Controversies in Long Term Care
Clinical Uncertainties in the Approach to Long Term Care Residents With Possible Urinary Tract Infection

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\textbf{A B S T R A C T}

Urinary tract infection (UTI) is arguably the most common infection in the long term care (LTC) setting. Making the diagnosis of UTI and deciding when to initiate treatment with antimicrobial therapy is a challenge to all LTC providers. Widespread prevalence of asymptomatic bacteriuria, lack of an accepted clinical or laboratory gold standard to start antibiotics for UTI, and a high prevalence of cognitive impairment in the LTC population all contribute to this challenge. Several consensus-based criteria for diagnosing UTI have been published, though these vary from each other owing to different intended purposes. The McGee and updated Stone criteria are intended for surveillance and benchmarking purposes. The 2005 Loeb criteria represent minimal criteria for the initiation of antimicrobial therapy. Our review focuses on residents without a urinary catheter. The Loeb criteria should be updated, by inclusion of isolated fever in those with profound cognitive impairment as well as scrotal or prostate swelling tenderness to be consistent with the updated McGee criteria by Stone et al. Urine testing and antimicrobial therapy should not be ordered in those with isolated nonspecific signs or noninfectious symptoms such as fatigue or delirium. Both cavalier urine testing and unnecessary antimicrobial therapy contribute to direct patient harm as well as the rapidly escalating threat of antimicrobial resistance. Observation and monitoring of residents in whom the diagnosis of UTI is unclear is a best practice that should be implemented. Facilities should consider addressing UTI management as part of their quality assurance and performance improvement process.

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There are few clinical problems in long term care (LTC) that prove more controversial than the approach to the resident with suspected urinary tract infection (UTI).\textsuperscript{1,2} UTI are the most common type of infection identified in LTC residents. While we can rest assured that LTC residents have been diagnosed with UTI since opening of the first nursing facilities, no gold standard has emerged for diagnosing UTI in this population. Each clinician is left relying on her or his own clinical judgment to decide whether a UTI is present or absent. To explore this controversy in greater detail, consider the following case which should be familiar to all LTC providers.

\textbf{Case}

Mrs Smith is a 92-year-old female with stage 5 Alzheimer's disease. She resides in a nursing facility because of severe knee arthritis, which has prevented her from walking for the past year. In addition to the arthritis and dementia, she suffers from depression and advanced glaucoma. The nursing home staff contacts the on-call physician 1 weekend after noting the resident's urine is dark and concentrated. The nursing staff also reports the resident is slightly more confused. The resident is afebrile with normal vitals and has no urinary catheter in place. The nursing staff verbalizes a request to "send a urine." The on-call physician complies by ordering a urine analysis and culture. No antibiotic is started. Two days later the primary attending is called with the urine results, having little knowledge of the clinical situation.
surrounding the original test order. The resident has been stable with no fever or urinary symptoms. The urine analysis is remarkable for moderate pyuria and 1+ nitrates. The culture grows greater than 100,000 CFU of a gram negative rod for which an antibiotic is ordered.

At the next quality improvement (QI) meeting, the facility infection control practitioner expresses concern over the rate of UTIs within the facility. In particular, the infection control practitioner notes this case did not meet the McGeer criteria for UTI and feels the resident should not have been treated. One week later, the patient continues to have dark urine but remains stable with no fever or urinary symptoms. The resident's family now requests "a repeat urine to make sure the infection has resolved."

This case highlights several important questions that LTC clinicians confront and for which there is a controversial evidence base.

1. Are there minimal criteria that should be considered prior to initiating antimicrobial treatment for suspected UTI in a LTC resident?
2. Is there a potential for harm when ordering urine tests for LTC residents in the setting of non-specific symptoms?
3. Should clinicians order a urine culture to perform a test of cure?
4. Is withholding an antibiotic in the presence of non-specific symptoms the same as failure to treat?
5. What is the role of the facility's infection control program and the medical director in reducing over-diagnosis and treatment of UTI?

