URINARY TRACT INFECTIONS: Focus on CA-UTIs

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2025

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LECTURE TOPICS

- Prevalence
- Pathogenesis
- Etiology of UTIs
- Risk factors
- Prevention

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Sources of Healthcare-Associated Pathogens

Weinstein RA. Am J Med 1991:91 (suppl 3B):179S

- Endogenous flora (SSI, UTI, CLABSI): 40-60%
- Exogenous: 20-40% (e.g., cross-infection via contaminated hands [staff, visitors])
- Other (environment): 20%
  - Medical devices
  - Contact with environmental surfaces (direct and indirect contact)

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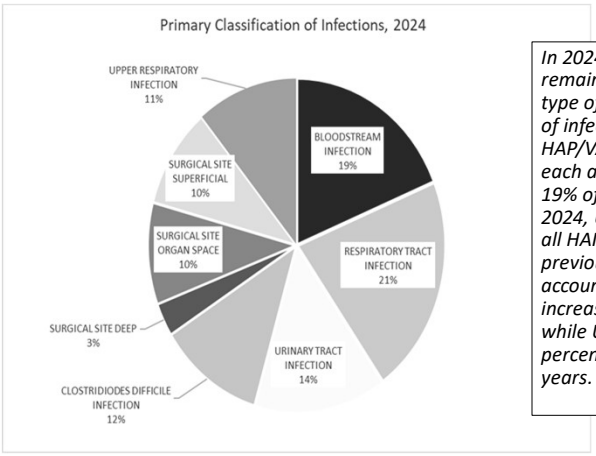

In 2024, surgical site infections remained the most prevalent type of HAI, accounting for ~23% of infections, followed by HAP/VAP/VAE and bloodstream, each accounting for 20% and 19% of infections, respectively. In 2024, URI accounted for 11% of all HAI (an increase from previous years) and CDI accounted for 12% of all HAI (an increase compared to 2023), while UTI accounted for lower percentage of HAI than previous years.

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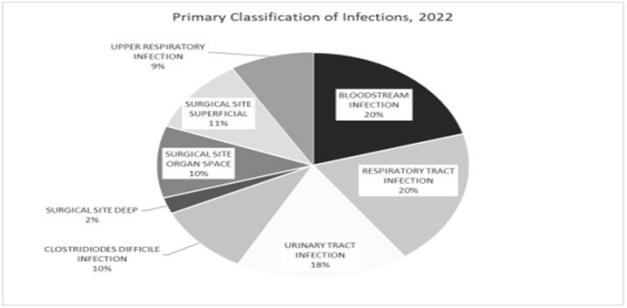
UNC Medical Center, 2022



In 2022, surgical site infections remain the most prevalent type of HAI, accounting for 23% of infections, followed by bloodstream infections and HAP/VAP/VAE, each accounting for 20% of infections. In 2021, URI only accounted for 2% of the total HAI, however in 2022, URI accounted for 9% of all HAI

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CA-UTIs

- Definitions
  - CA infection refers to infection occurring in a person whose urinary tract (UT) is currently catheterized or has been catheterized within the previous 48h
  - UTI refers to significant bacteriuria in a patient with symptoms or signs attributable to the UT
  - Asymptomatic bacteriuria refers to significant bacteriuria in a patient without symptoms or signs attributable to UT. May be source of HA bacteremia. Treatment not recommended.

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CATHETER-ASSOCIATED URINARY TRACT INFECTIONS (CA-UTI)

- Prevalence, Incidence
  - Common site of HAI: Accounts for up to 30% of all reported HAIs by acute care hospitals
  - Approx. 75% of UTIs acquired in the hospital are associated with urinary catheters
  - Almost half of UTIs (45%) occurred among ICU patients
  - Estimated >560,000 healthcare-associated UTIs annually

Adapted from CDC: http://www.cdc.gov/HAI/pdfs/toolkits/CAUTItoolkit_3_10.pdf

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CATHETER-ASSOCIATED URINARY TRACT INFECTIONS (CA-UTI)

- Prevalence, Incidence
  - 15-25% patients in hospitals have a urethral catheter
  - Most hospitalized patients are catheterized for only 2-4 days but many longer
  - Incidence of bacteriuria's associated with indwelling catheter is 3-8% per day
  - Almost all persons catheterized for a month or more will have catheter-associated bacteriuria

Adapted from CDC: http://www.cdc.gov/HAI/pdfs/toolkits/CAUTItoolkit_3_10.pdf; Trautner, Hooten, PPID 2020

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CATHETER-ASSOCIATED URINARY TRACT INFECTIONS (CA-UTI)

- Impact
  - About 15% of cases of nosocomial bacteremia are attributable to the UT
  - Bacteriuria is the most common source of gram-negative bacteremia among hospitalized patients
  - Bacteremia complicates CA-bacteriuria in 1-4% of cases
  - Estimated 13,000 attributable deaths annually
  - Leading cause of secondary BSI with ~10% mortality
  - Excess length of stay: 2-4 days
  - Increased cost: $0.4-0.5 billion per year nationally

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URINARY CATHETER USE

- 15-25% of hospitalized patients
- 5-10% (75,000-150,000) of patients in extended care facilities
- Often placed for inappropriate purposes
- Physicians frequently unaware
  - In a survey of US hospitals:
    - **>50% did not monitor which patients were catheterized**
    - **75% did not monitor duration and/or discontinuation**

Adapted from CDC: http://www.cdc.gov/HAI/pdfs/toolkits/CAUTItoolkit_3_10.pdf

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LECTURE TOPICS

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- Risk factors
- Prevention

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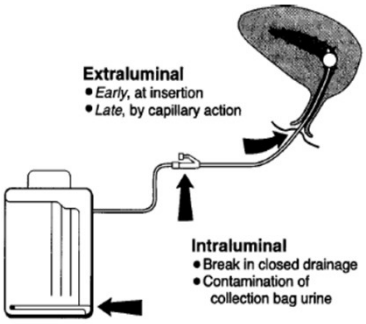
PATHOGENESIS OF CA-UTI

- Source of microorganisms
  - Endogenous: meatal, rectal, vaginal colonization
  - Exogenous: via contaminated hands of HCP during catheter insertion or manipulation of the collecting system



Maki DG, Tambyah PA. Emerg Infect Dis 2001;7:1-6

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CA-UTIs

- Introduction of bacteria into the bladder at the time of catheter insertion
- Extraluminal migration of bacteria or perianal bacteria into the bladder along the outer surface of the catheter
- Intraluminal retrograde migration of bacteria into the bladder from the drainage bag along the inner surface of the catheter following a catheter care violation

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SOURCE OF CA-UTI PATHOGENS

Table 2. Mechanisms of catheter-associated urinary tract infection, based on a prospective study of 1,497 newly catheterized patients who had 235 new-onset infections (16)

	Organisms causing CAUTI[a]			
Mechanism of CAUTI	Gram-positive cocci (n=44)	Yeasts (n=34)	Gram-negative bacilli (n=37)	Overall (n=115)
Extraluminal	79%	69%	54%	66%
Intraluminal	21%	31%	46%	34%

[a]Percentages refer to organisms in which the mechanism of infection could be determined. For comparison of gram-positive cocci and yeasts vs. gram-negative bacilli, p = 0.007.
CAUTI = catheter-associated urinary tract infection.

