Challenges in Assessing Nursing Home Residents with Advanced Dementia for Suspected Urinary Tract Infections

Erika D'Agata, MDM, MPH, Mark B. Loeb, MD,† and Susan L. Mitchell, MD, MPH*‡*

OBJECTIVES: To describe the presentation of suspected urinary tract infections (UTIs) in nursing home (NH) residents with advanced dementia and how they align with minimum criteria to justify antimicrobial initiation.

DESIGN: Twelve-month prospective study.

SETTING: Twenty-five NHs.

PARTICIPANTS: Two hundred sixty-six NH residents with advanced dementia.

MEASUREMENTS: Charts were abstracted monthly for documentation of suspected UTI episodes to determine whether episodes met minimum criteria to initiate antimicrobial therapy according to consensus guidelines.

RESULTS: Seventy-two residents experienced 131 suspected UTI episodes. Presenting symptoms and signs for these episodes are mental status change (44.3%), fever (20.6%), hematuria (6.9%), dysuria (3.8%), costovertebral tenderness (2.3%), urinary frequency (1.5%), rigor (1.5%), urgency (0%), and suprapubic pain (0%). Only 21 (16.0%) episodes met minimal criteria to initiate antimicrobial therapy based on signs and symptoms. Of the 110 episodes that lacked minimum criteria to justify antimicrobial initiation, 82 (74.5%) were treated with antimicrobial therapy. Urinalyses and urine culture results were available for 101 episodes, of which 80 (79.2%) had positive results on both tests. The proportion of episodes with a positive urinalysis and culture was similar for those that met (83.3%) and did not meet (78.3%) minimum criteria ($P = .06$).

CONCLUSION: The symptoms and signs necessary to meet minimum criteria to support antimicrobial initiation for UTIs are frequently absent in NH residents with advanced dementia. Antimicrobial therapy is prescribed for the majority of suspected UTIs that do not meet these minimum criteria. Urine specimens are frequently positive regardless of symptoms. These observations underscore the need to reconsider the diagnosis and the initiation of treatment for suspected UTIs in advanced dementia. **J Am Geriatr Soc 61:62–66, 2013.**

Key words: advanced dementia; urinary tract infection; antimicrobial therapy; criteria

Urinary tract infections (UTIs) are the most common infection diagnosed in nursing homes (NH) residents and account for the majority of antimicrobial prescriptions in this setting,[1–4] but approximately one-third of UTIs in NH residents are misdiagnosed, leading to unnecessary antimicrobial exposure.[5] The diagnosis of a UTI requires the presence of symptoms (e.g., fever, dysuria, frequency), as well as positive findings on urinalyses and urine cultures.[6] Prior work clearly shows that antimicrobial therapy is not warranted for asymptomatic bacteriuria, yet this problem continues to account for the majority of antimicrobial misuse in the NH setting.[6]

More than 5 million Americans have Alzheimer's disease or a related dementia.[7] An increasing proportion of these individuals are surviving to the advanced stage of their disease, the majority of whom are cared for in NHs. Antimicrobial therapy in the NH setting is often started empirically based on the residents' clinical symptoms and signs. The clinical assessment of NH residents with advanced dementia to determine whether they have symptoms of UTI is particularly challenging. These residents, by definition, have minimal to no verbal communication (speech limited to < 5 words).[8] Thus, their ability to express the typical genitourinary symptoms of UTI (e.g., dysuria, costovertebral pain) meaningfully is limited. Moreover, these residents have profound cognitive deficits and urinary incontinence. Thus, mental status changes and urinary frequency is difficult to detect. Despite these challenges, NH residents with advanced dementia are commonly treated with antimicrobial therapy for suspected UTIs.[9] Antimicrobial misuse is particularly troubling in these residents because they are three times as likely

From the *Department of Medicine, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, Massachusetts; †Department of Pathology and Molecular Medicine, McMaster University, Hamilton, Ontario, Canada; and ‡Hebrew Senior Life Institute for Aging Research, Boston, Massachusetts.