Are There Minimal Criteria That Should Be Considered Prior to Initiating Antimicrobial Treatment for Suspected UTI in a LTC Resident?

Despite being recognized as the most commonly diagnosed infection in LTC settings, there is no universally accepted definition of UTI used for initiating treatment. Several consensus-based definitions of UTI have been promulgated and revised over time to improve their performance.8-11 While differing in the precise criteria applied, all of these definitions require the presence of urinary tract signs and symptoms. Urinary tract signs and symptoms include dysuria, new onset frequency, urgency, incontinence, flank pain/tenderness, suprapubic pain, gross hematuria, or focal tenderness or swelling of the testis, epididymis, or prostate. Recent catheter trauma, obstruction, or purulent drainage around the catheter also provides evidence of localization in the face of systemic infectious illness in addition to the localizing signs and symptoms described above. These consensus definitions have gained wide spread acceptance among infection control experts. In practice, however, many clinicians consider the presence of non-specific symptoms such as fever alone, functional decline, behavioral changes, and mental status changes when diagnosing UTI in older adults.12,13 This is due to wide appreciation that diseases frequently present atypically in frail older adults, particularly those with cognitive impairment.14-17 Unfortunately, non-specific symptoms are just that: non-specific. They can be present in any number of other infectious or noninfectious conditions and, therefore, have low positive predictive value.18 For example, Orr et al estimated UTI to be present in less than 10% of nursing facility residents with positive urine cultures and in whom the only symptom present was fever.19 Boscia et al found no association between malaise, anorexia or fatigue and the presence of bacteriuria.20 Studies exploring the association between mental status changes or delirium and UTI are very limited. Available evidence does not support a clear association of mental status changes or delirium with uncomplicated UTI.21,22 The role of fever and leukocytosis in diagnosing UTI is imprecise in frail older adults. Studies evaluating the association between fever and UTI have not used consistent definitions. In 2 studies looking at hospitalized patients with bactereemic UTI, typical urinary symptoms were absent; however, fever, defined several ways, was present in the vast majority.23,24 Leukocytosis (>11,000 leukocytes/mm3) was also present in the majority of these patients. These studies only evaluated hospitalized patients with bacteremic infections; whether the findings apply to patients with typical non-bacteremic UTI remains to be proven. Patients with significantly advanced cognitive impairment present a challenge in that they may not be able to report any symptoms. In this group of selected patients, the presence of fever, peripheral leukocytosis, or hemodynamic instability alone may be adequate to warrant antimicrobial treatment.25-27 Thus, non-specific symptoms in the absence of urinary symptoms should not be used alone to rule in a UTI, with the possible exception of isolated fever or leukocytosis in patients with significantly advanced cognitive impairment.28,29

A number of investigators have attempted to refine the consensus UTI definitions in the hopes of creating a stronger evidence base and resolving the contentious role of non-specific findings.30-32 Unfortunately, these studies have suffered from a key methodological flaw: the absence of a uniformly applied and accepted UTI definition for case-finding purposes.33 In all of these studies, the outcome definition used was “suspected UTI,” which simply amounts to whatever criteria the clinician decided to use at the time. The McGeer criteria are perhaps the most widely quoted consensus criteria. The McGeer criteria were first composed over 2 decades ago and have recently been updated by Stone and colleagues (Table 1).34-36 Confusion over the role of these criteria exists, and many clinicians are unfamiliar with the criteria.37-39 The role of the McGeer, and now Stone, criteria for UTI are for surveillance purposes, not determining if antimicrobials should be used. Surveillance definitions are designed to be highly specific, so that rates can be reliably benchmarked across facilities. Surveillance criteria are not meant to be highly sensitive and, therefore, may miss cases of disease when truly present. The McGeer and Stone criteria for UTI are, thus, intended to compare rates of UTI within a facility over time and between facilities for benchmarking purposes. These criteria are often determined retrospectively following a full assessment over time. Given their intended purpose, the McGeer criteria should not be considered the standard for minimal criteria for initiating antimicrobial therapy for UTI.

