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Lack of Positive Association Between Falls and Bacteriuria Plus Pyuria in Older Nursing Home Residents

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To the Editor

Falls are common among older nursing home residents. The 2004 National Nursing Home Survey estimated that 36% of residents had at least one reported fall in the prior six months.¹ Although multiple factors account for these falls, they often prompt empiric antibiotic treatment for urinary tract infection (UTI).² As antimicrobial prescriptions are frequent in nursing homes and inappropriate use fosters the development of antibiotic resistance, it is important to examine the relationship between falls and UTI.³

Previous studies have reported a positive association between falls and UTI in older adults.⁴ The rate of UTI among older adults who fall has been reported to be as high as 18%, making it one of the most commonly associated diagnoses.⁵ However, in these studies, the diagnostic criteria for UTI have not been explicitly defined.^{5,6} The rate of falls among residents with suspected UTI and subsequently confirmed with bacteriuria (>100,000 colony forming units per milliliter) plus pyuria (>10 white blood cells per high power field on urinalysis) has not been systematically examined to date.

In our previously described cohort of non-catheterized nursing home residents with clinically suspected UTI,⁷ we investigated the association of falls with bacteriuria plus pyuria. In this prospective cohort of 551 participants, there were 397 episodes of clinically suspected UTI among 228 residents. Falls were identified by nursing home staff caring for participants at the time of clinically suspected UTI. We examined the longitudinal association of falls with bacteriuria plus pyuria.

Of 397 clinically suspected UTI episodes, 45 falls occurred in 39 participants (34 participants fell once, four participants fell twice, and one participant fell three times). Twelve participants had at least one of the following urinary tract specific signs or symptoms: costovertebral tenderness, suprapubic pain, hematuria, new or increased urinary incontinence, urgency or frequency; thirteen participants had changes in urinary

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Author Contributions:

Theresa Rowe and Manisha Juthani-Mehta were involved in study concept and design, analysis and interpretation of data, and preparation of manuscript. Virginia Towle was involved in acquisition of subjects and/or data and preparation of manuscript. Peter H. Van Ness was involved with analysis and interpretation of data and preparation of manuscript.

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characteristics (i.e., change in urine color or odor); eight participants had change in mental status; and four patients had dysuria.

Table 1 shows a cross-classification of episodes of falls and bacteriuria plus pyuria. Of the 45 fall episodes, nine (20.0%) were cross-classified with bacteriuria plus pyuria. Of the 352 episodes without a fall, 137 (38.9%) were cross-classified with bacteriuria plus pyuria. A Rao-Scott chi-square statistic, adjusting for the nesting of episodes within participants and participants within nursing homes, showed a statistically significant negative association between episodes of falls and bacteriuria plus pyuria ($\chi^2=6.69$, $df=1$, $p=0.01$). However, in a multivariable regression model, using generalized estimating equations approach to account for serial correlation among recurrent episodes of bacteriuria plus pyuria, and controlling for key covariates (i.e., dysuria, fever, and change in mental status), the negative association between falls and bacteriuria plus pyuria lost its statistical significance (results not shown). Of the 45 falls, 22 had urinary dipstick testing performed. Seven were negative to leukocyte esterase and nitrate; all 7 episodes did not have bacteriuria plus pyuria.

In this study, contrary to previously reports,^{4,5} falls were not associated with bacteriuria plus pyuria. Out of the 45 fall episodes, 80% did not have bacteria plus pyuria, suggesting that UTI was unlikely to be associated with the fall. In addition, out of the 22 participants that fell and were evaluated with a urine dipstick, 32% (7 of 22) had a negative test for both leukocyte esterase and nitrate, subsequently with no bacteriuria plus pyuria. Urinary dipstick testing for leukocyte esterase and nitrate has been shown to have a negative predictive value of 100%,⁸ consistent with our current findings. These results suggest that the majority of patients in our cohort suspected of having UTI because of a fall would not have benefited from empiric antibiotics. Although participants in this study were from New Haven area nursing homes only, they are representative of nursing home residents in the United States.⁷

Antibiotic resistance in nursing home residents is increasing and often attributed to over-utilization of antibiotics.⁹ Nursing home residents are particularly susceptible to overuse of antibiotics because of non-specific symptoms associated with infection such as altered mental status or fall. Our results do not support claims for a positive association between falls and UTI. Thus, empiric treatment with antibiotics for fall is not warranted and may contribute to the over-utilization of antimicrobials in nursing homes with negative consequences, including isolation of increasingly drug-resistant bacterial pathogens, adverse drug reactions, and secondary infections due to overgrowth of organisms such as *Clostridium difficile*.

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Table 1

Cross-classification of Falls with Bacteriuria plus Pyuria

	Bacteriuria plus pyuria	No bacteriuria plus pyuria	Total
Fall	9	36	45
No Fall	137	215	352
Total	146	251	397