

# Key Definitions

In order to make sure that every member of the team is clear about the definitions that will be used, we have provided a list of key terms in the next few pages along with commonly used definitions for each term.

Additionally, we define both the process (also known “intermediate outcome”) measures as well as the clinically-relevant outcome measures we will be using to evaluate how our program is working.

These definitions were provided to us from the North Carolina Center for Hospital Quality and Patient Safety, Centers for Disease Control and Prevention (CDC), and from a toolkit used by the Michigan Health and Hospital Association written by Mohamad G. Fakhri, MD, MPH, Sanjay Saint, MD, MPH, Sarah Krein, RN, PhD., and Russ Olmsted, MPH, CIC. We have modified the definitions and the material as appropriate.

Finally, we also provide recent material and definitions used by the CDC’s National Healthcare Safety Network (NHSN) as a reference source.

**Key definitions (modified from the North Carolina Prevent Catheter-Associated Urinary Tract Infections Collaborative Tool Kit developed by the North Carolina Center for Hospital Quality and Patient Safety):**

1. Asymptomatic bacteriuria (a.k.a. ASB): the presence of bacteria in the urine, which is not causing symptoms of a UTI. 75% to 90% of patients with ASB do not develop a systemic inflammatory response or other clinical manifestations suggesting infection. Treatment of ASB has not been shown to be clinically beneficial in most patient populations and is associated with development of multi-drug resistant organisms. Of note, the National Healthcare Safety Network (NHSN) removed the ASB definition from its UTI definitions in 2009.
2. Biofilm: communities of different types of microorganisms that attach to environmental surfaces, such as medical devices. They enclose themselves in a protective matrix that is highly protective, and are typically far more resistant to antibiotics than free-floating organisms. They develop rapidly and may be found on any surface where moisture and nutrients are present.
3. Catheter-associated urinary tract infection (CAUTI): as defined by the NHSN, is divided into two classifications: symptomatic CAUTI and asymptomatic, bacteremic urinary tract infection (bloodstream infection secondary to a UTI). For details, see the NHSN definitions section at the end of this section. Of note, definitions of CAUTI vary between studies, making the appraisal of evidence very difficult. Unfortunately, investigators have used many different definitions for CAUTI, and have often not distinguished between symptomatic CAUTI and asymptomatic bacteriuria.
4. External catheter (a.k.a. condom catheter, Texas catheter.): a urine containment device that fits over the external genitalia and is attached to a urinary drainage bag. Used in men.
5. Indwelling urinary catheter: drainage tube that is inserted aseptically into the urinary bladder through the urethra, is left in place, and is connected to a closed collection system. (Frequently called a “Foley catheter.”)

6. Short-term catheterization: generally considered to be a period of less than 30 days of having an indwelling urinary catheter.
7. Straight catheterization (a.k.a. intermittent catheterization or in-and-out catheterization): brief insertion (and removal) of a catheter into the bladder via the urethra to drain urine at different time intervals.
8. Symptomatic UTI (SUTI): patients with a positive urine culture and experiencing, NHSN-defined UTI signs or symptoms with no other recognized cause of the symptoms.

### **Process measures:**

1. Utilization ratio = Number of patients with a urinary catheter on the unit / Total number of patients on the unit
2. Prevalence rate = (Number of patients with a urinary catheter on the unit / Total number of patients on the unit) x 100
3. Rate of unnecessary urinary catheter use = (Days of unnecessary urinary catheters / Total number of patient days) x 1000
4. Unnecessary urinary catheter % = (Days of unnecessary urinary catheters / Total number of days of urinary catheters used) x 100
5. Discontinuation rate of unnecessary urinary catheter % = (Number of unnecessary urinary catheters discontinued / All urinary catheters without valid indications) x 100

### **Outcome Measures**

1. Symptomatic CAUTI rate\* = (Number of symptomatic CAUTIs / number of urinary catheter days) x 1000
2. Symptomatic CAUTI rate (using patient days) = (Number of symptomatic CAUTIs / Number of patient days) x 10,000

3. Bloodstream infection related to CAUTI\* (NHSN rate) = (Number of bloodstream-related infections due to CAUTI/number of urinary catheter days ) x 1000

\* Established rates used by the CDC's National Healthcare Safety Network

The next several pages come from the CDC and provide additional definitions.



## Catheter-Associated Urinary Tract Infection (CAUTI) Event

**Introduction:** The urinary tract is the most common site of healthcare-associated infection, accounting for more than 30% of infections reported by acute care hospitals<sup>1</sup>. Virtually all healthcare-associated urinary tract infections (UTIs) are caused by instrumentation of the urinary tract.

CAUTI can lead to such complications as cystitis, pyelonephritis, gram-negative bacteremia, prostatitis, epididymitis, and orchitis in males and, less commonly, endocarditis, vertebral osteomyelitis, septic arthritis, endophthalmitis, and meningitis in all patients. Complications associated with CAUTI cause discomfort to the patient, prolonged hospital stay, and increased cost and mortality. Each year, more than 13,000 deaths are associated with UTIs.<sup>1</sup>

Prevention of CAUTIs is discussed in the CDC/HICPAC document, *Guideline for Prevention of Catheter-associated Urinary Tract Infections*<sup>2</sup>.