In contrast, clinicians must make treatment decisions in real time, often during a phone contact on the night of disease onset.40-42 Criterions used in this situation must be designed to be applied prospectively. The Loeb criteria for UTI were specifically designed for this purpose (Table 1).43 These criteria were updated in 2005. Building on evidence from randomized controlled trials, observational studies, and qualitative studies, algorithms incorporating minimum criteria for ordering a urine culture and initiating antimicrobial treatment for UTI were developed.44-46 These criteria were supported by a cluster randomized controlled trial of an educational intervention. The trial led to a 31% reduction in prescriptions for UTI without any increase in hospitalizations or mortality.47 Reduction in UTI treatment rates and overall antibiotic use were also found in a separate single facility study using very similar criteria.48 Two Agency for Healthcare Research and Quality funded studies attempting to implement the Loeb criteria were recently conducted.49,50 In a QI study conducted by the American Institutes for Research, antimicrobial utilization for UTI improved in facilities demonstrating adherence to the Loeb criteria.49 A separate study conducted by Abt Associates failed to find an association between the Loeb criteria and antibiotic utilization. However, in the Abt study, adherence to the Loeb criteria was determined by retrospective chart review, was exceptionally low, and was determined only for a subsample of residents in which an antimicrobial was prescribed.51,52
Table 1
Comparison of Criteria for Diagnosing and/or Treating Noncatheter-Related Urinary Tract Infection (UTI) in Long Term Care (LTC) Settings