Maki DG, Tambyah PA. Emerg Infect Dis 2001;7:1-6

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PATHOGENESIS OF CA-UTI

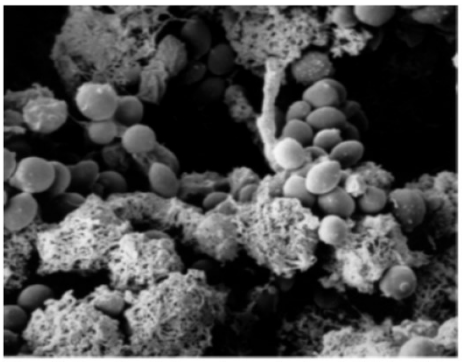

Figure 2. Scanning electron micrograph of an infected catheter showing dense and complex biofilm on the extraluminal surface. Urine culture at catheter removal yielded *Candida albicans* 10^4 CFU/mL and *C. glabrata* 10^4 CFU/mL (X 5000).

- Formation of biofilms by urinary pathogens common on surfaces of catheters and collecting systems
- Bacteria within biofilms resistant to antimicrobials and host defenses
- Some novel strategies in CA-UTI prevention have targeted biofilms

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Diagnosis

- NHSN
  - If the patient has a urinary catheter and a positive urine culture that meets NHSN criteria for a CAUTI on the same day as the fever, a CAUTI reported

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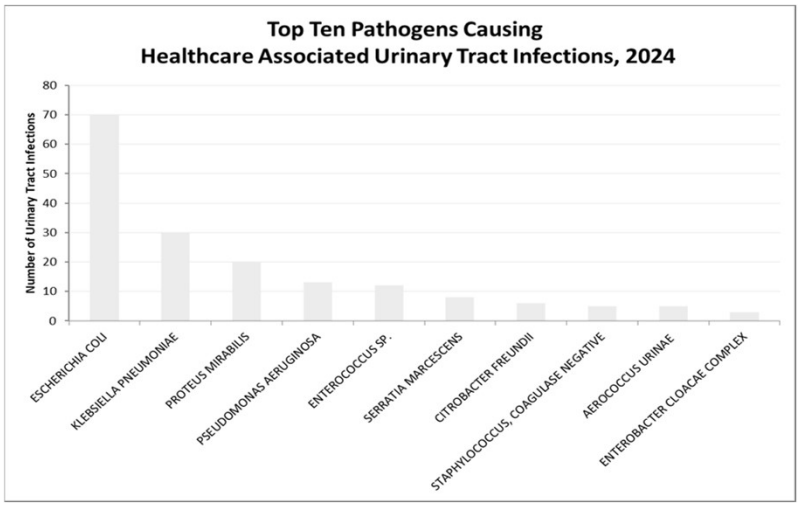

Escherichia coli again accounted for >40% of all 2024 hospital-associated urinary tract infections. Proportions of these pathogens did not shift in 2024 compared to previous few years.

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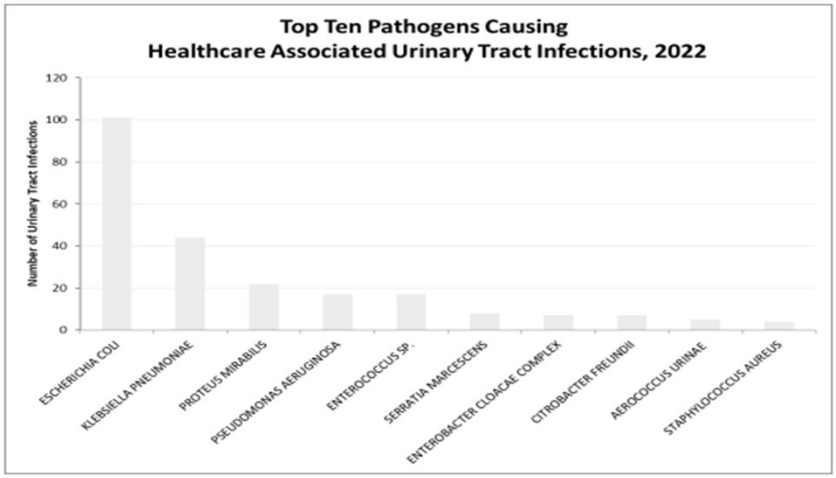

Escherichia coli accounted for 47% of all 2022 hospital-associated urinary tract infections. There was a higher proportion of UTI with proteus mirabilis and lower proportion of UTI with pseudomonas aeruginosa in 2022 compared to 2021.

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HAI PATHOGENS, NHSN, 2011-2014

TABLE 4. Distribution and Rank Order of Pathogens Frequently Reported to the National Healthcare Safety Network (NHSN), by Type of Healthcare-Associated Infection (HAI), 2011–2014

	Overall		CLABSI		CAUTI		VAP[a]		SSI	
Pathogen	No. (%) of pathogens	Rank[b]	No. (%) of pathogens	Rank[b]	No. (%) of pathogens	Rank[b]	No. (%) of pathogens	Rank[b]	No. (%) of pathogens	Rank[b]
Escherichia coli	62,904 (15.4)	1	5,193 (5.4)	7	36,806 (23.9)	1	476 (5.4)	6	20,429 (13.7)	2
Staphylococcus aureus	48,302 (11.8)	2	12,706 (13.2)	2	2,515 (1.6)	14	2,179 (24.7)	1	30,902 (20.7)	1
Klebsiella (pneumoniae/oxytoca)	31,498 (7.7)	3	8,062 (8.4)	4	15,471 (10.1)	4	898 (10.2)	3	7,067 (4.7)	6
Coagulase-negative staphylococci[c]	31,361 (7.7)	4	15,794 (16.4)	1	3,696 (2.4)	13	72 (0.8)	13	11,799 (7.9)	3
Enterococcus faecalis[d]	30,034 (7.4)	5	8,118 (8.4)	3	10,728 (7.0)	5	32 (0.4)	21	11,156 (7.5)	4
Pseudomonas aeruginosa	29,636 (7.3)	6	3,881 (4.0)	10	15,848 (10.3)	3	1,449 (16.5)	2	8,458 (5.7)	5
Candida albicans[d]	27,231 (6.7)	7	5,761 (6.0)	6	17,926 (11.7)	2	193 (2.2)	10	3,351 (2.2)	12
Enterobacter spp[c]	17,235 (4.2)	8	4,204 (4.4)	9	5,689 (3.7)	9	727 (8.3)	4	6,615 (4.4)	8
Enterococcus faecium[d]	14,942 (3.7)	9	6,567 (6.8)	5	4,212 (2.7)	11	23 (0.3)	24	4,140 (2.8)	11
Other *Enterococcus* spp.[d]	14,694 (3.6)	10	1,974 (2.0)	14	6,291 (4.1)	7	19 (0.2)	27	6,410 (4.3)	9
Proteus spp.[c]	11,249 (2.8)	11	820 (0.8)	17	6,108 (4.0)	8	125 (1.4)	12	4,196 (2.8)	10
Yeast NOS[e]	10,811 (2.6)	12	763 (0.8)	18	9,443 (6.1)	6	54 (0.6)	16	551 (0.4)	25
Other *Candida* spp.[d]	10,641 (2.6)	13	4,730 (4.9)	8	5,178 (3.4)	10	37 (0.4)	19	696 (0.5)	19
Candida glabrata[d]	8,121 (2.0)	14	3,314 (3.4)	11	4,121 (2.7)	12	12 (0.1)	33	674 (0.5)	20
Bacteroides spp.	7,560 (1.9)	15	515 (0.5)	19	2 (<0.1)	130	2 (<0.1)	72	7,041 (4.7)	7
Other pathogen	51,932 (12.7)		14,130 (14.6)		9,771 (6.4)		2,507 (28.5)		25,524 (17.1)	
Total	408,151 (100)		96,532 (100)		153,805 (100)		8,805 (100)		149,009 (100)	

