 per 1,000 catheter days for adult inpatient units in 2011[9]. Because the daily risk of acquisition of bacteriuria varies from 3% to 7% when an indwelling urethral catheter remains in situ[10], most physicians prefer CIC to chronic indwelling urethral catheter on the basis of the claim that the rate of CAUTI is lower. Morbidity attributable to any single episode of catheterization is limited[11]; however, the high frequency of catheterization creates a substantial cumulative burden[12-15]. CIC has been associated with rates of bacteriuria ranging from 1% to 3% per catheterization[16].

Therefore, the rate of CAUTI in hospitalized patients with transient AUR who required CIC or indwelling urethral catheter for only a short-term period should be determined.

The primary objective of this study was to determine the risk of CAUTI in hospitalized adults with transient AUR treated with short-term CIC versus those treated with short-term indwelling urethral catheter.

Secondary objectives include the comparison of quality of life, pain score, rates of gross hematuria, and cloudy urine in these two interventions.

## Material and Method

We queried the hospitalized patients in Ramathibodi Hospital who developed first-time AUR between June 2014 and May 2015. Patients under 18 years of age with a history of urinary retention, urinary tract infection, and poor compliance were excluded from this study. All the patients gave their written informed consents. The patients were randomly divided into two groups depending on the type of assigned intervention, CIC and indwelling urethral catheter groups using a sealed-envelope technique. In CIC group, we used the clean technique with cleansed, re-used catheters implied hand washing with soap and water, and cleansing the perineum only if fecal or other wastes were presented as described by Lapides et al[17].

All the patients were followed-up after two weeks. Urinalysis and urine culture were obtained at the time of AUR and whenever the patients developed UTI-associated symptoms. The patients with positive urine culture at the time of AUR were excluded from the study.

According to the 2009 guidelines from the Infectious Diseases Society of America, a CAUTI is defined by the presence of symptoms or signs compatible with UTI and no other identified source of infection, along with 103 CFU/mL or more of one or more bacterial species in a single catheter urine specimen or in a midstream voided urine specimen from a patient whose urethral catheter has been removed within the previous 48 hours. Catheter-associated asymptomatic bacteriuria is defined by the presence of 105 CFU/mL or more of one or more bacterial species in a single catheter urine specimen from a patient without symptoms compatible with UTI[18].

The patients who developed CAUTI during the study were treated with antibiotics until the urine cultures were negative.

Extracted data also included patients' demographics, type of operation, amount of residual urine from the first urinary catheterization, presence of gross hematuria and cloudy urine, pain score, and whether the patients could void after two weeks. All the patients had to complete the quality of life questionnaires at the time of follow-up.

The patients who could not void at the follow-up time were continuously treated with either CIC or indwelling urinary catheter, followed-up again and considered for causes of urinary retention other than transient causes.

The main outcomes of this study were catheter-associated asymptomatic bacteriuria and CAUTI. The secondary outcomes were pain, gross hematuria, cloudy urine, and quality of life.

Pain was assessed with visual analog scale (VAS)[19]. Quality of life was assessed on the basis of social functioning (SF) that was derived from SF-36 questionnaire[20,21] (Tables 7).

Statistical analysis was performed using SPSS Statistics (version 19) software. Frequencies and proportions were used to report categorical variables. Mean and standard deviations were used for continuous variables. Frequencies and proportions were compared using the Chi-square test. The means were compared using the student t-test and the Mann-Whitney test. A *p*-value of less than 0.05 was considered as statistically significant.

## Results

Between June 2014 and May 2015, there were 141 hospitalized patients diagnosed with AUR at Ramathibodi Hospital. Forty-one patients were excluded on the basis of the any of the following criteria, age of the patient was less than 18 years, presence of bacteriuria at the time of AUR, previous history of urinary retention, or poor compliance. Finally, 100

patients were randomly divided into the CIC group (50) and the indwelling urethral catheter group (50). The mean patient age ($p = 0.604$), male-to-female ratio ($p = 0.841$), and amount of residual urine at the first urinary catheterization ($p = 0.081$) of the groups were similar (Table 1). The non-operative-to-postoperative ratio ($p = 0.688$) and types of operation ($p = 0.830$) were also similar (Table 2).

