



Catheter Associated Urinary Tract Infections (CAUTI)

TAKING PRECAUTIONS

Evidence-Based Practice in Prevention of Catheter Associated Urinary Tract Infections (CA-UTI)

Catheter Associated Urinary Tract Infection (CAUTI) Initiative

Infection Prevention Conference

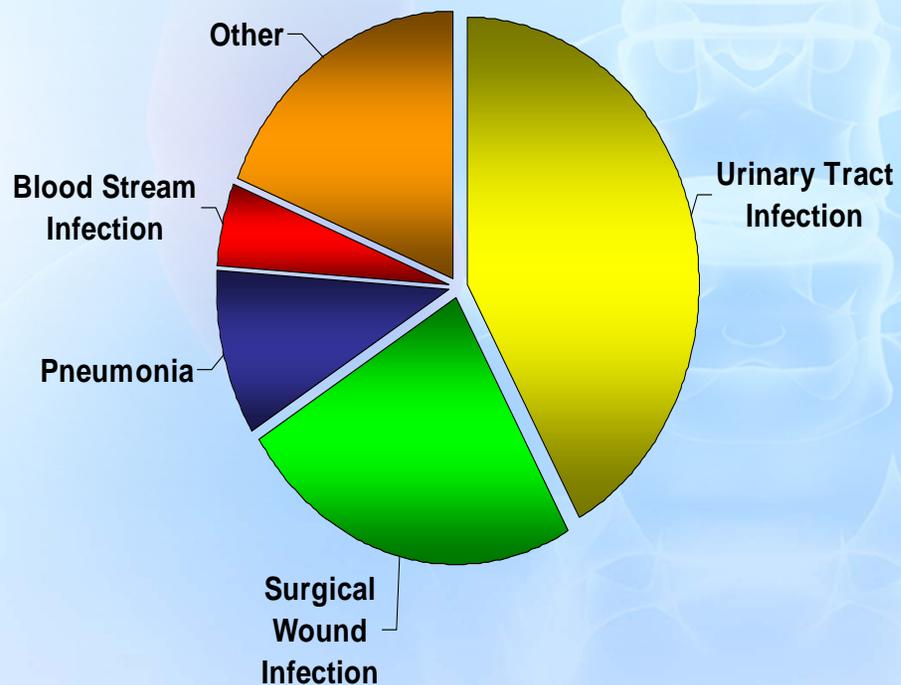
Bismarck, North Dakota

August 17, 18, 2011



TAKING PRECAU-TIONS

- Urinary Tract Infections (UTI) are the most common type of healthcare associated infections



- **Urinary Tract Infection = 42%**
- **Surgical Site Infection = 24%**
- **Pneumonia = 10%**
- **Blood Stream Infection = 5%**
- **Other Infections = 19%**

National Facts You Should Know



- CAUTI is the 2nd most common cause of nosocomial bloodstream infection
- Approximately 3% of all patients with a catheter will develop bacteremia
- Incidences of sterile urine conversion to bacteruria occurs at a rate of 3-10% per day
- Each year more than 13,000 deaths are associated with UTIs
- CAUTI increases morbidity and mortality by 2.8-fold
- CAUTI increases hospital length of stay by 1-3 days
- Approximately 80% of all UTI's are associated with indwelling Foley catheters

Catheter Associated Urinary Tract Infections: Fact Sheet. Retrieved February 9, 2010 from http://www.wocn.org/pdfs/WOCN_Library/Fact_Sheets/cauti_fact_sheet.pdf

Catheter Associated Urinary Tract Infections (CAUTI) Event. Retrieved February 9, 2010 from <http://www.cdc.gov/nhsn/pdfs/pscManual/7pscCAUTIcurrent.pdf>

Medicare's New Rules

- CMS (Medicare) will not pay for preventable hospital-acquired complications. One of their high priorities is CA-UTI -- due to its high cost and high volume
 - CA-UTI adds \$500 to \$1,000 to direct costs of an acute care hospitalization; additional \$3,800 if bacteremia occurs
 - Over 1 Million nosocomial UTIs occur per year
 - According to CMS, annual cost due to CA-UTI amounts to \$424M to \$451M