%MRSA by site: CLABSI, 50.7% (2014); VAP, 42.4% (2012); SSI, 42.6% (2014); CAUTI, 52.0% (2014)

Weiner LM, et al. ICHE 2016;37:1288-1301

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HAI Pathogens, NHSH, 2011-2014

Weiner LM, et al. ICHE 2016;37:1288-1301

Pathogen (UTI)	Number (%)
E. coli	**36,806 (23.9)**
Candida albicans	**17,926 (11.7)**
Pseudomonas aeruginosa	**15,848 (10.3)**
K. pneumoniae/oxytoca	**15,471 (10.1)**
Enterococcus faecalis	**10,728 (7.0)**
Yeast	**9,443 (6.1)**
Other Enterococcus spp	**6,291 (4.1)**
Proteus spp	**6,108 (4.0)**
Enterobacter spp.	**5,680 (3.7)**

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HEALTHCARE-ASSOCIATED UTIs, UNC HOSPITALS, 2006-2009

	CA-UTI (N=1218)	UTI (N=459)
E. coli	23.6%	29.0%
Enterococcus spp.	15.4%	16.3%
Candida spp.	14.9%	6.1%
P. aeruginosa	9.2%	7.2%
Klebsiella spp.	9.1%	12.6%
Proteus spp.	6.2%	4.1%
Enterobacter spp.	4.7%	4.6%
Coag neg staph	2.9%	4.6%
Torulopsis glabrata	2.1%	0.7%
Acinetobacter	1.8%	0.0%
S. aureus	1.6%	2.4%
Serratia marcescens	1.3%	1.3%
Citrobacter spp.	1.2%	2.2%
Other	6.0%	8.9%

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CA-UTI: NHSN, 2006-2008

Edwards JR, et al. Am J Infect Control 2009;37:783-85

Unit	Infection Rate (pooled mean)	Infection Rate (10% - 90%)	Urinary Cath Utilization Ratio
Burn ICU	7.4	2.6 - 12.3	0.61
Medical cardiac ICU	4.8	0.0 – 9.4	0.56
Medical, major teaching ICU	4.7	1.0 – 8.9	0.72
Neurology ICU	7.4	NA	0.77
Neurosurgical ICU	6.9	1.6 – 10.8	0.76
Pediatric medical ICU	4.0	NA	0.21
Pediatric, med/surg ICU	4.2	0.0 – 7.2	0.29
Surgical ICU	4.3	0.7 – 9.1	0.81
Cardiothoracic ICU	3.6	0.7 – 7.0	0.77
Trauma ICU	5.4	0.2 – 8.1	0.89
Medicine floor	6.7	1.2 – 14.4	0.20
Surgical floor	6.5	0.0 – 11.8	0.26

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HEALTHCARE-ASSOCIATED UTIs, UNCHC, 2006-2009

Weber, Sickbert-Bennett, Gould, Brown, Huslage, Rutala. ICHE. 2011;32:822

	CA-UTI Number	CA-UTI Rate*	UTI Number	UTI Rate^
Medicine ICU	133	3.75	6	0.16
Medicine Step Down	27	2.65	7	0.42
Medicine Ward	101	3.35	77	0.43
Surgery ICU	300	4.81	9	0.13
Surgery Step Down	31	2.90	3	0.30
Surgery Ward	358	4.59	108	0.42
Pediatric ICU	50	4.52	77	0.92
Pediatric Ward	25	4.83	38	0.32
Rehabilitation Ward	43	10.12	60	1.68
Psychiatric Ward			26	0.30
TOTAL	1068	4.32	411	0.48

* Per 1,000 days catheterized ^ Per 1,000 days hospitalized

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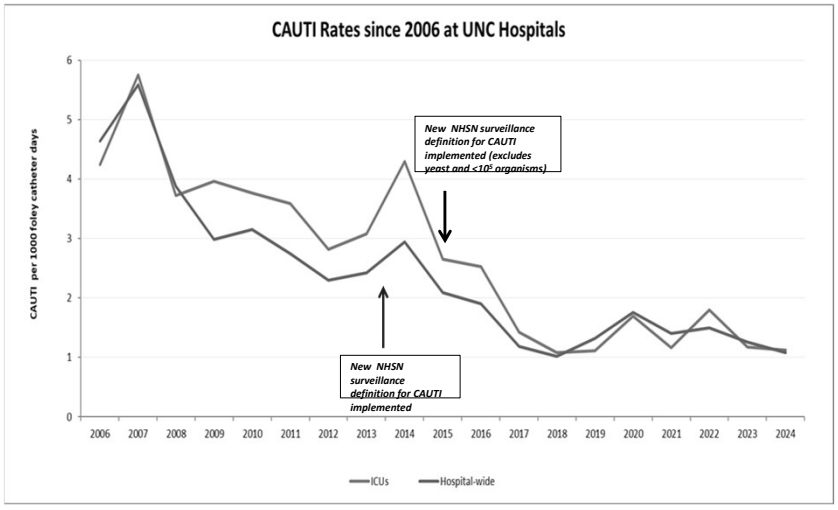

We had a decrease in our CAUTI rates in ICUs and hospital-wide in 2024 compared to the previous year.
The overall CAUTI rate is the lowest it has been in 6 years.