After two weeks of urinary catheterization, there was no statistically significant difference in the rates of CAUTI in the CIC group (10%) compared with those in the indwelling urethral catheter group (8%). In addition, there was no statistically significant difference in the rates of catheter-associated asymptomatic bacteriuria in the CIC group (52%) compared with those in the indwelling urethral catheter group (36%) ($p = 0.214$) (Table 3). Table 4 shows the types of organisms that were isolated from urine cultures.

The percentages of patients who could void after two weeks were similar in the CIC group (84%, 42/50) and the indwelling urethral catheter group (86%, 43/50) ($p = 0.779$).

There was no statistically significant difference between the CIC group and the indwelling urethral catheter group with regard to the rates of gross hematuria (8% vs. 20% respectively, $p = 0.084$) and cloudy urine (26% vs. 22% respectively, $p = 0.640$) (Tables 5).

**Table 1.** Patient characteristics

| Total (n = 100) | CIC (n = 50) | Indwelling catheter (n = 50) | *p*-value |
|---|---|---|---|
| Gender (male/female) | 25/25 | 26/24 | 0.841 |
| Mean age ± SD (years) | 69.8±15.1 | 68.10±16.0 | 0.604 |
| 1st residual urine (mL) | 416±214.152 | 514.4±267.491 | 0.081 |

SD = standard deviation; CIC = clean intermittent catheterization

**Table 2.** Nonoperative and postoperative care, and types of operation

| Total (n = 100) | CIC (n = 50) | Indwelling catheter (n = 50) | *p*-value |
|---|---|---|---|
| Nonoperative/postoperative | 48/52 | 44/56 | 0.688 |
| Types of operation (total = 108) | n = 52 | n = 56 | |
| Orthopedics | 8 (30.8%) | 7 (25%) | |
| Neurosurgery | 5 (19.2%) | 11 (39.3%) | |
| General surgery | 7 (26.9%) | 4 (14.3%) | |
| Vascular | 1 (3.8%) | 1 (3.6%) | |
| Cardiothoracic | 1 (3.8%) | 0 (0%) | |
| Eye | 1 (3.8%) | 2 (7.1%) | |
| HPB | 2 (7.7%) | 2 (7.1%) | |
| ENT | 1 (3.8%) | 1 (3.6%) | 0.830 |

HPB = Hepato-pancreato-biliary surgery; ENT = Ear, nose, and throat surgery

**Table 3.** Rates of catheter-associated asymptomatic bacteriuria and CAUTI

| Total (n = 100) | CIC (n = 50) | Indwelling catheter (n = 50) | *p*-value |
|---|---|---|---|
| No UTI | 19 (38%) | 28 (56%) | |
| Catheter-associated asymptomatic bacteriuria | 26 (52%) | 18 (36%) | |
| CAUTI | 5 (10%) | 4 (8%) | 0.214 |

UTI = urinary tract infection; CAUTI = catheter-associated urinary tract infection

There was also no statistically significant difference in the pain scores of the CIC group [0 (range, 0 to 7)] and the indwelling urethral catheter group [0 (range, 0 to 6)] ($p = 0.246$) (Table 6).

The quality of life scores of the CIC and indwelling urethral catheter groups were also similar [5 (range, 2 to 5) vs. 5 (range, 2 to 5), $p = 0.596$] (Table 8).

## Discussion

Acute urinary retention (AUR) is a common problem in hospitalized patients. From our study in Ramathibodi Hospital (between June 2014 and May 2015), the incidence of AUR in hospitalized patients was 141 patients per year (approximately 12 cases per month).

Most of the patients in our study (84% in the CIC group and 86% in the indwelling urethral catheter group) could void after two weeks, thus, confirming that the causes of AUR in hospitalized patients were usually transient.

Urinary tract infection (UTI) associated with the use of a urinary catheter is one of the most common infections acquired by patients in health care facilities.