Address correspondence to Erika D'Agata, Division Infectious Diseases, Beth Israel Deaconess Medical Center, 110 Francis Street Suite 6A, Boston, MA 02215. E-mail: edagata@bidmc.harvard.edu

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to acquire antimicrobial-resistant bacteria as other residents.[10]

In 2001, the Society for Healthcare Epidemiology of America (SHEA) endorsed minimum clinical criteria to initiate antimicrobial therapy in the general NH population for suspected infections, including UTIs.[11] In 2009, a National Institutes of Health–funded prospective study of infection management in NH home residents with advanced dementia entitled the Study of Pathogen Resistance and Exposure to Antimicrobials in Dementia (SPREAD) was initiated. As part of this study, the SHEA criteria were used to determine whether minimum criteria were met to initiate antimicrobial therapy for suspected UTIs. The objective of this report was to describe the presentation of suspected UTIs in NH residents with advanced dementia and how they align with minimum criteria to justify initiation of antimicrobial therapy. A better understanding of the clinical challenges facing NH practitioners in diagnosing UTIs in these residents is needed to inform strategies aimed at preventing inappropriate antimicrobial use in this vulnerable population.

METHODS

Setting and Subjects

Data were obtained from the ongoing SPREAD. SPREAD's overriding goals are to examine antimicrobial exposure in NH residents with advanced dementia to further understanding of how such exposure contributes to antimicrobial resistance. Results from the first 266 residents recruited for this study are presented in this report. The institutional review board of Hebrew SeniorLife approved the conduct of this study.

From September 2009 through November 2011, residents with advanced dementia were recruited from 25 NHs. Participating NHs had to be within 60 miles of Boston, Massachusetts, and have a minimum of 45 beds. Resident eligibility criteria included aged 65 and older, dementia (any type, determined from the medical record), an available English-speaking proxy to provide informed consent, and a Global Deterioration Scale score of 7 (ascertained in an interview with a nurse caring for the resident).[8] A Global Deterioration Scale score of 7 is characterized by profound memory deficits (unable to recognize family), limited verbal communication (<5 words), incontinence, and inability to ambulate.

Data Collection and Variables

Research nurses collected data analyzed in this report from residents' medical records at baseline and monthly thereafter for up to 12 months. For residents who died during the study period, a medical record review was conducted within 14 days of death. A brief baseline interview with the resident's nurse was conducted to quantify the resident's functional status as measured using the Bedford Alzheimer's Nursing Severity-Subscale (BANS-S) (range 7–28); higher scores indicate more functional disability.[12] Other baseline resident characteristics included age, sex, and race.

At baseline, monthly, and on the death assessment, all suspected UTIs that a nurse, nurse practitioner, physician assistant, or physician documented in the resident's medical record were identified. Documentation required that the provider specifically state that the resident had an infection for which the suspected source was the urinary tract. For each suspected UTI episode, documentation of whether the resident had a Foley catheter; temperature data; and the presence of new dysuria, frequency, urgency, hematuria, costovertebral tenderness, suprapubic pain, change in mental status ("mental status change," " lethargy," or "alteration from cognitive status from baseline"), or rigor was ascertained. Temperature data included highest recorded temperature, source (oral, rectal, axillary), whether the resident had an oral temperature greater than 99°F (>37.2°C) more than once, and whether the resident had a temperature of more than 2°F (>1.1°C) greater than baseline temperature.

Whether urinalyses or urine cultures were obtained was determined, and if so, the results of these tests were ascertained. Urinalyses were considered positive if microscopic analysis showed more than 10,000 white blood cells per liter or if a urine dipstick was positive for white blood cells, leukocyte esterase, or nitrites.[13] A urine culture was considered positive if it grew more than 10^5 colony forming units (cfu) of at least one bacterial organism in residents without a Foley catheter and more than 10^3 cfu of at least one bacterial organism in residents with a Foley catheter.[6,14]

Criteria for Antimicrobial Initiation

Whether the minimum criteria for antimicrobial initiation were present was based on the published SHEA guidelines (Table 1). For residents without Foley catheters, the minimum symptoms or signs were presence of dysuria or fever with at least one of frequency, urgency, hematuria, costovertebral tenderness, suprapubic pain, a mental status change, or rigor.[11] Although mental status and rigor were not included in the original SHEA guidelines for noncatheterized NH residents, it was decided to include them given the inability of residents with advanced dementia to express other symptoms. For residents with an indwelling Foley catheter, minimum symptoms or signs included the presence of at least one of fever, rigor, or change in mental status. For all residents, fever was defined as a single oral temperature greater than 100°F (>37.8°C), repeated (≥ 2) oral temperature greater than 99°F (>37.2°C), or an increase in temperature of more than 2°F (>1.1°C) over baseline temperature.[15] For residents without any localizing findings, UTI was considered only if an alternate infectious source was not identified.