**Settings:** Surveillance will occur in any of three types of inpatient locations: (1) ICUs, (2) SCAs (includes hematology/oncology wards, bone marrow transplant units, solid organ transplant units, inpatient dialysis units, long term acute care areas), and (3) any other inpatient location in the institution where denominator data can be collected (e.g., surgical wards).

NOTE: It is not required to monitor for CAUTIs after the patient is discharged from the facility, however, if discovered, they should be reported to NHSN. No additional indwelling catheter days are reported.

**Requirements:** Surveillance for CAUTI is performed in at least one inpatient location in the healthcare institution for at least one calendar month as indicated in the *Patient Safety Monthly Reporting Plan* (CDC 57.106).

### Definitions:

Urinary tract infections (UTI) are defined using symptomatic urinary tract infection (SUTI) criteria or Asymptomatic Bacteremic UTI (ABUTI) criteria (Table 1 and Figure 1). Report UTIs that are catheter-associated (i.e. patient had an indwelling urinary catheter at the time of or within 48 hours before onset of the event). NOTE: There is no minimum period of time that the catheter must be in place in order for the UTI to be considered catheter-associated. NOTE: SUTI 1b and 2b and other UTI (OUTI) cannot be catheter-associated.

EXAMPLE: Patient has a Foley catheter in place on an inpatient unit. It is discontinued, and 4 days later patient meets the criteria for a UTI. This is not reported as a CAUTI because the time since Foley discontinuation exceeds 48 hours.



**Location of attribution:** The location where the patient was assigned on the date of the UTI event, which is further defined as the date when the first clinical evidence appeared or the date the specimen used to meet the criterion was collected, whichever came first.

**EXAMPLE:** Patient has a Foley catheter inserted in the Emergency Department and then is admitted to the MICU. Within 24 hours of admission to the MICU, patient meets criteria for UTI. This is reported to the NHSN as a CAUTI for the MICU, because the Emergency Department is not an inpatient location and no denominator data are collected there.

**EXAMPLE:** Patient on the urology ward of Hospital A had the Foley catheter removed and is discharged home a few hours later. The ICP from Hospital B calls the next day to report that this patient has been admitted to Hospital B with a UTI. This CAUTI should be reported to NHSN for Hospital A and attributed to the urology ward.

**EXCEPTION:** If a CAUTI develops within 48 hours of transfer from one inpatient location to another in the same facility, the infection is attributed to the transferring location. This is called the Transfer Rule and examples are shown below.

- Patient with a Foley catheter in place in the SICU is transferred to the surgical ward. Thirty six (36) hours later, the patient meets the criteria for UTI. This is reported to NHSN as a CAUTI for the SICU.
- Patient is transferred to the medical ward from the MSICU after having the Foley catheter removed. Within 24 hours, patient meets criteria for a UTI. This is reported to NHSN as a CAUTI for the MSICU.
- Patient with a Foley catheter in place is transferred from the medical ward to the coronary care ICU (CCU). After 4 days in the CCU, the patient meets the criteria for UTI. This is reported to NHSN as a CAUTI for the CCU.

**Indwelling catheter:** a drainage tube that is inserted into the urinary bladder through the urethra, is left in place, and is connected to a closed collection system; also called a Foley catheter; does not include straight in-and-out catheters.

**Numerator Data:** The *Urinary Tract Infection (UTI) Form* (CDC 57.114) is used to collect and report each CAUTI that is identified during the month selected for surveillance. The *Instructions for Completion of Urinary Tract Infection Form* (Tables of Instructions, Tables 5 and 2a) includes brief instructions for collection and entry of each data element on the form. The UTI form includes patient demographic information and information on whether or not an indwelling urinary catheter was present. Additional data include the specific criteria met for identifying the UTI, whether the patient developed a secondary bloodstream infection, whether the patient died, and the organisms isolated from cultures and their antimicrobial susceptibilities.

**Denominator data:** Device days and patient days are used for denominators (See Chapter 16 Key Terms). Indwelling urinary catheter days, which are the number of patients with an indwelling urinary catheter device, are collected daily, at the same time each day, according to the chosen location using the appropriate form (CDC 57.116,



57.117, and 57.118). These daily counts are summed and only the total for the month is entered into NHSN. Indwelling urinary catheter days and patient days are collected separately for each of the locations monitored.

**Data Analyses:** The CAUTI rate per 1000 urinary catheter days is calculated by dividing the number of CAUTIs by the number of catheter days and multiplying the result by 1000. The Urinary Catheter Utilization Ratio is calculated by dividing the number of urinary catheter days by the number of patient days. These calculations will be performed separately for the different types of ICUs, specialty care areas, and other locations in the institution, except for neonatal locations.

---

<sup>1</sup>Klebens RM, Edward JR, et al. Estimating health care-associated infections and deaths in U.S. hospitals, 2002. *Public Health Reports* 2007;122:160-166.

<sup>2</sup>Wong ES. Guideline for prevention of catheter-associated urinary tract infections. *Infect Control* 1981;2:126-30.