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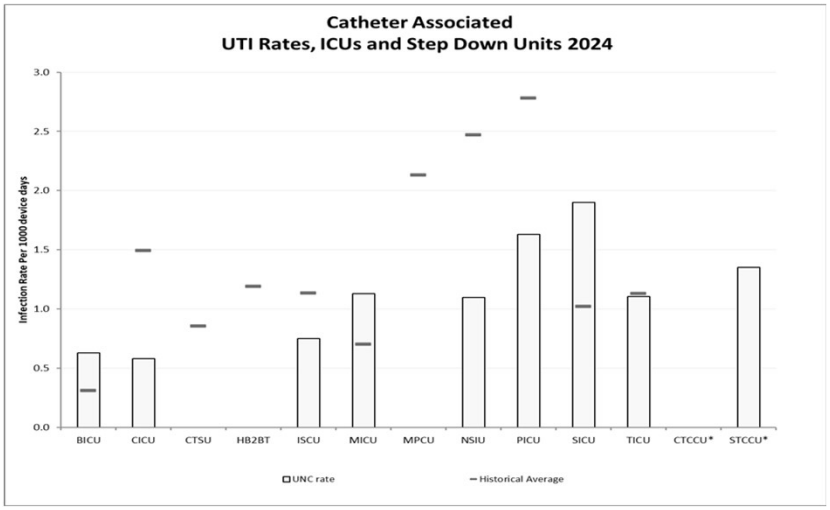

The CAUTI rates in 2024 for BICU, MICU and SICU exceeded the unit's historical average (based on data from 2021-2023) CAUTI rate.
52% of CAUTI (n=24) were attributed to ICU or stepdown unit

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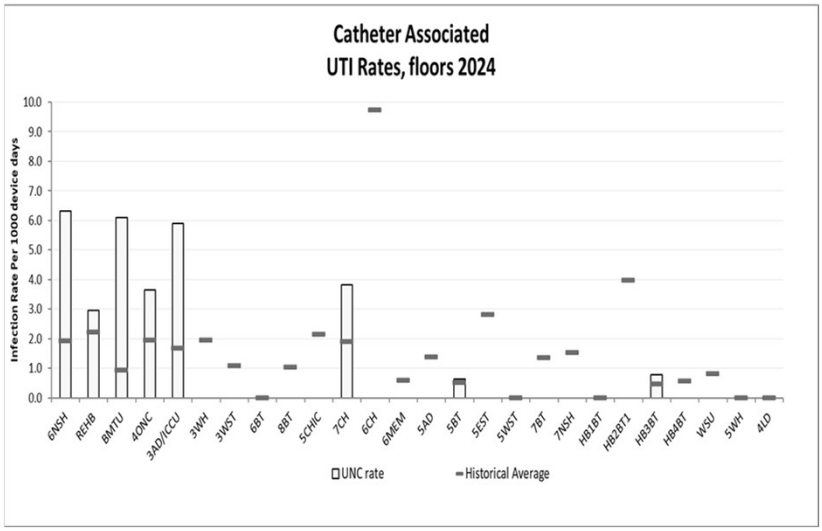

The CAUTI rates in 2024 for 6NSH, REHB, BMTU, 4ONC, 3AD/ICCU and 7CH exceeded the unit's historical average CAUTI rate with more than 1 infection.

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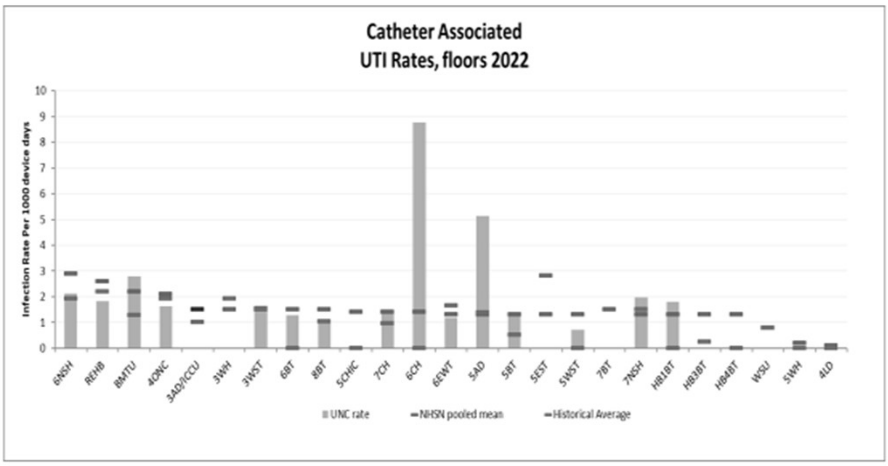

The CAUTI rates in 2022 for 6NSH, 5AD, 5BT and 7NSH exceeded the unit's historical average CAUTI rate with more than 1 infection.*

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LECTURE TOPICS

- Prevalence
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- Risk factors
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RISK FACTORS FOR CA-UTI

Hooton, et al. IDSA Guidelines CID 2010:50:625

- Indwelling catheterization
- Not receiving systemic antimicrobial therapy
- Female sex
- Positive urethral meatal culture results
- Microbial colonization of the drainage bag
- Catheter insertion outside the OR
- Catheter care violations
- Older age
- Diabetes mellitus (high blood sugar, weakens immune response)
- Rapidly fatal underlying illness
- Elevated serum creatinine (poor kidney function) at the time of catheterization

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RISK FACTORS FOR CA-UTI

Maki DG Emerg Infect Dis 2001;7:1-6

Table 3. Risk factors for catheter-associated urinary tract infection, based on prospective studies and use of multivariable statistical modeling (27-30)

Factor	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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EVIDENCE-BASED RISK FACTORS FOR CA-UTI

Symptomatic UTI	Bacteriuria
Prolonged catheterization*	Disconnection of drainage system*
Female gender^	Lower professional training of inserter*
Older age^	Placement of catheter outside of OR^
Impaired immunity^	Incontinence^
	Diabetes
	Meatal colonization
	Renal dysfunction
	Orthopaedic/neurology services

* Main modifiable risk factors ^ Also inform recommendations

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ANTIBACTERIAL HOST DEFENSES IN THE URINARY TRACT

Urine (osmolality, pH, organic acids)
Urine flow and micturition
Urinary tract mucosa (bactericidal activity, cytokines)
Urinary inhibitors of bacterial adherence
  Tamm-Horsfall protein
  Bladder mucopolysaccharide
  Low-molecular-weight oligosaccharides
  Secretory immunoglobulin A (SIgA)
  Lactoferrin
Inflammatory response
  Polymorphonuclear neutrophils (PMNs)
  Cytokines
Immune system
  Humoral immunity
  Cell-mediated immunity
  Miscellaneous
    Prostatic secretions

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CA-UTI DEFINITIONS

- UTI that occurs in a patient who has had an indwelling urethral catheter in place within the 48-hour period before the onset of the UTI
- Does not include in and out catheters or urinary catheters that are not placed in the urethra (e.g., suprapubic catheter)
- Do not include patients with asymptomatic bacteriuria

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Urinary Tract Infection Criteria

January 2023

Criterion	Urinary Tract Infection (UTI)
	Symptomatic UTI (SUTI) Must meet at least ***one*** of the following criteria:
SUTI 1a **Catheter-associated Urinary Tract Infection (CAUTI) in any age patient**	Patient must meet 1, 2, and 3 below: 1. Patient had an indwelling urinary catheter that had been in place for more than 2 consecutive days in an inpatient location on the date of event AND was either: • Present for any portion of the calendar day on the date of event†, **OR** • Removed the day before the date of event‡ 2. Patient has at least ***one*** of the following signs or symptoms: • fever (>38.0°C) • suprapubic tenderness* • costovertebral angle pain or tenderness* • urinary urgency ^ • urinary frequency ^ • dysuria ^ 3. Patient has a urine culture with no more than two species of organisms identified, at least one of which is a bacterium of ≥10^5 CFU/ml (See Comments). All elements of the SUTI criterion must occur during the IWP (See IWP Definition Chapter 2 Identifying HAIs in NHSN).