• Catheter Associated Urinary Tract Infections: Fact Sheet. Retrieved February 9, 2010 from http://www.wocn.org/pdfs/WOCN_Library/Fact_Sheets/cauti_fact_sheet.pdf

• Catheter Associated Urinary Tract Infections (CAUTI) Event. Retrieved February 9, 2010 from <http://www.cdc.gov/nhsn/pdfs/pscManual/7pscCAUTIcurrent.pdf>



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The duration of catheterization is the most important risk factor for developing CAUTI

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

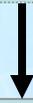
Dennis G. Maki and Paul A. Tambyah **Engineering Out the Risk of Infection with Urinary Catheters** Emerg Infect Dis Vol. 7, No. 2, March–April 2001



Pathogenesis of CAUTI



Insertion of a standard urinary catheter



Deposition of a conditioning film on the surface of the catheter
(conditioning film is made up of proteins, electrolytes, and other components of urine)



Microbes attach to this conditioning film and begin secreting polysaccharides that form the architectural structure of **biofilm**



Note:

When organisms detach from the biofilm and become free-floating in the urine this will then lead to symptomatic infection



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- CAUTI comprise perhaps the largest institutional reservoir of hospital acquired antibiotic-resistant pathogens **

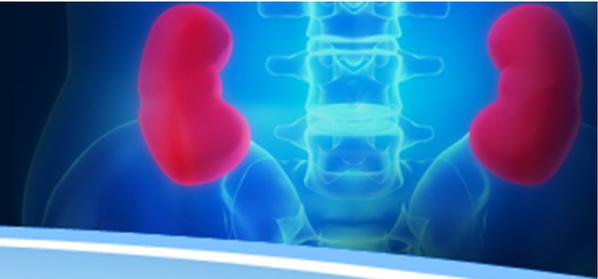
Organisms frequently seen include:

- Vancomycin-resistant Enterococcus sp. (VRE)
- Methicillin-resistant Staphylococcus aureus (MRSA)
- Multi-drug Resistant Gram-negative Rods

** Maki DG and Tambyah PA. Engineering Out the Risk of Infection with Urinary Catheters. Emerg Infect Dis, 2001



What is Biofilm?

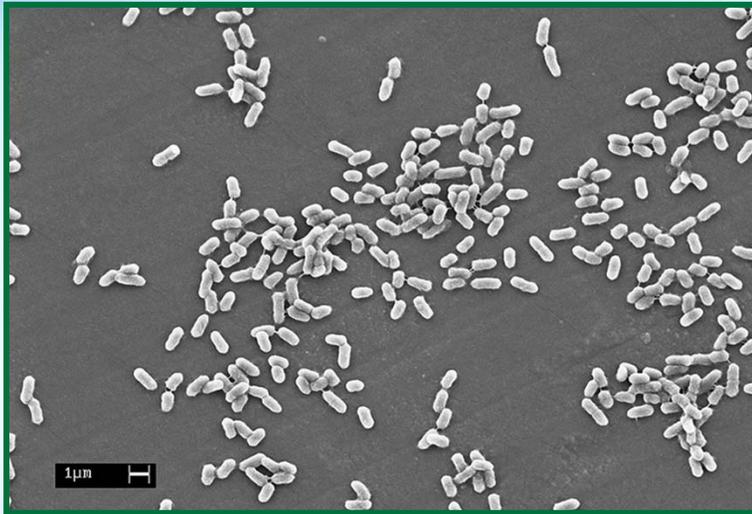


- Biofilm is both tenacious and resistant to antimicrobial agents
- Biofilm is generated by gram-negative organisms, gram-positive organisms or yeasts
- Biofilm is a survival strategy for microorganisms, offering protection from both the body's defenses and antimicrobial agents.
- Initially composed of a single species, the biofilm on a long-term indwelling urinary catheter can also contain multiple species, with mixed-organism biofilm containing as many as 16 different strains of bacteria.