Table 1-Urinary Tract Infection Criteria

Criterion	<b>Symptomatic Urinary Tract Infection (SUTI)</b> Must meet at least 1 of the following criteria:
1a	Patient had an indwelling urinary catheter in place at the time of specimen collection <i>and</i> at least 1 of the following signs or symptoms with no other recognized cause: fever (>38°C), suprapubic tenderness, or costovertebral angle pain or tenderness <i>and</i> a positive urine culture of $\geq 10^5$ colony-forming units (CFU)/ml with no more than 2 species of microorganisms.  -----OR-----  Patient had indwelling urinary catheter <u>removed within the 48 hours prior</u> to specimen collection <i>and</i> at least 1 of the following signs or symptoms with no other recognized cause: fever (>38°C), urgency, frequency, dysuria, suprapubic tenderness, or costovertebral angle pain or tenderness <i>and</i> a positive urine culture of $\geq 10^5$ colony-forming units (CFU)/ml with no more than 2 species of microorganisms.
1b	Patient did <u>not</u> have an indwelling urinary catheter in place at the time of specimen collection nor within 48 hours prior to specimen collection <i>and</i> has at least 1 of the following signs or symptoms with no other recognized cause: fever (>38°C) in a patient that is $\leq 65$ years of age, urgency, frequency, dysuria, suprapubic tenderness, or costovertebral angle pain or tenderness <i>and</i> a positive urine culture of $\geq 10^5$ CFU/ml with no more than 2 species of microorganisms.
2a	Patient had an indwelling urinary catheter in place at the time of specimen collection <i>and</i> at least 1 of the following signs or symptoms with no other recognized cause: fever (>38°C), suprapubic tenderness, or costovertebral angle pain or tenderness <i>and</i> a positive urinalysis demonstrated by at least 1 of the following findings: <ol style="list-style-type: none"> <li>a. positive dipstick for leukocyte esterase and/or nitrite</li> <li>b. pyuria (urine specimen with <math>\geq 10</math> white blood cells [WBC]/mm<sup>3</sup> or <math>\geq 3</math> WBC/high power field of unspun urine)</li> <li>c. microorganisms seen on Gram stain of unspun urine</li> </ol> <i>and</i> a positive urine culture of $\geq 10^3$ and $< 10^5$ CFU/ml with no more than 2 species of microorganisms.  -----OR-----  Patient had indwelling urinary catheter <u>removed within the 48 hours prior</u> to specimen collection <i>and</i> at least 1 of the following signs or symptoms with no other recognized cause: fever (>38°C), urgency, frequency, dysuria, suprapubic tenderness, or costovertebral angle pain or tenderness <i>and</i> a positive urinalysis demonstrated by at least 1 of the following findings: <ol style="list-style-type: none"> <li>a. positive dipstick for leukocyte esterase and/or nitrite</li> <li>b. pyuria (urine specimen with <math>\geq 10</math> white blood cells [WBC]/mm<sup>3</sup> or <math>\geq 3</math> WBC/high power</li> </ol>