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COMPLICATIONS OF SHORT-TERM CATHETERIZATION

- Less than 25% of hospitalized patients with CA-bacteriuria develop UTI symptoms
- ~15% of cases of nosocomial bacteremia are attributable to the urinary tract
- Bacteriuria is the most common source of Gram-negative bacteremia among hospitalized patients
- However, bacteremia complicates CA-bacteriuria in only <1% to 4% of cases
- The mortality of nosocomial bacteremic UTI is ~13%, but <1% of hospital deaths are due to bacteremic UTI

Hooton TM, et al. Clin Infect Dis 2010;50:625-663

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LECTURE TOPICS

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Core Prevention Strategies (CDC)

- Insert catheters only for appropriate indications
- Leave catheters in place only as long as needed
- Ensure that only properly trained persons insert and maintain catheters
- Following aseptic insertion, maintain a closed drainage system
- Maintain unobstructed urine flow
- Hand hygiene and standard precautions

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CA-UTI Prevention-IHI

- Avoid unnecessary catheters
- Insert urinary catheters using aseptic technique
- Maintain urinary catheters based on recommended guidelines
- Review urinary catheters necessity daily and remove promptly when not needed

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CA-UTI Prevention-IHI

- Avoid unnecessary urinary catheters
  - Explicit criteria for appropriate insertion should be in place and verification that criteria are met prior to insertion
  - Indications
    - **Preoperative use for selected surgical patients**
    - **Urine output monitoring in critically ill patients**
    - **Management of acute urinary retention and urinary obstruction**
    - **Assistance in pressure ulcer healing for incontinent patients**
    - **As an exception, at patient request to improve comfort or for comfort during end-of-life care**
  - **Avoid use for management of incontinence**
  - Strategies: require verification that criteria are meet; build criteria for catheter insertion into order entry systems and require documentation of need at time of order; review cases of insertion that do not meet criteria

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CATHETER-ASSOCIATED URINARY TRACT INFECTION (CAUTI) PREVENTION BUNDLE

INSERTION

- ❑ Avoid unnecessary catheterization, following UNC insertion criteria
- ❑ Follow aseptic technique and refer to policy for insertion procedure
- ❑ Consider other methods for bladder management (external catheters for men and women, intermittent catheterization)

MAINTENANCE

- ❑ Maintain unobstructed **downward** flow of urine
  - *Keep bag below level of bladder - free from kinking and dependent loop*
  - *Do not put bag in the bed during transfers*
- ❑ Secure catheter properly
- ❑ Maintain closed drainage system
- ❑ Do not let bag touch the floor
- ❑ Perform catheter and perineal care daily and as needed

REMOVAL

- ❑ Review catheter indication and necessity daily
- ❑ Remove catheter when it no longer meets insertion criteria
- ❑ Avoid reinsertion by following Trial of Void protocol

APPROPRIATE DIAGNOSIS

- ❑ Order urinalysis (UA) for patients with appropriate urinary symptoms (frequency, burning, pain)
- ❑ Interpret UA and order urine culture only if UA abnormal*
- ❑ Treat patient based on culture results and following guideline*

* UTI diagnosis and treatment guideline

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CA-UTI Prevention-IHI

- Insert urinary catheters using aseptic technique
  - Use appropriate hand hygiene
  - Insert catheter using aseptic technique and sterile equipment (gloves, drape, sponges, antiseptic solution for cleaning urethral meatus, sterile lubricant gel)
  - Use as small a catheter as possible consistent with proper drainage
  - Strategies: checklist for indications for catheter use and insertion; kits; education and training of staff; competency assessment

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CA-UTI Prevention-IHI

- Maintain catheters based on recommended guidelines
  - Maintain sterile, continuously closed drainage system
  - Keep catheter properly secured to prevent movement and urethral traction
  - Keep collection bag below the level of the bladder
  - Maintain unobstructed urine flow (keep catheter and collecting tube free from kinking)
  - Empty collection bag regularly using a separate clean container for each patient. Ensure drainage spigot does not contact nonsterile container.
- Strategies: verify and document five items at least once per shift; avoid irrigating catheters, disconnecting the catheter from the drainage bag, and replacing catheters routinely

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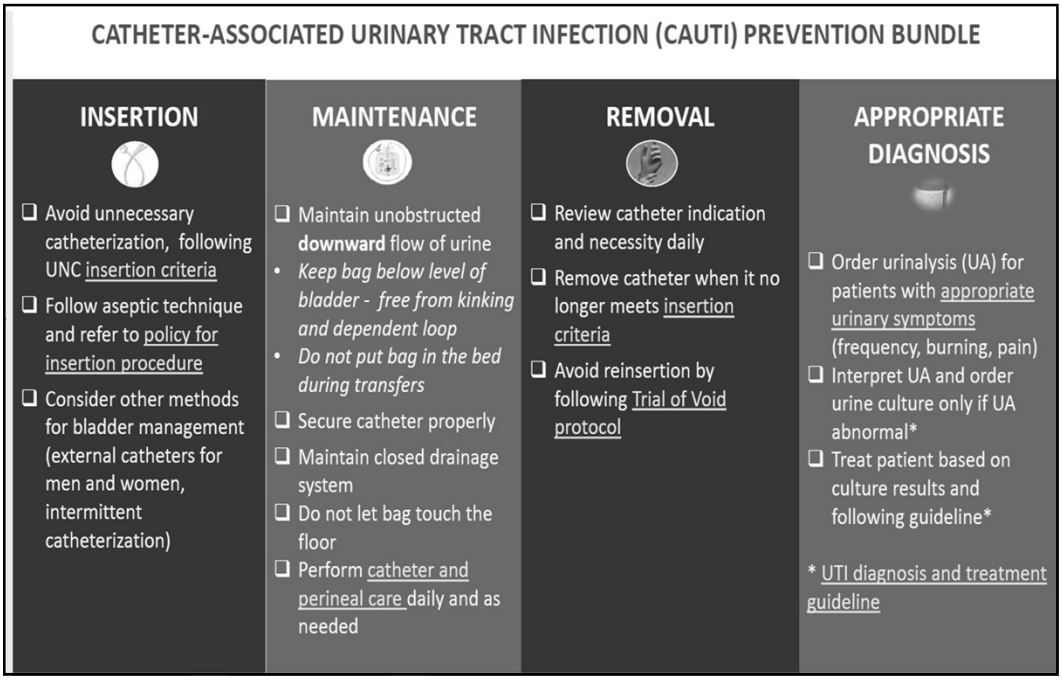