Stickler DJ reported that the most important cause of bacteriuria is biofilm formation along the catheter surface. Biofilm formation begins immediately after catheter insertion. Both the exterior and interior catheter surfaces are involved. Bacteria can originate from the periurethral area or ascend the drainage tubing following colonization of the drainage bag[22].

Hooton TM et al have reported that the most common infecting organism is *Escherichia coli* (*E. coli*)[18]. Nicolle LE has reported that other Enterobacteriaceae as well as *Enterococci* spp., coagulase-negative *Staphylococcus*, *Pseudomonas aeruginosa*, other non-fermenters, and *Candida* spp. are also frequently isolated[23]. In our study, *E. coli* was the most commonly isolated organism and *E. coli* (ESBL) was followed by *Pseudomonas aeruginosa* and *Enterococci* spp. (Tables 4).

Gross hematuria, cloudy urine, and pain are

**Table 4.** Organisms isolated from urine culture

| Organism | Total (53) |
|---|---|
| *E. coli* | 16 (30.2%) |
| *E. coli* (ESBL) | 11 (20.8%) |
| *Pseudomonas aeruginosa* | 10 (18.9%) |
| *Enterococci* spp. | 8 (15.1%) |
| *Proteus mirabilis* | 2 (3.8%) |
| *Stenotrophomonas maltophilia* | 2 (3.8%) |
| *Klebsiella pneumoniae* | 2 (3.8%) |
| *Candida albicans* | 2 (3.8%) |

*E. coli* = *Escherichia coli*; *E. coli* (ESBL) = Extended-spectrum beta-lactamase producing *E. coli*

**Table 5.** The ability to void after 2 weeks, rates of hematuria, and cloudy urine

| Total (n = 100) | CIC (n = 50) | Indwelling catheter (n = 50) | *p*-value |
|---|---|---|---|
| Hematuria | 4 (8%) | 10 (20%) | 0.084 |
| Cloudy urine | 13 (26%) | 11 (22%) | 0.640 |
| Could void after 2 weeks | 42 (84%) | 43 (86%) | |
| Could not void after 2 weeks | 8 (16%) | 7 (14%) | 0.779 |

**Table 6.** Comparison of pain scores between CIC and indwelling urethral catheter group using VAS

| Pain score | CIC (n = 50) | Indwelling catheter (n = 50) | *p*-value |
|---|---|---|---|
| 0 | 26 (52%) | 32 (64%) | |
| 1 | 11 (22%) | 7 (14%) | |
| 2 | 4 (8%) | 5 (10%) | |
| 3 | 2 (4%) | 3 (6%) | |
| 4 | 4 (8%) | 1 (2%) | |
| 5 | 2 (4%) | 1 (2%) | |
| 6 | 0 (0%) | 1 (2%) | |
| 7 | 1 (2%) | 0 (0%) | 0.246 |

also common complications that resulted from urinary catheterization. Moreover, urinary catheterization may affect the patients' quality of life.

From our study, there was no statistically significant difference in the rates of CAUTI (10% in the CIC group and 8% in indwelling urethral catheter group). In addition, there was no statistically significant difference in the rates of catheter-associated asymptomatic bacteriuria (52% in the CIC group and 36% in the indwelling urethral catheter group) ($p$ = 0.214).

The National Healthcare Safety Network (NHSN) has reported CAUTI rates of 0.2 to 4.8 per 1,000 catheter days for adult inpatient units in 2011[9]. However, in our study, the rates of CAUTI were high (10% in the CIC group and 8% in the indwelling urethral catheter group).

There was also no statistically significant difference between the CIC and indwelling urethral catheter groups in terms of gross hematuria (8% vs. 20%, $p$ = 0.084), cloudy urine (26% vs. 22%, $p$ = 0.640), pain score [0 (range, 0 to 7) vs. 0 (range, 0 to 6), $p$ = 0.246], and quality of life [5 (range, 2 to 5) vs. 5 (range, 2 to 5), $p$ = 0.596].

In our study, we concluded that the rates of CAUTI, catheter-associated asymptomatic bacteriuria, gross hematuria, cloudy urine, pain, and quality of life were similar in CIC and indwelling urethral catheter groups. Therefore, in disabled patients who did not have caretakers to do the CIC, indwelling catheterization seems to be preferable.