Table 1-Urinary Tract Infection Criteria

	<p>field of unspun urine)  c. microorganisms seen on Gram stain of unspun urine  <i>and</i>  a positive urine culture of <math>\geq 10^3</math> and <math>&lt; 10^5</math> CFU/ml with no more than 2 species of microorganisms.</p>
2b	<p>Patient did <u>not</u> have an indwelling urinary catheter in place at the time of specimen collection nor within 48 hours prior to specimen collection  <i>and</i>  has at least 1 of the following signs or symptoms with no other recognized cause: fever (<math>&gt;38^\circ\text{C}</math>) in a patient that is <math>\leq 65</math> years of age, urgency, frequency, dysuria, suprapubic tenderness, or costovertebral angle pain or tenderness  <i>and</i>  a positive urinalysis demonstrated by at least 1 of the following findings:  a. positive dipstick for leukocyte esterase and/or nitrite  b. pyuria (urine specimen with <math>\geq 10</math> WBC/mm<sup>3</sup> or <math>\geq 3</math> WBC/high power field of unspun urine)  c. microorganisms seen on Gram stain of unspun urine  <i>and</i>  a positive urine culture of <math>\geq 10^3</math> and <math>&lt; 10^5</math> CFU/ml with no more than 2 species of microorganisms.</p>
3	<p>Patient <math>\leq 1</math> year of age with or without an indwelling urinary catheter has at least 1 of the following signs or symptoms with no other recognized cause: fever (<math>&gt;38^\circ\text{C}</math> core), hypothermia (<math>&lt;36^\circ\text{C}</math> core), apnea, bradycardia, dysuria, lethargy, or vomiting  <i>and</i>  a positive urine culture of <math>\geq 10^5</math> CFU/ml with no more than 2 species of microorganisms.</p>
4	<p>Patient <math>\leq 1</math> year of age with or without an indwelling urinary catheter has at least 1 of the following signs or symptoms with no other recognized cause: fever (<math>&gt;38^\circ\text{C}</math> core), hypothermia (<math>&lt;36^\circ\text{C}</math> core), apnea, bradycardia, dysuria, lethargy, or vomiting  <i>and</i>  a positive urinalysis demonstrated by at least one of the following findings:  a. positive dipstick for leukocyte esterase and/or nitrite  b. pyuria (urine specimen with <math>\geq 10</math> WBC/mm<sup>3</sup> or <math>\geq 3</math> WBC/high power field of unspun urine)  c. microorganisms seen on Gram's stain of unspun urine  <i>and</i>  a positive urine culture of between <math>\geq 10^3</math> and <math>&lt; 10^5</math> CFU/ml with no more than two species of microorganisms.</p>
<b>Criterion</b>	<b>Asymptomatic Bacteremic Urinary Tract Infection (ABUTI)</b>
	<p>Patient with or without an indwelling urinary catheter has <u>no</u> signs or symptoms (i.e., <u>no</u> fever (<math>&gt;38^\circ\text{C}</math>) for patients <math>\leq 65</math> years of age*; and for any age patient <u>no</u> urgency, frequency, dysuria, suprapubic tenderness, or costovertebral angle pain or tenderness, <u>OR</u> for a patient <math>\leq 1</math> year of age, <u>no</u> fever (<math>&gt;38^\circ\text{C}</math> core), hypothermia (<math>&lt;36^\circ\text{C}</math> core), apnea, bradycardia, dysuria, lethargy, or vomiting)  <i>and</i>  a positive urine culture of <math>\geq 10^5</math> CFU/ml with no more than 2 species of uropathogen microorganisms**  <i>and</i>  a positive blood culture with at least 1 matching uropathogen microorganism to the urine culture.</p> <p>*Fever is not diagnostic for UTI in the elderly (<math>&gt;65</math> years of age) and therefore fever in this age group does not disqualify from meeting the criteria of an ABUTI.  **Uropathogen microorganisms are: Gram-negative bacilli, <i>Staphylococcus</i> spp., yeasts, beta-hemolytic <i>Streptococcus</i> spp., <i>Enterococcus</i> spp., <i>G. vaginalis</i>, <i>Aerococcus urinae</i>, and <i>Corynebacterium</i> (urease positive).</p>
<b>Comments</b>	<ul style="list-style-type: none"> <li>Urinary catheter tips should not be cultured and are not acceptable for the diagnosis of a urinary tract infection.</li> <li>Urine cultures must be obtained using appropriate technique, such as clean catch collection or</li> </ul>

Table 1-Urinary Tract Infection Criteria

	<p>catheterization. Specimens from indwelling catheters should be aspirated through the disinfected sampling ports.</p> <ul style="list-style-type: none"> <li>• In infants, urine cultures should be obtained by bladder catheterization or suprapubic aspiration; positive urine cultures from bag specimens are unreliable and should be confirmed by specimens aseptically obtained by catheterization or suprapubic aspiration.</li> <li>• Urine specimens for culture should be processed as soon as possible, preferably within 1 to 2 hours. If urine specimens cannot be processed within 30 minutes of collection, they should be refrigerated, or inoculated into primary isolation medium before transport, or transported in an appropriate urine preservative. Refrigerated specimens should be cultured within 24 hours.</li> <li>• Urine specimen labels should indicate whether or not the patient is symptomatic.</li> <li>• Report secondary bloodstream infection = “Yes” for all cases of Asymptomatic Bacteremic Urinary Tract Infection (ABUTI).</li> <li>• Report <i>Corynebacterium</i> (urease positive) as either <i>Corynebacterium species unspecified</i> (COS) or, as <i>C. urealyticum</i> (CORUR) if so speciated.</li> </ul>
<b>Criterion</b>	<b>Other Urinary Tract Infection (OUTI) (kidney, ureter, bladder, urethra, or tissue surrounding the retroperineal or perinephric space)</b> Other infections of the urinary tract must meet at least 1 of the following criteria:
1	Patient has microorganisms isolated from culture of fluid (other than urine) or tissue from affected site.
2	Patient has an abscess or other evidence of infection seen on direct examination, during a surgical operation, or during a histopathologic examination.
3	Patient has at least 2 of the following signs or symptoms with no other recognized cause: fever (>38°C), localized pain, or localized tenderness at the involved site <i>and</i> at least 1 of the following: <ul style="list-style-type: none"> <li>a. purulent drainage from affected site</li> <li>b. microorganisms cultured from blood that are compatible with suspected site of infection</li> <li>c. radiographic evidence of infection (e.g., abnormal ultrasound, CT scan, magnetic resonance imaging [MRI], or radiolabel scan [gallium, technetium]).</li> </ul>
4	Patient ≤ 1 year of age has at least 1 of the following signs or symptoms with no other recognized cause: fever (>38°C core), hypothermia (<36°C core), apnea, bradycardia, lethargy, or vomiting <i>and</i> at least 1 of the following: <ul style="list-style-type: none"> <li>a. purulent drainage from affected site</li> <li>b. microorganisms cultured from blood that are compatible with suspected site of infection</li> <li>c. radiographic evidence of infection, (e.g., abnormal ultrasound, CT scan, magnetic resonance imaging [MRI], or radiolabel scan [gallium, technetium]).</li> </ul>
<b>Comment</b>	<ul style="list-style-type: none"> <li>• Report infections following circumcision in newborns as SST-CIRC.</li> </ul>



