

Additional materials

Summary of CDC Major Recommendations for Catheter Care

<http://www.cdc.gov/ncidod/hip/guide/uritract.htm>

Category I. Strongly Recommended for Adoption*

- Educate personnel in correct techniques of catheter insertion and care.
- Catheterize only when necessary.
- Emphasize handwashing.
- Insert catheter using aseptic technique and sterile equipment.
- Secure catheter properly.
- Maintain closed sterile drainage.
- Obtain urine samples aseptically.
- Maintain unobstructed urine flow.

Category II. Moderately Recommended for Adoption

- Periodically re-educate personnel in catheter care.
- Use smallest suitable bore catheter.
- Avoid irrigation unless needed to prevent or relieve obstruction.
- Refrain from daily meatal care with either of the regimens discussed in text.
- Do not change catheters at arbitrary fixed intervals.

Category III. Weakly Recommended for Adoption

- Consider alternative techniques of urinary drainage before using an indwelling urethral catheter.
- Replace the collecting system when sterile closed drainage has been violated.
- Spatially separate infected and uninfected patients with indwelling catheters.
- Avoid routine bacteriologic monitoring

Catheter Associated Urinary Tract Infection (CAUTI)

Maki DG, Tambyah PL. Engineering out the Risk of Infection with Urinary Catheters. *Emerging Infectious Disease* 2001; <http://www.cdc.gov/ncidod/eid/vol7no2/maki.htm>

“Most clinicians use a clean-voided specimen showing $>10^5$ CFU/mL as the criterion for "significant" bacteriuria (i.e., true infection) for noncatheterized patients (4). However, once any microorganisms are identified in urine from a patient's indwelling catheter, unless suppressive antimicrobial-drug therapy is being given or started, progression to concentrations $>10^5$ CFU/mL occurs predictably and rapidly, usually within 72 hours. (7). Thus, most authorities consider concentrations $>10^2$ or 10^3 CFU/mL, in urine collected with a needle from the sampling port of the catheter, to be indicative of true CAUTI. This concentration can be reproducibly detected in the laboratory, and this definition is useful for therapeutic decisions and epidemiologic research (1-7).”

Risk factors for CAUTI	Relative Risk
Prolonged catheterization >6 days	5.1-6.8
Female gender	2.5-3.7
Catheter insertion outside operating room	2.0-5.3
Urology service	2.0-4.0
Other active sites of infection	2.3-2.4
Diabetes	2.2-2.3
Malnutrition	2.4
Azotemia (creatinine >2.0 mg/dL)	2.1-2.6
Ureteral stent	2.5
Monitoring of urine output	2.0
Drainage tube below level of bladder and above collection bag	1.9
Antimicrobial-drug therapy	0.1-0.4

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2. Burke JP, Riley DK. Nosocomial urinary tract infection. In: Mayhall CG, editor. *Hospital epidemiology and infection control*. Baltimore: Williams and Wilkins; 1996. p. 139-53.
3. Warren JW. [Catheter-associated urinary tract infections](#). *Infect Dis Clin North Am* 1997;11:609-22.
4. Kunin CM. Care of the urinary catheter. In: *Urinary tract infections: detection, prevention and management*. Fifth ed. Baltimore: Williams and Wilkins; 1997. p. 227-99.
5. Kunin CM, McCormack RC. [Prevention of catheter-induced urinary-tract infections by sterile closed drainage](#). *N Engl J Med* 1966;274:1155-61.
6. Garibaldi RA, Mooney BR, Epstein BJ, Britt MR. [An evaluation of daily bacteriologic monitoring to identify preventable episodes of catheter associated UTI](#). *Infect Control* 1982;3:466-70.
7. Stark RP, Maki DG. [Bacteriuria in the catheterized patient](#). *N Engl J Med* 1984;311:560-4.

Guidelines for Preventing CAUTI

Several catheter-care practices are universally recommended to prevent or at least delay the onset of CAUTI: avoid unnecessary catheterizations; consider a condom or suprapubic catheter; have a trained professional insert the catheter aseptically; remove the catheter as soon as no longer needed; maintain uncompromising closed drainage; ensure dependent drainage; minimize manipulations of the system; and separate catheterized patients (1-4). However, few of these practices have been proven to be effective by randomized controlled trials.

- 1) Avoid unnecessary catheterizations

- 2) Consider alternatives to urethral catheterization: Suprapubic catheterization; for incontinent men without bladder outlet obstruction, condom drainage
- 3) Insertion using aseptic technique
- 4) Closed drainage
- 5) Ensure dependent drainage: collection tubing and bag should always remain below the level of the patient's bladder, but the drainage tubing should always be above the level of the collection bag.
- 6) Urine collection: manipulate system as little as possible; monitor urine output should be monitored hourly only when clearly indicated by the patient's condition.
- 7) Other practices: If feasible, separate catheterized patients geographically on care units to reduce the risk of cross-infection with multidrug-resistant nosocomial organisms (eg, *Serratia*, *Klebsiella*, *Pseudomonas*, and *Enterobacter*).
- 8) Because most CAUTIs are asymptomatic and do not result in urosepsis, it is difficult to justify antimicrobial therapy of asymptomatic bacteriuria other than for granulocytopenic or other severely immunocompromised patients, patients scheduled for urologic surgery, pregnant women, or patients with *Serratia*. Systemic antimicrobial prophylaxis can reduce the risk of CAUTI for short-term catheterizations, but subsequent infections that do occur are far more likely to be caused by antibiotic-resistant bacteria and yeasts.