The present study has several limitations. First, the number of patients enrolled in this study were small. Second, we did not follow-up the patients who could not void after a period of two weeks. Therefore, further study needs to be conducted to follow-up these patients to know the exact time at which they could spontaneously void and whether they get CAUTI.

**Table 7.** Quality of life is assessed on the basis of social functioning (SF) that is derived from SF-36 questionnaire

| During the past two weeks, how much time has your physical health or emotional problems associated with urinary diversion interfered with your social activities? | |
|---|---|
| 1 | All of the time |
| 2 | Most of the time |
| 3 | Some of the time |
| 4 | A little bit of the time |
| 5 | None of the time |

## Conclusion

In hospitalized patients with transient AUR, CIC was not shown to be superior to indwelling urethral catheterization in terms of rates of CAUTI and catheter-associated asymptomatic bacteriuria. Quality of life, pain, rates of gross hematuria, and cloudy urine were also similar in both the groups. Indwelling urethral catheterization is an appropriate therapeutic intervention for hospitalized patients with transient AUR, especially in disabled patients without caretakers to handle the CIC.

## What is already known on this topic?

Most physicians prefer CIC to chronic indwelling urethral catheter on the basis of the claim that the rate of catheter-associated urinary tract infection (CAUTI) is lower.

However, the rate of CAUTI in hospitalized patients with transient AUR who required CIC or indwelling urethral catheter for only a short-term period has not been determined.

## What this study adds?

In hospitalized patients with transient AUR, CIC was not shown to be superior to indwelling urethral catheterization in terms of rates of infections. Indwelling

**Table 8.** Comparison of quality of life between CIC and indwelling urethral catheter groups (Limitations of social activities associated with each type of urinary diversion).

| Limitations of social activities | CIC (n = 50) | Indwelling catheter (n = 50) | $p$-value |
|---|---|---|---|
| 1) All of the time | 0 (0%) | 0 (0%) | |
| 2) Most of the time | 4 (8%) | 2 (4%) | |
| 3) Some of the time | 4 (8%) | 4 (8%) | |
| 4) A little bit of the time | 14 (28%) | 14 (28%) | |
| 5) None of the Time | 28 (56%) | 30 (60%) | 0.596 |

catheterization is preferable in patients without caretakers. Quality of life, pain, rates of gross hematuria, and cloudy urine were also similar in both the groups. Most of the patients in our study could void after two weeks, thus, confirming that the causes of AUR in hospitalized patients were usually transient.

**Potential conflicts of interest**

None.

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## การศึกษาทดลองแบบสุ่มเพื่อเปรียบเทียบวิธีการรักษาระหว่างวิธีการคาสายสวนปัสสาวะและวิธีการสวนปัสสาวะตามเวลาแบบสะอาดสำหรับการรักษาระยะสั้นในผู้ป่วยในที่มีภาวะปัสสาวะคั่งเฉียบพลันแบบชั่วคราว

**พชรพงศ์ เจนจิตรานันท์, วรพัฒน์ อัตเวทยานนท์, ปกเกศ ศิริศรีตรีรักษ์, เปรมสันติ์ สังฆ์คุ้ม, วิทย์ วิเศษสินธุ์**

***ภูมิหลัง:*** *ภาวะปัสสาวะคั่งเฉียบพลันเป็นปัญหาที่พบบ่อยในผู้ป่วยใน โดยอาจรักษาด้วยวิธีการคาสายสวนปัสสาวะหรือวิธีการสวนปัสสาวะตามเวลาแบบสะอาด การติดเชื้อระบบปัสสาวะจากสายสวนปัสสาวะถือเป็นผลแทรกซ้อนที่พบได้บ่อย โดยงานวิจัยที่มีมาก่อนหน้านี้มักทำการศึกษาเปรียบเทียบอัตราการติดเชื้อระบบปัสสาวะจากสายสวนปัสสาวะในผู้ป่วยที่มีภาวะปัสสาวะคั่งแบบเรื้อรัง*