## Identification and Categorization of SUTI Indwelling Catheter Discontinued in Prior 48 Hours

Figure

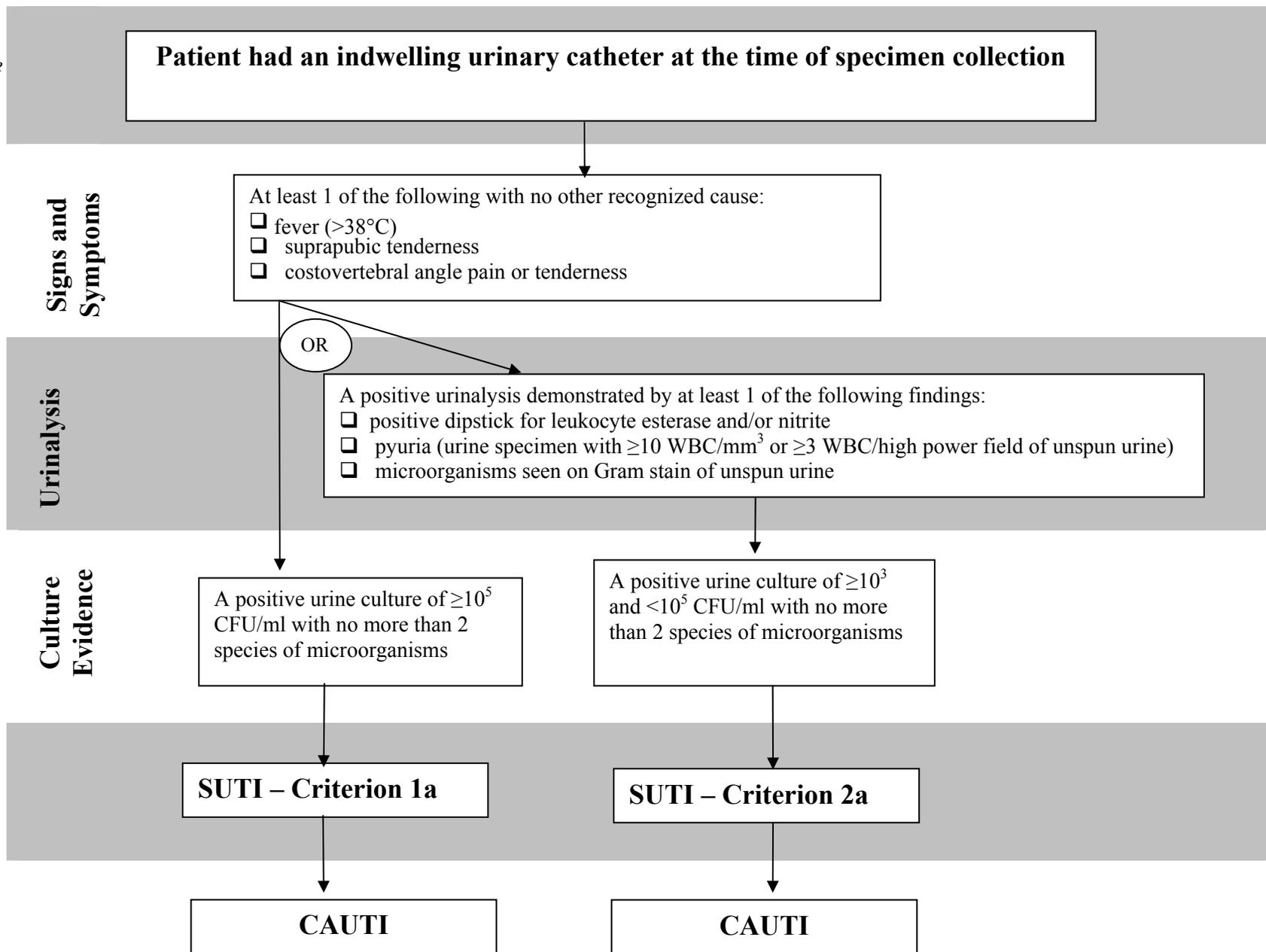
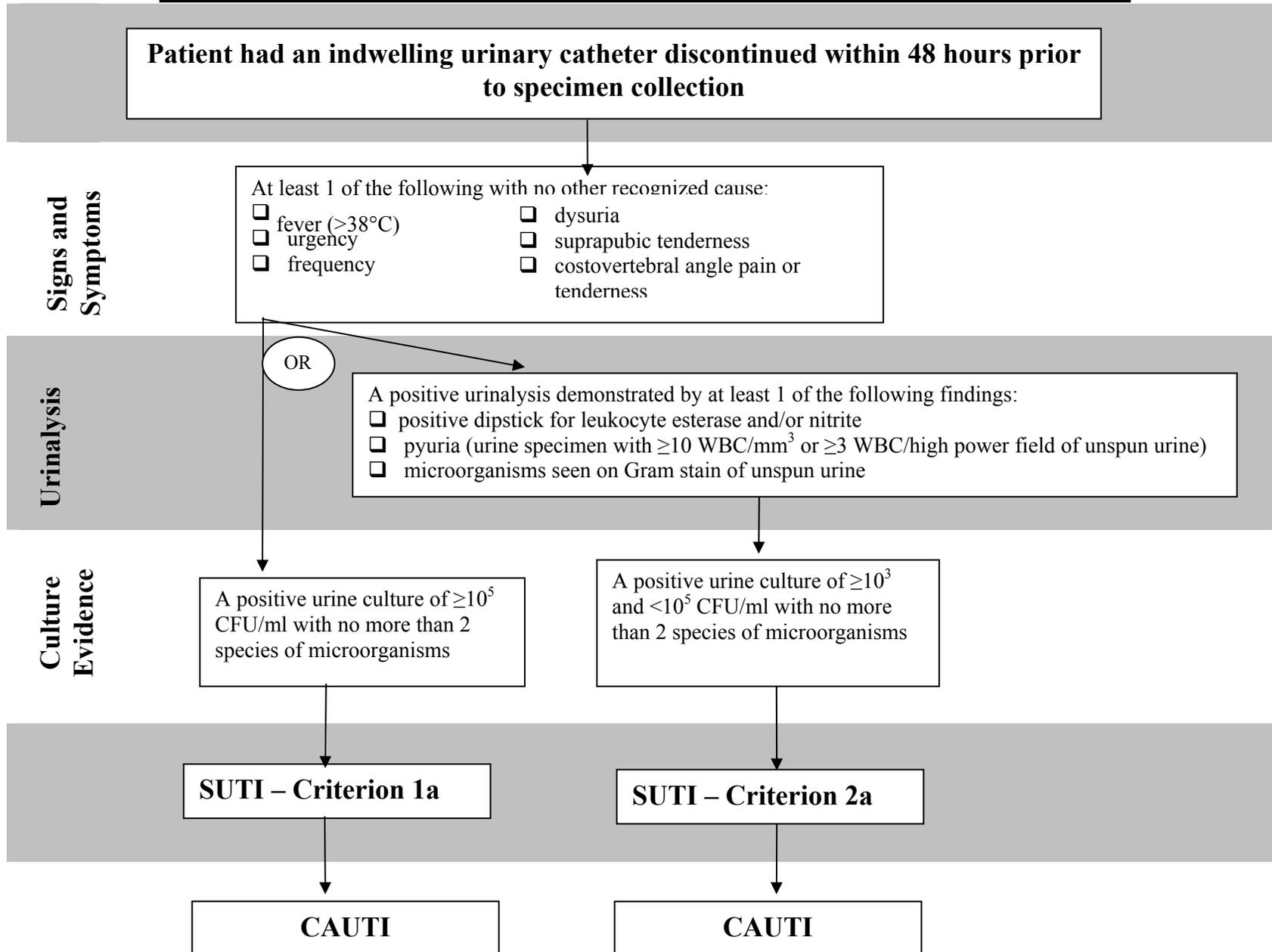


