Catheter-Associated Urinary Tract Infection (CAUTI) Event

Introduction: Urinary tract infections (UTIs) are tied with pneumonia as the second most common type of healthcare-associated infection, second only to SSIs. UTIs account for more than 15% of infections reported by acute care hospitals[1]. Virtually all healthcare-associated 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[2]. Each year, more than 13,000 deaths are associated with UTIs.[3]

Prevention of CAUTIs is discussed in the CDC/HICPAC document, *Guideline for Prevention of Catheter-associated Urinary Tract Infection*[4].

Settings: Surveillance will occur in any inpatient locations where denominator data can be collected, which may include critical intensive care units (ICU), specialty care areas (SCA), step down units, and long term care wards. Neonatal ICUs may participate, but only off plan (not as a part of their monthly reporting plan). A complete listing of inpatient locations and instructions for mapping can be found in CDC Locations and Descriptions chapter.

NOTE: It is not required to monitor for CAUTIs after the patient is discharged from the facility. However, if discovered, any CAUTI occurring on the day of discharge or the next day should be reported to NHSN; day of discharge is considered Day 1. No additional indwelling catheter days are reported.

Requirements: Surveillance for HAI 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:

Healthcare-associated infections (HAI): An infection is considered an HAI if all elements of a CDC/NHSN site-specific infection criterion were first present together on or after the 3rd hospital day (day of hospital admission is day 1). For an HAI, an element of the infection criterion may be present during the first 2 hospital days as long as it is also present on or after day 3. All elements used to meet the infection criterion must occur within a timeframe that does not exceed a gap of 1 calendar day between elements.

Urinary tract infections (UTI) are defined using symptomatic urinary tract infection (SUTI) criteria or Asymptomatic Bacteremic UTI (ABUTI) criteria (Table 1 and Figures 1-5).

Date of event: For a UTI the date of event is the date when the last element used to meet the UTI infection criterion occurred. Synonyms: infection date, date of infection.

Indwelling catheter: A drainage tube that is inserted into the urinary bladder through the urethra is left in place, and is connected to a drainage bag (including leg bags), also called a Foley catheter. This does not include suprapubic, condom, or straight in-and-out catheters. This definition includes indwelling urethral catheters that are used for intermittent or continuous irrigation.

Catheter-associated UTI (CAUTI): A UTI where an indwelling urinary catheter was in place for >2 calendar days when all elements of the UTI infection criterion were first present together, with day of device placement being Day 1,
and
an indwelling urinary catheter was in place on the date of event or the day before.

EXAMPLE: A patient has a Foley catheter inserted on an inpatient unit and the following morning the patient meets criteria for a UTI. Because the catheter has not been in place >2 calendar days when all elements of the infection criterion were first present together, this is not a CAUTI.

NOTE:

1. SUTI 1b and 2b and other UTI (OUTI), as defined in the HAI Definitions chapter cannot be catheter-associated.

Location of attribution: The inpatient location where the patient was assigned on the date of the UTI event, which is further defined as the date when the last element used to meet the UTI criterion occurred (see exception below).

EXCEPTION TO LOCATION OF ATTRIBUTION:
Transfer Rule: If all elements of a CAUTI are present within 2 calendar days of transfer from one inpatient location to another in the same facility or a new facility (i.e., on the day of transfer or the next day), the infection is attributed to the transferring location or facility. Receiving facilities should share information about such HAIs with the transferring facility to enable reporting. 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. On the next day, all elements for UTI are first present together. This is reported to NHSN as a CAUTI for the SICU.
- Patient is transferred in the morning to the medical ward from the MSICU after having the Foley catheter removed. Later that night, all elements for a UTI are first present together. This is reported to NHSN as a CAUTI for the MSICU.

- On Monday, patient with a Foley catheter in place is transferred from the medical ward to the coronary care ICU (CCU). Wednesday in the CCU, all elements for UTI are first present together. This is reported to NHSN as a CAUTI for the CCU, as the UTI event date is on the 3rd calendar day after transfer.
- Patient on the urology ward of Hospital A had the Foley catheter removed after it had been in place for 5 days and is discharged home a few hours later. The IP 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 TO TRANSFER RULE:
Locations which do not house patients overnight (e.g., Emergency Department or Operating Room) will have no denominator data, i.e., patient days or catheter days. Therefore, CAUTIs cannot be attributed to these locations. Instead, the CAUTI must be attributed to the next inpatient location in which the patient stays.