Novel Technology

Technologic innovations to prevent nosocomial infection are most likely to be most effective if they are based on a clear understanding of the pathogenesis and epidemiology of the infection (36). Novel technologies must be designed to block CAUTI by either the extraluminal or intraluminal routes or both (Figure 1). Technologic innovations have been proposed and evaluated during the past 25 years but have not proven conclusively beneficial (1-5). Among these innovations are using antiinfective lubricants when inserting the catheter; soaking the catheter in an antiinfective antimicrobial-drug solution before insertion; regular metal cleansing or periodically applying antiinfective creams or ointments to metals; continuously irrigating the catheterized bladder with an antiinfective solution through a triple-lumen catheter; or periodically instilling an antiinfective solution into the collection bag (Table 4). Bladder irrigation with antimicrobial-drug solutions has not only shown no benefit for prevention but has been associated with a strikingly increased proportion of CAUTIs caused by microorganisms resistant to the drugs in the irrigating solution (37).

Are Suprapubic catheters better for long term decompression?

Making Health Care Safer: A critical analysis of patient safety practices. AHCPR 2001. <http://www.ahcpr.gov/clinic/ptsafety/chap15b.htm>

Table: Prospective studies comparing suprapubic with urethral catheters

Study	Design, Outcomes	Patient Population*	Bacteriuria (%) ^b		Odds Ratio (95% CI) ^b	Comments ^c
			Suprapubic	Urethral		
Shapiro, 1982 ¹⁶	Level 1, Level 2	General surgical patients with urinary retention	2/25 (8)	21/31 (68)	0.04 (0.01-0.24)	Pseudorandomized (urethral catheters used in every third patient) study; suprapubic group had less pain but more mechanical complications
Andersen, 1985 ¹³	Level 1, Level 2	Women undergoing vaginal surgery	10/48 (21)	20/44 (45)	0.32 (0.11-0.86)	Patients rated acceptability of suprapubic catheters greater
Ichsan, 1987 ⁹	Level 1, Level 2	Patients with acute urinary retention	3/29 (10)	11/37 (30)	0.27 (0.04-1.22)	None of the suprapubic group complained of discomfort compared with 17 of the patients given urethral catheters
Sethia, 1987 ¹¹	Level 1, Level 2	General surgical patients requiring urine output monitoring	2/32 (6)	16/34 (47)	0.08 (0.01-0.41)	Decrease in bacteriuria was more significant in women than in men
Schiotz, 1989 ¹²	Level 1, Level 2	Women undergoing vaginal surgery	8/38 (21)	5/40 (12)	1.87 (0.48-8.01)	26% of suprapubic group versus 5% of urethral group had mechanical complications

Horgan, 1992 ¹⁵	Level 2, Level 2	Men with acute urinary retention due to prostatic enlargement	10/56 (18)	12/30 (40)	0.33 (0.11-0.99)	21% of suprapubic group versus 3% of urethral group had dislodgement; 0% of suprapubic group versus 17% of urethral group developed urethral strictures
O'Kelley, 1995 ⁸	Level 1, Level 2	General surgical patients requiring abdominal surgery	3/28 (11)	3/29 (10)	1.04 (0.13-8.51)	Study design unclear, but probably not randomized; suprapubic catheters caused significantly fewer days of catheter-related pain
Ratnaval, 1996 ¹⁴	Level 1, Level 2	Men undergoing colorectal surgery	1/24 (4)	3/26 (12)	0.33 (0.01-4.60)	Suprapubic group had fewer voiding difficulties
Bergman, 1987 ²¹	Level 1, Level 2	Women undergoing vaginal surgery for stress incontinence	4/24 (17)	17/27 (63)	0.26 (0.10-0.68)	Length of hospital stay was significantly less (by 1 day) in the suprapubic catheter group
Abrams, 1980 ²⁰	Level 1, Level 2	Men with urinary retention	21/52 (40)	13/50 (26)	1.6 (0.88-2.75)	12% of suprapubic catheter group found catheter uncomfortable compared with 64% in the standard urethral catheter group (p<0.001)
Vandoni, 1994 ²²	Level 1, Level 2	Patients requiring surgery for various indications	0/19 (0)	6/24 (25)	0 (0-0.95)	All patients given pre-catheterization antibiotics; slight decrease in pain and discomfort in

						suprapubic group but not significant (authors do not provide actual satisfaction data)
Perrin, 1997 ¹⁷	Level 1, Level 2	Patients undergoing rectal surgery	12/49 (24)	29/59 (49)	0.34 (0.13-0.83)	12% of suprapubic group reported catheter discomfort compared with 29% of urethral group

* Studies enrolled both men and women unless otherwise noted.

^a Indicates the ratio of patients who developed bacteriuria to the total number of participants assigned to each group.

^b Odds of developing bacteriuria in the suprapubic versus urethral catheter groups; CI indicates confidence interval.

^c Mechanical complications consisted of failed introduction of catheter, and catheter dislodgement or obstruction