Figure 2.

March, 2009

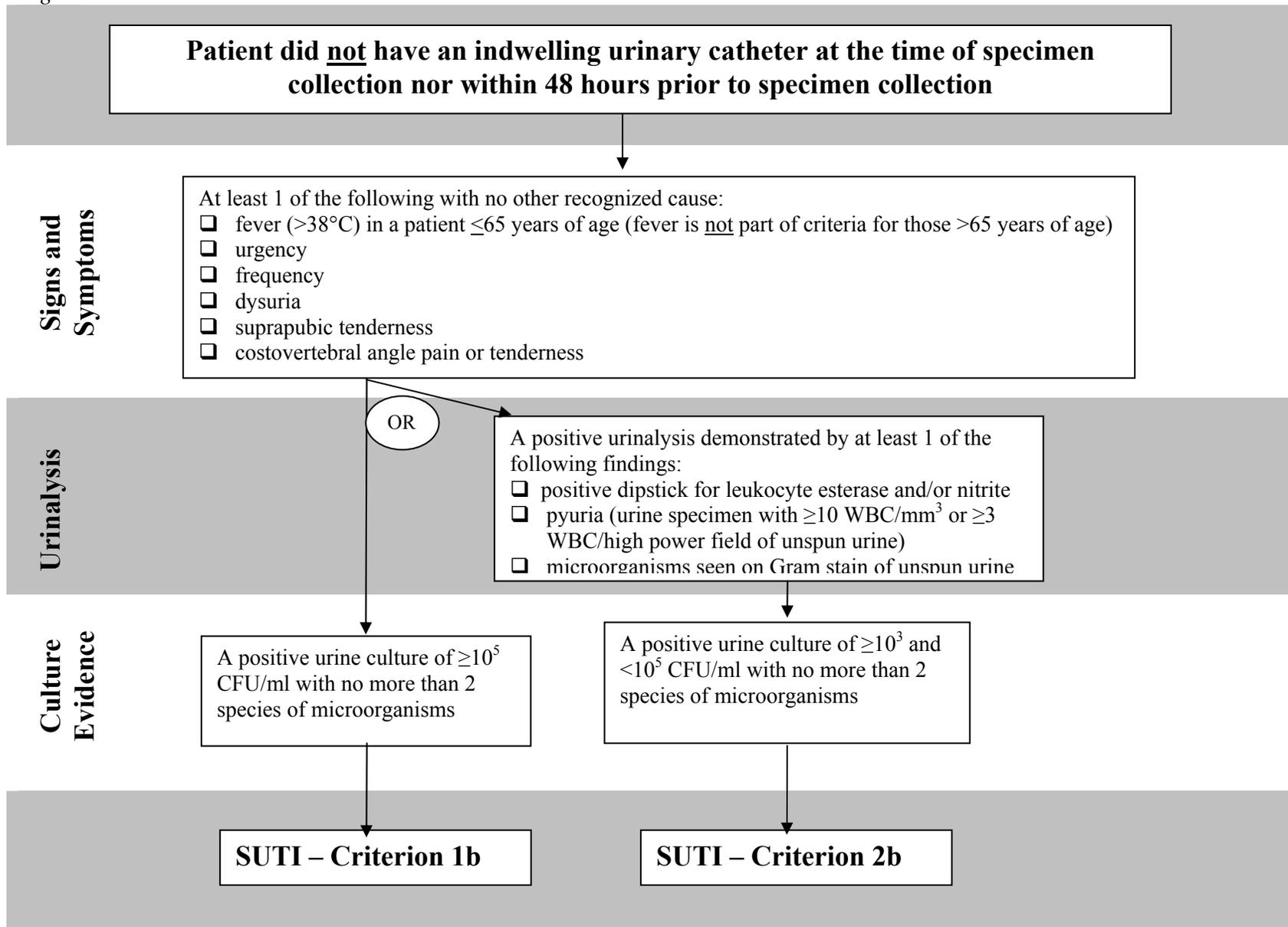
7-7

## Identification and Categorization of SUTI Indwelling Catheter Discontinued in Prior 48 Hours