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CA-UTI Prevention-IHI

- Implement quality improvement programs
- Review urinary catheter necessity daily and remove promptly (duration of catheterization is the most important risk factor for development of infection)
  - Daily review of catheter necessity is recommended
- Strategies: automatic stop orders; daily reminders by nurses to physicians; alerts in computerized ordering systems; daily assessment at the start of every shift with the requirement to contact physician if criteria are not meet

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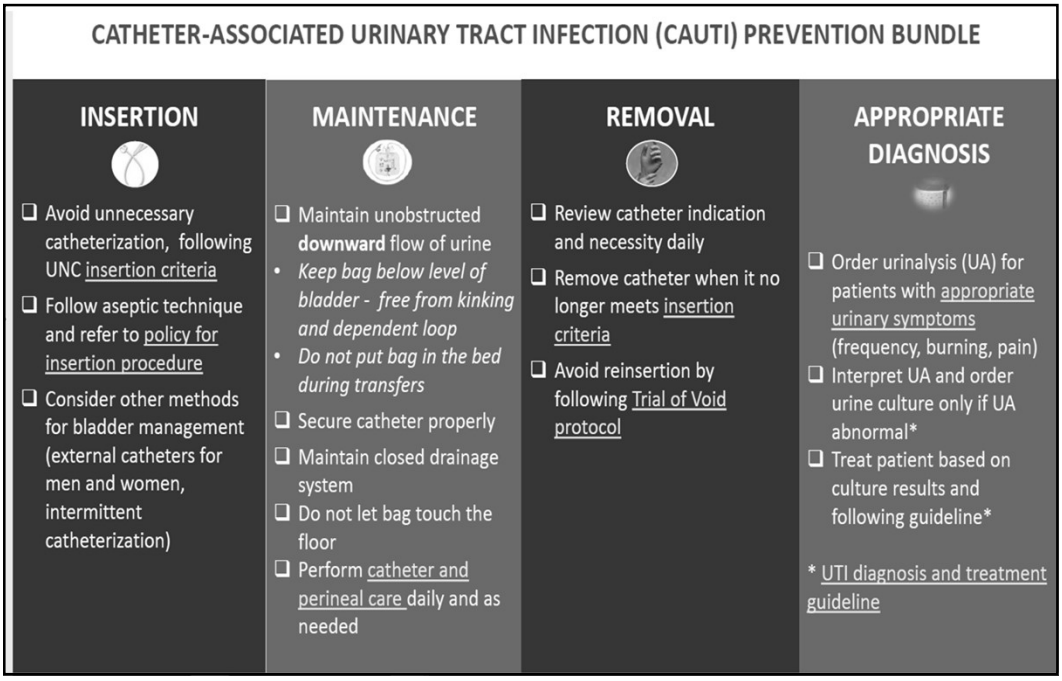

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CA-UTI Prevention-IHI

- Process Measures-what a provider does to improve infection prevention
  - Unnecessary urinary catheters (inserted without appropriate indication documented at the time of insertion)
  - Number of patient records or forms with documentation of aseptic technique
  - Urinary catheters maintained according to recommended practices (sterile, closed drainage; bag below bladder, etc.)
  - Unnecessary urinary catheter days (number of days with no documentation of indication for continued necessity)

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Foley Catheter Peer Audits CY2024

Percentage of Compliance

	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24	Oct-24	Nov-24	Dec-24
Unobstructed urine flow	94	96	98	96	98	98	95	95	98	91	97	96
Catheter properly secured	96	96	96	98	96	92	95	91	96	95	96	91
Collection bag lower than the bladder	100	100	100	100	100	100	100	100	100	100	100	100
Collection bag not touching the floor	96	97	100	100	98	98	99	99	99	100	99	100
Absence of dependent loop	89	87	92	88	87	89	87	82	87	88	89	91
Daily foley care charted last 24 hours	83	79	88	84	88	85	89	74	80	82	86	86
Feedback provided	94	96	98	96	98	98	95	95	98	91	97	96

Audit components consistently <90% include absence of dependent loop and daily foley care charted in last 24 hours.
All other components assessed are consistently above 90% compliant.

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Foley Catheter Peer Audits CY2022

Percentage of Compliance

	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22
Unobstructed urine flow	98.3	96.4	99.0	97.5	96.0	97.2	99.0	98.9	96.0	97.7	94.5	96.4
Catheter properly secured	91.3	95.5	96.0	97.9	97.0	96.2	95.3	94.9	93.8	96.5	90.9	96.6
Seal between bag and catheter	91.2	95.9	96.6	96.3	97.0	98.0	96.3	95.0	89.7	92.3	93.6	94.9
Collection bag lower than the bladder	100.0	99.6	100.0	100.0	100.0	99.1	100.0	100.0	99.6	100.0	100.0	100.0
Collection bag not touching the floor	100.0	97.6	99.0	97.9	99.0	98.1	99.0	97.9	98.8	98.5	99.2	99.2
Absence of dependent loop	84.4	89.6	90.5	88.4	90.0	85.5	88.0	83.0	88.8	83.5	83.4	86.6
Feedback provided	98.3	96.4	99.0	97.5	96.0	97.2	99.0	98.9	96.0	97.7	94.5	96.4
Daily foley care charted last 24 hours	84.2	85.4	77.6	86.7	91.3	88.0	89.3	86.4	87.8	84.5	86.2	87.3

Still need improvements on absence of dependent loops and charting. All other components assessed are consistently above 90% compliant.