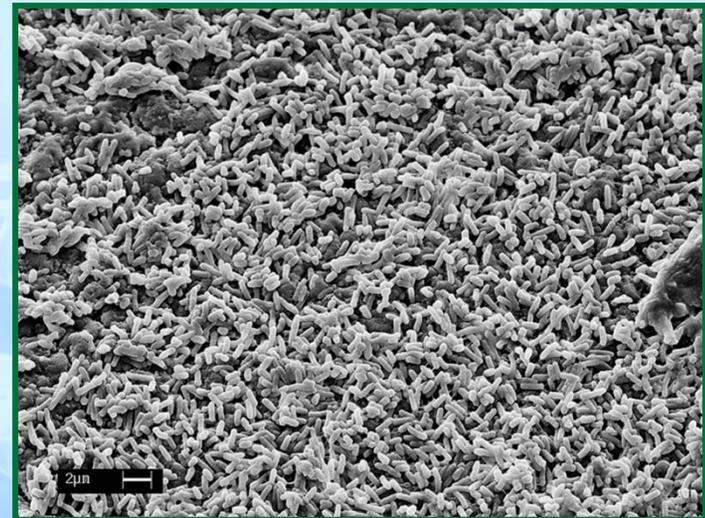
Biofilm Development



Pseudomonas aeruginosa

@ 2 Hours

on an uncoated
100% silicone catheter



Pseudomonas aeruginosa

@ 18 Hours

on an uncoated
100% silicone catheter

Routes of Entry of Uropathogens to CA-UTI



1. EXTRALUMINAL Contamination
 - direct inoculation during insertion
 - organisms ascending from the perineum along the external catheter surface

2. INTRALUMINAL Contamination
 - Reflux of microbes gaining access to the catheter lumen from failure of closed drainage
 - Contamination of urine in the collection bag

Mechanisms of Catheter Acquired Urinary Tract Infection



- **Extraluminal – Outside the Catheter**

- Biofilm
- Encrustation
- Organism Migration
- Fecal Incontinence



- **Intraluminal – Inside the Catheter**

- Biofilm
- Encrustation
- Disconnection of Catheter / Drainage System
- Contamination at Sample Port
- Contamination of Outlet Tube

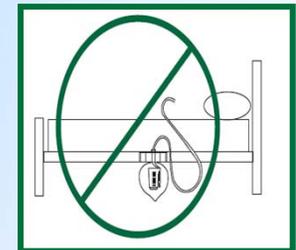
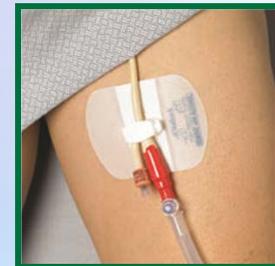




RN Best Practice



- Hand hygiene/ aseptic insertion, manipulation
- Monitor Foley use daily/ remove ASAP
- No “routine” Foley changes
- Securement device in place (Statlock)
- Perineal care daily and PRN with soap and water
- Maintain sterile closed system
- Keep Foley bag below level of bladder/ off floor
- No tubing kinks/ dependent loops
- Empty bag regularly into patient’s own container without contaminating drainage spigot



Adopted from: CDC Guidelines for Prevention of Catheter Associated Urinary Tract Infection 2009

CA-UTI Bundle Acronym



- **N** ever should Foley touch the floor
- **O** nly “indicated” Foleys stay in
- **F** oley care with soap and water
- **O** pen system only for obstruction
- **L** oops & kinks – avoid them!
- **E** very patient has own labeled collection container
- **Y** ou must secure the Foley

Acronym used with permission from Jean Henderson

Appropriate Indications for Catheter Use



1. Acute urinary retention / bladder outlet obstruction
2. Peri-operative use in selected surgical procedures
3. Assist in healing of open perineal and sacral wounds in incontinent patients
4. Hospice/ comfort/ palliative care
5. Prolonged immobilization for trauma or surgery
6. Chronic indwelling urinary catheter on admission
7. Accurate measurement of urinary output in critically ill patients

CDC Guidelines for Appropriate Indications for Indwelling Urethral Catheter Use, 2009



Acute Urinary Retention or Obstruction = 1

- Outflow obstruction: examples include prostatic hypertrophy with obstruction, urethral obstruction related to severe anasarca, urinary blood clots with obstruction
- Acute urinary retention: may be medication-induced, medical (neurogenic bladder) or related to trauma to spinal cord



Perioperative Use In Selected Surgeries = 2

- Anticipated prolonged duration of surgery, large volume infusions during surgery, or need for intraoperative urinary output monitoring
- Urologic surgery or other surgery on contiguous structures of the genitourinary tract
- Spinal or epidural anesthesia may lead to urinary retention (prompt discontinuation of this type of anesthesia should prevent need for urinary catheter placement)



Assist Healing of Open Perineal / Sacral Wounds in Incontinent Patients = 3

- This is an indication when there is concern that urinary incontinence is leading to worsening skin integrity in areas where there is skin breakdown.