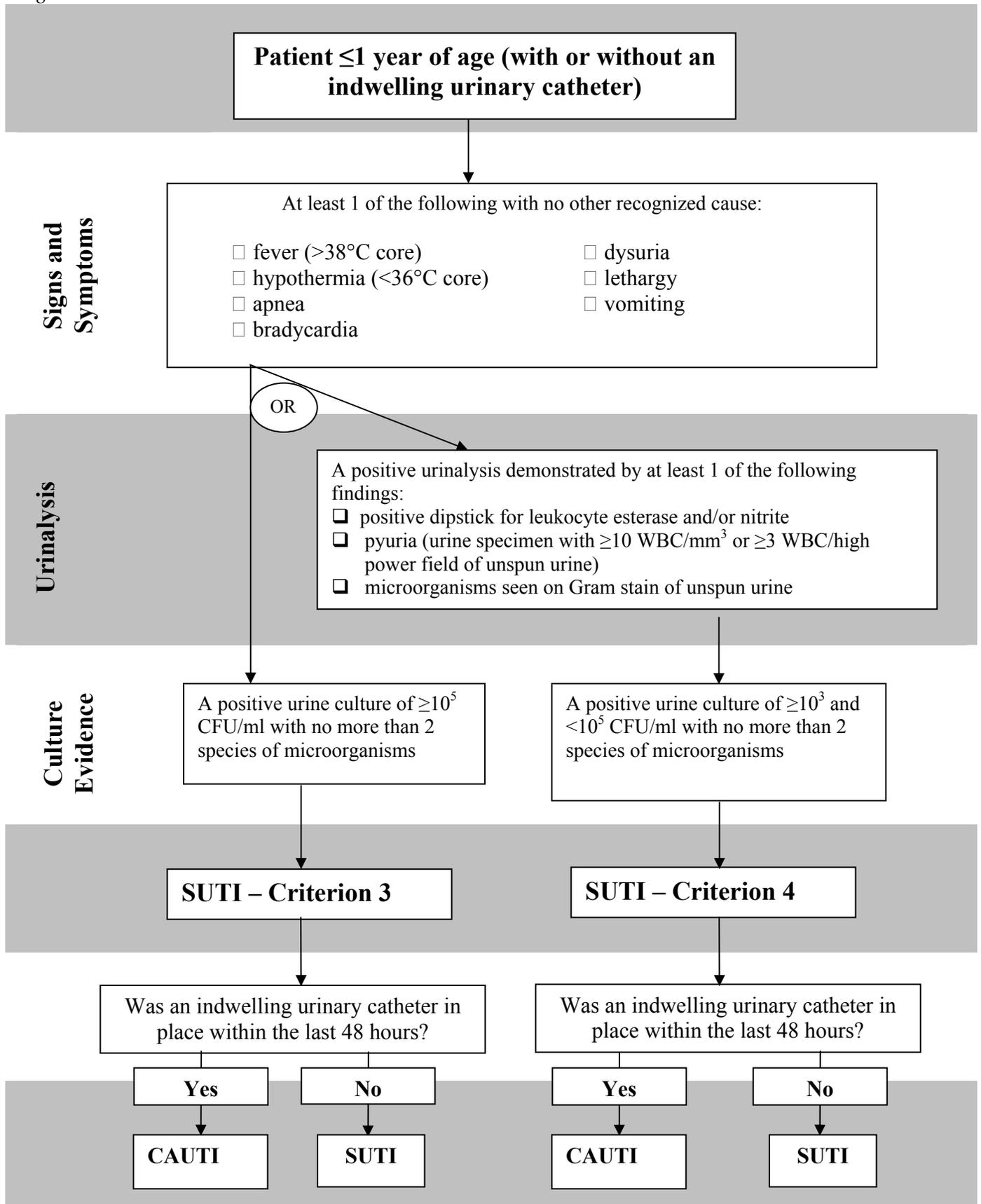
**Identification and Categorization of SUTI Without Indwelling Catheter at Time of or Within 48 Hours Prior to Specimen Collection**

Figure 3.



