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Urinary tract infection treatment practices in nursing homes reporting to the National Healthcare Safety Network, 2017

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Abstract

We describe differences between urinary tract infection treatment and events reported by nursing homes enrolled in the National Healthcare Safety Network. In 2017, almost 4 times as many antibiotic starts as infection events were reported, suggesting that opportunities exist for antibiotic stewardship and improvement of urinary tract infection reporting.

Urinary tract infections (UTIs) are a common cause of infections and antibiotic prescribing in nursing home residents.[1,2] Beginning in 2015, nursing homes reporting UTIs to the Centers for Disease Control and Prevention (CDC) National Healthcare Safety Network (NHSN) Long-Term Care Facility (LTCF) Component have been required to report data on UTI treatment.[3] The aim of this analysis was to assess difference between the frequency of reported UTI treatment and events to highlight potential opportunities for improving the diagnosis and treatment of UTIs in nursing home residents.

Methods

Data submitted by nursing homes to the NHSN LTCF Component UTI module in calendar year 2017 were analyzed. For a UTI event to meet surveillance definitions, specific infection and urinary signs and symptoms, in addition to laboratory results, were required.[3] A reporting month was included in the analysis if both UTI event counts and denominator data (number of resident days) were reported for that month. Nursing homes also report total antibiotic starts for UTI each month. The medians and interquartile ranges (IQRs) of months reported per facility were calculated. The total antibiotic starts for UTI and UTI events were reported. The UTI treatment ratio, defined as the total number of new antibiotic starts for UTI divided by the total number of UTI events, was calculated. Because not all facilities reported monthly data for the entire year, a monthly averages for antibiotic starts and UTI events were calculated for each facility. The median and IQR of the facility-level UTI treatment ratio were calculated. For facilities with no reported UTI events in 2017, a denominator of 1 was used to avoid having zero in the denominator. Facility characteristics

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were extracted from the most recent annual facility survey,[4] including the self-reported implementation of CDC Core Elements of Antibiotic Stewardship for Nursing Homes.[5] A descriptive analysis of facility characteristics was conducted among facilities submitting data to the NHSN UTI Module, and these characteristics were compared to those of all US nursing homes.[6] All analyses were conducted using SAS version 9.4 software (SAS Institute, Cary, NC).

Results

In 2017, 298 nursing homes reported UTI data to NHSN. These facilities contributed a total of 2,032 reporting months, with individual facilities reporting a median of 7 months (IQR, 2–12). In total, 8,956 new antibiotic starts for UTI were reported for nursing home residents experiencing 2,269 UTI events meeting the surveillance definitions, with an overall UTI treatment ratio of 4.0. At a facility-level, the monthly average UTI antibiotic starts per month was 2.5, and the monthly average number UTI events was 0.25. The median facility-level treatment ratio was 3.0 (IQR, 1.1–8.0). Notably, 126 facilities (46%) did not report any UTI events in 2017 but reported 1,479 antibiotic starts for UTIs.

The nonprofit and government-owned nursing homes (46%), and smaller facilities (25% with <50 beds) were overrepresented in this cohort compared to the larger US nursing home industry (Table 1).

Discussion

In 2017, nursing homes reported almost 4 times as many antibiotic starts for UTIs in nursing home residents as UTI events meeting surveillance definitions. Treatment of asymptomatic bacteriuria is a common cause of inappropriate antibiotic use in nursing home residents. In one study, among noncatheterized nursing-home residents, 50% of prescriptions for suspected UTI were for residents with no documented UTI symptoms.[7] A point-prevalence survey revealed that among residents who received an antibiotic for treatment of UTI, only 15%–45% had UTI events that met various criteria for initiating antibiotics, depending on the algorithm used.[8] In a cross-sectional chart review in 5 nursing homes in Australia, confusion was the strongest factor associated with antibiotic treatment for suspected UTI.[9] The variability of UTI treatment ratios across facilities also highlights the significant differences in UTI treatment practices across providers in this setting. Brown et al[10] described high variability in urine culture testing practices across 591 nursing homes in Canada. They found that higher urine culturing rates were associated with higher antibiotic use and *Clostridioides difficile* infection rates, even after adjustment for resident characteristics.

