



## Major article

## Using electronic medical records to increase the efficiency of catheter-associated urinary tract infection surveillance for National Health and Safety Network reporting

John Shepard MBA, MHA<sup>a,\*</sup>, Eric Hadhazy MS<sup>b</sup>, John Frederick BA<sup>c</sup>, Spencer Nicol BA<sup>d</sup>, Padmaja Gade BS<sup>a</sup>, Andrew Cardon BA<sup>d</sup>, Jorge Wilson BA, MS<sup>a</sup>, Yohan Vetteth BA<sup>a</sup>, Sasha Madison MPH, CIC<sup>e</sup>

<sup>a</sup> Department of Clinical Business Analytics, Stanford Hospital and Clinics, Stanford, CA

<sup>b</sup> Department of Quality, Patient Safety, and Effectiveness, Stanford Hospital and Clinics, Stanford, CA

<sup>c</sup> Department of Hospital Epidemiology, Veterans Administration, New York, NY

<sup>d</sup> Health Catalyst, Salt Lake City, UT

<sup>e</sup> Infection Prevention and Control Department, Stanford Hospital and Clinics, Stanford, CA

### Key Words:

Infection control surveillance  
Electronic surveillance  
Automated surveillance  
CAUTI  
CAUTI surveillance  
Cost reduction

**Background:** Streamlining health care–associated infection surveillance is essential for health care facilities owing to the continuing increases in reporting requirements.

**Methods:** Stanford Hospital, a 583-bed adult tertiary care center, used their electronic medical record (EMR) to develop an electronic algorithm to reduce the time required to conduct catheter-associated urinary tract infection (CAUTI) surveillance in adults. The algorithm provides inclusion and exclusion criteria, using the National Healthcare Safety Network definitions, for patients with a CAUTI. The algorithm was validated by trained infection preventionists through complete chart review for a random sample of cultures collected during the study period, September 1, 2012, to February 28, 2013.

**Results:** During the study period, a total of 6,379 positive urine cultures were identified. The Stanford Hospital electronic CAUTI algorithm identified 6,101 of these positive cultures (95.64%) as not a CAUTI, 191 (2.99%) as a possible CAUTI requiring further validation, and 87 (1.36%) as a definite CAUTI. Overall, use of the algorithm reduced CAUTI surveillance requirements at Stanford Hospital by 97.01%.

**Conclusions:** The electronic algorithm proved effective in increasing the efficiency of CAUTI surveillance. The data suggest that CAUTI surveillance using the National Healthcare Safety Network definitions can be fully automated.

Copyright © 2014 by the Association for Professionals in Infection Control and Epidemiology, Inc. Published by Elsevier Inc. All rights reserved.

State and national mandates require the reporting of select health care–associated infections (HAIs) to the Center of Disease Control and Prevention's (CDC) National Health Safety Network (NHSN).<sup>1–3</sup> Catheter-associated urinary tract infections (CAUTIs) are HAIs reported for both accreditation purposes and regulatory requirements.<sup>4–6</sup> CAUTIs are considered the most common HAI in the United States, associated with increased health care costs and mortality,<sup>7</sup> and identifying CAUTIs is costly and time-consuming for infection prevention departments.<sup>1,6,8–11</sup>

Given the time and costs associated with HAI surveillance, many facilities are looking to their electronic medical record (EMR) to provide a more efficient process. The purpose of this study was to develop an accurate and completely automated electronic algorithm, using our EPIC 2012 EMR, which eliminates the cost of CAUTI surveillance. The primary study outcome was the number of urine cultures in which the electronic algorithm could automatically identify the presence or absence of a CAUTI.

### METHODS

Stanford Hospital, a 583-bed tertiary care center, assigned a multidisciplinary team of front-line providers, infection preventionists, and clinical informaticists to create an automated electronic algorithm and data reporting system to increase the

\* Address correspondence to John Shepard, MBA, MHA, 940 Oakes St, East Palo Alto, CA 94303.

E-mail address: [john@stanfordmed.org](mailto:john@stanfordmed.org) (J. Shepard).

This study was funded through hospital quality improvement initiatives.