Statistical Analysis

Descriptive statistics were used to describe all resident characteristics and features of suspected UTIs using frequencies for categorical variables and means with standard deviations for continuous variables. Odds ratios (ORs) and 95% and confidence intervals (CIs) were generated to examine the association between laboratory evidence consistent with a diagnosis of UTI (whether urinalysis and culture urine were both positive) and presence of minimum criteria to initiate antimicrobial

Table 1. Minimum Criteria for Initiation of Antimicrobial Therapy Use for Suspected Urinary Tract Infection in Nursing Home (NH) Residents with Advanced Dementia[11]

No indwelling Foley catheter
Acute dysuria or fever (single oral temperature >100°F (>37.8°C), oral temperature >99°F (>37.2°C) ≥2 times, or increase in temperature >2°F (>1.1°C) over baseline temperature) and ≥1 of
New or worse urinary frequency
Urgency
Costovertebral tenderness
Gross hematuria
Suprapubic pain
Mental status change[a]
Rigor[a]
Indwelling Foley catheter ≥1 of
Fever (single oral temperature >100°F (>37.8°C), oral temperature >99°F (>37.2°C) ≥ 2 times, or increase in temperature >2°F (>1.1°C) over baseline temperature)
Rigor
Change in mental status[a]

[a]At the start of this study, mental status change and rigor were added to Society for Healthcare Epidemiology of America endorsed minimum clinical criteria to initiate antimicrobial therapy for suspected urinary tract infections in the general NH population to slightly liberalize these criteria for residents with advanced dementia.

therapy (e.g., clinical evidence suggestive of UTI). All analyses were conducted using Stata 10.0 (Stata Corp., College Station, TX).

RESULTS

Subjects

Subjects included in this report were chosen from the first 700 NH residents who met eligibility criteria for the SPREAD study, of whom 266 (38%) residents were recruited. Proxy refusal was the sole reason for nonparticipation, except for one resident whose physician refused to allow enrollment. Eligible residents who did not participate did not differ from participants with respect to age and sex (data not shown).

Demographic characteristics of the 266 subjects included in this report were mean age ± standard deviation, 86.6 ± 7.4, 85.7% female, and 92.5% white. Mean BANS-S score was 21.8 ± 2.4, indicating severe functional disability.[10] Eleven (4.1%) residents had urinary catheters. At the time of this report, 87 (32.7%) residents had died, and the mean follow-up time for the entire cohort was 221.2 ± 131.8 days.

Characteristics of Suspected Urinary Tract Infections

Seventy-two (27.1%) of 266 residents experienced 131 suspected UTIs during the follow-up period. Ten (13.9%) residents had a urinary catheter. Residents had a mean of two suspected UTI episodes (range 1–9 episodes). Fifteen (11.5%) suspected UTI episodes occurred in residents with a Foley catheter and 116 (88.5%) in residents without.

Characteristics of the 131 episodes are shown in Table 2. Mental status changes were the sole symptom or

Table 2. Characteristics of Suspected Urinary Tract Infection Episodes in Nursing Home Residents with Advanced Dementia

Characteristic	All Episodes, N = 131	Episodes in Residents with a Foley Catheter, n = 15	Episodes in Residents without a Foley Catheter, n = 116
	n (%)		
Symptoms or signs			
Fever	27 (20.6)	5 (33.3)	22 (19.0)
Dysuria	5 (3.8)	1 (6.7)	4 (3.4)
Frequency	2 (1.5)	0 (0)	2 (1.7)
Urgency	0 (0)	0 (0)	0 (0)
Hematuria	9 (6.9)	3 (13.3)	6 (5.2)
Costovertebral tenderness	3 (2.3)	1 (6.7)	2 (1.7)
Suprapubic pain	0 (0)	0 (0)	0 (0)
Mental status change	58 (44.3)	3 (13.3)	56 (48.3)
Rigors	2 (1.5)	1 (6.7)	1 (.9)
Minimum symptoms and signs to support antimicrobial initiation	21 (16.0)	6 (40.0)	15 (12.9)

sign documented for 47 (35.9%) episodes. Twenty-one (16.0%) episodes met the minimum criteria to initiate antimicrobial therapy based on documented signs or symptoms according to the expanded version of the original SHEA guidelines (mental status changes and rigor included as adjunct symptoms for noncatheterized residents).