Table 1. ***Urinary Tract Infection Criteria***

Criterion	Urinary Tract Infection (UTI)
	Symptomatic UTI (SUTI) Must meet at least 1 of the following criteria:
1a	Patient had an indwelling urinary catheter in place for >2 calendar days, with day of device placement being Day 1, and catheter was in place when all elements of this criterion were first present together. *and* at least 1 of the following signs or symptoms: fever (>38°C); suprapubic tenderness*****; 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. Elements of the criterion must occur within a timeframe that does not exceed a gap of 1 calendar day (see Comments section below). ----------OR---------- Patient had an indwelling urinary catheter in place for >2 calendar days and had it removed the day of or the day before all elements of this criterion were first present together *and* at least 1 of the following signs or symptoms: fever (>38°C); urgency*****; frequency*****; dysuria*****; suprapubic tenderness*****; 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. Elements of the criterion must occur within a timeframe that does not exceed a gap of 1 calendar day (see Comments section below). *****With no other recognized cause
1b	Patient did <u>not</u> have an indwelling urinary catheter in place at the time of or the day before all elements of this criterion were first present together *and* has at least 1 of the following signs or symptoms: fever (>38°C) in a patient that is ≤65 years of age; urgency*****; frequency*****; dysuria*****; suprapubic tenderness*****; costovertebral angle pain or tenderness***** *and* a positive urine culture of $\geq 10^5$ CFU/ml with no more than 2 species of microorganisms. Elements of the criterion must occur within a timeframe that does not exceed a gap of 1 calendar day (see Comments section below). *****With no other recognized cause

Criterion	Urinary Tract Infection (UTI)
2a	Patient had an indwelling urinary catheter in place for >2 calendar days, with day of device placement being Day 1, and catheter was in place when all elements of this criterion were first present together *and* at least 1 of the following signs or symptoms: fever (>38°C); suprapubic tenderness*****; costovertebral angle pain or tenderness***** *and* at least 1 of the following findings: a. positive dipstick for leukocyte esterase and/or nitrite b. pyuria (urine specimen with ≥10 white blood cells [WBC]/mm^3 of unspun urine or >5 WBC/high power field of spun urine) c. microorganisms seen on Gram's 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. Elements of the criterion must occur within a timeframe that does not exceed a gap of 1 calendar day (see Comments section below). ----------OR---------- Patient with an indwelling urinary catheter in place for > 2 calendar days and had it removed the day of or the day before all elements of this criterion were first present together *and* at least 1 of the following signs or symptoms: fever (>38°C); urgency*****; frequency*****; dysuria*****; suprapubic tenderness*****; costovertebral angle pain or tenderness***** *and* at least 1 of the following findings: a. positive dipstick for leukocyte esterase and/or nitrite b. pyuria (urine specimen with ≥10 WBC/mm^3 of unspun urine or >5 WBC/high power field of spun urine c. microorganisms seen on Gram's 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. Elements of the criterion must occur within a timeframe that does not exceed a gap of 1 calendar day (see Comments section below). *****With no other recognized cause