Conflict of interest: None to report.

| Stanford Hospital Electronic CAUTI Algorithm Results                |                                   |                  |
|---|-----------------------------------|------------------|
| Electronic Algorithm Ruling   | Number of Positive Urine Cultures | Percent of Total |
| “Not a CAUTI” Urine Cultures  | 6,101                             | 95.64%           |
| “Possible CAUTI” Urine Cultures*                                    | 191                               | 2.99%            |
| “Definite CAUTI” Urine Cultures                                     | 87                                | 1.36%            |
| <b>Total Number of Positive Urine Cultures at Stanford Hospital</b> | <b>6,379</b>                      | <b>100%</b>      |

\*Infection prevention need to complete chart review on the “Possible CAUTI” positive urine cultures only

| Algorithm Ruling      | Algorithm Score Code  | Number of Positive Urine Cultures (% of Total) | Stanford Hospital Electronic CAUTI Algorithm Score Description  |
|-----------------------|-----------------------|--|---|
| <b>Not a CAUTI</b>    | POA                   | 5,328 (83.52%)                                 | The culture was collected in the first 2 days of hospitalization <sup>1</sup> , indicating the culture was present on admission (POA). However, the rules about location of attribution <sup>2</sup> and the transfer rule <sup>3</sup> require that we check that the CAUTI is not associated with a previous admission. A culture in this score implies there was not an inpatient encounter within 1 calendar day prior to the positive urine culture collection or the prior encounter did not have an active Foley catheter for more than 2 calendar days on the final 3 calendar days of the patient’s encounter.   |
|                       | I/2B                  | 459 (7.20%)                                    | The I/2B score identifies positive urine cultures where there was not an active Foley catheter at least 3 out of 4 calendar days prior to the positive urine culture with no gap days. <sup>4</sup>   |
|                       | 0A                    | 68 (1.07%)                                     | Colony forming units (CFU) of positive urine culture was <10 <sup>3</sup> CFU/ml, so it cannot be a CAUTI. <sup>5</sup>   |
|                       | 0B                    | 39 (0.61%)                                     | CFU of positive urine culture was ≥10 <sup>3</sup> and <10 <sup>5</sup> CFU/ml, but the urine culture result comments indicated the presence more than 2 species of microorganisms. Mixed flora cultures cannot be attributed to a CAUTI. <sup>6</sup>  |
|                       | 0C                    | 36 (0.56%)                                     | CFU of positive urine culture was ≥10 <sup>3</sup> and <10 <sup>5</sup> CFU/ml, but the urine culture result comments indicated the presence more than 2 species of microorganisms. Mixed flora cultures cannot be attributed to a CAUTI. <sup>6</sup>  |
|                       | 0D                    | 7 (0.11%)                                      | CFU of positive urine culture was ≥10 <sup>3</sup> and <10 <sup>5</sup> CFU/ml, but there was either: the patient did not have a positive urinalysis (UA); there was not an active Foley catheter for at least 3 out of 4 catheter calendar days with no gap days prior to the collection of a positive UA; or the positive UA was collected more than 5 calendar days from positive urine culture; urine culture collection date being Day 1. Since there was no compliant positive UA, this culture cannot be attributed to a CAUTI. <sup>7</sup>   |
|                       | OE                    | 163 (2.56%)                                    | CFU of positive urine culture was POA, but the patient was discharged from the hospital the day of or the day prior to the positive urine culture collection date. The positive urine culture was ≥10 <sup>3</sup> and <10 <sup>5</sup> CFU/ml, but there was either no positive UA, or UA was not within 2 calendar days of the previous discharge, so event date was not present on admission. <sup>7</sup>   |
|                       | PA                    | 0 (0.00%)                                      | Present on admission with a previous compliant encounter with an active Foley catheter for more than 2 calendar days on the final 3 calendar days of the patient’s encounter, but the CFU of positive urine culture was <10 <sup>3</sup> CFU/ml, so it cannot be a CAUTI. <sup>5</sup>  |
|                       | PB                    | 0 (0.00%)                                      | Present on admission with a previous compliant encounter with an active Foley catheter for more than 2 calendar days on the final 3 calendar days of the patient’s encounter. CFU of positive urine culture was ≥10 <sup>5</sup> CFU/ml, but the urine culture result comments indicated the presence more than 2 species of microorganisms. Mixed flora cultures cannot be attributed to a CAUTI. <sup>6</sup>   |
|                       | PC                    | 0 (0.00%)                                      | Present on admission with a previous compliant encounter with an active Foley catheter for more than 2 calendar days on the final 3 calendar days of the patient’s encounter. CFU of positive urine culture was ≥10 <sup>3</sup> and <10 <sup>5</sup> CFU/ml, but the urine culture result comments indicated the presence more than 2 species of microorganisms. Mixed flora cultures cannot be attributed to a CAUTI. <sup>6</sup>  |
|                       | PD                    | 1 (0.02%)                                      | Present on admission with a previous compliant encounter with an active Foley catheter for more than 2 calendar days on the final 3 calendar days of the patient’s encounter. The positive urine culture ≥10 <sup>3</sup> and <10 <sup>5</sup> CFU/ml, but there was either no positive UA, or positive UA was not collected within 2 calendar days of the previous discharge, so the culture cannot be attributed to a CAUTI. <sup>2,3,7</sup>   |
