

Managing Urinary Tract Infections in the Nursing Home: Myths, Mysteries and Realities

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Abstract

Urinary tract infections (UTIs) are the most common bacterial infections encountered in older adults.¹ Diagnosis, and treatment of UTIs is often challenging in older adults residing in nursing home as clinical manifestations are often atypical. In the elderly, female/male ratio of UTI incidence narrows approaching 2:1. More types of urinary pathogens are isolated from elder patients with UTI compared to their younger counterparts with *E. coli* being the most frequently isolated pathogen. In patients with recurrent infections resistant gram-negative bacteria other than *E. coli* and gram-positive bacteria (e.g. enterococci, coagulase negative staphylococci, and group B streptococci) are more frequently isolated as a result of using antibiotics that are only active against gram negative bacteria. Urine cultures should not be sent if no symptoms, if the outcome is known before hand, or if the clinician is not going to treat. There is no consensus on the duration of antibiotic therapy in nursing home residents with UTI. Most elderly women with uncomplicated lower tract UTI should be treated with antibiotics for 10 days; elderly men are generally treated for 14 days. Abbreviated courses (< 7 days) or treatment for UTI are not recommended for elderly patients because of relatively high rates of failure and relapse. Patients with pyelonephritis or urosepsis should be treated a minimum of 14 days. Intravenous antibiotics may be given if patient is not able to take antibiotics orally because of vomiting for example. There is no need to send urine culture to document clearance of infection after completing the treatment course as long as the patient is asymptomatic.

EPIDEMIOLOGY

The prevalence of UTIs increases in both sexes with age. In the elderly, female/male ratio of UTI incidence narrows approaching 2:1. This is attributed to the fact that elderly men often have bladder outlet obstruction due to benign prostatic hyperplasia. In addition, there is a relative reduction in UTI incidence among elderly women due to decreased sexual activity, which can introduce bacteria into the bladder. Severe UTIs, particularly those complicated by septicemia, become more common with age. Recurrent and complicated infections are also more common in older adults because of the higher frequency of predisposing anatomic and pathophysiologic factors, such as uterine prolapse, urolithiasis, and genitourinary tract malignancies. Catheter associated UTIs are common and carry increased risks of complications and morbidity.

ETIOLOGY

More types of urinary pathogens are isolated from elderly patients with UTI compared to younger patients. *Escherichia coli* (*E. coli*) accounts for about 70% of pathogens of UTI in outpatient elderly females and about 40% in older patients

with indwelling catheters. *Klebsiella pneumoniae* is the second most frequently isolated pathogen. *Proteus* (*P. mirabilis*, *P. vulgaris*, *P. incostans* and *Morganella morganii*) are more common in men than women and more frequently isolated from patients with calculi as they grow best in an alkaline milieu. *Proteus* species, *M. Moraine* and *Prudence* species are commonly isolated from patients who are chronically catheterized. *Serratia*, *Nitrobacteria*, *Acinetobacter*, and *Pseudomonas* species are isolated mainly from patients with nosocomial UTIs.

In patients with recurrent UTIs resistant gram-negative bacteria other than *E. coli* and gram-positive bacteria (e.g. enterococci, coagulase negative staphylococci, and group B streptococci) are more frequently isolated. Enterococcal superinfection often results from frequent use of antibiotics that are inactive against these organisms (e.g. quinolones)

RISK FACTORS FOR UTI IN THE ELDERLY

There are several factors that have been linked to the development of UTI in the elderly (table 1). These include increased age, menopause, and instrumentation of the

urinary tract. Another risk factor that is often overlooked is dehydration. Factors that were found unrelated to the development of UTI include diet, and personal hygiene.

Table 1: Common Risk Factors for UTI in the elderly

- Atrophic urethritis
- Atrophic vaginitis
- Benign prostatic hyperplasia
- Cancer of prostate
- Catheter use
- Genitourinary abnormalities (e.g. vesicorectal fistula)
- Genitourinary calculi
- Renal and perinephric abscess formation
- Urinary diversion procedure (e.g. ileal bladder diversion)
- Urethral stricture

ASYMPTOMATIC BACTERIURIA OR UTI

According to the Association for Practitioners in Infection Control (APIC) and the Society for Healthcare Epidemiology of America (SHEA), a laboratory confirmation of > 100,000 colony-forming units (CFU)/ml is the standard to confirm a positive urine culture. A positive urine culture, however, does not indicate whether a nursing home resident has a UTI or simply bacteriuria (a positive culture without dysuria, urinary frequency, incontinence of recent onset, flank pain, fever, or other signs of infection during the week before a urine sample was obtained).

Asymptomatic bacteriuria is not a UTI and should not be treated unless accompanied by symptoms that suggest a UTI. A diagnosis of UTI versus asymptomatic bacteriuria should be based on the combination of laboratory and clinical findings not the laboratory findings alone. Studies have shown that asymptomatic bacteriuria does not cause increased mortality or chronic genitourinary symptoms such as incontinence.