<table>
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<tr>
<td><strong>Intended Purpose of Criteria</strong></td>
<td><strong>Surveillance and Benchmarking</strong></td>
<td><strong>Minimum Criteria for Ordering a Urine Culture</strong></td>
<td><strong>Minimal Criteria for Initiating Antimicrobials</strong></td>
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<tr>
<td><strong>Criteria</strong></td>
<td><strong>Surveillance and Benchmarking</strong></td>
<td><strong>Fever &gt;37.9°C and 1 or more of the following, order a urine culture:</strong></td>
<td><strong>Positive urine culture (&gt;10^5 CFU/ml) and dysuria, OR</strong></td>
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<td>Residence has at least 3 of the following signs and symptoms:</td>
<td>Both criteria 1 and 2 must be met.</td>
<td>• Fever</td>
<td>Positive urine culture (&gt;10^5 CFU/ml) and 2 or more of the following:</td>
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<tr>
<td>• Fever &gt;38°C or chills</td>
<td>1. At least 1 of the following signs and symptoms:</td>
<td>• Dysuria</td>
<td>• Fever</td>
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<tr>
<td>• New or increased burning pain on urination, frequency, or urgency</td>
<td>a. Dysuria OR acute pain, swelling, tenderness of the testes, epididymis, or prostate</td>
<td>• Urgency</td>
<td>• Urgency</td>
</tr>
<tr>
<td>• New flank or suprapubic pain or tenderness</td>
<td>b. Fever or leukocytosis</td>
<td>• Flank pain</td>
<td>• Flank pain</td>
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<tr>
<td>• Change in character of the urine</td>
<td>AND at least 1 of the following:</td>
<td>• Urinary incontinence</td>
<td>• Urinary incontinence</td>
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<td>• Worsening of mental or functional status</td>
<td>i. CVT OR</td>
<td>• Frequency</td>
<td>• Shaking chills</td>
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<tr>
<td>CVAT, costovertebral angle tenderness.</td>
<td>ii. Suprapubic pain</td>
<td>• Gross hematuria</td>
<td>• Suprapubic pain</td>
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<td><em>Single oral temperature &gt;37.8°C (&gt;100°F) OR repeated oral temperatures &gt;37.2°C (99°F) OR rectal temperatures &gt;37.5°C (99.5°F) OR single temperature &gt;1.1°C (2°F) over baseline from any site.</em></td>
<td>iii. Gross hematuria</td>
<td>• Suprapubic pain</td>
<td>• Shaking chills</td>
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<tr>
<td>Ongoing adherence with the Loeb criteria remains a challenge for facilities and future research is critically needed in this area. Taken together, these studies provide some support, albeit limited, of the feasibility and effectiveness of the Loeb criteria.</td>
<td>iv. New or increased incontinence</td>
<td>• Urinary incontinence</td>
<td>• Frequency</td>
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<td>In the case presented, the clinician should not rely on the Loeb criteria for deciding whether to initiate antimicrobial therapy. The clinician could consider using the Loeb criteria which have been developed for this purpose. The resident in question would not have met the Loeb criteria for either obtaining a urine culture, or initiating antimicrobial therapy once the culture results had returned. The lack of urinary symptoms and stability of this resident’s clinical course over time would argue against the diagnosis of UTI. As always, clinical judgment should be exercised.</td>
<td>v. New or increased frequency</td>
<td>• Gross hematuria</td>
<td>• Suprapubic pain</td>
</tr>
<tr>
<td>Is There a Potential for Harm When Ordering Urine Tests for LTC Residents in the Setting of Nonspecific Symptoms?</td>
<td>2. One of the following:</td>
<td>• New or increased frequency</td>
<td>• If fever &gt;37.9°C but 2 or more symptoms of non-UTI infection, DO NOT ORDER A URINE</td>
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<td></td>
<td>a. &gt;10^5 CFU/ml of no more than 2 organisms in a voided urine</td>
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<tr>
<td></td>
<td>b. &gt;10^5 CFU/ml of any number of organisms in an in/out catheter sample</td>
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Lack of an association is not surprising given the known challenges with incomplete documentation of infections and infectious symptoms in LTC resident charts, and the insufficient power in this study. Ongoing adherence with the Loeb criteria remains a challenge for facilities and future research is critically needed in this area. Taken together, these studies provide some support, albeit limited, of the feasibility and effectiveness of the Loeb criteria.
In interpreting the value of a clinical test, clinicians are trained to consider the pre-test probability of a disease in a given population. The problem in the case of UTI, though, is that while LTC residents are frequently treated for UTI, many of the “infections” identified are actually cases of asymptomatic bacteriuria. Asymptomatic bacteriuria is extremely common among nursing home residents, with prevalence rates of between 15% and 50%. Asymptomatic bacteriuria is simply the presence of bacteria in the urine, regardless of the quantity present, in a person without any symptoms. Studies have consistently documented the futility of antimicrobial therapy in residents with asymptomatic bacteriuria. Thus, there is a high likelihood of obtaining a positive urine analysis or culture in any LTC resident regardless of whether a UTI is present or not. This translates into a very high false positive rate (i.e., low positive predictive value). Urine analyses and urine cultures do not rule in the diagnosis, they can only rule out the diagnosis of UTI when negative.

Unnecessary antimicrobial therapy poses serious threats. Antibiotic use is one of the largest risk factors for having an adverse drug event, many of which may be preventable. In a study of 2 Rhode Island nursing homes, inappropriate antibiotic prescribing for asymptomatic bacteriuria was associated with a 12% incidence of Clostridium difficile colitis within 3 weeks and an 8-fold increased risk of Clostridium difficile colitis within 3 months of treatment. In another study of 234 antibiotic courses for presumed UTI in 5 New Haven nursing homes, adverse outcomes included drug rash as well as Clostridium difficile infection. More importantly, there is the growing crisis of antimicrobial resistance across the healthcare system which threatens to reduce healthcare in the post-antibiotic era. For example, Klebsiella pneumoniae resistance to third-generation cephalosporins has increased by more than 2-fold in LTC residents from 1999–2010, and the rate of carbapenem resistance is rapidly increasing. Antibiotic exposure and poor antibiotic stewardship are major drivers of this growing resistance.

What is alarming is that LTC facilities play a significant part in the spread of antimicrobial resistance to other parts of the healthcare system. Unfortunately, in the setting of uncertainty clinicians tend to overestimate the benefit of treatment for a given person, while simultaneously overlooking the potential for adverse outcomes.