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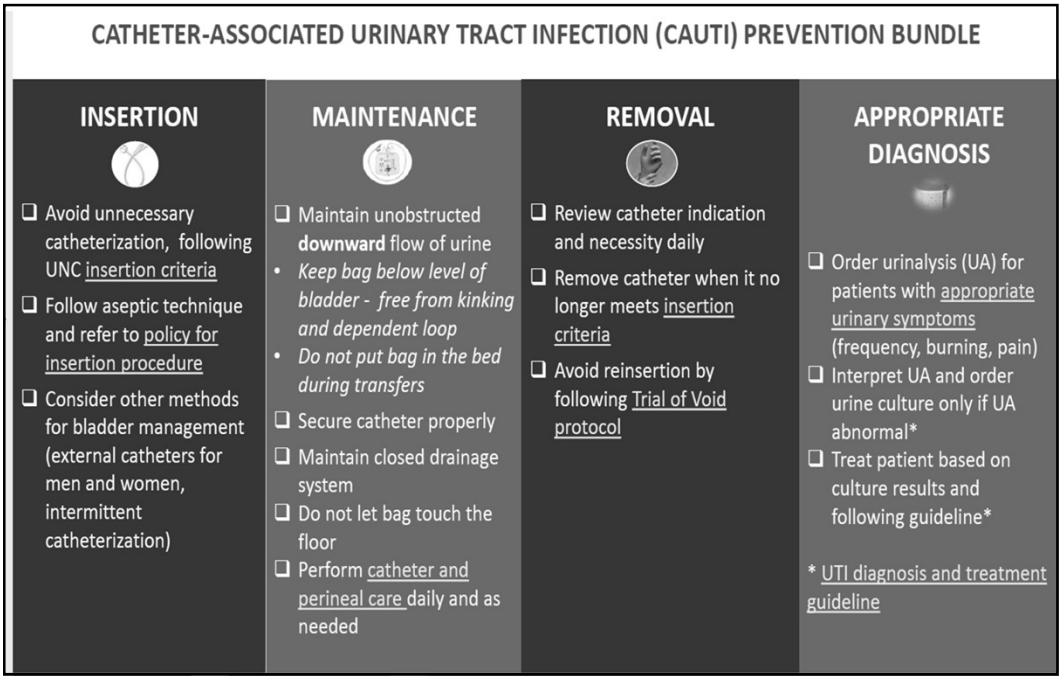

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CA-UTI Prevention-IHI

- Forming the Team
- Champions-person supports a cause
- Setting Aims
  - Decrease the rate of CA-UTI by 5% within one year by achieving high levels of performance in the preventive measures
- Assess where we stand presently

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CA-UTI Prevention-IHI Questions

- Do we require verification that catheter indications are met
- Do we conduct a daily review of catheter necessity
- Are we measuring unnecessary catheters
- Is there a process in place for daily review of inserted catheters
- Are we using an insertion checklist
- Do we follow daily maintenance procedures
- Are all supplies for compliance with appropriate insertion available at point of care
- Do we teach core principles of prevention of CA-UTI
- Where are urinary catheters used most frequently
- What is our CA-UTI rate

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CDC/HICPAC AND IDSA SCORING SYSTEMS

Table 1. Modified HICPAC Categorization Scheme* for Recommendations	
Category IA	A strong recommendation supported by high to moderate quality† evidence suggesting net clinical benefits or harms
Category IB	A strong recommendation supported by low quality evidence suggesting net clinical benefits or harms or an accepted practice (e.g., aseptic technique) supported by low to very low quality evidence
Category IC	A strong recommendation required by state or federal regulation.
Category II	A weak recommendation supported by any quality evidence suggesting a trade off between clinical benefits and harms
No recommendation/ unresolved issue	Unresolved issue for which there is low to very low quality evidence with uncertain trade offs between benefits and harms

Table 1. Strength of Recommendation and Quality of Evidence

Category/grade	Definition
Strength of recommendation	
A	Good evidence to support a recommendation for or against use.
B	Moderate evidence to support a recommendation for or against use.
C	Poor evidence to support a recommendation for or against use.
Quality of evidence	
I	Evidence from >1 properly randomized, controlled trial.
II	Evidence from >1 well-designed clinical trial, without randomization; from cohort or case-controlled analytic studies (preferably from >1 center); from multiple time-series; or from dramatic results from uncontrolled experiments.
III	Evidence from opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees.

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PREVENTION

- Appropriate catheter use
  - **Insert urinary catheters only for appropriate indications and leave in place only as long as needed (IB)**
  - **Avoid urinary catheters in patients for management of incontinence (IB)**
  - **Use urinary catheters in operative patients only as necessary, rather than routinely (IB)**
  - **For operative patients who require a catheter, remove it as rapidly as possible, preferably within 24 hours (IB)**

CDC. http://www.cdc.gov/hicpac/pdf/CAUTI/CAUTIguideline2009final.pdf

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PREVENTION:
APPROPRIATE INDICATIONS FOR A CATHETER

- Patient has acute urinary retention or bladder obstruction
- Need for accurate measurement of urinary output in critically ill patients
- Perioperative use for selected surgical patients
  - Urological surgery or other surgery on contiguous structures of GU tract
  - Anticipated prolonged duration of surgery (remove in PACU)
  - Patient anticipated to receive large volume infusions or diuretics during surgery
  - Need for intraoperative monitoring of urinary output
- To assist in healing of open sacral or perineal wounds in incontinent patients

Adapted from CDC: http://www.cdc.gov/HAI/pdfs/toolkits/CAUTItoolkit_3_10.pdf

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PREVENTION:
APPROPRIATE INDICATIONS FOR A CATHETER

Table 2. Acceptable Indications for Indwelling Urinary Catheter Use

Indication	Comment(s)
Clinically significant urinary retention	Temporary relief or longer-term drainage if medical therapy is not effective and surgical correction is not indicated.
Urinary incontinence	For comfort in a terminally ill patient; if less invasive measures (eg, behavioral and pharmacological interventions or incontinence pads) fail and external collecting devices are not an acceptable alternative.
Accurate urine output monitoring required	Frequent or urgent monitoring needed, such as with critically ill patients.
Patient unable or unwilling to collect urine	During prolonged surgical procedures with general or spinal anesthesia; selected urological and gynecological procedures in the perioperative period.

Hooton TM, et al. Clin Infect Dis 2010;50:626-663

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ALTERNATIVES TO INDWELLING URETHRAL CATHETERIZATION IN SELECTED PATIENTS

- Consider an external catheter in cooperative male patients without urinary retention or bladder outlet obstruction (II)
- Consider intermittent catheterization in spinal cord injury patients (II)
- Consider intermittent catheterization in children with myelomeningocele and neurogenic bladder (II)
- Intermittent catheterization is preferable to an indwelling urethral or suprapubic catheter in patients with bladder or emptying dysfunction (II)

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PREVENTION

- Use Standard Precautions during manipulation of the catheter or collection system (IB)

Not recommended:

- Changing indwelling catheters or drainage bags at routine, fixed intervals is not recommended. Change based on clinical indications such as infection, obstruction or whether the system is compromised (II)
- Do not clean the periurethral area with antiseptics to prevent CAUTI while the catheter is in place (IB)
- Unless obstruction is anticipated, bladder irrigation is not recommended (II)

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PREVENTION

- Urinary catheter insertion
  - **Perform hand hygiene before and after insertion (IB)**
  - **Insert catheters using aseptic technique and sterile equipment (IB)**
    - **Use sterile gloves, drape, sponges, an appropriate antiseptic for periurethral cleaning, and a single-use packet of lubricant jelly for insertion**
    - **Routine use of antiseptic lubricants is not necessary**
  - **Properly secure indwelling catheters after insertion (IB)**
  - **If intermittent catheterization is used, perform it at regular intervals (IB)**
- Catheter maintenance
  - **Following aseptic insertion, maintain a closed drainage system (IB)**
  - **Maintain unobstructed urine flow (IB)**