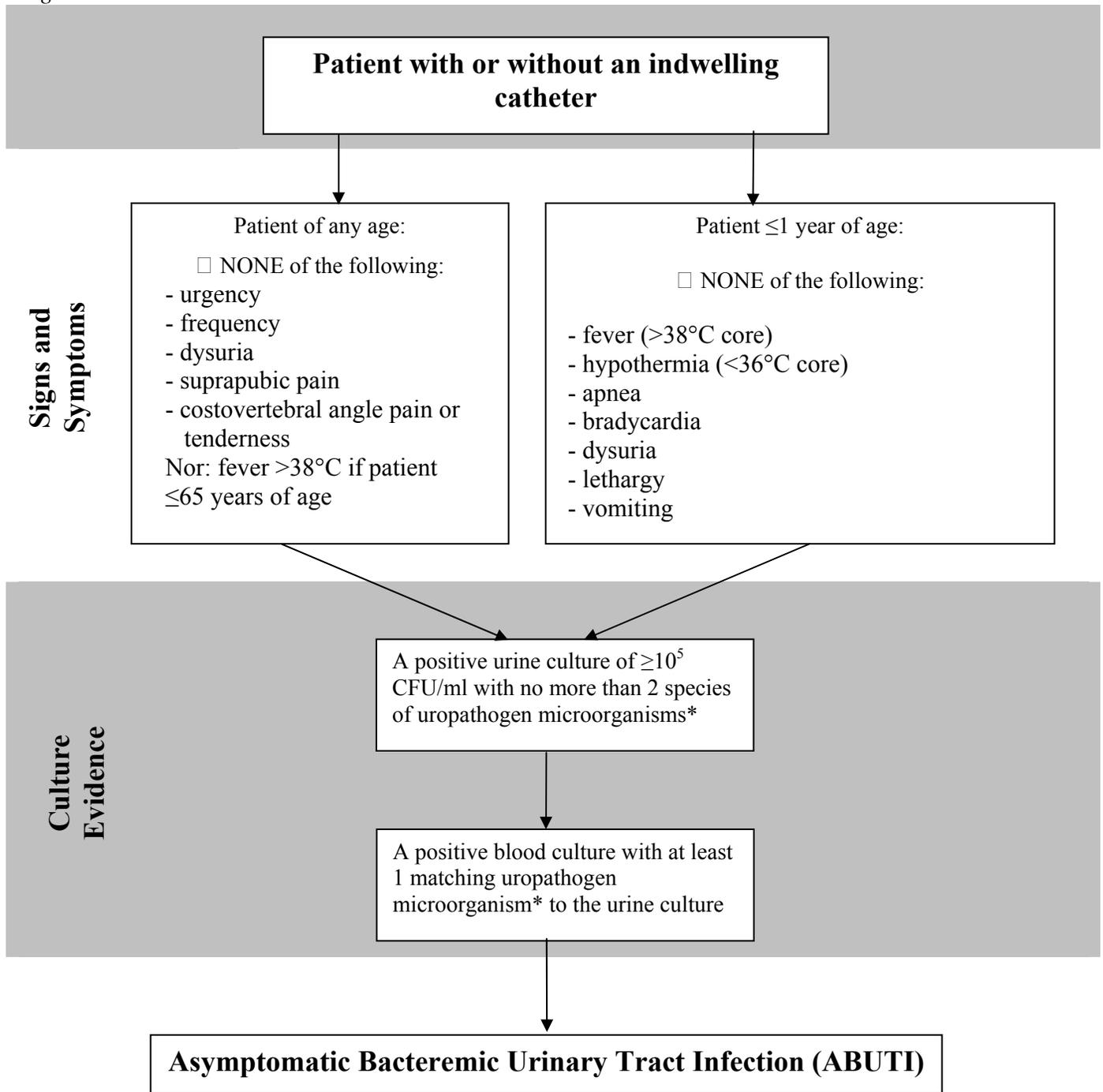
## Identification and Categorization of SUTI in Patient $\leq 1$ Year of Age

Figure 4.



Identification of Asymptomatic Bacteremic Urinary Tract Infection (ABUTI)

Figure 5.



\*Uropathogen microorganisms are: Gram-negative bacilli, *Staphylococcus* spp., yeasts, beta-hemolytic *Streptococcus* spp., *Enterococcus* spp., *G. vaginalis*, *Aerococcus urinae*, *Corynebacterium* (urease positive)<sup>†</sup>.

<sup>†</sup>Report *Corynebacterium* (urease positive) as either *Corynebacterium species unspecified* (COS) or, as *C. urealyticum* (CORUR) if so speciated..