Criterion	Urinary Tract Infection (UTI)
2b	Patient did not have an indwelling urinary catheter in place at the time of, or the day before all elements of this criterion were first present together *and* has at least 1 of the following signs or symptoms: fever (>38°C) in a patient that is ≤65 years of age; urgency*****; frequency*****; dysuria*****; suprapubic tenderness*****; costovertebral angle pain or tenderness* *and* at least 1 of the following findings: a. positive dipstick for leukocyte esterase and/or nitrite b. pyuria (urine specimen with ≥10 WBC/mm^3 of unspun urine or >5 WBC/high power field of spun urine c. microorganisms seen on Gram's stain of unspun urine *and* a positive urine culture of ≥10^3 and <10^5 CFU/ml with no more than 2 species of microorganisms. Elements of the criterion must occur within a timeframe that does not exceed a gap of 1 calendar day (see Comments section below). *****With no other recognized cause
3	Patient ≤1 year of age with****** or without an indwelling urinary catheter has at least 1 of the following signs or symptoms: fever (>38°C core); hypothermia (<36°C core); apnea*****; bradycardia*****; dysuria*****; lethargy*****; vomiting* *and* a positive urine culture of ≥10^5 CFU/ml with no more than 2 species of microorganisms. Elements of the criterion must occur within a timeframe that does not exceed a gap of 1 calendar day (see Comments section below). *****With no other recognized cause ****** Patient had an indwelling urinary catheter in place for >2 calendar days, with day of device placement being Day 1, and catheter was in place when all elements of this criterion were first present together.
4	Patient ≤1 year of age with****** or without an indwelling urinary catheter has at least 1 of the following signs or symptoms: fever (>38°C core); hypothermia (<36°C core); apnea*****; bradycardia*****; dysuria*****; lethargy*****; vomiting***** *and* at least 1 of the following findings: a. positive dipstick for leukocyte esterase and/or nitrite b. pyuria (urine specimen with ≥10 WBC/mm^3 of unspun urine or >5 WBC/high power field of spun urine c. microorganisms seen on Gram's stain of unspun urine *and* a positive urine culture of between ≥10^3 and <10^5 CFU/ml with no more than two species of microorganisms. Elements of the criterion must occur within a timeframe that does not exceed a gap of 1 calendar day (see Comments section

Criterion	Urinary Tract Infection (UTI)
	below). *With no other recognized cause ** Patient had an indwelling urinary catheter in place for >2 calendar days, with day of device placement being Day 1, and catheter was in place when all elements of this criterion were first present together.

Criterion	Asymptomatic Bacteremic Urinary Tract Infection (ABUTI)
	Patient with* or without an indwelling urinary catheter has no signs or symptoms (i.e., for any age patient, no fever (>38°C); urgency; frequency; dysuria; suprapubic tenderness; costovertebral angle pain or tenderness OR for a patient ≤1 year of age; no fever (>38°C core); hypothermia (<36°C core); apnea; bradycardia; dysuria; lethargy; or vomiting) *and* a positive urine culture of $\geq 10^5$ CFU/ml with no more than 2 species of uropathogen microorganisms** (see Comments section below) *and* a positive blood culture with at least 1 matching uropathogen microorganism to the urine culture, or at least 2 matching blood cultures drawn on separate occasions if the matching pathogen is a common skin commensal. Elements of the criterion must occur within a timeframe that does not exceed a gap of 1 calendar day (see Comments section below). *Patient had an indwelling urinary catheter in place for >2 calendar days, with day of device placement being Day 1, and catheter was in place when all elements of this criterion were first present together. **Uropathogen microorganisms are: Gram-negative bacilli, *Staphylococcus spp.*, yeasts, beta-hemolytic *Streptococcus spp*., *Enterococcus spp*., *G. vaginalis*, *Aerococcus urinae*, and *Corynebacterium* (urease positive)[+]. [+]Report *Corynebacterium* (urease positive) as either *Corynebacterium species unspecified (COS*) or as *C. urealyticum* (CORUR) if so speciated. (See complete list of uropathogen microorganisms at http://www.cdc.gov/nhsn/XLS/master-organism-Com-Commensals-Lists.xlsx.)
Comments	• Laboratory cultures reported as "mixed flora" represent at least 2 species of organisms. Therefore an additional organism recovered from the same culture, would represent >2 species of microorganisms. Such a specimen cannot be used to meet the UTI criteria. • Urinary catheter tips should not be cultured and are not acceptable for the diagnosis of a urinary tract infection. • Urine cultures must be obtained using appropriate technique, such as clean catch collection or catheterization. Specimens from indwelling catheters should be aspirated through the disinfected sampling ports. • 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. • 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. • Urine specimen labels should indicate whether or not the patient is symptomatic. • Report secondary bloodstream infection = "Yes" for all cases of Asymptomatic Bacteremic Urinary Tract Infection (ABUTI). • Report only pathogens in both blood and urine specimens for ABUTI. • Report *Corynebacterium* (urease positive) as either *Corynebacterium species* unspecified (COS) or as *C. urealyticum* (CORUR) if speciated.