|                       | <b>Possible CAUTI</b> | Missing  | 6 (0.09%)   |
| Secondary             |                       | 40 (0.63%)                                     | A positive non-urine culture collected with same organism as urine culture within 3 days of the urine culture date. Check for possible secondary infections.  |
| ABUTI                 |                       | 3 (0.05%)                                      | There was a positive blood culture with the same organism as the positive urine culture within 3 calendar day of each other. This is a possible ABUTI given that there is a positive blood culture with same organism. <sup>8</sup>   |
| UTI-1A-1              |                       | 105 (1.65%)                                    | CFU of positive urine culture was ≥10 <sup>5</sup> CFU/ml, but there was : no fever; no active Foley catheter at least 3 out of 4 calendar days prior to the fever with no gap days; or fever was more than 3 calendar days from positive urine culture with the urine culture collection date being Day 1. The culture cannot be attributed to a CAUTI, unless other relevant symptoms are identified. <sup>5</sup>  |
| UTI-P1A-1             |                       | 1 (0.02%)                                      | The positive urine culture was POA, but the patient was discharged from the hospital the day of or the day prior to the positive urine culture collection date. CFU of positive urine culture was ≥10 <sup>5</sup> CFU/ml, but there was either no fever or fever was not within 2 calendar days of the previous discharge date. The culture cannot be attributed to a CAUTI, unless other relevant symptoms are identified. <sup>2,3,5</sup>   |
| UTI-2A-1              |                       | 31 (0.49%)                                     | CFU of positive urine culture was ≥10 <sup>3</sup> and < 10 <sup>5</sup> CFU/ml but there was: no fever; no active catheter at least 3 out of 4 catheter calendar days on or prior to the fever with no gap days; or fever was more than 5 calendar days from positive urine culture with urine culture collection date being Day 1. The culture cannot be attributed to a CAUTI, unless other relevant symptoms are identified. <sup>7</sup>   |
| UTI-P2A-1             |                       | 1 (0.02%)                                      | The positive urine culture was POA, but the patient was discharged from the hospital the day of or the day prior to the positive urine culture collection date. CFU of positive urine culture was ≥10 <sup>3</sup> and < 10 <sup>5</sup> CFU/ml, but there was either no fever or the fever was not within 2 calendar days of the previous discharge date. The culture cannot be attributed to a CAUTI, unless other relevant symptoms are identified. <sup>2,3,7</sup>   |
| UTI-2A-2              |                       | 4 (0.06%)                                      | The positive urine culture was ≥10 <sup>3</sup> and < 10 <sup>5</sup> CFU/ml and there was a: positive UA and fever; an active catheter for at least 3 out of 4 catheter calendar days on or prior to the positive UA and fever collection with no gap days. However either the: UA and fever were not within 5 calendar days of the positive urine culture collection; the urine culture, UA, and fever were not within 5 calendar days of each other; or all 3 event components (urine culture, positive UA, and fever) were within 5 calendar days of each other but had more than a 1 calendar day gap between 2 of the events. So, the culture cannot be attributed to a CAUTI, unless other relevant symptoms are identified. <sup>7</sup>                      |
| <b>Definite CAUTI</b> | UTI-1A                | 53 (0.83%)                                     | The positive urine culture was ≥10 <sup>5</sup> CFU/ml, the patient had a fever, an active catheter at least 3 out of 4 catheter calendar days on or prior to the fever and positive urine culture with no gap days; and the fever was within 3 calendar days of the positive urine culture. This culture is a CAUTI 1A. <sup>5</sup>   |
|                       | UTI-P1A               | 0 (0.00%)                                      | Present on admission with a previous compliant encounter with an active Foley catheter for more than 2 calendar days on the final 3 calendar days of the patient’s encounter. The positive urine culture was ≥10 <sup>5</sup> CFU/ml, the patient had a fever, an active catheter at least 3 out of 4 catheter calendar days on or prior to the fever and positive urine culture with no gap days; and the fever was within 3 calendar days of the positive urine culture. This culture is a CAUTI 1A. <sup>5</sup>   |
|                       | UTI-P2A               | 0 (0.00%)                                      | Present on admission with a previous compliant encounter with an active Foley catheter for more than 2 calendar days on the final 3 calendar days of the patient’s encounter. The positive urine culture was ≥10 <sup>3</sup> and < 10 <sup>5</sup> CFU/ml, there was both a positive UA and fever; the patient had an active catheter at least 3 out of 4 catheter calendar days on or prior to the positive UA and fever and positive urine culture collection with no gap days; the UA and fever were within 5 calendar days of the positive urine culture; all 3 event components (urine culture, positive UA, and fever) were within 5 calendar days of each other; and all 3 event components had at most 1 calendar day gap between any 2 events. <sup>7</sup> |
|                       | UTI-2A                | 34 (0.53%)                                     | The positive urine culture was ≥10 <sup>3</sup> and < 10 <sup>5</sup> CFU/ml, there was both a positive UA and fever; the patient had an active catheter at least 3 out of 4 catheter calendar days on or prior to the positive UA and fever and positive urine culture collection with no gap days; the UA and fever were within 5 calendar days of the positive urine culture; all 3 event components (urine culture, positive UA, and fever) were within 5 calendar days of each other; and all 3 event components had at most 1 calendar day gap between any 2 events. <sup>7</sup>   |

