High Incidence of Community-onset Urinary Tract Infections following Hospitalization

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Updated Abstract

Background: Urinary tract infections (UTI) represent a large portion of healthcare-associated infections. Surveillance for healthcare-associated UTI (hUTI) is typically limited to those infections that are hospital onset (HO). The purpose of this study was to assess the potentially unidentified fraction of hUTI that is community-onset (CO).

Methods: We assembled a retrospective cohort of adults hospitalized at Oregon Health & Science University between May 2009 and Dec 2011 who receive primary care in the Department of Family Medicine. Pregnant females, patients with a history of chronic cystitis or pyelonephritis, or patients with an acute UTI diagnosis within 48 hours of admission or the previous 30 days were excluded. UTIs were identified by ICD-9 diagnosis codes. Patients not admitted or diagnosed with a UTI during the index hospitalization were considered at risk for CO-hUTI following discharge. HO-hUTI were identified during the index admission using culture or urinalysis dates to establish time of infection onset as greater than 48 hours post-admission. Cumulative incidence of hUTI was calculated as the proportion of HO-hUTI and CO-hUTI among the total cohort at risk. The proportion of CO-hUTI among all hUTI was calculated to represent the potentially unidentified fraction of hUTI. Uropathogen susceptibilities were also compared (Fisher's exact test).

Results: Among the 3,879 patient admissions in the cohort, 47 (1.2%) had HO-hUTI during the index admission and 65 (1.7%) experienced a CO-hUTI. Of cases of CO-hUTI, 56.9% were diagnosed within 14 days post-discharge. The cumulative incidence of HA-UTI in this cohort was 2.9% (95%CI: 2.4-3.5%). Thus, 65/112 (58.0%) of hUTI were CO and represent the potentially unidentified fraction. *Escherichia coli* was the most frequently isolated pathogen at 39.1% of HO-hUTI and 34.1 % of CO-hUTI. *E. coli* susceptibility to trimethoprim/sulfamethoxazole (88.9 v. 78.6%; p=0.63) and ciprofloxacin (83.3% v. 71.4%; p=0.67) did not differ between HO- and CO-hUTI.

Conclusion: Current surveillance methodologies for healthcare-associated infections are typically limited to the period of hospitalization. This approach may underestimate true hUTI incidence. Further work is needed to confirm the probable CO-hUTI infections as true cases of hUTI.

Background

- UTIs represent a major source of healthcare-associated infections
- Surveillance and epidemiologic studies of healthcare-associated infections are largely limited to infections identified during hospitalization
- Risk of acquiring healthcare-associated infection does not end immediately upon discharge
  - Existing need to quantify and characterize community-onset, healthcare-associated UTI

Objective

To assess the unidentified fraction of potentially healthcare-associated UTI (hUTI) that is community-onset (CO).

Methods

Patient Cohort

- Cohort included adults with primary care provider in Department of Family Medicine hospitalized between May 2009 and December 2011
- Patients with the following ICD-9 diagnosis codes were excluded:
  - Chronic pyelonephritis or cystitis (590.0x, 590.3, 595.1, 595.2, 595.81, 595.82) in the year prior to index admission
  - Acute UTI ICD-9 code (590.1x, 590.8x, 590.9, 595.0, 595.9, 599.0, 996.64) within first 48 hours of admission or 30 days prior to index admission
  - Prenatal visit or ICD-9 code related to pregnancy in the 30 days prior to index admission

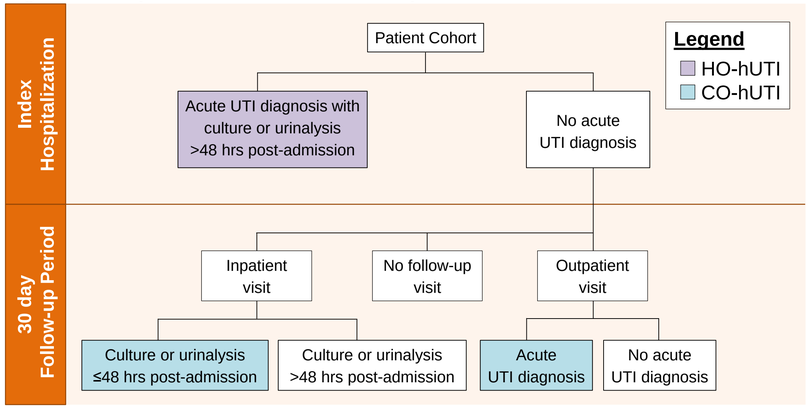
Endpoint Definitions

- HO-hUTI: UTI diagnosed between >48 hours post-admission and hospital discharge based on culture/urinalysis date
- CO-hUTI: Among patients not diagnosed with UTI during index admission
  - Patients with outpatient visit and acute UTI ICD-9 code within 30 days post-discharge or subsequent hospitalization (Figure), or
  - Patients with inpatient visit and acute UTI ICD-9 code within first 48 hours of admission based on culture/urinalysis date (Figure)