This analysis has several limitations. NHSN reporting only captures UTI events meeting surveillance definitions and does not necessarily capture all clinical UTIs for which initiation of empiric antibiotics may be appropriate. Antibiotic therapy is frequently started in the absence of diagnostic testing results in frail older adults. Also, with incomplete documentation of symptoms and variation in culture practices in nursing homes, reported UTI events may underestimate the true number of clinical UTIs. However, facilities can still use these data to identify antibiotic starts for which further evaluation could improve

diagnostic and treatment practices, or where documentation can be improved. The large number of facilities reporting zero UTI events in 2017 also signals likely underreporting of UTI events and opportunities to improve infection event reporting in NHSN. Another limitation is a lack of generalizability of these findings due to the small number of facilities reporting to NHSN. Core element implementation was higher in this nursing home cohort reporting UTI events compared to all facilities enrolled in the NHSN in 2016 (58% vs 42%),[11] which may reflect a selection bias for facilities reporting UTI events to NHSN. The reported mismatch between UTI treatment and events may be higher nationally. Another important difference is that 95% of nursing home in this cohort reported having electronic health records available (Table 1), whereas 49.1% of 927 nursing homes in an analysis by Bjarnadottir et al[12] reported implementing healthcare records. Further evaluation of the use of electronic health records to facilitate and accurately capture surveillance events in nursing homes is needed.

One year of nursing home data revealed many more antibiotic starts than UTI events. The large discrepancy and variation in UTI treatment ratio between facilities suggest that opportunities might exist for improving clinical documentation and infection reporting for UTIs in nursing homes. Further evaluation of measures to track and report infections antibiotic prescribing practices can help inform efforts of antibiotic stewardship programs in nursing homes.

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Table 1.

Facility Characteristics Among Nursing Homes Reporting UTI Events to the National Healthcare Safety Network, 2017[a] Compared to all US Nursing Homes (Select Characteristics)

Characteristic	NHSN Facilities (N=298)	All US Nursing Homes[b] (N=15,640)
Ownership, no. (%) [c]		
Nonprofit	138 (46.5)	3,754 (24.0)
For profit	128 (43.1)	10,917 (69.8)
Government (not VA)	31 (10.4)	970 (6.2)
Affiliation, no. (%)		
Independent	113 (37.9)	
Hospital system	95 (31.9)	
Multi-facility organization	90 (30.2)	
Bed size, no. (%) [c]		
<50	75 (25.3)	2,018 (12.9)
50–99	111 (37.4)	5,771 (36.9)
≥100	111 (37.4)	7,851 (50.2)
% occupancy, median (IQR)[cd]	88.3 (77.3–93.8)	
% short-stay residents, median (IQR)[ef]	16.6 (8.1–30.9)	
Electronic health records available, no. (%)[c]	282 (95.0)	
Catheter utilization ratio, median (IQR)[g]	3.6 (1.7–6.7)	
Average infection prevention staff hours per week, median (IQR)[c]	15.0 (8.0–25.0)	
Core element implementation, median (IQR)[h]	7 (6–7)	
Core element implementation, no. (%)[h]		
0	0 (0.0)	
1	2 (0.7)	
2	2 (0.7)	
3	10 (3.4)	
4	9 (3.0)	
5	38 (12.8)	
6	62 (20.9)	
7	173 (58.4)	

[a] Characteristics in the facility's most recent annual survey (2015=1, 2016=87, 2017=210).

[b] Centers for Medicare & Medicaid Services. *Nursing Home Data Compendium 2015 Edition*.6

[c] 1 facility missing this variable.

[d] Facility percent occupancy = (average daily census/number of beds) ×100.

[e] 33 facilities missing this variable.

[f] Percent short stay residents = (number of skilled nursing residents on a single day/total census on a single day) ×100.

[g] % catheter utilization = (total catheter days/total resident days) ×100.

[h] Core element implementation only analyzed for surveys 2016 or later; 2 facilities missing this variable (one 2015 survey, one did not complete these questions).