Figure 1: Identification and Categorization of SUTI with Indwelling Catheter (see comments section page 7-7 thru 7-8 for important details)

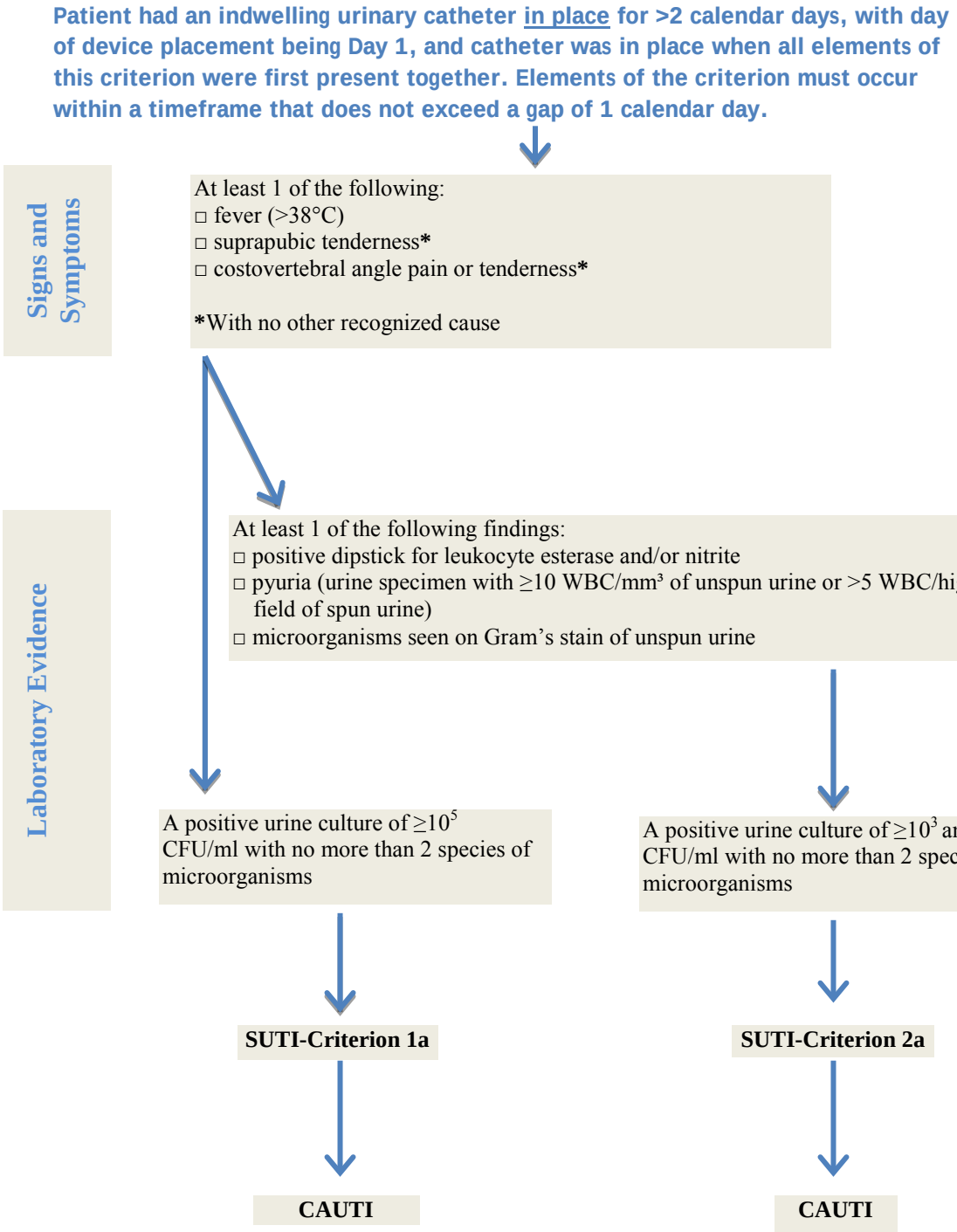


Figure 2: Identification and Categorization of SUTI When Indwelling Catheter has been removed (see comments section page 7-7 thru 7-8 for important details)