DIAGNOSING UTI IN THE NURSING HOME

Many patients are asymptomatic. Symptoms that may occur include dysuria, urinary frequency, and incontinence of recent onset, flank pain and fever. Confusion and delirium

are often attributed to a UTI, although without high fever or sepsis, uncomplicated UTI is unlikely to cause significant central nervous system dysfunction.

Diagnosis of symptomatic UTI can be challenging in the elderly. Symptoms like dysuria, urinary frequency, and incontinence of recent onset, flank pain, and fever may not be present. The diagnosis of UTI requires consideration not only of clinical symptoms, but also of co-morbidities. For example, confusion and delirium may indicate a severe UTI, as might a change in appetite and/or agitation. Or an elder with urinary incontinence and a UTI may experience an increase in the number of episodes of incontinence. Some practitioners use the McGeer & MSHD definitions for long term care nosocomial infections to diagnose symptomatic UTI.²

To meet the criteria for a suspected UTI without an indwelling catheter, three of the following must be met:

- Fever (>38 degrees C) or chills
- New or increased burning pain on urination
- New flank or suprapubic pain or tenderness
- Changes in character of urine, and worsening mental function

To meet the criteria for a suspected UTI with an indwelling catheter, two of the following must be met:

- Fever (>38 degree C) or chills
- New flank or suprapubic pain or tenderness
- Changes in character of urine
- Worsening mental function

The diversity of potential pathogens makes it necessary to obtain urine cultures in elderly persons with suspected UTI. When or if to send urine culture is another controversial issue. In general, cultures should not be sent in the absence of symptoms, if the outcome is known before hand, or if the clinician is not going to treat. Surveillance cultures for patients with indwelling catheters are not useful and are not recommended. Asymptomatic bacteriuria can be identified in 95 to 100% of nursing home residents who had indwelling catheters for over 30 days.³ The cost of culture and sensitivity test of the urine is greater than \$100 and this need to be taken into consideration when ordering urine culture

and sensitivity.

Treatment for symptomatic UTI should not be delayed while waiting for culture and sensitivity results. It may be helpful to start empiric treatment based on previous culture and sensitivity results and information of sensitivity pattern in the facility. Bacteriologic diagnosis of UTI is often based on the concept of clinically significant bacteriuria which is usually defined as $> 10^5$ CFU/ml in a clean catch after more than 4 hours of bladder incubation. The urine must be refrigerated if culture and incubation are delayed; however, storage for > 4 hours should be avoided because substantial bacterial replication still occurs, even at cold temperatures.

Dipstick (rapid) tests can help identify bacteruria and can be performed in the facility.

Studies, however, have shown that dipstick analysis is not sensitive enough to diagnose UTI in high-risk patient in whom a missed diagnosis would have a serious consequence.⁴

In addition, dipstick tests do not detect gram positive organisms such as enterococcus. The most widely used dipstick test is the nitrite test, in which the conversion of nitrate to nitrite by bacteria in the urine is demonstrated by color change on a dipstick. The test has a high degree of sensitivity and specificity but does not demonstrate bacteriuria caused by pseudomonas sp, staphylococci or enterococci which are incapable of reducing nitrate to nitrite.

CATHETER ASSOCIATED UTIS

In long-term care facilities, 5 to 15% of residents have chronic urinary catheter in place. Catheters are commonly used for urinary retention, incontinence control, wound management, and patient comfort. Transurethral catheters are more common than suprapubic or condom-type devices, but no method has been proven superior for use in long-term care. The incidence of symptomatic urinary tract infection in chronically catheterized residents has been estimated at 21% per month. When compared with urethral catheterization, most evidence suggests that the suprapubic route is associated with a reduced risk of bacteriuria and improved patient satisfaction this method, however, is associated with a higher degree of mechanical failure and complications.

Intermittent catheterization may be an alternative to indwelling catheter use. This technique is commonly used in the spinal cord injury population who perform self-catheterization at home. In nursing home facilities, most

residents are unable to perform this task independently and would rely on nurses to perform the procedure. The burden on nursing time would prohibit general use of this technique in many facilities and the cost of disposable catheters is also not insignificant.

The frequency at which indwelling catheters should be changed remains virtually unstudied. It is common practice for routine replacement to occur on a monthly basis. The practice may be a result of the increasing rate of mechanical catheter failure after 2 to 4 weeks of use. Only one small randomized controlled study has looked at the frequency of routine catheter change. No reduction in the risk of symptomatic UTI was demonstrated with monthly versus as needed catheter changes. Catheter change at the onset of UTI is also a common practice. This strategy has been shown to hasten clinical improvement, reduce febrile days and decrease the rate of infection relapse.⁵

Catheter-related bacteriuria in the elderly is a frequent complication. Indwelling urinary catheterization causes bacteriuria to occur at a rate of 3 to 10% of patients per day; a single in and out catheterization may cause bacteriuria in as many as 20% of patients. By about 30 days (the conventional cutoff between short and long term catheterization), more patients are bacteriuric. At any given time, an estimated 100,000 nursing home residents have long-term indwelling urinary catheters. Bacteriuria associated with short-term catheterization usually involves a single pathogen, most commonly E. coli; bacteriuria associated with long-term catheterization is often polymicrobial.