Adapted from CDC: http://www.cdc.gov/HAI/pdfs/toolkits/CAUTItoolkit_3_10.pdf

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PREVENTION

- Screening for and treatment of CA-ASB are not recommended to reduce subsequent CA-bacteriuria or CA-UTI in patients with short or long-term indwelling urethral catheters
- Screening for and treatment of CA-ASB are not recommended to reduce subsequent CA-bacteriuria or CA-UTI in patients with neurogenic bladders managed with intermittent catheterization
- Screening for and treatment of CA-ASB are not recommended to reduce subsequent CA-bacteriuria or CA-UTI in other patients, except in pregnant women and patients who undergo urologic procedures for which visible mucosal bleeding is anticipated

Hooton TM, et al. Clin Infect Dis 2010;50:626-663

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PREVENTION

- Routine instillation of antiseptic or antimicrobial solutions into the urinary drainage bags is not recommended (II)
- Further research is needed on the effect of antimicrobial/antiseptic-impregnated catheters in reducing the risk of symptomatic UTI (no recommendation)
- Further research is needed on the benefit of spatial separation of patients with urinary catheters (no recommendation)

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PREVENTION

- Quality Improvement Programs
  - Assure appropriate utilization of catheters
  - Remove catheters when no longer needed
  - Education and performance feedback regarding appropriate use, hand hygiene, and catheter care
  - Algorithms for perioperative management (removal, urinary retention)

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SUMMARY OF PREVENTION MEASURES

CORE MEASURES

- **Insert catheters only for appropriate indications**
- **Leave catheters in place only as long as needed**
- **Only properly trained persons insert and maintain catheters**
- **Maintain a closed drainage system**
- **Maintain unobstructed urine flow**
- **Hand hygiene and standard (or appropriate isolation precautions)**

SUPPLEMENTAL MEASURES

- **Alternatives to indwelling urinary catheterization**
- **Portable ultrasound devices to reduce unnecessary catheterizations**
- **Antimicrobial/antiseptic impregnated catheters (consider if CAUTI rates not decreasing after implementing comprehensive strategy)**

Adapted from CDC: http://www.cdc.gov/HAI/pdfs/toolkits/CAUTItoolkit_3_10.pdf

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STRATEGIES NOT RECOMMENDED FOR CA-UTI PREVENTION

- Complex urinary drainage systems (e.g., antiseptic-releasing cartridges in drain port)
- Changing catheters or drainage bags at routine, fixed intervals (clinical indications include infection, obstruction, or compromise of closed system)
- Routine antimicrobial prophylaxis
- Cleaning of periurethral area with antiseptics while catheter is in place (use routine hygiene)
- Irrigation of bladder with antimicrobials
- Cranberry products
- Instillation of antiseptic or antimicrobial solutions into drainage bags
- Routine screening for asymptomatic bacteriuria

Adapted from CDC: http://www.cdc.gov/HAI/pdfs/toolkits/CAUTItoolkit_3_10.pdf

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PREVENTION STRATEGIES WITH POSSIBLE BENEFIT

- Antiseptic and antimicrobial-coated catheters-available data do not support routine use
- Prophylaxis with antimicrobial agents-routine use discouraged
- Methenamine salts-overall, the data are unconvincing in reducing risks in patients managed with long-term indwelling catheterization

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LECTURE TOPICS

- Prevalence
- Pathogenesis
- Etiology of UTIs
- Risk factors
- Prevention

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REFERENCES

- **Lo E, et al. Strategies to prevent catheter-associated urinary tract infections in acute care hospitals. Infect Control Hosp Epidemiol 2008;29(suppl 1):S41-50**
- **Gould CV, et al. Guideline for prevention of catheter-associated urinary tract infections 2009. http://www.cdc.gov/hicpac/pdf/CAUTI/CAUTIguideline2009final.pdf**
- **Hooton TM, et al. Diagnosis, prevention and treatment of catheter-associated urinary tract infection in adults: 2009 international clinical practice guidelines from the Infectious Disease Society of America. Clin Infect Dis 2010;50:625-663.**
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- **Trautner BW, Hooten TM. Health Care-associated urinary tract infections. Principles and Practices of Infection Diseases, Bennett, Dolin, Blaser. 2020:3585**
- **Yokoe DS et al. A compendium of strategies to prevent HAIs in acute-care hospitals. ICHE 2014;35 Suppl 2:S21**

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Prevention of Catheter-Associated UTI

- Changing indwelling catheters or drainage bags at routine, fixed intervals is not recommended.
- Rather, it is suggested to change catheters and drainage bags based on clinical indications such as:
  - Infection,
  - Obstruction, or
  - When the closed system is compromised.
- Urine samples should be obtained aseptically.[1]
- If an indwelling catheter has been in place for >2 weeks at the onset of CA-UTI and is still indicated, the catheter should be replaced to hasten resolution of symptoms and to reduce the risk of subsequent CA-bacteriuria and CA-UTI
  - The urine culture should be obtained from the freshly placed catheter [2]

[1]https://www.cdc.gov/infectioncontrol/guidelines/cauti/index.html

[2]https://www.idsociety.org/practice-guideline/catheter-associated-urinary-tract-infection/

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Detect CA-UTI in Non-Responsive Patient

- Signs and symptoms (at least one)-fever (>38°C), suprapubic tenderness, urinary urgency, urinary frequency, dysuria, costovertebral angle pain or tenderness
- For purposes of NHSN surveillance for CA-UTI must be documented in the medical record

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Pathogens Causing UTIs

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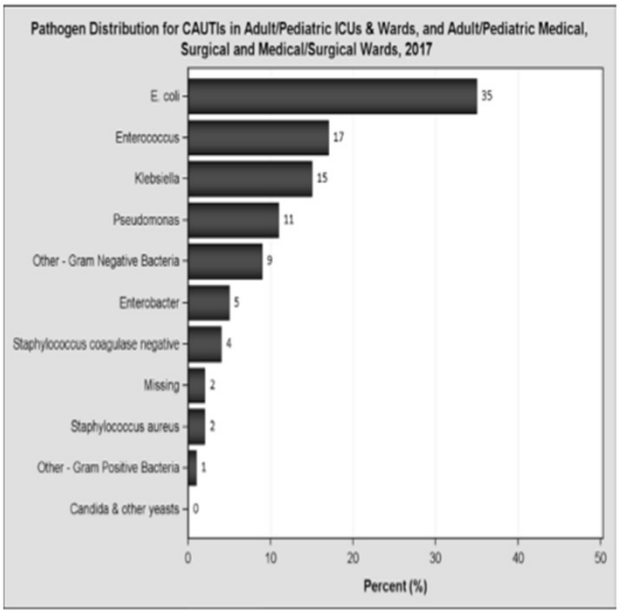

How to Understand Figure 11:

- *E. coli* (35%) and *Enterococcus* (17%) were the most commonly identified pathogens among reported CAUTI infections in 2017
- *Candida* species and other yeasts are considered excluded organisms and cannot be used to meet the UTI definition

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