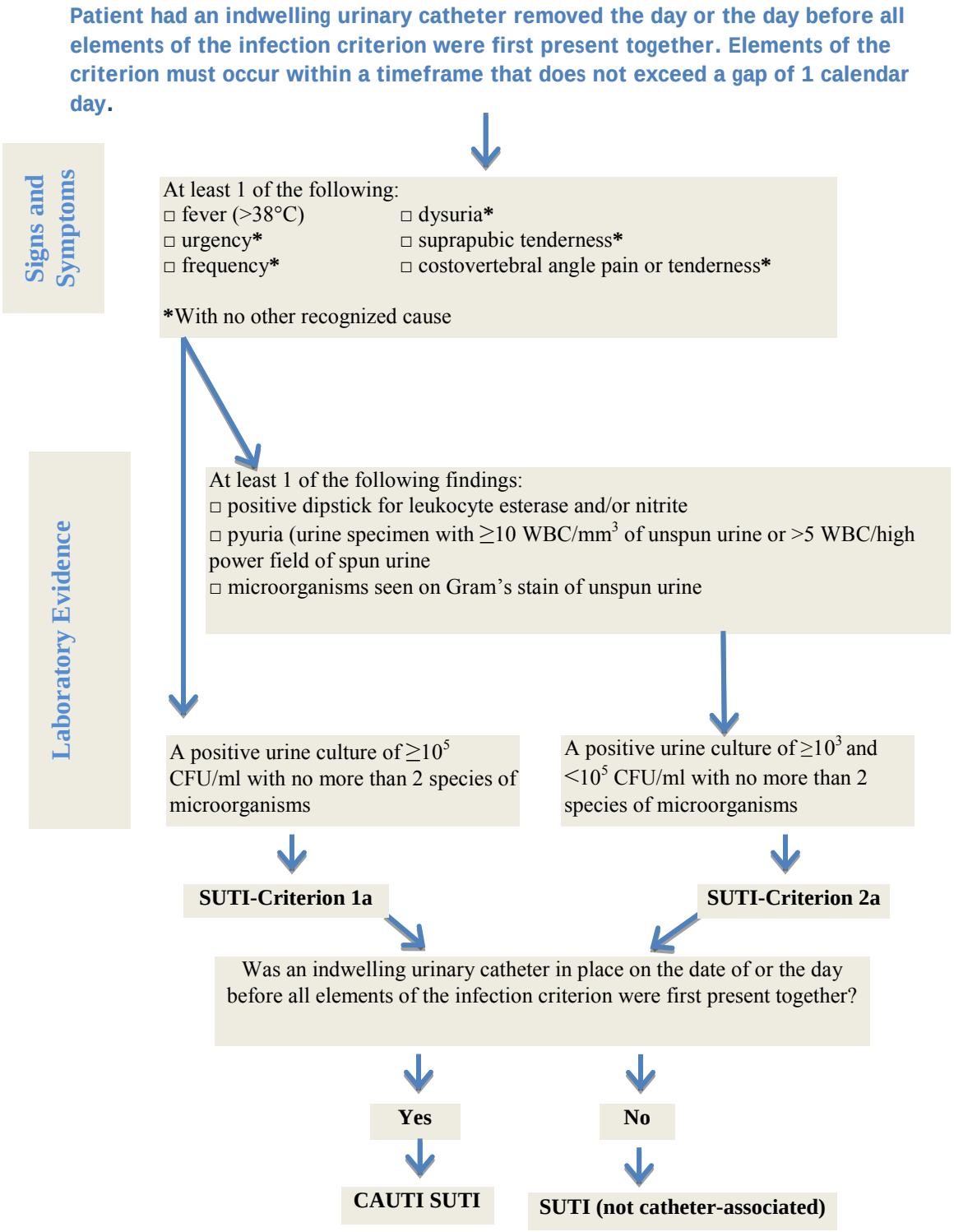


Figure 3: Identification and Categorization of SUTI without Indwelling Catheter (see comments section page 7-7 thru 7-8 for important details)

Patient did not have an indwelling urinary catheter in place at the time of, or the day before all elements of this criterion were first present together. Elements of the criterion must occur within a timeframe that does not exceed a gap of 1 calendar day.