Hospice / Comfort Care / Palliative Care = 4

- Patient comfort at end-of-life
- This is the only indication that would be acceptable in the case of a patient request for a urinary catheter



Required Immobilization for Trauma or Surgery = 5

- Unstable thoracic or lumbar spine
- Multiple traumatic injuries, such as pelvic fractures
- Acute hip fracture with risk of displacement with movement



Chronic Indwelling Urinary catheter on Admission = 6

- Patients from home or an extended care facility with a chronic urinary catheter
- Chronic indwelling urinary catheter (defined as present for >30 days): it is not infrequent to see patients admitted from extended care facilities with a chronic urinary catheter without being able to find the reason for initial placement when assessed. We suggest that these patients represent a special category and may need a different assessment for the appropriateness of catheterization. We consider them to have an acceptable urinary catheter use in the hospital.



Accurate measurement of urinary output in the critically ill patient = 7

- This applies to patients in the intensive care setting only



Unacceptable Reasons for Catheter Placement



- Urine output monitoring OUTSIDE the ICU's = 8
- Incontinence without a sacral/ perineal pressure sore = 9
- Prolonged postop use w/o appropriate indication = 10
(such as structural repair of urethra or contiguous structures, prolonged epidural anesthesia effects, etc)
- Others = 11
(those transferred from intensive care, morbid obesity, immobility, confusion or dementia, and patient request)



Evidence Based Nursing Practice Changes



- Don't change Foley on a routine basis
- Don't pre-test balloon before insertion
- When removing Foley don't pull back on syringe to remove fluid from balloon, let it empty by passive deflation. Also don't cut off lumen.



Evidence Based Nursing Practice Changes

- Don't change Foley on a routine basis

EVIDENCE:

CDC Guidelines for Prevention of CAUTI 2009

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.



Evidence Based Nursing Practice Changes

- Don't pre-test balloon before insertion

EVIDENCE:

Manufacturer does not recommend inflation of the Foley prior to use.

Practice is unnecessary in that they test 100% of their balloons as part of their QA process. (Letter 7/10/08 / Bard Director/ Med. Svcs)

Pretesting silicone balloons is not recommended; the silicone can form a cuff/crease at the balloon area that can cause trauma to urethra during catheter insertion. (Smith. J. Indwelling Catheter Management: From Habit Based to Evidence Based Practice. *Ostomy Wound Management*, Dec 2003.vol.49-12,34-45.)



Evidence Based Nursing Practice Changes

- When removing Foley don't pull back on syringe to remove fluid from balloon, let it empty by passive deflation. Also don't cut off lumen.

EVIDENCE:

Foley Catheter Removal (May depend on the catheter system you use)

1. To deflate catheter balloon gently insert a insert luer lock or slip tip syringe in the catheter valve. Never use more force than is required to make the syringe "stick" in the valve
2. Allow the pressure within the balloon to force the plunger back and fill the syringe with water. If you notice slow or no deflation, re-seat the syringe gently
3. Use only gentle aspiration to encourage deflation if needed. Vigorous aspiration may collapse the inflation lumen, preventing balloon deflation



Evidence Based Nursing Practice Changes

When removing Foley don't pull back on syringe to remove fluid from balloon, let it empty by passive deflation. Also don't cut off lumen.

EVIDENCE: (Gonzalzo. M and Walsh P. urology 61:825-827, 2003)

- Slow passive balloon deflation aids return of pre-inflated shape
- Decreases incidence of cuffing which can cause urethral trauma
- If cuffing occurs once balloon is empty add 0.5-1.0 ml of sterile water and then slowly remove. This eliminates the balloon cuff smoothing out the retaining ridge.