What is clear from the literature is that urine tests drive treatment decisions. If a urine test is ordered, there is a high likelihood the resident will receive antibiotic treatment, regardless of whether a UTI is present or not. In a study that included asymptomatic older adults presenting to the emergency department for reasons unrelated to possible infection, urine cultures were positive in 14%. Seventy-one percent of these asymptomatic, uninfected individuals received antibiotics unnecessarily. Two LTC intervention trials seeking to reduce overtreatment of asymptomatic UTI have been conducted. As a central component, both of these trials incorporated algorithms to reduce unnecessary urine testing with the consideration that urine testing drives overtreatment. Both trials were successful in reducing overtreatment. The first study included information about mortality and hospitalizations and found no negative outcomes resulting from the reduced treatment of UTI.

Thus, by ordering a urine test not only does the clinician gain very little information, she/he also increases the risk of treating asymptomatic bacteriuria, and by extension, increases the risk of adverse drug events, Clostridium difficile infection, and antimicrobial resistance. The risks, then, of obtaining a urine analysis or urine culture are essentially the risks posed by unnecessary antibiotic treatment. Unnecessary urine testing not only can, but does lead to harm. Urine testing should only be performed when there is a reasonable likelihood the resident may have a UTI, as judged by meeting at least minimal criteria for initiating antibiotics.

Should Clinicians Order a Urine Culture to Perform a “Test of Cure”? As noted in the discussion above, there is absolutely no evidence to support the ordering of urine cultures in asymptomatic residents. Current guidelines from the Infectious Disease Society of America strongly recommend against testing of asymptomatic residents, and this is a core message of the AMDA and American Geriatric Society’s Choosing Wisely Campaigns. Repeat urine testing in the case above is never indicated and should not be done.

Is Withholding an Antibiotic in the Presence of Nonspecific Symptoms the Same as Failure to Treat? When contacted regarding a resident’s change in condition, the clinician is generally expected to take some tangible action. In the case presented, the symptoms are nonspecific and do not meet accepted diagnostic or surveillance criteria. The symptoms in this case could easily be due to dehydration, a new medication, acute renal failure, worsening heart failure, depression with reduced oral intake, or any number of other conditions. Likewise, while urine cultures can facilitate choice of the antibiotic agent, their positive predictive value are so low that positive results should not impact decisions to initiate antibiotics. By not formulating a wide differential diagnosis, blindly focusing on the resident’s urine, and initiating potentially unnecessary antimicrobial treatment, the clinician risks misdiagnosis and the potential for adverse drug events, Clostridium difficile infection, and antimicrobial resistance as discussed above.

Owing to the unique nature of the LTC setting, clinicians rarely evaluate residents personally before diagnosing UTI. Remaining options then are to prescribe an antimicrobial agent, or to simply observe and monitor. Clinicians faced with this dilemma frequently opt for antimicrobial therapy citing concerns over missing an infection, delaying treatment, or not meeting a resident’s or family’s expectations. In doing so, clinicians overvalue the benefits of immediate antimicrobial therapy to the patient and undervalue the strong likelihood of negative outcomes. This was elegantly captured in a qualitative study evaluating the use of clinical pathways for UTI management where a facility staff member reported, “we go along with what the family wants most of the time unless not possible or may be dangerous.” This comment poignantly illustrates how adverse drug events, Clostridium difficile, and antimicrobial resistance are frequently not considered likely possibilities in an individual resident.

On the other hand, clinicians may not consider observation and monitoring, or “watchful waiting” as taking action. This cannot be further from the truth. Uncertainty and observation are part of medicine. Watchful waiting is a skilled service and a cornerstone of clinician practice. In a study evaluating the impact of an educational intervention to reduce antimicrobial prescribing, Pettersson et al demonstrated an increase in the rate of observation and monitoring interventions (where antimicrobial therapy was held or delayed) without any increase in hospitalizations. In the case above, the absence of urinary symptoms and the absence of progression of symptoms from initial presentation would suggest that antimicrobial initiation is not warranted. The clinician should support continued monitoring. Such a decision is supported from the experience of multiple randomized controlled trials showing no benefit to treatment of asymptomatic bacteriuria. Facilities should develop and implement observation protocols that include monitoring vital signs, attention to hydration status, repeated physical assessments by nursing home staff, and prompt communication of any changes in condition. Informing residents and family members about
observation protocols can also be reassuring. Figure 1 provides an example of an observation order set clinicians can use to standardize the observation process.