Catheter associated UTI are common and carry increased risks of complications and morbidity. Federal regulations mandate that certain criteria be met in order to justify use of an indwelling catheter in long term setting. As noted in the State Operation Manual, an indwelling catheter should only be used "when there is valid medical justification. The resident should be assessed for and provided the care and treatment needed to reach his or her highest level of continence possible. The facility is expected to show evidence of any medical factors which caused the intervention". Many residents are transferred to the nursing home from the acute care hospitals with indwelling catheter. Unlike long term care setting, acute care hospitals do not have to adhere to stringent criteria to justify use of catheter. The results that many nursing home residents who are sent to hospitals return catheterized although they did not leave the facility with a catheter. Although it may have been

appropriate to catheterize the patient briefly while in hospital, in many cases the catheter is inappropriately left in place throughout the hospitalization, increasing the resident's risk to develop UTI. The CDC has published guidelines for prevention of catheter associated urinary tract infections. These are listed in table 2.

Table 2: CDC Guidelines for Prevention of Catheter-Associated Urinary tract Infections

Strongly recommended

- Catheterize only when necessary
- Educate personnel in correct catheter care and insertion techniques
- Insert catheters using sterile equipment aseptic technique
- Secure catheter
- Maintain closed sterile drainage system
- When irrigation is necessary, use intermittent method
- Obtain urine samples aseptically, when indicated
- Maintain unobstructed urine flow

Moderately recommended

- Periodically reeducate personnel in catheter care
- Use smallest bore of catheter possible
- Avoid continuous irrigation
- Refrain from daily meatal care
- Avoid changing catheters at arbitrary intervals

Urine cultures obtained from the lumen of urinary catheters often contain more species than are actually present in the bladder; removal of the catheter and replacement with a new catheter before obtaining cultures are often recommended. Randomly or routinely screening urine is almost guaranteed to detect bacterial presence. However, asymptomatic colonization should not be treated. The use of prophylactic antibiotics to prevent infection is also not recommended. Table 3 lists recommendations from APIC and SHEA regarding initiating treatment for UTI in catheterized

individuals.

Figure 1

Table 3: suggested criteria for initiating treatment of urinary tract infection in catheterized patients

Source	APIC*	SHEA Consensus Panel**
Criteria	2 signs or symptoms	Fever (>37.9 C)
	Fever (>38 C) or chills	New costovertebral tenderness
	New flank or suprapubic pain	Rigors
	Change in urine catheter	Delirium
	Alteration in mental status or function	

*APIC: Association for Parishioners in infection Control
 **SHEA: Society for Healthcare Epidemiology of America

TREATMENT

Asymptomatic bacteriuria generally need not be treated. The organisms (especially E.Coli) often lose their virulence and become susceptible to the bactericidal effect of normal human plasma. Most elderly women with uncomplicated lower tract UTI should be treated with antibiotics for 10 days; elderly men are generally treated for 14 days. Abbreviated courses (< 7 days) or treatment for UTI are not recommended for elderly patients because of relatively high rates of failure and relapse. Patients with pyelonephritis or urosepsis should be treated a minimum of 14 days. Intravenous antibiotics may be given if the patient is not able to take antibiotics orally (e.g. because of vomiting).

There is no consensus on the duration of antibiotic therapy in nursing home residents. Takahashi et al, studied 196 elderly women (22% nursing home residents) and (78% were community dwelling) in Olmsted County Minnesota and found that nursing home residents were more likely to be treated for longer duration than community dwelling elderly. Nearly all nursing home residents were treated for more than 7 days and overall they were 5.1 times more than community subjects to be treated for 10 days or longer, 80 health care providers. The results from this study are shown in table 4.

Figure 2

Table 4: Duration of antibiotic therapy and response to treatment among study subjects⁶

	Nursing Home (n=44)	Community Subjects (n=152)
Duration of initial antibiotic treatment		
3 days	0(0%)	39 (26%)
5 days	1(2%)	17(11%)
7 days	21(48%)	52(34%)
10 days or longer	22(50%)	25(16%)
Response to therapy		
Pretreatment	13 (30%)	21(14%)
Adverse events	5(11%)	2(1%)

Urologic consultation may be sought when obstructive uropathy, calculi, abscesses or GU tract anatomic abnormalities are suspected. After treating a UTI, it is not necessary to document "clearing of the urine by

culture if the resident is asymptomatic.

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