EVIDENCE: (Mosby Procedure: Urinary Catheters: Indwelling Catheter Removal)

Insert hub of syringe into inflation valve (balloon port). Allow sterile water to return into syringe by gravity until the plunger stops moving and the amount instilled is removed.

Rationale: Many manufacturers recommend that fluid return to syringe by gravity. Manual aspiration leads to increased discomfort when removing catheter, resulting in the development of creases or ridges in balloon.



TAKING PRECAU-TIONS

- Approximately 80% of all urinary tract infections are associated with Urinary Catheters

Other urinary catheter related complications include:

- Pain / Discomfort
- Acute Renal Failure
- Prolonged hospital stay
- Secondary bacteremia
- Sepsis
- Increased mortality
- Formation of encrustations and obstruction to flow
- Urethral strictures, prostatitis, and orchitis
- Reservoir for MDROs





TAKING PRECAU-TIONS

- How do infections impact the Hospital?

↑ Length of Stay (CA-UTI can increase LOS by 3.8 days)

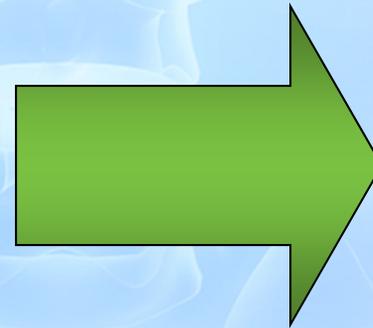
↑ Resource Consumption

↑ Cost of Care

↓ Patient Satisfaction

↓ Patient Throughput

↓ Margins/Profit



Negative
Impact on the
bottom line

Losses from 5% of patients that acquire infections erode 63% of net inpatient profits



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- Losses of Medicare and Private Insurer Reimbursement
 - CMS Inpatient Prospective Payment System Final Rule of FY2008
 - Hospitals will no longer receive additional reimbursement for patients who develop a Hospital Acquired CAUTI
 - Hospitals will have to absorb the additional cost of treating the infection and the increased LOS
 - Rule designed to hold hospitals accountable for not preventing certain healthcare-associated complications by withholding additional reimbursement



TAKING PRECAU-TIONS

Foley Catheter
Utilization and
Removal

Aseptic
Insertion

**CAUTI
Prevention**

Catheter
Management

Product
Selection



TAKING PRECAU-TIONS

- CA-UTI Prevention Team established / meets monthly
- Co-Leads:

Overall Goal:

To identify, educate and implement best practice measures that will reduce and/or prevent catheter associated urinary tract infections for all patient populations that have had indwelling urinary catheters



TAKING PRECAUTIONS

- Example - Specific Team Goals:
 - Educate nurses and physicians as to CA-UTI prevention
 - Self Learning Module (SLM) being developed for nurses
 - Work closely with SCIP Team on SCIP Measure #9 (removal of Foley- POD 1 or 2)
 - Involvement in CUSP CA-UTI Statewide Initiative (start date: _____)
 - This will include 2 units (to be decided)
 - Educate nurses and physicians as to appropriate indications for catheter insertion
 - SLM, indication for insertion
 - New Foley Insertion Kit has CA-UTI reminders (would like to change to this system if not in place already)
 - Eliminate unnecessary use of urinary catheters by daily monitoring
 - Create Foley stop reminder daily for physicians
 - If Foley needed, create a system in to document reason
 - Provide indwelling catheter alternatives (Condom catheters or intermittent catheterization)
 - Monitor CA-UTI rates and catheter utilization rates



TAKING PRECAUTIONS

- All best Practice Measures are adopted from current quality evidence (Category 1) which are considered strong recommendations by nationally known and respected groups.