Table 2 shows data stratified according to whether the suspected UTIs occurred in residents with and without a Foley catheter. Mental status change was more commonly documented (48.3% vs 13.3%) and fever was less commonly documented (19.0% vs 33.3%) for episodes in noncatheterized than catheterized residents. The proportion of episodes for which the minimum criteria to initiate antimicrobial therapy were met based on symptoms and signs was also lower in noncatheterized residents (12.9% vs 40.0%).

Urinalyses and Urine Cultures

Overall, of 131 suspected UTI episodes, urinalyses and cultures were available for 101 episodes in 52 residents. (Seven residents had a urinary catheter.) Eighty of these episodes (79.2%) were positive for both tests. This percentage was not statistically significantly different between episodes that met (15/18, 83.3%) and did not meet (65/83, 78.3%) minimum symptoms or signs to initiate antimicrobial therapy (OR = 1.3, 95% CI = 0.3–8.2; $P = .6$).

Taken together, only 15 (11.4%) of all 131 suspected UTI episodes in NH residents with advanced dementia had the minimum symptoms or signs and positive laboratory findings to meet the complete diagnostic criteria for a UTI.

Antimicrobial Exposure

One hundred two (77.9%) of all suspected UTIs were treated with antimicrobial therapy. Twelve episodes occurred in nine residents with urinary catheters. Eighty-two of all 102 suspected UTIs (80.4%) lacked minimum criteria to justify antimicrobial initiation. Eighty-two of the 110 episodes that did not meet minimum criteria (74.5%) were treated with antimicrobial therapy (Figure 1).

DISCUSSION

This report demonstrates the difficulties associated with diagnosing UTI in NH residents with advanced dementia and the extent to which antimicrobial therapy is initiated unnecessarily. Even with the liberalized adaption of the SHEA guidelines, 84% of suspected UTIs lacked the minimum clinical criteria to support antimicrobial initiation, yet 74.5% of these episodes were treated with antimicrobial therapy. The usefulness of urinary specimens in diagnosing UTIs in these residents was also questionable, because urinalyses and urine cultures were positive in the vast majority of episodes regardless of whether minimum signs or symptoms were present. These observations underscore the need to reconsider the diagnosis and treatment of UTI in individuals with advanced dementia.

Based on the SHEA criteria, at a minimum, fever or dysuria must be present to support antimicrobial initiation for a suspected UTI.[11] Fever was present in approximately one in five suspected UTI episodes and was thus a helpful objective clinical sign when present, but older adults with known infections sometimes do not have a fever.[15] Given that they cannot reliably express dysuria, strict application of the SHEA criteria would require the presence of fever plus another symptom or sign, but the usefulness of adjunctive symptoms such as urgency, costovertebral tenderness, and suprapubic pain is also limited because they are rarely reported, and the validity of the few instances that they are documented is questionable given that the resident were effectively mute.[8,16] Mental status changes were the most common documented symptom associated with a suspected UTI, but reliance on mental status changes as supportive evidence for a UTI,[17] may be valid