Statistical Analysis

- SAS v. 9.2 used for data management and statistical testing
- Fisher's Exact test used to compare uropathogens and antibiotic susceptibilities

Figure. Description of Cohort and Follow-up Period



Results

- Total cohort included 3,879 admissions with 47 (1.2%) HO-hUTI and 65 (1.7%) CO-hUTI; characteristics are shown in Table 1
  - 56.9% of CO-hUTI diagnosed within 14 days post-discharge
- No follow-up visits within 30 days for 688 (18.0%) of 3,832 index admissions at risk for CO-hUTI
- Cumulative incidence of hUTI among the cohort at risk was 2.9% (95%CI: 2.4-3.5%; 112/3879)
  - Unidentified fraction of CO-hUTI was 58.0% (65/112)
- Table 2 displays uropathogens and antibiotic susceptibilities for hUTI visits
  - No difference between HO-hUTI and CO-hUTI in uropathogens isolated or antibiotic susceptibilities

Table 1. Patient characteristics and potential risk factors

Characteristic	HO-hUTI Visits (n=47)	CO-hUTI Visits (n=65)	Total Cohort (n=4,126)
Mean age in years (SD)	60.9 (16.8)	57.0 (17.9)	54.2 (17.0)
Female, (%)	33 (70.2)	47 (72.3)	2312 (56.0)
White only race, (%)	42 (89.4)	56 (86.2)	3576 (86.7)
Non-Hispanic ethnicity, (%)	46 (97.9)	64 (98.5)	3985 (96.6)
Antibiotic exposure during index admission, (%)	47 (100.0)	26 (40.0)	1594 (38.6)
Menopausal female, (%)	22 (66.7)	20 (42.6)	956 (41.4)
Urogenital/recto-anal surgery during index admission, (%)	2 (4.3)	6 (9.2)	269 (6.5)
Sexually transmitted infection in 30 days prior to index admission, (%)	0 (0.0)	1 (1.5)	3 (0.1)
Catheter present during index admission, (%)	26 (55.3)	14 (21.5)	901 (21.8)

Table 2. Uropathogens and antibiotic susceptibilities for hUTI visits

Characteristic	HO-hUTI Visits n (%)	CO-hUTI Visits n (%)	P-Value[a]
Uropathogens			
E. coli	18 (39.1)	16 (34.0)	0.670
Enterococcus spp.	9 (19.6)	10 (21.3)	>0.999
Klebsiella spp.	7 (15.2)	6 (12.8)	0.773
Other gram negative organisms	3 (6.5)	6 (12.8)	0.486
Other gram positive organisms	9 (19.6)	9 (19.2)	>0.999
Antibiotic susceptibilities			
Enterobacteriaceae			
TMP/SMX susceptible	29 (93.6)	23 (79.3)	0.140
Ciprofloxacin susceptible	28 (90.3)	23 (79.3)	0.292
Nitrofurantoin susceptible	25 (80.7)	20 (69.0)	0.376
Other uropathogens			
TMP/SMX susceptible[b]	-	-	-
Ciprofloxacin susceptible	8 (72.7)	8 (66.7)	>0.999
Nitrofurantoin susceptible	8 (80.0)	12 (92.3)	0.560

[a]Fisher's exact test; [b]numbers not reported due to <10 susceptibility tests performed in this group.

Conclusions

- Our data suggest that current surveillance strategies for hUTI may underestimate true rates
  - Infections with onset post-discharge may represent roughly half of all hUTI
- Uropathogens causing infection do not differ significantly in species or antibiotic susceptibilities between hospital onset and community onset infections
  - This supports that uropathogens were all likely acquired in hospital
- Further efforts are needed to verify that UTI with onset post-discharge is hospital associated and identify optimal follow up time frames

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