***วัตถุประสงค์:*** *จุดประสงค์หลักของการวิจัยนี้เพื่อเปรียบเทียบอัตราการติดเชื้อระบบปัสสาวะ จากสายสวนปัสสาวะระหว่างวิธีการคาสายสวนปัสสาวะและวิธีการสวนปัสสาวะตามเวลาแบบสะอาดสำหรับการรักษาระยะสั้นในผู้ป่วยในที่มีภาวะปัสสาวะคั่งเฉียบพลันแบบชั่วคราว*

***วัสดุและวิธีการ:*** *ทำการศึกษาผู้ป่วยในที่มีภาวะปัสสาวะคั่งเฉียบพลันเป็นครั้งแรกโดยเก็บข้อมูลตั้งแต่เดือนมิถุนายน พ.ศ. 2557 ถึง เดือนพฤษภาคม พ.ศ. 2558 มีผู้เข้าร่วมวิจัยจำนวนทั้งหมด 100 รายซึ่งจะถูกสุ่มวิธีการรักษาเป็น 2 กลุ่ม ด้วยวิธีการคาสายสวนปัสสาวะหรือวิธีการสวนปัสสาวะตามเวลาแบบสะอาด ผลลัพธ์หลักที่ประเมิน ได้แก่ การตรวจพบแบคทีเรียในปัสสาวะโดยไม่มีอาการของการติดเชื้อจากสายสวนปัสสาวะ และการติดเชื้อระบบปัสสาวะจากสายสวนปัสสาวะ ผลลัพธ์รองที่ประเมิน ได้แก่ ความปวด การปัสสาวะเป็นเลือด การปัสสาวะขุ่น และคุณภาพชีวิต ผลการรักษาพบว่าผู้ป่วยส่วนใหญ่สามารถปัสสาวะได้เองเมื่อติดตามการรักษาที่ระยะเวลา 2 สัปดาห์*

***ผลการศึกษา:*** *ไม่พบความแตกต่างอย่างมีนัยสำคัญทางสถิติระหว่างวิธีการสวนปัสสาวะตามเวลาแบบสะอาดและวิธีการคาสายสวนปัสสาวะสำหรับอัตราการติดเชื้อจากสายสวนปัสสาวะ (ร้อยละ 10 และร้อยละ 8 ตามลำดับ) และอัตราการตรวจพบแบคทีเรียในปัสสาวะโดยไม่มีอาการของการติดเชื้อจากสายสวนปัสสาวะ (ร้อยละ 52 และร้อยละ 36 ตามลำดับ) (ค่า p เท่ากับ 0.214) นอกจากนี้ยังไม่พบความแตกต่างอย่างมีนัยสำคัญทางสถิติระหว่างการรักษาสองวิธีนี้สำหรับการปัสสาวะเป็นเลือด (ร้อยละ 8 และร้อยละ 20, ค่า p เท่ากับ 0.084) การปัสสาวะขุ่น (ร้อยละ 26 และร้อยละ 22, ค่า p เท่ากับ 0.640) ระดับความปวด [0 (พิสัย 0 ถึง 7) และ 0 (พิสัย 0 ถึง 6), ค่า p เท่ากับ 0.246] และคุณภาพชีวิต [5 (พิสัย 2 ถึง 5) และ 5 (พิสัย 2 ถึง 5), ค่า p เท่ากับ 0.596]*

***สรุป:*** *สำหรับผู้ป่วยในที่มีภาวะปัสสาวะคั่งเฉียบพลัน การรักษาด้วยวิธีการสวนปัสสาวะตามเวลาแบบสะอาดไม่ได้เหนือกว่าวิธีการคาสายสวนปัสสาวะในด้านของการติดเชื้อจากสายสวนปัสสาวะ คุณภาพชีวิต ความปวด อัตราการเกิดปัสสาวะเป็นเลือดและปัสสาวะขุ่น ก็ไม่ได้แตกต่างกันระหว่างสองกลุ่ม นอกจากนี้การรักษาด้วยวิธีการคาสายสวนปัสสาวะถือเป็นวิธีที่เหมาะสมกว่าสำหรับผู้ป่วยที่ไม่มีผู้ดูแล*