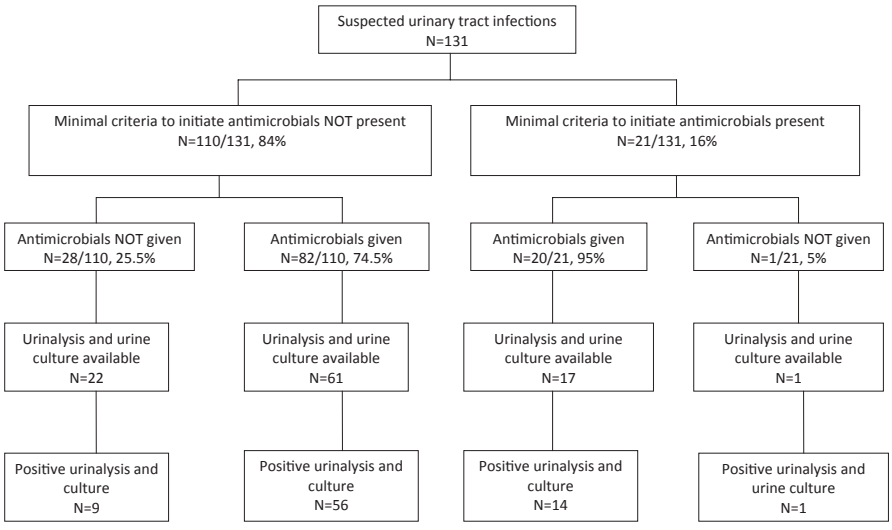

Figure 1. Flowchart for episodes of suspected urinary tract infections (n = 131) in nursing home residents with advanced dementia (N = 266) showing whether minimum criteria to initiate antimicrobial therapy were met based on symptoms and signs, whether the episode was treated with antimicrobial therapy, and results of urine tests in episodes for which urine specimens were available.

but is problematic. Individuals with advanced dementia have such profound cognitive deficits at baseline that a mental change is challenging to detect and is often transient. Moreover, the reason for a mental status change is impossible to discern in the absence of more-specific signs and symptoms.

The original SHEA criteria were developed for the general NH population and did not take into consideration the unique characteristics of residents with profound cognitive impairment who are nonverbal.[8,11] Because dysuria and adjunctive symptoms and signs are also hard to discern, fever alone may be adequate evidence to justify antimicrobial initiation for a suspected UTI, so long as there are no additional symptoms (e.g., new cough) to suggest an alternative source of infection, although if this approach is adopted, diligence to discontinue antimicrobial therapy for a suspected UTI should be enforced as soon as the urinalysis and urine culture results are confirmed negative.[6] If the test results are positive, the healthcare provider must still apply clinical judgment to assess whether the combination of signs or symptoms and positive urine tests reflect a true UTI rather than another etiology for the fever in the presence of asymptomatic bacteriuria.

Finally, treatment decisions for infections in advanced dementia, including UTI, should also incorporate the residents' preferences regarding the goal of their medical care (e.g., comfort only vs life prolongation) as ascertained from their healthcare proxies. The examination and treatment of UTI is potentially burdensome in this frail population near the end of life. Urine specimens often need to be obtained using bladder catheterization, which can be an uncomfortable procedure. Antimicrobial therapy has the potential for interactions with other drugs and adverse effects (e.g., *Clostridium difficile* infection) and can be challenging to administer in these residents, who often have swallowing problems. Thus, for the majority of NH residents with advanced dementia for whom the goal of care is comfort,[18] the potential disadvantages of the examination and treatment of suspected UTI may outweigh the advantages, particularly when the likelihood of a true UTI is low.

There are several limitations of this report that warrant discussion. First, documentation of symptoms and signs in the residents' charts, which may or may not have captured the actual clinical situation, was relied on, but appropriate medical documentation is generally considered a standard of care. Second, the study was limited to NHs in the Boston area and may not be generalizable to other regions.

This study demonstrates that UTIs are commonly suspected in NH residents with advanced dementia but that the great majority of these episodes probably do not reflect a true UTI, resulting in substantial inappropriate antimicrobial exposure. Rates of antimicrobial-resistant bacteria in the NH population are rapidly rising, and residents with advanced dementia are among the subgroups of residents in NH at highest risk of harboring these resistant bacteria.[10,19] From infectious disease and palliative care perspectives, it is imperative to minimize inappropriate treatment of UTIs in individuals with advanced dementia. This report provides insight into future research initiatives for optimizing the criteria required to diagnose a UTI in the unique NH population with advanced dementia and ultimately in decreasing inappropriate antimicrobial use.

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Author Contributions: Drs. D'Agata and Mitchell conceived the study concept and design, acquired subjects and data, analyzed and interpreted the data, and prepared the manuscript. Dr. Loeb assisted in the study design, analyzed and interpreted the data, and prepared the manuscript.

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