**What Is the Role of the Facility's Infection Control Program and the Medical Director in Reducing Over-Diagnosis and Treatment of UTI?**

Under federal nursing home licensure regulations, all nursing facilities must have an infection control program that “investigates, controls, and prevents infections in the facility.” Moreover, it is expected that the medical director be actively involved in oversight of the program, and that the facility communicates information about infection control to the attending physicians. Since UTI is the most commonly diagnosed infection in LTC settings, and since the prevalence of UTI is one of the publically reported nursing facility quality measures, facilities have a strong incentive to ensure they track and manage UTI appropriately. UTI management should be considered as a quality assurance and performance improvement (QAPI) initiative by all nursing facilities. Appropriate QAPI targets are ones that are prevalent, pose significant safety and liability risks, are associated with significant costs, and have the potential to significantly impact resident quality of life. The role of the medical director in facilitating the QAPI process cannot be overstated, especially given the limited skills and experience of nursing home staff in implementing QI interventions. The medical director should review any unnecessary drug citations. The medical director might also review residents being frequently treated for UTI, collaborate with practitioners and nursing staff to establish minimum criteria for ordering urine diagnostics, communicate findings from the facility’s urinary antibiotic with clinicians, or promote the use of decision support tools such as standardized communication forms for reporting changes in a resident condition (e.g., Situation, Background, Assessment, Response or SBAR forms). The infection control program should track the incidence of UTI within a facility using a standard definition such as the ones described above. It should be understood the definition used for surveillance may differ from that used to initiate antimicrobial therapy. The facility should also track the rate of antimicrobial treatment when minimal criteria for antimicrobial therapy are not met. This information should be shared with the medical director and performance feedback provided to individual clinicians. The medical director should also work with the infection control program to establish continuous training for staff regarding symptoms of UTI and criteria that should be met before consideration is given to urinary testing. Resident and family education are also important. AMDA’s and the American Geriatrics Society’s Choosing Wisely Campaigns are tools that can be used to educate residents, families, as well as staff and physicians. Another potential educational tool specifically designed for LTC is the recently developed Agency for Healthcare Research and Quality pamphlet, *Not All Infections Need Antibiotics*, expected to be released in the near future (personal communication American Institutes for Research to DN, 10/29/2013).

**Conclusions**

Practitioners must rely on consensus based criteria for the diagnosis of UTI. Identifying signs and symptoms localized to the urinary tract is an important though controversial prerequisite to avoiding overtreatment of asymptomatic bacteriuria. For patients with significantly advanced cognitive impairment who cannot reliably report symptoms, presence of fever, leukocytosis, or hemodynamic instability alone may be adequate to justify initiation of antimicrobial therapy. However, the use of other non-specific symptoms such as fatigue or mental status changes alone in diagnosing or treating UTI, especially in the absence of a urinary catheter, is not recommended. The McGee criteria have been designed for surveillance and benchmarking purposes, but meeting these specific criteria should not be a prerequisite for initiation of antimicrobial therapy. Over reliance on urinary tests such as urine analyses and urine cultures leads to unnecessary treatment of asymptomatic bacteriuria as well as adverse drug events. *Clostridium difficile* infection, and antimicrobial resistance and should be avoided. There is no role for ordering urine tests in asymptomatic residents as tests of cure. Observation and monitoring of residents in whom the diagnosis of UTI is unclear is a best practice that allows for further data gathering, can provide reassurance to residents and family members, may optimize antimicrobial therapy, and minimizes the chance of misdiagnosis. Facilities should consider addressing UTI management as part of their QAPI process.

**References**