Signs and Symptoms

At least 1 of the following:
□ fever (>38°C) **in a patient that is ≤65 years of age**
□ urgency*
□ frequency*
□ dysuria*
□ suprapubic tenderness*
□ costovertebral angle pain or tenderness*

*With no other recognized cause

Laboratory Evidence

At least 1 of the following findings:
□ positive dipstick for leukocyte esterase and/or nitrite
□ pyuria (urine specimen with ≥10 WBC/mm^3 of unspun urine or >5 WBC/high power field of spun urine)
□ microorganisms seen on Gram's stain of unspun urine

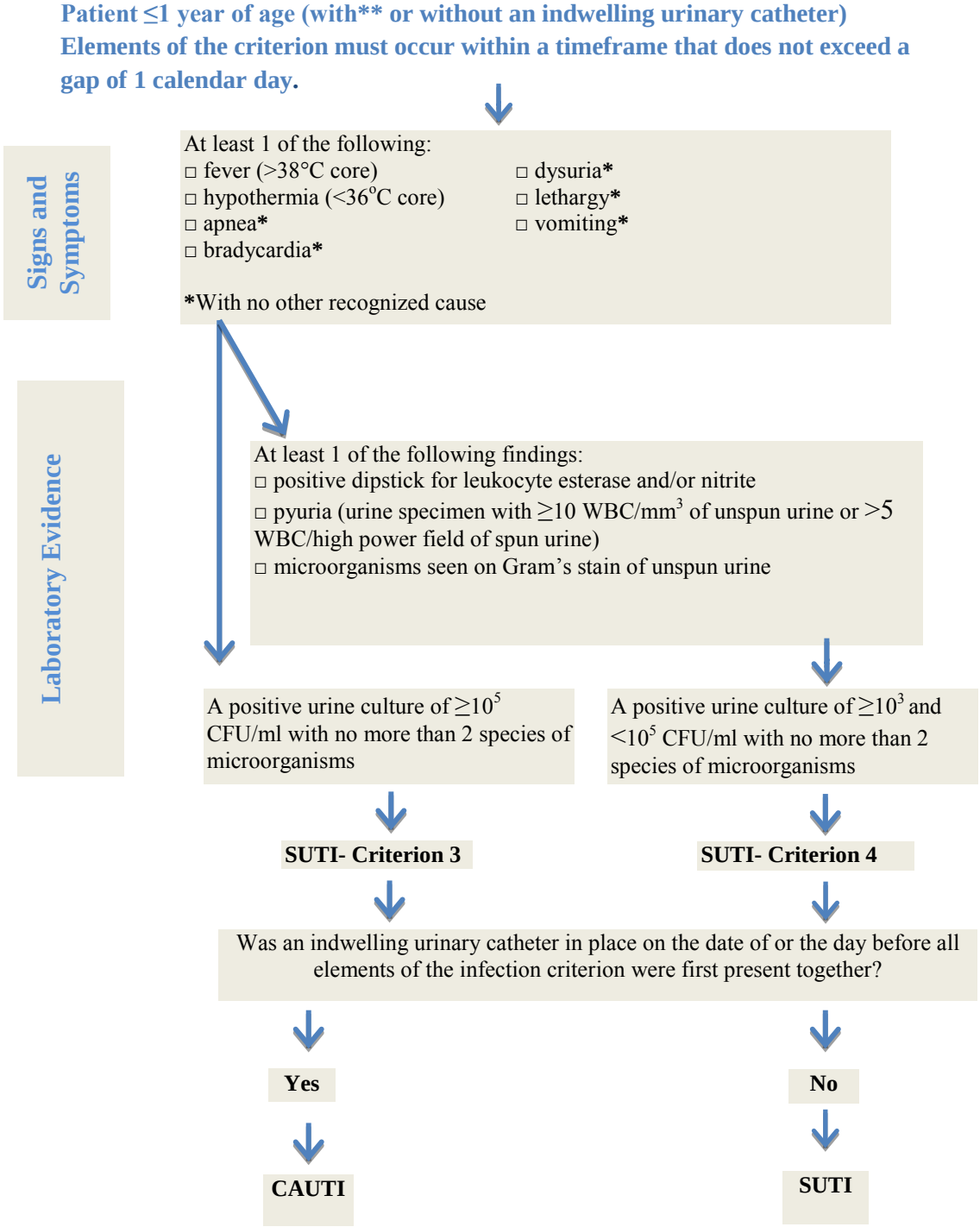
A positive urine culture of ≥10^5 CFU/ml with no more than 2 species of microorganisms