1. Catheter-Associated Urinary Tract Infection (CAUTI) Event, “Definition of healthcare-associated infections” Pg. 1
2. Catheter-Associated Urinary Tract Infection (CAUTI) Event, “Location of Attribution” Pg. 2-3
3. Catheter-Associated Urinary Tract Infection (CAUTI) Event, “Transfer Rule” Pg. 2-3
4. Catheter-Associated Urinary Tract Infection (CAUTI) Event, “Catheter-associated UTI (CAUTI)” Pg. 2
5. Catheter-Associated Urinary Tract Infection (CAUTI) Event, “Catheter-associated UTI (CAUTI)”, Table 1, “Criterion 1A” Pg. 4
6. Catheter-Associated Urinary Tract Infection (CAUTI) Event, “Comments” Pg. 8-Bullet Point 1
7. Catheter-Associated Urinary Tract Infection (CAUTI) Event, “Catheter-associated UTI (CAUTI)”, Table 1, “Criterion 2A” Pg. 5
8. Catheter-Associated Urinary Tract Infection (CAUTI) Event, “Catheter-associated UTI (CAUTI)”, Table 1, “Asymptomatic Bacteremic Urinary Tract Infection (ABUTI)” Pg. 8

Fig 1. Stanford Hospital electronic CAUTI algorithm ruling and code descriptions.

Download English Version:

<https://daneshyari.com/en/article/2637680>

Download Persian Version:

<https://daneshyari.com/article/2637680>

[Daneshyari.com](https://daneshyari.com)