Catheter-Associated Urinary Tract Infections (CAUTIs) and Secondary Hospital-Onset Bloodstream Infections (HO-BSIs)… Only the Tip of the Iceberg?

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Background

HO-BSIs – secondary to urinary tract infections (UTIs) – can result in substantial morbidity and mortality.[1] Further, the Centers for Disease Control and Prevention report that CAUTIs are the leading cause of secondary nosocomial BSIs.[2]

Narrow attention to reportable CAUTIs – a focus on the tip of the iceberg – may underestimate the burden of HO-BSIs that are secondary to other hospital-onset UTIs (HO-UTIs), including those that are not reportable to the National Healthcare Safety Network (NHSN). Strassel found that more than 70% of HO-UTIs may be non-device associated.[3] In addition, the revised 2015 NSHN definition change for CAUTI was found to lead to a significant reduction in CAUTI rates and, in turn, an increase in candidemia and enterococcemia cases classified as CLABSI events.[4]

Objectives

Determine the incidence of Non-Reportable HO-UTI (NR HO-UTI) relative to the incidence of CAUTI. Determine the incidence of secondary HO-BSI in both groups. Examine the likely location of the CAUTI or NR HO-UTI – either the ICU setting or non-ICU setting.

Methods

A retrospective cohort analysis of nosocomial infections from 43 US hospitals was conducted using de-identified, real-world data from an electronic infection surveillance system (EISS – BD HealthSight™ Infection Advisor, Becton Dickinson and Company, Franklin Lakes, NJ). The analytic cohort included adults ≥18 years, without an infection diagnosis, and hospital length of stay ≥2 days, between October 2015 and June 2019.

HO-UTI subjects were defined as those presenting with a non-contaminated positive urine culture on day 3 or later (only the first non-contaminated positive urine culture was evaluated). *Clinically meaningful* HO-UTIs (and CAUTIs), were defined as those with antimicrobials ordered ±2 days of the positive urine culture. CAUTI was defined per the NSHN definition and reported by the hospital. Non-Reportable HO-UTIs (NR HO-UTI) were defined as those HO-UTIs not meeting the CAUTI definition.

Secondary HO-BSIs were defined as non-contaminated, positive blood cultures, with a BSI/Sepsis pathogen,[5] occurring 2 days before or 4 days after the positive urine specimen, requiring an antimicrobial susceptibility test, and presenting with the same pathogen as the urine.

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Results

Of the 674,611 inpatient admissions, 549,433 met the inclusion criteria. The vast majority of CAUTIs (434 of 463; 93.7%), and a substantial portion of NR HO-UTIs (3,177 of 4,730; 67.2%) were *Clinically Meaningful* – see Case Tree.

The relative burden of secondary HO-BSI was greater in patients with CAUTI (7.8%) compared to NR HO-UTI (3.2%). However, the absolute risk of secondary HO-BSI was three-times greater in NR HO-UTI compared to CAUTI (101 cases vs. 34 cases, respectively).

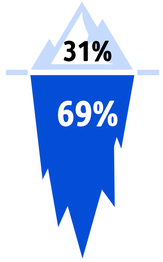
The majority of HO-BSI secondary to CAUTI (55.9%) likely originated in the ICU, while only 30.7% of secondary HO-BSI in NR HO-UTI, likely originated in the intensive care unit (ICU).