SUTI- Criterion 1b

A positive urine culture of ≥10^3 and <10^5 CFU/ml with no more than 2 species of microorganisms

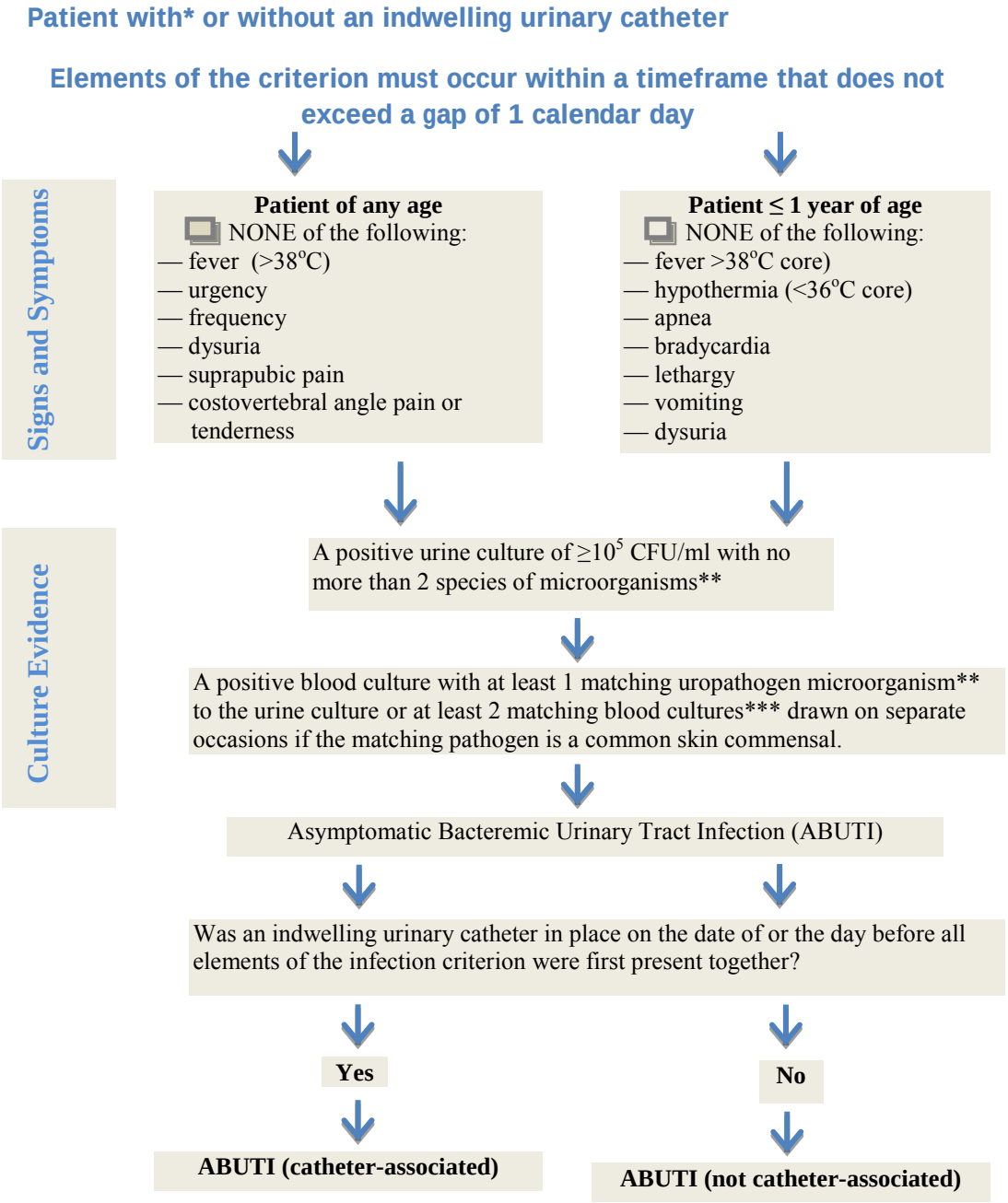
SUTI- Criterion 2b

Figure 4: Identification and Categorization of SUTI in Patient ≤1 Year of Age (see comments section page 7-7 thru 7-8 for important details)



** Patient had an indwelling urinary catheter in place for >2 calendar days, with day of device placement being Day 1, and catheter was in place when all elements of this criterion were first present together.

Figure 5: Identification of Asymptomatic Bacteremic Urinary Tract Infection (ABUTI)
(see comments section page 7-7 thru 7-8 for important details)



* Patient had an indwelling urinary catheter in place for >2 calendar days, with day of device placement being Day 1, and catheter was in place when all elements of this criterion were first present together.

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

Only genus and species identification should be utilized to determine the sameness of organisms (i.e. matching organisms). No additional comparative methods should be used (e.g., morphology or antibiograms) because laboratory testing capabilities and protocols may vary between facilities.

[†]Report *Corynebacterium* (urease positive) as either *Corynebacterium species unspecified* (COS) or as C. *urealyticum (CORUR) if so speciated*.

Numerator Data: The *Urinary Tract Infection (UTI)* form 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 include 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.

REPORTING INSTRUCTIONS:

- If no CAUTIs are identified during the month of surveillance, the Report No Events box must be checked on the appropriate denominator summary screen, e.g., *Denominators for Intensive Care Unit (ICU)/Other Locations (Not NICU or SCA/ONC).*

Denominator Data: Device days and patient days are used for denominators (See Key Terms chapter). 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 57.117 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. When denominator data are available from electronic databases, these sources may be used as long as the counts are not substantially different (+/- 5%) from manually collected counts, validated for a minimum of 3 months.