CDC Guidelines for Prevention of Catheter Associated Urinary Tract Infections (2009)

APIC Guide to the Elimination of Catheter Associated Urinary Tract Infections 2008

SHEA/IDS Practice Recommendation “Strategies to Prevent Catheter Associated Urinary Tract Infections in Acute Care Hospitals, Infection Control and Hospital Epidemiology



TAKING PRECAUTIONS

- 2009 NHSN UTI definition for patients with Indwelling Foley Catheter

Criteria 1

- Patient has at least 1 of the following signs or symptoms with no other recognized cause:
 - Fever ($>38^{\circ}\text{C}$), Suprapubic tenderness, or Costovertebral angle pain or tenderness
- And**
- A positive urine culture of $\geq 10^5$ colony-forming units (CFU)/ml with no more than 2 species of microorganisms

Criteria 2

- Patient has at least 1 of the following signs or symptoms with no other recognized cause:
 - Fever ($>38^{\circ}\text{C}$), Suprapubic tenderness, or costovertebral angle pain or tenderness
- And**
- A positive urinalysis demonstrated by at least 1 of the following findings:
 - Positive dipstick for leukocyte esterase and/or nitrite, pyuria (urine specimen with ≥ 10 white blood cells [WBC]/ mm^3 or ≥ 3 WBC/high power field of unspun urine), microorganisms seen on Gram stain of unspun urine
- And**
- A positive urine culture of $\geq 10^3$ and $< 10^5$ CFU/ml with no more than 2 species of microorganisms



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FY 2010 CA - UTI RATES** FOR ___ ICU'S

ICU UNIT	FY10 Q1	FY10 Q2	FY10 Q3	FY10 Q4	FY10 Avg. Rate	FY10 Goal: At or below NHSN median value
						3.40
						7.30
						3.80
						3.20

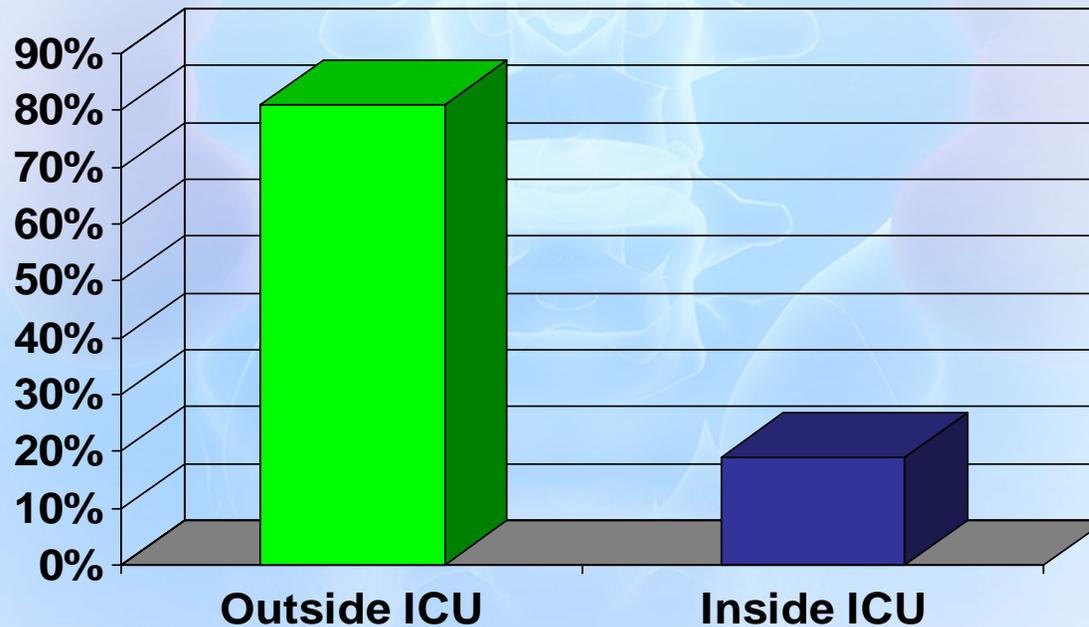
** Rate per 1,000 indwelling catheter days



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Approximately 81% of UTIs occur outside of the ICU