Key Observations

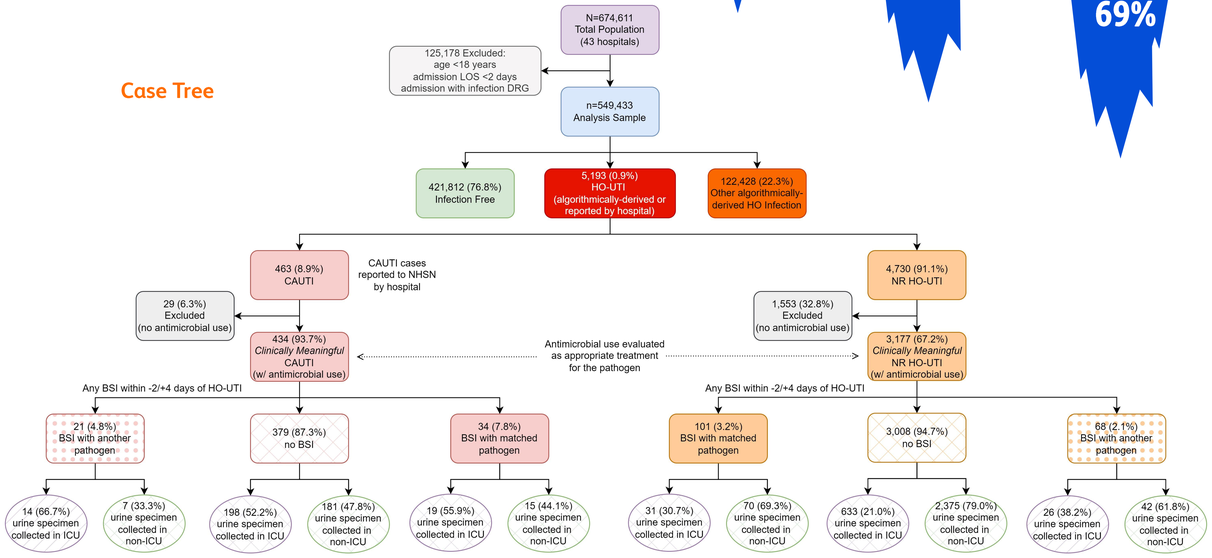
For every reportable CAUTI, there were 7 Non-Reportable Hospital-Onset UTIs

For every BSI, secondary to CAUTI, there were 3 that were secondary to Non-Reportable Hospital-Onset UTIs

For BSIs secondary to Non-Reportable Hospital-Onset UTIs, more than two-thirds occurred in the non-ICU setting



Case Tree



Limitations

The following factors and patient characteristics were not evaluated in this analysis:

- Acuity, co-morbidity level, ICU length of stay, prior history
- Dose and duration of the antimicrobials ordered
- Whether the antimicrobials ordered were actually administered

Other limitations include:

- The *"Clinically Meaningful"* definition selected by the researchers may have underestimated true clinical burden and morbidity
- Based on the criteria employed by the researchers, the preponderance of bloodstream infections with the same pathogen as the HO-UTI were assumed to be secondary to HO-UTI and not causative of the HO-UTI
- The attribution of the urine specimen to the unit where it was collected may not have accurately identified the true physical location of infection

Discussion

The data suggests that evaluating CAUTI alone may underestimate the true burden of *Clinically Meaningful* HO-UTI – all of the iceberg. HO-BSIs are costly ($10,000 to $20,000).[6] HO-BSIs that are related to HO-UTIs have been associated with mortality as high as 32.8%.[7] The highest case fatality rate in that 9-year study of HO-UTI-related bloodstream infections at the University of Michigan – 49.2% – were associated with *Candida sp.*[7] – infections, that by definition, could not be associated with CAUTI.

Conclusions

This retrospective, observational study found the number of *Clinically Meaningful* NR HO-UTIs to be 7-fold higher than the number of CAUTIs. In addition, the absolute burden of secondary HO-BSI was substantially higher in these NR HO-UTIs and more likely to be associated with the non-ICU setting.

References

[1]Patel PK, Greene MT, Rogers MAM, et al. The epidemiology of hospital-acquired urinary tract-related bloodstream infection in veterans. *Am J Infect Control*. 2018;46(7):747-750.

[2]Guideline for Prevention of CAUTI (2009). CDC. https://www.cdc.gov/infectioncontrol/guidelines/cauti/background.html# Page last reviewed: Oct. 16, 2015. Accessed: Sept. 3, 2022.

[3]Strassel PD, Sickbert-Bennett EE, et al. Incidence and risk factors of non-device-associated urinary tract infections in an acute-care hospital. *Infect Cntrl Hosp Epidemiol*. 2019;40(11):1242-1247.

[4]Fakih MG, Groves C, Bufalino A, et al. Definitional change in NHSN CAUTI was associated with an increase in CLABSI events: evaluation of a large health system. *Infect Cntrl Hosp Epidemiol*. 2017;38(06):685-689.

[5]Hospital Toolkit for Adult Sepsis Surveillance. Centers for Disease Control and Prevention. March 2018.

[6]Kilgore M, Brossette S. Cost of bloodstream infections. *American Journal of Infection Control*. 2008;36(10):S172.e1-S172.e3.

[7]Chang R, Greene MT, Chenoweth CE, et al. Epidemiology of hospital-acquired urinary tract–related bloodstream infection at a university hospital. *Infect Cntrl Hosp Epidemiol*. 2011;32(11):1127-1129.