Data Analyses: The Standardized Infection Ratio (SIR) is calculated by dividing the number of observed infections by the number of expected infections. The number of expected infections, in the context of statistical prediction, is calculated using CAUTI rates from a standard population during a baseline time period, which represents a standard population's CAUTI experience.[5]

NOTE: The SIR will be calculated only if the number of expected HAIs (numExp) is ≥1.

$$\text{SIR} = \frac{\text{Observed (O) HAIs}}{\text{Expected (E) HAIs}}$$

While the CAUTI SIR can be calculated for single locations, the measure also allows you to summarize your data by multiple locations, adjusting for differences in the incidence of infection among the location types. For example, you will be able to obtain one CAUTI SIR adjusting for all locations reported. Similarly, you can obtain one CAUTI SIR for all specialty care areas in your facility.

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.

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[1]Magill SS, Hellinger W, et al. Prevalence of healthcare-associated infections in acute care facilities. Infect Control Hosp Epidemiol. 2012;33:283-91.

[2]Scott Rd. The Direct Medical Costs of Healthcare-Associated Infections in U.S. Hospitals and the Benefits of Prevention, 2009. Division of Healthcare Quality Promotion, National Center for Preparedness, Detection, and Control of Infectious Diseases, Coordinating Center for Infectious Diseases, Centers for Disease Control and Prevention, February 2009.

[3]Klevens RM, Edward JR, et al. Estimating health care-associated infections and deaths in U.S. hospitals, 2002. Public Health Reports 2007;122:160-166.

[4]Gould CV, Umscheid CA, Agarwal RK, Kuntz G, Pegues DA. Guideline for prevention of catheter-associated urinary tract infections 2009. Infect Control Hosp Epidemiol. 2010;31:319-26.

[5]Dudeck MA, Horan TC, Peterson KD, et al. National Healthcare Safety Network (NHSN) report, data summary for 2009, device-associated module, issued January 2011. Am J Infect Control 2011;39:349-67.