UTI Inside and Outside the ICU

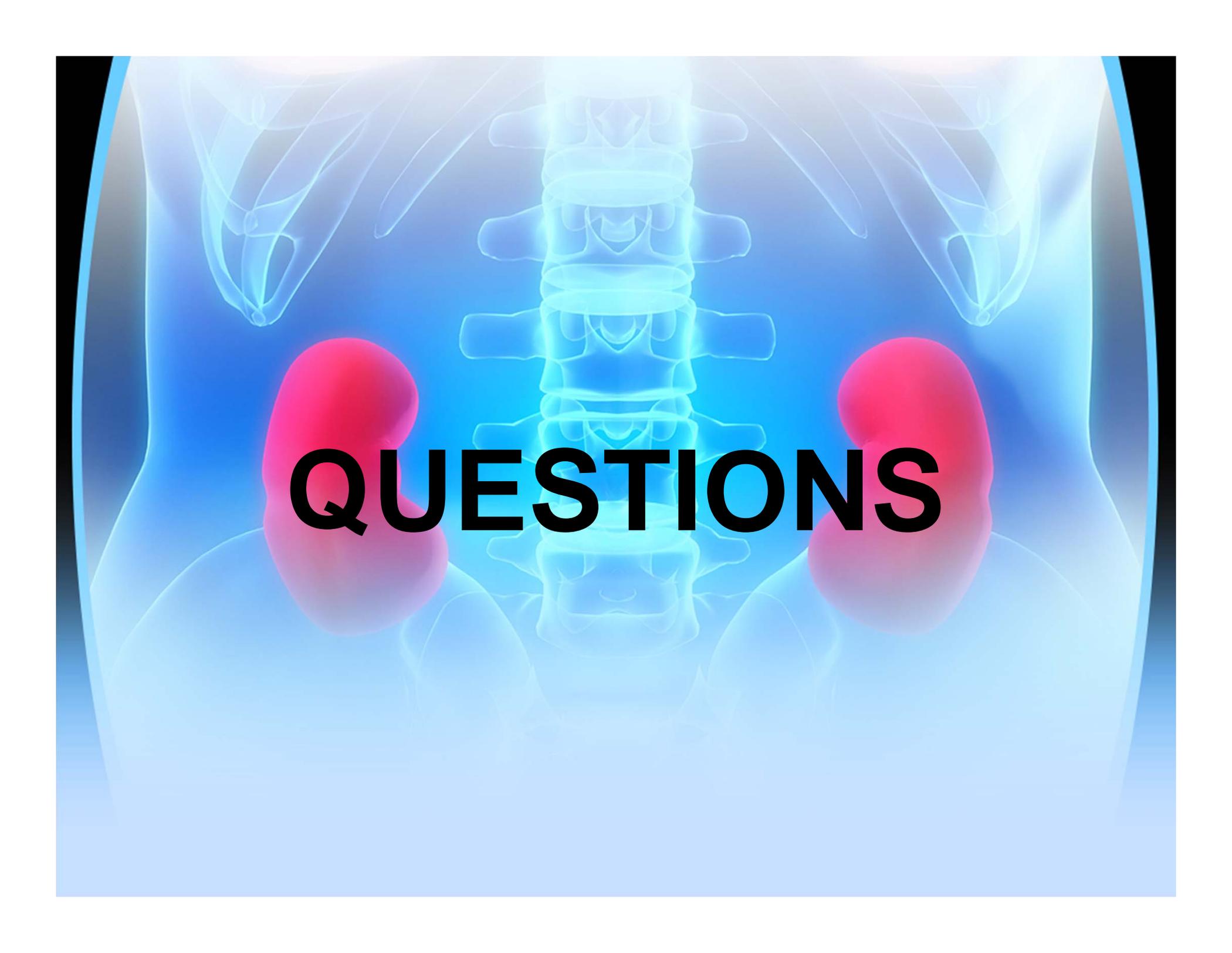


Klevens RM, Edwards JR, Richards CL, et al. Estimating health care associated infections and deaths in U.S. hospitals, 2002. Public Health Rep. 2007; 122:160-167



TAKING PRECAU-TIONS

CA-UTI WAS THE NUMBER ONE HOSPITAL ACQUIRED INFECTION IN 1981 AND IS STILL NUMBER ONE TODAY!

An anatomical illustration of the human torso, focusing on the back and abdominal area. The spine is shown in a light blue, semi-transparent style, with the vertebrae clearly visible. On either side of the spine, the kidneys are depicted in a bright red color, standing out against the blue background. The overall image has a soft, glowing blue light effect, particularly around the spine and kidneys. The word "QUESTIONS" is written in large, bold, black capital letters across the center of the image, overlapping the kidneys and the lower part of the spine.

QUESTIONS